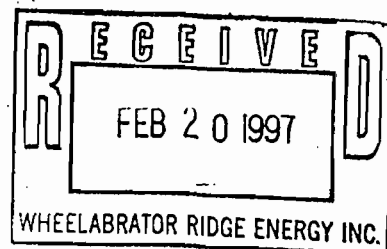


STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOTICE OF FINAL AMENDED PERMIT



In the Matter of an
Application for Permit

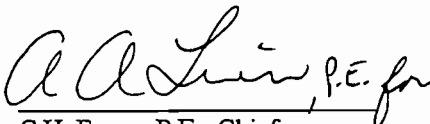
Mr. George D. Woodward, Plant Manager
Wheelabrator Ridge Energy, Inc.
3131 K-Ville Avenue
Auburndale, Florida 33823

DEP File No. AC53-206244
PSD-FL-183

Enclosed is the FINAL Amended Permit AC53-206244 and PSD-FL-183 to construct a wood/tire/landfill gas power generation facility at State Road 542 and Taylor Road near Auburndale, Polk County. The final amended permit incorporates the Final Best Available Control Technology Determination (BACT) and revisions of permit conditions as a result of increased utilization of tires as fuel. This permit is issued pursuant to Section 403, F.S.

Any party to this order (permit) has the right to seek judicial review of the permit pursuant to Section 120.68, F.S., by the filing of a Notice of Appeal pursuant to Rule 9.110, Florida Rules of Appellate Procedure, with the Clerk of the Department in the Legal Office; and by filing a copy of the Notice of Appeal accompanied by the applicable filing fees with the appropriate District Court of Appeal. The Notice of Appeal must be filed within 14 (fourteen) days from the date this Notice is filed with the Clerk of the Department.

Executed in Tallahassee, Florida.


C.H. Fancy, P.E., Chief
Bureau of Air Regulation

CERTIFICATE OF SERVICE

The undersigned duly designated deputy agency clerk hereby certifies that this NOTICE OF FINAL PERMIT (including the FINAL permit) was sent by certified mail (*) and copies were mailed by U.S. Mail before the close of business on 2-14-97 to the person(s) listed:

Mr. George D. Woodward *
Mr. Brian Beals, EPA
Mr. John Bunyak, NPS
Mr. R. Harwood, Polk County
Mr. Matt Killeen, WREI
Mr. Bill Thomas, SWD

Clerk Stamp

FILING AND ACKNOWLEDGMENT FILED, on this date, pursuant to §120.52(7), Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.

 2-14-97
(Clerk) (Date)



Department of Environmental Protection

Lawton Chiles
Governor

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Virginia B. Wetherell
Secretary

PERMITTEE:
Wheelabrator Ridge Energy, Inc.
3131 K-ville Avenue
Auburndale, FL 33823

Permit Number: AC 53-206244
PSD-FL-183
Expiration Date: May 31, 1997
County: Polk
Project: Wood/Tire Burning
Power Generation
Facility

This permit is issued under the provisions of Chapter 403, Florida Statutes (F.S.), and Chapters 62-204 through 62-297, and 62-4, Florida Administrative Code (F.A.C.). The above named permittee is hereby authorized to perform the work or operate the emission unit shown on the application and approved drawings, plans, and other documents attached hereto or on file with the Department of Environmental Protection (Department) and specifically described as indicated below:

For the construction of a 50 Megawatt power generation facility to be known as the Ridge Generating Station located at State Road 5 and Taylor Road near Auburndale, Polk County Florida. The UTM coordinates are 416.7 km East and 3,100.4 km North.

Construction of this facility shall be in accordance with the permit application, plans, documents, amendments and drawings, except as otherwise noted in the General and Specific Conditions.

Attachments are listed below:

1. DEP letter dated 1-17-92.	14. DEP letter dated 7-17-95.
2. WRE letter dated 3-19-92.	15. Amendment dated 8-8-95.
3. WRE letter dated 3-27-92.	16. WRE letter dated 12-26-95.
4. WRE letter dated 4-6-92.	17. DEP letter dated 1-29-96.
5. NPS letter dated 6-12-92.	18. WRE letter dated 5-14-96.
6. EPA letter dated 7-15-92.	19. DEP letter dated 6-5-96.
7. WRE letter dated 8-24-92.	20. WRE letter dated 7-31-96.
8. EPA letter dated 8-27-92.	21. DEP letter dated 10-8-96.
9. Permit issued 9-29-92.	22. WRE letter dated 11-13-96.
10. WRE letter dated 2-2-95.	23. WRE letter dated 12-6-96.
11. WRE letter dated 4-27-95.	24. DEP letter dated 1-9-97.
12. DEP letter dated 7-3-95.	25. WRE letter dated 1-17-97.
13. DEP letter dated 7-6-95.	

PERMITTEE:

Permit Number: AC 53-206244
PSD-FL-183

Wheelabrator Ridge Energy Inc.

Expiration Date: May 31, 1997

GENERAL CONDITIONS:

1. The terms, conditions, requirements, limitations, and restrictions set forth in this permit are "Permit Conditions" and are binding and enforceable pursuant to Sections 403.161, 403.727, or 403.859 through 403.861, F.S. The permittee is placed on notice that the Department will review this permit periodically and may initiate enforcement action for any violation of these conditions.
2. This permit is valid only for the specific processes and operations applied for and indicated in the approved drawings or exhibits. Any unauthorized deviation from the approved drawings, exhibits, specifications, or conditions of this permit may constitute grounds for revocation and enforcement action by the Department.
3. As provided in Subsections 403.087(6) and 403.722(5), F.S., the issuance of this permit does not convey any vested rights or any exclusive privileges. Neither does it authorize any injury to public or private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations. This permit is not a waiver of or approval of any other Department permit that may be required for other aspects of the total project which are not addressed in the permit.
4. This permit conveys no title to land or water, does not constitute State recognition or acknowledgement of title, and does not constitute authority for the use of submerged lands unless herein provided and the necessary title or leasehold interests have been obtained from the State. Only the Trustees of the Internal Improvement Trust Fund may express State opinion as to title.
5. This permit does not relieve the permittee from liability for harm or injury to human health or welfare, animal, or plant life, or property caused by the construction or operation of this permitted source, or from penalties therefore; nor does it allow the permittee to cause pollution in contravention of Florida Statutes and Department rules, unless specifically authorized by an order from the Department.
6. The permittee shall properly operate and maintain the facility and systems of treatment and control (and related appurtenances) that are installed or used by the permittee to achieve compliance with the conditions of this permit, as required by Department rules. This provision includes the operation of backup or auxiliary facilities or similar systems when necessary to achieve compliance with the conditions of the permit and when required by Department rules.
7. The permittee, by accepting this permit, specifically agrees to allow authorized Department personnel, upon presentation of

PERMITTEE:

Wheelabrator Ridge Energy Inc.

Permit Number:

AC 53-206244

PSD-FL-183

Expiration Date:

May 31, 1997

GENERAL CONDITIONS:

credentials or other documents as may be required by law and at a reasonable time, access to the premises, where the permitted activity is located or conducted to:

a. have access to and copy any records that must be kept under the conditions of the permit;

b. inspect the facility, equipment, practices, or operations regulated or required under this permit; and

c. sample or monitor any substances or parameters at any location reasonably necessary to assure compliance with this permit or Department rules.

Reasonable time may depend on the nature of the concern being investigated.

8. If, for any reason, the permittee does not comply with or will be unable to comply with any condition or limitation specified in this permit, the permittee shall immediately provide the Department with the following information:

a. a description of and cause of non-compliance; and

b. the period of noncompliance, including dates and times; or, if not corrected, the anticipated time the non-compliance is expected to continue, and steps being taken to reduce, eliminate, and prevent recurrence of the non-compliance.

The permittee shall be responsible for any and all damages which may result and may be subject to enforcement action by the Department for penalties or for revocation of this permit.

9. In accepting this permit, the permittee understands and agrees that all records, notes, monitoring data and other information relating to the construction or operation of this permitted source which are submitted to the Department may be used by the Department as evidence in any enforcement case involving the permitted source arising under the Florida Statutes or Department rules, except where such use is prescribed by Sections 403.73 and 403.111, F.S. Such evidence shall only be used to the extent it is consistent with the Florida Rules of Civil Procedure and appropriate evidentiary rules.

10. The permittee agrees to comply with changes in Department rules and F.S. after a reasonable time for compliance, provided, however, the permittee does not waive any other rights granted by Florida Statutes or Department rules.

PERMITTEE:

Wheelabrator Ridge Energy Inc.

Permit Number:

AC 53-206244

PSD-FL-183

Expiration Date:

May 31, 1997

GENERAL CONDITIONS:

11. This permit is transferable only upon Department approval in accordance with Rules 62-4.120 and 62-30.300, F.A.C., as applicable. The permittee shall be liable for any non-compliance of the permitted activity until the transfer is approved by the Department.

12. This permit or a copy thereof shall be kept at the work site of the permitted activity.

13. This permit also constitutes:

- (X) Determination of Best Available Control Technology
(BACT - Attached and incorporated into this permit)
- (X) Determination of Prevention of Significant Deterioration
(PSD)
- (X) Compliance with New Source Performance Standards (NSPS)

14. The permittee shall comply with the following:

a. Upon request, the permittee shall furnish all records and plans required under Department rules. During enforcement actions, the retention period for all records will be extended automatically unless otherwise stipulated by the Department.

b. The permittee shall hold at the facility or other location designated by this permit records of all monitoring information (including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation) required by the permit, copies of all reports required by this permit, and records of all data used to complete the application for this permit. These materials shall be retained at least three years from the date of the sample, measurement, report, or application unless otherwise specified by Department rule.

c. Records of monitoring information shall include:

- the date, exact place, and time of sampling or measurements;
- the person responsible for performing the sampling or measurements;
- the dates analyses were performed;
- the person responsible for performing the analyses;
- the analytical techniques or methods used; and
- the results of such analyses.

15. When requested by the Department, the permittee shall within a reasonable time furnish any information required by law which is needed to determine compliance with the permit. If the permittee becomes aware that relevant facts were not submitted or were incorrect in the permit application or in any report to the Department, such facts or information shall be corrected promptly.

PERMITTEE:
Wheelabrator Ridge Energy Inc.

Permit Number: AC53-206244
PSD-FL-183
Expiration Date: May 31, 1997

SPECIFIC CONDITIONS:

1. Unless otherwise indicated, the construction and operation of the Ridge Generating Station (RGS) facility shall be in accordance with the capacities and specifications stated in the revised application. [Rule 62-210.300, F.A.C.]

2. The RGS facility shall be allowed to operate at a maximum capacity of 50 Megawatts (approximately equivalent to 630 MMBtu/hr) for 8760 hours per year. [Rule 62-210.200(223), F.A.C.]

3. Fuel for firing the RGS boiler shall consist only of wood, yard waste, landfill gas, and up to 16.1 percent tires (percent by weight equivalent to 40 percent tires based on heat content and based on a 24-hour block average). The 16.1 percent tire weight limitation is equivalent to a tire firing rate of 18,505 pounds of tires per hour. Propane may be used as a startup, shutdown, and combustion stabilization fuel and shall not exceed an annual capacity factor of 10 percent of total heat input. [Rule 62-210.200(223), F.A.C.]

4. No municipal type solid waste, as defined in 40 CFR 60, Subpart Ea (except tires, yard waste and waste wood) or hazardous waste, as defined in 40 CFR 261 and Rule 62-730.020, F.A.C., or medical waste as defined in 40 CFR 60.51a, or biomedical waste as defined in Rule 62-712.200, F.A.C., shall be burned at any time at the RGS facility. The combined total of tires, yard waste, and any waste wood that is defined as municipal solid waste in 40 CFR 60, Subpart Ea, shall not exceed 30 percent (by weight) of the facility fuel feed stream, as measured on a calendar quarterly basis. [Rule 62-210.200(223), F.A.C.]

5. The RGS boiler exhaust gases shall not exceed the following limits. [Rule 62-212.400, F.A.C.]:

Pollutant	lbs/hr	tons/yr	Basis for Compliance
SO ₂	65.0	284.7	30-day rolling average CEMS
NO _x	90.0	394.2	30-day rolling average CEMS
CO	200.0	876.0	30-day rolling average CEMS
VOC	22.1	96.8	EPA Method 25A if test required
HCl	5.0	21.9	EPA Method 26 if test required
Hg	0.022	0.096	EPA Method 101A if test required
Pb	0.25	1.1	EPA Method 12 if test required
Be	0.0063	0.028	EPA Method 104 if test required
VE	10% opacity		EPA Method 9 - annual
PM/PM ₁₀	0.0080 gr/SCF (corrected to 7% O ₂)		EPA Method 5 if test required

PERMITTEE:**Wheelabrator Ridge Energy Inc.****Permit Number:****AC 53-206244****PSD-FL-183****Expiration Date:****May 31, 1997****SPECIFIC CONDITIONS:**

6. Visible emissions from the ash handling area vent filter, the lime silo vent filter, and the fuel transfer building vent filter shall not exceed 10 percent opacity. [Rule 62-212.400, F.A.C.]

7. Since the performance test requirements for the RGS facility have been satisfied through completion of the emissions testing program required by the interim construction permit, no further testing shall be required other than annual compliance tests. The compliance tests shall be conducted at permitted capacity. Permitted capacity is defined as 90-100 percent of the maximum operating rate allowed by the permit. If it is impracticable to test at permitted capacity, then the emission unit may be tested at less than capacity (i.e., less than 90 percent of maximum operating rate allowed by the permit); in this case, subsequent emission unit operation is limited to 110 percent of the test load until a new test is conducted. Once the emission unit is so limited, then operation at higher capacities is allowed for no more than 15 consecutive days for the purposes of additional compliance testing to regain the permitted capacity in the permit. [Rule 62-297.340(1)(a)]

8. The Department's Southwest District Office shall be notified at least 15 days prior to the compliance tests. Compliance test results shall be submitted to the Department's Southwest District Office within 45 days after completion of the tests. Sampling facilities, methods, and reporting shall be in accordance with Rule 62-297.310, F.A.C. and 40 CFR 60, Appendix A.

9. Continuous monitoring equipment shall be installed and operated to measure and record generator output, furnace temperature, stack opacity, and SO₂, NO_x and CO emissions. The tire feed rate in pounds per hour shall be monitored continuously by a commercially available weight detecting system with recording capability. The tire feed rate data shall be maintained and provided to the Department upon request. [Rule 62-297.310, F.A.C.]

10. All reasonable precautions set forth in Rule 62-296.320(4)(c), F.A.C., as well as all measures proposed by the permittee in the application (except that a water truck is no longer required since roads have been paved) shall be taken by the permittee to prevent fugitive emissions. [Rule 62-296.320, F.A.C.]

11. In the event of any malfunction resulting in failure of emission control equipment or emission-related process equipment to perform as required by this permit, the operator shall immediately stop the feeding of tires into the boiler and shall use propane firing to maintain a minimum of 1800 degrees F in the combustion zone until all tires in the system have been combusted. No tires may be refed into the boiler following the malfunction until the emission control equipment has been put into proper working order. [Rule 62-210.700, F.A.C.]

PERMITTEE:
Wheelabrator Ridge Energy Inc.

Permit Number: AC53-206244
PSD-FL-183
Expiration Date: May 31, 1997

SPECIFIC CONDITIONS:

12. Whenever the baghouse bypass is activated during an on-line operating situation for any reason, the permittee shall within 24 hours provide the Department's Southwest District office with a complete report of the circumstances and reasons for the occurrence and indicating the amounts of pollutants estimated to have been discharged during the bypass period. [Rule 62-4.130, F.A.C.]

13. No pollutants shall be discharged from the RGS facility which cause or contribute to an objectionable odor. [Rule 62-296.320(2), F.A.C.]

14. The permittee, for good cause, may request that this construction permit be extended. Such a request shall be submitted to the Department's Bureau of Air Regulation in Tallahassee prior to 60 days before the expiration of the permit. [Rule 62-4.090, F.A.C.]

15. An application for a Title V operation permit required under Chapter 62-213, F.A.C., must be submitted to the Department's Southwest District office at least 90 days prior to the expiration date of this construction permit. To properly apply for a Title V operation permit, the applicant shall submit the appropriate application form with certification that construction was completed noting any deviations from the conditions in the construction permit, and compliance test reports as required by this permit. [Rule 62-4.220, F.A.C.]

**STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL PROTECTION**


Howard L. Rhodes, Director
Division of Air Resources
Management

Best Available Control Technology (BACT) Determination
Ridge Generating Station
Polk County
(REVISED FOR FINAL PERMIT LIMITS)

In 1992 the Department issued a permit to construct a 50 MW power generation facility named the Ridge Generating Station (RGS) and located near Auburndale in Polk County, Florida. The facility consists of a solid fuel boiler, steam turbine, generator and associated equipment. Fuel for the facility consists of a mixture of waste wood and scrap tires.

A BACT determination was required for all regulated air pollutants emitted in amounts equal to or greater than the significant emission rates listed in Table 212.400-2 of Florida Administrative Code (F.A.C.) Rule 62-212.400. The Department issued the construction permit with preliminary emission limits under the condition that final emission limits would be established following completion of a comprehensive emissions testing program conducted by the permittee. This revised BACT determination is pursuant to that permit condition.

The permittee proposed final emission limits based on a statistical analysis of the comprehensive test program results covering the period from September 1, 1994, through April 30, 1995. During this period, the full range of permitted fuels were fired ranging from 100% wood-0% tires to 60% wood-40% tires. Compared to those proposed limits below are the current "interim" permitted limits based on maximum emissions for the worst case fuel mix of 60% wood-40% tires. Also shown are the average actual and maximum emissions determined by the Department from the RGS data for operation under the worst-case condition of firing 60% wood-40% tires at 90-100% of permitted capacity (45-50 MW) during the period from March 1, 1995 through April 30, 1995.

Pollutant	Maximum Allowable Emissions (All Fuels)				60% Wood-40% Tires		
	RGS Proposed		Final*		Test Program Actuals		
	lb/hr		lb/hr		lb/hr		
	tons/yr		tons/yr		lb/hr		
PM/PM10	12.6	55.2	12.6	55.2	1.2~	2.1~	5.3~
SO2	96.0	420.5	72.0**	315.4	75.0^	213.5^	328.5^
NOx	94.5	413.9	94.5	413.9	83.2^	153.1^	364.4^
CO	230.0	1,007.4	315.0	1,379.7	76.4^	447.2^	334.6^
VOC	22.1	96.8	22.1	96.8	1.4~	1.7~	6.1~
HCL	5.0	22.1	5.0	22.1	0.4~	0.7~	1.8~
Hg	0.022	0.097	0.022	0.097	8.6~"	9.1~"	37.7~"
Pb	0.25	1.1	0.25	1.1	9.3~"	40.0~"	40.7~"
Be	0.0063	0.03	0.0063	0.03	1.8~'	1.8~'	7.9~'

* Based on 24 hr. block averages of CEMS data over 8 month period.

** 30-day rolling average (amended for firing of 60% wood-40% tires).

~ Based on averages of two quarterly manual stack tests.

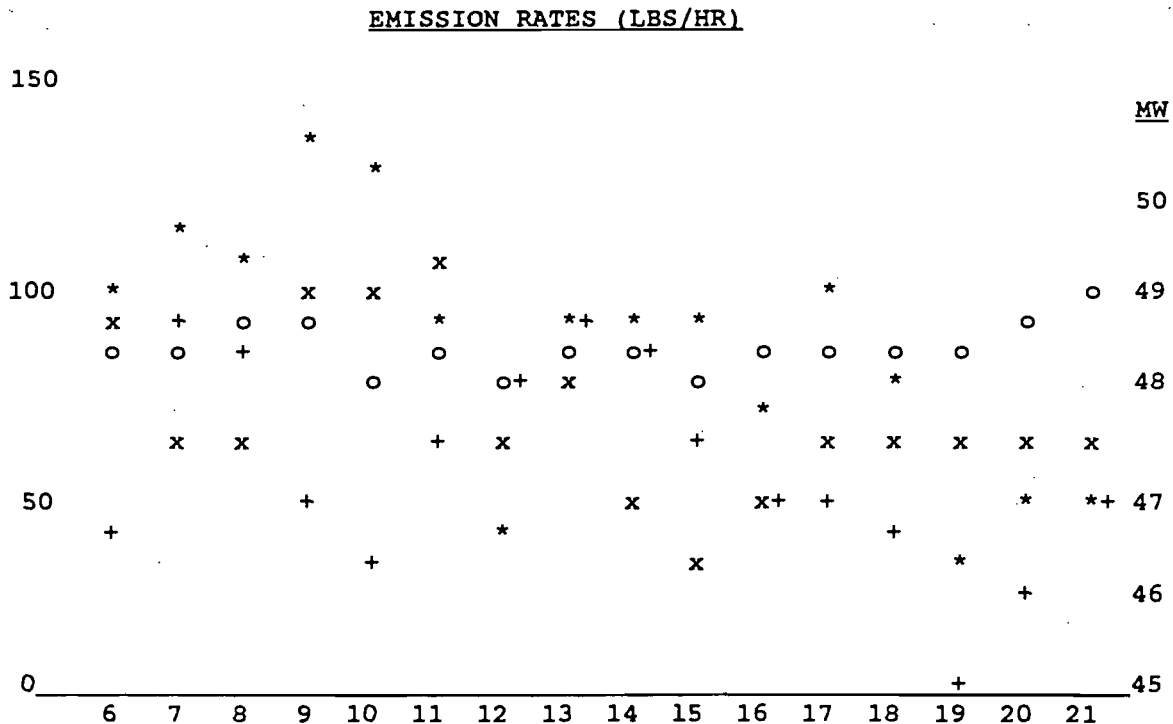
^ Based on total CEMS average for worst-case operation over 2 month period.

" Multiply by 0.0001.

' Multiply by 0.00001.

Wheelabrator Ridge Energy, Inc.
 Revised BACT Determination
 Page Two

The SO2 emissions varied greatly compared to the fluctuations in NOx emissions, indicating far better response and control for the SNCR system relative to the Spray Dryer-Absorber/Fabric Filter system. Wide variation in CO emissions occurred but this was expected due to the nature of the feed. The response of the SO2 control system appears to lag considerably behind changes in megawatts produced. This can be seen below from the operating data for the longest sustained operating period at 90-100% of capacity while firing 60% wood-40% tires (about 16 hours). Other operating cycles of less duration showed similar variations:



HOUR # - CEMS DATA FOR 3/1/95
 (*) - SO2 (o) - NOx (x) - CO (+) - MW

In establishing initial limits based on 24-hour averages, the Department did not know that the fluctuation in emissions would be great enough to justify longer-term averages in setting final limits. Also, it was not known initially that periods of continuous operation of the RGS boiler at full capacity would be so short relative to boilers firing more conventional fuels. For these reasons, the Department has proposed final emission limits based on 30-day rolling averages. Listed below are the 30-day rolling averages calculated by the Department for the worst case condition (60% wood-40% tires), assuming that no interruptions had occurred in normal operation during the 30 days following initial firing with 40% tires through the final day of the test program on April 30.

Wheelabrator Ridge Energy, Inc.
Revised BACT Determination
Page Three

30-DAY ROLLING AVERAGE EMISSION RATE (LBS/HR)
FOR 3/30/95 - 4/30/95 (60% WOOD-40% TIRES)

<u>DATE</u>	<u>SO2</u>	<u>NOx</u>	<u>CO</u>
3/30	57.9	80.1	98.4
3/31	57.1	80.3	99.0
4/1	57.9	80.8	101.6
4/2		BOILER DOWN	
4/3		" "	
4/4		" "	
4/5		" "	
4/6		" "	
4/7		" "	
4/8		" "	
4/9		" "	
4/10	57.3*	79.1*	101.3*
4/11	56.3	78.1	99.1
4/12	56.9	76.3	98.6
4/13	56.4	74.5	95.3
4/14	54.8	73.5	94.3
4/15	54.3	72.8	95.7
4/16	53.1	71.7	95.5
4/17	52.6	70.7	93.8
4/18	52.7	69.9	91.1
4/19	53.9	69.6	89.6
4/20	53.6	68.7	88.6
4/21	52.6	68.2	89.4
4/22	52.4	67.7	89.7
4/23	52.7	67.6	89.9
4/24	52.3	67.0	92.1
4/25	51.7	67.1	95.3
4/26	52.1	67.8	95.7
4/27	51.3	67.1	94.7
4/28		BOILER DOWN	
4/29		" "	
4/30	51.6*	66.5*	93.9*

* Assumes that operation was essentially continuous over the previous 30 days.

Wheelabrator Ridge Energy, Inc.
Revised BACT Determination
Page Four

The Department believes that final BACT emission limits should be based on the highest of the above CEMS data plus a margin for compliance. The following shows how these final limits for SO₂ and NO_x compare on the basis of heat input with the 40 CFR 60 Subpart Db limits for boilers:

Pollutant	Highest 30-DRA	Final Limit 30-DRA		Subpart Db
	lb/hr	lb/hr	lb/MMBTU*	lb/MMBTU
SO ₂	57.9	65.0	0.10	0.5 (oil>0.5%S)
NO _x	80.8	90.0	0.14	0.3 (gas-wood-MSW)

* Based on an average factor for MMBTU/MW of 12.8. This is presented for comparison only and is not a limit to be enforced.

On the basis of data recorded through December 31, 1995, the permittee requested and was granted a greater margin for compliance in the case of CO emissions, since higher CO is tied to the uncontrollable moisture content of the wood fired.

All of the final BACT emission limits are presented in the following table. In view of the extremely low emissions of VOCs, HCl, Hg, Pb, and Be relative to the interim limits, and the fact no control measures appear to be warranted for them at this time, the Department accepts the permittee's proposal to maintain the interim limits as the final limits for these pollutants. The Department found insufficient justification for including final limits for other pollutants such as ammonia, arsenic, benzene, cadmium, chromium, PCBs, dioxins/furans, zinc oxide, and sulfuric acid.

Pollutant	Final BACT Limit	Basis for Compliance
SO ₂	65.0 lb/hr	30-Day Rolling Average CEMS*
NO _x	90.0 lb/hr	30-Day Rolling Average CEMS*
CO	200.0 lb/hr	30-Day Rolling Average CEMS*
PM/PM ₁₀	0.0080 gr/dscf	EPA Method 5^-only if requested
VOC	22.1 lb/hr	EPA Method 25A^-only if requested
HCl	5.0 lb/hr	EPA Method 26^-only if requested
Hg	0.022 lb/hr	EPA Method 101A^-only if requested
Pb	0.25 lb/hr	EPA Method 12^-only if requested
Be	0.0063 lb/hr	EPA Method 104^-only if requested
VE	10% Opacity	EPA Method 9-annual basis

* A new 30-day rolling average emission rate is calculated each steam generating unit operating day as the average of all of the hourly emission data for the preceding 30 steam generating unit operating days.

^ As performed during test program.

Wheelabrator Ridge Energy, Inc.
Revised BACT Determination
Page Five

Contacts For Further Information:

John Reynolds, Permit Engineer
A. A. Linero, P.E. Administrator
New Source Review Section
Bureau of Air Regulation
2600 Blair Stone Road
Tallahassee, FL 32399-2400
Telephone 904-488-1344

Recommended By:

C. H. Fancy

C. H. Fancy, P.E., Chief
Bureau of Air Regulation

Date

2/10/97

Approved By:

Howard L. Rhodes

Howard L. Rhodes, Director
Division of Air Resources Management

Date

2/11/97



Department of Environmental Protection

Lawton Chiles
Governor

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400
July 17, 1995

Virginia B. Wetherell
Secretary

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Rodney Williams
Plant Manager
Wheelabrator Ridge Energy Inc.
3131 K-ville Avenue
Auburndale, Florida 33823

Re: Amendment of Permit No. AC53-206244, PSD-FL-183(A)

Dear Mr. Williams:

Enclosed is one copy of the Draft Permit Amendment, Intent to Issue, and Notice of Intent to Issue for the Ridge Generation Station located in Polk County, Florida. This amendment allows the facility to burn up to 16.9 percent tires (40 percent of heat input). All of the interim air pollution limits (except for sulfur dioxide) remain the same as in the original permit. The interim sulfur dioxide limit has been reduced to 72 pounds per hour on a 30-day rolling average.

Pursuant to discussions with your consultant and company personnel we still need to review the recently submitted long term emissions monitoring data prior to setting a final Best Available Control Technology (BACT) and permit sulfur dioxide limit. It may be higher or lower than the revised interim limit and may be expressed on a different basis. BACT limits are generally related to cost-effectiveness of control and not just a statistically probable value. Therefore we expect Wheelabrator Ridge to minimize any actual emissions increase caused by burning additional tires.

Please submit any comments you may have concerning the Department's proposed action to Mr. A. A. Linero, P. E., at the above address. If you have any questions regarding this matter, please call Mr. Linero at (904) 488-1344.

Sincerely,

C.H. Fancy, P. E.
Chief
Bureau of Air Regulation

CHF/aal/w

cc: Steve Smallwood, P. E.
Bill Thomas, SWD
John Reynolds, BAR
Jewell Harper, EPA
John Bunyak, NPS

"Protect, Conserve and Manage Florida's Environment and Natural Resources"

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOTICE OF INTENT TO ISSUE PERMIT AMENDMENT

PSD-FL-183(A)
AC53-206244

The Department of Environmental Protection (Department) gives notice of its intent to issue a permit amendment to Wheelabrator Ridge Energy, Inc., 3131 K-Ville Avenue, Auburndale Florida 33823. This recently constructed and permitted facility consists of a stoke boiler which combusts waste wood, landfill gas, and up to 9 percent tires (by weight) while generating up to 50 megawatts of electric power. The amendment will allow the facility to burn up to 16.9 percent tires (40 percent of heat input). Emissions of acid gasses, metals, and particulate matter are controlled by a lime spray dryer/fabric filter and a selective non-catalytic reduction unit. Recent testing showed that emissions when burning 16.9 percent tires will be within the present permit limits. Additionally the applicant has agreed to reduce its interim sulfur dioxide emission limit from 109.4 pounds per hour to 72 pounds per hour.

A person whose substantial interests are affected by the Department's proposed permitting decision may petition for an administrative proceeding (hearing) in accordance with Section 120.57, Florida Statutes (F.S.). The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 2600 Blair Stone Road, Tallahassee, Florida 32399-2400, within 14 days of publication of this notice. Petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. Failure to file a petition within this time period shall constitute a waiver of any right such person may have to request an administrative determination (hearing) under Section 120.57, F.S.

The Petition shall contain the following information; (a) The name, address, and telephone number of each petitioner, the applicant's name and address, the Department Permit File Number and the county in which the project is proposed; (b) A statement of how and when each petitioner received notice of the Department's action or proposed action; (c) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action; (d) A statement of the material facts disputed by Petitioner, if any; (e) A statement of facts which petitioner contends warrant reversal or modification of the Department's action or proposed action; (f) A statement of which rules or statutes petitioner contends require reversal or modification of the Department's action or proposed action; and, (g) A statement of the relief sought by petitioner, stating precisely the action petitioner wants the Department to take with respect to the Department's action or proposed action.

If a petition is filed, the administrative hearing process is designed to formulate agency action. Accordingly, the Department's final action may be different from the

position taken by it in this Notice. Persons whose substantial interests will be affected by any decision of the Department with regard to the application/ request have the right to petition to become a party to the proceeding. The petition must conform to the requirements specified above and be filed (received) within 14 days of publication of this notice in the Office of General Counsel at the above address of the Department. Failure to petition within the allowed time frame constitutes a waiver of any right such person has to request a hearing under Section 120.57, F.S., and to participate as a party to this proceeding. Any subsequent intervention will only be at the approval of the presiding officer upon motion filed pursuant to Rule 28-5.207, Florida Administrative Code.

The application/request is available for public inspection during normal business hours, 8:00 a.m. to 5:00 p.m., Monday through Friday, except legal holidays, at:

Department of Environmental Protection
Bureau of Air Regulation
111 S. Magnolia Drive, Suite 4
Tallahassee, Florida 32301

Department of Environmental Protection
Central District
Suite 200B
7825 Baymeadows Way
Jacksonville, Florida 32256-7577

Any person may send written comments on the proposed action to Administrator, New Source Review Section at the Department of Environmental Protection, Bureau of Air Regulation, Mail Station 5505, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400 . All comments received within 14 days of the publication of this notice will be considered in the Department's final determination.

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

CERTIFIED MAIL

In the Matter of an
Application for Permit by:

DEP File No. AC53-206244 PSD-FL-183(A)
Polk County

Mr. Rodney Williams
Plant Manager
Wheelabrator Ridge Energy, Inc.
3131 K-Ville Avenue
Auburndale, Florida 33823

INTENT TO ISSUE PERMIT AMENDMENT

The Department of Environmental Protection (Department) gives notice of its intent to issue a permit amendment (copy attached) to the applicant as detailed in the application/request specified above for the reasons stated in below.

The applicant, Wheelabrator Ridge Energy, Inc., applied on May 5, 1995 to the Department to amend the current air construction permit issued for its facility located in Polk County pursuant to Prevention of Significant Deterioration (PSD permit). The amendment will allow the applicant to increase the amount of tires burned at its recently construction facility from 9 percent (by weight) to 16.9 percent (40 percent of heat input) while generating up to 50 megawatts of electric power.

The facility demonstrated that it could comply with previously set interim emission limits under both the 9 percent and 16.9 percent tire burning scenarios. The Department chose to lower the existing interim sulfur dioxide limitation and allow the facility to operate as requested while a final Best Available Control Technology (BACT) determination is conducted.

The Department has permitting jurisdiction under the provisions of Chapter 403, Florida Statutes (F.S.), and Chapters 62-212 and 62-4, Florida Administrative Code (F.A.C.). The project is not exempt from permitting procedures. The Department has determined that a permit amendment and public notice is required for the proposed work.

Pursuant to Section 403.815, F.S., and Rule 62-103.150, F.A.C., you (the applicant) are required to publish at your own expense the enclosed Notice of Intent to Issue Permit Amendment. The notice shall be published one time only within 30 days in the legal ad section of a newspaper of general circulation in the area affected. For

the purpose of this rule, "publication in a newspaper of general circulation in the area affected" means publication in a newspaper meeting the requirements of Sections 50.011 and 50.031, F.S., in the county where the activity is to take place. The applicant shall provide proof of publication to the Department's Bureau of Air Regulation, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400, within seven days of publication. Failure to publish the notice and provide proof of publication within the allotted time may result in the denial of the permit amendment.

The Department will issue the permit amendment with the attached conditions unless a petition for an administrative proceeding (hearing) is filed pursuant to the provisions of Section 120.57, F.S.

A person whose substantial interests are affected by the Department's proposed permitting decision may petition for an administrative proceeding (hearing) in accordance with Section 120.57, F.S. The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 2600 Blair Stone Road, Tallahassee, Florida 32399-2400. Petitions filed by the permit applicant and the parties listed below must be filed within 14 days of receipt of this intent. Petitions filed by other persons must be filed within 14 days of publication of the public notice or within 14 days of their receipt of this intent, whichever first occurs. Petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. Failure to file a petition within this time period shall constitute a waiver of any right such person may have to request an administrative determination (hearing) under Section 120.57, F.S.

The Petition shall contain the following information;

(a) The name, address, and telephone number of each petitioner, the applicant's name and address, the Department Permit File Number and the county in which the project is proposed;

(b) A statement of how and when each petitioner received notice of the Department's action or proposed action;

(c) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action;

(d) A statement of the material facts disputed by Petitioner, if any;

(e) A statement of facts which petitioner contends warrant reversal or modification of the Department's action or proposed action;

(f) A statement of which rules or statutes petitioner contends require reversal or modification of the Department's action or proposed action; and,

(g) A statement of the relief sought by petitioner, stating precisely the action petitioner wants the Department to take with respect to the Department's action or proposed action.

If a petition is filed, the administrative hearing process is designed to formulate agency action. Accordingly, the Department's final action may be different from the position taken by it in this intent. Persons whose substantial interests will be affected

by any decision of the Department with regard to the application/ request have the right to petition to become a party to the proceeding. The petition must conform to the requirements specified above and be filed (received) within 14 days of receipt of this intent in the Office of General Counsel at the above address of the Department. Failure to petition within the allowed time frame constitutes a waiver of any right such person has to request a hearing under Section 120.57, F.S., and to participate as a party to this proceeding. Any subsequent intervention will only be at the approval of the presiding officer upon motion filed pursuant to Rule 28-5.207, F.A.C.

Executed in Tallahassee, Florida.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL PROTECTION

C. H. Fancy ^{7/17} P.E. for

C. H. Fancy, P.E., Chief
Bureau of Air Regulation
2600 Blair Stone Road
Tallahassee, Florida 32399
904-488-1344

CERTIFICATE OF SERVICE

The undersigned duly designated deputy clerk hereby certifies that this INTENT TO ISSUE PERMIT AMENDMENT all copies were mailed by certified mail before the close of business on 7-18-95 to the listed persons.

Clerk Stamp

FILING AND ACKNOWLEDGMENT
FILED, on this date, pursuant to
§120.52(11), Florida Statutes, with the
designated Department Clerk, receipt of
which is hereby acknowledged.

Kin Joken

Clerk

7-18-95

Date

Copies furnished to:

B. Thomas, SWD
J. Reynolds, BAR
S. Smallwood, P. E.
J. Harper, EPA
J. Bunyak, NPS



Department of Environmental Protection

Lawton Chiles
Governor

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Virginia B. Wetherell
Secretary

August xx, 1995

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Rodney Williams
Plant Manager
Wheelabrator Ridge Energy, Inc.
3131 K-Ville Avenue
Auburndale, Florida 33823

DRAFT

Dear Mr. Williams:

RE: Amendment to Construction Permit No. AC 53-206244, PSD-FL-183(A)

The Department has reviewed your May 5, 1995 request to amend the tire firing capacity permit requirements and the interim emissions limits of the subject permit. The Department's determination on this amendment request is as follows:

A. Firing Capacity:

Specific Condition No. 3 is amended as follows:

From:

3. Fuel for firing the RGS boiler shall consist only of wood, landfill gas, and up to 9.0 percent tires (percent by weight equivalent to 20 percent tires based on heat content). The 9.0 percent tire weight limitation is equivalent to a tire firing rate of 9,000 pounds of tires per hour. Propane may be used as a startup, shutdown, and combustion stabilization fuel.

To:

3. Fuel for firing the RGS boiler shall consist only of wood, landfill gas, and up to 18.0 percent tires (percent by weight equivalent to 40 percent tires based on heat content). The 16.9 percent tire weight limitation is equivalent to a tire firing rate of 16,900 pounds of tires per hour. Propane may be used as a startup, shutdown, and combustion stabilization fuel.

DRAFT

B. Emissions Limits:

Specific Condition No. 5 is amended as follows:

From:

5. Initially, the RGS boiler exhaust gases shall not exceed the limits shown below. Following completion of the emission testing program required in Specific Condition No. 8, these limits may be revised.

<u>Pollutant</u>	<u>lbs/hr*</u>	<u>tons/yr</u>
PM/PM ₁₀	12.6	55.2
SO ₂	109.4	479.2
NO _x	94.5	413.9
CO	315.0	1379.7
VOC	22.1	96.8
HCl	5.0	22.1
Hg	0.022	0.097
Pb	0.25	1.1
Be	0.0063	0.03

*Based on 24 hour average. The feasibility of establishing startup/shutdown limits, hourly limits, or rolling average limits in addition to or in lieu of the above limits will be determined after analysis of the emission testing program.

To:

5. Initially, the RGS boiler exhaust gases shall not exceed the limits shown below. Following completion of the emission testing program required in Specific Condition No. 8, these limits may be revised.

<u>Pollutant</u>	<u>lbs/hr*</u>	<u>tons/yr</u>
PM/PM ₁₀	12.6	55.2
SO ₂	63.0 †	275.9
NO _x	94.5	413.9
CO	315.0	1379.7
VOC	22.1	96.8
HCl	5.0	22.1
Hg	0.022	0.097
Pb	0.25	1.1
Be	0.0063	0.03

*Based on 24 hour average. †Based on a 30-day rolling average. The feasibility of establishing startup/shutdown limits, hourly limits, or rolling average limits in addition to

DRAFT

or in lieu of the above limits will be determined after analysis of the emission testing program.

C. Attachments to be Incorporated:

- Wheelabrator letter dated May 5, 1995
- DEP letter dated July 3, 1995
- Wheelabrator letter dated July 17, 1995
- DEP Letter dated July 17, 1995

A person whose substantial interests are affected by the Department's proposed permitting decision may petition for an administrative proceeding (hearing) in accordance with Section 120.57, Florida Statutes (F.S.). The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 2600 Blair Stone Road, Tallahassee, Florida 32399-2400. Petitions filed by the applicant of the amendment request/application and the parties listed below must be filed within 14 days of receipt of this amendment. Petitions filed by other persons must be filed within 14 days of the amendment issuance or within 14 days of their receipt of this amendment, whichever occurs first. Petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. Failure to file a petition within this time period shall constitute a waiver of any right such person may have to request an administrative determination (hearing) under Section 120.57, F.S.

The Petition shall contain the following information:

- (a) The name, address and telephone number of each petitioner, the applicant's name and address, the Department Permit File Number and the county in which the project is proposed;
- (b) A statement of how and when each petitioner received notice of the Department's action or proposed action;
- (c) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action;
- (d) A statement of the material facts disputed by Petitioner, if any;
- (e) A statement of facts which petitioner contends warrant reversal or modification of the Department's action or proposed action;
- (f) A statement of which rules or statutes petitioner contends require reversal or modification of the Department's action or proposed action; and,
- (g) A statement of the relief sought by petitioner, stating precisely the action the petitioner wants the Department to take with respect to the Department's action or proposed action.

If a petition is filed, the administrative hearing process is designed to formulate agency action. Accordingly, the Department's final action may be different from the

Mr. Rodney Williams
Wheelabrator Ridge, Inc.
August xx, 1995
Page 4 of 5

DRAFT

position taken by it in this amendment. Persons whose substantial interests will be affected by any decision of the Department with regard to the request/application have the right to petition to become a party to the proceeding. The petition must conform to the requirements specified above and be filed (received) within 14 days of receipt of this amendment in the Office of General Counsel at the above address of the Department. Failure to petition within the allowed time frame constitutes a waiver of any right such person has to request a hearing under Section 120.57, F.S., and to participate as a party to this proceeding. Any subsequent intervention will only be at the approval of the presiding officer upon motion filed pursuant to Rule 28-5.207, F.A.C.

This letter amendment must be attached to the construction permit, No. AC 53 - 206244, PSD-FL-183 and shall become part of the permit.

Sincerely,

Howard L. Rhodes
Director
Division of Air Resources
Management

HLR/AAL/kw

Attachment

Mr. Rodney Williams
Wheelabrator Ridge, Inc.
August xx, 1995
Page 5 of 5

DRAFT

CERTIFICATE OF SERVICE

The undersigned duly designated deputy clerk hereby certifies that this AMENDMENT and all copies were mailed by certified mail before the close of business on _____ to the listed persons.

FILING AND ACKNOWLEDGMENT FILED,
on this date, pursuant to §120.52(11),
Florida Statutes, with the designated
Department Clerk, receipt of which is
hereby acknowledged.

Clerk

Date

copies furnished to: B. Thomas, SWD
J. Reynolds, BAR
S. Smallwood, P. E.
J. Harper, EPA
J. Bunyak, NPS

Reynolds, John

From: Anette Dearden [adearden@nmceg.com]
Sent: Tuesday, January 16, 2001 9:36 AM
To: Reynolds, John
Subject: RE: Wheelabrator Ridge Energy

Thanks for the reply - here it is:

NMC Environmental Group
40 Forest Falls Drive, #3
Yarmouth, ME 04096

-----Original Message-----

From: Reynolds, John
To: Anette Dearden
Sent: 1/16/01 8:01 AM
Subject: RE: Wheelabrator Ridge Energy

We will need your street address or P.O. Box in order to send the copies requested.

-----Original Message-----

From: Anette Dearden [mailto:adearden@nmceg.com]
Sent: Friday, January 12, 2001 12:22 PM
To: Reynolds, John
Cc: Adams, Patty
Subject: Wheelabrator Ridge Energy

Hello -

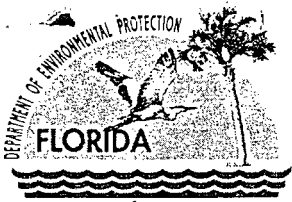
I spoke with Scott Sheplack (sp?) in your office today - he told me you were/are the project engineer for the facility referenced above, and gave me your email address.

I'm working on a BACT analysis for a similar source in Maine and would like to obtain a copy of the appropriate Ridge Energy permit - - the permit information available on line through the DEP web site does not address/post-dates my specific focus (which is whether or not BACT requires a scrubber when a wood-burning boiler/facility adds TDF as a fuel). My understanding is that the permit issued in 1997 contains this information, so I believe this is the permit I'm seeking. If possible, I'd also like to obtain a copy of the BACT analysis filed by Wheelabrator, and perhaps obtain the name and phone number of the facility contact. Can you help??

I'm sending a copy of this request to Patty Adams at Scott S.'s suggestion, with the hope of expediting the process of getting copies. If you need more information or if there is a fee for copies I need to address, please let me know. I understand you're out of the office, John, Mondays and I will be on the road next week through Wednesday afternoon, so if possible please respond via email (I can pick it up remotely).

Thanks very much in advance for your assistance.

Anette Dearden
NMC Environmental Group
Yarmouth, ME 04096



Department of Environmental Protection

Lawton Chiles
Governor

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Virginia B. Wetherell
Secretary

March 12, 1998

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. John Neil
Director of Health, Safety and Environmental Compliance
Wheelabrator Ridge Energy, Inc.
3131 K-Ville Avenue
Auburndale, Florida 33823

RE: Typographical Error in Permit No. AC53-206244 (PSD-FL-183)

Dear Mr. Neil:

This is in response to your March 5 letter requesting correction of a minor typo in the referenced permit. Enclosed is a corrected copy.

If there are any questions, please contact me or John Reynolds at (850)921-9536.

Sincerely,

A. A. Linero, P.E., Administrator
New Source Review Section

AAL/JR

c: B. Thomas, SWD

PERMITTEE:

Wheelabrator Ridge Energy Inc.

Permit Number:

AC 53-206244

PSD-FL-183

Expiration Date:

May 31, 1997

SPECIFIC CONDITIONS:

1. Unless otherwise indicated, the construction and operation of the Ridge Generating Station (RGS) facility shall be in accordance with the capacities and specifications stated in the revised application. [Rule 62-210.300, F.A.C.]

2. The RGS facility shall be allowed to operate at a maximum capacity of 50 Megawatts (approximately equivalent to 630 MMBTU/hr) for 8760 hours per year. [Rule 62-210.200(223), F.A.C.]

3. Fuel for firing the RGS boiler shall consist only of wood, yard waste, landfill gas, and up to 16.1 percent tires (percent by weight equivalent to 40 percent tires based on heat content and based on a 24-hour block average). The 16.1 percent tire weight limitation is equivalent to a tire firing rate of 18,505 pounds of tires per hour. Propane may be used as a startup, shutdown, and combustion stabilization fuel and shall not exceed an annual capacity factor of 10 percent of total heat input. [Rule 62-210.200(223), F.A.C.]

4. No municipal type solid waste, as defined in 40CFR60, Subpart Ea (except tires, yard waste and waste wood) or hazardous waste, as defined in 40CFR261 and Rule 62-730.020, F.A.C., or medical waste as defined in 40CFR60.51a, or biomedical waste as defined in Rule 62-712.200, F.A.C., shall be burned at any time at the RGS facility. The combined total of tires, yard waste, and any waste wood that is defined as municipal solid waste in 40CFR60, Subpart Ea, shall not exceed 30 percent (by weight) of the facility fuel feed stream, as measured on a calendar quarterly basis. [Rule 62-210.200(223), F.A.C.]

5. The RGS boiler exhaust gases shall not exceed the following limits [Rule 62-212.400, F.A.C.]:

<u>Pollutant</u>	<u>Lbs/hr</u>	<u>Tons/yr</u>	<u>Basis for Compliance</u>
SO ₂	65.0	284.7	30-Day Rolling Average CEMS
NO _x	90.0	394.2	30-day Rolling Average CEMS
CO	200.0	876.0	30-day Rolling Average CEMS
VOC	22.1	96.8	EPA Method 25A if test req'd
HCL	5.0	21.9	EPA Method 26 if test req'd
Hg	0.022	0.096	EPA Method 101A if test req'd
Pb	0.25	1.1	EPA Method 12 if test req'd
Be	0.0063	0.028	EPA Method 104 if test req'd
VE	10% Opacity		EPA Method 9 - annual
PM/PM ₁₀	0.0080 gr/SCF		EPA Method 5 if test req'd
	(corrected to 7% O ₂)		



Wheelabrator Ridge Energy Inc.

A Wheelabrator Technologies Company
3131 K-Ville Avenue
Auburndale, FL 33823

Phone 941.665.2255
Fax 941.665.0400

RECEIVED

MAR 09 1998

**BUREAU OF
AIR REGULATION**

Certified Mail P-432-885-183

March 5, 1998

John Reynolds
Permit Engineer
New Source Review Section
Bureau of Air Regulation
2600 Blair Stone Road
Tallahassee, FL 32399-2400

RE: **Wheelabrator Ridge Energy - Permit # AC 53-206244**

Sir:

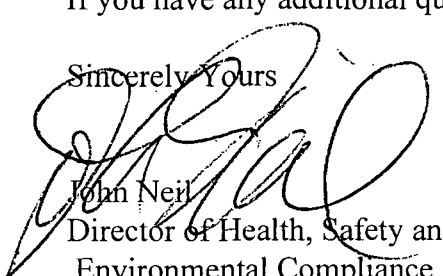
As we discussed a typographical error exists in Specific Condition 5 of the Wheelabrator Ridge Energy Air Permit # AC53-206244. Specifically the line that reads:

Hg	0.022	0.096	EPA Method 101A is test required
		should say	
Hg	0.022	0.096	EPA Method 101A if test required.

I have attached a copy of the permit. Could the Department please send a corrected permit or page.

If you have any additional questions please call me at (941) 665-2255 ext. 250.

Sincerely Yours


John Neil
Director of Health, Safety and
Environmental Compliance
Wheelabrator Ridge Energy.

 **WHEELABRATOR ENVIRONMENTAL
SYSTEMS INC.**

Liberty Lane
Hampton, NH 03842
603-929-3000

December 19, 1991

Florida Department of Environmental Regulation
Division of Air Resources Management
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Attention: Mr. Barry Andrews, Administrator
Permitting and Standards Section
Bureau of Air Regulation

Re: Ridge Generating Station
Air Emission Source Construction Permit Application

Dear Mr. Andrews:

Ridge Generating Station Limited Partnership (RGSLP) is proposing to develop an independent power production facility in Polk County, Florida. The General Partners of RGSLP are Decker Energy-Ridge, Inc., and Wheelabrator Polk Inc.

The proposed facility will be designated as the Ridge Generating Station (RGS). The facility will consist of a 45-MW multi-fuel, steam driven electric power plant, with one boiler providing the total steam production. It will generate up to 40 megawatts (net) of electric power by burning a mixture of wood, tires and landfill gas. The electric power will be sold under an existing contract to Florida Power Corporation.

Enclosed are an original and six copies of an air emission source construction permit application for the project. Also enclosed is one package of computer printouts in support of the application's ambient air quality impact analysis, and a check for the permit application fee in the amount of \$7,500.00.

Please direct all written correspondence regarding this project to me with a copy also sent to Mr. Macauley Whiting, Jr. Both addresses are provided on Page 2-1 of the application. We will be pleased to assist as needed in helping you complete your

Florida Department of Environmental Regulation
Mr. Barry Andrews, Administrator
December 19, 1991
Page 2

review of the application. If you have questions or comments on the application materials, please contact Matt Killeen, of Wheelabrator Environmental Systems Inc., at 1-800-682-0026.

Sincerely,



Richard C. Stone
Project Manager
Wheelabrator Polk Inc.

MPK101/cjb

Enclosures

- o Original and 6 copies of Construction Permit Application
- o Package of modeling printouts
- o Application fee (\$7,500.00)

cc: Macauley Whiting, Jr. - Decker Energy - Ridge, Inc.
Matthew Killeen - Wheelabrator Environmental Systems Inc.

**APPLICATION FOR PERMIT TO CONSTRUCT
AIR EMISSION SOURCES**

**(INCLUDING PREVENTION OF SIGNIFICANT
DETERIORATION EVALUATION)**

**RIDGE GENERATING STATION
POLK COUNTY, FLORIDA**

**OWNER:
RIDGE GENERATING STATION LIMITED PARTNERSHIP**

**GENERAL PARTNERS:
DECKER ENERGY - RIDGE, INC.
AND
WHEELABRATOR POLK INC.**

**SUBMITTED TO:
FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION**

**PREPARED WITH ASSISTANCE OF
DAMES & MOORE
AND
SFT, INC.**

December 1991

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ABBREVIATIONS AND ACRONYMS

SUBSTANCES

Be	-	beryllium
CO	-	carbon monoxide
HCl	-	hydrogen chloride (hydrochloric acid)
HF	-	hydrogen fluoride
Hg	-	mercury
H ₂ SO ₄	-	sulfuric acid
NH ₃	-	ammonia
NO _x	-	nitrogen oxides
NO ₂	-	nitrogen dioxide
O ₂	-	oxygen (molecular)
PM	-	particulate matter (total)
PM ₁₀	-	particulate matter (equivalent aerodynamic diameter of 10μm or less)
SO ₂	-	sulfur dioxide

DIMENSIONAL AND QUANTITY UNITS

acfm	-	actual cubic foot per minute
Btu	-	British thermal unit
°F	-	degree fahrenheit
ft	-	foot
g	-	gram
gr	-	grain
hr	-	hour
K	-	kelvin
km	-	kilometer
lb	-	pound
m	-	meter
mg	-	milligram
min	-	minute
MMBtu	-	million British thermal units
MW	-	megawatt
ppm	-	parts per million
ppmv	-	parts per million by volume
s	-	second
ton	-	short ton (2,000 lb)
yr	-	year
μg	-	microgram

ABBREVIATIONS AND ACRONYMS (Continued)

PROJECT RELATED AND OTHER TERMS

BACT	-	best available control technology
C&D	-	construction and demolition
DER	-	Florida Department of Environmental Regulation
DSI	-	dry sorbent injection
EPA	-	U.S. Environmental Protection Agency
ESP	-	electrostatic precipitator
FAAQS	-	Florida ambient air quality standards
FF	-	fabric filter
GEP	-	good engineering practice
LAER	-	lowest achievable emission rate
MCR	-	maximum continuous rating
MSW	-	municipal-type solid waste
MWC	-	municipal waste combustor
NAAQS	-	national ambient air quality standards
NSPS	-	new source performance standards
NTL	-	no-threat level
PSD	-	prevention of significant deterioration
RDF	-	refuse-derived fuel
RGS	-	Ridge Generating Station
RGSLP	-	Ridge Generating Station Limited Partnership
SCR	-	selective catalytic reduction
SDA	-	spray dryer absorber
SNCR	-	selective noncatalytic reduction
UTM	-	Universal Transverse Mercator

1.0 INTRODUCTION

Ridge Generation Station Limited Partnership (RGSLP) proposes to construct and operate a 45-MW electric power generating station in central Polk County, Florida. The proposed facility will be designated as the Ridge Generating Station (RGS) and will sell power under an existing contract with Florida Power Corporation. Facility construction is planned to begin during July 1992, and the start of operation is planned for July of 1994.

The power block portion of the RGS will include one boiler. This boiler will be capable of burning wood, tires, and landfill gas. The various fuel mixes that can be accommodated consist of wood alone, a mixture of wood and tires with tires representing up to 20 percent of the heat input to the boiler, and a mixture of wood, tires, and landfill gas. Landfill gas will be extracted from the Polk County North Central Landfill located adjacent to the RGS site.

Estimated RGS emissions are of sufficient quantity that the project is subject to prevention of significant deterioration (PSD) air quality regulations. This permit application therefore addresses all PSD requirements including compliance with best available control technology (BACT) requirements. In addition, the impacts of toxic air pollutant emissions have been assessed to determine compliance with the Florida air toxics permitting strategy.

The project is being designed to meet stringent air pollution control objectives. The principal air pollution control features consist of (1) a spray dryer absorber and fabric filter for control of acid gases, particulate matter (including metals), and organic compounds, and (2) a selective noncatalytic reduction system for control of oxides of nitrogen. Through use of efficient air pollution control equipment and appropriate operating procedures, the RGS project will comply with all applicable air quality protection requirements.

2.0 APPLICANT AND SITE INFORMATION

2.1 APPLICANT INFORMATION

The proposed project will be developed by Ridge Generating Station Limited Partnership.

The Ridge Generating Station Limited Partnership is comprised solely of subsidiaries of Decker Energy International, Inc. and Wheelabrator Environmental Systems Inc. The two General Partners are Decker Energy-Ridge, Inc. and Wheelabrator Polk Inc. The contact persons, their addresses and telephone numbers are as follows:

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Wheelabrator Polk Inc.
Liberty Lane
Hampton, New Hampshire 03842
(803) 929-3456

2.2 SITE INFORMATION

The location of the RGS site is in Polk County as shown in Figure 2-1 and Figure 2-2. The site is approximately five miles east of Lakeland in the southeast part of Section 19, Township 28 South, Range 25 East. The site is approximately 30 acres in size. It is located about three-quarters of a mile from the nearest residence and is bounded on the north by mined-out phosphate lands and on the south by the Polk County North Central Landfill.

2.3 APPLICATION FORM

Appendix A contains a signed copy of DER Form 17-1.202(1).

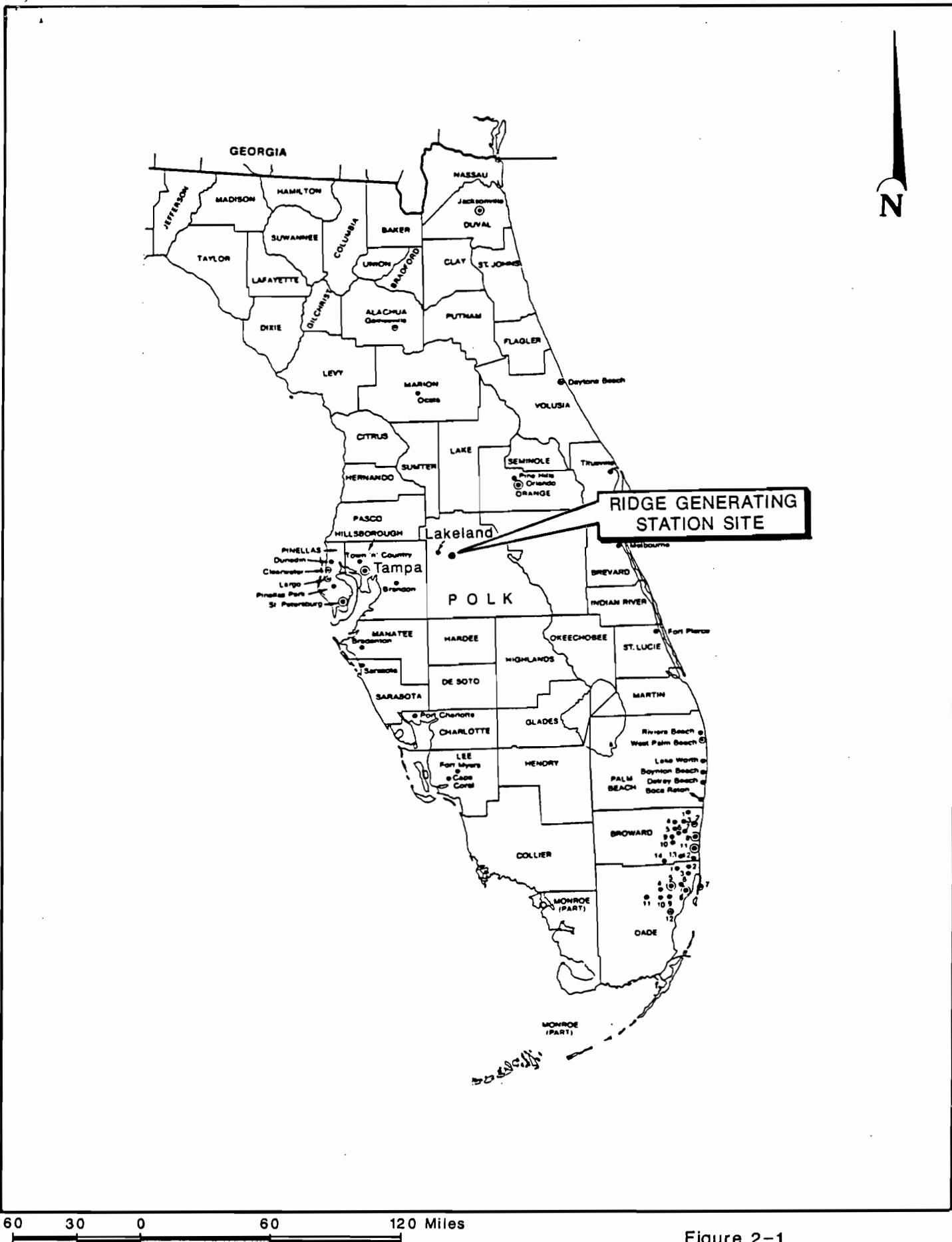
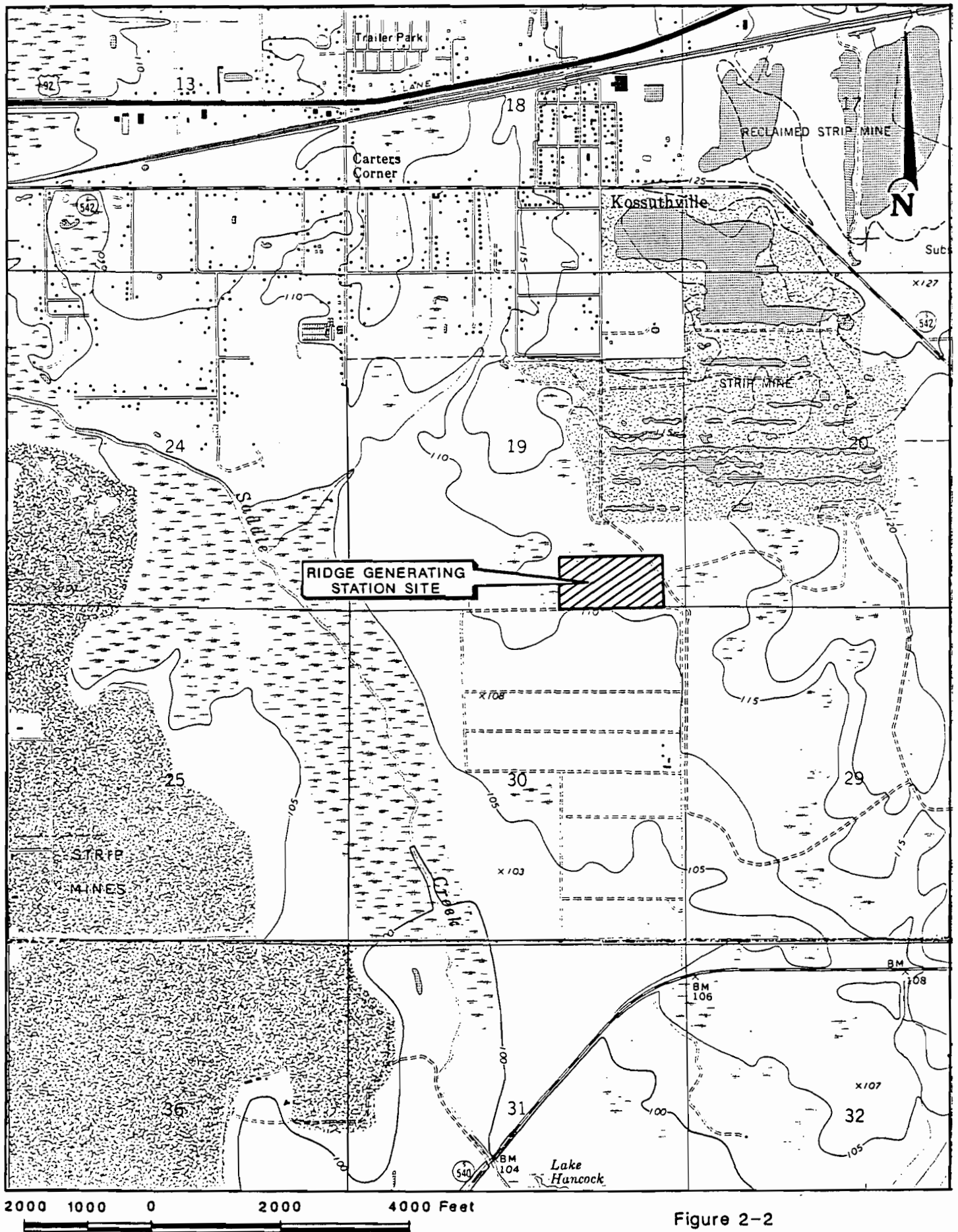


Figure 2-1
RIDGE GENERATING STATION SITE LOCATION



SOURCE: USGS 7.5' Auburn, Fla. Quadrangle,
Photorevised 1988

Figure 2-2
RIDGE GENERATING STATION SITE BOUNDARIES

3.0 PROJECT DESCRIPTION

3.1 TYPE OF PROJECT

The Ridge Generating Station consists of a 45-MW multi-fuel, steam-driven electric power plant, with one boiler providing the total steam production. The boiler will typically burn a mixture of wood, tires, and landfill gas. Figure 3-1 contains a flow diagram for station operations. A site plan is shown in Figure 3-2.

3.2 DESCRIPTION OF FUELS AND EXPECTED FUEL USE

Four different fuels will be used to fire the boiler: wood, tires, landfill gas, and propane. Wood, tires, and landfill gas will be the primary fuels used on a regular basis, whereas propane will be used for start-up, shutdown, and emergency purposes only. The wood and tires will be obtained from a variety of sources, while the landfill gas will be delivered by pipeline from the Polk County North Central Landfill located adjacent to the RGS site. Combustion of propane will not exceed a heat input of 180 MMBtu/hr.

The boiler will be designed to burn wood alone as well as a combination of wood, tires, and landfill gas. Table 3-1 provides the projected range of fuels by weight for each category. Tire usage will be limited to 20 percent of the total heat input (equivalent to approximately 10 percent on a weight basis). The average fuel combination will be a mix of approximately 75 percent wood, 15 percent tires, and 10 percent landfill gas on a heat input basis. Table 3-2 shows the typical expected fuel analysis for the individual fuel components. Each of the three fuels will exhibit a certain degree of variability in their makeup. Due to both the number of suppliers and local weather conditions, the wood components are expected to exhibit the greatest degree of variability. Therefore, although the Btu/lb value of wood is shown in Table 3-2 to be 5,450, the actual heating value may vary from 5,000 to 5,900 Btu/lb. The expected fuel analysis for the average condition fuel mix and the maximum tire use fuel mix is given in Table 3-3.

3.2.1 Wood Fuels

Wood accepted at RGS is anticipated to have a moisture content of less than 50 percent. The wood will be essentially free of dirt, concrete, steel, aluminum, and other metals. Wood fuel will be obtained from independent contractors, and will include the following materials: construction and demolition (C&D) material, forest residuals/land clearing material, industrial wood wastes, and wood chips derived from processing residential yard waste. C&D wood includes scrap wood from new construction, lumber from demolished buildings, and processed/separated wood from C&D processing facilities and transfer stations. Forest residuals/land clearing material includes commercial tree trimmings, electric/telephone transmission line clearing and maintenance material, and brush and land clearing residuals including trees, limbs, logging waste, orchard trimmings, etc. Industrial waste wood includes materials from pallet companies, sawmills, manufacturers of wood products, and may also include a small percentage of railroad ties and utility poles. Finally, wood derived from processing residential yard waste includes wood material, sized one inch and greater, separated from grass clippings, leaves, and other yard waste material that would otherwise be suitable for composting. While the plant will have wood processing equipment, it is planned that the bulk of the wood fuel will be delivered in a minus 2-inch processed form suitable as boiler-ready fuel.

Wood fuel will be obtained from sources as close to the RGS site as possible to minimize transportation costs. While most of the wood will be obtained from within a 50-mile radius of the site, it is expected that wood fuels will be delivered to the facility from an area approximately 75 miles in radius. The primary procurement area includes the following counties: Polk, Hardee, Hillsborough, Pasco, Lake, Orange, and Osceola. The secondary procurement area includes the following counties: Highlands, De Soto, Sarasota, Manatee, Pinellas, Hernando, Citrus, Sumter, Seminole, Brevard, and Volusia.

3.2.2 Scrap Tires

Scrap tires will be received at the plant from various sources. Tires accepted at the site will be essentially free of dirt, metal rims, and other foreign matter. Both whole tires and chipped tires will be accepted. The plant will have a whole tire shredder to process tires into minus 2-inch material prior to its being mixed with the processed wood fuel. RGS will co-fire tires at an expected rate of 15-20 percent of the heat input to the boiler.

3.2.3 Landfill Gas

Polk County's North Central Landfill will be required to install a landfill gas collection system by 1994 in order to comply with Florida landfill regulations. The gas is planned to be collected, dehydrated, and compressed at the County site for delivery to RGS. Based on current estimates, the landfill gas will represent 5-10 percent of the heat input to the boiler.

3.3 FUEL PROCESSING, HANDLING, AND STORAGE

Received tires will be stored in a designated tire storage area. This area will be constructed in accordance with Florida DER Chapter 17-711 Waste Tire Rule. The approximate size of the tire storage area is 2.4 acres. Tires will be processed as required using a single shredder with sizing screens. The size of the shredded tire pieces will be minus 2-inch. Tires will be conveyed to the processed wood receiving hopper and onto one of the two covered conveyors feeding the powerhouse. Given the composition of tires and the fact that tires will not be shredded to extremely small size, the generation of fugitive dust will be minimal from this process.

Two types of wood will be delivered to the site: processed (ground) and unprocessed (unground). Processed wood is expected to account for 75 percent of deliveries. Unprocessed wood is expected to be delivered in self unloading trucks. These trucks will back into individual bays and unload. The bays will have access from both ends. A front end loader will either stack the unprocessed wood in a pile or deliver it to the processing area. Processed wood will be delivered in trucks using a

truck dump unloader feeding a receiving hopper. The hopper will feed either into a screw and thence to a radial unloader, or onto conveyors directly feeding the powerhouse. The unloader will drop the fuel directly into the ground wood pile.

Wood will be stored outside in two piles: processed and unprocessed. The total size of the wood storage area will be approximately 8 to 10 acres. The wood pile areas will be surfaced with crushed stone. Unprocessed wood will be transported to a wood processing area by using front end loaders.

Large size wood materials will be reduced in size in two stages. Tree trunks, utility poles, railroad ties, construction debris, etc. will be initially sized with a course hogger having a capacity of 25 ton/hr. The output from this unit will feed a trommel or other screening device. A magnetic separator will extract ferrous metal from the oversize material before it is sent to the final stage of size reduction in a hammermill-type hogger. Processed wood passing through the trommel (or screen) and discharging from the secondary hogger will be conveyed to the boiler fuel storage bin or stacked-out in the processed wood storage area. Fines from the on-site processing of wood will be collected and disposed of off site.

Mixing of solid fuels will be accomplished by direct feed of tires onto the active fuel feed conveyor. The mixed fuel will be fed into a storage bin located in front of the boiler. The storage bin will provide a minimum storage of fuel in the powerhouse, as required for fuel flow/surge control.

Landfill gas and propane will be piped directly into burners located in the boiler.

3.4 POWER PLANT EQUIPMENT

3.4.1 Boiler and Generator

The power plant will have a gross generation capability of 45 MW and a net capability of approximately 39.6 MW. It will utilize a traditional rankine cycle boiler and steam turbine-generator combination.

There will be one boiler and one steam turbine-generator. The boiler will have a steam generating capacity of 375,000 lb/hr. Steam will be generated at 1,250 psig and 950°F. The steam turbine-generator will have a nameplate rating of 45 MW. Steam for feedwater heating will be provided by three turbine extraction points. Based on the steam capacity of the steam turbine-generator and the minimal amount of auxiliary steam use, the boiler should never have to operate beyond its stated capacity.

As discussed above, propane will be used for startup, shutdown, and emergency purposes. The propane burner will have a heat input capacity of 180 MMBtu/hr.

Boiler steam will be used for sootblowing. However, only a nominal amount of steam will be used for this purpose. Sootblowing will occur on an intermittent basis, typically three times a day.

The boiler will be a conventional wood-fired boiler with membrane waterwall construction. The fuel feed will be via a spreader stoker design using either a traveling grate, a vibrating grate, or a reciprocating grate, depending upon boiler vendor selection. A spreader stoker design uses either pneumatic or mechanical fuel distributors located in the stoker front wall to distribute the fuel uniformly throughout the furnace. Fine particles of fuel entering the furnace are burned in suspension. Strategically located high pressure overfire air jets provide turbulence and thorough mixing of the fine fuel and air to assure complete combustion. The coarser, heavier particles of fuel are spread evenly on the grate forming a thin, fast-burning fuel bed.

The plant systems will be designed and operated so that optimum furnace combustion conditions will be maintained. As a result, a high combustion efficiency and low carbon monoxide emissions will be achieved. Some of the measures that will be taken to assure this are: consistent fuel sizing (low fines), proper feeder control, fuel blending, varying grate speed, proper air distribution, and air preheating.

The grate provides a platform on which the fuel can burn and the ash is conveyed away. The grate also serves as a means of introducing part of the combustion air requirements. The remainder of the combustion air is injected through

overfire air ports located above the grates. In a traveling grate, the grate moves from the rear to the front where ash is discharged. Both the reciprocating and vibrating grate use intermittent grate movement or vibration to carry the fuel bed forward through the furnace and automatically discharge the ash off the forward end of the grates.

Gases from the furnace section of the boiler will pass through the superheater and steam generating section. Gases will leave the boiler and then pass through an economizer and air heater before entering the air pollution control system.

The 45-MW steam turbine-generator will be a three extraction condensing type unit equipped with a water cooled steam surface condenser. Water will be supplied to the condenser from a cooling tower. The cooling tower will be a multi-cell unit using a mechanical draft counterflow design. High efficiency drift eliminators will force three distinct changes in air direction to obtain exceptionally low drift rates. The RGS is being designed for zero discharge of waste water. Three wells on-site will provide both service and potable water.

3.4.2 Air Pollution Control System

Spray Dryer Absorber and Fabric Filter System

The air pollution control system for sulfur dioxide and particulate matter will use a spray dryer absorber (SDA) and fabric filter (FF) technology to control acid gases and particulate matter. In this system, lime is fed from a silo into a slaker to form a high solids slurry. The RGS system will incorporate redundant slakers. After being screened for grit removal, the solids slurry is stored in an agitated tank. The slurry is then pumped to the SDA where it is diluted before being introduced into an atomizer located at the inlet of the spray dryer absorber. The SDA will be equipped with multiple atomizers.

Flue gas enters the spray dryer absorber where it is brought in contact with the finely atomized lime - water slurry. Both acid gas absorption and gas cooling occur within the spray dryer absorber. Calcium hydroxide in the lime slurry reacts with sulfur

dioxide and hydrogen chloride to form primarily calcium sulfite and calcium chloride. Proper residence time in the absorber allows drying of the reaction products into dry particles. Residence time is estimated to be 10 seconds. The flow of lime slurry is controlled to maintain a pre-set absorber outlet temperature. A portion of the dried particulate matter falls out in the SDA; however, the majority is carried onto the fabric filter. The expected calcium:sulfur molar ratio range is 2.5 - 3.75.

The fabric filter will be a pulse jet type using acid resistant fiberglass bags. The flue gas leaving the SDA is ducted into a parallel arrangement of fabric filter modules. Flue gas is pulled through the modules by an induced draft fan. Particulate matter is collected on the outside of the bags. The bags are periodically cleaned with a pulse of compressed air. Dust falls off the bags and into hoppers where it is evacuated by the ash handling system. The clean flue gas is drawn through the induced draft fan and discharged into the stack.

The fabric filter will be designed for adequate collection of fly ash at all boiler loads. Protection will be furnished to maintain temperatures above the dew point temperature. The maximum net air-to-cloth ratio, defined as one module out of service and all other modules operating, will not exceed 3.75 to 1. A minimum of six modules will be used. The pulse jet type bag cleaning system will be capable of cleaning a module either in service or out of service without affecting the outlet dust loading or opacity. Bag support cages will be galvanized steel wire mesh or welded wire with a minimum thickness of 16 gauge. Each module gas inlet will be above the ash hopper and will include all necessary turning vanes and distribution devices to assure even distribution of gas throughout the module and minimize reentrainment of ash into the gas stream. Inlet, outlet, and bypass dampers will be automated and will be the poppet type. The baghouse will be designed for a maximum inlet gas temperature of 500 °F.

The ash removal system will vary depending on the type of ash. Bottom ash will be removed using wet drag conveyors. The wetting of the bottom ash will minimize any fugitive dust emissions from that source. Solid waste from the sifting hoppers, economizers hoppers, SDA hoppers, and fabric filter hoppers will be removed by a combination of screw conveyors and/or drag conveyors. All ash conveyors will

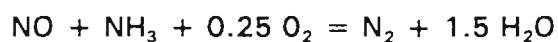
feed an ash silo equipped with an ash handling vent filter to minimize emissions during loading. The silo will also include an ash conditioner. The ash conditioner will moisten the waste to insure minimization of fugitive emissions. Ash will be removed from the site using trucks.

Due to the potential for the mixture of wet bottom ash, flyash, and SDA residue (with excess lime) to solidify, an alternative method of handling/storing of combined ash is also being considered. The alternative would entail the wetting (conditioning) of the dry flyash/SDA residue mixture to suppress fugitive dust before it is combined with the bottom ash from the wet drag conveyor. The combined ash would then be sent to an enclosed ash load-out area where it would be deposited in roll-on/roll-off ash containers. The enclosure would incorporate an ash handling vent filter to prevent dust migration outside of the structure. Provisions for a minimum of 90 hours of on-site storage of ash will be made with either alternative.

Nitrogen Oxides Control System

A combination of combustion controls and selective noncatalytic reduction (SNCR) will be used to control NO_x emissions from the facility. SNCR refers to add-on NO_x control techniques which reduce NO_x to N_2 without the use of catalysts. There are two commercially available systems: Exxon's "Thermal De NO_x " which uses ammonia injection and the Electric Power Research Institute's "NO $_x$ Out" (FuelTech) process which uses urea as the reagent. Since urea quickly decomposes to ammonia when heated to the appropriate temperatures, the process chemistry described below is applicable to both the ammonia and the urea SNCR systems.

Selective noncatalytic reduction uses ammonia to react with oxides of nitrogen in the combustion gas, forming nitrogen and water. Ammonia (NH_3) or urea is injected into the upper furnace area, where it reacts with NO_x . The desired reaction created by the use of SNCR occurs in the temperature range from 1,600 °F to 1,800 °F, with an optimum temperature of about 1,750 °F. The reaction is a homogeneous, gas-phase reaction; therefore, no catalyst is required. The reactions proceed in the presence of excess oxygen within a critical temperature range. The overall NO_x reduction reaction is summarized in the equation below:



The reduction of NO_x using SNCR requires a specific temperature window, residence time, and good mixing of the ammonia in the flue gas. If these conditions are achieved, the amount of ammonia injected into the flue gas will be based on the theoretical NH_3/NO_x mole ratio of 1. However, the temperature within the furnace will vary due to changes in various parameters, including the moisture and heat content of the fuel and the fuel feed rate. Irregular flow patterns in the furnace will prevent perfect mixing/distribution of the ammonia in the flue gas. At present, there are no monitoring and controlling systems with the capability for instantaneous control of a NO_x/NH_3 process. Since no method exists to continuously monitor uncontrolled NO_x within the furnace before the ammonia injection, the ammonia feed rate is established by a feedback control from a post-control NO_x monitor. Therefore, some lag time always exists between reading any higher or lower NO_x emissions and adjusting the NH_3 appropriately. Thus excess ammonia must be injected into the flue gas to ensure the desired reduction efficiency. The ammonia which does not react with NO_x will pass through the furnace. Unreacted NH_3 exiting the boiler is referred to as "ammonia slip."

The SNCR vendor helps locate the optimum furnace injection points to achieve efficient reagent mixing within the temperature window, and the facility operator makes adjustment to assure consistency of the furnace operation and/or minimize shifts in the temperature profile. This combination of careful attention to the design and operation of the system is used to maximize NO_x removal and minimize NH_3 slip.

3.5 VEHICLE TRAFFIC DURING STATION OPERATION

Wood and tires will be brought in by truck. The expected number of deliveries is approximately 70 to 130 trucks per day depending on the mix of 5-ton trucks, 8-ton trucks, and 25-ton vans. Lime for the scrubber system will be delivered by truck on an expected schedule of two trucks per week. Trucks will also be used to transport ash from the site to a landfill. Approximately four truck loads per day are expected for ash disposal, operating on a Monday through Saturday schedule. Additional vehicle

traffic will include employee commuter traffic (from a total operational work force of approximately 36 employees) and miscellaneous traffic associated with supply deliveries, visitors, etc.

TABLE 3-1

RIDGE GENERATING STATION
PROJECTED FUEL SUPPLY MIX

Fuel Source	Weight Percent Range
Construction and Demolition Material	40-60
Forest Residuals/Land Clearing	25-40
Wood Derived from Residential Yard Waste	15-29
Polk County North Central Landfill Gas	5-10
Industrial Waste Wood	5-10
Scrap Tires (15-20% heat input)	7-10

TABLE 3-2

**RIDGE GENERATING STATION
ESTIMATED ANALYSIS FOR BOILER FUEL COMPONENTS**

	Wood ^a	Tires	Landfill Gas
Percent by Weight			
Ash	7.93	6.55	
Sulfur	0.15	1.50	
Hydrogen (H ₂)	3.86	6.78	6.67
Carbon	32.57	78.18	20.00
Water	29.23	1.02	
Nitrogen (N ₂)	0.22	0.12	
Oxygen (O ₂)	25.96	5.86	
Carbon Dioxide			73.33
Heating Value, Btu/lb	5,450	14,000	6,000

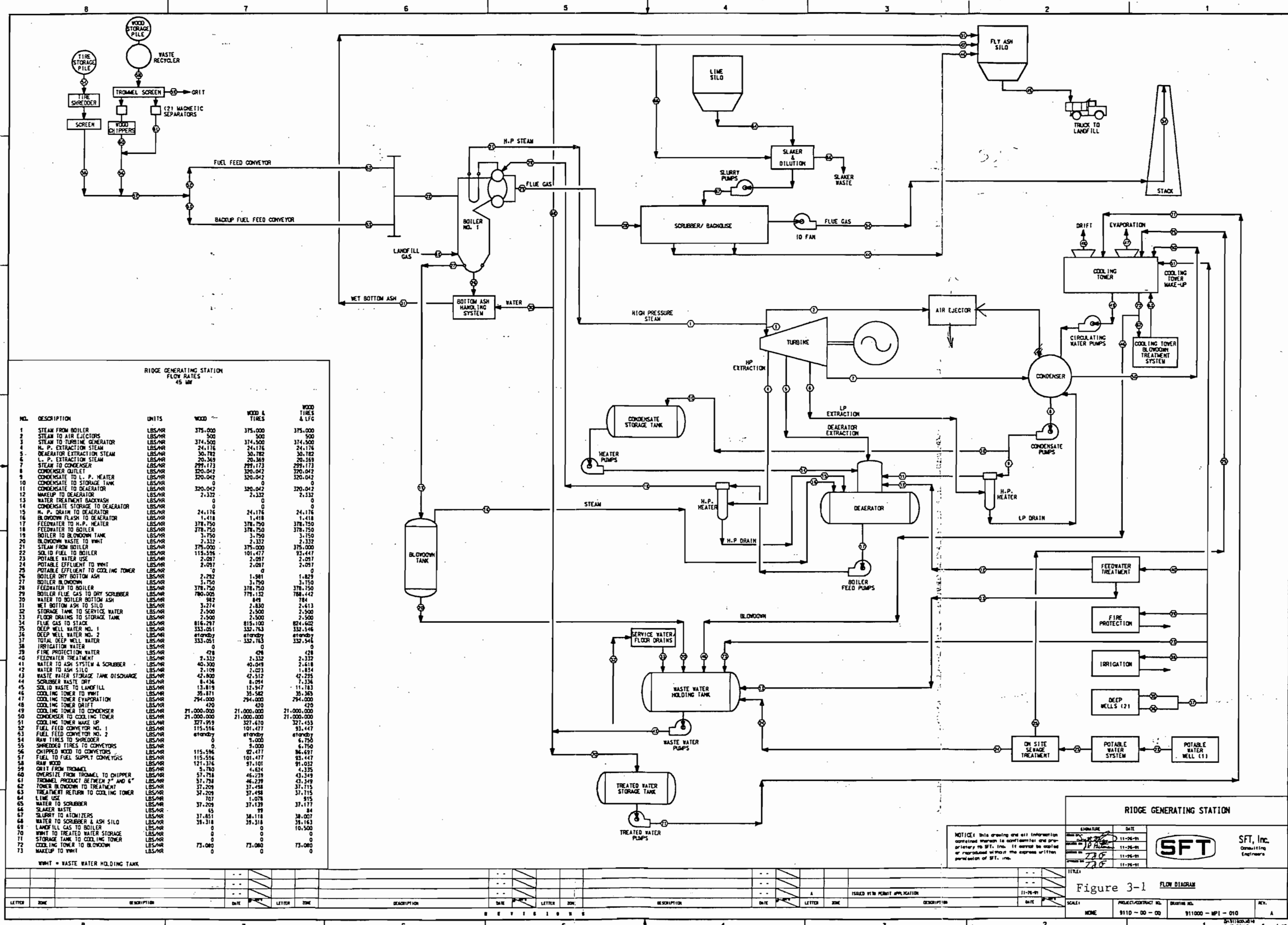
^a These values are for the expected typical wood mix. The heating value of the wood component will vary depending on the mixtures of wood in use.

TABLE 3-3
RIDGE GENERATING STATION
ESTIMATED ANALYSIS FOR BOILER FUEL MIXES

	100% Wood ^a	80% Wood 20% Tires ^a	75% Wood 15% Tires 10% Landfill Gas ^a
Percent by Weight			
Ash	7.93	7.81	7.04
Sulfur	0.15	0.27	0.22
Hydrogen (H ₂)	3.86	4.12	4.33
Carbon	32.57	36.62	34.26
Water	29.23	26.73	24.45
Nitrogen (N ₂)	0.22	0.21	0.19
Oxygen (O ₂)	25.96	24.18	22.03
Carbon Dioxide			7.41
Heating Value, Btu/lb	5,450	6,208	6,061

^a Percentages on a heat input basis.

Note: The heating values will vary depending on the mixtures of wood in use.



RIDGE GENERATING STATION FLOW RATES 45 MW				
NOL	DESCRIPTION	UNITS	WOOD	WOOD & TIRES
1	STEAM FROM BOILER	LBS/HR	375,000	375,000
2	STEAM TO AIR EJECTORS	LBS/HR	500	500
3	STEAM TO TURBINE GENERATOR	LBS/HR	374,500	374,500
4	H. P. EXTRACTION STEAM	LBS/HR	24,176	24,176
5	DEAERATOR EXTRACTION STEAM	LBS/HR	30,782	30,782
6	L. P. EXTRACTION STEAM	LBS/HR	20,369	20,369
7	STEAM TO CONDENSER	LBS/HR	299,173	299,173
8	CONDENSER OUTLET	LBS/HR	320,042	320,042
9	CONDENSATE TO L. P. HEATER	LBS/HR	320,042	320,042
10	CONDENSATE TO STORAGE TANK	LBS/HR	0	0
11	CONDENSATE TO DEAERATOR	LBS/HR	320,042	320,042
12	WATER TO DEAERATOR	LBS/HR	2,332	2,332
13	WATER TREATMENT BACKWASH	LBS/HR	0	0
14	CONDENSATE STORAGE TO DEAERATOR	LBS/HR	0	0
15	H. P. DRAIN TO DEAERATOR	LBS/HR	24,176	24,176
16	BLOWDOWN FLASH TO DEAERATOR	LBS/HR	1,418	1,418
17	FEEDWATER TO H. P. HEATER	LBS/HR	378,750	378,750
18	FEEDWATER TO BOILER	LBS/HR	378,750	378,750
19	BOILER TO BLOWDOWN TANK	LBS/HR	3,750	3,750
20	BLOWDOWN WASTE TO WHWT	LBS/HR	2,332	2,332
21	STEAM FROM BOILER	LBS/HR	375,000	375,000
22	SOLID FUEL TO BOILER	LBS/HR	115,516	101,477
23	POTABLE WATER USE	LBS/HR	2,097	2,097
24	POTABLE EFFLUENT TO WHWT	LBS/HR	2,097	2,097
25	POTABLE EFFLUENT TO COOLING TOWER	LBS/HR	0	0
26	BOILER DRY BOTTOM ASH	LBS/HR	2,292	1,981
27	BOILER BLOWDOWN	LBS/HR	3,750	3,750
28	FEEDWATER TO BOILER	LBS/HR	378,750	378,750
29	BOILER FLUE GAS TO DRY SCRUBBER	LBS/HR	780,005	779,132
30	WATER TO BOILER BOTTOM ASH	LBS/HR	982	849
31	WET BOTTOM ASH TO SILO	LBS/HR	1,214	2,630
32	STORAGE TANK TO SERVICE WATER	LBS/HR	2,500	2,500
33	FLOOR DRAINS TO STORAGE TANK	LBS/HR	2,500	2,500
34	FLUE GAS TO STACK	LBS/HR	816,297	815,100
35	DEEP WELL WATER NO. 1	LBS/HR	332,051	332,763
36	DEEP WELL WATER NO. 2	LBS/HR	61,000	61,000
37	TOTAL DEEP WELL WATER	LBS/HR	332,051	332,763
38	IRRIGATION WATER	LBS/HR	0	0
39	FIRE PROTECTION WATER	LBS/HR	428	428
40	FEEDWATER TREATMENT	LBS/HR	2,332	2,332
41	WATER TO ASH SYSTEM & SCRUBBER	LBS/HR	40,300	40,048
42	WATER TO ASH SILO	LBS/HR	2,109	2,023
43	WASTE WATER STORAGE TANK DISCHARGE	LBS/HR	42,800	42,512
44	SCRUBBER WASTE DRY	LBS/HR	8,436	8,094
45	SOLID WASTE TO LANDFILL	LBS/HR	13,819	12,947
46	COOLING TOWER TO WHWT	LBS/HR	35,871	35,583
47	COOLING TOWER EVAPORATION	LBS/HR	294,000	294,000
48	COOLING TOWER DRIFT	LBS/HR	420	420
49	COOLING TOWER TO CONDENSER	LBS/HR	21,000,000	21,000,000
50	CONDENSER TO COOLING TOWER	LBS/HR	21,000,000	21,000,000
51	COOLING TOWER MAKE UP	LBS/HR	327,959	327,453
52	FUEL FEED CONVEYOR NO. 1	LBS/HR	115,516	101,477
53	FUEL FEED CONVEYOR NO. 2	LBS/HR	standby	standby
54	RAW TIRES TO SHREDDER	LBS/HR	0	0
55	SHREDDER TIRES TO CONVEYORS	LBS/HR	0	0
56	CHIPPED WOOD TO CONVEYORS	LBS/HR	115,516	101,477
57	FUEL TO FUEL SUPPLY CONVEYORS	LBS/HR	121,316	97,101
58	RAW WOOD	LBS/HR	5,780	4,625
59	GRIT FROM TROMMEL	LBS/HR	57,798	46,239
60	OVERSIZE FROM TROMMEL TO CHIPPER	LBS/HR	57,798	46,239
61	TROMMEL PRODUCT BETWEEN 2" AND 6"	LBS/HR	37,209	37,498
62	TROMMEL BLOWDOWN TO TREATMENT	LBS/HR	37,209	37,498
63	TREATMENT RETURN TO COOLING TOWER	LBS/HR	707	615
64	LIME USE	LBS/HR	37,209	37,177
65	WATER TO SCRUBBER	LBS/HR	65	84
66	SLURRY TO ATCHIZERS	LBS/HR	37,851	38,007
67	WATER TO SCRUBBER & ASH SILO	LBS/HR	39,318	38,163
68	LANDFILL GAS TO BOILER	LBS/HR	0	0
69	WHWT TO TREATED WATER STORAGE	LBS/HR	0	0
70	STORAGE TANK TO COOLING TOWER	LBS/HR	0	0
71	COOLING TOWER TO BLOWDOWN	LBS/HR	73,080	73,080
72	MAKEUP TO WHWT	LBS/HR	0	0

WHWT = WASTE WATER HOLDING TANK

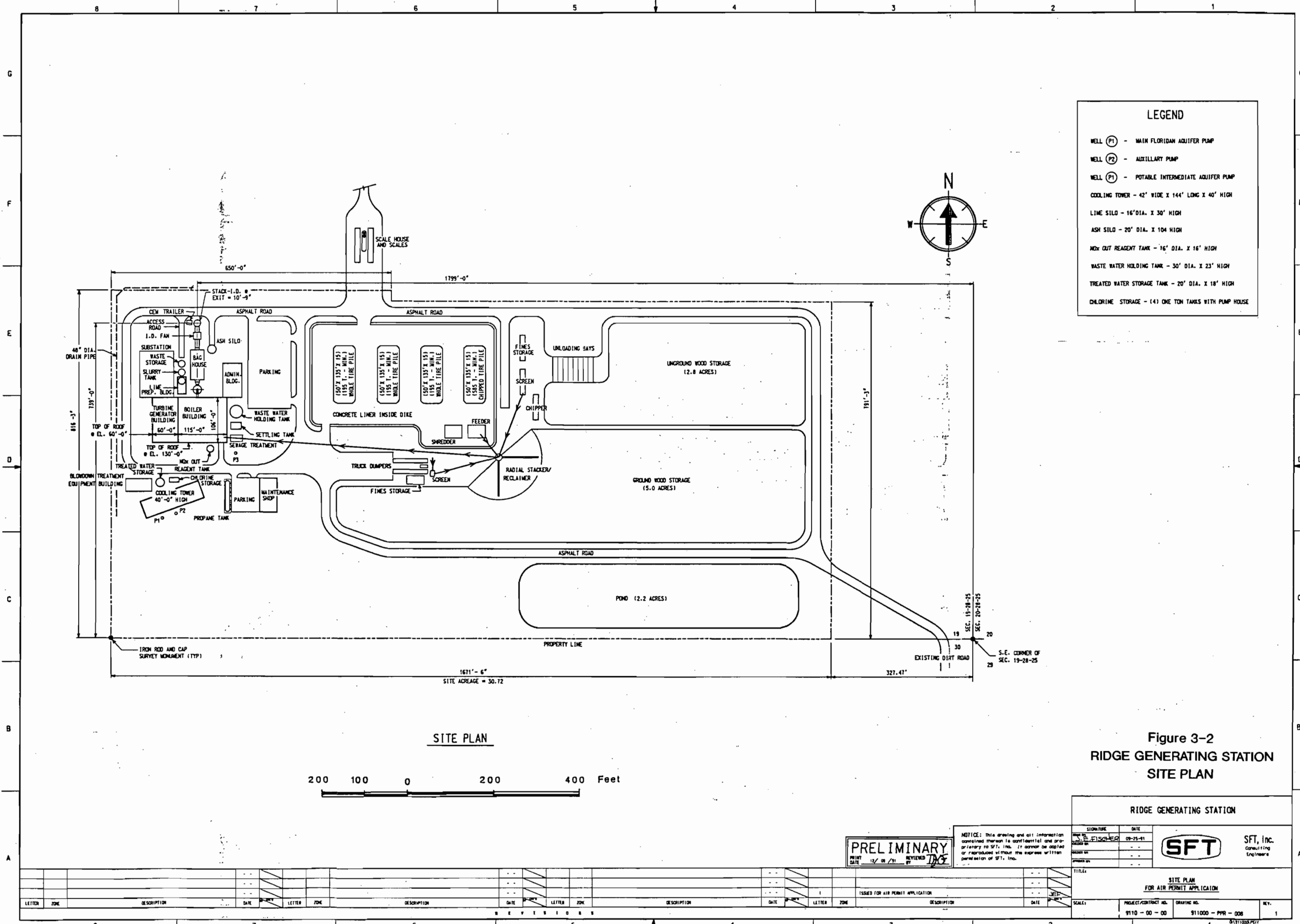
LETTER	ZONE	DESCRIPTION	DATE	LETTER	ZONE	DESCRIPTION	DATE

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Figure 3-1 FLOW DIAGRAM

SCALE	PROJECT/CONTRACT NO.	DRAWING NO.	REV.
NONE	9110 - 00 - 00	911000 - MPI - 010	A



4.0 PROJECT EMISSION SOURCE INFORMATION

4.1 BOILER EMISSION CHARACTERISTICS

4.1.1 PSD Pollutants

As previously discussed, the RGS boiler will be capable of burning a combination of wood, tires, and landfill gas. The combustion of tires will be limited to a maximum of 20 percent of total heat input (approximately 10 percent on a total weight basis). The average fuel is expected to consist of a mixture of 75 percent wood, 15 percent tires, and 10 percent landfill gas (percentages on a heat input basis).

Boiler emission source characteristics are summarized in Tables 4-1, 4-3, and 4-3. These tables provide data for three operating levels: maximum continuous rating (MCR), 75 percent load, and 50 percent load. The information provided includes operating data (heat input, steam generated, and fuel combustion rate), stack data, and emission rates for those pollutants with a defined significant emission rate in PSD regulations. (Emissions of toxic air pollutants without a defined significant emission rate are addressed in Section 4.1.2.) Emission rate calculations are provided in Appendix B.

The hourly emission rates in Table 4-1 for maximum continuous operation have been used to develop estimates of annual emission rates assuming continuous year round operation (8,760 hours per year) at MCR. Estimated maximum annual emissions compared with PSD significant emission levels are shown in Table 4-4. As can be seen, the RGS project will be a "major source" (with emissions exceeding 250 ton/yr for at least one regulated pollutant) and will be a "significant" source for PM, PM₁₀, SO₂, NO_x, CO, VOC's, Pb, and Be.

4.1.2 Toxic Air Pollutants

Several references were reviewed to assist in estimating toxic air pollutant emissions (see Section 9.0). These references included reports, recent permit applications, and emissions test data. Most of these references applied to facilities

Cite
sources of "test
data" and
"other literature"
show how
estimate arrived
at.

Same
NO_x
factor?
(All factors
same)?
except NH₃

Request
copy,
any data
besides CO?

Which
NO_x
process?

any
details
on this?

Which
NO_x
process
is being
proposed?

any other
methods
available for
controlling?

500°F may
be too low.
Is there
a bypass
around
baghouse?

What are
optimum conditions
i.e. efficiency
% CO

need breakdown
on wood
waste,
% treated vs.
untreated

that burn either wood only or tires only. The information available for combination wood- and tire-fired boilers pertains primarily to facilities not equipped with spray dryer absorbers and fabric filters as proposed for RGS.

Before presenting an estimate of emissions, the following points should be noted:

- The use of a spray dryer absorber/fabric filter will result in control of toxic air pollutants as well as sulfur dioxide and particulate matter. Hydrogen chloride, for example, will be controlled effectively by this method. The SDA/FF will result in very high removal efficiencies for non-volatile metals and has been demonstrated to be effective at controlling certain organic emissions. Published toxic air pollutant emission factors (for wood burning emissions especially) do not typically reflect use of SDA/FF controls.
- Some of the toxic air pollutant emission factors cited for wood combustion are based on tests for woodstoves and residential fireplaces. These factors are not appropriate for large wood-fired boilers. Not only would emission rates for boilers be much lower (per pound of fuel burned), some of the substances emitted by woodstoves and fireplaces would not be emitted from boilers due to the much more efficient oxidizing environment of a boiler (greater temperature, combustion time, and turbulence).
- One of the EPA publications cited to identify the toxic air pollutants that might be emitted from various emission sources is "Control Technologies for Hazardous Air Pollutants" (U.S. Environmental Protection Agency, 1986). This publication contains an entry for wood combustion. However, the types of emission sources for the wood combustion category consist of furnaces, boilers, and woodstoves/fireplaces, with no comment as to whether the identified pollutants pertain to all three sources or just to one or two. As indicated above, this distinction is important because emissions from woodstoves and fireplaces may not be applicable to boilers. Therefore, although the EPA "Control Technologies" publication was consulted, other references are considered more relevant to RGS boiler emissions.

Estimated toxic air pollutant emissions from the RGS boiler are listed in Table 4-5. These emission rates have been conservatively estimated from available data and apply to emissions at maximum continuous rating. Emissions at 75 percent and 50 percent load levels would be approximately 0.75 and 0.50 times those shown for MCR. For completeness sake, Table 4-5 contains an emission rate for lead (a criteria pollutant) and for the non-criteria regulated pollutants that have a defined

significant emission rate and that are also listed in Table 4-1. Emission rate calculations provided in Appendix B.

As will be shown in Section 6.0, the estimated toxic air pollutant emission rates in Table 4-5 result in compliance with the Florida no-threat levels by a wide margin.

The toxic air pollutants listed in Table 4-5 are divided into three categories: metals, non-metal inorganic compounds, and organic compounds. The specific substances selected for listing are those that are expected to be emitted in greatest quantities, or those that are often considered to be of most potential concern from a human exposure standpoint even though emitted in small quantities. The substances expected to be emitted in greatest amount are zinc in the metals category (resulting from the combustion of tires), and ammonia and hydrogen chloride in the non-metal inorganics category. Representing those substances often considered of most potential concern from an exposure standpoint (and that generally have the lowest acceptable ambient concentration levels) are the remaining metals in Table 4-5 (arsenic, beryllium, etc.), formaldehyde, and benzene. The polycyclic organic matter sometimes associated with wood combustion are expected to be effectively controlled through efficient furnace operation.

Substances that might theoretically be emitted from the combustion of any treated wood that may be included in the construction and demolition fraction of the wood fuel are expected to be negligible. The construction and demolition materials will be processed to remove non-woody contaminants prior to combustion. The wood fuel is expected to contain only a small percentage of treated wood. In addition, the boiler operating features designed to promote complete combustion will help minimize emissions of any organic treatment chemicals that may evolve from the burning of treated wood. Likewise, the highly efficient scrubber and baghouse will help minimize emissions of organic or metallic compounds present in treated wood.

4.2 ADDITIONAL PARTICULATE MATTER POINT SOURCES

Two point sources of particulate matter emissions will exist in addition to the boiler. Both sources will be minor. One source is the lime silo vent filter and the other is the ash handling vent filter. Expected lime and ash quantities are listed in Figure 3-1.

where
on 3-1?

The lime silo will be operated about twice a week for approximately an hour at a time. PM emissions will be controlled through use of a bin vent filter limiting emissions to 0.02 gr/ft³. At an expected flow rate of 1,400 ft³/min through the filter, estimated PM emissions are 0.24 lb/hr. For an operating schedule of two hours a week, annual PM emissions would be only about 0.013 ton/yr.

X

Ash will be conveyed to the ash silo (or the ash load-out area in the alternate design) by mechanical or belt conveyors. The ash silo or ash load-out area will be equipped with an ash handling vent filter limiting PM emissions to 0.02 gr/ft³. At a flow rate of 1400 ft³/min estimated PM emissions are 0.24 lb/hr. Therefore, the annual PM emissions are expected to be approximately 1.05 ton/yr.

X

The total annual PM emissions from both vent filters combined are expected to be slightly more than 1 ton/yr.

4.3 OTHER EMISSION SOURCES

4.3.1 Fugitive Dust Emissions

Potential fugitive dust sources include unprocessed wood unloading, storage, chipping, and handling; processed wood unloading, storage and handling; tire unloading, storage, shredding, and handling; and vehicle movements. Factors that will act to reduce fugitive dust emissions are summarized in Section 5.0.

4.3.2 Cooling Tower

A single, multi-cell mechanical draft cooling tower will be used to supply cooling water to the condenser. Drift emissions will be minimized through use of high efficiency drift eliminators. Particulate emissions resulting from evaporation of drift droplets are expected to be minimal.

TABLE 4-1

**RIDGE GENERATING STATION
BOILER OPERATING AND EMISSION CHARACTERISTICS
AT MAXIMUM CONTINUOUS RATING**

Characteristic	Fuel ^a		
	100% Wood	80% Wood 20% Tires	75% Wood 15% Tires 10% Landfill Gas
Operating Data			
Heat Input, MMBtu/hr	630	630	630
Steam Generated, lb/hr	375,000	375,000	375,000
Wood Burned, lb/hr	115,596	92,477	86,697
Tires Burned, lb/hr	0	9,000	6,750
Landfill Gas Burned, lb/hr	0	0	10,500
Total Fuel Burned, lb/hr	115,596	101,477	103,947
Stack Data			
Stack Height, ft	325	325	325
Stack Diameter, ft	10	10	10
Flue Gas Temperature, °F	170	170	170
Flue Gas Volume, ft ³ /min (actual)	226,556	224,693	227,553
Flue Gas Velocity, ft/s (actual)	48.1	47.7	48.3
Pollutant^b Emission Rate, lb/hr			
Particulate Matter (PM and PM ₁₀)	12.6	12.6	12.6
Sulfur Dioxide	69.4	109.4	92.5
Nitrogen Oxides (as NO ₂)	94.5	94.5	94.5
Carbon Monoxide	315.0	315.0	315.0
Volatile Organic Compounds	22.1	22.1	22.1
Lead ^c	0.25	0.25	0.25
Beryllium ^c	0.0063	0.0063	0.0063
Mercury ^c	0.022	0.022	0.022
Fluorides	Negligible	Negligible	Negligible
Asbestos	Negligible	Negligible	Negligible
Vinyl Chloride	Negligible	Negligible	Negligible
Sulfuric Acid Mist	Negligible	Negligible	Negligible
Hydrogen Sulfide	Negligible	Negligible	Negligible
Total Reduced Sulfur	Negligible	Negligible	Negligible
Reduced Sulfur Compounds	Negligible	Negligible	Negligible

^a Fuel percentages on a heat input basis.

^b Pollutants with a defined significant emission rate in PSD regulations.

^c The highest estimated emission rate for any fuel mix is shown in each column.

TABLE 4-2

**RIDGE GENERATING STATION
BOILER OPERATING AND EMISSION CHARACTERISTICS
AT 75 PERCENT LOAD**

Characteristic	Fuel ^a		
	100% Wood	80% Wood 20% Tires	75% Wood 15% Tires 10% Landfill Gas
Operating Data			
Heat Input, MMBtu/hr	473	473	473
Steam Generated, lb/hr	281,250	281,250	281,250
Wood Burned, lb/hr	86,697	69,358	65,023
Tires Burned, lb/hr	0	6,750	5,063
Landfill Gas Burned, lb/hr	0	0	7,875
Total Fuel Burned, lb/hr	86,697	76,108	77,960
Stack Data			
Stack Height, ft	325	325	325
Stack Diameter, ft	10	10	10
Flue Gas Temperature, °F	170	170	170
Flue Gas Volume, ft ³ /min (actual)	169,917	168,520	170,665
Flue Gas Velocity, ft/s (actual)	36.1	35.8	36.2
Pollutant^b Emission Rate, lb/hr			
Particulate Matter (PM and PM ₁₀)	9.5	9.5	9.5
Sulfur Dioxide	52.0	82.0	69.3
Nitrogen Oxides (as NO ₂)	70.9	70.9	70.9
Carbon Monoxide	236.5	236.5	236.5
Volatile Organic Compounds	16.5	16.5	16.5
Lead ^c	0.19	0.19	0.19
Beryllium ^c	0.0047	0.0047	0.0047
Mercury ^c	0.017	0.017	0.017
Fluorides	Negligible	Negligible	Negligible
Asbestos	Negligible	Negligible	Negligible
Vinyl Chloride	Negligible	Negligible	Negligible
Sulfuric Acid Mist	Negligible	Negligible	Negligible
Hydrogen Sulfide	Negligible	Negligible	Negligible
Total Reduced Sulfur	Negligible	Negligible	Negligible
Reduced Sulfur Compounds	Negligible	Negligible	Negligible

^a Fuel percentages on a heat input basis.

^b Pollutants with a defined significant emission rate in PSD regulations.

^c The highest estimated emission rate for any fuel mix is shown in each column.

TABLE 4-3
RIDGE GENERATING STATION
BOILER OPERATING AND EMISSION CHARACTERISTICS
AT 50 PERCENT LOAD

Characteristic	Fuel ^a		
	100% Wood	80% Wood 20% Tires	75% Wood 15% Tires 10% Landfill Gas
Operating Data			
Heat Input, MMBtu/hr	315	315	315
Steam Generated, lb/hr	187,500	187,500	187,500
Wood Burned, lb/hr	57,798	46,239	43,349
Tires Burned, lb/hr	0	4,500	3,375
Landfill Gas Burned, lb/hr	0	0	5,250
Total Fuel Burned, lb/hr	57,798	50,739	51,974
Stack Data			
Stack Height, ft	325	325	325
Stack Diameter, ft	10	10	10
Flue Gas Temperature, °F	170	170	170
Flue Gas Volume, ft ³ (actual)	120,471	119,715	121,142
Flue Gas Velocity, ft/3 (actual)	25.6	25.4	25.7
Pollutant^b Emission Rate, lb/hr			
Particulate Matter (PM and PM ₁₀)	6.3	6.3	6.3
Sulfur Dioxide	34.7	54.7	46.2
Nitrogen Oxides (as NO ₂)	47.3	47.3	47.3
Carbon Monoxide	157.5	157.5	157.5
Volatile Organic Compounds	11.0	11.0	11.0
Lead ^c	0.13	0.13	0.13
Beryllium ^c	0.0032	0.0032	0.0032
Mercury ^c	0.011	0.011	0.011
Fluorides	Negligible	Negligible	Negligible
Asbestos	Negligible	Negligible	Negligible
Vinyl Chloride	Negligible	Negligible	Negligible
Sulfuric Acid Mist	Negligible	Negligible	Negligible
Hydrogen Sulfide	Negligible	Negligible	Negligible
Total Reduced Sulfur	Negligible	Negligible	Negligible
Reduced Sulfur Compounds	Negligible	Negligible	Negligible

^a Fuel percentages on a heat input basis.

^b Pollutants with a defined significant emission rate in PSD regulations.

^c The highest estimated emission rate for any fuel mix is shown in each column.

TABLE 4-4

**RIDGE GENERATING STATION
ESTIMATED BOILER EMISSION RATES COMPARED TO
PSD SIGNIFICANT EMISSION LEVELS**

Pollutant	Estimated Emissions Assuming Continuous Operation at Maximum Continuous Rating (ton/yr)			PSD Significant Emission Level (ton/yr)
	100% Wood ^a	80% Wood 20% Tires ^a	75 % Wood 15% Tires 10% Landfill Gas ^a	
Particulate Matter (PM/PM ₁₀)	55.2	55.2	55.2	25 (PM) 15 (PM ₁₀)
Sulfur Dioxide	304.0	479.2	405.2	40
Nitrogen Oxides	413.9	413.9	413.9	40
Carbon Monoxide	1,379.7	1,379.7	1,379.7	100
Volatile Organic Compounds	96.8	96.8	96.8	40
Lead ^b	1.1	1.1	1.1	0.6
Beryllium ^b	0.03	0.03	0.03	0.0004
Mercury ^b	0.096	0.096	0.096	0.1
Fluorides	Negligible	Negligible	Negligible	3
Asbestos	Negligible	Negligible	Negligible	0.007
Vinyl Chloride	Negligible	Negligible	Negligible	1
Sulfuric Acid Mist	Negligible	Negligible	Negligible	7
Hydrogen Sulfide	Negligible	Negligible	Negligible	10
Total Reduced Sulfur	Negligible	Negligible	Negligible	10
Reduced Sulfur Compounds	Negligible	Negligible	Negligible	10

^a Percentages on a heat input basis.

^b The highest estimated emission rate for any fuel mix is shown in each column.

TABLE 4-5

RIDGE GENERATING STATION
ESTIMATED TOXIC AIR POLLUTANT EMISSIONS
AT MAXIMUM CONTINUOUS RATING

Pollutant	Highest Emissions (lb/hr) for Any Fuel Mix
• Metals	
arsenic	0.019
beryllium	0.0063
cadmium	0.033
chromium VI	0.016
lead	0.25
mercury	0.022
nickel	0.063
zinc	0.63
• Non-Metal Inorganics	
ammonia	17.8
hydrogen chloride	3.2
• Organics	
benzene	5.0
formaldehyde	1.7

TP7

 $\times 4.38 = .083$ $= .028$ $= .145$ $= .07$ $= 1.1$ $= .096$ $= .276$ $= 2.76$ 78.0 14.0 21.9 7.45

5.0 EMISSION CONTROLS AND COMPLIANCE WITH EMISSION STANDARDS

5.1 BEST AVAILABLE CONTROL TECHNOLOGY FOR BOILER

5.1.1 Introduction

The regulated pollutants subject to PSD review as a result of boiler emissions are particulate matter, sulfur dioxide, nitrogen oxides, carbon monoxide, volatile organic compounds, lead, and beryllium. These pollutants are assessed in the following best available control technology (BACT) evaluation.

BACT evaluations must be performed following EPA's "top-down" BACT approach. The top-down approach first entails identifying the technically feasible alternatives applicable to a given type of emission source. The most stringent of the technically feasible alternatives is then evaluated in terms of economic, energy, and environmental factors. If the "top" alternative is justifiable on the basis of these factors, it is selected as the BACT alternative and less stringent alternatives need not be considered. If the top alternative is shown to be not justified, the next most stringent alternative is evaluated. This process continues until a justifiable alternative remains. This then becomes the proposed BACT alternative. It should also be noted that the term "alternatives" can refer not only to different types of control methods, but also to different emission rates potentially achievable by the same method.

Another aspect of BACT evaluations is consideration of "unregulated" pollutants. EPA's North County remand decision requires that the environmental impact of pollutants not subject to PSD review be taken into account when evaluating the BACT emission control alternatives for PSD-regulated pollutants. Examples of non-PSD pollutants applicable to the RGS boiler BACT evaluation include metals (other than Pb and Be), hydrogen chloride, and specific organic compounds.

Information sources considered for the BACT evaluation consist of the following:

- The EPA BACT/LAER Information System, BACT/LAER Clearinghouse.
- Federal, state, and local air quality permits.
- Federal, state, and local agency representatives identified as contacts for similar sources.
- Control equipment vendors.
- Other sources such as trade journals and publications.

Table 5-1 was developed from these sources and contains a summary of wood-fired boilers similar in size to the RGS boiler. Three other facilities have been identified as permitted to burn tires as the sole fuel. Information on these facilities is presented in Table 5-2. A number of additional facilities have been identified as burning wood and tires. These facilities are generally hog fuel boilers located at pulp and paper mills. Included among these facilities are the following:

- Fort Howard Paper, Green Bay, Wisconsin
- Great Southern Paper, Cedar Springs, Georgia
- Inland-Rome Paper, Rome, Georgia
- Nekoosa Paper, Tomahawk, Wisconsin
- Willamette Industries, Albany, Oregon
- Jefferson Smurfit Paper, Newberg, Oregon
- Champion International, Bucksport, Maine
- Port Townsend Paper, Port Townsend, Washington

In each of these cases tire-firing was added to an existing boiler with little or no change made to air pollution control equipment.

The search for emission source information did not disclose any facilities that were originally permitted, designed, and built to burn a mixture of wood and tires. A wood/tire facility in Michigan was identified which is currently in the permitting process.

The pollutants assessed in the BACT evaluation can be grouped into three categories: combustion products not including acid gases, acid gases, and products

of incomplete combustion. The RGS boiler emissions subject to BACT evaluation within these three categories are as follows:

- Combustion products not including acid gases: PM/PM₁₀, Pb, Be
- Acid gases: SO₂, NO_x
- Products of incomplete combustion: CO, VOC's

not combustion products per se

PM and metals (the non-acid combustion products) are most often controlled by flue gas particulate collection devices. NO_x is most often controlled in newer wood- or tire-fired boilers by using a selective noncatalytic reduction system. Due to the low sulfur content of wood, SO₂ emissions are generally uncontrolled from wood-fired boilers. SO₂ emissions from tire-fired boilers are typically controlled using a scrubber. CO and VOC's (the products of incomplete combustion) are most often controlled by operating practices that promote complete combustion.

The facilities listed in Table 5-1 include fluid bed combustors as well as conventional boilers. Because of the considerable design and operating differences between fluid bed combustors and non-fluid bed boilers, the information for fluid bed combustors is not considered applicable to the RGS project. The reason for not selecting a fluid bed combustor for the RGS project is that this technology has not been demonstrated for tire combustion, and it is anticipated that operational problems would occur if one were used.

5.1.2 Particulate Matter

Technically Feasible Control Technologies -- PM

The generally recognized techniques for particulate matter control are fabric filters, electrostatic precipitators (ESP's), venturi scrubbers, and cyclone-type mechanical collectors.

Ranking of Control Technology Alternatives -- PM

A review of the various information sources previously listed indicated that wood-fired boilers are equipped almost exclusively with ESP's, mechanical collectors, and venturi scrubbers. Baghouses have historically been avoided on wood-fired units due to the potential fire hazard they present. However, at RGS the proposed emissions control system includes installation of a spray dryer absorber prior to the particulate control device. This design arrangement mitigates the potential for carryover of "sparklers," thereby greatly decreasing the chance of a fire occurring in the particulate control device. When particulate control equipment is located downstream of a spray dryer absorber, a fabric filter is recognized as the "top" control technology. Fabric filtration is proposed for the RGS facility. Therefore, no other control alternatives need be considered. In addition, collection efficiency is enhanced when a fabric filter is used in conjunction with an SDA due to agglomeration of finer particles into larger ones. A fabric filter is not as sensitive as other particulate control devices, such as an ESP, to changes in gas volume, composition, inlet concentration, and temperature. Fabric filters will accept surges in gas flow and particulate concentration with no significant increase in particulate emissions. Fluctuations in fly ash resistivity, which affects particulate removal with an ESP, is not a problem with a fabric filter.

A fabric filter also serves as BACT for PM₁₀. Fabric filters are capable of achieving the highest PM₁₀ removal efficiency of the applicable control devices.

Ranking of Emission Rate Alternatives -- PM

The minimum level of control that must be achieved by a given emission source is the level that complies with applicable emission standards. As discussed in Section 5.3, the emission standard considered applicable to the RGS project requires a PM emission rate not to exceed 0.10 lb/MMBtu heat input. However, newer wood and tire burning facilities have been permitted at lower levels. The three tire burners listed in Table 5-2 all use scrubber/baghouse combinations and have maximum allowable particulate limits in the range of 0.02 - 0.03 lb/MMBtu. The one wood-fired boiler permitted with a baghouse is limited to 0.03 lb/MMBtu. The most recently

permitted wood-fired unit identified is a unit at the Beaver-Livermore facility. This facility was permitted September 5, 1991, with a particulate limit of 0.02 lb/MMBtu. It is the fourth unit listed in Table 5-1.

Non-PSD Pollutant Considerations -- PM

Use of fabric filtration for control of PM emissions will achieve control of any pollutants appearing in particulate form. This would include various heavy metals such as zinc emissions from tire combustion. The major advantage of fabric filter systems over ESP systems is their improved control efficiency for particulate in the submicron particle size range. Since small particles have a greater relative surface area than larger ones, it is believed that trace metals and noncondensable organics tend to accumulate on the smaller particulate matter. Hence, the fabric filter's greater capability for removing particulate matter also enhances its ability to remove trace metals and noncondensable organics.

As noted above, the FF's ability to remove submicron particles enhances its capability to remove trace metals and condensable organics. The actual formation mechanisms of particles containing trace metal constituents are not completely understood. It is theorized that the removal mechanisms are condensation and/or absorption coupled with collection in the particulate control device. The temperature of the flue gas and efficiency of particle collection (especially in the submicron size range) are, therefore, the two most important factors affecting trace metal emissions removal in the flue control system. Most of the metal compounds potentially emitted by the facility have condensation points well above 300°C and are typically removed by the particulate removal device with a high efficiency.

Non-volatile trace metal emissions represent a concentration of the metal in the PM exiting the facility. The removal of trace metal PM emissions, which would include arsenic, beryllium, cadmium, chromium (total and hexavalent), lead, nickel, zinc, and to a lesser degree mercury, is accomplished by the fabric filter, but it is assisted by the action of the SDA. Reducing the flue gas temperature in the SDA aids in condensation and the agglomeration of particles for easier collection in the FF. The high uniform collection efficiency of the FF across all particle size ranges also contributes to trace

metal PM emission control. Therefore, RGS will be applying the most efficient control system to control trace metals.

Selected BACT -- PM

An emission rate of 0.02 lb/MMBtu using fabric filtration is proposed as BACT. This selection represents the "top" control alternative. Furthermore, based on modeling results, an emission rate of 0.02 lb/MMBtu will result in an insignificant particulate matter ambient impact.

5.1.3 Sulfur Dioxide

The SO₂ control method generally acceptable for wood-fired units is fuel selection because of the inherently low sulfur content of most wood fuels. SO₂ control for facilities using tires as the primary fuel is generally achieved using a scrubber/fabric filter combination. Post-combustion methods for SO₂ control include spray dryer absorbers, wet scrubbers, and dry sorbent injection (DSI) with either a fabric filter or ESP.

Ranking of Control Technology Alternatives -- SO₂

The SO₂ BACT control hierarchy would Rank SDA and wet scrubbers as the "top" level of control. Either an SDA or a wet scrubber is capable of achieving 80 percent SO₂ removal and 95 percent HCL removal reliably on a long-term basis. DSI Systems cannot achieve equally stringent control requirements on a continuous, long-term basis. Therefore, DSI would not be considered BACT.

The energy and economic impacts of an SDA and a wet scrubber are not equal. A wet scrubber has a larger pressure drop requiring more energy, and the capital costs for wastewater treatment add significantly to the economics. In addition, from an environmental perspective, wet scrubbers have significant disadvantages compared to the proposed SDA system. Wet scrubber systems use large quantities of water, produce wet sludge which must be stabilized before disposal (requiring large

predisposal storage capacity), require high maintenance due to scaling and corrosion of equipment in the system, and require costly reheat for equipment protection and adequate plume dispersion. For these reasons, when fuel sulfur content requires the use of a flue gas desulfurization system, the SDA/FF SO₂ removal method is most often selected for non-fluid bed boilers burning fuels other than fossil fuels. This method represents the "top" SO₂ control technology. No other control technology has been demonstrated to achieve greater control of acid gas emissions in the United States. Since an SDA/FF system is proposed for the RGS facility, no other control technology alternatives need be considered in the BACT evaluation.

Ranking of Emission Rate Alternatives -- SO₂

The specific SO₂ emission rates resulting from application of a given control technology will depend of fuel sulfur content as well as on the removal efficiency of the control device. Fuel sulfur content variability is compounded in the case of the RGS facility since the facility will be designed to burn wood, tires, and landfill gas at different percentages. Because of fuel and sulfur content variability, it is not appropriate to compare SO₂ emissions from the RGS facility to units that burn only wood or only tires. For example, the SO₂ emission limits shown in Table 5-1 for wood-fired boilers tend to be low due in large part to the low sulfur content of most wood fuels. A mix of wood fuels will be combusted at RGS. Some of these fuels, such as the wood fuel derived from C&D materials, are expected to have higher sulfur contents. The SDA/FF design being developed for RGS will achieve a removal efficiency of approximately 80 percent. Based on the expected range of fuel sulfur content, this control efficiency will result in SO₂ emissions of 0.17 lb/MMBtu or less on a 24-hour block average basis.

too high!
shoot for
0.10

Non-PSD Pollutant Considerations -- SO₂

Use of an SDA/FF system for SO₂ will also result in control of acid gases such as HCl. As previously discussed, the SDA/FF system provides the combination of factors that are most favorable for trace metal emissions removal. As the spray droplets in the lime slurry evaporate and the flue gas is cooled, the metals condense and impact or absorb onto the smaller particles in the gas stream. The greater submicron removal efficiency of the FF results in higher overall metal removal efficiencies for the SDA-based system. Removal efficiencies for heavy metals in the SDA/fabric filter system will exceed 99 percent. The SDA in conjunction with the fabric filter will also remove a smaller percentage of volatile trace metals, such as mercury which may occur in very low concentrations in the RGS fuel mix. Removal efficiency for mercury is expected to be approximately 50 percent. This removal is accomplished through a variety of mechanisms, which include vapor condensation in the SDA and adsorption/absorption in the fabric filter. In addition, control of some organic compounds is accomplished in SDA/FF systems. For example, while dioxin emissions attributable to this type of facility are negligible, SDA/FF systems have been demonstrated to reduce dioxin emissions by approximately 90 percent.

Selected BACT Alternative -- SO₂

The control approach selected as BACT for SO₂ is use of a dry scrubber/fabric filtration system limiting SO₂ emissions to 0.17 lb/MMBtu on a 24-hour block average basis. Based on modeling results, an emission rate of 0.17 lb/MMBtu will result in an insignificant ambient impact.

5.1.4. Nitrogen Oxides

Technically Feasible Alternatives -- NO_x

The technically feasible control alternatives consist of combustor design, add-on controls, or a combination of the two. The candidate add-on control methods for large combustion sources in general are selective noncatalytic reduction (SNCR) and selective catalytic reduction (SCR). While SCR has been demonstrated to be effective

on a developmental basis on oil-, gas- and coal-fired boilers and has been commercially applied to several gas-fired combustion processes in the United States, SCR has not been commercially proven at wood-fired or tire-fired boiler facilities. Based on the information sources previously cited, SCR technology has not been used at existing or proposed wood- and/or tire-fired boilers. SCR technology for wood- and/or tire-fired combustion is therefore not considered a sufficiently proven method to be considered as a technically feasible alternative for the RGS project.

Ranking of Control Technology Alternatives -- NO_x

Use of SNCR can achieve a greater NO_x control efficiency than combustor design alone. A combination of SNCR and combustor design should theoretically be able to achieve greater control than either method individually. This combination approach, which represents the "top" control method, is proposed for the RGS facility. Therefore, no other control method need be considered in the BACT evaluation. Features of the furnace designed for installation at the RGS facility that will help minimize NO_x emissions include an enlarged furnace volume and installation of an overfire air system.

Ranking of Emission Rate Alternatives -- NO_x

NO_x formation is influenced by both the amount of nitrogen in the fuel and the combustion technology applied. The expected average fuel mix on a heat input basis is 75 percent wood, 15 percent tires, and 10 percent landfill gas. On a weight basis, this equates to 83 percent wood, 7 percent tires, and 10 percent landfill gas. Given these percentages, the combustion process and, hence, NO_x formation will be dominated by wood firing. Therefore, NO_x emissions from the RGS facility should be evaluated based on units burning 100 percent wood.

How?
X

The list in Table 5-1 contains three fluid bed units. As pointed out previously, however, fluid bed combustors are not appropriate for comparison to conventional boilers. The non-fluid bed boilers in Table 5-1 show a NO_x range of 0.11 - 1.19 lb/MMBtu. The RGS facility is designed based on stoker firing. Therefore, the most appropriate BACT reference is to stoker-fired units using SNCR.

Nine units are listed in Table 5-1 that use SNCR and are not fluid bed units. Two of these units have a NO_x limit of 0.11 lb/MMBtu. Five have a limit of 0.15 lb/MMBtu. One has a limit of 0.21 lb/MMBtu, and one has a limit of 246.6 ton/yr. A mix of wood fuels will be combusted at RGS. Some of these fuels, such as the wood fuel derived from yard waste, are expected to have a higher nitrogen content than others. Using this higher nitrogen fuel will increase NO_x emissions. Therefore, based on the fuel mix, it is anticipated that an SNCR system at RGS will result in NO_x emissions in the upper range of the nine units identified in Table 5-1 as using SNCR on a non-fluid bed boiler.

*Revise
BACT limits
after compliance
test.*

Non-PSD Pollutant Considerations -- NO_x

As discussed in Section 3.4.2, the two types of SNCR systems, ammonia injection and urea injection, will result in ammonia emissions. These emissions, referred to as ammonia slip, occur when the injected reagent does not react completely with NO_x. Ammonia emissions are minimized by careful design and operation, but they are an unavoidable byproduct of achieving better control of NO_x emissions. As will be discussed in Section 6.0, modeling of the ammonia emissions estimated for the RGS boiler indicates that the ambient concentrations resulting from ammonia slip will be less than the no threat levels defined by DER.

Selected BACT Alternative -- NO_x

The alternative selected as BACT for RGS NO_x emissions is use of SNCR and combustion design to achieve a NO_x emission rate of 0.15 lb/MMBtu on a 24-hour block average basis. This alternative is consistent with the most recent BACT determination made for a wood-fired unit (Beaver-Livermore) and is commensurate with fuel nitrogen content levels expected over the anticipated fuel mix. Based on modeling results, an emission rate of 0.15 lb/MMBtu will result in an insignificant ambient impact.

5.1.5 Carbon Monoxide

Technically Feasible Alternatives -- CO

In fuel burning equipment, CO emissions result from incomplete combustion. Procedures accepted as BACT for CO control consist of techniques to enhance combustion efficiency. As far as is known, no boiler owners have installed or proposed installation of add-on control systems for CO.

Ranking of Control Technology Alternatives -- CO

The approach proposed as BACT for CO emissions from the RGS facility is use of good combustion practices. This approach is consistent with the control methods accepted as BACT for other wood- and/or tire-fired boilers as indicated by a review of the BACT/LAER Clearinghouse entries, and is the "top" control method. Therefore, no other control technology need be considered.

Ranking of Emission Rate Alternatives -- CO

Combustion practices that minimize CO will generally increase NO_x production. Therefore, selection of a CO emission rate has to be made in conjunction with the NO_x emission limit selection. The five units in Table 5-1 which have a NO_x limit of 0.15 lb/MMBtu have CO limits of 0.3 to 0.4 lb/MMBtu. Another consideration in selecting a CO emission rate is the effect of tire burning on CO emissions. Boiler vendors have indicated that CO emissions will increase when tires are co-fired with wood. In addition, a recent study on emissions from tire burning facilities was published by Malcolm Pirnie, Inc., entitled "Air Emissions Associated With the Combustion of Scrap Tires for Energy Recovery." This report includes CO emissions data on five boilers. The results, summarized in Table 5-3, show that adding tires to the base fuel increased CO emissions in four of five facilities. These increases ranged from 35 to 88 percent. Based on these data, burning tires with wood at RGS is expected to increase CO emissions as compared to burning wood alone.

An emission limit of 0.5 lb/MMBtu (24-hour block average) has been selected as BACT. This limit is based upon a review of actual CO emissions data at several operating wood-fired boilers, and giving consideration to the mix of wood fuels anticipated to be fired, as well as the information which indicates that CO emissions will increase when tires are co-fired with wood in the boiler.

Non-PSD Pollutant Considerations -- CO

The good combustion practices employed to reduce CO emissions will also help reduce emissions of organic compounds.

Selected BACT Alternative -- CO

The alternative selected as BACT for CO emissions is good combustion practices. The furnace will be designed to provide conditions conducive to good combustion. The methods that will be used to ensure high combustion efficiency and minimize CO and VOC emissions from the combustion process include:

- High combustion temperatures
- Sufficiently long residence times
- Good fuel mixing and fuel bed management
- Controlled distribution of combustion air
- High combustion gas turbulence.

These methods will achieve an emission limit of 0.5 lb/MMBtu on a 24-hour block average basis, excluding periods of start-up and shut down. The proposed CO limit is slightly higher than the limits established for recently permitted wood-fired facilities with a NO_x limit of 0.15 lb/MMBtu. This high end value is warranted due to the proposed fuel mix at this facility.. Based on modeling results, an emission rate of 0.5 lb/MMBtu will result in an insignificant ambient impact.

5.1.6 Volatile Organic Compounds (VOC's) -- VOC's

Technically Feasible Alternatives -- VOC's

Control technologies for VOC emissions from industrial processes include incineration, carbon adsorption, absorption, and condensation. However, due to their low concentrations in a high volume of flue gas, wood-fired boiler VOC emissions are such that carbon adsorption, absorption, and condensation would be ineffective add-on control technologies. These control methods are therefore considered not technically feasible for the project. Thermal incineration of VOC's is the most appropriate technology, and is accomplished in a boiler furnace by a combination of residence time, temperature, and mixing velocities. Maintaining good combustion practices to assure proper residence time, temperature, and turbulence is the only feasible control technology applicable to the RGS project.

Ranking of Control Technology Alternatives -- VOC's

Proper combustion practices is the top VOC control technology for boilers. The same methods used to ensure high combustion efficiency and reduce CO emissions are also used to minimize VOC emissions. Since good combustion practices are being proposed for RGS facility, no other control technology alternatives need to be considered in the BACT analysis.

Ranking of Emission Rate Alternatives -- VOC's

For non-fluid bed boilers, Table 5-1 shows a range of permitted VOC emission limits from 0.016 - 0.126 lb/MMBtu. A VOC emission limit is available for only one of the tire-fired units in Table 5-2. This limit is listed as 0.032 lb/MMBtu.

Non-PSD Pollutant Considerations -- VOC's

Control of VOC emissions as a general class of organics will of course also control the specific organic compounds that make up this class.

Selected BACT Alternatives -- VOC's

The alternative selected as BACT for VOC emissions from the RGS project is good combustion practices with an emission limit of 0.035 lb/MMBtu. This emission limit is in the lower end of the range shown for other wood-fired units and is similar to the one tire-fired plant having a VOC limit.

5.1.7 Lead

As discussed above, the BACT selected for particulate matter (fabric filtration) is also applicable to metals such as lead which remain primarily in particulate form following combustion. The proposed maximum Pb emission rate is .0004 lb/MMBtu.

5.1.8 Beryllium

As discussed above, the BACT selected for particulate matter (fabric filtration) is also applicable to metals such as beryllium which remain primarily in particulate form following combustion. The proposed maximum Be emission rate is 0.00001 lb/MMBtu.

5.1.9 BACT Summary

Table 5-4 presents a summary of the control technologies and emission rates proposed as BACT for PM, SO₂, NO_x, CO, VOC's, Pb, and Be.

5.2 OTHER EMISSION CONTROL CONSIDERATIONS

5.2.1. Toxic Air Pollutants from Fuel Combustion

As previously indicated, the control methods proposed for the regulated pollutants emitted in significant amounts will also serve to reduce emissions of many toxic air pollutants. On the other hand, emissions of one toxic air pollutant (ammonia) are an unavoidable byproduct of the proposed control method for NO_x . The following summary addresses toxic air pollutant emissions from the RGS boiler.

Hydrogen Chloride - HCl will be controlled by the SO_2 acid gas control system (SDA/FF). The expected removal efficiency of uncontrolled HCl emissions is approximately 95 percent.

Metals - Metals that remain in particulate form during combustion will be effectively controlled by the fabric filtration system. As discussed above, the SDA/FF provides the combination of factors that are most favorable for trace metal emissions removal. The removal efficiencies for the majority of the heavy metals (i.e., non-volatile metals) will exceed 99 percent, with a lower removal efficiency expected for the more volatile metals.

Specific Organic Compounds - Good operating practices for VOC control in general will also act to control emissions of specific organic compounds. In addition, a spray dryer/fabric filter control system for acid gases and particulate matter has been found effective in removing a significant portion of the organic compounds from the flue gases of some combustors.

Ammonia - Ammonia emissions will occur only as a result of "ammonia slip" from the SNCR system that will be used to control NO_x emissions. The presence of ammonia is therefore a tradeoff involved in controlling NO_x emissions. Keeping ammonia emissions to a minimum will be achieved by proper design and operation of the SNCR system.

5.2.2 Other Particulate Matter Emission Sources

Ash Silo and Lime Silo

Particulate emissions from the ash silo and lime silo will be controlled by bin vent filters. The expected outlet dust loadings from these filters is 0.02 gr/ft³. In addition, loading and unloading operations involving the ash and lime silos will occur on an intermittent basis. The lime silo is expected to be loaded about twice a week for about an hour per loading. The ash silo will be in use about six times per day for about an hour each time.

The alternative ash handling system that is being considered eliminates the ash silo and its vent filter. With the alternate design an enclosed ash loadout structure is included which will have its own ash handling vent filter. Because both bottom ash and the combined fly ash/SDA residue will be wetted before being loaded into containers, fugitive dust emissions are expected to be less than with the ash silo option. If the ash loadout area is incorporated into the plant design, it will be located within 50 ft of the proposed ash silo, adjacent to the baghouse, SDA, and boiler. The ash handling vent filter will be on the roof of that structure, and will have an expected outlet dust loading of 0.02 gr/ft³.

Cooling Tower

Particulate emissions from the cooling tower will be controlled by an effective drift elimination design. The cooling tower will be equipped with high efficiency drift eliminators forcing three distinct changes in air direction and obtaining extremely low drift rates.

Fugitive Dust Sources

Factors that will serve to minimize fugitive dust emissions are as follows:

- Unprocessed wood unloading, storage, chipping and handling - The unprocessed wood portion of the RGS fuel supply is expected to make up

less than 19 percent of the average boiler heat input. By virtue of the relatively small quantity and the size of the unprocessed material, unloading and storage are not expected to create a significant fugitive dust source. The chipping or hogging of these materials may produce fines or dust. Therefore, measures will be taken in fuel procurement to minimize deliveries of loads which could result in dust generation. For the atypical loads which could cause dusting, wood yard operators will have available service water hose stations which will be used for wash-down and dust suppression. Fines which are generated in the hogging operations will be collected by mechanical or pneumatic means, stored temporarily, then sent to an approved landfill.

- Processed wood unloading, storage and handling - Processed or ground wood will be received in covered trucks and will be unloaded into the receiving hopper using a hydraulic truck unloader. From the receiving hopper, sized fuel will be added to the fuel pile via the radial stacker. To minimize windborn dust as the wood chips fall off the stacker onto the pile, the height of the stacker will be adjusted by woodyard operators. The use of the stacker reclaimer will not generate dust emissions, and the use of a covered fuel conveyor to the boiler house will keep windswept emissions from that source to a minimum.
- Tire unloading, storage, shredding, and handling - Tires will be received as whole tires and fragments, but not powdered. Tire materials as received will not be inherently dusty when unloaded and stored. The tire fragments resulting from shredding will be relatively large (minus 2-inch) and should not result in excessive dust emissions during the shredding process or when conveyed to the boiler.
- Vehicle movements - On-site roads will be paved, and the surface of the wood storage area will be compacted crushed stone which will minimize dust from vehicle movement in that area. In addition, a water truck will be maintained on-site, and the driving surfaces will be wetted as needed to control dust.

5.3 COMPLIANCE WITH EMISSION STANDARDS

5.3.1 Applicable Standards

40 CFR 60, Subpart Db

Portions of the federal new source performance standards (NSPS) in 40 CFR 60, Subpart Db, pertaining to industrial - commercial - institutional steam generating units with a heat input capacity greater than 100 MMBtu/hr are considered applicable to the RGS project. However, not all of the standards in Subpart Db are

applicable. The applicable standards are (1) the emission rate standard for particulate matter when combusting wood or a mixture of wood and other fuels, and (2) the opacity standard. The standard for sulfur dioxide is not applicable because it pertains to coal and oil combustion. The standard for nitrogen oxides is 0.30 lb/MMBtu for facilities that simultaneously combust natural gas with wood, municipal-type solid waste, or other solid fuel, except coal. However, this standard does not apply if the facility has a federally enforceable requirement that limits operation of the facility to an annual capacity factor of 10 percent or less for natural gas. RGS is willing to accept such a permit condition.

The Subpart Db particulate standard applicable to wood combustion (40 CFR 60.43b(c)(1)) is 0.10 lb/MMBtu heat input. The proposed RGS boiler emission rate of 0.02 lb/MMBtu will easily meet this standard.

The applicable opacity standard (40 CFR 60.43b(f)) requires that discharges will be limited to an opacity of 20 percent (6-minute average), except for one 6-minute period per hour when opacity can increase to 27 percent. The RGS boiler will be operated to comply with this standard.

Florida Rule 17-2.610(2) and 17-2.610(3)

Florida Rule 17-2.610 contains general particulate emission limiting standards. Rule 17-2.610(2), the general visible emissions standard, is considered applicable to the RGS ash handling system and lime silo. This standard requires limiting discharges to less than 20 percent opacity. The vent filters installed for control of ash and lime emissions will achieve this requirement. Rule 17-2.610(3) pertains to unconfined emissions of particulate matter from sources such as vehicular movement, transportation of materials, loading, unloading, storing, and handling. RGSLP will take reasonable precautions to reduce fugitive dust emissions, including paving of on-site roads.

5.3.2 Standards Not Considered Applicable

The following standards are not considered applicable to the RGS project for the reasons stated:

- 40 CFR 60, Subpart Da, the federal NSPS for electric utility steam generating units with a heat input greater than 250 MMBtu/hr using fossil fuel. -- Subpart Da applies to units burning fossil fuels alone or in combination with other fuels. At least 250 MMBtu/hr of fossil fuels must be burned for a unit to be an affected facility. The only fossil fuel that will be burned in the RGS boiler is propane. The propane burner design will limit heat input from propane to 180 MMBtu/hr. Since the total fossil fuel heat input will be less than 250 MMBtu/hr, the facility is not subject to Subpart Da.
- 40 CFR 60, Subpart Ea, the federal NSPS for municipal waste combustors (MWC's) with a capacity greater than 250 tons per day of municipal-type solid waste (MSW) or refuse-derived fuel (RDF). --- RGS will not be subject to the standards in Subpart Ea because 30 percent or less (by weight) of the fuel feed stream will be comprised of municipal solid waste (MSW) as defined in 40 CFR 60, Subpart Ea. To satisfy the criteria for exclusion of co-fired combustors from the standards, RGS will accept a federally enforceable permit condition which limits the percent of MSW in the fuel stream to no more than 30 percent, by weight, measured on a daily basis. RGS will also comply with all applicable reporting requirements contained in Subpart Ea.
- 40 CFR 61, Subpart C, the national emission standard for hazardous air pollutants pertaining to beryllium. --- The provisions of this subpart apply to extraction plants, ceramic plans, foundries, incinerators, and propellant plants which process beryllium ore, beryllium, beryllium oxide, beryllium alloys, or beryllium-containing waste. The RGS facility is not in one of these affected source categories. It is not an incinerator within the bounds of this standard because incinerator is defined as "any furnace used in the process of burning waste for the primary purpose of reducing the volume of the waste by removing combustible matter." The primary purpose of the RGS facility is to produce electric power.
- 40 CFR 60, Subpart E, the federal NSPS for incinerators with a charging rate greater than 50 tons per day of solid waste. --- These standards are not considered applicable for two reasons. First, the Subpart E definition of "incinerator" is a "furnace used in the process of burning solid waste for the purpose of reducing the volume of the waste by removing combustible matter." The purpose of the RGS project is to produce power, not to reduce the volume of waste. Second, "solid waste" means refuse, more than 50 percent of which is municipal type waste on a weight basis. As discussed above, the fuel burned in the RGS boiler will contain less than 50 percent MSW by weight.

- Florida Rule 17-2.610(1), the process weight table of the general particulate emission limiting standards. --- The process weight table emission rates are not applicable to ash and lime handling because ash and lime materials are not used to produce a finished product.

Note that federal NSPS are also referenced in Florida Rule 17-2.660. Conclusions above regarding the applicability or inapplicability of federal NSPS also pertain to 17-2.660.

TABLE 5-1

BACT/LAER Clearinghouse Data
WOOD FIRED BOILERS

BACT/LAER CLEARINGHOUSE DATA FOR
WOOD-FIRED BOILERS

CODE	PERMIT ISSUE	SIZE MMBtu/Hr	NOx Lb/MMBtu	PM Lb/MMBtu	CO Lb/MMBtu	VOC Lb/MMBtu	SO2 Lb/MMBtu	NOTES
1)	#VT-0004	Jul-90	300	0.150	.001 gr/dsc	0.300	0.030	Mech Coll & ESP, NH3 Inj, Limit VE, BAP & NH3
2)	CA-0294	Jul-88	230	0.094	0.018	0.150	0.027	FBC, NH3 Inj., Multicl & ESP, Limestone Inj.
3)	#VT-0002	May-84	670	0.200	.007 gr/dsc +1500 ppmv		*0.3 % fuel	Mech Dust Collector & ESP, gas NOx 0.13, low NOx burners
4)	ME-*****	Sep-91	534	0.150	0.020	0.300	0.016	0.014 Comb Control, multiclone, dry ESP, urea injection, CEMS
5)	CA-0261	Nov-87	127	0.180	0.022	0.173	0.126	Limit 8000 H/yr, Multicl & ESP, Ccomb Controls
6)	CA-0295	Not Built	216	0.063	0.029	0.038	0.027	FBC, NH3 Inj., Limestone Inj., Multicl & Baghouse
7)	#CA-0172	Apr-85	*18.4 T/H Lu	0.140	.010 gr/dscf			FBC, Htd Stgd Air Addition, Multicyc. & ESP
8)	MI-0139	Dec-89	300	0.150	0.030	0.350	0.070	0.018 Mech Coll & ESP, Boiler Des, Comb Contr, SNCR, Lim BAP
9)	MI-0147	Jan-90	293	0.210	0.030	0.350	0.069	0.017 Mech Coll, Baghouse, Good Comb Contr, Limit BAP & NH3, SNCR
10)	MI-0151	Mar-90	450	0.150	0.030	0.400	0.050	Multiclone, ESP, Stack Monitor, SNCR, Design & Oper Practices, Limit
11)	MI-0180	none	523	0.150	0.030	0.400	0.043	ESP, SNCR, Comb Controls
12)	CA-0235	Mar-87	198	0.110	0.032	0.217		Thermal DeNOx, Low Exc Air, ESP & Multicl Precleaner
13)	CA-0188	Jan-85	309	0.200	0.040	0.400		HP overfire air sys., Multiclones & ESP
14)	NC-0046	Jan-89	666	0.350	0.041	0.660	0.077	Auto Comb Controls, Cyclone Sep & ESP
15)	#CA-0071	Sep-83	162	*130 ppmv	.020 gr/dscf			Stgd Comb, CEM-NOx, O2, CO, Baghouse
16)	#CA-0194	Jan-87	357	0.157	.020 gr/dscf			ACFB, Boiler design, ESP
17)	KY-0001	Jun-80	400		0.075			
18)	GA-0020	Nov-86	290		0.100			Multicyclone & Venturi Scrubber
19)	MS-0009	Mar-87	151	0.300	0.100	0.476	0.038	Multiclone & Scrubber, Low Exc Air, Comb Design

BACT/LAER Clearinghouse Data

TABLE 5-1 (continued)

WOOD FIRED BOILERS

CODE	PERMIT ISSUE	SIZE MMBtu/Hr	NOx Lb/MMBtu	PM Lb/MMBtu	CO Lb/MMBtu	VOC Lb/MMBtu	SO2 Lb/MMBtu	NOTES
20)	NC-0002	Mar-81	*120 kLb/H	*35.23 Lb/	0.100	*44.04 Lb/H	*33.03 Lb/H	Venturi Scrubber & Multiclone, Low S Fuel, Equip Oper
21)	CA-0039	Oct-82	145	*139 T/Yr	.035 gr/dscf	*126 T/Yr	*55 T/Yr	*21 T/Yr Multiclone & Venturi Scrubber, Comb Parm. Control
22)	ME-0003	Aug-82	84		0.120		0.136	Multiclones [Common stack w/Dryer]
23)	ME-0004	Jan-82	25		0.150			ESP
24)	VA-0132	May-88	4		0.200	0.480		Gas Gen & Boiler, Limit Formaldehyde (.12 Lb/H)
25)	ID-0005	Dec-82	88	0.200	0.241	0.200		2 Stgd Multiclones [See Note]
26)	SC-0005	Jun-81	172	1.190	0.250			Bark/Woodwaste, Mech Coll & ESP, Equip Oper & Design
27)	TX-0057	Jan-80	*70 kLb/H		*10.7 Lb/H			Scrubber in series w/Scrubber
28)	NC-0007	Jan-80	*165 kLb/H		*246 T/Yr			Bagfilters, Cyc & Venturi Scrubber
29)	CA-0265	Mar-88	*38.5 MW	*246.7 T/Y	*65.7 T/Yr	*674.5 T/Y	*92.97 T/Y	*20.49 T/Yr Multiclone & ESP, Stgd Comb, NH3 Inj, complete Comb
→ 30)	CA-0268	May-88	335	0.110		0.500		Secondary Air Inj., NH3 Injection
31)	CA-0272	Nov-88	287			2.056	0.122	[mod. source] Good Oper & Comb Practices, Stgd Comb
32)	MI-0165	Aug-90						[small] Limit BAP, Cyclone
33)	MI-0166	Aug-90	5					Limit BAP
34)	MS-0009*	Mar-87	137	0.200		0.036		Gas Firing, Low Exc Air, Comb Design
35)	NC-0022	Jan-82	22			*917 T/Y		Limit wood use to limit VOC

* PM level as listed in gr/dscf. Conversion to Lb/MMBtu is approximate.

***** as listed in permit, not from BACT/LAER Clearinghouse.

TABLE 5-2

100 PERCENT TIRE-FIRED BOILERS
MAXIMUM PERMIT LIMITS

Facility	Heat Input (MMBtu/hr)	Permitted Emission Rates				
		PM (lb/MMBtu)	SO ₂ (lb/MMBtu)	NO _x (lb/MMBtu)	CO (lb/MMBtu)	VOC's (lb/MMBtu)
Modesto, California	188	0.02	0.06	0.11	0.08	0.033
Sterling, Connecticut	362	0.03	0.11	0.12	0.17	--
Moapa, Nevada	605	0.03	0.19	0.18	0.19	--

MOST SIMILAR

630 MMBTU/HR X .20 = 126 MMBTU/HR FROM TIRES

TABLE 5-3
EFFECT OF BURNING TIRES
ON
CO EMISSIONS

CO EMISSIONS					
Location	Fuels	Units	Without Tires	With Tires	Percent Change in CO Emissions Due to Burning Tires
Nekoosa Packaging Tomahawk, Wisconsin	Coal, Bark & Tires	lb/hr	223	301	+ 35.0
Uniroyal Goodrich Tire Eau Claire, Wisconsin	Coal and Tires	lb/hr	3.1	1.1	- 64.5
Virginia Polytechnic Institute	Coal and Tires	lb/MMBtu	0.17	0.32	+ 88.2
Monsanto Company Sauget, Illinois	Coal and Tires	lb/hr	0.38	0.53	+ 39.4
Energy Product of Idaho	RDF and Tires	ppm	20.0	30.0	+ 50.0

TABLE 5-4

RIDGE GENERATING STATION
SUMMARY OF PROPOSED BACT APPROACH

Pollutant	Proposed Best Available Control Technology	Proposed Emission Limit (lb/MMBtu)
PM	Fabric Filtration	0.02 .02
SO ₂	Spray Dryer with Fabric Filtration	0.17 ^a .10
NO _x	Combustor Design and Selective Noncatalytic Reduction System	0.15 ^a .11
CO	Good Combustion Practices	0.5 ^{a, b} .21
VOCs	Good Combustion Practices	0.035 .035
Pb	Fabric Filtration	0.0004 .0004
Be	Fabric Filtration	0.00001 .00001

^a On a 24-hour block average basis

^b Excluding periods of start-up and shut down.

Add Hg since .096 $\approx$ 0.1

MODESTO STERLING

.02 .03

.06 $\leftarrow$.10 $\rightarrow$.11

0.11 $\leftarrow$.11 $\rightarrow$.12

0.08 $\leftarrow$.21 $\rightarrow$.17

0.033

6.0 PRIMARY AMBIENT AIR QUALITY IMPACT ANALYSIS

6.1 MODELING APPROACH

The dispersion modeling analysis for the project was designed to assess the potential impact on ambient air quality of emissions from the proposed RGS project. As indicated previously, the operation of this facility is expected to result in "significant" emissions (as defined by DER and EPA) of carbon monoxide, nitrogen oxides, particulate matter (PM and PM₁₀), sulfur dioxide, volatile organic compounds, lead, and beryllium. In addition to the pollutants with "significant" emission rates, a modeling analysis was also performed for several toxic air pollutants that are subject to the Florida air toxics permitting strategy.

Prior to initiating the air quality impact analysis described in this section, Dames & Moore prepared and submitted to Mr. Cleve Holladay of DER a dispersion modeling protocol dated November 1, 1991. The dispersion models, meteorological data, and modeling approach used to develop impact analysis results are in accordance with this protocol.

6.1.1 Dispersion Model

Dispersion modeling results were obtained using the most recent version of EPA's short-term Industrial Source Complex (ISCST) model and SCREEN model. The ISCST model was used to determine annual average concentrations as well as short-term concentrations (24-hours or less).

6.1.2 Ridge Generating Station Emission Source Data

The boiler will be the dominant emission source at RGS and was the only RGS source considered for the modeling evaluation. Tables 4-1, 4-2, and 4-3 show boiler emission rates and stack conditions for the 100 percent wood case, the 80 percent wood/20 percent tire case, and the wood/tire/landfill gas case. The wood/tire combination fuel has either higher emission rates or essentially the same emission rates compared to other fuel cases. Also, wood/tire combustion results in the lowest

exhaust gas velocities for all load levels. Since the expected exhaust gas exit temperature is the same for all three fuel cases, lowest plume rise will occur with the wood/tire fuel case. Taking into account both emission rates and plume dispersion characteristics, the wood/tire fuel case is the worst-case fuel from an air quality standpoint and was the only case evaluated in the modeling analysis.

Three boiler load levels were considered for modeling: maximum continuous rating, 75 percent load, and 50 percent load. To help determine which of these load levels to include in the detailed ISCST modeling assessment, they were first evaluated with the SCREEN model. The 50 percent load level clearly resulted in the lowest concentrations, but the results for the MCR and 75 percent load levels were similar. Therefore, detailed ISCST evaluations were performed for both the MCR and 75 percent load levels.

RGS boiler emission characteristics in metric units as used for modeling purposes are listed in Table 6-1. A normalized emission rate of 1.0 g/s was used in each ISCST modeling run so that concentrations for different pollutants could be obtained easily by scaling. Actual emission rates in g/s are listed in Table 6-2.

As will be shown later, RGS emissions result in maximum concentrations that are less than the PSD significant impact levels. Assessing the interaction of the RGS boiler with other emission sources is therefore not required. Consequently, this application does not contain an inventory for other emission sources or a modeling analysis involving other sources.

6.1.3 Meteorological Input Data

The meteorological data base used with the ISCST model consisted of five years (1982-1986) of national weather service surface and upper air observations from Tampa, Florida. Data were obtained in processed format from DER.

6.1.4 Receptor Specification

As is typical for PSD evaluations, the initial modeling calculations were made for RGS emissions to determine if these emissions will produce a significant impact (with reference to defined significant impact levels). In this analysis, no attempt was made to exclude areas within the site boundary under the concept that on-site locations are not "ambient air" locations. Preliminary modeling results from both SCREEN and ISCST indicated that predicted maximum concentrations occur at distances beyond the RGS site boundary. Specifically, initial modeling demonstrated that maximum predicted concentrations occur at distances beyond 250 m.

The significant impact analysis was conducted using a polar coordinate grid centered on the boiler stack. The first set of calculations specified receptors along radial lines spaced 10 degrees apart. For these first calculations, receptors were specified at intervals of 250 m beginning at a distance of 250 m and going out to a distance of 3,000 m from the boiler stack. Calculations were made with all five years of meteorological data for MCR conditions and 75 percent load level conditions.

The predicted normalized concentrations from these initial calculations were then tabulated in a list showing the maximum predicted concentration for each averaging period, for each meteorological data year, and for both load levels. The ten maximum concentrations thus obtained for each averaging period were listed in descending order. The highest of the yearly maximum concentrations, plus any other yearly maximum concentrations within 10 percent of the highest, were then evaluated in a second set of calculations using a polar receptor grid consisting of radials spaced 2 degrees apart and a distance spacing of 100 m. This approach provides an estimate of maximum concentrations to a receptor spacing resolution of 100 m.

An example will illustrate the details of this process. From the first set of calculations, the predicted maximum (normalized) 24-hour concentrations for each year and load level are shown below in ranked order, together with the direction and distance of the receptor where the maximum was predicted. (In this listing, the concentrations for the 75 percent load level represent an emission rate of 0.75 g/s for comparison with an emission rate of 1.0 g/s at MCR.)

<u>Concentration</u>	<u>Year</u>	<u>Load</u>	<u>Direction</u>	<u>Distance</u>
0.31082	1983	MCR	250°	1,500 m
0.30128	1982	MCR	360°	1,750 m
0.28378	1983	75%	250°	1,500 m
0.27785	1986	MCR	90°	1,250 m
0.27312	1984	MCR	250°	1,250 m
0.27284	1982	75%	360°	1,500 m
0.26790	1985	MCR	80°	1,500 m
0.25211	1986	75%	90°	1,250 m
0.24588	1985	75%	80°	1,250 m
0.24489	1984	75%	90°	1,250 m

From this ranking, only the second and third yearly maximum values are within 10 percent of the highest value. Therefore, the top three values were evaluated further. The receptor grid specified for further evaluation of the highest value consisted of directions 246°, 248°, 250°, 252°, and 254°, and distances of 1,300, 1,400, 1,500, 1,600, and 1,700 m. A similar method was used to specify receptors for further evaluation of the second and third yearly maximum concentrations in the rank order.

Modeling results obtained from the significant impact analysis were also used to assess compliance with the DER toxic air pollutant no-threat levels (NTL's). Therefore, toxic air pollutant concentrations attributable to RGS boiler emissions were determined to a receptor spacing resolution of 100 m.

Modeling was also conducted to determine the impact of RGS boiler emissions within the nearest PSD Class I area, the Chassahowitzka National Wilderness Area (a part of the Chassahowitzka National Wildlife Refuge). This area is located on the Gulf Coast about 100 km to the northwest of the RGS site at its closest point. The receptor coordinates used to represent the Chassahowitzka PSD Class I area were obtained from DER. DER supplied UTM coordinates for receptors used in a previous evaluation. These receptors represent the landward side of the area. The receptor coordinates obtained from DER are as follows (in meters):

340300 E, 3165700 N
340300 E, 3169800 N
342000 E, 3174000 N
343700 E, 3178300 N
341100 E, 3183400 N

340300 E, 3167700 N
340700 E, 3171990 N
343000 E, 3176200 N
342400 E, 3180600 N

These points were modeled as discrete receptors with respect to the RGS boiler stack UTM coordinates of 416690 E, 3100380 N.

6.1.5 Model Option Selection

The ISCST model contains options that determine the way in which calculations are made. The choice of options was made consistent with EPA's current recommended approach by specifying the regulatory default option. Due to the RGS site location in an undeveloped part of Polk County, the selected terrain option was rural terrain.

6.1.6 Good Engineering Practice Stack Height

GEP stack height is determined on the basis of the dimensions of "nearby" structures. "Nearby" means a structure that is within a distance of $5L$ from a stack, where L is the lesser of the structure height or maximum projected width.

Table 6-3 lists the dimensions of taller structures that are within $5L$ of the RGS boiler stack. The location of these structures is shown in Figure 3-2. Also shown in Table 6-3 is the GEP stack height calculated for each structure. The greatest GEP height is produced by the upper tier of the boiler building. The GEP height associated with this structure is 325 ft.

The proposed height of the RGS boiler stack is the GEP height of 325 ft. Because this height does not exceed the GEP level, the entire height can be credited in the modeling analysis. Furthermore, because the proposed height equals GEP height, building downwash effects need not be considered.

6.2 SIGNIFICANT IMPACT DETERMINATION

Predicted maximum normalized concentrations (emission rate = 1.0 g/s) are shown in Tables 6-4 and 6-5 for MCR and 75 percent load levels. These concentrations can be multiplied by the emission rates in Table 6-2 to obtain total concentrations. The annual concentrations are based on an assumed continuous operation at either MCR or 75 percent load.

Maximum concentrations considering both MCR and 75 percent load are listed in Table 6-6 for SO₂, NO₂, PM, CO, and Pb. Maximum SO₂, NO₂, PM, and CO concentrations are well below the significant impact levels. The maximum Pb concentration is well below the national and Florida ambient air quality standard. (A significant impact level does not exist for Pb.)

The conclusion from these results is that emissions from the proposed boiler will not produce a significant impact within the area surrounding the RGS site. In accordance with PSD assessment policies, no further modeling is needed to demonstrate that the proposed project is acceptable from the standpoint of PSD Class II increment consumption and compliance with NAAQS and FAAQS.

6.3 IMPACT ON NEAREST PSD CLASS I AREA

The significant impact concept is not as well defined for PSD Class I areas as it is for PSD Class II areas. However, EPA has suggested significance levels for use in assessing SO₂, NO₂, and PM concentrations within PSD Class I areas (U.S. Environmental Protection Agency, 1991).

Predicted maximum concentrations within the Chassahowitzka PSD Class I area attributable to RGS boiler emissions are listed in Table 6-7. These maximum concentrations are less than the EPA-suggested PSD Class I significance levels. The conclusion is, therefore, that the RGS project will have an insignificant impact on the nearest PSD Class I area. This is a reasonable conclusion given the large distance separating the RGS site from the Chassahowitzka National Wilderness area. Of further note is that the modeling technique employed to evaluate PSD Class I impacts made

no allowance for chemical transformation or other depletion of pollutants during the time required for plume transport over a distance of 100 km. Nor was any attempt made to compensate for the fact that the steady-state meteorological conditions assumed by the ISCST model are unlikely to persist from the point of emissions release to the point of impact. The predicted PSD Class I area concentrations reported in Table 6-7 are therefore likely to be very conservative.

6.4 COMPLIANCE WITH FLORIDA AIR TOXICS PERMITTING STRATEGY

The Florida air toxics permitting strategy was developed for the purpose of controlling toxic emissions from stationary sources to levels that would not endanger public health. The strategy is based on comparing the predicted ambient impacts of individual toxic air pollutants with ambient exposure levels considered protective of public health. Acceptable ambient exposure levels, referred to as no-threat levels (NTL's), have been developed by the Florida Air Toxics Working Group composed of DER and local county air toxics staff representatives. NTL's are tabulated in a document entitled the "Florida Air Toxics Working List," and are revised as needed to match changes in accepted concentration values.

To evaluate the effect of toxic air pollutant emissions from the RGS boiler, predicted maximum concentration (based on all five years of meteorological data) have been compared with appropriate NTL's. The NTL's used for this comparison were verified with DER to confirm that currently accepted values were used.

Table 6-8 contains a comparison of predicted maximum concentrations with the Florida NTL's. As can be seen, predicted maximum concentrations are less than the NTL's. Therefore, predicted concentrations attributable to toxic air pollutant emissions from the RGS boiler comply with the Florida air toxics permitting strategy.

TABLE 6-1

**RIDGE GENERATING STATION
BOILER EMISSION CHARACTERISTICS AS
USED FOR MODELING ANALYSIS^a**

Emission Characteristic	Load Level	
	MCR	75% Load
Emission rate, g/s	1.0 ^b	1.0 ^b
Stack Height, m	99.06	99.06
Stack Diameter, m	3.05	3.05
Exit Temperature, K	349.82	349.82
Exit Velocity, m/s	14.54	10.91

^a Data for the 80% wood/20% tires fuel mix.

^b Normalized emission rate used for model input. Modeling results can be scaled using the actual emission rates in Table 6-2.

TABLE 6-2

RIDGE GENERATING STATION
EMISSION RATES FOR CONVERSION OF NORMALIZED CONCENTRATIONS

To convert the predicted normalized concentrations in Tables 6-4 and 6-5 to total concentrations, use the following emission rates. These rates apply to the RGS boiler firing an 80% wood/20% tires fuel mix.

<u>Pollutant</u>	<u>MCR Emission Rate (g/s)</u>	<u>75% Load Level Emission Rate (g/s)</u>
Sulfur Oxides (as SO ₂)	13.78	10.33
Nitrogen Oxides (as NO ₂)	11.91	8.93
Particulate Matter (PM/PM ₁₀)	1.59	1.20
Carbon Monoxide	39.69	29.80
Lead	0.032	0.024
Beryllium	0.0008	20.0006

TABLE 6-3

**RIDGE GENERATING STATION
GOOD ENGINEERING PRACTICE STACK HEIGHT CALCULATIONS**

Structure	Structure Dimensions		GEP Stack Height ^a (ft)
	Height (ft)	Maximum Projected Width (ft)	
Upper Part of Boiler Building	130	156	325
Lower Part of Boiler Building + Turbine Generator Building	60	205	150
Baghouse	56	76	140
Ash Silo	104	20	134
Lime Silo	30	16	54

^a GEP height = $H + 1.5L$, where H is the structure height and L is the lesser of the structure height or maximum projected width.

TABLE 6-4
RIDGE GENERATING STATION
SUMMARY OF PREDICTED MAXIMUM NORMALIZED CONCENTRATIONS
FOR BOILER EMISSIONS
OPERATING AT MAXIMUM CONTINUOUS RATING
(EMISSION RATE = 1.0 g/s)

Year of Meteorological Data	Receptor Resolution	Predicted Maximum Normalized Concentrations ($\mu\text{g}/\text{m}^3$)				
		1-Hour	3-Hour	8-Hour	24-hour	Annual
1982	250 m 100 m	2.119 ---	1.072 ---	0.678 ---	0.301 0.319 (1700 m/2°)	0.019 ---
1983	250 m 100 m	2.048 ---	1.247 ---	0.686 ---	0.311 ---	0.016 ---
1984	250 m 100 m	2.055 ---	1.273 ---	0.765 ---	0.273 ---	0.019 ---
1985	250 m 100 m	2.494 ---	1.182 ---	0.627 ---	0.268 ---	0.024 ---
1986	250 m 100 m	2.082 ---	1.303 1.355 (700 m/92°)	0.834 0.884 (1300 m/86°)	0.278 ---	0.030 0.030 (1500 m/86°)

Notes:

1. Predicted concentrations based on stack parameters for 80% wood/20% tires fuel mix.
2. [m/°] designation refers to distance in meters and azimuth direction in degrees relative to RGS boiler stack for the 100-m receptor resolution concentrations.
3. To obtain total concentrations, multiply the normalized concentrations in this table by the appropriate emission rates in Table 6-2.
4. The concentrations shown for the 100-m receptor resolution are the highest values obtained for each averaging period considering both MCR and 75 percent load conditions. These values are used to compute the concentrations in Table 6-6. The highest 1-hour value was obtained for the 75% load level and is listed in Table 6-5.

TABLE 6-5
 RIDGE GENERATING STATION
 SUMMARY OF PREDICTED MAXIMUM NORMALIZED CONCENTRATIONS
 FOR BOILER EMISSIONS
 OPERATING AT 75 PERCENT LOAD LEVEL
 (EMISSION RATE = 1.0 g/s)

Year of Meteorological Data	Receptor Resolution	Predicted Maximum Normalized Concentrations ($\mu\text{g}/\text{m}^3$)				
		1-Hour	3-Hour	8-Hour	24-hour	Annual
1982	250 m 100 m	3.868 4.212 (600 m/92°)	1.289 ---	0.818 ---	0.364 ---	0.023 ---
1983	250 m 100 m	2.461 ---	1.459 ---	0.833 ---	0.378 ---	0.020 ---
1984	250 m 100 m	2.434 ---	1.474 ---	0.894 ---	0.326 ---	0.023 ---
1985	250 m 100 m	2.714 ---	1.373 ---	0.751 ---	0.328 ---	0.029 ---
1986	250 m 100 m	2.491 ---	1.514 ---	1.008 ---	0.336 ---	0.036 ---

Notes:

1. Predicted concentrations based on stack parameters for 80% wood/20% tires fuel mix.
2. [m/°] designation refers to distance in meters and azimuth direction in degrees relative to RGS boiler stack for the 100-m receptor resolution concentrations.
3. To obtain total concentrations, multiply the normalized concentrations in this table by the appropriate emission rates in Table 6-2.
4. The concentrations shown for the 100-m receptor resolution are the highest values obtained for each averaging period considering both MCR and 75 percent load conditions. These values are used to compute the concentrations in Table 6-6. The highest 3-hour, 8-hour, 24-hour, and annual concentrations were obtained for MCR (100% load) conditions and are listed in Table 6-4.

TABLE 6-6

**RIDGE GENERATING STATION
SUMMARY OF PREDICTED MAXIMUM CONCENTRATIONS
FOR POLLUTANTS WITH SIGNIFICANT IMPACT LEVELS**

Pollutant and Averaging Period	Maximum Predicted Concentration ^a (μg/m ³)	Significant Impact Level (μg/m ³)
Sulfur Dioxide		
3-Hour	18.7	25
24-Hour	4.4	5
Annual	0.4	1
Nitrogen Dioxide		
Annual	0.4	1
Particulate Matter		
24-Hour	0.5	5
Annual	0.05	1
Carbon Monoxide		
1-Hour	125.5	2,000
8-Hour	35.1	500
Lead		
Quarterly	0.001 ^b	1.5 ^c

^a Based on operating year-round at maximum continuous rating or at 75 percent load firing an 80% wood/20% tires fuel mix. Concentrations shown are maximum concentrations for all five years of meteorological data.

^b This is the predicted maximum annual average concentration used to represent the maximum quarterly concentration.

^c This is a national and Florida ambient air quality standard and not a significant impact level.

TABLE 6-7

RIDGE GENERATING STATION
SUMMARY OF PREDICTED MAXIMUM CONCENTRATIONS
WITHIN THE CHASSAHOWITZKA PSD CLASS I AREA
ATTRIBUTABLE TO BOILER EMISSIONS

Pollutant and Averaging Period	Predicted Maximum Concentration ^a ($\mu\text{g}/\text{m}^3$)	PSD Class I Increments ($\mu\text{g}/\text{m}^3$)	EPA Suggested ^b Significance Levels ($\mu\text{g}/\text{m}^3$)
Sulfur Dioxide			
3-Hour	0.71	25	1.23
24-Hour	0.16	5	0.275
Annual	0.01	2	0.1
Nitrogen Dioxide			
Annual	0.01	2.5	0.1
Particulate Matter			
24-Hour	0.02	10	1.35
Annual	0.001	5	0.27

^a Based on modeling with all 5 years of meteorological data at both MCR and 75 percent load conditions.

^b Reference: U.S. Environmental Protection Agency, 1991.

TABLE 6-8

**RIDGE GENERATING STATION
SUMMARY OF PREDICTED MAXIMUM CONCENTRATIONS
OF TOXIC AIR POLLUTANTS ATTRIBUTABLE
TO BOILER EMISSIONS**

Pollutant	Maximum Predicted Concentrations ($\mu\text{g}/\text{m}^3$)			Florida DER No-Threat Levels ^b ($\mu\text{g}/\text{m}^3$)		
	8-Hour	24-Hour	Annual	8-Hour	24-Hour	Annual
Arsenic	0.002	0.0008	7.2×10^{-5}	2	0.48	2.3×10^{-4}
Beryllium	0.0007	0.0003	2.4×10^{-5}	0.02	0.005	4.2×10^{-4}
Cadmium	0.004	0.001	1.2×10^{-4}	0.5	0.12	5.6×10^{-4}
Chromium VI	0.002	0.0006	6.0×10^{-5}	0.5	0.12	8.3×10^{-5}
Lead	0.03	0.01	9.5×10^{-4}	1.5	0.36	9.0×10^{-2}
Mercury	0.002	0.0009	8.4×10^{-5}	0.5	0.12	0.3
Nickel	0.007	0.003	2.4×10^{-4}	0.5	0.12	4.2×10^{-3}
Zinc	0.07	0.03	-	50	12	-
Ammonia	2.0	0.7	0.07	180	43.2	1.0
Hydrogenchloride	0.4	0.1	0.01	70	16.8	7.0
Formaldehyde	0.2	0.07	6.4×10^{-3}	4.5	1.08	7.7×10^{-2}
Benzene	0.6	0.2	0.02	30	7.2	0.12

^a Based on operating year-round at maximum continuous rating or 75 percent load firing an 80% wood/20% tires fuel mix.

^b Including any relevant federal reference air concentrations, reference specific doses (divided by 10), or inhalation reference concentrations.

7.0 OTHER IMPACT CONSIDERATIONS

7.1 VISIBILITY

For PSD sources, the principal visibility impacts of concern are impacts on visibility conditions within the nearest PSD Class I area. The nearest such area, as previously discussed, is the Chassahowitzka National Wilderness Area located (at its closest point) about 100 km from the site of the proposed RGS project.

The effect of RGS emissions on visibility conditions within the Chassahowitzka PSD Class I Area has been evaluated by a Level-1 plume visual impact screening analysis using the latest version of the EPA VISCREEN model. The input data used for visibility impact analysis are as follows:

primary particulate matter emissions -	12.6 lb/hr
nitrogen oxides emissions (as NO ₂) -	94.5 lb/hr
minimum distance from source to Class I area -	100 km
maximum distance from source to Class I area -	120 km
background visual range -	25 km

The emission rates are for operation of the RGS boiler at maximum continuous rating.

VISCREEN modeling results are shown in Table 7-1. Based on the Level-1 screening criteria, VISCREEN results indicate that RGS emissions will not have an adverse impact on visibility conditions within the Chassahowitzka PSD Class I Area.

7.2 VEGETATION AND SOILS

Effects on vegetation and soils associated with power generating facilities are primarily related to SO₂ and NO_x emissions. Since RGS SO₂ and NO_x emissions are predicted to have an insignificant impact, adverse effects on vegetation and soils are highly unlikely.

7.3 ASSOCIATED GROWTH

When RGS begins operation, approximately 40 employees will be needed for the facility. Adding this small number of employees to the area work force will not result in significant residential or commercial growth. Furthermore, the project on its own is not expected to produce significant industrial growth in central Florida. Also, the project will be a net generator of electricity and will not require additional power generation (and associated additional emissions) from existing power generating utilities. Therefore, the secondary air quality impacts related to residential, commercial, or industrial growth associated with the project are expected to be minor.

7.4 NONATTAINMENT AREAS

Polk County is currently considered in attainment with all ambient air quality standards. The nearest designated nonattainment area is the Hillsborough/Pinellas County ozone nonattainment area. Ozone precursor emissions from RGS are not expected to interfere with strategies to achieve compliance with the ozone standard in the Tampa/St. Petersburg area.

TABLE 7-1

Visual Effects Screening Analysis for
Source: RIDGE GENERATING STATION
Class I Area: CHASSAHOWITZKA NWA

*** Level-1 Screening ***
Input Emissions for

Particulates	12.60	LB /HR
NOx (as NO2)	94.50	LB /HR
Primary NO2	.00	LB /HR
Soot	.00	LB /HR
Primary SO4	.00	LB /HR

**** Default Particle Characteristics Assumed

Transport Scenario Specifications:

Background Ozone:	.04 ppm
Background Visual Range:	25.00 km
Source-Observer Distance:	100.00 km
Min. Source-Class I Distance:	100.00 km
Max. Source-Class I Distance:	120.00 km
Plume-Source-Observer Angle:	11.25 degrees
Stability:	6
Wind Speed:	1.00 m/s

R E S U L T S

Asterisks (*) indicate plume impacts that exceed screening criteria

Maximum Visual Impacts INSIDE Class I Area

Screening Criteria ARE NOT Exceeded

Backgrnd	Theta	Azi	Distance	Alpha	Delta E		Contrast	
					Crit	Plume	Crit	Plume
SKY	10.	84.	100.0	84.	2.00	.019	.05	.000
SKY	140.	84.	100.0	84.	2.00	.005	.05	-.000
TERRAIN	10.	84.	100.0	84.	2.00	.001	.05	.000
TERRAIN	140.	84.	100.0	84.	2.00	.000	.05	.000

Maximum Visual Impacts OUTSIDE Class I Area

Screening Criteria ARE NOT Exceeded

Backgrnd	Theta	Azi	Distance	Alpha	Delta E		Contrast	
					Crit	Plume	Crit	Plume
SKY	10.	75.	96.8	94.	2.00	.020	.05	.000
SKY	140.	75.	96.8	94.	2.00	.005	.05	-.000
TERRAIN	10.	60.	91.5	109.	2.00	.002	.05	.000
TERRAIN	140.	60.	91.5	109.	2.00	.000	.05	.000

8.0 PSD PRECONSTRUCTION MONITORING EXEMPTION REQUEST

As previously discussed, the RGS project is subject to PSD review for the following regulated pollutants: SO₂, NO_x, CO, PM/PM₁₀, VOC's (and O₃), Pb, and Be. An exemption from PSD preconstruction ambient air quality monitoring requirements is requested on the basis of the reasons discussed below. Included in these exemption requests is a reference to the *de minimis* ambient impact levels that can serve as a basis for a monitoring exemption at the discretion of the reviewing agency. The *de minimis* levels for the regulated pollutants subject to PSD review for RGS are as follows:

sulfur dioxide -	13 µg/m ³ (24-hour average)
nitrogen dioxide -	14 µg/m ³ (annual average)
carbon monoxide -	575 µg/m ³ (8-hour average)
particulate matter (PM ₁₀) -	10 µg/m ³ (24-hour average)
ozone -	100 ton/yr of VOC emissions
lead -	0.1 µg/m ³ (3-month average)
beryllium -	0.001 µg/m ³ (24-hour average)

Sulfur Dioxide

The maximum predicted 24-hour SO₂ concentration attributable to RGS emissions is 4.4 µg/m³. This concentration is less than the *de minimis* level. A monitoring exemption is requested on the basis of the maximum predicted concentration being less than the *de minimis* level.

Nitrogen Dioxide

The maximum predicted annual average NO₂ concentration attributable to RGS NO_x emissions is 0.4 µg/m³ which is less than the *de minimis* level. A monitoring exemption is requested on the basis of the maximum predicted concentration being less than the *de minimis* level.

Carbon Monoxide

The maximum predicted 8-hour average CO concentration attributable to RGS emissions is $35.1 \mu\text{g}/\text{m}^3$ which is less than the *de minimis* level. A monitoring exemption is requested on the basis of the maximum predicted concentration being less than the *de minimis* level.

Particulate Matter

The maximum predicted 24-hour average PM concentration attributable to RGS emissions is $0.5 \mu\text{g}/\text{m}^3$ which is less than the *de minimis* level. A monitoring exemption is requested on the basis of the maximum predicted concentration being less than the *de minimis* level.

Ozone

Estimated VOC emissions from RGS are 96.6 ton/yr. A monitoring exemption for ozone is requested on the basis of project-related VOC emissions being less than the *de minimis* level of 100 ton/yr.

Lead

The maximum predicted annual average Pb concentration attributable to RGS emissions is $0.01 \mu\text{g}/\text{m}^3$ which is less than the *de minimis* level (assuming the maximum annual concentration represents a 3-month average.) A monitoring exemption is requested on the basis of the maximum predicted concentration being less than the *de minimis* level.

Beryllium

The maximum predicted 24-hour average Be concentration attributable to RGS emissions is $0.0003 \mu\text{g}/\text{m}^3$ which is less than the *de minimis* level. A monitoring exemption is requested on the basis of the maximum predicted concentration being less than the *de minimis* level.

9.0 REFERENCES

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- Grasso, D.T. and Atkins, R.S., Environmental Risk Limited, 1990. The composition of recycled wood fuel and its environmental permitting implications. Presented at the ACA/CIPCA Fourth Annual Meeting and Exposition, Hartford, C.T., September 16-17, 1990.
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- Oxford Energy Co., 1988. Final emission test report for Modesto Energy Company waste tire to energy facility, Westley, California.
- Oxford Energy Co., 1990. Stack test report (for the Oxford Energy Company facility at Westley, California, October 9-10, 1990).
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- U.S. Environmental Protection Agency, 1991. Class I area significant impact level. Memorandum from John Calcagni, Director, Air Quality Management Division, September 10, 1991.
- Washington Department of Ecology, 1986. Source test for Port Townsend Paper Company (February 25 and March 5, 1986).
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APPENDIX A
PERMIT APPLICATION FORM

BEST AVAILABLE COPY

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2800 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301



AC53-206244
PSD-FL-183

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

\$7500 pd.
12-30-91
Rept. # 18724

APPLICATION TO OPERATE/CONSTRUCT AIR POLLUTION SOURCES

SOURCE TYPE: New ☒ New¹ ☐ Existing¹

APPLICATION TYPE: ☐ Construction ☐ Operation ☐ Modification

COMPANY NAME: Ridge Generating Station Limited Partnership COUNTY: Polk

By: Decker Energy - Ridge, Inc., General Partner
Identify the specific emission point source(s) addressed in this application (i.e. Line

Kiln No. 4 with Venturi Scrubber; Peaking Unit No. 2, Gas Fired) Boiler and Related Equipment

SOURCE LOCATION: Street State Road 542 and Taylor Rd. City Auburndale

UTM: East 416690 m North 3100380 m

Latitude ° ' "N Longitude ° ' "W

APPLICANT NAME AND TITLE: Macauley Whiting, Jr., President - Decker Energy - Ridge, Inc.*

APPLICANT ADDRESS: P.O. Box 2397, Winter Park, FL 32790

SECTION I: STATEMENTS BY APPLICANT AND ENGINEER

A. APPLICANT

I am the undersigned owner or authorized representative* of Ridge Generating Station Limited Partnership

I certify that the statements made in this application for a construction permit are true, correct and complete to the best of my knowledge and belief. Further, I agree to maintain and operate the pollution control source and pollution control facilities in such a manner as to comply with the provision of Chapter 403, Florida Statutes, and all the rules and regulations of the department and revisions thereof. I also understand that a permit, if granted by the department, will be non-transferable and I will promptly notify the department upon sale or legal transfer of the permitted establishment.

*Attach letter of authorization

Signed: Macauley Whiting Jr.

Macauley Whiting, Jr., President - Decker Energy - Ridge, Inc.*
Name and Title (Please Type)

Date: 12-10-91 Telephone No. 407/628-8900

B. PROFESSIONAL ENGINEER REGISTERED IN FLORIDA (where required by Chapter 471, F.S.)

This is to certify that the engineering features of this pollution control project have been designed/examined by me and found to be in conformity with modern engineering principles applicable to the treatment and disposal of pollutants characterized in the permit application. There is reasonable assurance, in my professional judgment, that

See Florida Administrative Code Rule 17-2.100(57) and (104)

DER Form 17-1.202(1)

Effective October 31, 1982

Page 1 of 12

*Decker Energy - Ridge, Inc. is a General Partner of Ridge Generating Station, L.P.

the pollution control facilities, when properly maintained and operated, will discharge an effluent that complies with all applicable statutes of the State of Florida and the rules and regulations of the department. It is also agreed that the undersigned will furnish, if authorized by the owner, the applicant a set of instructions for the proper maintenance and operation of the pollution control facilities and, if applicable, pollution sources.

Signed Thomas J. Fitzpatrick, 12/10/91

Thomas J. Fitzpatrick

Name (Please Type)

SFT, Inc.

Company Name (Please Type)

6629 W. Central Ave., Toledo, OH 43617

Mailing Address (Please Type)

Florida Registration No. 0044846 Date: 1991 Telephone No. 419/843-8200

SECTION II: GENERAL PROJECT INFORMATION

- A. Describe the nature and extent of the project. Refer to pollution control equipment, and expected improvements in source performance as a result of installation. State whether the project will result in full compliance. Attach additional sheet if necessary.

The project consists of a power generating facility with a boiler that will burn
wood, tires, and landfill gas. Pollution control equipment will meet BACT requirements
and will result in compliance with all applicable standards (see attached report)

- B. Schedule of project covered in this application (Construction Permit Application Only)

Start of Construction July 1992 Completion of Construction July 1994

- C. Costs of pollution control system(s): (Note: Show breakdown of estimated costs only for individual components/units of the project serving pollution control purposes. Information on actual costs shall be furnished with the application for operation permit.)

To be determined

- D. Indicate any previous DER permits, orders and notices associated with the emission point, including permit issuance and expiration dates.

None

E. Requested permitted equipment operating time: hrs/day 24 ; days/wk 7 ; wks/yr 52 ;
if power plant, hrs/yr 8760; if seasonal, describe: _____

F. If this is a new source or major modification, answer the following questions.
(Yes or No)

1. Is this source in a non-attainment area for a particular pollutant? No
a. If yes, has "offset" been applied? _____
b. If yes, has "Lowest Achievable Emission Rate" been applied? _____
c. If yes, list non-attainment pollutants. _____

2. Does best available control technology (BACT) apply to this source?
If yes, see Section VI. Yes

3. Does the State "Prevention of Significant Deterioration" (PSD)
requirement apply to this source? If yes, see Sections VI and VII. Yes

4. Do "Standards of Performance for New Stationary Sources" (NSPS)
apply to this source? Yes

5. Do "National Emission Standards for Hazardous Air Pollutants"
(NESHAP) apply to this source? No

H. Do "Reasonably Available Control Technology" (RACT) requirements apply
to this source? No

a. If yes, for what pollutants? _____

b. If yes, in addition to the information required in this form,
any information requested in Rule 17-2.650 must be submitted.

Attach all supportive information related to any answer of "Yes". Attach any justifi-
cation for any answer of "No" that might be considered questionable.

[BOILER]

SECTION III: AIR POLLUTION SOURCES & CONTROL DEVICES (Other than Incinerators)

A. Raw Materials and Chemicals Used in your Process, if applicable:

Description	Contaminants		Utilization Rate - lbs/hr	Relate to Flow Diagram
	Type	% Wt		
(see attached report)				

B. Process Rate, if applicable: (See Section V, Item 1) Not applicable

1. Total Process Input Rate (lbs/hr): _____

2. Product Weight (lbs/hr): _____

C. Airborne Contaminants Emitted: (Information in this table must be submitted for each emission point, use additional sheets as necessary)

Boiler emissions

Name of Contaminant	Emission ¹		Allowed ² Emission Rate per Rule 17-2	Allowable ³ Emission lbs/hr	Potential ⁴ Emission		Relate to Flow Diagram
	Maximum lbs/hr	Actual T/yr			lbs/yr	T/yr	
SO ₂							See
PM/PM ₁₀	(See attached report)						attached
NO _x							report
CO							
VOC's							

¹See Section V, Item 2. (See attached report for other contaminants)

²Reference applicable emission standards and units (e.g. Rule 17-2.600(5)(b)2. Table II, E. (1) - 0.1 pounds per million BTU heat input)

³Calculated from operating rate and applicable standard.

⁴Emission, if source operated without control (See Section V, Item 3).

[BOILER]

J. Control Devices: (See Section V, Item 4)

Name and Type (Model & Serial No.)	Contaminant	Efficiency	Range of Particles Size Collected (in microns) (If applicable)	Basis for Efficiency (Section V Item 5)
(See attached report)				

E. Fuels

Type (Be Specific)	Consumption*		Maximum Heat Input (MMBTU/hr)
	avg/hr	max./hr	
(See attached report)			

*Units: Natural Gas--MMCF/hr; Fuel Oils--gallons/hr; Coal, wood, refuse, other--lbs/hr.

Fuel Analysis: (See attached report)

Percent Sulfur: _____ Percent Ash: _____

Density: _____ lbs/gal Typical Percent Nitrogen: _____

Heat Capacity: _____ BTU/lb _____ BTU/gal

Other Fuel Contaminants (which may cause air pollution): _____

F. If applicable, indicate the percent of fuel used for space heating. Not applicable.

Annual Average _____ Maximum _____

G. Indicate liquid or solid wastes generated and method of disposal.

Fly ash and bottom ash will be disposed of in a landfill permitted to accept such materials.

[BOILER]

H. Emission Stack Geometry and Flow Characteristics (Provide data for each stack):

Stack Height: (See attached report) _____ ft. Stack Diameter: _____ ft.
 Gas Flow Rate: _____ ACFM _____ DSCFM Gas Exit Temperature: _____ °F.
 Water Vapor Content: _____ % Velocity: _____ FPS

SECTION IV: INCINERATOR INFORMATION (NOT APPLICABLE)

Type of Waste	Type 0 (Plastics)	Type I (Rubbish)	Type II (Refuse)	Type III (Garbage)	Type IV (Pathological)	Type V (Liq. & Gas By-prod.)	Type VI (Solid By-prod.)
Actual lb/hr Incinerated							
Uncontrolled (lbs/hr)							

Description of Waste _____

Total Weight Incinerated (lbs/hr) _____ Design Capacity (lbs/hr) _____

Approximate Number of Hours of Operation per day _____ day/wk _____ wks/yr. _____

Manufacturer _____

Date Constructed _____ Model No. _____

	Volume (ft) ³	Heat Release (BTU/hr)	Fuel		Temperature (°F)
			Type	BTU/hr	
Primary Chamber					
Secondary Chamber					

Stack Height: _____ ft. Stack Diameter: _____ Stack Temp. _____

Gas Flow Rate: _____ ACFM _____ DSCFM* Velocity: _____ FPS

*If 50 or more tons per day design capacity, submit the emissions rate in grains per standard cubic foot dry gas corrected to 50% excess air.

Type of pollution control device: ☐ Cyclone ☐ Wet Scrubber ☐ Afterburner

☐ Other (specify) _____

[ASH HANDLING VENT FILTER]

SECTION III: AIR POLLUTION SOURCES & CONTROL DEVICES (Other than Incinerators)

A. Raw Materials and Chemicals Used in your Process, if applicable:

Description	Contaminants		Utilization Rate - lbs/hr	Relate to Flow Diagram
	Type	% Wt		
Boiler Ash	PM	100	(See attached report)	

B. Process Rate, if applicable: (See Section V, Item 1) (See attached report)

1. Total Process Input Rate (lbs/hr): _____
2. Product Weight (lbs/hr): _____

C. Airborne Contaminants Emitted: (Information in this table must be submitted for each emission point, use additional sheets as necessary)

Name of Contaminant	Emission ¹		Allowed Emission Rate per Rule 17-2	Allowable ³ Emission lbs/hr	Potential ⁴ Emission		Relate to Flow Diagram
	Maximum lbs/hr	Actual T/yr			lbs/yr	T/yr	
PM/PM ₁₀	(See attached report)						

¹See Section V, Item 2.

²Reference applicable emission standards and units (e.g. Rule 17-2.600(5)(b)2. Table II, E. (1) - 0.1 pounds per million BTU heat input)

³Calculated from operating rate and applicable standard.

⁴Emission, if source operated without control (See Section V, Item 3).

[ASH HANDLING VENT FILTER]

Control Devices: (See Section V, Item 4)

Name and Type (Model & Serial No.)	Contaminant	Efficiency	Range of Particles Size Collected (in microns) (If applicable)	Basis for Efficiency (Section V Item 5)
Bin Vent Filter	PM	0.02 gr/ft ³	Unknown	Vendor Data

E. Fuels

Type (Be Specific)	Consumption*		Maximum Heat Input (MMBTU/hr)
	avg/hr	max./hr	
NOT APPLICABLE			

*Units: Natural Gas--MMCF/hr; Fuel Oils--gallons/hr; Coal, wood, refuse, other--lbs/hr.

Fuel Analysis:

Percent Sulfur: _____ Percent Ash: _____
 Density: _____ lbs/gal Typical Percent Nitrogen: _____
 Heat Capacity: _____ BTU/lb _____ BTU/gal
 Other Fuel Contaminants (which may cause air pollution): _____

F. If applicable, indicate the percent of fuel used for space heating.

Annual Average _____ Maximum _____

G. Indicate liquid or solid wastes generated and method of disposal.

[ASH HANDLING VENT FILTER]

H. Emission Stack Geometry and Flow Characteristics (Provide data for each stack):

Stack Height: _____ ft. Stack Diameter: _____ ft.
 Gas Flow Rate: 1,400 ACFM _____ DSCFM Gas Exit Temperature: Ambient °F.
 Water Vapor Content: _____ % Velocity: _____ FPS

SECTION IV: INCINERATOR INFORMATION

NOT APPLICABLE

Type of Waste	Type 0 (Plastics)	Type I (Rubbish)	Type II (Refuse)	Type III (Garbage)	Type IV (Pathological)	Type V (Liq. & Gas By-prod.)	Type VI (Solid By-prod.)
Actual lb/hr Incinerated							
Uncontrolled (lbs/hr)							

Description of Waste _____

Total Weight Incinerated (lbs/hr) _____ Design Capacity (lbs/hr) _____

Approximate Number of Hours of Operation per day _____ day/wk _____ wks/yr. _____

Manufacturer: _____

Date Constructed _____ Model No. _____

	Volume (ft) ³	Heat Release (BTU/hr)	Fuel		Temperature (°F)
			Type	BTU/hr	
Primary Chamber					
Secondary Chamber					

Stack Height: _____ ft. Stack Diameter: _____ Stack Temp. _____

Gas Flow Rate: _____ ACFM _____ DSCFM* Velocity: _____ FPS

*If 50 or more tons per day design capacity, submit the emissions rate in grains per standard cubic foot dry gas corrected to 50% excess air.

Type of pollution control device: ☐ Cyclone ☐ Wet Scrubber ☐ Afterburner

☐ Other (specify) _____

[LIME SILO]

SECTION III: AIR POLLUTION SOURCES & CONTROL DEVICES (Other than Incinerators)

A. Raw Materials and Chemicals Used in your Process, if applicable:

Description	Contaminants		Utilization Rate - lbs/hr	Relate to Flow Diagram
	Type	% Wt		
Lime	PM	100	(See attached report)	

B. Process Rate, if applicable: (See Section V, Item 1) (See attached report)

1. Total Process Input Rate (lbs/hr): _____

2. Product Weight (lbs/hr): _____

C. Airborne Contaminants Emitted: (Information in this table must be submitted for each emission point, use additional sheets as necessary)

Name of Contaminant	Emission ¹		Allowed ⁴ Emission Rate per Rule 17-2	Allowable ³ Emission lbs/hr	Potential ⁴ Emission		Relate to Flow Diagram
	Maximum lbs/hr	Actual T/yr			lbs/yr	T/yr	
PM/PM ₁₀	(See attached report)						

¹See Section V, Item 2.

²Reference applicable emission standards and units (e.g. Rule 17-2.600(5)(b)2. Table II, E. (1) - 0.1 pounds per million BTU heat input)

³Calculated from operating rate and applicable standard.

⁴Emission, if source operated without control (See Section V, Item 3).

[LIME SILO]

Control Devices: (See Section V, Item 4)

Name and Type (Model & Serial No.)	Contaminant	Efficiency	Range of Particles Size Collected (in microns) (If applicable)	Basis for Efficiency (Section V Item 5)
Bin Vent Filter	PM	0.02 gr/ft ³	Unknown	Vendor Data

E. Fuels

Type (Be Specific)	Consumption*		Maximum Heat Input (MMBTU/hr)
	avg/hr	max./hr	
NOT APPLICABLE			

*Units: Natural Gas--MMCF/hr; Fuel Oils--gallons/hr; Coal, wood, refuse, other--lbs/hr.

Fuel Analysis:

Percent Sulfur: _____ Percent Ash: _____

Density: _____ lbs/gal Typical Percent Nitrogen: _____

Heat Capacity: _____ BTU/lb _____ BTU/gal

Other Fuel Contaminants (which may cause air pollution): _____

F. If applicable, indicate the percent of fuel used for space heating.

Annual Average _____ Maximum _____

G. Indicate liquid or solid wastes generated and method of disposal.

[LIME SILO]

H. Emission Stack Geometry and Flow Characteristics (Provide data for each stack):

Stack Height: _____ ft. Stack Diameter: _____ ft.
 Gas Flow Rate: 1,400 ACFM _____ DSCFM Gas Exit Temperature: ambient °F.
 Water Vapor Content: _____ % Velocity: _____ FPS

SECTION IV: INCINERATOR INFORMATION

NOT APPLICABLE

Type of Waste	Type O (Plastics)	Type I (Rubbish)	Type II (Refuse)	Type III (Garbage)	Type IV (Pathological)	Type V (Liq. & Gas By-prod.)	Type VI (Solid By-prod.)
Actual lb/hr Incinerated							
Uncontrolled (lbs/hr)							

Description of Waste _____

Total Weight Incinerated (lbs/hr) _____ Design Capacity (lbs/hr) _____

Approximate Number of Hours of Operation per day _____ day/wk _____ wks/yr. _____

Manufacturer _____

Date Constructed _____ Model No. _____

	Volume (ft) ³	Heat Release (BTU/hr)	Fuel		Temperature (°F)
			Type	BTU/hr	
Primary Chamber					
Secondary Chamber					

Stack Height: _____ ft. Stack Diameter: _____ Stack Temp. _____

Gas Flow Rate: _____ ACFM _____ DSCFM* Velocity: _____ FPS

*If 50 or more tons per day design capacity, submit the emissions rate in grains per standard cubic foot dry gas corrected to 50% excess air.

Type of pollution control device: ☐ Cyclone ☐ Wet Scrubber ☐ Afterburner

☐ Other (specify) _____

APPENDIX B

CALCULATION OF EMISSION RATES FOR RIDGE GENERATING STATION BOILER

The following calculations apply to generation at maximum continuous rating (MCR or 100 percent load). Heat input, fuel consumption, and emission rates at lower load levels are expected to be approximately in proportion to conditions at MCR. Therefore, emissions at 75 percent and 50 percent loads can be calculated by multiplying MCR emission rates by 0.75 and 0.50.

The emission rates shown in this application are expressed in pounds per hour. Maximum annual emission rates can be calculated conservatively by assuming continuous year-round operation at MCR. Hence, annual emissions in tons per year equal:

$$(\text{lb/hr}) \times (8,760 \text{ hr/yr}) / (2,000 \text{ lb/ton}) = 4.38 \times (\text{lb/hr})$$

Table B-1 contains a summary of emission rate calculations by fuel mix for each pollutant. The calculation equations in this table use letter designations for the calculation variables. These letter designations are defined in Table B-2. Derivations of calculation variables are given in Table B-3.

TABLE B-1

**RIDGE GENERATING STATION BOILER
EMISSION RATE CALCULATIONS FOR
MAXIMUM CONTINUOUS RATING**

EMISSION RATES (LB/HR) BY FUEL TYPE (FUEL PERCENTAGES ON A HEAT INPUT BASIS)			
POLLUTANT	100% WOOD	80% WOOD 20% TIRES	75% WOOD 15% TIRES 10% LANDFILL GAS
sulfur oxides (as SO ₂)	$B \times C \times E \times H = 69.4$	$B \times C \times E \times H = 109.4$	$B \times C \times E \times H = 92.5$
particulate matter/PM ₁₀	$A \times I = 12.6$	$A \times I = 12.6$	$A \times I = 12.6$
nitrogen oxides (as NO ₂)	$A \times J = 94.5$	$A \times J = 94.5$	$A \times J = 94.5$
carbon monoxide	$A \times K = 315.0$	$A \times K = 315.0$	$A \times K = 315.0$
volatile organic compounds	$A \times L = 22.1$	$A \times L = 22.1$	$A \times L = 22.1$
lead ^a	$A \times M = 0.25$	$A \times M = 0.25$	$A \times M = 0.25$
hydrogen chloride ^a	$A \times F = 3.2$	$A \times F = 3.2$	$A \times F = 3.2$
beryllium ^a	$A \times N = 0.0063$	$A \times N = 0.0063$	$A \times N = 0.0063$
mercury ^a	$A \times O = 0.022$	$A \times O = 0.022$	$A \times O = 0.022$
ammonia ^a	$P \times Q \times R = 17.8$	$P \times Q \times R = 17.8$	$P \times Q \times R = 17.8$
arsenic ^a	$A \times S = 0.019$	$A \times S = 0.019$	$A \times S = 0.019$
cadmium ^a	$A \times T = 0.033$	$A \times T = 0.033$	$A \times T = 0.033$
chromium VI ^a	$A \times U = 0.016$	$A \times U = 0.016$	$A \times U = 0.016$
nickel ^a	$A \times V = 0.063$	$A \times V = 0.063$	$A \times V = 0.063$
zinc ^a	$A \times W = 0.63$	$A \times W = 0.63$	$A \times W = 0.63$
benzene ^a	$A \times X = 5.0$	$A \times X = 5.0$	$A \times X = 5.0$
formaldehyde ^a	$A \times Y = 1.7$	$A \times Y = 1.7$	$A \times Y = 1.7$

Note: Calculation variables are defined in Table B-2.

^a Highest estimated emissions for any fuel mix shown in each column.

TABLE B-2

RIDGE GENERATING STATION BOILER
EMISSION RATE CALCULATION VARIABLES FOR
MAXIMUM CONTINUOUS RATING

VARIABLE	CALCULATION VALUES BY FUEL TYPE (FUEL PERCENTAGES ON A HEAT INPUT BASIS)		
	100% WOOD	80% WOOD 20% TIRES	75% WOOD 15% TIRES 10% LANDFILL GAS
A = heat input, MMBTU/hr	630	630	630
B = fuel consumption, lb/hr	115,596	101,477	103,947
C = SO ₂ dry scrubber/ fabric filter efficiency factor (1 - 80%/100%)	0.2	0.2	0.2
E = fuel sulfur content fraction	0.0015	0.00269	0.00222
F = HCl emission factor ^a , lb/MMBTU	0.005	0.005	0.005
H = ratio of SO ₂ to S	2	2	2
I = PM emission factor, lb/MMBTU	0.02	0.02	0.02
J = NO _x emission factor, lb/MMBTU	0.15	0.15	0.15
K = CO emission factor, lb/MMBTU	0.50	0.50	0.50
L = VOC emission factor, lb/MMBTU	0.035	0.035	0.035
M = Pb emission factor ^a , lb/MMBTU	0.0004	0.0004	0.0004
N = Be emission factor ^a , lb/MMBTU	0.00001	0.00001	0.00001
O = Hg emission factor ^a , lb/MMBTU	0.000035 <i>630 = 0.0221 lb/hr x 8760 = 1932.18 lb/yr = 0.00035</i>	0.000035	0.000035
P = NH ₃ volume (ppmv) divided by 10 ⁶	35.36/10 ⁶	35.18/10 ⁶	35.26/10 ⁶
Q = flue gas volume, ft ³ /hr (@ 170°F)	13,593,360	13,481,580	13,653,180
R = factor to convert ft ³ of NH ₃ @ 170°F flue gas exit temperature	0.037	0.037	0.037
S = arsenic emission factor ^a , lb/MMBtu	~~0.0003~~ 0.00003	0.0003	0.0003

TABLE B-2

RIDGE GENERATING STATION BOILER
EMISSION RATE CALCULATION VARIABLES FOR
MAXIMUM CONTINUOUS RATING
(continued)

CALCULATION VALUES BY FUEL TYPE (FUEL PERCENTAGES ON A HEAT INPUT BASIS)			
VARIABLE	100% WOOD	80% WOOD 20% TIRES	75% WOOD 15% TIRES 10% LANDFILL GAS
T = cadmium emission factor ^a , lb/MMBtu	0.000052	0.000052	0.000052
U = chromium emission factor ^a , lb/MMBtu	0.000026	0.000026	0.000026
V = nickel emission factor ^a , lb/MMBtu	0.0001	0.0001	0.0001
W = zinc emission factor ^a , lb/MMBtu	0.001	0.001	0.001
X = benzene emission factor ^a , lb/MMBtu	0.008	0.008	0.008
Y = formaldehyde emission factor ^a , lb/MMBtu	0.0027	0.0027	0.0027

^a Represents highest emission factor for any fuel combination.

TABLE B-3

**RIDGE GENERATING STATION BOILER
DERIVATION OF EMISSION RATE CALCULATION VARIABLES**

VARIABLE ^a	DERIVATION
A	design data
B	design data and expected fuel heating value
C	design data
E	test data
F	estimated based on review of test data and other literature
H	basic chemistry
I	design data
J	design data
K	design data
L	design data
M	estimated based on review of test data and other literature
N	estimated based on review of test data and other literature
O	estimated based on review of test data and other literature
P	design data
Q	design data
R	$17 \text{ lb/lb mole} \times \text{lb mole}/358.8 \text{ ft}^3 \text{ (@ } 32 \text{ }^\circ\text{F}) \times (460 + 32 \text{ }^\circ\text{R})/(460 + 170 \text{ }^\circ\text{R}) = 0.037$
S	estimated based on review of test data and other literature
T	estimated based on review of test data and other literature
U	estimated based on review of test data and other literature
V	estimated based on review of test data and other literature
W	estimated based on review of test data and other literature
X	estimated based on review of test data and other literature
Y	estimated based on review of test data and other literature
Z	estimated based on review of test data and other literature

^a Variable defined in Table B-2.

APPENDIX C MODELING PRINTOUTS LIST

Printouts of modeling results are being submitted in a separate package. This package also contains diskettes with the output files from which printouts were produced. The following files/printouts are provided:

<u>File Number</u>	<u>Met. Year</u>	<u>Load Level</u>	<u>PSD Area</u>	<u>Averaging Period</u>	<u>Grid</u>
RGS82P15	1982	100%	Class II	All	10°, 250-m spacing
RGS83P15	1983	100%	Class II	All	10°, 250-m spacing
RGS84P15	1984	100%	Class II	All	10°, 250-m spacing
RGS85P15	1985	100%	Class II	All	10°, 250-m spacing
RGS86P15	1986	100%	Class II	All	10°, 250-m spacing
RGS82P16	1982	75%	Class II	All	10°, 250-m spacing
RGS83P16	1983	75%	Class II	All	10°, 250-m spacing
RGS84P16	1984	75%	Class II	All	10°, 250-m spacing
RGS85P16	1985	75%	Class II	All	10°, 250-m spacing
RGS86P16	1986	75%	Class II	All	10°, 250-m spacing
RGC182P4	1982	100%	Class I	All	[Discrete Receptors]
RGC183P4	1983	100%	Class I	All	[Discrete Receptors]
RGC184P4	1984	100%	Class I	All	[Discrete Receptors]
RGC185P4	1985	100%	Class I	All	[Discrete Receptors]
RGC186P4	1986	100%	Class I	All	[Discrete Receptors]
RGC182P5	1982	75%	Class I	All	[Discrete Receptors]
RGC183P5	1983	75%	Class I	All	[Discrete Receptors]
RGC184P5	1984	75%	Class I	All	[Discrete Receptors]
RGC185P5	1985	75%	Class I	All	[Discrete Receptors]
RGC186P5	1986	75%	Class I	All	[Discrete Receptors]

<u>File Number</u>	<u>Met. Year</u>	<u>Load Level</u>	<u>PSD Area</u>	<u>Averaging Period</u>	<u>Grid</u>
RGS82P21	1982	75%	Class II	1-hour	2°, 100-m spacing
RGS83P17	1983	100%	Class II	3-hour	2°, 100-m spacing
RGS84P17	1984	100%	Class II	3-hour	2°, 100-m spacing
RGS85P17	1985	100%	Class II	3-hour	2°, 100-m spacing
RGS86P17	1986	100%	Class II	3-hour	2°, 100-m spacing
RGS84P18	1984	100%	Class II	8-hour	2°, 100-m spacing
RGS86P18	1986	100%	Class II	8-hour	2°, 100-m spacing
RGS86P18A	1986	75%	Class II	8-hour	2°, 100-m spacing
RGS82P19	1982	100%	Class II	24-hour	2°, 100-m spacing
RGS83P19	1983	100%	Class II	24-hour	2°, 100-m spacing
RGS83P19A	1983	75%	Class II	24-hour	2°, 100-m spacing
RGS86P20	1986	100%	Class II	Annual	2°, 100-m spacing
RGS100SC	Screen Results for 100% Load				
RGS75SC	Screen Results for 75% Load				
RGS50SC	Screen Results for 50% Load				

TIRE BURNING ISSUE

- ◆ The Wheelabrator Ridge Facility is a 50MW electrical generating facility fueled by waste wood and waste tires near Lakeland, Florida.
- ◆ The Facility burns approximately 300,000 tons/year of wood and 45,000 tons/year (4,500,000 tires).
- ◆ During the Pre-Application Meeting with the FDEP in the fall of 1991, the Company was told that, in order to be permitted to burn tires, a spray dryer absorber for SO₂ control and fabric filter would be required. If burning only wood, an electrostatic precipitator would meet permit requirements. QIR
- ◆ The Company made the decision to assume the added capital cost, as well as the additional ongoing operational cost of the S.D.A. and fabric filter because the relative fuel price advantage of tires vs. wood justified the expenditure.
- ◆ In 1995, when the Ridge Facility applied to increase its tire burning capacity from 32,000 tons per year to 45,000 tons per year the Company had to agree to reduce its initial SO₂ limits from 109.4#/hour to 65#/hour in the final permit in order to gain state approval.
- ◆ Tampa Electric is now applying for a permit modification to allow its Gannon Station Unit 3 to burn tires with SO₂ emissions uncontrolled. TECO
Control Tires
- ◆ To now have someone with no SO₂ control equipment be allowed to burn tires because they have a lax 1980's SO₂ permit (2.4#/MMBTU at Gannon vs. 0.1#/MMBTU at Ridge) is inconceivable.
- ◆ Since the Ridge Facility started up in 1994, all known significant tire piles have been consumed in central and southern Florida and the disposal is no longer a problem in Florida.

Howard Rhoads

1. Does rule allow a different fuel type to be burned without a new review of conditions?

2. Test burn for Teco, results in Department now.

Call Mr. ...

John Zubeck
difference between
Tire Sales and
Decker?



February 2, 1995

Mr. Clair Fancy, P.E.
Chief, Bureau of Air Regulation
Florida Department of Environmental Protection
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Re: Ridge Generating Station
Permit Number AC53-206244 PSD-FL-183
Request for Permit Amendment

Dear Mr. Fancy:

Thank you for meeting with us on December 15, 1994 to discuss the potential future use of other acceptable fuels at the Ridge Generating Station (RGS). Based on the feedback that we received at that meeting, we have decided to focus our initial attention on increasing the tire component of the fuel mix. We are proposing to increase the percentage of tires, such that the maximum heat input associated with tires would be increased from 20 percent to 40 percent. The purpose of this letter is to request your authorization to modify the approved Comprehensive Emissions Testing Program Protocol and to obtain your approval to increase the tire component of the fuel mix to 40 percent (on a heat input basis) contingent upon a demonstration that the existing permit limits can be met. We are not requesting any modifications to the emissions limitations to accommodate this change.

Discussion

Although we plan to consider various alternative fuels that may be acceptable for future use, we believe the best course of action for now is to increase the percentage of tires in the fuel mix that is authorized in the subject permit. The permit currently limits tire firing to 9.0 percent by weight which is equivalent to 20 percent based on heat input to the boiler. We are proposing to increase tire firing to 16.1 percent by weight which is equivalent to 40 percent based on heat input. The 16.1 percent weight limitation is equivalent to a tire firing rate of 18,505 pounds of tires per hour. The calculation of the relationship between heat input and weight is based on actual fuel analysis data from RGS. The calculations are summarized in Attachment A.

Based on our operating experience at RGS, we are confident that an increase in tire firing is technically feasible. In addition, based on the results of the first two emissions testing events, we believe that RGS can increase the tire firing to 40 percent and continue to operate within the existing emissions limitations. We propose to modify our comprehensive emissions testing program to demonstrate that the facility emission limits can be met with the increased tire firing. The approved Comprehensive Emissions Testing Program Protocol currently includes an initial stack test and three additional quarterly stack tests. The initial stack test was conducted during August/September, 1994, and the first quarterly stack test was conducted during November, 1994. The next quarterly stack test is proposed to begin during the week of February 20, 1995 and be concluded on or about March 3, 1995. The final quarterly stack test is currently scheduled for April, 1995.

Under the approved protocol, the February quarterly test will consist of testing for each of the pollutants identified in the permit. It will be conducted at 100 percent capacity, while firing 80 percent wood/20 percent tire feed and while firing 100 percent wood feed. We are requesting authorization to add an additional test condition, which would consist of testing for each pollutant while firing 60 percent wood/40 percent tire feed. We are also requesting authorization to delete the 80 percent wood/20 percent tire feed condition during the final quarterly stack test and replace it with a 60 percent wood/40 percent tire feed condition. A revised Comprehensive Emissions Testing Program Protocol is provided as Attachment B. A description of the revisions has been added to summarize the proposed revisions to this document, and the revisions are marked by a line in the margin of each revised page.

As indicated above, we believe that the emissions limits in the subject permit can be met when firing 40 percent tire feed. Attachment C includes summary tables which contain the stack testing results from the initial and first quarterly testing events. The additional testing, described above, will be used to demonstrate compliance with the emission limits when firing 60 percent wood/40 percent tires.

We are requesting an amendment to the permit which will allow us to fire up to 40 percent tires (on a heat input basis), as soon as the stack test data from the February/March test demonstrates compliance with the emission limits in the permit. We are requesting that the amendment be issued along with the authorization to amend the testing protocol. The amendment could contain a condition which required the submittal of a successful demonstration and approval by the department before RGS could increase the percentage of tires in the fuel mix.

In a related matter, RGS has been seeking approvals for three Alternate Sampling Procedure requests. Our most recent submittal on this issue was sent to Mr. M. Harley, P.E., DEP on January 6, 1995, and he has informed us by telephone that he has all the information he needs to make a decision. The requests were made in order to utilize methodologies which will result in lower detection limits for arsenic, beryllium and lead emissions, as well as set forth procedures for performing ammonia and PCB sampling for which there are currently no FDEP

approved methods. The testing time frames specified in our request are based on our assumption that these procedures will be allowed. If these methods are not allowed, RGS will use the methods currently approved by Mr. Harley; however, the testing periods will have to be extended by another seven days. Therefore, we are anxious to resolve this issue before the February testing begins.

As we discussed in our earlier meeting, the timing of these activities is important to RGS. Therefore, your timely review and response will be greatly appreciated. If you have questions related to this request or need any additional information, please call me at (813) 665-2255 or call Matt Killeen at 1-800-682-0026.

Sincerely,


Rodney Williams
Plant Manager

/lc

Attachments

cc: G. Aguinaga
W. Ferguson
M. Killeen
S. Smallwood

ATTACHMENT A

FUEL FEED RATE CALCULATION

February 2, 1995

FUEL FEED RATE CALCULATION

RGS is proposing to increase the tire firing rate to 40% on a furnace heat input basis. The original fuel feed rate calculations were based on typical heating values contained in the literature. However, based on extensive RGS fuel sampling and laboratory analyses, it has been determined that the heating value (HHV) of the average fuel burned at RGS is lower than originally thought, for both tires and wood.

For tires, laboratory analyses have shown that 13,618 Btu/lb is a more representative HHV than the originally assumed 14,000 Btu/lb. For this reason, somewhat more than double the weight of tires is required (18,505 lb/hr) to double the heat input from 20% to 40%. Similarly, averaging over 100 fuel sample analyses taken from suppliers and during plant tests results in an average wood HHV of 3,923 Btu/lb. Due to significantly higher than anticipated moisture and ash content, the actual RGS wood fuels have a lower HHV than the originally assumed 5,450 Btu/lb. Therefore, wood feed rates have to increase in order to achieve the permitted furnace heat input.

The proposed fuel feed rates are based on the heating values derived from actual RGS fuel analyses, as illustrated in the calculation below:

Basis: Design Heat Input = 630 mm Btu/hr
HHV_{tires} = 13,618 Btu/lb
HHV_{wood} = 3,923 Btu/lb

Fuel Feed Rates: with 60% Wood/ 40% Tire Mixture on a heat input basis

$$\begin{aligned}M_{\text{wood}} &= (\text{Heat Input})_{\text{wood}} \div \text{HHV}_{\text{wood}} \\&= (630 \text{ mm Btu/hr} \times .60) \div 3,923 \text{ Btu/lb} \\&= 96,355 \text{ lb/hr}\end{aligned}$$

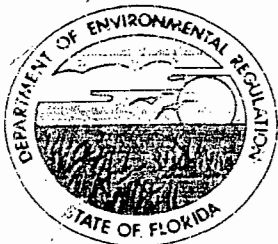
$$\begin{aligned}M_{\text{tires}} &= (\text{Heat Input})_{\text{tires}} \div \text{HHV}_{\text{tires}} \\&= (630 \text{ mm Btu/hr} \times .40) \div 13,618 \text{ Btu/lb} \\&= 18,505 \text{ lb/hr}\end{aligned}$$

$$\begin{aligned}\text{Total Fuel Feedrate} = M_{\text{total}} &= M_{\text{wood}} + M_{\text{tires}} \\&= 96,355 \text{ lb/hr} + 18,505 \text{ lb/hr} \\&= 114,860 \text{ lb/hr wood \& tires}\end{aligned}$$

Weight Basis Fuel Feedrates:

$$\% \text{ Wood} = M_{\text{wood}} \div M_{\text{total}} = \frac{96,355 \text{ lb/hr}}{114,860 \text{ lb/hr}} = 83.9\%$$

$$\% \text{ Tires} = M_{\text{tires}} \div M_{\text{total}} = \frac{18,505 \text{ lb/hr}}{114,860 \text{ lb/hr}} = 16.1\%$$



000128
000090
000123

Florida Department of Environmental Regulation

Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400

Lawton Chiles, Governor

Carol M. Browner, Secretary

June 22, 1992

CERTIFIED MAIL-RETURN RECEIPT REQUESTED

Mr. Macauley Whiting, Jr., President
Decker Energy - Ridge, Inc.
P.O. Box 2397
Winter Park, Florida 32790

Dear Mr. Whiting:

Attached is one copy of the Technical Evaluation and Preliminary Determination and proposed permit for Ridge Generating Station to construct a wood/tire burning power generation facility near Auburndale, Polk County, Florida.

Please submit any written comments you wish to have considered concerning the Department's proposed action to Mr. Preston Lewis of the Bureau of Air Regulation.

Sincerely,


James K. Pennington, P.E.
Chief
Bureau of Air Regulation

CHF/JR/plm

Attachments

c: W. Thomas, SWD
R. Anders, Polk County
J. Harper, EPA
C. Shaver, NPS
T. Fitzpatrick, P.E.
M. Killeen, WESI
J. Little, D&M
R. Stone, RGS

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

CERTIFIED MAIL

In the Matter of an
Application for Permit by:

DER File No. AC 53-206244
PSD-FL-183
Polk County

Decker Energy - Ridge, Inc.
P.O. Box 2397
Winter Park, Florida 32790

INTENT TO ISSUE

The Department of Environmental Regulation gives notice of its intent to issue a permit (copy attached) for the proposed project as detailed in the application specified above, for the reasons stated in the attached Technical Evaluation and Preliminary Determination.

The applicant, Ridge Generating Station, L.P., applied on April 6, 1992, to the Department of Environmental Regulation for a permit to construct a wood/tire burning power generation facility near Auburndale in Polk County, Florida.

The Department has permitting jurisdiction under the provisions of Chapter 403, Florida Statutes and Florida Administrative Code (F.A.C.) Chapters 17-2 and 17-4. The project is not exempt from permitting procedures. The Department has determined that a construction permit is required for the proposed work.

Pursuant to Section 403.815, Florida Statutes and Rule 17-103.150, F.A.C., you (the applicant) are required to publish at your own expense the enclosed Notice of Intent to Issue Permit. The notice shall be published one time only within 30 days in the legal ad section of a newspaper of general circulation in the area affected. For the purpose of this rule, "publication in a newspaper of general circulation in the area affected" means publication in a newspaper meeting the requirements of Sections 50.011 and 50.031, F.S., in the county where the activity is to take place. The applicant shall provide proof of publication to the Department's Bureau of Air Regulation, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400, within seven days of publication. Failure to publish the notice and provide proof of publication within the allotted time may result in the denial of the permit.

The Department will issue the permit with the attached conditions unless a petition for an administrative proceeding (hearing) is filed pursuant to the provisions of Section 120.57, F.S.

A person whose substantial interests are affected by the Department's proposed permitting decision may petition for an administrative proceeding (hearing) in accordance with Section 120.57, Florida Statutes. The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 2600 Blair Stone Road, Tallahassee, Florida 32399-2400. Petitions filed by the permit applicant and the parties listed below must be filed within 14 days of receipt of this intent. Petitions filed by other persons must be filed within 14 days of publication of the public notice or within 14 days of their receipt of this intent, whichever first occurs. Petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. Failure to file a petition within this time period shall constitute a waiver of any right such person may have to request an administrative determination (hearing) under Section 120.57, Florida Statutes.

The Petition shall contain the following information;

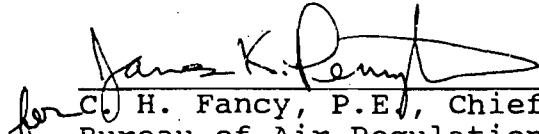
- (a) The name, address, and telephone number of each petitioner, the applicant's name and address, the Department Permit File Number and the county in which the project is proposed;
- (b) A statement of how and when each petitioner received notice of the Department's action or proposed action;
- (c) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action;
- (d) A statement of the material facts disputed by Petitioner, if any;
- (e) A statement of facts which petitioner contends warrant reversal or modification of the Department's action or proposed action;
- (f) A statement of which rules or statutes petitioner contends require reversal or modification of the Department's action or proposed action; and
- (g) A statement of the relief sought by petitioner, stating precisely the action petitioner wants the Department to take with respect to the Department's action or proposed action.

If a petition is filed, the administrative hearing process is designed to formulate agency action. Accordingly, the Department's final action may be different from the position taken by it in this intent. Persons whose substantial interests will be affected by any decision of the Department with regard to the application have the right to petition to become a party to the proceeding. The petition must conform to the requirements specified above and be filed (received) within 14 days of receipt of this intent in the Office of General Counsel at the above address of the Department. Failure to petition within the allowed time frame constitutes a waiver of any right such person has to request a hearing under Section 120.57, F.S., and to participate as a party to this

proceeding. Any subsequent intervention will only be at the approval of the presiding officer upon motion filed pursuant to Rule 28-5.207, F.A.C.

Executed in Tallahassee, Florida.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION


for C. H. Fancy, P.E., Chief
Bureau of Air Regulation
2600 Blair Stone Road
Tallahassee, Florida 32399
904-488-1344

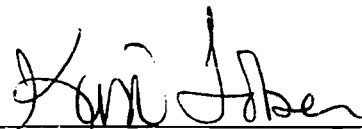
CERTIFICATE OF SERVICE

The undersigned duly designated deputy clerk hereby certifies that this INTENT TO ISSUE and all copies were mailed by certified mail before the close of business on 6-24-92 to the listed persons.

Clerk Stamp

FILING AND ACKNOWLEDGMENT

FILED, on this date, pursuant to §120.52(11), Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.


Clerk 6-24-92
Date

Copies furnished to:

W. Thomas, SWD
R. Anders, Polk County
J. Harper, EPA
C. Shaver, NPS
T. Fitzpatrick, P.E.
M. Killeen, WESI
J. Little, D&M
R. Stone, RGS

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
NOTICE OF INTENT TO ISSUE PERMIT

The Department of Environmental Regulation gives notice of its intent to issue a permit to Ridge Generating Station, P.O. Box 2397, Winter Park, Florida 32790, to construct a wood/tire burning power generation facility at State Road 542 and Taylor Road near Auburndale, Polk County, Florida. A determination of Best Available Control Technology (BACT) was required. The proposed project is subject to Prevention of Significant Deterioration (PSD) regulations. Modeling results show that increases in ground-level concentrations are less than PSD significant impact levels for the applicable pollutants. The Department is issuing this Intent to Issue for the reasons stated in the Technical Evaluation and Preliminary Determination.

A person whose substantial interests are affected by the Department's proposed permitting decision may petition for an administrative proceeding (hearing) in accordance with Section 120.57, Florida Statutes. The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 2600 Blair Stone Road, Tallahassee, Florida 32399-2400, within 14 days of publication of this notice. Petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. Failure to file a petition within this time period shall constitute a waiver of any right such person may have to request an administrative determination (hearing) under Section 120.57, Florida Statutes.

The Petition shall contain the following information; (a) The name, address, and telephone number of each petitioner, the applicant's name and address, the Department Permit File Number and the county in which the project is proposed; (b) A statement of how and when each petitioner received notice of the Department's action or proposed action; (c) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action; (d) A statement of the material facts disputed by Petitioner, if any; (e) A statement of facts which petitioner contends warrant reversal or modification of the Department's action or proposed action; (f) A statement of which rules or statutes petitioner contends require reversal or modification of the Department's action or proposed action; and (g) A statement of the relief sought by petitioner, stating precisely the action petitioner wants the Department to take with respect to the Department's action or proposed action.

If a petition is filed, the administrative hearing process is designed to formulate agency action. Accordingly, the Department's final action may be different from the position taken by it in this Notice. Persons whose substantial interests will be affected by

any decision of the Department with regard to the application have the right to petition to become a party to the proceeding. The petition must conform to the requirements specified above and be filed (received) within 14 days of publication of this notice in the Office of General Counsel at the above address of the Department. Failure to petition within the allowed time frame constitutes a waiver of any right such person has to request a hearing under Section 120.57, F.S., and to participate as a party to this proceeding. Any subsequent intervention will only be at the approval of the presiding officer upon motion filed pursuant to Rule 28-5.207, F.A.C.

The application is available for public inspection during normal business hours, 8:00 a.m. to 5:00 p.m., Monday through Friday, except legal holidays, at:

Department of Environmental Regulation
Bureau of Air Regulation
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Department of Environmental Regulation
Southwest District
4520 Oak Fair Blvd.
Tampa, Florida 33610-7347

Any person may send written comments on the proposed action to Mr. Preston Lewis at the Department's Tallahassee address. All comments received within 30 days of the publication of this notice will be considered in the Department's final determination. Further, a public hearing can be requested by any person. Such requests must be submitted within 30 days of this notice.

Technical Evaluation
and
Preliminary Determination

Ridge Generating Station
Polk County, Florida

PSD-FL-183
AC 53-206244

Department of Environmental Regulation
Division of Air Resources Management
Bureau of Air Regulation

June 22, 1992

I. Application Information

A. Applicant

Ridge Generating Station, L.P.
P.O. Box 2397
Winter Park, FL 32790

B. Request

The Department received a complete application on April 6, 1992, for a permit to construct a 45 megawatt (MW) independent power generation facility known as the Ridge Generating Station (RGS) near Auburndale, Polk County, Florida.

C. Classification/Location

The subject facility (SIC Code 4911) will be located at State Road 542 and Taylor Road near Auburndale, Florida. The UTM coordinates of the site are 416.7 km E and 3100.4 km N.

II. Project Description/Emissions

The applicant proposes to construct a 45 MW power generation facility consisting of a solid-fuel boiler, steam turbine, generator, and associated equipment. The RGS boiler will fire a mixture of waste wood, scrap tires, and landfill gas. Propane will be used for boiler startup and combustion stabilization. Fuel mix possibilities include wood, wood and tires, or a combination of wood, tires, and landfill gas from the adjacent Polk County North Central Landfill. No other fuels will be required. The RGS facility will not be permitted to burn any municipal solid waste or hazardous waste as defined in applicable federal and state regulations.

State-of-the-art emission control equipment will include a spray dryer-absorber/fabric filter for control of particulates and acid gases as well as most toxics and metals. The spray dryer-absorber employs an atomized lime-water solution to react with sulfur dioxide in the boiler flue gases. The dried compounds of calcium thus formed will be removed by the fabric filter. Nitrogen oxides will be controlled by selective noncatalytic reduction (SNCR) which reduces NO_x to elemental nitrogen by injecting ammonia into the boiler furnace.

The applicant's estimated actual emissions for three anticipated fuel mix scenarios (based on heat input percentages using the applicant's proposed emission limits) are tabulated below. Since the hours of operation under each of the three scenarios are unknown, and since other fuel mix percentages will also occur, projections of maximum proposed annual emissions would be based on the maximums for these anticipated fuel mix cases.

	100% Wood		80% Wood 20% Tires		75% Wood/15% Tires 10% Landfill Gas		PSD Level
	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	tons/yr
PM/PM ₁₀	12.6	55.2	12.6	55.2	12.6	55.2	25/10
SO ₂	69.4	304.0	109.4	479.2	92.5	405.2	40
NO _x	94.5	413.9	94.5	413.9	94.5	413.9	40
CO	315.0	1,379.7	315.0	1,379.7	315.0	1,379.7	100
VOC	22.1	96.6	22.1	96.6	22.1	96.6	40
NH ₃	17.8	78.0	17.8	78.0	17.8	78.0	-
C ₆ H ₆	5.0	21.9	5.0	21.9	5.0	21.9	-
HCHO	1.7	7.5	1.7	7.5	1.7	7.5	-
HCL	5.0	22.1	5.0	22.1	5.0	22.1	-
Pb	0.25	1.1	0.25	1.1	0.25	1.1	0.6
Zn	0.63	2.8	0.63	2.8	0.63	2.8	-
Hg	0.02	0.1	0.02	0.1	0.02	0.1	0.1
Be	.0063	0.03	.0063	0.03	.0063	0.03	.0004

III. Rule Applicability

The construction permit application is subject to review under Chapter 403, Florida Statutes, and Florida Administrative Code (F.A.C.) Chapters 17-2 and 17-4. The proposed facility is subject to the provisions of F.A.C. Rule 17-2.500, Prevention of Significant Deterioration (PSD). The facility is located in an area classified as attainment for all regulated air pollutants. Proposed emissions of PM/PM₁₀, SO₂, NO_x, CO, VOC, Pb, Hg, and Be equal or exceed the significant levels set forth in Table 500-2 of F.A.C. Rule 17-2.500. Preconstruction review must include a determination of Best Available Control Technology (BACT), good-engineering practice stack height, ambient impact analysis, impact on soils, vegetation and visibility. Applicable emission limit rules are F.A.C. Rules 17-2.660, Table 660-1, Section 60.40b, Subpart Db, 60.43b (c)(1), (f) and (g), 60.44b (d), Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units. For the ash handling system and lime silo, applicable rules are F.A.C. Rules 17-2.610(2) and (3). The above rules would dictate limits except that BACT limits are more stringent and therefore apply.

IV. Air Quality Analysis

a. Introduction

The operation of the proposed facility will result in emissions increases which are projected to be greater than the PSD significant emission rates for the following pollutants: NO_x, SO₂, PM, PM₁₀, Be, CO, VOC, Pb, and Hg. Therefore, the project is subject to the PSD NSR requirements contained in F.A.C. Rule 17-2.500(5) for these pollutants. Part of these requirements is an air quality impact analysis for these pollutants, which includes:

- An analysis of existing air quality;
- A PSD increment analysis (for SO₂, PM, PM₁₀, and NO_x);
- An ambient Air Quality Standards analysis (AAQS);
- An analysis of impacts on soils, vegetation, visibility and growth-related air quality impacts; and,
- A Good Engineering Practice (GEP) stack height determination

The analysis of existing air quality generally relies on preconstruction monitoring data collected in accordance with EPA-approved methods. The PSD increment and AAQS analyses are based on air quality dispersion modeling completed in accordance with EPA guidelines.

Based on these required analyses, the Department has reasonable assurance that the proposed project, as described in this report and subject to the conditions of approval proposed herein, will not cause or contribute to a violation of any PSD increment or ambient air quality standard. A brief description of the modeling methods used and results of the required analyses follow. A more complete description is contained in the permit application on file.

b. Analysis of the Existing Air Quality

Preconstruction ambient air quality monitoring may be required for pollutants subject to PSD review. However, an exemption to the monitoring requirement can be obtained if the maximum air quality impact resulting from the projected emissions increase, as determined through air quality modeling, is less than a pollutant-specific de minimus concentration. The predicted maximum concentration increase for each pollutant subject to PSD (NSR) is given below:

	SO ₂	TSP & PM10	NO _x	CO	Be	Pb	Hg
PSD de minimus Concentra. (ug/m ³)	13	10	14	575	0.001	0.1	0.25
Averaging Time	24-hr	24-hr	Annual	8-hr	24-hr	3 mo.	24-hr
Maximum Predicted Impact (ug/m ³)	4.4	0.5	0.4	35	.0003	<.01	0.0009

There are no monitoring de minimus concentrations for VOC emissions. As shown above, the predicted impacts are all less than the corresponding de minimus concentrations; therefore, no preconstruction monitoring is required for these pollutants.

c. Modeling Method

The EPA-approved Industrial Source Complex Short-Term (ISCST) dispersion model was used by the applicant to predict the impact of

the proposed project on the surrounding ambient air. All recommended EPA default options were used. No downwash effects were considered because the stacks will be equal to the good engineering practice (GEP) stack height. Five years of sequential hourly surface and mixing depth data from the Tampa Florida National Weather Service (NWS) station collected during 1982 through 1986 were used in the model. Since five years of data were used, the highest-second-high (HSH) short-term predicted concentrations are compared with the appropriate ambient air quality standards or PSD increments. For the annual averages, the highest predicted yearly average was compared with the standards.

d. Modeling Results

The applicant first evaluated the potential increase in ambient ground-level concentrations associated with the project to determine if these predicted ambient concentration increases would be greater than specified PSD significant impact levels for criteria pollutants SO₂, CO, NO₂, PM and PM₁₀. This evaluation was based on the proposed boiler operating at load conditions of 100, 75, and 50 percent. The modeling was performed using the highest emissions coupled with the lowest exit gas flow rates to maximize predicted impacts. Maximum modeled emissions were based on the use of the wood/tire combination for fuel. The maximum predicted concentrations occur for either the 100% or the 75% operating load. Dispersion modeling was performed with receptors placed along the 36 standard radial directions (10 degrees apart) surrounding the proposed unit beginning at 250m and going out at intervals of 250m to a distance of 3000m from the proposed boiler. The results of this modeling presented below show that the increases in ambient ground-level concentrations for all averaging times are less than the PSD significant impact levels for SO₂, CO, NO₂, PM and PM₁₀.

	SO ₂			NO ₂		CO		PM and PM ₁₀	
Avg. Time	Annual	3-hr	24-hr	Annual	1-hr	8-hr	Ann.	24-hr	
PSD Signifi. Level (ug/m ³)	1.0	25.0	5.0	1.0	2000	800	1.0	5.0	
Ambient Concen. Increase (ug/m ³)	0.4	18.7	4.4	0.4	126	35	0.05	0.5	

Therefore, further dispersion modeling for comparison with AAQS and PSD Class II increment consumption were not required for these pollutants. There is currently no acceptable method to model VOC for ozone formation. Pb has no significant impact level; however, maximum predicted Pb concentrations were less than the 1.5 ug/m³ quarterly ambient air quality standard.

Be and Hg are noncriteria pollutants, which means that neither national AAQS nor PSD Significant Impacts have been defined for these pollutants. However, the Department does have a draft

Air Toxics Permitting Strategy, which defines no threat levels for these pollutants. The Department and the applicant have used the same modeling procedure described above to evaluate the maximum increase in ground level concentration of these pollutants for comparison with the no-threat levels. The results of this analysis are shown below:

<u>Avg. Time</u>	<u>Be Annual</u>	<u>Hg 24-hr</u>
No Threat-Level (ug/m ³)	0.00042	0.3
Max. Concen. <u>Increase</u>	<u>0.00002</u>	<u>0.00008</u>

All of these values are less than their respective no-threat levels.

The nearest PSD Class I area is the Chassahowitzka National Wilderness Area located 100 km northwest of the facility. The predicted impact of the proposed project on this area was evaluated by first using the ISCST model to predict maximum increment consumptions by the source alone and by comparing these predicted values to the appropriate recommended significance levels to determine whether further modeling was necessary. The significance levels used by the Department were the more stringent National Park Service (NPS) recommended levels. The predicted maximum PM/PM₁₀ and NO₂ increment consumptions for all applicable averaging times were less than these significance levels. Therefore, no further modeling for PM/PM₁₀ and NO₂ was required. In addition, the predicted maximum SO₂ annual average increment consumption by the source alone was also below the NPS significance level. However, the predicted maximum SO₂ 24-hour and 3-hour concentrations were predicted to be greater than the NPS levels. The Department and the NPS directed the applicant to further evaluate the SO₂ short term impacts on the Class I area by using the long range transport model, Mesopuff. This model is more applicable for distances greater than 100km. Mesopuff model results show that the maximum predicted SO₂ 3-hour average increment consumption for the project alone is predicted to be below the NPS significance level of 0.48 ug/m³. Therefore, no further modeling was necessary for the SO₂ 3-hour averaging time. For the SO₂ 24-hour averaging case, Mesopuff results show that when the project alone is predicted to have impacts greater than the NPS significance level of 0.07 ug/m³ (maximum predicted impact of 0.09 ug/m³) cumulative impacts from all modeled sources in the area are less than the PSD Class I increment of 5.0 ug/m³.

e. Additional Impacts Analysis

A Level-1 screening analysis using the EPA model, VISCREEN was used to determine any potential adverse visibility impacts on the Class I Chassahowitzka National Wilderness Area located about 100km away. Based on this analysis, the maximum predicted visual impacts due to the proposed project are less than the screening criteria both inside and outside the Class I area. A comprehensive air quality related values (AQRV) analysis for this Class I area was performed by the applicant. No significant impacts on the Class I area are expected.

In addition, the maximum predicted concentrations from NOx, CO, SO₂, PM and PM₁₀ are predicted to be less than the AAQS, including the national secondary standards designed to protect public welfare-related values. As such, no harmful effects on soil and vegetation are expected in the area of the project. Also, the proposed modification will not significantly change employment, population, housing or commercial/industrial development in the area to the extent that a significant air quality impact will result.

V. Air Toxics Evaluation

Based on extensive test data for other facilities that burn tires, only negligible quantities of toxic pollutants will escape the emission control equipment and therefore are of no environmental concern.

VI. Conclusion

Based on the information provided by Ridge Generating Station, the Department has reasonable assurance that the proposed installation, as described in this evaluation, and subject to the conditions proposed herein, will not cause or contribute to a violation of any air quality standard, PSD increment, or any other technical provision of Chapter 17-2 of the Florida Administrative Code.

Stanton
PE # 41755



Florida Department of Environmental Regulation

Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400

Lawton Chiles, Governor

Carol M. Browner, Secretary

PERMITTEE:

Ridge Generating Station, L.P.
P. O. Box 2397
Winter Park, Florida 32790

Permit Number: AC 53-206244

PSD-FL-183

Expiration Date: December 31, 1994

County: Polk

Latitude/Longitude: ° ' "N
 ° ' "W

Project: Wood/Tire Burning Power
Generation Facility

This permit is issued under the provisions of Chapter 403, Florida Statutes, and Florida Administrative Code Chapters 17-2 and 17-4. The above named permittee is hereby authorized to perform the work or operate the facility shown on the application and approved drawings, plans, and other documents attached hereto or on file with the Department and made a part hereof and specifically described as follows:

For the construction of a 45 Megawatt power generation facility to be located at State Road 542 and Taylor Road near Auburndale, Polk County, Florida. The UTM coordinates are 416.7 km East and 3,100.4 km North.

The source shall be constructed in accordance with the permit application, plans, documents, amendments and drawings, except as otherwise noted in the General and Specific Conditions.

Attachments are listed below:

1. DER incompleteness letter dated 1-17-92.
2. RGS letter dated 3-19-92.
3. RGS letter dated 3-27-92.
4. RGS submittal received 4-6-92.

PERMITTEE:
Ridge Generating Station, L.P.

Permit Number: AC 53-206244
PSD-FL-183
Expiration Date: December 31, 1994

GENERAL CONDITIONS:

1. The terms, conditions, requirements, limitations, and restrictions set forth in this permit are "Permit Conditions" and are binding and enforceable pursuant to Sections 403.161, 403.727, or 403.859 through 403.861, Florida Statutes. The permittee is placed on notice that the Department will review this permit periodically and may initiate enforcement action for any violation of these conditions.

2. This permit is valid only for the specific processes and operations applied for and indicated in the approved drawings or exhibits. Any unauthorized deviation from the approved drawings, exhibits, specifications, or conditions of this permit may constitute grounds for revocation and enforcement action by the Department.

3. As provided in Subsections 403.087(6) and 403.722(5), Florida Statutes, the issuance of this permit does not convey any vested rights or any exclusive privileges. Neither does it authorize any injury to public or private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations. This permit is not a waiver of or approval of any other Department permit that may be required for other aspects of the total project which are not addressed in the permit.

4. This permit conveys no title to land or water, does not constitute State recognition or acknowledgement of title, and does not constitute authority for the use of submerged lands unless herein provided and the necessary title or leasehold interests have been obtained from the State. Only the Trustees of the Internal Improvement Trust Fund may express State opinion as to title.

5. This permit does not relieve the permittee from liability for harm or injury to human health or welfare, animal, or plant life, or property caused by the construction or operation of this permitted source, or from penalties therefore; nor does it allow the permittee to cause pollution in contravention of Florida Statutes and Department rules, unless specifically authorized by an order from the Department.

6. The permittee shall properly operate and maintain the facility and systems of treatment and control (and related appurtenances) that are installed or used by the permittee to achieve compliance with the conditions of this permit, as required by Department rules. This provision includes the operation of backup or

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Ridge Generating Station, L.P.

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GENERAL CONDITIONS:

auxiliary facilities or similar systems when necessary to achieve compliance with the conditions of the permit and when required by Department rules.

7. The permittee, by accepting this permit, specifically agrees to allow authorized Department personnel, upon presentation of credentials or other documents as may be required by law and at a reasonable time, access to the premises, where the permitted activity is located or conducted to:

- a. Have access to and copy any records that must be kept under the conditions of the permit;
- b. Inspect the facility, equipment, practices, or operations regulated or required under this permit; and
- c. Sample or monitor any substances or parameters at any location reasonably necessary to assure compliance with this permit or Department rules.

Reasonable time may depend on the nature of the concern being investigated.

8. If, for any reason, the permittee does not comply with or will be unable to comply with any condition or limitation specified in this permit, the permittee shall immediately provide the Department with the following information:

- a. a description of and cause of non-compliance; and
- b. the period of noncompliance, including dates and times; or, if not corrected, the anticipated time the non-compliance is expected to continue, and steps being taken to reduce, eliminate, and prevent recurrence of the non-compliance.

The permittee shall be responsible for any and all damages which may result and may be subject to enforcement action by the Department for penalties or for revocation of this permit.

9. In accepting this permit, the permittee understands and agrees that all records, notes, monitoring data and other information relating to the construction or operation of this permitted source which are submitted to the Department may be used by the Department as evidence in any enforcement case involving the permitted source arising under the Florida Statutes or Department rules, except

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GENERAL CONDITIONS:

where such use is prescribed by Sections 403.73 and 403.111, Florida Statutes. Such evidence shall only be used to the extent it is consistent with the Florida Rules of Civil Procedure and appropriate evidentiary rules.

10. The permittee agrees to comply with changes in Department rules and Florida Statutes after a reasonable time for compliance, provided, however, the permittee does not waive any other rights granted by Florida Statutes or Department rules.

11. This permit is transferable only upon Department approval in accordance with Florida Administrative Code Rules 17-4.120 and 17-30.300, F.A.C., as applicable. The permittee shall be liable for any non-compliance of the permitted activity until the transfer is approved by the Department.

12. This permit or a copy thereof shall be kept at the work site of the permitted activity.

13. This permit also constitutes:

- (x) Determination of Best Available Control Technology (BACT)
- (x) Determination of Prevention of Significant Deterioration (PSD)
- (x) Compliance with New Source Performance Standards (NSPS)

14. The permittee shall comply with the following:

- a. Upon request, the permittee shall furnish all records and plans required under Department rules. During enforcement actions, the retention period for all records will be extended automatically unless otherwise stipulated by the Department.
- b. The permittee shall hold at the facility or other location designated by this permit records of all monitoring information (including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation) required by the permit, copies of all reports required by this permit, and records of all data used to complete the application for this permit. These materials shall be retained at least

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three years from the date of the sample, measurement, report, or application unless otherwise specified by Department rule.

c. Records of monitoring information shall include:

- the date, exact place, and time of sampling or measurements;
- the person responsible for performing the sampling or measurements;
- the dates analyses were performed;
- the person responsible for performing the analyses;
- the analytical techniques or methods used; and
- the results of such analyses.

15. When requested by the Department, the permittee shall within a reasonable time furnish any information required by law which is needed to determine compliance with the permit. If the permittee becomes aware that relevant facts were not submitted or were incorrect in the permit application or in any report to the Department, such facts or information shall be corrected promptly.

SPECIFIC CONDITIONS:

1. Unless otherwise indicated, the construction and operation of the Ridge Generating Station (RGS) facility shall be in accordance with the capacities and specifications stated in the revised application.

2. The RGS facility shall be allowed to operate at a maximum capacity of ⁴⁵₅₀ Megawatts for 8,760 hours per year.

3. Fuel for firing the RGS boiler shall consist only of wood, landfill gas, and up to 9.0 percent tires (percent by weight equivalent to 20 percent tires based on heat content). The 9.0 percent tire weight limitation is equivalent to a tire firing rate of 4,500 pounds of tires per hour.

4. No municipal type solid waste, as defined in 40 CFR 60, Subpart Ea, and ~~Florida Administrative Code (F.A.C.) Rule 17-2.100~~, or hazardous waste, as defined in 40 CFR 261 and F.A.C. Rule 17-730.020, shall be burned at any time at the RGS facility.

except wood and tires as stated in the application,

PERMITTEE:
Ridge Generating Station, L.P.

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SPECIFIC CONDITIONS:

5. The RGS boiler exhaust gases shall not exceed the following limits:

Pollutant	Basis (lb/MMBTU)	TARGET	MAX *	TARGET	MAX *
		Lbs/hr	_____	Tons/yr	_____
PM/PM ₁₀	0.02	12.6		55.2	
SO ₂	0.10	63.0		275.9	
NO _x	0.11	69.3		303.5	
CO	0.21	132.3		579.5	
VOC	0.035	22.1		96.6	
HCL	0.008	5.0		22.1	
Hg	0.000035	0.022		0.1	
Pb	0.0004	0.25		1.1	
Be	0.00001	0.0063		0.03	

The feasibility of establishing rolling average limits in addition to or in lieu of the above limits will be determined after analysis of compliance test data.

6. SNCR chemical injection into the boiler exhaust gases shall be provided by an automated control system as described in the application. Ammonia emissions shall be continuously monitored at a prevailing downwind location on the RGS property line by commercially available ambient monitoring equipment. The monitoring data shall be reported for the entire operating period from startup to the time that the initial compliance test results are submitted. Thereafter, the monitoring data shall be stored and made available to the Department upon request.

7. Visible emissions from the RGS boiler stack, the ash handling system, and the lime silo shall not exceed 10 percent opacity.

8. Before this construction permit expires, the RGS facility shall be tested for compliance with the emission limits and other requirements specified herein. Annual compliance tests shall be carried out each year thereafter. The compliance tests shall be conducted at 100 percent of permitted capacity. The following EPA test methods shall be followed:

<u>Pollutant</u>	<u>Test Method</u>
PM/PM ₁₀	5 (front half only)
SO ₂	6C
NO _x	7E

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Ridge Generating Station, L.P.

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SPECIFIC CONDITIONS:

8. Cont'd	<u>Pollutant</u>	<u>Test Method</u>
	CO	10
	VOC	25 or 25A
	HCL	26
	Hg	101A
	Pb	12 or MULTI METALS
	Be	104

9. As part of the initial compliance requirement, the permittee shall sample the RGS boiler stack for the following pollutants after proposing acceptable test methods to the Department's Bureau of Air Regulation in Tallahassee. The results of these additional tests shall be reported in lbs/hr and ug/m3 along with the initial compliance test results: Ammonia, Arsenic, Cadmium, Chromium (total), Chromium VI, Zinc Oxide, Benzene, Sulfuric Acid, Polychlorinated Biphenyls (PCBs), Dioxins/Furans.

10. Continuous monitoring equipment shall be installed and operated to measure and record generator output, furnace temperature, stack opacity, and SO₂, NO_x and CO emissions. The tire feed rate in pounds per hour shall be monitored continuously by a commercially available weight detecting system with recording capability. The tire feed rate data shall be maintained and provided to the Department upon request.

11. Fugitive emissions from the RGS material receiving, processing, storage and transfer operations shall be determined according to EPA Method 22 over a 3-day period that is representative of typical operation. Results of the fugitive emissions survey shall be reported along with the compliance test results.

12. All reasonable precautions set forth in F.A.C. Rule 17-2.610(3), as well as all measures proposed by the permittee in the application, shall be taken by the permittee to prevent fugitive emissions.

13. In the event of any malfunction resulting in failure of emission control equipment or emission-related process equipment to perform as required by this permit, the operator shall immediately stop the feeding of tires into the boiler and shall use propane firing to maintain a minimum of 1800 degrees F in the combustion zone until all tires in the system have been combusted. No tires

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may be refed into the boiler following the malfunction until the emission control equipment has been put into proper working order.

14. Whenever the baghouse bypass is activated during an on-line operating situation for any reason, the permittee shall, within 24 hours, provide the Department's Southwest District Office with a complete report of the circumstances and reasons for the occurrence, indicating the amounts of pollutants estimated to have been discharged during the bypass period.

15. No pollutants shall be discharged from the RGS facility which cause or contribute to an objectionable odor (F.A.C. Rule 17-2.620(2)).

16. The Department's Southwest District office shall be notified at least 30 days prior to the compliance tests. Compliance test results and other required submittals shall be submitted to the Department's Southwest District office and the Department's Bureau of Air Regulation Office in Tallahassee within 45 days after completion of the tests. Sampling facilities, methods, and reporting shall be in accordance with F.A.C. Rule 17-2.700 and 40 CFR 60, Appendix A. Along with the submittal to the Department's Bureau of Air Regulation Office, the permittee shall include a revised BACT application.

17. Within 90 days of receipt of initial compliance test results and the permittee's revised BACT application, the Department's Bureau of Air Regulation in Tallahassee shall revise the BACT determination and permit limits and conditions as required with the goal of allowing the RGS facility to be operated in an environmentally responsible manner. Revisions may include additional emission limits for other air pollutants as well as separate limits for specific operating conditions.

18. The permittee, for good cause, may request that this construction permit be extended. Such a request shall be submitted to the Department's Bureau of Air Regulation in Tallahassee prior to 60 days before the expiration of the permit (F.A.C. Rule 17-4.090)

19. An application for an operation permit including an operation and maintenance plan must be submitted to the Department's Southwest District office at least 90 days prior to the expiration date of this construction permit or within 45 days after completion

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of compliance testing, whichever occurs first. To properly apply for an operation permit, the applicant shall submit the appropriate application form, fee, certification that construction was completed noting any deviations from the conditions in the construction permit, and compliance test reports as required by this permit (F.A.C. Rule 17-4.220).

Issued this _____ day
of _____, 1992

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION

Carol M. Browner, Secretary
Department of Environmental
Regulation

Best Available Control Technology (BACT) Determination
Ridge Generating Station
Polk County

The applicant proposes to construct a 45 MW power generation facility to be named the Ridge Generating Station and located near Auburndale in Polk County, Florida. The facility will consist of a solid fuel boiler, steam turbine, generator and associated equipment. Fuel for the facility will consist of a mixture of waste wood, scrap tires, and landfill gas.

A BACT determination is required for all regulated air pollutants emitted in amounts equal to or greater than the significant emission rates listed in Table 500-2 of Florida Administrative Code (F.A.C.) Rule 17-2.500. Maximum annual emissions proposed by the applicant are tabulated below and in the Technical Evaluation and Preliminary Determination. Maximum allowable emissions as determined from the BACT determination are listed below in tons per year (based on burning 80% wood/20% tires):

Pollutant	Maximum Allowable Emissions		PSD Level
	Proposed by RGS	Proposed by DER	
PM/PM ₁₀	55.2	55.2	25/10
SO ₂	479.2	275.9	40
NO _x	413.9	303.5	40
CO	1,379.7	579.5	100
VOC	96.6	96.6	40
HCL	22.1	22.1	-
Hg	0.1	0.1	0.1
Pb	1.1	1.1	0.6
Be	0.03	0.03	0.0004

Date of Receipt of a Complete Application

April 6, 1992

BACT Determination Requested by Applicant

Control Technology: Spray Dryer-Absorber/Fabric Filter
Selective Noncatalytic Reduction (SNCR)
Combustion Efficiency

Emission Limits:	PM/PM ₁₀	0.02 lb/MMBTU
	SO ₂	0.17 lb/MMBTU
	NO _x	0.15 lb/MMBTU
	CO	0.50 lb/MMBTU
	VOC	0.035 lb/MMBTU
	Pb	0.0004 lb/MMBTU
	Be	0.00001 lb/MMBTU

BACT Determined by the Department

Control Technology: Spray Dryer-Absorber/Fabric Filter
Selective Noncatalytic Reduction (SNCR)
Combustion Efficiency

Emission Limits:	PM/PM ₁₀	0.02 lb/MMBTU*
	SO ₂	0.10 lb/MMBTU*
	NO _x	0.11 lb/MMBTU*
	CO	0.21 lb/MMBTU*
	VOC	0.035 lb/MMBTU*
	Hg	0.000035 lb/MMBTU**
	Pb	0.0004 lb/MMBTU*
	Be	0.00001 lb/MMBTU*

* Initial limits to be revised if necessary, following compliance tests.

** Hg considered as PSD significant due to rounding 0.096 to 0.1 TPY.

BACT Determination Procedure

In accordance with F.A.C. Chapter 17-2, this BACT determination is based on the maximum degree of reduction of each pollutant emitted which the Department, on a case by case basis, taking into account energy, environmental and economic impacts, and other costs, determines is achievable through application of production processes and available control methods, systems and techniques. In addition, the regulations require that in making the BACT determination the Department shall give consideration to:

- (a) Any Environmental Protection Agency determination of Best Available Control Technology pursuant to Section 169, and any emission limitation contained in 40 CFR Part 60 (Standards of Performance for New Stationary Sources) or 40 CFR Part 61 (National Emission Standards for Hazardous Air Pollutants).
- (b) All scientific, engineering and technical material and other information available to the Department.
- (c) The emission limiting standards or BACT determinations of any other State.
- (d) The social and economic impact of the application of such technology.

The EPA currently stresses that BACT should be determined using the "top-down" approach. The first step in this approach is to determine for the emission source in question the most stringent control available for a similar or identical source or source

category. If it is shown that this level of control is technically or economically infeasible for the source in question, then the next most stringent level of control is determined and similarly evaluated. This process continues until the BACT level under consideration cannot be eliminated by any substantial or unique technical, environmental, or economic objections.

BACT Determination Rationale

A review of EPA's BACT/LAER Clearinghouse indicates that there are no existing sources using the fuel mix proposed for the RGS facility. Therefore, the Department has proposed initial emission limits and permit conditions that may be revised if necessary following the compliance tests. The preliminary limits are based on the more stringent permit limits listed in the BACT/LAER Clearinghouse data. Since there are significant differences between existing wood/tire burning units and the proposed RGS facility, and since this facility is the first of its kind, the only reasonable approach would involve a two-step BACT determination; a preliminary followed by a final determination based on compliance test results. This two-step procedure will allow the applicant to revise their current "preliminary" BACT application prior to the final BACT determination in regard to setting final limits and conditions.

The Department believes that the applicant has selected the best control technology available based on a review of the literature and permit requirements for similar facilities. To confirm this, the applicant's final BACT application should include a detailed analysis of the economic justification for the control systems selected, since all of the economic data will be available by that time.

Details of the Analysis May be Obtained by Contacting:

Preston Lewis, P.E., BACT Coordinator
Department of Environmental Regulation
Bureau of Air Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Recommended by:

Approved by:

C. H. Fancy, P.E., Chief
Bureau of Air Regulation

Carol M. Browner, Secretary
Dept. of Environmental Regulation

Date 1992

Date 1992



Department of Environmental Protection

Lawton Chiles
Governor

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Virginia B. Wetherell
Secretary

August 8, 1996

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Matthew P. Killeen
Manager, Environmental Permitting
Wheelabrator Environmental Systems, Inc.
Liberty Lane
Hampton, New Hampshire 03842

RE: Final BACT Limits for Ridge Generating Station (PSD-FL-231/AC53-206244)

Dear Mr. Killeen:

This will confirm your conversation last week with John Reynolds concerning the appropriate strategy for setting final BACT emission limits for the Ridge Generating Station. You discussed whether or not an annual stack test in the worst case mode (60% wood/40% tires) might be preferable to 30-day rolling averages in view of the variability in emissions and fuel ratios. Though this would represent a departure from the Subpart Db compliance approach for SO₂, NO_x and CO, it might be justifiable on the basis of the emission swings not normally seen for Subpart Db units.

Another possibility is that of basing the limits on the CEMS data recorded only during operation at 90-100% of capacity while in the worst case mode (60/40). The data submitted on July 31 show that the currently proposed limit for CO of 114 lb/hr (30 DRA) can be met using that approach. Please indicate which approach is preferred by Wheelabrator.

If there are any questions, please call me or John Reynolds at 904-488-1344.

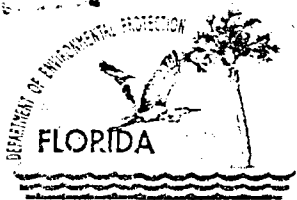
Sincerely,

A. A. Linero, P.E.
Administrator
New Source Review Section

AAL/JR

c: B. Thomas, SWD
R. Harwood, Polk County
J. Harper, EPA
J. Bunyak, NPS

JR's Copy



Department of Environmental Protection

Lawton Chiles
Governor

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Virginia B. Wetherell
Secretary

June 5, 1996

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Rodney Williams
Plant Manager
Wheelabrator Ridge Energy, Inc.
3131 K-Ville Avenue
Auburndale, Florida 33823

Dear Mr. Williams:

RE: Revised BACT Limits - Ridge Generating Station (PSD-FL-183)

On May 20 the Bureau of Air Regulation received your comments dated May 14 regarding the proposed final BACT limits. Apparently your submittal was mailed to the Southwest District and then forwarded here.

There are several statements in your submittal that we differ on. Page two contains the statement that the Department focused on the period March 1 through April 30, 1995 (the only period for 60% wood/40% tires) because we assumed it would represent the worst case for all of the pollutants. To the contrary, that period was selected because it represented the worst case for the pollutants in total. As indicated below, test program results showed average total emissions for the three major air pollutants (SO₂, NO_x and CO) at 45-50 MW to be 1,028 tons/yr for the 40% tire mix compared to 905 tons/yr for 0% tires. These two sets of conditions represent both ends of the emissions spectrum:

	<u>100% Wood (2/27/95-2/28/95)</u>		<u>60% Wood - 40% Tires</u>	
	<u>Avg. lb/hr</u>	<u>Avg. tons/yr</u>	<u>Avg. lb/hr</u>	<u>Avg. tons/yr</u>
SO ₂	48.2	211.1	75.0	328.5
NO _x	88.0	385.4	83.2	364.4
CO	70.4	<u>308.5</u>	76.4	<u>334.6</u>
	Total	905.0	Total	1,027.5

We recognize that the 100% wood averages are based on a smaller number of hourly averages available while operating at 45-50 MW. However, the data sufficiently show that the 60% wood/40% tire case generates the highest total emissions (about 14% more for the three major pollutants). The CEMS results indicate that CO emissions while burning 40% tires at 45-50 MW may actually be as high or possibly higher than those for 100% wood, which runs counter to the conclusion reached in your submittal. The manual testing results suggest to us that the higher CO emissions experienced there for 100% wood may have to do with excess air as well as moisture in the

Mr. Rodney Williams
June 5, 1996
Page Two

wood since the stack %O₂ was lower during the 100% wood tests.

The Department's standard practice in setting emission limits is to base them on operation at 90-100% of capacity using the most common feed or the feed generating the highest emissions. This means that emissions from the RGS facility while operating at 45-50 MW using 60% Wood/40% tires are of primary concern and must be the basis for final limits as well as compliance/enforcement. This means that your argument for retaining the initial PM/PM₁₀ limit of 12.6 lb/hr on the ground that there were a few higher runs while burning 80% wood/20% tires is moot because you would only have to do a VE or Method 5 test in the 60%/40% mode. The same reasoning applies to your CO argument and makes it moot as well, since the Department will revise its proposal by clarifying that the 30 DRA's will be calculated using readouts from >20% tire firing only. (As you pointed out in the May 14 submittal, the "40%" mode actually turned out to be a range from about 20% to 30+%).

The Department believes that the proposed 65 lb SO₂/hr limit can be achieved by improving the response time of the SO₂ control system. This problem was discussed in the Draft Revised BACT and was depicted by plotting the values of SO₂ and MW for the longest sustained operating period at 45-50 MW in the 60%/40% mode. Had the SO₂ not moved in the opposite direction and tracked the MW more closely, about 200-250 lb. of SO₂ would not have been emitted over that 16-hour period, resulting in an average reduction of $225/16 = 14$ lb SO₂/hr. Such a reduction more than compensates for the difference between the 72 lb/hr RGS has requested and the proposed 65 lb/hr.

The RGS facility has changed its targeted fuel mix on several occasions, seeking at one point to burn recycled plastic material from automobile salvaging operations, then switching to increased tire firing when wood supplies appeared to be diminishing. The Department acknowledges the need for flexibility in fuels due to the nature of this facility. Yet the emission limits must be based on the "worst case" fuel mix, that is, the one expected to generate the highest emissions in total. It would not be practicable to have separate limits for each mode of operation. Consequently, the Department plans to issue the Final Revised BACT as proposed except with the following revision:

"A new 30-day rolling average emission rate is calculated each steam generating unit operating day as the average of all of the hourly emission data for the preceding 30 steam generating unit operating days during which greater than twenty percent of the fuel mix, on a heat input basis, is composed of tires."

and the plant is operating between 45-50 MW."

Mr. Rodney Williams
June 5, 1996
Page Three

If you have questions or want to request a meeting regarding this, please contact me or John Reynolds at 904-488-1344 before the end of this month.

Sincerely,

A handwritten signature in cursive script, appearing to read "A. A. Linero", followed by a date "6/5".

A. A. Linero, P.E.
Administrator
New Source Review Section

AAL/JR

c: B. Thomas, SWD
R. Harwood, Polk County
J. Harper, EPA
J. Bunyak, NPS

JR



Department of Environmental Protection

Lawton Chiles
Governor

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Virginia B. Wetherell
Secretary

January 29, 1996

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Rodney Williams
Plant Manager
Wheelabrator Ridge Energy, Inc.
3131 K-Ville Avenue
Auburndale, Florida 33823

RE: Amendment of Permit AC 53-206244 (PSD-FL-183)

Dear Mr. Williams:

This is in response to your letter received on January 3 requesting several minor changes to the referenced permit. Since the 30-day deadline for our response is approaching, we wanted to confirm, in writing, our previous discussion to the effect that we will address the minor changes requested at the same time that we issue the final proposed BACT limits. Therefore, we await your comments on the initial draft of the proposed BACT limits.

If there are any questions regarding the above, please call me or John Reynolds at 904-488-1344.

Sincerely,

A. A. Linero, P.E.
Administrator
New Source Review Section

AAL/JR

c: B. Thomas, SWD
R. Harwood, Polk County
J. Harper, EPA
J. Bunyak, NPS
M. Killeen, WREI



December 26, 1995

RECEIVED

JAN 03 1996

BUREAU OF
AIR REGULATION

Mr. A. A. Linero
Bureau of Air Regulation
Florida Department of Environmental Protection
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Subject: Ridge Generating Station
Permit #AC53-206244 PSD-FL-183

Dear Mr. Linero:

As we have discussed with Mr. J. Reynolds and yourself, there are a number of minor changes that we would like to make to the subject permit. The changes are primarily clarifications that will facilitate the Title V permitting process. Based on our discussions, it appears prudent to address these changes concurrently with the establishment of the final revised BACT limits.

The following revisions are requested:

1. Specific Condition #2 should be revised to clarify the method for demonstrating compliance with the maximum capacity limit. This can be accomplished as follows:

"The RGS facility shall be allowed to operate at a maximum capacity of 50 megawatts (based on a 24-hour block average basis) for 8,760 hours per year." (50 megawatts is equivalent to approximately 630 MM BTU/hr.)

By moving the reference to MM BTU's, it is clear that compliance with the maximum capacity limit is based on the recorded megawatt values and not on the heat input. In addition, an averaging period is necessary because of the variability in the BTU content of the various fuels fed to the furnace. A 24-hour block average is proposed as a reasonable averaging period.

2. Specific Condition #3 should be revised as follows to clarify the basis for demonstrating compliance with the fuel-firing rates:

"Fuel for firing the RGS boiler shall consist only of wood, landfill gas, and tires. The tire firing rate shall be limited to 16,900 pounds of tires per hour, based on a 24-hour block average. Propane may be used as a startup, shutdown, and combustion stabilization fuel. Propane

firing shall not exceed an annual capacity factor of 10 percent as determined by 40 CFR 60.44^b(6)(d)."

The proposed revisions will clarify the basis for demonstrating compliance with the tire firing rate by specifying that compliance will be demonstrated by measuring the pounds per hour of tire feed with an appropriate averaging feed. An averaging period is necessary because the load cell is located on a belt that intermittently delivers tires to feed hoppers rather than directly to the boiler.

The annual capacity factor for propane is necessary to clarify the facility requirements related to 40 CFR 60, Subpart Db.

3. Specific Condition #4 should be modified as follows:

"No municipal type solid waste, as defined in 40 CFR 60, Subpart Ea (except tires, yard waste, and waste wood), or hazardous waste as defined in 40 CFR 261 and F.A.C. Rule 62-730.020, or medical waste as defined in 40 CFR 60.51a, or biomedical waste as defined in F.A.C. Rule 62-712.200, shall be burned at any time at the RGS facility without prior written approval by the Department. Municipal solid waste (as defined in 40 CFR 60, Subpart Ea) shall be limited to 30 percent or less (by weight) of the fuel feed stream, as measured on a calendar quarterly basis."

These revisions will clarify the methods for demonstrating compliance with the specific condition. The applicability and definitions sections of Subpart Ea have been modified to make them consistent with new Subpart Eb regulations. Since yard waste is included in the definition of MSW contained in Subparts Ea and Eb, it should be added to the list of MSW type wastes that can be accepted at the facility. The regulatory citations for medical and biomedical wastes have been updated because the existing citations are no longer correct. Adding the phrase "without prior written approval by the Department" may provide additional flexibility if other suitable fuels are identified in the future. The requested 30 percent limitation on MSW feed is necessary to clarify the regulatory requirements related to 40 CFR 60, Subpart Ea, and the quarterly basis for demonstrating compliance is consistent with the newly promulgated revisions to Subparts Ea and Eb.

4. Specific Condition #6 should be revised to delete the requirements associated with the ammonia ambient air monitoring equipment. Documentation supporting this request has been previously submitted to the Department.

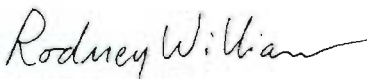
5. Specific Condition #7 should be revised to add the fuel transfer building vent filter. As we informed you on October 29, 1993, a vent filter was added to the fuel transfer building to reduce potential fugitive emissions associated with fuel handling activities.
6. The regulatory citation in Specific Condition #12 should be changed from "F.A.C. Rule 17-2.610(3)" to "F.A.C. Rule 62-296.310(3)" to reflect the current regulations. Specific Condition #12 also specifies that all fugitive dust control measures specified in the application shall be used to prevent fugitive emissions. We have determined that since construction has been completed and the facility roads have been paved, a water truck is no longer necessary to control fugitive emissions at the facility. Therefore, we are requesting your concurrence that a water truck is not required by Specific Conditions #1 or #12.
7. Specific Condition #15 should be revised to update the regulatory citation. "F.A.C. Rule 17-2.620(2)" should be deleted and replaced with "F.A.C. Rule 62-296.320(2)".

Two additional point sources were inadvertently omitted from the initial application. These include the propane vaporizer and the diesel fuel storage tank vent. Each of these sources have a potential to emit less than 1 ton per year of any regulated pollutant and, as such, we currently intend to list them as potentially exempt sources in the Facility's Title V Application.

If you need any additional information related to these sources, or if you have any questions related to the requested permit revisions, please call Matt Killeen at 1-800-682-0026 or Chuck Davis at (941) 665-2255.

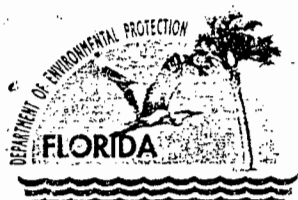
We will be providing comments on the draft revised BACT limits in a subsequent letter.

Sincerely,



Rodney Williams
Plant Manager

cc: W. Ferguson
J. Reynolds
C. Davis
G. Lynch



Department of Environmental Protection

John Reynolds

Lawton Chiles
Governor

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Virginia B. Wetherell
Secretary

July 3, 1995

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Rodney Williams
Plant Manager
Wheelabrator Ridge Energy Inc.
3131 K-Ville Avenue
Auburndale, FL 33823

RE: Ridge Generating Station Permit Number AC53-206244, PSD-FL-183
Request for Permit Amendment to Increase Tire Burning

Dear Mr. Williams:

The Department reviewed your request dated April 27, 1995 to increase the fraction of tires burned at your facility from 20 to 40 percent (%) and may not be able to approve it as an amendment under the conditions resulting from the recent testing. The reasons are that the sulfur dioxide (SO₂) emission rate of 72.8 lb/hr under the 40% scenario exceeds the Best Available Control Technology (BACT) level of 63 lb/hr proposed by the Department in the original permit as well as the emission rate of 47.6 lb/hr measured under the 20% mode.

Wheelabrator apparently presumed that the allowable (and actual) emissions are 109.4 lb/hr based on the BACT level of 479.2 tons per year (TPY) originally proposed by the company and which has served as the interim emission limit until completion of the ongoing test program. The Department may indeed presume that actual emissions are the same as allowable emissions particularly in cases where a facility has not yet operated or operated for a very short period of time.

The Department, however, recommends that Wheelabrator commit to the interim limit of 63 lb/hr (275.9 TPY) as proposed by Department in its BACT determination. The final value can be set as previously agreed after Wheelabrator submits the rest of the data from the ongoing test program.

Based on your favorable reply, we will be able to issue an amendment of the original permit based on the enclosed draft. However our Notice will still need to be published.

We welcome your thoughts. If you have any questions on this matter, please call me or A. A. Linero at (904)488-1344.

Sincerely,

A. A. Linero, P.E. for

C. H. Fancy, P.E.

Chief

Bureau of Air Regulation

CHF/aal/l

cc: Steve Smallwood, P.E.
Bill Thomas, SWD
John Reynolds, BAR

"Protect, Conserve and Manage Florida's Environment and Natural Resources"

Printed on recycled paper.



Department of Environmental Protection

Lawton Chiles
Governor

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Virginia B. Wetherell
Secretary

July 6, 1995

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Rodney Williams
Plant Manager
Wheelabrator Ridge Energy, Inc.
3131 K-Ville Avenue
Auburndale, Florida 33823

DRAFT

Dear Mr. Williams:

RE: Amendment to Construction Permit No. AC 53-206244, PSD-FL-183

The Department has reviewed your May 5, 1995 request to amend the tire firing capacity permit requirements and the interim emissions limits of the subject permit. The Department's determination on this amendment request is as follows:

A. Firing Capacity:

Specific Condition No. 3 is amended as follows:

From:

3. Fuel for firing the RGS boiler shall consist only of wood, landfill gas, and up to 9.0 percent tires (percent by weight equivalent to 20 percent tires based on heat content). The 9.0 percent tire weight limitation is equivalent to a tire firing rate of 9,000 pounds of tires per hour. Propane may be used as a startup, shutdown, and combustion stabilization fuel.

To:

3. Fuel for firing the RGS boiler shall consist only of wood, landfill gas, and up to 18.0 percent tires (percent by weight equivalent to 40 percent tires based on heat content). The 18.0 percent tire weight limitation is equivalent to a tire firing rate of 18,000 pounds of tires per hour. Propane may be used as a startup, shutdown, and combustion stabilization fuel.

DRAFT

B. Emissions Limits:

Specific Condition No. 5 is amended as follows:

From:

5. Initially, the RGS boiler exhaust gases shall not exceed the limits shown below. Following completion of the emission testing program required in Specific Condition No. 8, these limits may be revised.

<u>Pollutant</u>	<u>lbs/hr*</u>	<u>tons/yr</u>
PM/PM ₁₀	12.6	55.2
SO ₂	109.4	479.2
NO _x	94.5	413.9
CO	315.0	1379.7
VOC	22.1	96.8
HCl	5.0	22.1
Hg	0.022	0.097
Pb	0.25	1.1
Be	0.0063	0.03

*Based on 24 hour average. The feasibility of establishing startup/shutdown limits, hourly limits, or rolling average limits in addition to or in lieu of the above limits will be determined after analysis of the emission testing program.

To:

5. Initially, the RGS boiler exhaust gases shall not exceed the limits shown below. Following completion of the emission testing program required in Specific Condition No. 8, these limits may be revised.

<u>Pollutant</u>	<u>lbs/hr*</u>	<u>tons/yr</u>
PM/PM ₁₀	12.6	55.2
SO ₂	63.0	275.9
NO _x	94.5	413.9
CO	315.0	1379.7
VOC	22.1	96.8
HCl	5.0	22.1
Hg	0.022	0.097
Pb	0.25	1.1
Be	0.0063	0.03

*Based on 24 hour average. The feasibility of establishing startup/shutdown limits, hourly limits, or rolling average limits in addition to or in lieu of the above limits will be determined after analysis of the emission testing program.

DRAFT

C. Attachments to be Incorporated:

- Wheelabrator letter dated May 5, 1995
- DEP letter dated July 3, 1995

A person whose substantial interests are affected by the Department's proposed permitting decision may petition for an administrative proceeding (hearing) in accordance with Section 120.57, Florida Statutes (F.S.). The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 2600 Blair Stone Road, Tallahassee, Florida 32399-2400. Petitions filed by the applicant of the amendment request/application and the parties listed below must be filed within 14 days of receipt of this amendment. Petitions filed by other persons must be filed within 14 days of the amendment issuance or within 14 days of their receipt of this amendment, whichever occurs first. Petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. Failure to file a petition within this time period shall constitute a waiver of any right such person may have to request an administrative determination (hearing) under Section 120.57, F.S.

The Petition shall contain the following information:

- (a) The name, address and telephone number of each petitioner, the applicant's name and address, the Department Permit File Number and the county in which the project is proposed;
- (b) A statement of how and when each petitioner received notice of the Department's action or proposed action;
- (c) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action;
- (d) A statement of the material facts disputed by Petitioner, if any;
- (e) A statement of facts which petitioner contends warrant reversal or modification of the Department's action or proposed action;
- (f) A statement of which rules or statutes petitioner contends require reversal or modification of the Department's action or proposed action; and,
- (g) A statement of the relief sought by petitioner, stating precisely the action the petitioner wants the Department to take with respect to the Department's action or proposed action.

If a petition is filed, the administrative hearing process is designed to formulate agency action. Accordingly, the Department's final action may be different from the position taken by it in this amendment. Persons whose substantial interests will be affected by any decision of the Department with regard to the request/application have the right to petition to become a party to the proceeding. The petition must conform to the requirements specified above and be filed (received) within 14 days of receipt of this

Mr. Rodney Williams
Wheelabrator Ridge, Inc.
July 6, 1995
Page 4 of 4

DRAFT

amendment in the Office of General Counsel at the above address of the Department. Failure to petition within the allowed time frame constitutes a waiver of any right such person has to request a hearing under Section 120.57, F.S., and to participate as a party to this proceeding. Any subsequent intervention will only be at the approval of the presiding officer upon motion filed pursuant to Rule 28-5.207, F.A.C.

This letter amendment must be attached to the construction permit, No. AC 53 - 206244, PSD-FL-183 and shall become part of the permit.

Sincerely,

Howard L. Rhodes
Director
Division of Air Resources
Management

HLR/AAL/kw

Attachment

cc: B. Thomas, SWD
J. Reynolds, BAR
S. Smallwood, P. E.
J. Harper, EPA
J. Bunyak, NPS

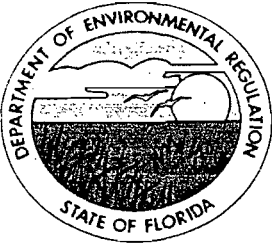
CERTIFICATE OF SERVICE

The undersigned duly designated deputy clerk hereby certifies that this AMENDMENT and all copies were mailed by certified mail before the close of business on _____ to the listed persons.

FILING AND ACKNOWLEDGMENT FILED,
on this date, pursuant to §120.52(11),
Florida Statutes, with the designated
Department Clerk, receipt of which is
hereby acknowledged.

Clerk

Date



Florida Department of Environmental Regulation

Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400

Lawton Chiles, Governor

Carol M. Browner, Secretary

July 24, 1992

CERTIFIED MAIL-RETURN RECEIPT REQUESTED

Mr. Macauley Whiting, Jr., President
Decker Energy - Ridge, Inc.
P.O. Box 2397
Winter Park, Florida 32790

Dear Mr. Whiting:

Attached is one copy of the Revised Technical Evaluation and Preliminary Determination and proposed permit for Ridge Generating Station to construct a wood/tire burning power generation facility near Auburndale, Polk County, Florida.

Please submit any written comments you wish to have considered concerning the Department's proposed action to Mr. Preston Lewis of the Bureau of Air Regulation.

Sincerely,

C. H. Fancy, P.E.
Chief
Bureau of Air Regulation

CHF/JR/plm

Attachments

c: W. Thomas, SWD
R. Anders, Polk County
J. Harper, EPA
C. Shaver, NPS
T. Fitzpatrick, P.E.
M. Killeen, WESI
J. Little, D&M
R. Stone, RGS

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

CERTIFIED MAIL

In the Matter of an
Application for Permit by:

DER File No. AC 53-206244
PSD-FL-183
Polk County

Decker Energy - Ridge, Inc.
P.O. Box 2397
Winter Park, Florida 32790

INTENT TO ISSUE

The Department of Environmental Regulation gives notice of its intent to issue a permit (copy attached) for the proposed project as detailed in the application specified above, for the reasons stated in the attached Technical Evaluation and Preliminary Determination.

The applicant, Ridge Generating Station, L.P., applied on April 6, 1992, to the Department of Environmental Regulation for a permit to construct a wood/tire burning power generation facility near Auburndale in Polk County, Florida.

The Department has permitting jurisdiction under the provisions of Chapter 403, Florida Statutes and Florida Administrative Code (F.A.C.) Chapters 17-2 and 17-4. The project is not exempt from permitting procedures. The Department has determined that a construction permit is required for the proposed work.

Pursuant to Section 403.815, Florida Statutes and Rule 17-103.150, F.A.C., you (the applicant) are required to publish at your own expense the enclosed Notice of Intent to Issue Permit. The notice shall be published one time only within 30 days in the legal ad section of a newspaper of general circulation in the area affected. For the purpose of this rule, "publication in a newspaper of general circulation in the area affected" means publication in a newspaper meeting the requirements of Sections 50.011 and 50.031, F.S., in the county where the activity is to take place. The applicant shall provide proof of publication to the Department's Bureau of Air Regulation, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400, within seven days of publication. Failure to publish the notice and provide proof of publication within the allotted time may result in the denial of the permit.

The Department will issue the permit with the attached conditions unless a petition for an administrative proceeding (hearing) is filed pursuant to the provisions of Section 120.57, F.S.

A person whose substantial interests are affected by the Department's proposed permitting decision may petition for an administrative proceeding (hearing) in accordance with Section 120.57, Florida Statutes. The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 2600 Blair Stone Road, Tallahassee, Florida 32399-2400. Petitions filed by the permit applicant and the parties listed below must be filed within 14 days of receipt of this intent. Petitions filed by other persons must be filed within 14 days of publication of the public notice or within 14 days of their receipt of this intent, whichever first occurs. Petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. Failure to file a petition within this time period shall constitute a waiver of any right such person may have to request an administrative determination (hearing) under Section 120.57, Florida Statutes.

The Petition shall contain the following information;

- (a) The name, address, and telephone number of each petitioner, the applicant's name and address, the Department Permit File Number and the county in which the project is proposed;
- (b) A statement of how and when each petitioner received notice of the Department's action or proposed action;
- (c) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action;
- (d) A statement of the material facts disputed by Petitioner, if any;
- (e) A statement of facts which petitioner contends warrant reversal or modification of the Department's action or proposed action;
- (f) A statement of which rules or statutes petitioner contends require reversal or modification of the Department's action or proposed action; and
- (g) A statement of the relief sought by petitioner, stating precisely the action petitioner wants the Department to take with respect to the Department's action or proposed action.

If a petition is filed, the administrative hearing process is designed to formulate agency action. Accordingly, the Department's final action may be different from the position taken by it in this intent. Persons whose substantial interests will be affected by any decision of the Department with regard to the application have the right to petition to become a party to the proceeding. The petition must conform to the requirements specified above and be filed (received) within 14 days of receipt of this intent in the Office of General Counsel at the above address of the Department. Failure to petition within the allowed time frame constitutes a waiver of any right such person has to request a hearing under Section 120.57, F.S., and to participate as a party to this

proceeding. Any subsequent intervention will only be at the approval of the presiding officer upon motion filed pursuant to Rule 28-5.207, F.A.C.

Executed in Tallahassee, Florida.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION



C. H. Fancy, P.E., Chief
Bureau of Air Regulation
2600 Blair Stone Road
Tallahassee, Florida 32399
904-488-1344

CERTIFICATE OF SERVICE

The undersigned duly designated deputy clerk hereby certifies that this INTENT TO ISSUE and all copies were mailed by certified mail before the close of business on 7-27-92 to the listed persons.

Clerk Stamp

FILING AND ACKNOWLEDGMENT

FILED, on this date, pursuant to §120.52(11), Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.



Clerk

7-27-92

Date

Copies furnished to:

W. Thomas, SWD
R. Anders, Polk County
J. Harper, EPA
C. Shaver, NPS
T. Fitzpatrick, P.E.
M. Killeen, WESI
J. Little, D&M
R. Stone, RGS

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
NOTICE OF INTENT TO ISSUE PERMIT

The Department of Environmental Regulation gives notice of its intent to issue a permit to Ridge Generating Station, P.O. Box 2397, Winter Park, Florida 32790, to construct a wood/tire burning power generation facility at State Road 542 and Taylor Road near Auburndale, Polk County, Florida. A determination of Best Available Control Technology (BACT) was required. The proposed project is subject to Prevention of Significant Deterioration (PSD) regulations. Modeling results show that increases in ground-level concentrations are less than PSD significant impact levels for the applicable pollutants. The Department is issuing this Intent to Issue for the reasons stated in the Technical Evaluation and Preliminary Determination.

A person whose substantial interests are affected by the Department's proposed permitting decision may petition for an administrative proceeding (hearing) in accordance with Section 120.57, Florida Statutes. The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 2600 Blair Stone Road, Tallahassee, Florida 32399-2400, within 14 days of publication of this notice. Petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. Failure to file a petition within this time period shall constitute a waiver of any right such person may have to request an administrative determination (hearing) under Section 120.57, Florida Statutes.

The Petition shall contain the following information; (a) The name, address, and telephone number of each petitioner, the applicant's name and address, the Department Permit File Number and the county in which the project is proposed; (b) A statement of how and when each petitioner received notice of the Department's action or proposed action; (c) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action; (d) A statement of the material facts disputed by Petitioner, if any; (e) A statement of facts which petitioner contends warrant reversal or modification of the Department's action or proposed action; (f) A statement of which rules or statutes petitioner contends require reversal or modification of the Department's action or proposed action; and (g) A statement of the relief sought by petitioner, stating precisely the action petitioner wants the Department to take with respect to the Department's action or proposed action.

If a petition is filed, the administrative hearing process is designed to formulate agency action. Accordingly, the Department's final action may be different from the position taken by it in this Notice. Persons whose substantial interests will be affected by

any decision of the Department with regard to the application have the right to petition to become a party to the proceeding. The petition must conform to the requirements specified above and be filed (received) within 14 days of publication of this notice in the Office of General Counsel at the above address of the Department. Failure to petition within the allowed time frame constitutes a waiver of any right such person has to request a hearing under Section 120.57, F.S., and to participate as a party to this proceeding. Any subsequent intervention will only be at the approval of the presiding officer upon motion filed pursuant to Rule 28-5.207, F.A.C.

The application is available for public inspection during normal business hours, 8:00 a.m. to 5:00 p.m., Monday through Friday, except legal holidays, at:

Department of Environmental Regulation
Bureau of Air Regulation
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Department of Environmental Regulation
Southwest District
4520 Oak Fair Blvd.
Tampa, Florida 33610-7347

Any person may send written comments on the proposed action to Mr. Preston Lewis at the Department's Tallahassee address. All comments received within 30 days of the publication of this notice will be considered in the Department's final determination. Further, a public hearing can be requested by any person. Such requests must be submitted within 30 days of this notice.

Revised
Technical Evaluation
and
Preliminary Determination

Ridge Generating Station
Polk County, Florida

PSD-FL-183
AC 53-206244

Department of Environmental Regulation
Division of Air Resources Management
Bureau of Air Regulation

July 24, 1992

I. Application Information

A. Applicant

Ridge Generating Station, L.P.
P.O. Box 2397
Winter Park, FL 32790

B. Request

The Department received a complete application on April 6, 1992, for a permit to construct a 50 megawatt (MW) independent power generation facility known as the Ridge Generating Station (RGS) near Auburndale, Polk County, Florida. On June 22, 1992, the Department notified the applicant of the proposed permit conditions. On July 1, 1992, the applicant met with Department staff to request reconsideration of the applicant's proposed emission limits. The Department agreed to consider the permit limits originally proposed for SO₂, NO_x and CO as target limits for the initial startup and operation pending the outcome of an emissions testing program. It was also agreed that the applicant's emission calculation for mercury will not be rounded off to make the RGS facility initially subject to PSD requirements for that pollutant. Other revisions include clarification of the municipal waste exclusion, correction of the maximum tire firing rate (9,000 lbs/hr), and modification of compliance test method requirements.

C. Classification/Location

The subject facility (SIC Code 4911) will be located at State Road 542 and Taylor Road near Auburndale, Florida. The UTM coordinates of the site are 416.7 km E and 3100.4 km N.

II. Project Description/Emissions

The applicant proposes to construct a 50 MW power generation facility consisting of a solid-fuel boiler, steam turbine, generator, and associated equipment. The RGS boiler will fire a mixture of waste wood, scrap tires, and landfill gas. Propane will be used for boiler startup and combustion stabilization. Fuel mix possibilities include wood, wood and tires, or a combination of wood, tires, and landfill gas from the adjacent Polk County North Central Landfill. No other fuels will be used. The RGS facility will not be permitted to burn any hazardous waste or municipal type solid waste as defined in applicable federal and state regulations, except tires and waste wood.

State-of-the-art emission control equipment will include a spray dryer-absorber/fabric filter for control of particulates and acid gases as well as most toxics and metals. The spray dryer-absorber employs an atomized lime-water solution to react with sulfur dioxide in the boiler flue gases. The dried compounds of calcium thus formed will be removed by the fabric filter. Nitrogen oxides will be controlled by selective noncatalytic

reduction (SNCR) which reduces NO_x to elemental nitrogen by injecting ammonia into the boiler furnace.

Since the hours of operation under each of the three scenarios are unknown, and since other fuel mix percentages will also occur, projections of maximum proposed annual emissions would have to be based on the maximums for these anticipated fuel mix cases. The applicant's estimated actual emissions for three anticipated fuel mix scenarios (based on heat input percentages using the applicant's proposed emission limits) are tabulated below.

	100% Wood		80% Wood 20% Tires		75% Wood/15% Tires 10% Landfill Gas		PSD
	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	Level
PM/PM ₁₀	12.6	55.2	12.6	55.2	12.6	55.2	25/10
SO ₂	69.4	304.0	109.4	479.2	92.5	405.2	40
NO _x	94.5	413.9	94.5	413.9	94.5	413.9	40
CO	315.0	1,379.7	315.0	1,379.7	315.0	1,379.7	100
VOC	22.1	96.8	22.1	96.8	22.1	96.8	40
NH ₃	17.8	78.0	17.8	78.0	17.8	78.0	-
C ₆ H ₆	5.0	21.9	5.0	21.9	5.0	21.9	-
HCHO	1.7	7.5	1.7	7.5	1.7	7.5	-
HCL	5.0	22.1	5.0	22.1	5.0	22.1	-
Pb	0.25	1.1	0.25	1.1	0.25	1.1	0.6
Zn	0.63	2.8	0.63	2.8	0.63	2.8	-
Hg	0.02	0.097	0.02	0.097	0.02	0.097	0.1
Be	.0063	0.03	.0063	0.03	.0063	0.03	.0004

III. Rule Applicability

The construction permit application is subject to review under Chapter 403, Florida Statutes, and Florida Administrative Code (F.A.C.) Chapters 17-2 and 17-4. The proposed facility is subject to the provisions of F.A.C. Rule 17-2.500, Prevention of Significant Deterioration (PSD). The facility is located in an area classified as attainment for all regulated air pollutants. Proposed emissions of PM/PM₁₀, SO₂, NO_x, CO, VOC, Pb, and Be equal or exceed the significant levels set forth in Table 500-2 of F.A.C. Rule 17-2.500. Preconstruction review must include a determination of Best Available Control Technology (BACT), good-engineering practice stack height, ambient impact analysis, impact on soils, vegetation and visibility. Applicable emission limit rules are F.A.C. Rules 17-2.660, Table 660-1, Section 60.40b, Subpart Db, 60.43b (c)(1), (f) and (g), 60.44b (d), Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units. For the ash handling system and lime silo, applicable rules are F.A.C. Rules 17-2.610(2) and (3). The above rules would dictate limits except that BACT limits are more stringent and therefore apply.

IV. Air Quality Analysis

a. Introduction

The operation of the proposed facility will result in emissions increases which are projected to be greater than the PSD significant emission rates for the following pollutants: NO_x, SO₂, PM, PM₁₀, Be, CO, VOC, and Pb. Therefore, the project is subject to the PSD NSR requirements contained in F.A.C. Rule 17-2.500(5) for these pollutants. Part of these requirements is an air quality impact analysis for these pollutants, which includes:

- An analysis of existing air quality;
- A PSD increment analysis (for SO₂, PM, PM₁₀, and NO_x);
- An ambient Air Quality Standards analysis (AAQS);
- An analysis of impacts on soils, vegetation, visibility and growth-related air quality impacts; and,
- A Good Engineering Practice (GEP) stack height determination.

The analysis of existing air quality generally relies on preconstruction monitoring data collected in accordance with EPA-approved methods. The PSD increment and AAQS analyses are based on air quality dispersion modeling completed in accordance with EPA guidelines.

Based on these required analyses, the Department has reasonable assurance that the proposed project, as described in this report and subject to the conditions of approval proposed herein, will not cause or contribute to a violation of any PSD increment or ambient air quality standard. A brief description of the modeling methods used and results of the required analyses follow. A more complete description is contained in the permit application on file.

b. Analysis of the Existing Air Quality

Preconstruction ambient air quality monitoring may be required for pollutants subject to PSD review. However, an exemption to the monitoring requirement can be obtained if the maximum air quality impact resulting from the projected emissions increase, as determined through air quality modeling, is less than a pollutant-specific de minimus concentration. The predicted maximum concentration increase for each pollutant subject to PSD (NSR) is given below:

	TSP					
	SO ₂	& PM ₁₀	NO _x	CO	Be	Pb
PSD de minimus Concentra. (ug/m ³)	13	10	14	575	0.001	0.1
Averaging Time	24-hr	24-hr	Annual	8-hr	24-hr	3 mo.
Maximum Predicted Impact (ug/m ³)	4.4	0.5	0.4	35	.0003	<.01

There are no monitoring de minimus concentrations for VOC emissions. As shown above, the predicted impacts are all less than the corresponding de minimus concentrations; therefore, no preconstruction monitoring is required for these pollutants.

c. Modeling Method

The EPA-approved Industrial Source Complex Short-Term (ISCST) dispersion model was used by the applicant to predict the impact of the proposed project on the surrounding ambient air. All recommended EPA default options were used. No downwash effects were considered because the stack will be equal to the good engineering practice (GEP) stack height. Five years of sequential hourly surface and mixing depth data from the Tampa Florida National Weather Service (NWS) station collected during 1982 through 1986 were used in the model. Since five years of data were used, the highest-second-high (HSH) short-term predicted concentrations are compared with the appropriate ambient air quality standards or PSD increments. For the annual averages, the highest predicted yearly average was compared with the standards.

d. Modeling Results

The applicant first evaluated the potential increase in ambient ground-level concentrations associated with the project to determine if these predicted ambient concentration increases would be greater than specified PSD significant impact levels for criteria pollutants SO₂, CO, NO₂, PM and PM₁₀. This evaluation was based on the proposed boiler operating at load conditions of 100, 75, and 50 percent. The modeling was performed using the highest emissions coupled with the lowest exit gas flow rates to maximize predicted impacts. Maximum modeled emissions were based on the use of the wood/tire combination for fuel. The maximum predicted concentrations occur for either the 100% or the 75% operating load. Dispersion modeling was performed with receptors placed along the 36 standard radial directions (10 degrees apart) surrounding the proposed unit beginning at 250m and going out at intervals of 250m to a distance of 3000m from the proposed boiler. The results of this modeling presented below show that the increases in ambient ground-level concentrations for all averaging times are less than the PSD significant impact levels for SO₂, CO, NO₂, PM and PM₁₀.

Avg. Time PSD Signifi. Level (ug/m ³)	SO ₂			NO ₂		CO		PM and PM ₁₀	
	Annual	3-hr	24-hr	Annual		1-hr	8-hr	Ann.	24-hr
	1.0	25.0	5.0	1.0		2000	500	1.0	5.0
Ambient Concen. Increase (ug/m ³)	0.4	18.7	4.4	0.4		126	35	0.05	0.5

Therefore, further dispersion modeling for comparison with AAQS and PSD Class II increment consumption were not required for

these pollutants. There is currently no acceptable method to model VOC for ozone formation. Pb has no significant impact level; however, maximum predicted Pb concentrations were less than the 1.5 ug/m³ quarterly ambient air quality standard.

Be and Hg are noncriteria pollutants, which means that neither national AAQS nor PSD Significant Impacts have been defined for these pollutants. However, the Department does have a draft Air Toxics Permitting Strategy, which defines no threat levels for these pollutants. The Department and the applicant have used the same modeling procedure described above to evaluate the maximum increase in ground level concentration of these pollutants for comparison with the no-threat levels. The results of this analysis are shown below:

<u>Avg. Time</u>	<u>Be Annual</u>	<u>Hg Annual</u>
No Threat-Level (ug/m ³)	0.00042	0.3
Max. Concen. <u>Increase</u>	<u>0.00002</u>	<u>0.00008</u>

All of these values are less than their respective no-threat levels.

The nearest PSD Class I area is the Chassahowitzka National Wilderness Area located 100 km northwest of the facility. The predicted impact of the proposed project on this area was evaluated by first using the ISCST model to predict maximum increment consumptions by the source alone and by comparing these predicted values to the appropriate recommended significance levels to determine whether further modeling was necessary. The significance levels used by the Department were the more stringent National Park Service (NPS) recommended levels. The predicted maximum PM/PM₁₀ and NO₂ increment consumptions for all applicable averaging times were less than these significance levels. Therefore, no further modeling for PM/PM₁₀ and NO₂ was required. In addition, the predicted maximum SO₂ annual average increment consumption by the source alone was also below the NPS significance level. However, the predicted maximum SO₂ 24-hour and 3-hour concentrations were predicted to be greater than the NPS levels. The Department and the NPS directed the applicant to further evaluate the SO₂ short term impacts on the Class I area by using the long range transport model, Mesopuff. This model is more applicable for distances greater than 100km. Mesopuff model results show that the maximum predicted SO₂ 3-hour average increment consumption for the project alone is predicted to be below the NPS significance level of 0.48 ug/m³. Therefore, no further modeling was necessary for the SO₂ 3-hour averaging time. For the SO₂ 24-hour averaging case, Mesopuff results show that when the project alone is predicted to

have impacts greater than the NPS significance level of 0.07 ug/m^3 (maximum predicted impact of 0.09 ug/m^3) cumulative impacts from all modeled sources in the area are less than the PSD Class I increment of 5.0 ug/m^3 .

e. Additional Impacts Analysis

A Level-1 screening analysis using the EPA model, VISCREEN was used to determine any potential adverse visibility impacts on the Class I Chassahowitzka National Wilderness Area located about 100km away. Based on this analysis, the maximum predicted visual impacts due to the proposed project are less than the screening criteria both inside and outside the Class I area. A comprehensive air quality related values (AQRV) analysis for this Class I area was performed by the applicant. No significant impacts on the Class I area are expected.

In addition, the maximum predicted concentrations from NO_x , CO, SO_2 , PM and PM_{10} are predicted to be less than the AAQS, including the national secondary standards designed to protect public welfare-related values. As such, no harmful effects on soil and vegetation are expected in the area of the project. Also, the proposed modification will not significantly change employment, population, housing or commercial/industrial development in the area to the extent that a significant air quality impact will result.

V. Air Toxics Evaluation

Based on extensive test data for other facilities that burn tires, only negligible quantities of toxic pollutants will escape the emission control equipment and therefore are of no environmental concern.

VI. Conclusion

Based on the information provided by Ridge Generating Station, the Department has reasonable assurance that the proposed installation, as described in this evaluation, and subject to the conditions proposed herein, will not cause or contribute to a violation of any air quality standard, PSD increment, or any other technical provision of Chapter 17-2 of the Florida Administrative Code.

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#41755

COPY



Wheelabrator Ridge Energy Inc.

A Wheelabrator Technologies Company
3131 K-Ville Avenue
Auburndale, FL 33823

Phone 941.665.2255
Fax 941.665.0400

May 14, 1996

Mr. Clair Fancy, P.E.
Chief, Bureau of Air Regulation
Florida Department of Environmental Protection
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Re: Ridge Generating Station
Permit Number AC 53-206244 PSD-FL-183
Comment on Proposed BACT Limits

Dear Mr. Fancy:

This letter provides our comments on the draft revised BACT limits for Ridge Generating Station (RGS) that were sent to us in your letter dated December 12, 1995. We agree with the proposed final BACT limits, test methods and averaging periods for Nitrogen Oxides (Nox), Volatile Organic Compounds (VOC), Hydrogen Chloride (HCL), Mercury (Hg), Lead (Pb), Beryllium (Be) and visual emissions. As discussed below however, we have comments on the proposed limits for Particulate Matter (PM), Carbon Monoxide (CO) and Sulfur Dioxide (SO₂) and we are requesting that these proposed limits be revised.

DISCUSSION

On September 29, 1992, the Florida Department of Environmental Protection (Department) issued a permit to construct RGS. Fuel for the facility consists of wood, tires and landfill gas. Various fuel mixes can be accommodated including wood alone, a mixture of wood and tires, and a mixture of wood, tires and landfill gas. To date, no landfill gas has been combusted, however, it is anticipated that the landfill gas supply will be available in approximately five months.

Specific Condition 5 of the permit specified initial emission limits for PM/PM₁₀, SO₂, Nox, CO, VOC, Hcl, Hg, Pb and Be. Specific Condition 5 also included provisions for revising the initial emission limits or modifying the averaging periods based on the results of the Comprehensive Emissions Test Program.

Specific Condition 8 included the requirements for the Comprehensive Emissions Testing Program. Pursuant to the permit condition, a protocol for the Comprehensive Emissions Testing Program was submitted to the Department on October 29, 1993 and it was approved by the Department on November 23, 1993. The test protocol discussed the specific stack testing procedures and schedule of

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boiler operating conditions and fuel mixtures. It also specified the statistical analyses that would be used to develop the revised BACT limits. The Comprehensive Emissions Testing Program included an initial stack test and three additional quarterly stack tests, as well as long term CEM data collection.

The initial permit limited the combustion of tires to 20% of the heat input to the boiler. On February 28, 1995, the Department authorized a test burn to evaluate the potential impacts associated with increasing the tire firing rate. The testing was conducted between March 1 and April 30, 1995. On August 8, 1995, the Department authorized an increase in the tire firing rate to 40% on a heat input basis. The Comprehensive Emission Testing Program addressed the full range of permitted fuel usage, from 100% wood/0% tires to 60% wood/40% tires.

Pursuant to specific Condition 16, the Comprehensive Emissions Testing Program Report was submitted to the Department on June 29, 1995. The report included data from the initial and three quarterly stack tests, which represented a variety of operating conditions. It also included a statistical analysis of the CEM data covering the time period from September 1, 1994 through April 30, 1995. In accordance with the approved protocol, revised permit limits were proposed based on the results of the testing program.

Instead of considering all of the results included in the Comprehensive Testing Program Report, the Department focused on the time period from March 1, 1995 through April 30, 1995 when establishing the proposed final BACT limits because it was assumed that the 60% wood/40% tires would represent worst case emissions for all pollutants. The Department established the proposed revised BACT limits by identifying the highest value (e.g. 30 day rolling average using CEM data or individual stack test result) measured during that time period and adding a margin for compliance. While we generally agree with that approach, we do not believe that 60% wood/40% tires represents the worst case condition for all pollutants. The 60% wood/40% tires will represent the worst case emissions for SO₂, however, as discussed below, it does not represent the worst case operating condition for other pollutants such as PM/PM₁₀ or CO. RGS needs to maintain the operational flexibility to combust the full range of permitted fuels (i.e., 100% wood/0% tires to 60% wood/40% tires). Therefore, the final BACT limits should be based on the worst case conditions for the full range of fuels.

Specific comments related to PM/PM₁₀, CO and SO₂ are provided below.

PM/PM₁₀

The proposed revised BACT limit for PM/PM₁₀ is 4.0 lb/hr (based on EPA Method 5). The Department established this proposed limit based on a measured emission rate of 2.1 lb/hr, which was associated with the highest of 6 individual runs that were

conducted while the facility was combusting 60% wood/40% tires at 100% load. The 2.1 lb/hr measured value was adjusted to provide a margin for compliance. While 2.1 lb/hr was the highest individual run for the 60% wood/40% tire condition, it was not the highest measured value for other fuel conditions.

As described in Appendix A of the Comprehensive Testing Program Report (submitted June 29, 1995), PM/PM10 data were collected during eight operating conditions with 3 test runs per condition for a total of 24 individual runs. While the average of the 24 individual runs equals 2.2 lb/hr, there were eight individual runs that were higher than the 2.1 lb/hr value referenced as the basis for the revised BACT limit. All eight of these occurred when the facility was combusting 80% wood/20% tires. One of these eight runs was at the proposed revised limit of 4.0 lb/hr and two of the individual runs exceeded the proposed revised BACT limit. More importantly, the three run average for Condition 1A (80% wood/20% tires) was 6.1 lb/hr, which is greater than the proposed final limit.

If we applied the same margin for compliance as that applied by the Department, the revised BACT Limit would be 11.6 lb/hr (i.e., $6.1 \times 1.9 = 11.6$). However, since one of the individual runs was measured at the current permit limit of 12.6 lb/hr, we request that the PM/PM10 limit be retained at the current permit limit of 12.6 lb/hr (based on EPA Method 5). This limit reflects an emission factor of 0.011 gr/DSCF corrected to 7% O₂ (0.02 lb/MM Btu) and it is an appropriate BACT limit for this type of facility. The PM limit was not identified as one of the disputed emission limitations in the initial BACT Determination (approved September 29, 1992). The initial Department's proposed BACT limit was the same as the limit proposed by Ridge Generating Station Limited Partnership (RGSLP), and the data illustrate that it is an appropriate emission limitation for this specific facility. The operating permit will require additional stack testing for PM/PM10 if the measured visual emissions (using EPA Method 9) exceed 10% opacity. Therefore, it is not necessary to reduce the limit, nor is it warranted based on the data.

Carbon Monoxide (CO)

The proposed revised BACT limit for CO was based on the highest 30 day rolling average (DRA) calculated by the Department for the time period from 3/30/95 through 4/30/95. The highest 30 DRA calculated by the Department during that time period was 101.6 lb/hr. This value was adjusted to provide a margin for compliance, which resulted in a proposed final BACT limit of 114.0 lb/hr.

It appears that this time period was selected because it was initially assumed that the 60% wood/40% tires condition would represent the worst case emissions with respect to the CO. A more comprehensive evaluation of the CEM data, however, demonstrates that the time period selected by the Department does not represent the worst case emissions for CO. Operating experience has demonstrated that the moisture content of the fuel is a very important factor with regard to CO

emissions. Since the moisture content of the wood is much higher than the moisture content of the tires, higher CO emissions appear to occur when tires represent less than 40% of the heat input to the boiler. Wood fuel with high moisture content will result in higher CO emissions due to its adverse effect on optimum combustion conditions. Compared to dry fuel, wet fuel does not burn as quickly or as efficiently on the grate or in the furnace since the moisture has to be driven off before complete combustion can occur. Optimum combustion conditions also require consistent fuel feed into the furnace and onto the grate. Wet fuel tends to cause unpredictable fuel system pluggages (chutes and hoppers) which can result in fuel flow interruptions and/or uneven fuel distribution into the furnace. When this occurs, operator adjustments can only have a limited effect on combustion until reliable fuel feed is re-established.

Thirty day rolling averages were calculated for the entire CEM data set that was submitted in Volume IV of the Comprehensive Emissions Testing Program Report. To simulate uninterrupted operations, the averages were calculated as 720 hour rolling averages including all hours of operation except those when the boiler was off-line (i.e., less than 5% load). The results of this analysis (see Attachment A) indicate that the average 30 DRA for the period running from September 1, 1994 through April 30, 1995 was 126.2 lbs/hr while the maximum 30 DRA was 191.6 lb/hr.

The CEM data for the period from May 1, 1995 to December 31, 1995 were also reviewed and 30 DRAs have been calculated (see Attachment B). This time period includes several months when the facility was authorized to combust up to 40% tires and also includes periods that are representative of anticipated worst case fuel conditions with respect to high moisture content in the wood. The average 30 DRA during this time period was 138.6 lb/hr with a maximum 30 DRA of 187.4 lb/hr. For this period, daily averages were calculated based on all of the operating hours in a given operating day and a 30 DRA was calculated each steam generating unit operating day by averaging the previous 30 steam generating operating day averages.

CO Revised to
2/2
7/31/96

These data clearly demonstrate that the RGS cannot consistently meet the final BACT limit proposed by the Department. Using an approach consistent with that used by the Department, RGSLP proposes a revised CO limit of 215 lb/hr based on a 30 DRA. This represents the highest recorded 30 DRA adjusted to provide a margin for compliance (i.e. 191.6 lb/hr x 1.12). This limit would result in a reduction of 438 TPY of CO when compared to the interim permitted level.

Sulfur Dioxide (SO₂)

The final BACT limit proposed by the Department for SO₂ will unnecessarily restrict the operation of the RGS. The Department used a similar approach to develop the proposed final limit for SO₂. The highest 30 DRA for the time period from March

30, 1995 to April 30, 1995 was selected and a margin was added for compliance. The revised BACT determination acknowledges that the proposed limit is below the limit necessary to allow for the continuous operation of the facility at full capacity. However, it erroneously assumes that the facility has the capability of continuously meeting the proposed limit by increasing the lime injection rates to further control SO₂ emissions. As discussed below, the proposed final limit would actually prevent the facility from operating at its full permitted capacity.

The following factors need to be considered when establishing the final BACT limit for SO₂:

- The Department analysis assumed that the facility was combusting 60% wood/40% tires during the 3/30/95 to 4/30/95 time period. As illustrated in Attachment C, tires consistently represented less than 40% of the heat input during that time period. The daily average heat input associated with tires was 23.1%, while the daily heat inputs ranged from 10.3% to 36.7%.
- As described in the initial BACT analysis (Section 5.1.3 of the Permit Application), the SDA was designed to reliably achieve an 80% SO₂ removal efficiency on a long term basis. The original permit limit was based on the expected fuel sulfur content associated with firing 80% wood/20% tires and an 80% SO₂ removal efficiency (see Appendix B in the initial application). This resulted in an initial SO₂ permit limit of 109.4 lbs/hr based on a 24-hour average. On August 8, 1995 the facility was authorized to combust up to 40% tires on a heat input basis, however, the SO₂ limit was reduced to 72 lb/hour on a 30-day rolling average. As illustrated in Attachment D, a removal efficiency in excess of 90% is required to meet the existing interim SO₂ limit of 72 lb/hr when the facility is firing 40% tires. The calculations in Attachment D are based on measured sulfur content of the tires and wood fuels accepted at RGS.
- The SDA design, including vessel size, residence time, SDA outlet temperature, nozzle atomization, and nozzle configuration and spray patterns (number of nozzles) were based on 80% SO₂ removal at the anticipated fuel mix (i.e. 80% wood/20% tires). The lime slaking (slurry preparation) system was also sized based on the 80% removal requirement. Two 1000 lb/hr lime slakers (one operating/one spare) were installed to meet the SDA design requirements.

While the conservative SDA design margins can achieve the 72 lb/hr limit at the elevated SO₂ inlet levels, the associated 90% removal rate is the maximum achievable on a continuous basis. Maintenance and operating costs have increased substantially to maintain the operability and

reliability of the system. To continuously operate at an 90% removal level with the higher SO₂ inlet level (i.e. 40% tires) is beyond the capability of a single slaker. The plant is maintaining the required SO₂ removal level at the maximum tire firing rate by operating both slakers simultaneously. The amount of slurry that can physically be fed is limited by the piping, pump capacity and nozzle configuration of the SDA. The solids content in the slurry is occasionally high enough that it creates problems with the atomization. This results in incomplete drying of the flue gas, which causes significant problems in the ash handling system because that system was designed to handle dry ash. Increasing the required SO₂ removal to continuously maintain an even lower emission level will push the SO₂ removal system further beyond its design limit and present operational levels.

- The SDA vendor was contacted to discuss measures that could be implemented to enhance the performance of the existing system. The installed slurry delivery piping has been replaced with different materials to improve SDA performance. This has resulted in less build-up in the piping and improved slurry delivery to the spray nozzles. The manufacturer is also designing new spray lance heads and nozzles with the objective of improving atomization of the slurry and the drying in the SDA. These measures will improve the operability and reliability of the system, but will not provide for a continuous removal efficiency greater than 90%. Therefore, given the current design of the SO₂ control system, it is not technically feasible to reliably and continuously meet a permit limit that is more stringent than 72 lb/hr.
- With the current interim SO₂ limit, RGS has been forced to periodically reduce the tire feed rate to the boiler in order to ensure compliance with the limit. Any further reduction in the emissions limit will increase the frequency of reduced tire firing.
- The proposed revised BACT limit for SO₂ assumes that the plant will continue to operate at a reduced load. While this has been the pattern to date, it is certainly not the desired long term operating objective. The Department's revised BACT analysis assumes that the proposed revised BACT limit will not limit future plant operations because further control can be achieved by simply increasing the lime injection rates. As discussed above, this is not the case. Further reducing the SO₂ limit will significantly restrict the potential operations of the facility. It will preclude the facility from operating at its permitted design capacity.

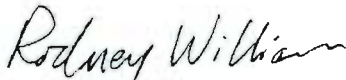
In summary, the limited two months of data that the Department relied on when preparing the proposed revised BACT limits were not representative of 60%

wood/40% tire operation. RGS has already accepted a 34% reduction in the SO₂ limit for the facility. The proposed revised BACT limit for SO₂ was based on the erroneous assumption that the current SDA can reliably achieve higher removal efficiencies. However, this is not technically feasible because the SDA is already performing significantly beyond its design capacity. The tire feed rates have to be reduced periodically to ensure compliance with the existing limit. Further reducing the SO₂ limit will prevent the facility from operating at its maximum permitted capacity. Therefore, we request that the current interim SO₂ limit of 72 lb/hour (based on a 30 day rolling average) be retained as the final BACT limit.

CONCLUSION

We understand that you intend to address our earlier request (dated December 26, 1995) for minor permit changes at the same time that you issue the final proposed BACT limits. If you have any questions associated with the minor permit changes or related to our comments on the proposed BACT, please call Chuck Davis at 941-665-2255 or Matt Killeen at 603-929-3420. If you intend to propose final BACT limits that are more stringent than we have requested in this letter, we would like to have an opportunity to meet and discuss the limits before they are issued.

Sincerely,



Rodney Williams
Plant Manager

Attachments

cc: C. Davis
M. Killeen
A. Linero
T. Porter
J. Reynolds

Certification #P 597 437 510



Wheelabrator Ridge Energy Inc.

3131 K-Ville Avenue
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July 19, 1995

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State of Florida
Department of Environmental Protection
Chief Bureau of Air Regulation
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Bureau of
Air Regulation

Re: Ridge Generating Station
Air Permit #AC53-206244, PSD-FL-183

Dear Sir:

In accordance with 40 C.F.R. 60.50a(d), 60.59a(b)(14), and 60.59a(m), enclosed please find data summarizing the daily weight of MSW and other fuels fired during the Second Quarter 1995. Our percentage of MSW combusted continues to be under 30%, so we remain subject only to the record keeping and reporting requirements for co-fired combustors under the MWC NSPS, 40 C.F.R. Part 60, Subpart Ea.

If you have any questions regarding this submittal, please contact Chuck Davis at (941) 665-2255.

Sincerely,


Rodney Williams
Plant Manager

cc: EPA Region IV
B. Proses, DEP S.W. District

Certification # P 013 080 057

BEST AVAILABLE COPY

WHEELABRATOR RIDGE ENERGY

APRIL '95 STATS

19-Jul

MSW PROCESSED

TOTAL
MSW

OTHER FUELS PROCESSED

YARDWASTE
TONSTIRES
TONSPROCESSED
TONSWOOD
TONSPROPANE
TONSTOTAL
PROCESSED
TONS

1st Qtr	7495.85	7181.40	14677.25	79575.84	344.30	94597.39
SUN						
MON						
TUE						
WED						
THU						
FRI						
SAT 1	62.26	103.12	165.38	937.15	4.43	1106.96
SUN 2	0.00	0.00	0.00	0.00	5.06	5.06
MON 3	0.00	0.00	0.00	0.00	0.00	0.00
TUE 4	0.00	0.00	0.00	0.00	0.00	0.00
WED 5	0.00	0.00	0.00	0.00	0.00	0.00
THU 6	0.00	0.00	0.00	0.00	0.00	0.00
FRI 7	0.00	0.00	0.00	0.00	0.00	0.00
SAT 8	0.00	0.00	0.00	0.00	0.00	0.00
SUN 9	5.50	17.70	23.20	88.34	21.52	133.06
MON 10	50.39	73.90	124.29	809.28	4.20	937.77
TUE 11	48.10	82.24	130.34	772.47	1.90	904.71
WED 12	54.67	107.55	162.22	878.01	0.63	1040.86
THU 13	33.35	47.14	80.49	535.62	12.66	628.77
FRI 14	67.11	90.33	157.44	1077.74	0.63	1235.81
SAT 15	62.69	84.49	147.18	1006.67	0.00	1153.85
SUN 16	61.28	103.78	165.06	857.88	0.00	1022.94
MON 17	64.87	99.19	164.06	908.20	0.00	1072.26
TUE 18	70.77	123.55	194.32	990.86	0.00	1185.18
WED 19	73.38	116.52	189.90	1027.30	0.00	1217.20
THU 20	39.72	85.06	124.78	556.09	6.96	687.83
FRI 21	77.49	59.78	137.27	1084.94	2.53	1224.74
SAT 22	73.39	50.76	124.15	1027.41	1.27	1152.83
SUN 23	203.08	43.49	246.57	1105.37	0.00	1351.94
MON 24	185.81	71.01	256.82	1011.38	0.00	1268.20
TUE 25	184.44	89.23	273.67	1003.95	0.63	1278.25
WED 26	169.00	100.58	269.58	919.91	0.00	1189.49
THU 27	160.15	90.85	251.00	871.71	0.00	1122.71
FRI 28	18.22	20.77	38.99	99.20	1.27	139.46
SAT 29	0.00	0.00	0.00	0.00	15.13	15.13
SUN 30	90.35	101.75	192.10	713.48	10.13	915.71
MTD	1856.05	1762.79	3618.84	18282.93	88.96	21990.73
			16.46%	83.14%	0.40%	100.00%

		YARDWASTE TONS	TIRES TONS	TOTAL MSW PROCESSED TONS	WOOD TONS	PROPANE TONS	TOTAL PROCESSED TONS
WK 1		62.26	103.12	165.38	937.15	4.43	1106.96
WK 2		0.00	0.00	0.00	0.00	5.06	5.06
WK 3		321.83	503.35	825.18	5168.11	41.55	6034.84
WK 4		460.90	638.64	1099.54	6452.68	10.76	7562.98
WK 5		920.71	415.93	1336.64	5011.51	17.03	6365.18
WK 6		90.35	101.75	192.10	713.48	10.13	915.71
MTD		1856.05	1762.79	3618.84	18282.93	88.96	21990.73
				15.69%	83.94%	0.37%	100.00%
YTD		9351.90	8944.19	18296.09	97858.77	433.26	116588.12

WHEELABRATOR RIDGE ENERGY

MAY '95 STATS

19-Jul

		YARDWASTE PROCESSED TONS	MSW TIRES PROCESSED TONS	TOTAL MSW PROCESSED TONS	OTHER FUELS WOOD PROCESSED TONS	PROPANE PROCESSED TONS	TOTAL PROCESSED TONS
SUN							
MON	1	114.20	91.68	205.88	901.81	9.07	1116.76
TUE	2	111.65	93.46	205.11	881.67	4.43	1091.21
WED	3	129.08	107.71	236.79	1019.35	0.00	1256.14
THU	4	115.66	104.47	220.13	913.36	0.00	1133.49
FRI	5	104.88	86.68	191.56	828.23	0.00	1019.79
SAT	6	141.85	105.40	247.25	1120.16	0.00	1367.41
SUN	7	198.75	107.09	305.84	1044.57	0.00	1350.41
MON	8	204.00	81.59	285.59	1072.18	0.00	1357.77
TUE	9	225.61	87.95	313.56	1185.72	0.00	1499.28
WED	10	198.59	107.59	306.18	1043.73	0.00	1349.91
THU	11	199.86	102.74	302.60	1050.39	0.00	1352.99
FRI	12	65.44	38.20	103.64	343.93	6.33	453.90
SAT	13	197.70	107.47	305.17	1039.02	0.00	1344.19
SUN	14	112.54	107.36	219.90	1061.83	0.00	1281.73
MON	15	114.86	102.29	217.15	1083.74	0.00	1300.89
TUE	16	114.85	107.10	221.95	1083.67	0.00	1305.62
WED	17	111.53	106.21	217.74	1052.30	0.63	1270.67
THU	18	106.26	100.32	206.58	1002.58	0.00	1209.16
FRI	19	76.38	58.34	134.72	720.71	0.00	855.43
SAT	20	88.08	99.06	187.14	831.01	26.55	1044.70
SUN	21	200.06	93.29	293.35	1073.42	0.00	1366.77
MON	22	204.23	65.94	270.17	1095.79	0.00	1365.96
TUE	23	251.41	28.88	280.29	1348.96	0.00	1629.25
WED	24	229.02	93.54	322.56	1228.81	0.00	1551.37
THU	25	154.74	96.72	251.46	830.23	5.06	1086.75
FRI	26	179.69	101.87	281.56	964.11	1.27	1246.94
SAT	27	177.48	90.51	267.99	952.28	0.00	1220.27
SUN	28	139.46	91.80	231.26	888.08	0.00	1119.34
MON	29	138.16	106.36	244.52	879.78	10.13	1134.43
TUE	30	112.74	85.85	198.59	717.90	12.90	929.39
WED	31	89.97	62.72	152.69	572.91	10.13	735.73
THU							
FRI							
SAT							

MTD	4608.72	2820.19	7428.91	29832.24	86.51	37347.66
			19.89%	79.88%	0.23%	100.00%

	YARDWASTE PROCESSED TONS	TIRES PROCESSED TONS	TOTAL MSW PROCESSED TONS	OTHER FUELS WOOD PROCESSED TONS	PROPANE PROCESSED TONS	TOTAL PROCESSED TONS
WK 1	717.32	589.40	1306.72	5664.58	13.50	6984.80
WK 2	1289.95	632.63	1922.58	6779.54	6.33	8708.45
WK 3	724.50	680.68	1405.18	6835.84	27.19	8268.21
WK 4	1396.62	570.75	1967.37	7493.61	6.33	9467.31
WK 5	480.34	346.73	827.07	3058.66	33.16	3918.89
MTD	4608.72	2820.19	7428.91	29832.24	86.51	37347.66
			16.71%	82.95%	0.34%	100.00%
YTD	13960.62	11764.38	25725.00	127691.01	519.77	153935.78

WHEELABRATOR RIDGE ENERGY

JUNE'95 STATS

19-Jul

		YARDWASTE PROCESSED TONS	MSW TIRES PROCESSED TONS	TOTAL MSW PROCESSED TONS	WOOD PROCESSED TONS	OTHER FUELS PROPANE PROCESSED TONS	TOTAL PROCESSED TONS
SUN							
MON							
TUE							
WED							
THU	1	101.34	67.25	168.59	645.28	15.83	829.70
FRI	2	106.04	74.00	180.04	675.20	5.87	861.11
SAT	3	133.69	99.39	233.08	851.32	0.38	1084.78
SUN	4	132.25	103.88	236.13	729.99	0.63	966.75
MON	5	99.96	88.92	188.88	551.75	10.76	751.39
TUE	6	65.66	37.91	103.57	362.41	0.63	466.61
WED	7	68.72	37.96	106.68	379.32	0.00	486.00
THU	8	0.00	0.00	0.00	0.00	0.00	0.00
FRI	9	0.00	0.00	0.00	0.00	1.87	1.87
SAT	10	133.60	55.22	188.82	737.41	6.33	932.56
SUN	11	49.88	63.55	113.43	578.62	12.03	704.08
MON	12	72.78	81.44	154.22	844.30	0.00	998.52
TUE	13	68.20	88.17	156.37	791.12	0.00	947.49
WED	14	69.78	67.54	137.32	809.52	6.96	953.80
THU	15	74.88	72.87	147.75	868.66	0.00	1016.41
FRI	16	68.56	82.36	150.92	795.35	0.00	946.27
SAT	17	68.49	57.37	125.86	794.48	5.70	926.04
SUN	18	174.55	72.87	247.42	718.76	0.00	966.18
MON	19	171.14	75.25	246.39	704.72	10.13	961.24
TUE	20	174.05	107.50	281.55	716.72	0.00	998.27
WED	21	158.60	104.58	263.18	653.11	0.00	916.29
THU	22	50.88	16.96	67.84	209.51	0.00	277.35
FRI	23	0.00	0.00	0.00	0.00	12.03	12.03
SAT	24	202.81	77.04	279.85	835.13	6.33	1121.31
SUN	25	103.70	85.36	189.06	949.95	0.00	1139.01
MON	26	94.43	77.89	172.32	865.02	0.00	1037.34
TUE	27	113.10	74.06	187.16	1036.02	0.00	1223.18
WED	28	105.54	66.16	171.70	966.81	0.63	1139.14
THU	29	98.54	70.33	168.87	902.62	0.00	1071.49
FRI	30	100.69	93.99	194.68	922.34	0.00	1117.02
SAT							

MTD	2861.85	1999.82	4861.67	19895.45	96.11	24853.23
			19.56%	80.05%	0.39%	100.00%

		YARDWASTE PROCESSED TONS	MSW TIRES PROCESSED TONS	TOTAL MSW PROCESSED TONS	WOOD PROCESSED TONS	OTHER FUELS PROPANE PROCESSED TONS	TOTAL PROCESSED TONS
WK	1	341.06	240.64	581.70	2171.81	22.08	2775.59
WK	2	500.19	323.89	824.08	2760.88	20.23	3605.19
WK	3	472.57	513.30	985.87	5482.05	24.69	6492.61
WK	4	932.02	454.20	1386.22	3837.96	28.49	5252.67
WK	5	616.01	467.79	1083.80	5642.75	0.63	6727.18
MTD		2861.85	1999.82	4861.67	19895.45	96.11	24853.23
				17.11%	82.55%	0.34%	100.00%
YTD		16822.47	13764.20	30586.67	147586.46	615.88	178789.01



State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

For Routing To Other Than The Addressee	
To _____	Location _____
To _____	Location _____
To _____	Location _____
From _____	Date _____

Interoffice Memorandum

TO: District Waste Program Administrators
District Air Program Administrators
County Air Program Administrators

FROM: Steve Smallwood, Director *SS*
Division of Air Resources Management

John Ruddell, Director *JR*
Division of Waste Management

SUBJ: Tire Burning at Municipal Waste Combustors and
Resource Recovery Facilities

DATE: April 16, 1992

This joint memorandum is to clarify the Division of Air Resources Management's and the Division of Waste Management's guidance on the use of municipal waste combustors and resource recovery facilities to dispose of tires through incineration.

Tires (shredded and whole) may be processed/fed to these units up to 3%, by weight, of the permitted capacity without any change in the existing permits.

However, any desire to process/feed tires above the 3% level will be considered a modification and the owner/operator of the source(s) will be required to obtain the necessary document(s) (i.e., construction permit modification) prior to increasing the processing/feed rate of the tires. This type of activity will require a Florida P.E. sealed application for a modification, processing fee, public notice, and additional air emission testing to determine the suitability of the unit for the processing of tires. The Air Construction Permit Modification will be processed by the Bureau of Air Regulation's Permitting and Standards Section. However, waste-to-energy facilities certified under the Power Plant Siting Act would require a modification of the certification. Submission of the same information by a Florida P.E. using the same forms you listed would be required. The \$10,000 modification fee would apply in those cases.

If you have any questions on the above, please contact Barry Andrews at (904)488-1344 or SunCom 278-1344.

SS/BM/rbm

If ^{tested} mercury emissions exceed .022 lbs/hr ^{per segment}
then this source shall be subject to the PSD ~~rule~~ for
mercury. This would include modeling and a BAET
review. Current BAET for mercury is carbon injection.



October 12, 1992

Mr. Clair H. Fancy
Bureau of Air Regulation
Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

RE: Polk County--A.P.
Polk Power Partners, L.P.--Mulberry Cogeneration Project
Permit Application AC 53-211670 and PSD-FL-187

Dear Clair:

Enclosed please find a copy of the notice of intent to issue the air construction permit for this project which was published in The Polk County Democrat on October 8, 1992.

We have provided several minor clarifications to the draft permit to John Reynolds, which he indicated would be made in the final permit. These clarifications involved:

1. Presenting emission limits for NO_x, sulfur content for SO₂, and opacity limits using fuel oil as backup after the first 3 years of operation (Specific Condition No. 2).
2. Specifying that natural gas and fuel oil can be fired until December 31, 1997 (3 years after the construction permit expiration date). After that date, the primary fuel will be natural gas; fuel oil can be used as a backup for no more than 30 days (Specific Condition No. 3). Fuel consumption rates for natural gas and fuel oil will be based on a temperature of 59°F or the benchmark. The number of hours of operation for the turbine firing fuel oil is 6,833, or 78 percent of the year.

In addition, a few clarifications to the BACT determination were discussed which made it more consistent with the specific conditions.

I greatly appreciate your staff's efforts in completing the review and issuing the draft permit.

Sincerely,

Robert C. McCoskey
Kennard F. Kosky, P.E.
President

KFK/tyf

cc: Mr. William Malenius, Ark Energy, Inc.
Mr. Ward Marshall, Central and South West Services, Inc.
File (2)

J. Reynolds
E. Halladay

B. Thomas, sup Dist
B. Harper, EPA
B. McNeill, NPS

S. Martin, PCPD

Division of Air
Resources Management

91193A1/13

KBN ENGINEERING AND APPLIED SCIENCES, INC.

1034 Northwest 57th Street Gainesville, Florida 32605 904/331-9000 FAX: 904/332-4189

RECEIVED

OCT 13 1992

AFFIDAVIT OF PUBLICATION
The Polk County Democrat

Published Semi-Weekly
Bartow, Polk County, Florida

Case No. _____

STATE OF FLORIDA
COUNTY OF POLK

Before the undersigned authority personally appeared _____
S. L. Frisbie, IV, who on oath says that (s)he is
Publisher of The Polk County Democrat, a newspaper
published at Bartow, Polk County, Florida; that the attached copy of advertisement,
being a Notice of Intenet to Issue Permit in the
matter of POLK POWER PARTNERS

in the _____ Court, was published in said newspaper in the issues
of October 8, 1992

Affiant further says that The Polk County Democrat is a newspaper published at
Bartow, in said Polk County, Florida, and that said newspaper has heretofore been continu-
ously published in said Polk County, Florida, each Monday and Thursday, and has been
entered as second class matter at the post office in Bartow, in said Polk County, Florida, for a
period of one year next preceeding the first publication of the attached copy of advertise-
ment; and affiant further says that he has neither paid nor promised any person, firm, or
corporation any discount, rebate, commission, or refund for the purpose of securing this
advertisement for publication in said newspaper

Signed _____

The foregoing instrument was acknowledged before me this 9th day of Oct.,

1992, by S. L. Frisbie, IV

who is personally known to me.

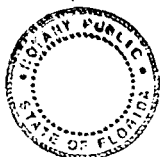
(Signature of Notary Public)

Teresa M. Pacetti

(Printed or typed name of Notary Public)

Notary Public

My Commission Expires:



Notary Public, State of Florida
TERESA M. PACETTI
My Comm. Exp. Dec. 19, 1995
Comm. No. CC 169408

DEPARTMENT OF
ENVIRONMENTAL
REGULATION
NOTICE OF
INTENT TO
ISSUE PERMIT

The Department of Environ-
mental Regulation gives notice of
its intent to issue a permit to
POLK POWER PARTNERS,
23293 South Pointe Drive, Lagu-
na Hills, California 92653, to
construct a cogeneration and CO2
recovery facility 3.7 miles south-
west of Bartow, Polk County, Flor-
ida. A determination of Best
Available Control Technology
(BACT) is required. The proposed
project is subject to Prevention of
Significant Deterioration (PSD)
regulations and federal new sour-
ce performance standards. Model-
ing results show that increases in
ground-level concentrations are
less than PSD significant impact
levels. The Department is issuing
this Intent to Issue for the reasons
stated in the Technical Evalua-
tion and Preliminary
Determination.

A person whose substantial
interests are affected by the
Department's proposed permit-
ting decision may petition for an
administrative proceeding (hear-
ing) in accordance with Section
120.57, Florida Statutes. The
petition must contain the infor-
mation set forth below and must
be filed (received) in the Office of
General Counsel of the Depart-
ment at 2600 Blair Stone Road,
Tallahassee, Florida 32399-2400,
within (14) days of publication of
this notice. Petitioner shall mail a
copy of the petition to the applic-
ant at the address indicated above
at the time of filing. Failure to file
a petition within this time period
shall constitute a waiver of any
right such person may have to
request an administrative deter-
mination (hearing) under Section
120.57, Florida Statutes.

The Petition shall contain the
following information; (a) The
name, address, and telephone
number of each petitioner, the
applicant's name and address, the
Department Permit File Number
and the county in which the
project is proposed; (b) A state-
ment of how and when each peti-
tioner received notice of the
Department's action or proposed
action; (c) A statement of how each
petitioner's substantial interests
are affected by the Department's
action or proposed action; (d) A
statement of the material facts
disputed by Petitioner, if any; (e)
A statement of facts which peti-
tioner contends warrant reversal
or modification of the Depart-
ment's action or proposed action;
(f) A statement of which rules or
statutes petitioner contends
require reversal or modification of
the Department's action or propo-
sed action; and (g) A statement of
the relief sought by petitioner,
stating precisely the action peti-
tioner wants the Department to
take with respect to the Depart-
ment's action or proposed action.

If a petition is filed, the admini-
strative hearing process is
designed to formulate agency
action. Accordingly, the Depart-
ment's final action may be differ-
ent from the position taken by it
in this Notice. Persons whose
substantial interests will be
affected by any decision of the
Department with regard to the
application have the right to peti-
tion to become a party to the
proceeding. The petition must
conform to the requirements spec-
ified above and be filed (received)
within 14 days of publication of
this notice in the Office of General
Counsel at the above address of
the Department. Failure to peti-
tion within the allowed time
frame constitutes a waiver of any
right such person has to request a
hearing under Section 120.57,
F.S., and to participate as a party
to this proceeding. Any subse-
quent intervention will only be at
the approval of the presiding offi-
cer upon motion filed pursuant to
Rule 28-6.207, F.A.C.

The application is available for
public inspection during normal
business hours, 8:00 a. m. to 5:00
p. m., Monday through Friday,
except legal holidays, at Depart-
ment of Environmental Regula-
tion, Bureau of Air Regulation,
2600 Blair Stone Road, Tallahas-
see, Florida 32399-2400 and
Department of Environmental
Regulation, Southwest District,
4520 Oak Fair Boulevard, Tampa,
Florida 33610-7347.

Any person may send written
comments on the proposed action
to Mr. Preston Lewis at the
Department's Tallahassee
address. All comments received
within 30 days of the publication



United States Department of the Interior

FISH AND WILDLIFE SERVICE
75 Spring Street, S.W.
Atlanta, Georgia
30303

TAKE
PRIDE IN
AMERICA

June 12, 1992

RECEIVED

JUN 18 1992

Mr. C. H. Fancy
Chief, Bureau of Air Regulation
Florida Department of
Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Division of Air
Resources Management

Dear Mr. Fancy:

We have completed our review of the material that you sent us regarding Ridge Generating Station Limited Partnership's (RGSLP) proposal to construct and operate a 45-MW electric power generating station in Polk County. The Ridge Generating Station would be located near Lakeland, approximately 100 km southeast of the Chassahowitzka Wilderness Area (WA), a Class I air quality area administered by the Fish and Wildlife Service. The facility would consist of one boiler designed to burn a mixture of fuels including wood, tires, and landfill gas. This fuel mix would result in significant emissions of sulfur dioxide (SO_2), nitrogen oxides, volatile organic compounds, particulate matter, lead, and beryllium. Based on concerns we have expressed in previous letters to you regarding increment consumption at the Chassahowitzka WA, we are particularly concerned about SO_2 emissions from the proposed facility.

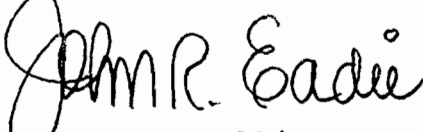
We were pleased to see that you required RGSLP to perform extensive SO_2 increment modeling analyses for the Chassahowitzka WA. Following consultations with us, RGSLP performed long range transport modeling using MESOPUFF II to evaluate their impact alone, plus their impact combined with other SO_2 increment-consuming sources, on the wilderness area. After reviewing the results of the modeling analyses, we are satisfied that the proposed Ridge Generating Station would not contribute significantly to an increment exceedance at the Chassahowitzka WA.

In addition, we agree that the proposed dry scrubber/baghouse and selective noncatalytic reduction systems represent best available control technology to minimize emissions from the boiler. Regarding the air quality related values analyses, RGSLP sufficiently addressed potential impacts to vegetation, soils and visibility in the wilderness area. However, RGSLP

failed to address potential impacts to freshwater creeks and related wildlife in the wilderness area from acid deposition. Nevertheless, based on the distance from the Chassahowitzka WA and the modeling results, we do not anticipate that resources will be adversely affected by emissions from the proposed facility.

We appreciate your continued cooperation in requiring applicants to adequately assess the impacts of new emissions on the resources in our Class I areas. If you have any further questions regarding our comments on the Ridge Generating Station application, please contact Ms. Tonnie Maniero of our Air Quality Office in Denver at 303/969-2071.

Sincerely yours,


for James W. Pulliam, Jr.
Regional Director

cc:

Ms. Jewell Harper, Chief
Air Enforcement Branch
Air, Pesticides and Toxic Management Division
U.S. EPA, Region 4
345 Courtland Street, NE
Atlanta, Georgia 30365

J. Reynolds
C. Halladay
C. Thomas, substitute

RIDGE GENERATING STATION, L. P.

General Partners



DECKER ENERGY-RIDGE, INC.



WHEELABRATOR POLK INC.

400 North New York Avenue, Suite 101
Winter Park, Florida 32789
Tel. 407-628-8900
Fax. 407-628-8535

RECEIVED

MAR 20 1992

Bureau of
Air Regulation

March 19, 1992

Florida Department of Environmental Regulation
Division of Air Resources Management
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Attention: C. H. Fancy, P.E.
Chief, Bureau of Air Regulation

Re: Permit Application AC 53-206244, PSD-FL-183
Ridge Generating Station

Dear Mr. Fancy:

This letter provides responses to the questions you raised in your letter dated January 17, 1992. For your convenience, we have repeated the questions and provided our response immediately below the question.

1. The flow diagram shows no bypass around the dry scrubber/baghouse. There may be times when the boiler flue gas temperature exceeds the baghouse design temperature. Are there plans to install a bypass, and if so, under what conditions would the bypass be open?

RESPONSE:

As discussed in the application, the Ridge Generating Station (RGS) will be equipped with a spray dryer absorber (SDA) and fabric filter. Under normal circumstances, the SDA and fabric filter will both be in operation when the boiler is on-line. A bypass of the fabric filter will, however, be installed to protect the bags and structural integrity of the baghouse during infrequent upset or emergency conditions.

The RGS boiler will be a conventional stoker fired unit, in which the solid fuel will be burned both in suspension and on the grate. If a system failure occurred which resulted in the SDA going off-line, the fuel feed to the boiler would automatically stop and the suspension burning would cease. However, fuel already on the grate would continue to burn, sending combustion products to the SDA/fabric filter. To

prevent the possibility of having burning embers and higher than normal temperature flue gases causing a fire, the bypass would be temporarily opened to divert the gases directly to the fabric filter outlet. The duration of the bypass would be limited to the time required to burn the fuel remaining on the grate at the time of the malfunction or the time necessary to correct the SDA malfunction, whichever is shorter.

As indicated above, the bypass capability would only be used under upset or emergency situations to prevent fires or damage to the air pollution control equipment. Conditions that would result in a bypass include:

- o Loss of water flow to the SDA. Redundant water pumps will be installed to minimize the potential for this occurrence.
- o Extreme high fabric filter inlet temperatures (i.e., greater than 500°F). This situation would occur only under system upset conditions.
- o Extremely high fabric filter pressure differential (i.e., greater than approximately 30 inches of water). Again, this situation would occur only under system upset conditions.

The only other proposed bypass condition would occur during periods of boiler warm-up when only propane gas is being burned. This bypass is warranted to prevent excess moisture from "blinding" the bags.

2. **How many days supply of wood and tires will be stored on site? Will landfill gas be available in sufficient quantities to offset temporary shortages of wood or tires? Are there contingency plans for use of other alternate fuels and if so, what are they?**

RESPONSE:

The site will have separate piles for both processed and unprocessed wood. The piles will encompass an area of approximately 2.8 acres of unprocessed wood storage and 8.5 acres of processed wood storage. Based upon this arrangement, on-site wood storage will provide an inventory in excess of thirty (30) days.

The tire pile storage area encompasses approximately 2.3 acres. There will be four (4) tire piles, each separated by fifty (50) foot fire access lanes. It is currently anticipated that one (1) pile will contain chipped tires and the remaining piles will contain whole tires. Based upon this arrangement, the tire piles will provide a fourteen (14) day inventory. The size of the tire storage area and the required layout limits the inventory to a maximum of 28 days.

Current estimates of the quantity of landfill gas indicate that up to 10% of the total heat input of the facility could be landfill gas. This fuel will not be available in sufficient quantities to be a complete substitute for wood and tires.

In addition to wood, tires, and landfill gas, the RGS boiler will be equipped with a propane burner (or burners). The propane burner(s) will have a maximum heat input of 180 MMBtu/hour and will be used for start-up, shutdown and infrequent combustion stabilization purposes. No other alternate fuels are proposed for use at RGS.

RGSLP has conducted two market studies of the supply of wood. These studies indicate that there are between 1.2 million and 2.5 million tons of wood fuel available per year within the procurement area. The project will require approximately 350,000 tons of wood per year.

It is also estimated that greater than 5 million scrap tires per year are disposed of within the procurement area of the facility. In addition, there are illegal tire piles which need to be brought into compliance, including a large site in Polk County.

Based on our studies, we are confident that there are adequate supplies of wood, scrap tires, and landfill gas from Polk County's North Central Landfill to reliably fuel the plant. Therefore, there are no contingency plans for use of other alternate fuels.

3. Unreacted ammonia from the SNCR system may pose a difficult control problem due to variability in the fuel mix. Given the public's and the Department's concern about ammonia discharges from phosphate plants in the area, some control system or practice must be in place to effectively prevent ammonia from being detected beyond the RGS property line. The application states that this problem will be minimized through careful attention to combustion control by the

operator (i.e, manual adjustments). A properly designed facility should have some control loop or system such that the operator will not have to make very many manual adjustments. The application should address other methods that may prove necessary for controlling ammonia slip.

RESPONSE:

The RGS will have an automated control system which will minimize manual adjustments by the operator. As discussed in the application, the SNCR process incorporates a reagent storage and delivery system to feed a solution through injectors into the combustion gases of the boiler. The injectors atomize the solution as it enters the boiler and mixes with the boiler flue gas. The solution reacts with the NO_x in the flue gas to form N_2 , and H_2O . Excess levels of solution can result in emissions of ammonia into the atmosphere (referred to as ammonia slip). Control of the SNCR system will be maintained through the use of a programmable logic controller and single loop controllers. This system will automatically maintain acceptable NO_x emissions and control reagent use, which will limit ammonia emissions. Operation and control of the SNCR system is described in the following paragraphs:

A concentrated solution is typically metered to the boiler for NO_x reduction by a variable stroke chemical metering pump. NO_x The feed rate of the solution is automatically controlled through an auto/manual NO_x control station that uses a feed-forward boiler load signal and a feedback stack NO_x signal. The control station output signal is sent to the chemical metering pump electronic capacity control which automatically adjusts the stroke of the pump.

Process water and the concentrated solution are typically mixed in the chemical mixing pump, located downstream of the chemical metering pump. In addition to providing intimate mixing when diluting the concentrated solution, the chemical mixing pump provides the required reagent pressure at the injectors. The degree of dilution is generally affected by the location of the injectors and the temperature and gas velocity profiles in the boiler. The net effect of the dilution is to assure more efficient contact between the NO_x and the solution in the boiler, thus increasing NO_x removal efficiency and minimizing ammonia slip.

from
 NO_x
CEMS?

Dilution water requirements will be optimized during start-up. A single loop controller will be used to provide for automatic control of the dilution water rate. The controller receives a signal from the pressure transmitter in the chemical mixing pump recirculation line and outputs a signal to the pressure regulating valve.

A control system will interface with the SNCR system, and will include a programmable logic controller for relay and timing functions, regulators, circuit breaker/fuses, selector switches, status lights and annunciator. The control system will include monitors and recorders for boiler load and NO_x emissions as well as chemical and carrier feed rates. Various status lights and annunciators will provide operators with continuous indications of system operability and equipment conditions. The control system will require only infrequent adjustment or manual operation by plant personnel.

Wheelabrator has SNCR systems currently operating at two facilities, including a California facility with three wood fired boilers. The automatic control systems at these facilities have proven to be effective at controlling NO_x emissions and ammonia slip. Therefore, Ridge Generating Station Limited Partnership (RGSLP) is confident that a similar control system at the RGS facility will minimize potential concerns associated with ammonia slip.

4. Table B-2 lists essentially the same emission factors for all three fuel types. Typically, one would expect some difference, although small. It would be helpful to include footnoted or numbered references in the discussion so that items such as "test data and other literature" could be properly identified. Also, an explanation of the rationale that went into derivation of the emission rates would be desirable.

RESPONSE:

Emission rates may vary depending on the specific mix of fuels being burned. For the most part, however, these variations are expected to be small. Furthermore, the primary objective of the emission estimation process was to assess maximum emissions for impact assessment purposes and for emission compliance purposes. Therefore, rather than indicating separate emission rates for all pollutants and all fuel mixes, the approach followed for most pollutants was

simply to indicate the maximum emission rate expected for operation of the Ridge Generating Station (RGS) at a given load level. These maximum rates were then in turn used in the impact analysis. Another consideration related to estimating variations in emissions is that available emissions data references are not specific to the types of fuels and types of emission controls to be used at RGS. With reference data of this type, making a precise distinction in emission factors among the RGS fuel mixes did not seem supportable.

The principal references used to derive the emission factors in Table B-2 are listed below. The complete citation for these references is provided as Attachment A. Also presented in the following list is a brief rationale for emission rate derivation.

Sulfur Oxides - Derived from the expected fuel sulfur content, the expected fuel mix and the anticipated scrubber control efficiency. Data on fuel sulfur content were obtained from wood analyses and published data, including Grasso and Atkins, 1990. See permit application for additional information on fuel analysis and control methods.

Particulate Matter - Based on design data and the BACT analysis. The emission rate of 0.02 lb/MMBtu assumes that the test method is U.S. EPA Method 5, front-half catch only. See permit application for additional information. Revised versions of Table 5-4 and Table B-2 are attached to clarify the test method for particulate matter.

Nitrogen Oxides - Based on design data and the BACT analysis. See permit application for additional information.

Carbon Monoxide - Based on design data and the BACT analysis. See application for additional information.

Volatile Organic Compounds - Based on design data and the BACT analysis. See permit application for additional information.

Lead - Based primarily on Genesee Generating Station, 1991 and an evaluation of urban wood ash compositional data (Grasso and Atkins, 1990). Also reviewed Malcolm Pirnie, 1991; Oxford Energy, 1988; and Oxford Energy, 1990.

Hydrogen Chloride - The emission rate presented in the application was based primarily on information presented in

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the permit applications for the Genesee Generating Station (1991) and the Westminster, Massachusetts facility (ERL 1989), which was adjusted based upon the anticipated control efficiency of the scrubber. Additional fuel chlorine content data have been obtained since the application was initially submitted. Attachment B summarizes the chlorine fuel data.

As a result of these data, RGSLP is proposing to increase the hydrogen chloride emission rate from 0.005 lb/MMBtu to 0.008 lb/MMBtu. This revised emission rate conservatively assumes a wood chlorine content of 0.12% (which represents the 95% upper confidence limit) and a scrubber removal efficiency of 95%.

Tables 4-5, 6-8, B-1 and B-2 have been revised to include this change. Table 6-8 shows that the predicted maximum ambient concentrations based on the increased emission rate is less than the Florida no-threat levels.

Beryllium - Based primarily on Genesee Generating Station, 1991 and emissions test data from Champion International in Bucksport, Maine (Malcolm Pirnie, 1991). Also reviewed Oxford Energy, 1990, and Dow Corning, 1989. Beryllium was not detected in Dow Corning test results.

Mercury - Based primarily on an evaluation of urban wood and ash compositional data (Grasso and Atkins, 1990, and personal communications with ERL, 1991 and 1992) with an assumed control efficiency of fifty percent, and tire emissions data (Oxford Energy, 1990). The Genesee Generating Station Permit Application (1991) and stack test data at Wheelabrator's Shasta wood-burning facility in California (Galson, 1991), were also considered.

Ammonia - Based on design data.

Arsenic - Based primarily on an evaluation of urban wood ash compositional data (Grasso and Atkins, 1990 and personal communications with ERL, 1991 and 1992) and the assumed particulate matter control efficiency. Also reviewed Oxford Energy (1988 and 1990) test results which show minimal arsenic emissions from tire burning.

Cadmium - Based primarily on wood and tire emission test data from the Port Townsend facility (Washington Department of Ecology, 1986).

Chromium - The emission rate initially proposed in the application was based upon total chromium emission test results (Dow Corning, 1989 and Washington Department of Ecology, 1986). Based upon a review of wood and ash composition data (Grasso and Atkins, 1990 and personal communications with ERL, 1991 and 1992) a revised emission rate is being proposed for chromium. RGSLP is proposing to increase the total chromium emission rate from $2.6E-05$ lb/MMBtu to $1.15E-04$ lb/MMBtu. The revised emission rate was derived using the chromium concentration in urban wood ash (95th percentile) when considering the proposed particulate matter control efficiency. Data on chromium concentrations in urban wood ash are provided in Attachment C.

Chromium VI - The proposed emission rate for hexavalent chromium is also being revised based upon the information obtained from ERL. ERL has indicated that a maximum of 5 to 10 percent of the total chromium could be in the form of hexavalent chromium. To be conservative, in terms of impact assessment, RGSLP has assumed that 20 percent of the total chromium could be in the form of Chromium VI. This results in a reduction of the Chromium VI emission rate from $2.6E-05$ to $2.3E-05$.

Tables 4-5, 6-8, B-1 and B-2 have been revised to account for the revisions to the emission rates for chromium and chromium VI. Table 6-8 shows that the predicted maximum ambient concentrations based on the revised emission rates are less than the Florida no-threat levels.

Nickel - Based primarily on wood and tire emission test data from the Port Townsend facility (Washington Department of Ecology, 1986).

Zinc - Based primarily on emissions test data from the Oxford Energy facility (1988), adjusted to account for the fact that Oxford Energy burns 100% tires, while RGS will burn mostly wood with a maximum of 20% tires. Tires will represent the primary source of zinc emissions. Wood emissions estimates are based upon urban wood compositional data (ERL, 1991 and 1992) and stack test data from the Champion International Facility in Bucksport, Maine (Malcolm Pirnie, 1991).

Benzene - Based primarily on emissions test data reported in Caron, et al., 1990.

Formaldehyde - Based primarily on stack test data from Wheelabrator's Shasta wood-burning facility in California (Galson, 1991) and personal communications with ERL related to their emissions databases.

Pursuant to your request, Table B-3 has been revised to identify the specific references that were used to establish the emission factors. This has been done by numbering the references and identifying the numbered reference for each emission factor.

5. The flow diagram contains a table showing the process material balance. Review of the application would be facilitated if the diagram also showed process conditions, including flue gas temperatures ahead of and after the baghouse.

RESPONSE:

A revised flow diagram is attached. It has been revised to provide the additional information that you requested. The information is provided to illustrate the expected conditions. It is based upon the best available information and it is expected to be representative. The actual conditions, however, may vary depending upon the final equipment suppliers that are selected for the facility.

It should be noted that a number of additional changes have also been made to the flow diagram. These additional changes deal with the facility water balance. There have been no changes in the amount of fuel used or flue gases generated.

6. The predicted maximum SO₂ 24-hour and 3-hour concentrations in the Chassohowitzka PSD Class I area due to the Ridge Generating Station boiler emissions are greater than the National Park Service proposed 24-hour and 3-hour significant impact levels of 0.07 and 0.48 ug/m³, respectively. Please perform a cumulative 24-hour and 3-hour SO₂ Class I increment analysis as required by the National Park Service. An air quality related

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values (AQRVs) analysis should also be done since there are presently no significant impact levels that exempt a proposed PSD project from performing this analysis. The AQRVs analysis includes impacts to soils, vegetation, and wildlife.

RESPONSE:

A response to Item No. 6 is in preparation. This response will include the results of an additional modeling evaluation assessing in more detail the effect of Ridge Generating Station sulfur dioxide emissions and emissions of other sources within a wide region around the Chassahowitzka PSD Class I area. Effects on air quality related values (including soils, vegetation, and wildlife) will also be discussed in the response.

During the process of preparing a response to Item No. 6, several discussions with DER's air quality modeling staff have been held. Among the topics discussed was the inventory of other sulfur dioxide emission sources to be included in the impact evaluation. DER has been developing an updated inventory of PSD sources that might affect ambient sulfur dioxide concentrations within the Chassahowitzka PSD Class I area. The latest version of this inventory, consisting of 83 emission sources, was received from DER on March 6, 1992. This recently updated inventory is being used in the modeling analysis required for preparation of a response to Item No. 6. A response will be submitted as soon as it is available.

ADDITIONAL TOPICS

Revised Site Plan

An updated site plan is also enclosed. While the turbine generator building, boiler building and stack configuration have remained unchanged from the original submittal, there have been a number of minor changes to other portions of the site. The paragraph below, summarizes the changes that have been made since the initial submittal.

The processed wood storage area has been expanded. The 2.2 acre pond has been removed. The sewage treatment system has been replaced by a septic system with drainfield. Potable well P3 has been moved to a location southwest of the turbine-generator building. The ash silo has been replaced by an ash building containing "roll-on roll-off" containers.

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The fines storage area located next to the truck dump has been removed. A condensate tank has been added and the name of the treated water tank has been changed to service water tank.

Table B-2

There is a typographical error in Table B-2 of the permit application. The emission factor shown in Table B-2 for Arsenic is 0.0003 lb/MMBtu, while the correct factor is 0.00003. The correct factor was used to calculate emissions in lb/hr so that the emission rates for Arsenic in Table B-1 and in Table 4-5 are correct. The correct emission rate was also used for the impact evaluation. A revision to Table B-2 containing the correct emission factor for Arsenic is attached.

We have attempted to provide comprehensive responses to Questions 1 through 5, to ensure that the application will now be complete with respect to those issues. As discussed above, a complete response to Question 6 will be forwarded as soon as it is completed. We currently expect to submit that response prior to March 27, 1992. The submittal of that response has been delayed by the revision of the emissions inventory and the large number of additional sources that were added to the inventory.

We would be happy to provide any additional assistance to facilitate the review of this application. Please contact Matt Killeen at 1-800-682-0026 if you have additional questions or comments. We appreciate the efforts of you and your staff on this important project.

Sincerely,


Richard C. Stone
Project Manager

MPK112:ga

Attachments (See attached List)

cc: John Reynolds - FDER
Cleve Holladay - FDER
Matt Killeen - WESI
Macauley Whiting - Decker

List of Attachments

1. Attachment A - References
2. Attachment B - Ultimate Analysis, Percent Chlorine in Wood and Tires
3. Attachment C - Summary Data from Six Wood Processors, Chromium Analysis
4. Revised Table 4-5 - Ridge Generating Station, Estimated Maximum Toxic Air Pollutant Emissions at Maximum Continuous Rating, dated 3/12/92.
5. Revised Table 5-4 - Ridge Generating Station, Summary of Proposed BACT Approach, dated 3/12/92.
6. Revised Table 6-8 - Ridge Generating Station, Summary of Predicted Maximum Concentrations of Toxic Air Pollutants Attributable to Boiler Emissions, dated 3/12/92.
7. Revised Table B-1 - Ridge Generating Station Boiler Emission Rate Calculations for Maximum Continuous Rating, dated 3/12/92.
8. Revised Table B-2 - Ridge Generating Station Boiler Emission Rate Calculation Variables for Maximum Continuous Rating, dated 3/12/92.
9. Revised Table B-3 - Ridge Generating Station Boiler Derivation of Emission Rate Calculation Variables, dated 3/12/92.
10. Revised Figure 3-1 - Ridge Generating Station Flow Diagram, last revised 3/11/92.
11. Revised Figure 3-2 - Ridge Generating Station Site Plan, last revised 02/06/92.

Attachment A

References

- Caron, A., Messmer, R. and Hoy, D., 1990. Project progress report: the emissions of selected air contaminants from wood-residue fired boilers, in Proceedings of 1990 National Council of the Paper Industry for Air and Stream Improvement West Coast Regional Meeting.
- Dow Corning Corp., 1989. Report of tire chip test burn performed March 9-29, 1989.
- Environmental Risk Limited (ERL), 1989. An Application to the Massachusetts Department of Environmental Protection for a 16 MW Wood-Fired Electric Generating Facility in Westminster, Massachusetts.
- ERL, 1991 and 1992. Personal communications with R. Atkins, M. Holzman and others; and information received from ERL databases.
- Galson Technical Services, 1991. Source Test Report, Source Emission Testing of the Wood-Fired Boiler #1 Exhaust Stack at the Wheelabrator Shasta Energy Company, Anderson, California.
- Genesee Generating Station, 1991. Air emission permit application for Genesee Generating Station, Michigan.
- Grasso, D.T. and Atkins, R.S., Environmental Risk Limited, 1990. The composition of recycled wood fuel and its environmental permitting implications. Presented at the ACA/CIPCA Fourth Annual Meeting and Exposition, Hartford, CT, September 16-17, 1990.
- Malcolm Pirnie, Inc., 1991. Air emissions associated with the combustion of scrap tires for energy recovery.
- Oxford Energy Co., 1988. Final emission test report for Modesto Energy Company waste tire to energy facility, Westley, California.
- Oxford Energy Co., 1990. Stack test report (for the Oxford Energy Company facility at Westley, California, October 9-10, 1990).
- Washington Department of Ecology, 1986. Source test for Port Townsend Paper Company (February 25 and March 5, 1986).

Attachment B

Ultimate Analysis

Percent Chlorine in Wood and Tires (Dry Weight Basis)

	Number of Samples	Arithmetic mean	Standard Deviation	95% Upper Confidence Limit
C/D Wood ^(b)	21	0.05	0.03	0.12 ^(a)
Tires ^(c)	7	0.10	0.05	0.15 ^(d)

Source: Environmental Risk Limited (ERL) Databases.

- Notes:
- a. Defined as mean plus two standard deviations.
 - b. Construction/Demolition wood composition data collected and analyzed by ERL.
 - c. Tire-derived fuel data summarized by ERL.
 - d. The maximum chlorine content detected was 0.15%. The mean plus two standard deviations was higher than the maximum detected; therefore, the 95% upper confidence limit was set equal to the maximum detected.

Attachment C

Summary Data from Six Wood Processors

Chromium Analysis (ppm in Ash)

Number of Samples	Arithmetic mean	95th Percentile
41	992	5760.9

Source: Environmental Risk Limited (ERL) Databases

TABLE 4-5
 RIDGE GENERATING STATION
 ESTIMATED TOXIC AIR POLLUTANT EMISSIONS
 AT MAXIMUM CONTINUOUS RATING

Pollutant	Highest Emissions (lb/hr) for Any Fuel Mix
• Metals	
arsenic	0.019
beryllium	0.0063
cadmium	0.033
chromium (total)	0.072
chromium VI	0.014
lead	0.25
mercury	0.022
nickel	0.063
zinc	0.63
• Non-Metal Inorganics	
ammonia	17.8
hydrogen chloride	5.04
• Organics	
benzene	5.0
formaldehyde	1.7

TABLE 5-4
RIDGE GENERATING STATION
SUMMARY OF PROPOSED BACT APPROACH

Pollutant	Proposed Best Available Control Technology	Proposed Emission Limit (lb/MMBtu)
PM	Fabric Filtration	0.02 ^a
SO ₂	Spray Dryer with Fabric Filtration	0.17 ^b
NO _x	Combustor Design and Selective Noncatalytic Reduction System	0.15 ^b
CO	Good Combustion Practices	0.5 ^{b,c}
VOCs	Good Combustion Practices	0.035
Pb	Fabric Filtration	0.0004
Be	Fabric Filtration	0.00001

^a Based on EPA Method 5 front-half catch only.

^b On a 24-hour block average basis.

^c Excluding periods of start-up and shut down.

TABLE 6-8

Revised 3/12/92

RIDGE GENERATING STATION
SUMMARY OF PREDICTED MAXIMUM CONCENTRATIONS
OF TOXIC AIR POLLUTANTS ATTRIBUTABLE
TO BOILER EMISSIONS

Pollutant	Maximum Predicted Concentrations ($\mu\text{g}/\text{m}^3$)			Florida DER No-Threat Levels ^b ($\mu\text{g}/\text{m}^3$)		
	8-Hour	24-Hour	Annual	8-Hour	24-Hour	Annual
Arsenic	0.002	0.0008	7.2×10^{-5}	2	0.48	2.3×10^{-4}
Beryllium	0.0007	0.0003	2.4×10^{-5}	0.02	0.005	4.2×10^{-4}
Cadmium	0.004	0.001	1.2×10^{-4}	0.5	0.12	5.6×10^{-4}
Chromium (total)	0.008	0.003	2.7×10^{-4}	5	1.2	2.0×10^{-3}
Chromium VI	0.002	0.0006	5.3×10^{-5}	0.5	0.12	8.3×10^{-5}
Lead	0.03	0.01	9.5×10^{-4}	1.5	0.36	9.0×10^{-2}
Mercury	0.002	0.0009	8.4×10^{-5}	0.5	0.12	0.3
Nickel	0.007	0.003	2.4×10^{-4}	0.5	0.12	4.2×10^{-3}
Zinc	0.07	0.03	-	50	12	-
Ammonia	2.0	0.7	0.07	180	43.2	1.0
Hydrogen chloride	0.6	0.2	0.02	70	16.8	7.0
Formaldehyde	0.2	0.07	6.4×10^{-3}	4.5	1.08	7.7×10^{-2}
Benzene	0.6	0.2	0.02	30	7.2	0.12

^a Based on operating year-round at maximum continuous rating or 75 percent load firing an 80% wood/20% tires fuel mix.

^b Including any relevant federal reference air concentrations, reference specific doses (divided by 10), or inhalation reference concentrations.

TABLE B-1

RIDGE GENERATING STATION BOILER
EMISSION RATE CALCULATIONS FOR
MAXIMUM CONTINUOUS RATING

EMISSION RATES (LB/HR) BY FUEL TYPE (FUEL PERCENTAGES ON A HEAT INPUT BASIS)			
POLLUTANT	100% WOOD	80% WOOD 20% TIRES	75% WOOD 15% TIRES 10% LANDFILL GAS
sulfur oxides (as SO ₂)	$B \times C \times E \times H = 69.4$	$B \times C \times E \times H = 109.4$	$B \times C \times E \times H = 92.5$
particulate matter/PM ₁₀	$A \times I = 12.6$	$A \times I = 12.6$	$A \times I = 12.6$
nitrogen oxides (as NO ₂)	$A \times J = 94.5$	$A \times J = 94.5$	$A \times J = 94.5$
carbon monoxide	$A \times K = 315.0$	$A \times K = 315.0$	$A \times K = 315.0$
volatile organic compounds	$A \times L = 22.1$	$A \times L = 22.1$	$A \times L = 22.1$
lead ^a	$A \times M = 0.25$	$A \times M = 0.25$	$A \times M = 0.25$
hydrogen chloride	$B \times D \times F \times G \times$ $AA = 5.04$	$B \times D \times F \times G \times$ $AA = 4.70$	$B \times D \times F \times G \times$ $AA = 4.44$
beryllium ^a	$A \times N = 0.0063$	$A \times N = 0.0063$	$A \times N = 0.0063$
mercury ^a	$A \times O = 0.022$	$A \times O = 0.022$	$A \times O = 0.022$
ammonia ^a	$P \times Q \times R = 17.8$	$P \times Q \times R = 17.8$	$P \times Q \times R = 17.8$
arsenic ^a	$A \times S = 0.019$	$A \times S = 0.019$	$A \times S = 0.019$
cadmium ^a	$A \times T = 0.033$	$A \times T = 0.033$	$A \times T = 0.033$
chromium (total) ^a	$A \times U = 0.072$	$A \times U = 0.072$	$A \times U = 0.072$
chromium VI ^a	$A \times U \times Z = 0.014$	$A \times U \times Z = 0.014$	$A \times U \times Z = 0.014$
nickel ^a	$A \times V = 0.063$	$A \times V = 0.063$	$A \times V = 0.063$
zinc ^a	$A \times W = 0.63$	$A \times W = 0.63$	$A \times W = 0.63$
benzene ^a	$A \times X = 5.0$	$A \times X = 5.0$	$A \times X = 5.0$
formaldehyde ^a	$A \times Y = 1.7$	$A \times Y = 1.7$	$A \times Y = 1.7$

Note: Calculation variables are defined in Table B-2.

^a Highest estimated emissions for any fuel mix shown in each column.

TABLE B-2

RIDGE GENERATING STATION BOILER
EMISSION RATE CALCULATION VARIABLES FOR
MAXIMUM CONTINUOUS RATING

VARIABLE	CALCULATION VALUES BY FUEL TYPE (FUEL PERCENTAGES ON A HEAT INPUT BASIS)		
	100% WOOD	80% WOOD 20% TIRES	75% WOOD 15% TIRES 10% LANDFILL GAS
A = heat input, MMBtu/hr	630	630	630
B = fuel consumption, lb/hr	115,596	101,477	103,947
C = SO ₂ dry scrubber/ fabric filter efficiency factor (1 - 80%/100%)	0.2	0.2	0.2
D = fuel chlorine content fraction, dry basis	0.0012	0.00123	0.00110
E = fuel sulfur content fraction	0.0015	0.00269	0.00222
F = <i>HCl emission factor</i> adjustment to dry fuel basis lb/MMBtu	0.708	0.733	0.756
G = ratio of HCl to Cl	1.028	1.028	1.028
H = ratio of SO ₂ to S	2	2	2
I = PM emission factor ^a , lb/MMBtu	0.02	0.02	0.02
J = NO _x emission factor, lb/MMBtu	0.15	0.15	0.15
K = CO emission factor, lb/MMBtu	0.50	0.50	0.50
L = VOC emission factor, lb/MMBtu	0.035	0.035	0.035
M = Pb emission factor ^b , lb/MMBtu	0.0004	0.0004	0.0004
N = Be emission factor ^b , lb/MMBtu	0.00001	0.00001	0.00001
O = Hg emission factor ^b , lb/MMBtu	0.000035	0.000035	0.000035

TABLE B-2

Revised 3/12/92

RIDGE GENERATING STATION BOILER
EMISSION RATE CALCULATION VARIABLES FOR
MAXIMUM CONTINUOUS RATING
(continued)

CALCULATION VALUES BY FUEL TYPE (FUEL PERCENTAGES ON A HEAT INPUT BASIS)			
VARIABLE	100% WOOD	80% WOOD 20% TIRES	75% WOOD 15% TIRES 10% LANDFILL GAS
P = NH ₃ volume (ppmv) divided by 10 ⁶	35.36/10 ⁶	35.18/10 ⁶	35.26/10 ⁶
Q = flue gas volume, ft ³ /hr (@ 170°F)	13,593,360	13,481,580	13,653,180
R = factor to convert ft ³ of NH ₃ @ 170°F flue gas exit temperature	0.037	0.037	0.037
S = arsenic emission factor ^b , lb/MMBtu	0.00003	0.00003	0.00003
T = cadmium emission factor ^b , lb/MMBtu	0.000052	0.000052	0.000052
U = chromium (total) emission factor ^b , lb/MMBtu	0.000115	0.000115	0.000115
V = nickel emission factor ^b , lb/MMBtu	0.0001	0.0001	0.0001
W = zinc emission factor ^b , lb/MMBtu	0.001	0.001	0.001
X = benzene emission factor ^b , lb/MMBtu	0.008	0.008	0.008
Y = formaldehyde emission factor ^b , lb/MMBtu	0.0027	0.0027	0.0027
Z = chromium VI fraction of total chromium	0.2	0.2	0.2
AA = HCl dry scrubber/fabric filter efficiency factor (1-95%/100%)	0.05	0.05	0.05

^a Based on EPA Method 5 front-half catch only.

^b Represents highest emission factor for any fuel combination.

TABLE B-3

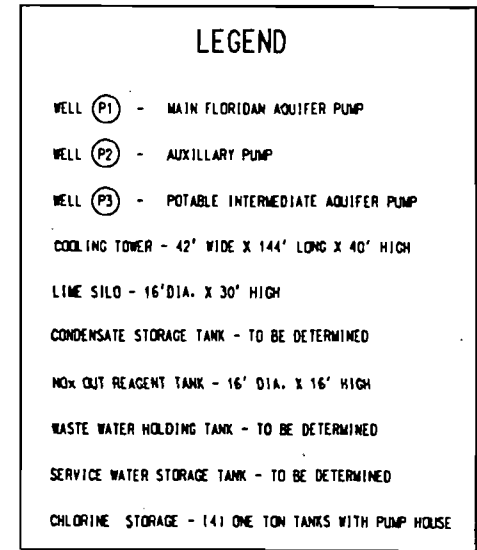
RIDGE GENERATING STATION BOILER
DERIVATION OF EMISSION RATE CALCULATION VARIABLES

VARIABLE ^a	DERIVATION
A	design data
B	design data and expected fuel heating value
C	design data
D	reference 4
E	test data
F	test data
G	basic chemistry
H	basic chemistry
I	design data
J	design data
K	design data
L	design data
M	references 6, 7, 8, 9, 10
N	references 2, 6, 8, 10
O	references 4, 5, 6, 7, 10
P	design data
Q	design data
R	$17 \text{ lb/lb mole} \times \text{lb mole}/358.8 \text{ ft}^3 \text{ (@ } 32 \text{ }^\circ\text{F}) \times (460 + 32 \text{ }^\circ\text{R})/(460 + 170 \text{ }^\circ\text{R}) = 0.037$
S	references 4, 7, 9, 10
T	reference 11
U	references 3, 4
V	reference 11
W	references 4, 8, 9
X	reference 1
Y	references 4,5
Z	reference 4
AA	design data

^a Variable defined in Table B-2.

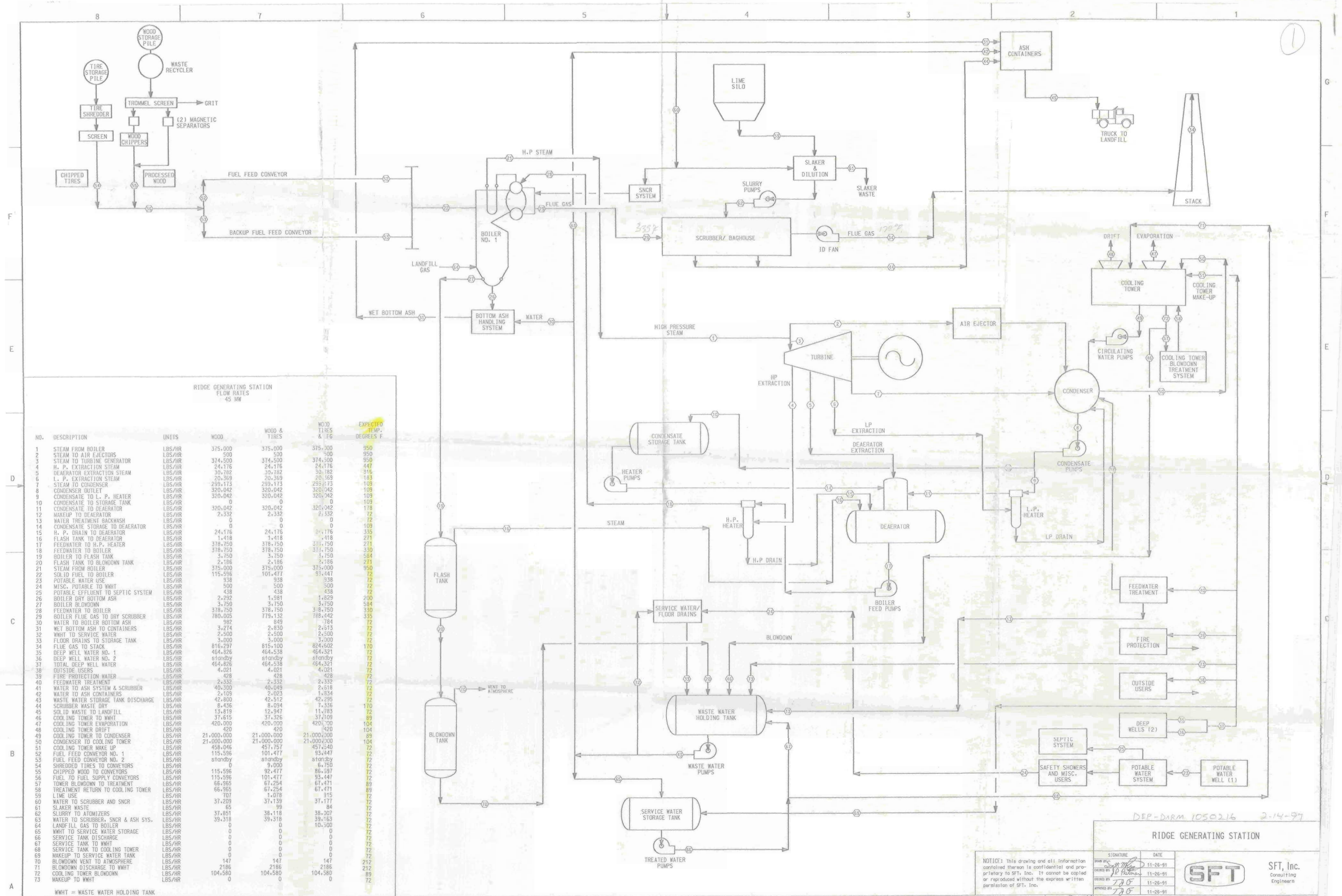
TABLE B-3
(Continued)

1. Caron, A., Messmer, R. and Hoy, D., 1990. Project progress report: the emissions of selected air contaminants from wood-residue fired boilers. In Proceedings of 1990 National Council of the Paper industry for Air and Stream Improvement West Coast Regional Meeting.
2. Dow Corning Corp., 1989. Report of tire chip test burn performed March 9-29, 1989.
3. Environmental Risk Limited, 1989. An application to the Massachusetts Department of Environmental Protection for a 16-MW wood-fired electric generating facility in Westminster, Massachusetts.
4. Environmental Risk Limited, 1991 and 1992. Personal communications with R. Atkins, M. Holzman, and others; and information received from Environmental Risk Limited databases.
5. Galson Technical Services, 1991. Source test report, source emission testing of the wood-fired boiler #1 exhaust stack at the Wheelabrator Shasta Energy Company, Anderson, California.
6. Genesee Generating Station, 1991. Air emission permit application for Genesee Generating Station, Michigan.
7. Grasso, D.T. and Atkins, R.S., Environmental Risk Limited, 1990. The composition of recycled wood fuel and its environmental permitting implications. Presented at the ACA/CIPCA Fourth Annual Meeting and Exposition, Hartford, CT, September 16-17, 1990.
8. Malcolm Pirnie, Inc., 1991. Air emissions associated with the combustion of scrap tires for energy recovery.
9. Oxford Energy Co., 1988. Final emission test report for Modesto Energy Company waste tire to energy facility, Westley, California.
10. Oxford Energy Co., 1990. Stack test report (for the Oxford Energy Company facility at Westley, California, October 9-10, 1990).
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REVISION	1	02-06-92					RIDGE GENERATING STATION
	2	02-06-92					
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			CH'KD:	- -	<u>FOR AIR PERMIT APPLICATION</u>		
			CH'KD:	- -			
			APP'D:	- -			
SFT, Inc. Consulting Engineers							
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NONE		9110-00-00		911000-PPR-008		2	

D:\911000\PS11
BASE SCALE: " = ' -0"



RIDGE GENERATING STATION FLOW RATES 45 MW					
NO.	DESCRIPTION	UNITS	WOOD	WOOD & TIRES	EXPECTED IF AP. DEGREES F
1	STEAM FROM BOILER	LBS/HR	375,000	375,000	375,000
2	STEAM TO AIR EJECTORS	LBS/HR	500	500	500
3	STEAM TO TURBINE GENERATOR	LBS/HR	374,500	374,500	374,500
4	H. P. EXTRACTION STEAM	LBS/HR	24,176	24,176	24,176
5	DEAERATOR EXTRACTION STEAM	LBS/HR	30,782	30,782	30,782
6	L. P. EXTRACTION STEAM	LBS/HR	20,369	20,369	20,369
7	STEAM TO CONDENSER	LBS/HR	299,173	299,173	299,173
8	CONDENSER OUTLET	LBS/HR	320,042	320,042	320,042
9	CONDENSATE TO L. P. HEATER	LBS/HR	320,042	320,042	320,042
10	CONDENSATE TO STORAGE TANK	LBS/HR	0	0	0
11	CONDENSATE TO DEAERATOR	LBS/HR	320,042	320,042	320,042
12	MAKEUP TO DEAERATOR	LBS/HR	2,332	2,332	2,332
13	WATER TREATMENT BACKWASH	LBS/HR	0	0	0
14	CONDENSATE STORAGE TO DEAERATOR	LBS/HR	0	0	0
15	H. P. DRAIN TO DEAERATOR	LBS/HR	24,176	24,176	24,176
16	FLASH TANK TO DEAERATOR	LBS/HR	1,418	1,418	1,418
17	FEEDWATER TO H. P. HEATER	LBS/HR	378,750	378,750	378,750
18	FEEDWATER TO BOILER	LBS/HR	378,750	378,750	378,750
19	BOILER TO FLASH TANK	LBS/HR	3,750	3,750	3,750
20	FLASH TANK TO BLOWDOWN TANK	LBS/HR	2,186	2,186	2,186
21	STEAM FROM BOILER	LBS/HR	375,000	375,000	375,000
22	SOLID FUEL TO BOILER	LBS/HR	115,596	101,477	91,447
23	POTABLE WATER USE	LBS/HR	938	938	938
24	MISC. POTABLE TO WHWT	LBS/HR	500	500	500
25	POTABLE EFFLUENT TO SEPTIC SYSTEM	LBS/HR	438	438	438
26	BOILER DRY BOTTOM ASH	LBS/HR	2,292	1,981	1,829
27	BOILER BLOWDOWN	LBS/HR	3,750	3,750	3,750
28	FEEDWATER TO BOILER	LBS/HR	378,750	378,750	378,750
29	BOILER FLUE GAS TO DRY SCRUBBER	LBS/HR	780,005	779,132	778,442
30	WATER TO BOILER BOTTOM ASH	LBS/HR	989	989	989
31	WET BOTTOM ASH TO CONTAINERS	LBS/HR	3,274	2,830	2,613
32	WHWT TO SERVICE WATER	LBS/HR	2,500	2,500	2,500
33	FLOOR DRAINS TO STORAGE TANK	LBS/HR	3,000	3,000	3,000
34	FLUE GAS TO STACK	LBS/HR	815,100	824,502	824,502
35	DEEP WELL WATER NO. 1	LBS/HR	464,826	464,826	464,826
36	DEEP WELL WATER NO. 2	LBS/HR	standby	standby	standby
37	TOTAL DEEP WELL WATER	LBS/HR	464,826	464,826	464,826
38	OUTSIDE USERS	LBS/HR	4,021	4,021	4,021
39	FIRE PROTECTION WATER	LBS/HR	428	428	428
40	FEEDWATER TREATMENT	LBS/HR	2,332	2,332	2,332
41	WATER TO ASH SYSTEM & SCRUBBER	LBS/HR	40,300	40,049	2,618
42	WATER TO ASH CONTAINERS	LBS/HR	2,109	2,023	1,834
43	WASTE WATER STORAGE TANK DISCHARGE	LBS/HR	42,512	42,512	42,512
44	SCRUBBER WASTE DRY	LBS/HR	8,436	8,094	7,336
45	SOLID WASTE TO LANDFILL	LBS/HR	13,819	12,947	11,783
46	COOLING TOWER TO WHWT	LBS/HR	37,615	37,326	37,109
47	COOLING TOWER EVAPORATION	LBS/HR	420,000	420,000	420,000
48	COOLING TOWER DRIFF	LBS/HR	420	420	420
49	COOLING TOWER TO CONDENSER	LBS/HR	21,000,000	21,000,000	21,000,000
50	CONDENSER TO COOLING TOWER	LBS/HR	21,000,000	21,000,000	21,000,000
51	COOLING TOWER MAKE UP	LBS/HR	458,046	457,757	457,440
52	FUEL FEED CONVEYOR NO. 1	LBS/HR	115,596	101,477	91,447
53	FUEL FEED CONVEYOR NO. 2	LBS/HR	standby	standby	standby
54	SHREDDED TIRES TO CONVEYORS	LBS/HR	0	9,000	6,750
55	CHIPPED WOOD TO CONVEYORS	LBS/HR	115,596	92,477	86,397
56	FUEL TO FUEL SUPPLY CONVEYORS	LBS/HR	115,596	101,477	93,447
57	TOWER BLOWDOWN TO TREATMENT	LBS/HR	66,965	67,471	67,471
58	TREATMENT RETURN TO COOLING TOWER	LBS/HR	66,965	67,254	67,471
59	LIME USE	LBS/HR	707	1,078	315
60	WATER TO SCRUBBER AND SNCR	LBS/HR	37,209	37,139	37,177
61	SLAKER WASTE	LBS/HR	65	65	65
62	SLURRY TO ATOMIZERS	LBS/HR	37,851	38,118	38,007
63	WATER TO SCRUBBER, SNCR & ASH SYS.	LBS/HR	39,318	39,318	39,163
64	LANDFILL GAS TO BOILER	LBS/HR	0	0	10,500
65	WHWT TO SERVICE WATER STORAGE	LBS/HR	0	0	0
66	SERVICE TANK DISCHARGE	LBS/HR	0	0	0
67	SERVICE TANK TO WHWT	LBS/HR	0	0	0
68	SERVICE TANK TO COOLING TOWER	LBS/HR	0	0	0
69	MAKEUP TO SERVICE WATER TANK	LBS/HR	0	0	0
70	BLOWDOWN VENT TO ATMOSPHERE	LBS/HR	147	147	147
71	BLOWDOWN DISCHARGE TO WHWT	LBS/HR	2186	2186	2186
72	COOLING TOWER BLOWDOWN	LBS/HR	104,580	104,580	104,580
73	MAKEUP TO WHWT	LBS/HR	0	0	0

EXETER ENERGY PROJECT

Tires-to-energy plant takes highroad in managing discharges

Building on previous success, this facility converts tires to electric power, recycles solid wastes, and employs a unique wet/dry cooling scheme

Used tires present some of the greatest disposal challenges of any solid waste. In landfills, they rise back to the surface. In above-ground tire piles, they are prone to fires that are close to impossible to control. And, when they lay around haphazardly in yards and backlots, they collect water, allowing vermin and insects to breed. Two billion of them have already accumulated nationwide and 200-million are scrapped annually.

Thus, a facility that screens tires for retreading or recycle, burns fully worn ones either whole or shredded, recycles much of the solid-waste products generated during combustion, maintains today's air-quality emissions standards, and demonstrates new cooling technology, serves both its community and the industry. Moreover, to locate the plant in Connecticut—where siting waste-to-energy plants, however beneficial, takes staying power—is no small feat itself.

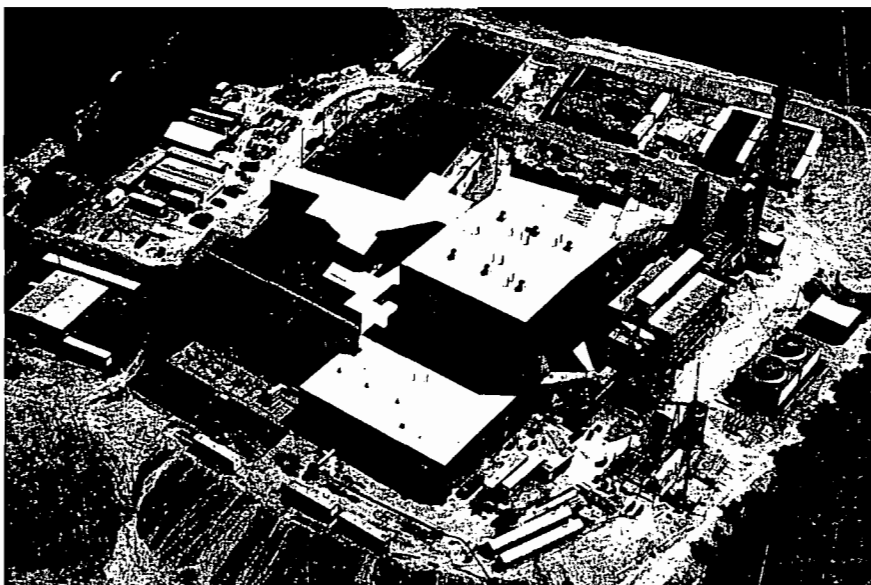
Carving the path

The Exeter Energy Project (Fig 1), Stirling, Conn, is following the trail blazed by Oxford Energy Co, Santa Rosa, Calif, at a similar facility located in Westley, Calif. There, the nation's first whole-tire-to-power facility has been operating for several years meeting very stringent environmental requirements. That 14-MW plant won POWER's Environmental Protection Award in 1988 (POWER, October 1988, p S-24).

Exeter, a 30-MW base-load facility with net output of 26 MW, employs two combustors of essentially the same type used in California, but of twice the capacity. But key differences are:

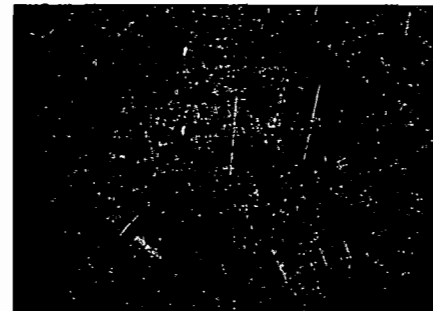
- The first facility is sited adjacent to the world's largest tire dump while Exeter contracts for tires through tipping fees, much like a conventional waste-to-energy plant.

- Exeter also can burn shredded tires (Fig 2).



1. Tires-to-energy facility (above) can eliminate 10-million tires a year, generate 25 MW, and recover zinc for metal processing, gypsum for construction†

2. Shredded tires (right) as well as whole ones are fired by the combustor



- The plant has pioneered a hybrid cooling system.

Controlled tire fire

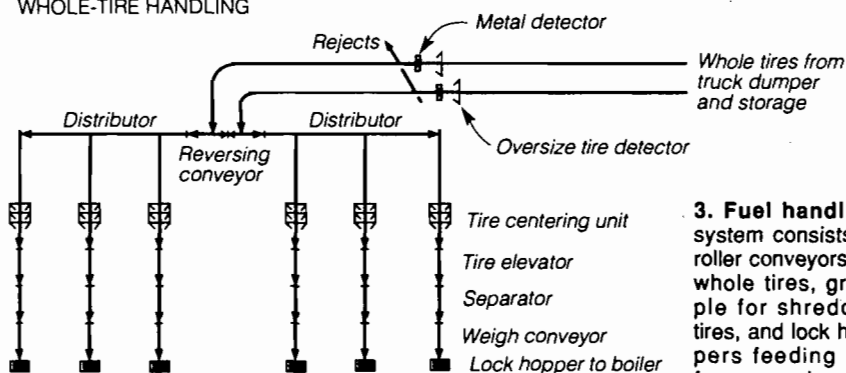
Tires burn on reciprocating grates, each composed of several thousand alloy steel bars that allow air to flow past the fuel. Ash and slag filter through the bars into a wet ash removal system. Around 80 to 100% excess air is used, much of it to cool the grates to below 400F. Temperatures on the grates are around 2500F. Furnace temperatures and steam flow are maintained by regulating tire feed rate.

Whole tires are off-loaded manually (Fig 3) and by truck tipplers and walking floors. From storage bins, they are then fed

to the furnaces by walking floors, roller conveyors, and elevators (Fig 4). Each boiler has three independent reciprocating grates fed by three conveyors. Currently, one boiler handles truck tires, the other auto tires. Single truck tires up to 4-ft diameter × 12-in. width and up to 200 lb can be burned whole. Three auto tires are fed to the grate at one time, but only one truck tire. Truck tires take 20 minutes to burn, auto tires around five minutes.

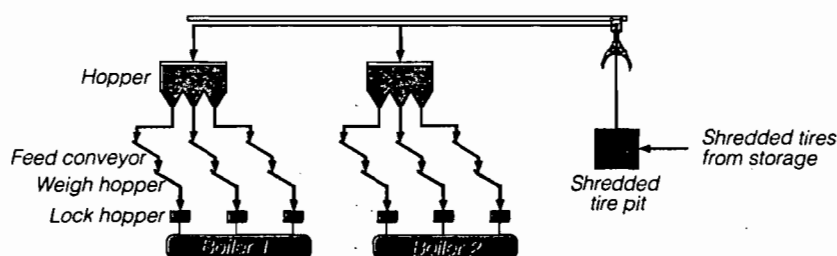
At full load, approximately 30,000 tires

WHOLE-TIRE HANDLING



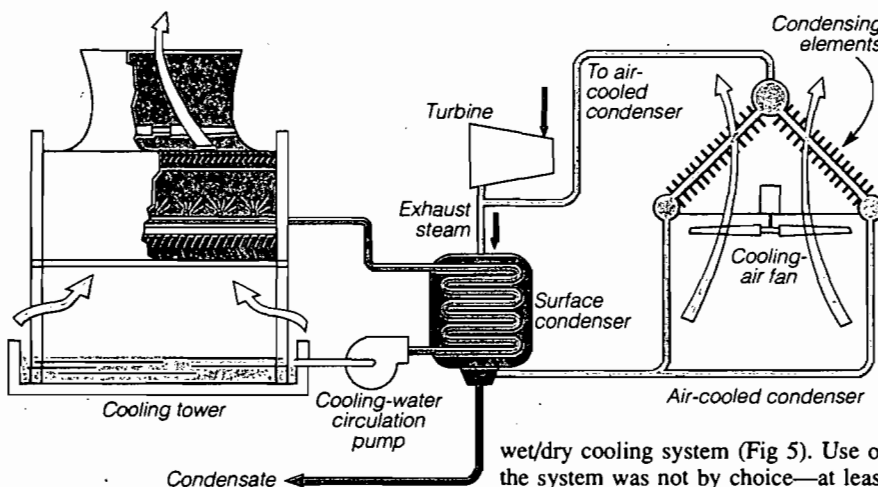
3. Fuel handling system consists of roller conveyors for whole tires, grapple for shredded tires, and lock hoppers feeding the furnace reciprocating grates

SHREDDED-TIRE HANDLING



4. Roller grate conveyors handle tires up to 48 in. in diameter, 200 lb in weight

5. Parallel dry/wet cooling system (right) is optimized to the available water supply, combines air-cooled and surface condensers



wet/dry cooling system (Fig 5). Use of the system was not by choice—at least in the original plant design. What happened was this: Engineers originally sized the plant to be 150% the capacity of the Westley (Calif) facility. As the project progressed, capacity was upped to 200% of Westley. Rather than seek new permits for the added water consumption and delay construction, plant officials sought an innovative solution.

The parallel condensing-type wet/dry system selected includes a surface condenser, a mechanical-draft cooling tower, and an air-cooled condenser. Each is a standard component.

The system permits independent modulation of heat rejection in both wet and dry sections. During operation, pressure in both the surface and air-cooled condensers automatically equilibrates. To illustrate: If water temperature in the surface condenser increases, steam flow to the air-cooled condenser (Figs 6, 7) increases correspondingly, though turbine backpressure increases slightly. This control is accomplished not with active components like valves, but by

are burned daily, or a total of 10-million tires annually. That represents 25% of the total number scrapped in all of New England and is twice the rate of tire accumulation in the state of Connecticut alone.

Average lower heating value of tires is 13,300 Btu/lb. Fuel analysis is: carbon, 71.14%; hydrogen, 5.87%; oxygen, 3.95%; sulfur, 1.6%; and nitrogen, 0.27%. Zinc makes up 1.55% of the fuel, iron 14.55%. Balance of the ash is 0.7%.

Each furnace/boiler produces close to 120,000 lb/hr of 965-psig/932F steam to drive the steam turbine/generator. Boilers are two-drum types with water-cooled membrane walls, primary and secondary superheaters, and one economizer with nine tube banks. To keep heat-transfer surfaces clean, each boiler is equipped with 62 sootblowers.

Auxiliary fuels are propane and No. 2 fuel oil, fired in four burners above the grates. The two propane burners are located

ed on opposite walls and support 30% of the boiler load; two oil burners on the front wall handle 70% of the steam load.

Emissions control

Extensive downstream controls include urea injection for NO_x reduction, a wet lime scrubber for SO₂ removal, a 10-compartment fabric filter for flyash removal when firing tires, and a single-field electrostatic precipitator used primarily during oil firing. CO emissions are limited by the automatic combustion controls.

All of the above air emissions are monitored continuously. Limits are as follows: NO_x, 0.12 lb/million Btu; SO₂, 0.109 lb/million Btu; CO, 0.167 lb/million Btu; and opacity, 10% or less. Note that dioxins and furans are not a concern at this waste-to-energy facility because tires contain little chlorine.

Around 25% of the input weight of the tires results in solid waste. According to

plans, bottom ash will be recycled to the Portland cement industry as a concrete filler or used in road construction; flyash, containing up to 50% zinc, will be sold to metal refiners for zinc recovery; and gypsum from the SO₂ scrubber will be recycled to wallboard manufacturers or used as soil conditioner, depending on its quality, market conditions, etc.

Note: To make the flyash attractive for resale, the 12% carbon it contains is driven off in a calciner. Final carbon content is less than 1%. Gypsum is dewatered first in a hydraulic cyclone to 40% moisture, then dried in a basket centrifuge to a maximum of 6% moisture.

Water management

Exeter cascades water used in the plant. To illustrate: Boiler blowdown is directed to the cooling tower, cooling-tower blowdown is used in the scrubber, and scrubber blowdown is treated in an evaporator/crystallizer unit prior to final discharge.

But the centerpiece of Exeter's water management is the novel combination

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transmission and distribution systems,
identifying existing capability and
construction plans; (3) names and
addresses of major utilities, plus
telephone, telex, and fax numbers; (4)
names/titles of top utility executives; (5)
listings of individual plants 100 MW
and larger identifying location,
capacity, type of generation, and fuel—
as well as other pertinent information.

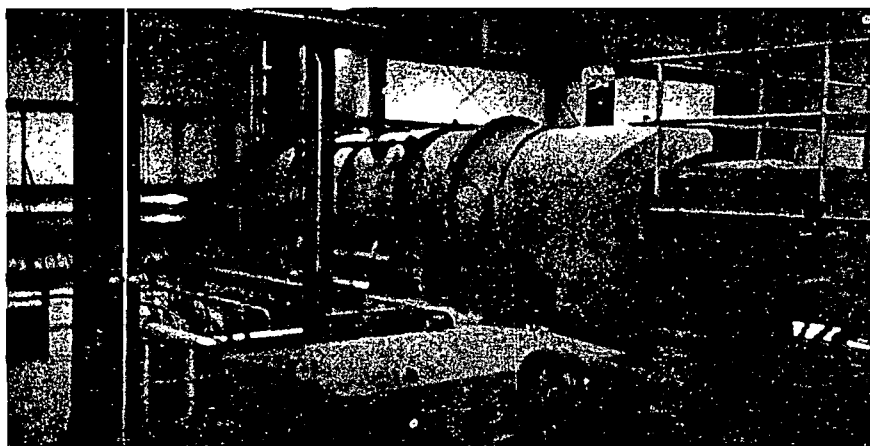
Maps show key facilities for all
countries with a demand greater than
500 MW. Directory also includes a
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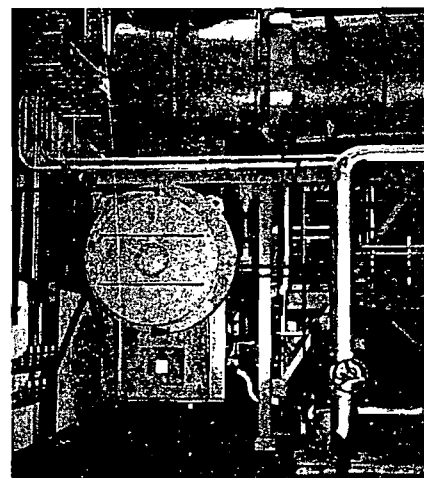


6, 7. Steam exiting turbine proceeds to
tee (above) that splits flow between the air-
cooled condenser (right) and the surface
condenser, depending on ambient
conditions, etc

varying the air flow through the cooling-
tower and air-cooled-condenser fans.

Control logic follows two parallel paths.
Primary feedback for air-cooled-condenser
control is steam-turbine condensing pres-
sure. The two-speed fan drives are
sequenced to maintain the selected back-
pressure, limited only by the thermal
capacity of the air-cooled condenser. At
sub-freezing temperatures, auxiliary func-
tions are activated which supercede the
pressure control if excessive subcooling of
the condensate occurs.

For the cooling tower—the surface con-
denser is treated as a passive extension of
the cooling tower—primary feedback
parameter is basin level. It modulates vari-
able-frequency motor drives, connected to



the fans, and the makeup water flow-con-
trol valves. When cooling-tower capacity
exceeds the available makeup water, basin
level falls below the control point and fan
speed, and evaporation is reduced accord-
ingly.

Jason Makansi

Major equipment suppliers

Fuel handling equipment	Kinergy Corp.
Combustion system	Standardkessel GmbH (Lambton stoker)
Steam generator	Zurn Industries Inc.
Burner management system	Honeywell Inc. (See our ad, p 95)
Boiler controls	Bailey Controls Co (See our ad, p 108)
Sootblowers	Diamond Power Specialty Co
Bottom-ash handling system	Zurn Industries Inc.
Diesel generator	Onan Corp., Cummins/Onan
Steam turbine/generator	General Electric Co
Turbine/generator controls	Woodward Governor Co (See our ad, p 34-35)
Integrated plant controls	Bailey Controls Co (See our ad, p 108)
Air heater	Standardkessel GmbH
Fans	Zurn Industries Inc.
Stack	Warren Environmental Inc.
Cooling tower	Thermal Dynamic Towers Inc.
Condensate, circulating-water pumps	BW/IP International Inc.
Air-cooled condenser	GEA Power Cooling Systems Inc (See our ad, p 153)
Surface condenser	Joy Power Products Inc, Ecolaire Condenser (See our ad, p 83)
Feedwater heaters	Southwestern Engineering Co
Boiler-feed pump	Sulzer Bingham Pumps Inc
Fabric filter	General Electric Environmental Services Inc.
Electrostatic precipitator	General Electric Environmental Services Inc.
Wet scrubber	General Electric Environmental Services Inc.
Flyash handling equipment	AshTech Corp.
DeNO _x system	Nalco/FuelTech
Limestone handling/preparation	Portec Inc.
Critical valves	Velan Valve Corp., Fisher Controls International Inc, Crosby Valve & Gage Co
Major pumps	Warman International Inc, Goulds Pumps Inc (See our ad, p 18-19)
Compressors	Cooper Industries, Industrial Machinery
Large motors	Siemens Energy & Automation Inc.



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June 11, 1992

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Resources Management

Mr. John Reynolds
State of Florida
Department of Environmental Regulations
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Dear John,

As we discussed, enclosed is a copy of an article on the Exeter Energy Project tire-burning facility in Sterling, CT.

If we can provide you with more information, please call.

Sincerely,

NALCO FUEL TECH

A handwritten signature in cursive script, reading "E. J. Capriotti".

E. J. Capriotti

EJC:ib
Encl.

RIDGE GENERATING STATION, L. P.

General Partners



DECKER ENERGY-RIDGE, INC.  WHEELABRATOR POLK INC.

400 North New York Avenue, Suite 101
Winter Park, Florida 32789
Tel. 407-628-8900
Fax. 407-628-8535

March 27, 1992

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Florida Department of Environmental Regulation
Division of Air Resources Management
Twin Towers Office Building
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Tallahassee, FL 32399-2400

Attention: C. H. Fancy, P.E.
Chief, Bureau of Air Regulation

Re: Permit Application AC 53-206244, PSD-FL-183
Ridge Generating Station

Dear Mr. Fancy:

The letter from your office dated January 17, 1992, raised six questions regarding the air emissions permit application for the Ridge Generating Station project. Our letter to you dated March 19, 1992, provided responses to the first five of these questions. A summary response to the sixth question is provided below (along with a repetition of the question for your convenience). We have scheduled a meeting on April 1, 1992, with Tom Rogers and Cleve Holladay of the Air Modeling and Assessment Section to discuss our response in detail. A written detailed response will also be provided.

6. The predicted maximum SO₂ 24-hour and 3-hour concentrations in the Chassahowitzka PSD Class I area due to the Ridge Generating Station boiler emissions are greater than the National Park Service proposed 24-hour and 3-hour significant impact levels of 0.07 and 0.48 µg/m³, respectively. Please perform a cumulative 24-hour and 3-hour SO₂ Class I increment analysis as required by the National Park Service. An air quality related values (AQRVs) analysis should also be done since there are presently no significant impact levels that exempt a proposed PSD project from performing this analysis. The AQRVs analysis includes impacts to soils, vegetation, and wildlife.

ADDITIONAL AIR QUALITY MODELING ANALYSIS

An additional analysis of SO₂ impacts at the Chassahowitzka PSD Class I area has been developed. This additional impact analysis is based on the use of the standard ISCST model and a long-range transport model, the MESOPUFF II model. The following

Mr. C. H. Fancy
March 27, 1992
Page 2

conclusions result from this additional analysis: (1) Predicted maximum 3-hour SO_2 concentrations at the Chassahowitzka PSD Class I area due to Ridge Generating Station (RGS) emissions are less than the proposed National Park Service significant impact level of $0.48 \mu\text{g}/\text{m}^3$. (2) Predicted maximum 24-hour SO_2 concentrations due to RGS emissions exceed the proposed National Park Service significant impact level of $0.07 \mu\text{g}/\text{m}^3$, but only on a very infrequent basis. Furthermore, during the meteorological conditions when RGS emissions result in concentrations above the proposed significant impact level, the cumulative predicted maximum 24-hour concentrations due to all PSD sources identified by DER are less than the PSD Class I increment. Therefore, RGS emissions neither cause nor contribute to a violation of the PSD Class I increment at the Chassahowitzka PSD Class I area.

AIR QUALITY RELATED VALUES ANALYSIS

An air quality related values analysis has also been developed. The conclusions reached from this analysis are that the RGS project (1) will not diminish the national significance of the Chassahowitzka National Wilderness Area (which comprises the PSD Class I area), (2) will not impair the quality of the visitor experience at this area, and (3) will not impair the structure and functioning of the ecosystems within the area.

Please contact Matt Killeen at 1-800-682-0026 if you have any questions or comments.

Sincerely,



Richard C. Stone
Project Manager

MPK118:cjb

cc: John Reynolds - FDER
Cleve Holladay - FDER
Matt Killeen - WESI
Macauley Whiting - Decker

BEST AVAILABLE COPY

For WED 10/23/91
MFG WITH LITTLERIDGE GENERATING STATION
AIR EMISSIONS PERMIT PRE-APPLICATION MEETING

A. PROJECT DESCRIPTION

1. Project Name -- Ridge Generating Station
2. Project Owner -- Ridge Generating Station Limited Partnership,
by: Decker Energy - Ridge, Inc., General Partner
3. Location -- Polk County, approximately 5 miles east of Lakeland
(see attached map)
4. Key Features

Electric generating capacity -- 39.6 MW.

One boiler.

Primary boiler fuel -- wood waste and scrap tires; boiler will be capable of firing with 100% wood or a wood/tire mixture containing up to 20% tires on a heat input basis.

Auxiliary boiler fuel -- natural gas or propane for startup purposes only. Boiler heat input -- 630 million Btu's per hour at 100% of maximum continuous rating (MCR).

Boiler fuel consumption at 100% MCR -- 55.4 tons per hour on 100% wood; 48.8 tons per hour on mix of 80% wood/20% tires.

5. Air Emission Characteristics (Preliminary)

- Boiler emission controls -- (1) electrostatic precipitator with multiclone for particulate matter; (2) selective noncatalytic reduction for nitrogen oxides; (3) **no controls for sulfur dioxide.**
- Boiler emission rate estimates assuming continuous operation at 100% MCR and assuming continuous use of 80% wood/20% tires fuel mix:

PM/PM ₁₀ --	55 tons-per year	8760 hrs/yr?	controlled?
SO ₂ --	1,608	$2.02 \times 10^6 \text{ lb/yr} = 630(10^6 \text{ Btu/hr}) \times 0.2$	
NO _x --	414	$= 2.9 \text{ lb/100 Btu uncontrolled}$	
CO --	828	0.3 lb/100 Btu	
VOC's --	97	0.03 lb/100 Btu	
Ammonia --	76	SNCR -- 400 ppm	
HCl --	163		
Lead --	1		

- Minor emission sources -- fuel and ash handling equipment (including silos), diesel-driven fire pump, diesel storage tank, cooling tower.

NO_x = 15 lb/mm Btu -- NH₃ or Urea
SNCR: continuous catalyst
PM = 0.02 lb/mm Btu

WOOD HV = 8,000 BTU/lb
10,000

Modesto: 6 TPH Tires
12 MW
Deriv: 9.76 TPH
39.6(2) MW

630(2) = 126 MM Btu/hr

48.8(2) = 9.76 TPH Tires

HV = $\frac{126}{9.76} = 12.9 \text{ MM Btu/hr}$
 $= 6,455 \text{ Btu/lb}$

40(10)⁶ waste heat x 3.413 = 136.540
630(10)⁶
Therm. Eff = 0.21

Tires 10% weight basis?
Nat Gas for startup?

NSPS
PM: 0.3 lb/100 Btu
39.6 reduction
20% reduction
NSPS
SO₂: 0.3 lb/100 Btu
10% reduction
NSPS
NO_x: 0.3 lb/100 Btu
65% reduction

Modesto Tire Test
SO₂ = 0.01 lb/100 Btu (controlled)
vs. Decker (uncontrolled) @
2400 TPH 42004 → 1800 TPH SO₂

Modesto Control Systems
• Thermal de-NO_x (NH₃ injection)
• Baghouse
• Lime Slurry Scrubber (SO₂)

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B. DISCUSSION ITEMS

1. Primary DER Contacts *Reynolds-BACT
Holladay - Modeling*
2. Best Available Control Technology
 - NO_x control.
 - PM/metals control.
 - SO₂ control.
 - CO and VOC's control.
3. Modeling
 - Need for revision of modeling protocol submitted to DER when project was planned for municipal waste combustion.
 - Confirmation of meteorological data (1982 - 1986 Tampa).
 - Any significant changes in emission inventory previously obtained from DER in July.
 - Boiler load levels to evaluate (100%, 75%, 50%).
 - PSD Class I modeling (Chassahowitzka National Wilderness Area).
 - Need for fugitive emissions assessment.
4. Preconstruction Monitoring Exemption *Background conc. SO₂*
5. Toxic Air Pollutant Impact Assessment *Class I - Chassahowitzka*
6. Need for Coordination with EPA (on BACT) or USFWS/NPS (on PSD Class I) *- Compare modeling results with
No threat levels*
7. Permit Application Review Procedures and Schedule
 - Completeness review.
 - Likelihood of public hearing.
 - Estimated schedule for permit issuance. →
8. Any Other Recent Wood-Burning or Tire-Burning Examples in Florida *No
Permits*
Stone Container considering

*EPA's
R31C Assessment
Screening
Procedure*

*ambient state
micrometeorological
background levels*

*ISC-ST
Screening* → *MesoPuff
Long Range
Transport
beyond 50 km*



State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

For Routing To Other Than The Addressee	
To _____	LOCATION _____
To _____	LOCATION _____
To _____	LOCATION _____
From _____	Date _____

Interoffice Memorandum

TO: Tom Rogers
John Reynolds ✓
Cleve Holladay
Barry Andrews

John
See me!
Preston

FROM: Preston Lewis

DATE: October 17, 1991

SUBJ: Pre-Application Meeting with Decker Energy - Proposed
wood/tires combustor

Jim Little, Dames and Moore, has requested a Pre-application meeting with DER to discuss the above project. Previously, this proposal was being reviewed for site certification as a resource recovery facility. The project is being revised to burn wood and tires and reviewed as a PSD source. They would like to discuss some specific questions concerning data, analysis and modeling that should be included in the application and report.

This meeting will be held At 2:00 PM in Room 350 Wed. 10/23/91.

Should you have a problem fitting this in your schedule, see me.

BEST AVAILABLE COPY

Date Submitted _____

RACT/BACT/LAER CLEARINGHOUSE
INPUT FORM

Facility Information

Company Name: WHEELABRATOR RIDGE ENERGY, INC. - PSD-FL-183Facility Address: 3131 K-VILLE AVENUECity: AUBURNDALECounty: POLKZip Code: 33823Agency Contact: JOHN REYNOLDSTelephone Number: 904-488-1344Permit Number: PSD-FL-183

(AIRS Facility Number)

brackets indicate input is optional

SIC Code: 4911Public Hearing Held? Y (N)The Source is: New Modified (circle one)

Notes: _____

Scheduling Information:

Est. Date

Actual Date

(Received Application):

/ /

/ /

(Control Tech. Determination):

/ /

/ /

(Air Quality Impact Analysis):

/ /

/ /

(Other Impact Analysis):

/ /

/ /

(Draft Permit):

/ /

/ /

(Public Notice):

/ /

/ /

(Permit Issued):

/ /

/ /

(Start Construction):

/ /

/ /

(Start Up):

/ /

/ /

(Compliance Verification):

/ /

/ /

☐ Notes Continued on a Separate Page ^a

Process Information

BLIS Process Code: _____

SCC Code: 10100903Process Description: Waste Fuel Boiler / Power GenerationThroughput Capacity/Size: 630 MM 300 / 50 MWPrimary Fuel: 60% WOOD / 40% TIRESCompliance Verified? (Y)

By What Method? (circle those that apply):

Stack Test? (Y)

N

Other Test? (Y)

N

Inspection? Y

N

Calculation? Y

N

* See List
*** cite EPA reference method
or other method for
compliance

VE - Method 9

*** Description: SO₂ - CEMSNO_x - CEMS

CO - CEMS

Process / Compliance Notes: _____

Pollutant Information

** see list for unit

Company: WHEELABRATOR - RIDGE ENERGY, INC.

Pollutant Name: SO₂, NO_x, CO, VOC, PM/PM₁₀ VE

(CAS Number): _____

Emission Limit: Primary: 65 lb/hr 90^{lb}/hr 200^{lb}/hr 22.1^{lb}/hr 0.0080 SNCR Fabric Filter

(Alternative): _____

RBLC Std.: 65 lb/hr 90^{lb}/hr 200^{lb}/hr 22.1^{lb}/hr

Emission Type? (circle one): area point fugitive

(No. of Pollution Reduction Options Examined) _____

(Rank of Pollution Reduction Option Selected) _____

Basis of Limit (circle one):

BACT-PSD BACT-Other
LAER MACT GACT RACT
NSPS NESHAPS OTHER

Pollution Reduction Method Description:

- ☐ Pollution Prevention (P2) ☐ Both P2 and Add-on
☒ Add-on Control Device ☒ No Controls Feasible

Pollution Prevention/Add-on Control Equipment Description: Lime Spray Dryer-Absorber

10% SNCR Fabric Filter

90/50

10%

Overall % Efficiency: _____

Cost Info: Capital Costs: _____

O & M Costs: _____

Annualized Costs: _____

Cost Effectiveness: _____

Costs are in _____ dollars (year)

(Costs verified by Agency? Y N)

Pollutant Name: Hcl Hg Pb Be

(CAS Number): _____

Emission Limit: Primary: 5^{lb}/hr 0.022^{lb}/hr 0.25^{lb}/hr 0.0063^{lb}/hr

(Alternative): _____

RBLC Std.: 5^{lb}/hr 0.022^{lb}/hr 0.25^{lb}/hr 0.0063^{lb}/hr

Emission Type? (circle one): area point fugitive

(No. of Pollution Reduction Options Examined) _____

(Rank of Pollution Reduction Option Selected) _____

Basis of Limit (circle one):

BACT-PSD BACT-Other
LAER MACT GACT RACT
NSPS NESHAPS OTHER

Pollution Reduction Method Description:

- ☐ Pollution Prevention (P2) ☐ Both P2 and Add-on
☐ Add-on Control Device ☒ No Controls Feasible

Pollution Prevention/Add-on Control Equipment Description: _____

Overall % Efficiency: _____

Cost Info: Capital Costs: _____

O & M Costs: _____

Annualized Costs: _____

Cost Effectiveness: _____

Costs are in _____ dollars (year)

(Costs verified by Agency? Y N)



Florida Department of Environmental Regulation

Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400

Lawton Chiles, Governor

Carol M. Browner, Secretary

June 22, 1992

CERTIFIED MAIL-RETURN RECEIPT REQUESTED

Mr. Macauley Whiting, Jr., President
Decker Energy - Ridge, Inc.
P.O. Box 2397
Winter Park, Florida 32790

Dear Mr. Whiting:

Attached is one copy of the Technical Evaluation and Preliminary Determination and proposed permit for Ridge Generating Station to construct a wood/tire burning power generation facility near Auburndale, Polk County, Florida.

Please submit any written comments you wish to have considered concerning the Department's proposed action to Mr. Preston Lewis of the Bureau of Air Regulation.

Sincerely,

for H. Fancy, P.E.
H. Fancy, P.E.
Chief
Bureau of Air Regulation

CHF/JR/plm

Attachments

c: W. Thomas, SWD
R. Anders, Polk County
J. Harper, EPA
C. Shaver, NPS
T. Fitzpatrick, P.E.
M. Killeen, WESI
J. Little, D&M
R. Stone, RGS

6/29/92

Cond. No. 8
Testing should be at
100% permitted capacity
and burning 4500 lbs.
tires per hr.

MS

PERMITTEE:
Ridge Generating Station, L.P.

Permit Number: AC 53-206244
PSD-FL-183
Expiration Date: December 31, 1994

SPECIFIC CONDITIONS:

8. Cont'd	<u>Pollutant</u>	<u>Test Method</u>
	CO	10
	VOC	25
	HCL	26
	Hg	101A
	Pb	12
	Be	104

9. As part of the initial compliance requirement, the permittee shall sample the RGS boiler stack for the following pollutants after proposing acceptable test methods to the Department's Bureau of Air Regulation in Tallahassee. The results of these additional tests shall be reported in lbs/hr and ug/m3 along with the initial compliance test results: Ammonia, Arsenic, Cadmium, Chromium (total), Chromium VI, Zinc Oxide, Benzene, Sulfuric Acid, Polychlorinated Biphenyls (PCBs), Dioxins/Furans.

10. Continuous monitoring equipment shall be installed and operated to measure and record generator output, furnace temperature, stack opacity, and SO₂, NO_x and CO emissions. The tire feed rate in pounds per hour shall be monitored continuously by a commercially available weight detecting system with recording capability. The tire feed rate data shall be maintained and provided to the Department upon request.

11. Fugitive emissions from the RGS material receiving, processing, storage and transfer operations shall be determined according to EPA Method 22 over a 3-day period that is representative of typical operation. Results of the fugitive emissions survey shall be reported along with the compliance test results.

12. All reasonable precautions set forth in F.A.C. Rule 17-2.610(3), as well as all measures proposed by the permittee in the application, shall be taken by the permittee to prevent fugitive emissions.

13. In the event of any malfunction resulting in failure of emission control equipment or emission-related process equipment to perform as required by this permit, the operator shall immediately stop the feeding of tires into the boiler and shall use propane firing to maintain a minimum of 1800 degrees F in the combustion zone until all tires in the system have been combusted. No tires

PERMITTEE:
Ridge Generating Station, L.P.

Permit Number: AC 53-206244
PSD-FL-183
Expiration Date: December 31, 1994

SPECIFIC CONDITIONS:

5. The RGS boiler exhaust gases shall not exceed the following limits:

<u>Pollutant</u>	<u>Basis (lb/MMBTU)</u>	<u>Lbs/hr</u>	<u>Tons/yr</u>
PM/PM ₁₀	0.02	12.6	55.2
SO ₂	0.10	63.0	275.9
NO _x	0.11	69.3	303.5
CO	0.21	132.3	579.5
VOC	0.035	22.1	96.6
HCL	0.008	5.0	22.1
Hg	0.000035	0.022	0.1
Pb	0.0004	0.25	1.1
Be	0.00001	0.0063	0.03

The feasibility of establishing rolling average limits in addition to or in lieu of the above limits will be determined after analysis of compliance test data.

6. SNCR chemical injection into the boiler exhaust gases shall be provided by an automated control system as described in the application. Ammonia emissions shall be continuously monitored at a prevailing downwind location on the RGS property line by commercially available ambient monitoring equipment. The monitoring data shall be reported for the entire operating period from startup to the time that the initial compliance test results are submitted. Thereafter, the monitoring data shall be stored and made available to the Department upon request.

7. Visible emissions from the RGS boiler stack, the ash handling system, and the lime silo shall not exceed 10 percent opacity.

8. Before this construction permit expires, the RGS facility shall be tested for compliance with the emission limits and other requirements specified herein. Annual compliance tests shall be carried out each year thereafter. The compliance tests shall be conducted at 100 percent of permitted capacity. The following EPA test methods shall be followed:

<u>Pollutant</u>	<u>Test Method</u>
PM/PM ₁₀	5 (front half only)
SO ₂	6C
NO _x	7E



Jeb Bush
Governor

Department of Environmental Protection

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

March 31, 1999

David B. Struhs
Secretary

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. George D. Woodward
Plant Manager
Wheelabrator Ridge Energy, Inc.
3131 K-Ville Avenue
Auburndale, Florida 33823

RE: DEP File No. AC53-206244 (PSD-FL-183A)
Permit Modifications

Dear Mr. Woodward:

This is in response to your letter dated February 19, 1999 requesting changes to the subject construction permit. The Department considered the requests and agrees to modify the permit conditions as indicated below. The request for averaging maximum megawatt production on a 24-hour basis was not approved due to the fact that short-term operation above the permitted output could result in excessive short-term emissions. Averaging the tire feed rate daily was allowed due to the variability in instrumentation sensitivity, however, the megawatt output is not subject to such instrumentation variability. Visible emissions tests by EPA Method 9 must be done annually since calibration of the COMS can vary as well. The permit is hereby modified as shown below:

SPECIFIC CONDITION NO. 3:

Fuel for firing the RGS boiler shall consist only of wood, yard waste, landfill gas, and tires. ~~up to 16.1 percent tires (percent by weight equivalent to 40 percent tires based on heat content and. The tire firing rate shall be limited to 18,505 pounds of tires per hour, based on a 24-hour block average). The 16.1 percent tire weight limitation is equivalent to a tire firing rate of 18,505 pounds of tires per hour.~~ Propane may be used as a startup, shutdown, and combustion stabilization fuel and shall not exceed an annual capacity factor of 10 percent of total heat input. [Rule 62-210.200(223), F.A.C.]

SPECIFIC CONDITION NO. 5:

The RGS boiler exhaust gases shall not exceed the following limits [Rule 62-212.400, F.A.C.]:

Pollutant	lbs/hr	tons/yr	Basis for Compliance
SO ₂	65.0	284.7	30-day rolling average CEMS
NO _x	90.0	394.2	30-day rolling average CEMS
CO	200.0	876.0	30-day rolling average CEMS
VOC	22.1	96.8	EPA Method 25A if test required
HCl	5.0	21.9	EPA Method 26 <u>or</u> 26A if test required
Hg	0.022	0.096	EPA Method 29 <u>or</u> 101A if test required
Pb	0.25	1.1	EPA Method 12 <u>or</u> 29 if test required
Be	0.0063	0.028	EPA Method 104 if test required
VE	10% opacity		EPA Method 9 - annual
PM/PM ₁₀	0.0080 gr/SCF (corrected to 7% O ₂)		EPA Method 5 if test required

SPECIFIC CONDITION NO. 6:

Visible emissions from the ~~ash handling area vent filter, the lime silo vent filter, and the fuel transfer building vent filter~~ shall not exceed 10 percent opacity. [Rule 62-212.400, F.A.C.]

A person whose substantial interests are affected by the proposed permitting decision may petition for an administrative proceeding (hearing) under Sections 120.569 and 120.57 of the Florida Statutes. The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station #35, Tallahassee, Florida, 32399-3000. Petitions filed by the permit applicant or any of the parties listed below must be filed within fourteen days of receipt of this notice of intent. Petitions filed by any persons other than those entitled to written notice under Section 120.60(3) of the Florida Statutes must be filed within fourteen days of publication of the public notice or within fourteen days of receipt of this notice of intent, whichever occurs first. Under Section 120.60(3), however, any person who asked the Department for notice of agency action may file a petition within fourteen days of receipt of that notice, regardless of the date of publication. A petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. The failure of any person to file a petition within the appropriate time period shall constitute a waiver of that person's right to request an administrative determination (hearing) under Sections 120.569 and 120.57 F.S., or to intervene in this proceeding and participate as a party to it. Any subsequent intervention will be only at the approval of the presiding officer upon the filing of a motion in compliance with Rule 28-106.205 of the Florida Administrative Code.

A petition that disputes the material facts on which the Department's action is based must contain the following information: (a) The name and address of each agency affected and each agency's file or identification number, if known; (b) The name, address, and telephone number of the petitioner, the name, address, and telephone number of the petitioner's representative, if any, which shall be the address for service purposes during the course of the proceeding; and an explanation of how the petitioner's substantial interests will be affected by the agency determination; (c) A statement of how and when petitioner received notice of the agency action or proposed action; (d) A statement of all disputed issues of material fact. If there are none, the petition must so indicate; (e) A concise statement of the ultimate facts alleged, as well as the Rules and statutes which entitle the petitioner to relief; and (f) A demand for relief.

A petition that does not dispute the material facts upon which the Department's action is based shall state that no such facts are in dispute and otherwise shall contain the same information as set forth above, as required by Rule 28-106.301

Because the administrative hearing process is designed to formulate final agency action, the filing of a petition means that the Department's final action may be different from the position taken by it in this notice. Persons whose substantial interests will be affected by any such final decision of the Department on the application have the right to petition to become a party to the proceeding, in accordance with the requirements set forth above. Mediation is not available in this proceeding.

In addition to the above, a person subject to regulation has a right to apply for a variance from or waiver of the requirements of particular Rules, on certain conditions, under Section 120.542 F.S. The relief provided by this state statute applies only to state Rules, not statutes, and not to any federal regulatory requirements. Applying for a variance or waiver does not substitute or extend the time for filing a petition for an administrative hearing or exercising any other right that a person may have in relation to the action proposed in this notice of intent.

The application for a variance or waiver is made by filing a petition with the Office of General Counsel of the Department, 3900 Commonwealth Boulevard, Mail Station #35, Tallahassee, Florida 32399-3000. The petition must specify the following information: (a) The name, address, and telephone number of the petitioner; (b) The name, address, and telephone number of the attorney or qualified representative of the petitioner, if any; (c) Each Rule or portion of a Rule from which a variance or waiver is requested; (d) The citation to the statute underlying (implemented by) the Rule identified in (c) above; (e) The type of action requested; (f) The specific facts that would justify a variance or waiver for the petitioner; (g) The reason why the variance or waiver would serve the purposes of the underlying statute (implemented by the Rule); and (h) A statement whether the variance or waiver is permanent or temporary and, if temporary, a statement of the dates showing the duration of the variance or waiver requested.

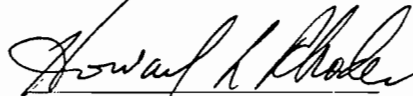
Mr. George D. Woodward
March 31, 1999
Page 3

The Department will grant a variance or waiver when the petition demonstrates both that the application of the Rule would create a substantial hardship or violate principles of fairness, as each of those terms is defined in Section 120.542(2) F.S., and that the purpose of the underlying statute will be or has been achieved by other means by the petitioner.

Persons subject to regulation pursuant to any federally delegated or approved air program should be aware that Florida is specifically not authorized to issue variances or waivers from any requirements of any such federally delegated or approved program. The requirements of the program remain fully enforceable by the Administrator of the EPA and by any person under the Clean Air Act unless and until the Administrator separately approves any variance or waiver in accordance with the procedures of the federal program.

A copy of this letter shall be filed with the referenced permit and certification and shall become part of the permit.

Sincerely,



Howard L. Rhodes, Director
Division of Air Resources
Management

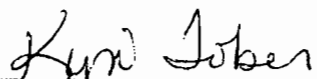
CERTIFICATE OF SERVICE

The undersigned duly designated deputy agency clerk hereby certifies that this Permit Modification was sent by certified mail (*) and copies were mailed by U.S. Mail before the close of business on 4-6-99 to the person(s) listed:

George D. Woodward, WESI *
Matt Killeen, WESI
Bill Thomas, SWD
Joe King, Polk County
Gregg Worley, EPA
John Bunyak, NPS

Clerk Stamp

FILING AND ACKNOWLEDGMENT FILED, on this date, pursuant to §120.52, Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.


(Clerk)

4-6-99
(Date)

INTEROFFICE MEMORANDUM

Date: 09-Apr-1999 01:15pm
From: r.cawkwell
r.cawkwell@worldnet.att.net@PMDF@EPIC66
Dept:
Tel No:

To: John Reynolds TAL 850/921-9536 (REYNOLDS_J@A1@DER)

Subject: Re: Wheelabrator-Ridge Energy

John:

I talked to Jerry yesterday and he does not have a copy of the modified PSD permit for Wheelabrator-Ridge Energy. Is it possible to e-mail me a copy or fax or mail a copy to me?

My fax number is 702-837-5368

Address is 321 Pleasant Summit Drive
Henderson, NV 89012

> Roger, the modification was mailed last week. We did not agree to the request
> to average megawatts over 24-hours due to the possibility of excess short-term
> emissions. We made minor changes to the language on the percentage of tires to
> eliminate the 16.1 percent while maintaining the 18,505 pounds/hour limit. The
> other requests concerning the elimination of emission points no longer used
and
> the updating of test methods were granted.
>

INTEROFFICE MEMORANDUM

Sensitivity: COMPANY CONFIDENTIAL

Date: 07-Apr-1999 09:46am
From: John Reynolds TAL
REYNOLDS_J
Dept: Air Resources Management
Tel No: 850/921-9536

To: r.cawkwell@worldnet.att.net@in

Subject: Wheelabrator-Ridge Energy

Roger, the modification was mailed last week. We did not agree to the request to average megawatts over 24-hours due to the possibility of excess short-term emissions. We made minor changes to the language on the percentage of tires to eliminate the 16.1 percent while maintaining the 18,505 pounds/hour limit. The other requests concerning the elimination of emission points no longer used and the updating of test methods were granted.

INTEROFFICE MEMORANDUM

Date: 07-Apr-1999 02:37am
From: Roger Cawkwell
r.cawkwell@worldnet.att.net@PMDf@EPIC66
Dept:
Tel No:

To: REYNOLDS_J (REYNOLDS_J@A1@DER)
CC: Kissel_g (Kissel_g@A1@TPA1)

Subject: Title V Permit for Ridge Generating Station (1050216)

Dear John:

I am working on the Draft Title V permit for Ridge Generating Station (Wheelabrator Ridge Energy) from my remote site south of Las Vegas (Henderson) and I had a few questions about Wheelabrator's request to modify their PSD permit. On February 19, 1999, Wheelabrator requested to revise four conditions in PSD Permit No.: AC53-206244/PSD-FL-183. The main concern is changing Specific Condition No. 2. From: The RGS facility shall be allowed to operate at a maximum capacity of 50 Megawatts.

To: The RGS facility shall be allowed to operate at a maximum capacity of 50 Megawatts based on a 24-hour block average basis for 8,760 hours per year.

Changing this condition would be seem to be a relaxation of the AC/PSD Permit Conditions. Have you had a chance to look at this request yet?
Roger

r.cawkwell@worldnet.att.net
(702) 837-5532

Telephone Call Ridge Generating 7/7/92

Concerns for Specific Conditions

- ① Basis - is this a calculation basis and LB/MMBTU not an enforceable standard. THE LB/HR PERMIT LIMITS ARE CALCULATED FROM LB/MMBTU, THEREFORE IT IS A BASIS (NOT ACTUALLY THE STANDARD). If not then * should be on LB/MMBTU NO!
- ② "CO Excluded during start-up & shutdown" was this deleted? DON'T UNDERSTAND. WHAT IS BEING SAID? 17-2.250
- ③ Specific Condition 7 - NOT NECESSARY 6 MINUTE AVERAGING 6 minute avg. IS DESCRIBED IN TEST PROCEDURE
- ④ Specific Condition 8 requires that test be 60 day after issue - 6 months prior initial start-up. Define "start-up as synchronization to grid" CAN'T READ THIS
- ⑤ OK ⑥ Update the permit limits and BACT emission limits (except for mercury ^{BACT} technology would not be revised).
- ⑦ OK ⑧ Extend the expiration to 12/95 because of the testing and recalculation methods we are proposing. Requiring that construction start within 18 months of issue date



Wheelabrator Ridge Energy Inc.

A Waste Management Company
3131 K-Ville Avenue
Auburndale, FL 33823

Phone 941.665.2255
Fax 941.665.0400

RECEIVED

FEB 22 1999

BUREAU OF
AIR REGULATION

February 19, 1999

Mr. John Reynolds
Mail Stop 5505
Department of Environmental Protection
Division of Air Resources Management
Bureau of Air Regulation
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Re: Request for Revisions to PSD Permit No.: AC 53-206244/PSD-FL-183
Ridge Generating Station, Auburndale: Facility ID No.: 1050216

Dear Mr. Reynolds:

During preparation of the facility's Title V permit application and review of the recently issued draft Title V permit, certain items were identified that, if revised, would streamline the facility's compliance with the conditions contained in the draft permit. However, since these revisions are to conditions found in the facility's existing PSD permit, the PSD permit must be revised in order for the Southwest District office to have authority to incorporate these revisions into the Title V permit.

Wheelabrator Ridge Energy Inc. is requesting that four of the conditions in the Ridge Generating Station's PSD permit be revised per the language in the enclosed table. The revisions are being requested for the following reasons, which are more fully discussed in the enclosed table.

1. Establishes averaging times for operational limitations.
2. Deletes duplicate limitations.
3. Allows the use of DEP-approved test methods that have been developed since the issuance of the permit.
4. Deletes reference to two emission points/control devices that are not required for proper operation of the facility.

Mr. John Reynolds
Florida D.E.P.
Revisions to Permit AC 53-206244/PSD-FL-183
Page 2

None of these revisions result in an increase of any permitted limitations or pollutant emissions from the facility.

Please feel free to call Mr. John Neil at 941/665-2255 (Ext. 250) if you have any questions concerning the proposed revisions.

Sincerely,

A handwritten signature in cursive script, appearing to read "George D. Woodward".

George D. Woodward, P.E.
Plant Manager

CERTIFIED MAIL: Z 075 834 277

cc: M. Killeen (WESI)
 T. Porter (WESI)
 G. Kissel (DEP Southwest District)



Wheelabrator Ridge Energy Inc.

A Waste Management Company
3131 K-Ville Avenue
Auburndale, FL 33823

Phone 941.665.2255
Fax 941.665.0400

RECEIVED

MAR 08 1999

**BUREAU OF
AIR REGULATION**

Certified Mail Z 075-834-414

Mr. John Reynolds
Mail Stop 5505
Department of Environmental Protection
Division of Air Resources Management
Bureau of Air Regulation
2600 Blair Stone Road
Tallahassee, FL 32399-2400

1050216-002-AC

RE: Request for Revision to PSD Permit No.: AC 53-206244/PSD-FL-183
Ridge Generating Station, Auburndale: Facility ID No.: 1050216
\$50.00 Minor Adjustment Fee.

Dear Mr. Reynolds:

In response to your March 3, 1999 letter, enclosed is the \$50.00 minor adjustment fee for Ridge Generating Station's February 19, 1999 request to adjust our PSD permit.

If you have any additional questions please call John Neil at (941) 665-2255 Ext 250.

Sincerely,

George D. Woodward, P.E.
Plant Manager

cc: M. Killeen (WESI)
T. Porter (WESI)



Jeb Bush
Governor

Department of Environmental Protection

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

David B. Struhs
Secretary

March 3, 1999

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. George D. Woodward
Plant Manager
Wheelabrator Ridge Energy, Inc.
3131 K-Ville Avenue
Auburndale, Florida 33823

RE: February 19, 1999 Request for Amended Air Construction
Permit No. AC53-206244 (PSD-FL-183A)

Dear Mr. Woodward:

This is in response to Wheelabrator Ridge Energy, Inc.'s referenced letter requesting changes to the subject construction permit. The Department will consider the requests upon receipt of the required fee of \$50 for minor amendments provided under Chapter 62-4 of the Florida Administrative Code.

Your letter provides sufficient information for processing the request. Therefore, the only additional requirement is the receipt of the fee for the permit amendment.

If there are any questions regarding the above, please contact me or John Reynolds at (850) 488-0114.

Sincerely,

A. A. Linero, P.E.
Administrator
New Source Review Section

AAL/r

c: G. Kissel, SWD

Memorandum

Florida Department of Environmental Protection

TO: ~~Al Linero~~
File PSD-FL-183A
FROM: John Reynolds *JR*
DATE: March 3, 1999
SUBJECT: Wheelabrator-Ridge Energy

On February 22 we received Wheelabrator's request (copy attached) for revisions to PSD-FL-183 which include averaging the maximum megawatt capacity over 24 hours instead of an hourly maximum, eliminating the "16.1 percent tires" requirement in lieu of the "18,505 pounds of tires per hour" restriction, updating test methods for certain pollutants, and deleting minor VE emission points.

We can accommodate Wheelabrator on the essence of the last three of these requests; however, averaging their megawatt output on a 24 hour basis is not a practice that we feel should be applied in most cases. The reason is that a daily average output rate instead of an hourly rate would not prevent short-term operation at rates that could result in excessive short-term emissions. There are cases for which this approach may be appropriate, such as when NSPS allows for such an average, or when process variability dictates that an average be employed. We do not believe that such variability exists in this case.

Attached is a copy of our letter notifying Wheelabrator that a fee is required before we can modify the permit as indicated above.

Attachment

C: G. Kissel, SWD

John - There are some references regarding short-term vs long-term MW output in the Okeelanta or Osceola files. We sent one of them a letter in response to a request to average over 24 hours.

- Get \$250.00 from these guys. I still consider an "amendment" to be like a change in address or to correct a scrivener's error.*
- They may feel more comfortable with the term - "Request for Revision of PSD, etc."*



Wheelabrator Ridge Energy Inc.

A Wheelabrator Technologies Company
3131 K-Ville Avenue
Auburndale, FL 33823

Phone 941.665.2255
Fax 941.665.9400

August 14, 1996

RECEIVED
AUG 19 1996
BUREAU OF
AIR REGULATION

Ms. Susan Pelz
Florida Department of Environmental Protection
Southwest District
3804 Coconut Palm Drive
Tampa, FL 33619

SUBJECT: Renewal of Solid Waste Management Facility Insurance Certificate to demonstrate closure and/or long term care financial assurance.

Dear Susan:

In accordance with Rule 62-711.510(2) F.A.C., Ridge Generating Station has performed the annual re-estimate of the cost estimate and hereby submits it at least 60 days prior to the 10/15/96 anniversary date of the insurance policy used as the instrument to demonstrate financial assurance. The quantity estimates are unchanged from the Department approved closure cost estimate dated 2/9/95 by H. Wayne Jones P.E. (Copy attached). The closure cost re-estimate dated 8/13/96 by Geotech Industries (copy attached) for Ridge Generating Station is \$166,640.00. This amount again provides financial assurance which is 11% higher than required. Ridge will renew National Guaranty Insurance Company, Policy number CPCS93-0014 for another year and forward the revised SWM Fac. Insurance Certificate to Frances Keith.

Sincerely,

Ty Quinn
Controller

cc: Bob Butera, FDEP SW Dist.
Frances Keith, FDEP, Tallahassee

STOCKPILE CAPACITY

Ridge Generating Station's tire storage area includes four storage piles with maximum dimensions of 135 feet (length) x 50 feet (width), and an assumed maximum endloader stacking height of 15 feet (height). The capacity of the Facility's tire storage area was derived from the following volume calculation:

$$\begin{array}{r} 135 \\ \times 50 \\ \hline 6,750 \text{ square feet} \\ \times 15 \\ \hline 101,250 \text{ cubic feet} \\ \div 27 \\ \hline 3,750 \text{ cubic yards per pile} \\ \times 4 \\ \hline 15,000 \text{ cubic yards/total storage capacity} \end{array}$$

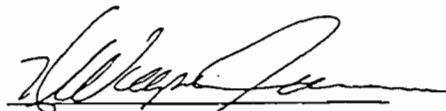
The Facility plans to store any combination of chipped tires or whole tires as market conditions would dictate. Scale data reflects an average density for two inch tire chips of approximately 1,000 lbs. per cubic yard and a volume reduction achieved by shredding of five to one.

Therefore, maximum capacity of each stockpile for 100% tire chip storage is 1,875 tons per pile or a total capacity of 7,500 tons. Conversely, the capacity of each tire pile assuming 100% whole tire storage is 375 tons per pile, resulting in a total capacity of 1,500 tons.

Dimension and calculations checked on this page only:

2-9-85

Date



H. Wayne Jones, P.E.

Reg. No: 46244



Tomorrow's Technology Today

August 13, 1996

Mr. Phil Tuohy
Director of Business Development
Wheelabrator Ridge Energy
3131 K-Ville Avenue
Auburndale, FL 33823

Sent Via Facsimile 941-665-0400

Dear Mr. Tuohy:

At your request, I have prepared the following estimate of Ridge Generating Station's capacity for tire storage.

Based on our conversation, the facility's tire storage area was designed to accommodate four storage piles with maximum dimensions of 150 feet (length) x 50 feet (width) x 15 feet (height). Therefore, in an effort to be conservative, I have based my capacity calculations on 4,166 cubic yards per pile. You indicated a desire to store any combination of chipped tires or whole tires as market conditions would dictate. GeoTech's experience indicates an average density for two-inch tire chips of 1,000 lbs. per yard (approximately 1 ton per 2 cubic yards). Maximum capacity of each tire pile, assuming 100% tire chip storage is 2,083 tons, resulting in a total capacity of 8,332 tons. The volume reduction achieved by shredding whole tires is five to one. Accordingly, the capacity of each tire pile, assuming 100% whole tire storage is 416 tons, resulting in a total capacity of 1,666 tons.

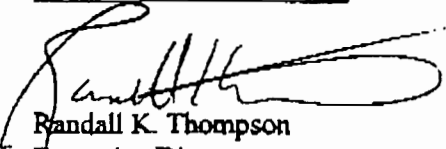
You asked that I estimate the cost of removing and disposing of the facility's maximum inventory if your facility was unable to process and dispose of the tires. Investigation revealed several Class III landfills within sixty (60) miles that accept chipped tires. Using any of these facilities, GeoTech would be able to load, transport, and dispose of Ridge's chipped tires for \$20.00 per ton. If the tire storage area were filled to capacity with chipped tires, the total cost of disposal would be \$166,640.00. GeoTech would charge \$75.00 per ton to load, transport, and dispose of Ridge Generating Station's whole tires. If the tire storage area were filled to capacity with whole tires, the total cost of disposal would be \$124,950.00.

Under the most likely circumstance that Ridge had a combination of whole tires and chipped tires on site, the total cost of disposal would fall between \$124,450.00 and \$166,640.00.

If I can be of any further assistance, please feel free to call.

Sincerely,

GEOTECH INDUSTRIES



Randall K. Thompson
Executive Director

Please Note: Our area code for all calls has been changed from 904 to 352.



Wheelabrator Ridge Energy Inc.

A Wheelabrator Technologies Company
3131 K-Ville Avenue
Auburndale, FL 33823

Phone 941.665.2255
Fax 941.665.0400

RECEIVED

AUG 1 1996

BUREAU OF
AIR REGULATION

July 24, 1996

Department of Environmental Protection
Southwest District
3804 Coconut Palm Drive
Tampa, FL 33619-8318

Attn: Mr. Bill Proses

Subject: Ridge Generating Station
Air Permit #AC53-206244
AIRS #1050216
Emissions Unit ID 001
Excess Emissions and Monitoring Systems Performance Report

Dear Sir:

Pursuant to 40CFR60, Subpart Db, and 40CFR60.7, please find enclosed Ridge Generating Station's Second Quarter 1996 Excess Emissions and Monitoring Systems Performance Report for Opacity. This covers the period from April 1, 1996 through June 30, 1996.

Also enclosed is a Cylinder Gas Audit (CGA) report for the CGA conducted during the second quarter of 1996. The report indicates that all of the accuracy results were within the 15 percent specifications.

Please feel free to contact Chuck Davis at (941) 665-2255 (Ext. 250) should you have any questions or concerns regarding this submittal.

Sincerely,

George Woodward
Plant Manager

cc: Chief Bureau of Air Regulation (w/o attachment)
EPA Region IV (w/o attachment)
T. Porter
F. Ferraro (w/o attachment)
Ridge File 6.2.1.4

Certification #P 597 437 527

SUMMARY REPORT - GASEOUS AND OPACITY EXCESS EMISSION AND MONITORING SYSTEM PERFORMANCEPollutant (Circle One -- SO₂ / NO_x / TRS / H₂S / CO Opacity)Reporting Period Dates: From 04/01/96 to 06/30/96**Company:** Ridge Generating Station**Emission Limitation:**10%**Address:** 3131 K-Ville Ave.
Auburndale, FL 33823**Monitor Manufacturer
and Model Number:**Thermal Environmental
Instruments, Inc. - Model 400B**Date of Latest CMS
Certification or Audit:**06/26/96**Process Unit(s) Description:**

Wood and Tire Fired Boiler - Unit 1

Total Source Operating**Time in Reporting Period:**106,607¹

Emission Data Summary		CMS Performance Summary	
1. Duration of excess emissions in reporting period due to:		1. CMS downtime in reporting period due to:	
a. Startup/shutdown	0	a. Monitor equipment malfunctions	618
b. Control equipment problems	118	b. Non-Monitor equipment malfunctions	1224
c. Process problems	0	c. Quality assurance calibration	1116
d. Other known causes	0	d. Other known causes	66
e. Unknown causes	0	e. Unknown causes	30
2. Total duration of excess emission	118	2. Total CMS Downtime	3054
3. Total duration of excess emissions x (100) (Total source operating time)	0.1% ²	3. [Total CMS Downtime] x (100) (Total source operating time)	2.86% ²

On a separate page, describe any changes since last quarter in CMS, process, or controls.

I certify that the information contained in this report is true, accurate, and complete.

George D. Woodward

Name

George D. Woodward
SignaturePlant Manager

Title

07/24/96

Date

¹ For opacity, record all times in minutes. For gases, record all times in hours.² For the reporting period: If the total duration of excess emissions is 1 percent or greater of the total operating time or the total CMS downtime is 5 percent or greater of the total operating time, both the summary report form and the excess emission report described in 560.7(c) shall be submitted.

RIDGE GENERATING STATION

SECOND QUARTER 1996

OPACITY

START-UP EXCESS EMISSIONS				
Date	Parameter	Duration	Magnitude*	Corrective Action
NONE				
SHUT-DOWN EXCESS EMISSIONS				
Date	Parameter	Duration	Magnitude*	Corrective Action
NONE				
MALFUNCTION EXCESS EMISSIONS				
Date	Parameter	Duration	Magnitude*	Corrective Action
06/06/96	Opacity	118	61.1%	Isolated and repaired faulty fabric filter compartment.
OTHER EXCESS EMISSIONS				
Date	Parameter	Duration	Magnitude*	Corrective Action
NONE				

*Magnitude in %

RIDGE GENERATING STATION

CEM DOWNTIME REPORT

SECOND QUARTER 1996

Analyzer	Date	Duration*	Nature of Repairs/Adjustments
Opacity	04/08/96	66	Changed clock from EST to EDT. Lost data.
Opaicty	05/03/96	6	Unknown
Opacity	05/13/96	24	Unknown
Opacity	06/19/96	756	Data logging unit lost programming. Required manual re-program.
Opacity	06/20/96	468	Data logging unit lost programming. Required manual re-program.
Opacity	06/27/96	438	Erratic readings. Broken wire in data cable. Replaced cable.
Opacity	06/28/96	180	Erratic readings. Broken wire in data cable. Replaced cable.

*Duration in Minutes



Wheelabrator Ridge Energy Inc.

A Wheelabrator Technologies Company
3131 K-ville Avenue
Auburndale, FL 33823

Phone 941.665.2255
Fax 941.665.0400

RECEIVED

JUL 28 1996

**BUREAU OF
AIR REGULATION**

July 18, 1996

State of Florida
Department of Environmental Protection
Chief Bureau of Air Regulation
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Re: Ridge Generating Station
Air Permit #AC53-206244, PSD-FL-183
AIRS Number 1050216
Emissions Unit Identification Number 001

Dear Sir:

In accordance with 40 C.F.R. 60.50a(d), 60.59a(b)(14), and 60.59a(m), enclosed please find data summarizing the daily weight of MSW and other fuels fired during the Second Quarter 1996. Our percentage of MSW combusted continues to be under 30%, so we remain subject only to the record keeping and reporting requirements for co-fired combustors under the MWC NSPS, 40 C.F.R. Part 60, Subpart Ea.

If you have any questions regarding this submittal, please contact Chuck Davis at (941) 665-2255.

Sincerely,

George D. Woodward
Plant Manager

cc: EPA Region IV
B. Proses, DEP S.W. District
Ridge File 6.2.1.3

Certification # P 597 437 525

WHEELABRATOR RIDGE ENERGY

APRIL 1996 STATS

ALL QUANTITIES IN TONS

DAY	MSW PROCESSED		TOTAL	OTHER FUELS PROCESSED		TOTAL
	YARDWASTE	TIRES	MSW PROCESSED	WOOD	PROPANE	PROCESSED
1	125.81	157.94	283.75	770.06	0.00	1053.81
2	136.44	164.35	300.79	837.81	0.00	1138.60
3	125.28	116.45	241.73	738.60	0.00	980.33
4	125.66	122.96	248.62	731.09	0.00	979.71
5	123.26	117.00	240.26	710.56	15.19	966.01
6	125.87	117.57	243.44	709.93	0.00	953.37
7	95.07	83.88	178.95	530.24	0.00	709.19
8	89.56	88.03	177.59	497.88	2.53	678.00
9	139.33	121.54	260.87	753.91	0.00	1014.78
10	175.59	111.01	286.60	892.75	0.00	1179.35
11	168.02	127.81	295.83	812.81	0.00	1108.64
12	134.33	122.80	257.13	628.17	0.00	885.30
13	0.00	0.00	0.00	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00
15	0.00	0.00	0.00	0.00	0.00	0.00
16	0.00	0.00	0.00	0.00	0.00	0.00
17	0.00	0.00	0.00	0.00	0.00	0.00
18	0.00	0.00	0.00	0.00	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	0.00
20	9.01	11.95	20.96	39.51	40.85	101.32
21	21.40	7.66	29.06	92.38	15.70	137.14
22	140.12	82.46	222.58	602.72	13.93	839.23
23	174.55	124.35	298.90	771.90	0.00	1070.80
24	159.69	124.38	284.07	686.53	0.00	970.60
25	176.05	117.77	293.82	755.52	0.63	1049.97
26	167.22	120.26	287.48	725.94	0.00	1013.42
27	145.13	90.73	235.86	630.34	0.00	866.20
28	153.22	124.91	278.13	653.43	0.00	931.56
29	173.38	124.34	297.72	740.70	0.00	1038.42
30	156.61	142.07	298.68	684.02	0.00	982.70
TOTAL	3040.59	2522.22	5562.81	14996.81	88.83	20648.45
PERCENT			26.94%	72.63%	0.43%	100.00%

WHEELABRATOR RIDGE ENERGY

MAY 1996 STATS

ALL QUANTITIES IN TONS

DAY	MSW PROCESSED		TOTAL MSW PROCESSED	OTHER FUELS PROCESSED		TOTAL PROCESSED
	YARDWASTE	TIRES		WOOD	PROPANE	
1	164.04	140.52	304.56	703.42	0.00	1007.98
2	158.73	123.37	282.10	674.30	0.00	956.40
3	104.74	95.73	200.47	444.73	10.13	655.33
4	24.14	28.24	52.38	102.64	12.03	167.05
5	153.93	119.32	273.25	646.93	0.00	920.18
6	148.40	82.07	230.47	611.72	0.00	842.19
7	160.85	159.99	320.84	668.22	0.00	989.06
8	156.73	177.39	334.12	643.46	0.00	977.58
9	168.74	185.07	353.81	687.55	0.00	1041.36
10	172.35	96.87	269.22	710.54	0.00	979.76
11	50.96	48.03	98.99	210.18	14.56	323.73
12	101.96	78.31	180.27	415.97	6.33	602.57
13	139.61	116.61	256.22	577.02	0.00	833.24
14	192.20	122.63	314.83	796.81	0.00	1111.64
15	140.97	154.04	295.01	593.50	0.00	888.51
16	122.08	109.28	231.36	517.17	0.00	748.53
17	99.18	152.89	252.07	426.58	0.00	678.65
18	135.92	61.74	197.66	584.60	8.23	790.49
19	147.32	101.58	248.90	640.15	0.00	889.05
20	109.93	83.49	193.42	481.66	0.00	675.08
21	93.58	89.62	183.20	416.39	0.00	599.59
22	126.00	73.72	199.72	567.22	0.00	766.94
23	87.46	63.25	150.71	392.32	0.63	543.66
24	118.39	90.04	208.43	535.21	2.53	746.17
25	150.04	95.97	246.01	678.56	0.00	924.57
26	129.72	98.10	227.82	581.15	0.00	808.97
27	132.59	129.03	261.62	587.28	0.00	848.90
28	86.13	90.42	176.55	395.96	0.00	572.51
29	95.05	100.24	195.29	443.07	0.00	638.36
30	118.82	107.53	226.35	545.39	0.00	771.74
31	101.07	122.94	224.01	468.87	0.00	692.88
TOTAL	3891.66	3298.03	7189.69	16748.54	54.44	23992.67
PERCENT			29.97%	69.81%	0.23%	100.00%

WHEELABRATOR RIDGE ENERGY

JUNE 1996 STATS

ALL QUANTITIES IN TONS

DAY	MSW PROCESSED		TOTAL MSW PROCESSED	OTHER FUELS PROCESSED		TOTAL PROCESSED
	YARDWASTE	TIRES		WOOD	PROPANE	
1	96.32	80.34	176.66	446.88	0.00	623.54
2	140.11	144.58	284.69	647.53	0.00	932.22
3	128.08	32.14	160.22	588.48	0.00	748.70
4	103.64	118.42	222.06	487.56	0.00	709.62
5	69.79	50.06	119.85	328.77	0.00	448.62
6	72.10	55.11	127.21	339.91	8.86	475.98
7	138.96	99.24	238.20	662.31	0.00	900.51
8	120.99	81.86	202.85	579.03	0.00	781.88
9	124.32	128.85	253.17	585.87	0.00	839.04
10	123.28	115.49	238.77	580.21	0.00	818.98
11	127.51	91.34	218.85	604.07	0.00	822.92
12	128.55	66.94	195.49	608.37	0.00	803.86
13	128.68	43.42	172.10	603.54	0.00	775.64
14	102.37	121.90	224.27	482.40	0.00	706.67
15	98.78	120.16	218.94	468.45	0.00	687.39
16	139.26	112.12	251.38	648.98	0.00	900.36
17	130.22	73.26	203.48	612.78	0.00	816.26
18	134.12	84.40	218.52	644.88	0.00	863.40
19	113.85	86.06	199.91	543.45	3.17	746.53
20	98.65	66.58	165.23	472.55	3.17	640.95
21	129.89	46.68	176.57	631.71	0.00	808.28
22	124.84	115.69	240.53	610.65	0.00	851.18
23	140.99	141.43	282.42	685.42	0.00	967.84
24	119.21	109.82	229.03	584.59	0.00	813.62
25	113.18	80.29	193.47	574.27	0.00	767.74
26	111.94	84.63	196.57	580.99	0.00	777.56
27	134.87	109.36	244.23	704.91	0.00	949.14
28	116.93	92.02	208.95	633.69	0.00	842.64
29	159.75	125.80	285.55	904.10	0.00	1189.65
30	172.25	69.57	241.82	967.17	0.00	1208.99
TOTAL	3643.43	2747.56	6390.99	17813.52	15.19	24219.70
PERCENT			26.39%	73.55%	0.06%	100.00%

WHEELABRATOR RIDGE ENERGY

2ND QUARTER 1996

SUMMARY

ALL QUANTITIES IN TONS

MONTH	MSW PROCESSED		TOTAL MSW PROCESSED	OTHER FUELS PROCESSED		TOTAL PROCESSED
	YARDWASTE	TIRES		WOOD	PROPANE	
APRIL	3040.59	2522.22	5562.81	14996.81	88.83	20648.45
MAY	3891.66	3298.03	7189.69	16748.54	54.44	23992.67
JUNE	3643.43	2747.56	6390.99	17813.52	15.19	24219.70
TOTAL	10575.68	8567.81	19143.49	49558.87	158.46	68860.82
PERCENT			27.80%	71.97%	0.23%	100.00%



Wheelabrator Ridge Energy Inc.

A Wheelabrator Technologies Company
3131 K-Ville Avenue
Auburndale, FL 33823

Phone 941.665.2255
Fax 941.665.0400

RECEIVED
APR 25 1996
BUREAU OF
AIR REGULATION

April 19, 1996

State of Florida
Department of Environmental Protection
Chief Bureau of Air Regulation
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Re: Ridge Generating Station
Air Permit #AC53-206244, PSD-FL-183
AIRS Number 1050216
Emissions Unit Identification Number 001

Dear Sir:

In accordance with 40 C.F.R. 60.50a(d), 60.59a(b)(14), and 60.59a(m), enclosed please find data summarizing the daily weight of MSW and other fuels fired during the First Quarter 1996. Our percentage of MSW combusted continues to be under 30%, so we remain subject only to the record keeping and reporting requirements for co-fired combustors under the MWC NSPS, 40 C.F.R. Part 60, Subpart Ea.

If you have any questions regarding this submittal, please contact Chuck Davis at (941) 665-2255.

Sincerely,


Rodney Williams
Plant Manager

cc: EPA Region IV
B. Proses, DEP S.W. District
Ridge File 6.2.1.3

Certification # P 597 437 502

WHEELABRATOR RIDGE ENERGY

JANUARY 1996 STATS

ALL QUANTITIES IN TONS

	MSW PROCESSED		TOTAL	OTHER FUELS PROCESSED		
			MSW			TOTAL
DAY	YARDWASTE	TIRES	PROCESSED	WOOD	PROPANE	PROCESSED
1	42.37	70.31	112.68	344.19	0.00	456.87
2	43.63	30.78	74.41	351.51	0.00	425.92
3	92.75	105.30	198.05	751.24	0.00	949.29
4	88.67	122.26	210.93	715.64	0.00	926.57
5	84.81	158.00	242.81	677.07	0.00	919.88
6	76.19	155.70	231.89	607.13	0.00	839.02
7	87.44	191.28	278.72	701.83	0.00	980.55
8	85.06	152.05	237.11	688.95	6.33	932.39
9	91.33	196.42	287.75	771.32	0.00	1059.07
10	81.02	175.31	256.33	688.94	5.70	950.97
11	78.32	152.01	230.33	665.16	8.86	904.35
12	90.66	183.42	274.08	770.84	0.40	1045.32
13	79.99	107.67	187.66	683.23	0.00	870.89
14	92.19	192.10	284.29	793.33	0.00	1077.62
15	78.62	166.72	245.34	708.44	0.00	953.78
16	72.72	156.07	228.79	660.43	0.00	889.22
17	88.72	178.88	267.60	826.27	0.00	1093.87
18	78.84	147.08	225.92	733.84	0.00	959.76
19	88.81	182.48	271.29	823.96	0.00	1095.25
20	83.73	157.23	240.96	776.29	0.00	1017.25
21	74.61	138.85	213.46	694.01	0.00	907.47
22	36.55	35.53	72.08	337.73	0.00	409.81
23	42.63	53.44	96.07	392.44	12.03	500.54
24	54.68	70.22	124.90	579.40	0.00	704.30
25	87.00	134.63	221.63	872.68	0.06	1094.25
26	63.61	144.62	208.23	633.94	6.96	849.13
27	39.13	61.97	101.10	389.69	8.23	499.02
28	34.56	88.91	123.47	343.70	12.66	479.83
29	71.10	78.78	149.88	731.41	0.43	881.72
30	69.04	140.76	209.80	715.68	0.00	925.48
31	69.40	165.20	234.60	727.41	0.00	962.01
TOTAL	2248.16	4093.98	6342.14	20157.72	61.66	26561.40
PERCENT			23.88%	75.89%	0.23%	100.00%

WHEELABRATOR RIDGE ENERGY

MARCH 1996 STATS

ALL QUANTITIES IN TONS

	MSW PROCESSED		TOTAL	OTHER FUELS PROCESSED		
			MSW			TOTAL
DAY	YARDWASTE	TIRES	PROCESSED	WOOD	PROPANE	PROCESSED
1	0.00	0.00	0.00	0.00	0.00	0.00
2	7.34	4.50	11.84	55.15	13.29	80.28
3	113.72	103.05	216.77	848.63	0.00	1065.40
4	121.35	114.70	236.05	892.10	0.00	1128.15
5	90.51	156.18	246.69	655.92	0.00	902.61
6	85.73	144.84	230.57	619.20	0.00	849.77
7	104.71	149.97	254.68	719.75	0.00	974.43
8	144.97	158.69	303.66	977.01	0.00	1280.67
9	189.06	135.87	324.93	1270.55	0.63	1596.11
10	137.08	163.05	300.13	919.42	0.00	1219.55
11	132.09	197.52	329.61	882.79	0.00	1212.40
12	83.30	199.76	283.06	669.87	0.00	952.94
13	114.31	182.83	297.14	760.52	0.00	1057.66
14	72.83	73.06	145.89	481.44	0.00	627.33
15	96.45	83.33	179.78	640.27	0.00	820.05
16	132.29	109.51	241.80	873.42	0.00	1115.21
17	118.39	116.33	234.72	782.59	0.00	1017.31
18	84.66	149.16	233.82	557.71	0.00	791.54
19	98.86	163.41	262.27	654.39	0.00	916.66
20	81.03	142.75	223.78	545.61	0.00	769.39
21	20.76	20.95	41.71	136.35	16.46	194.52
22	139.33	127.70	267.03	912.09	0.30	1179.42
23	99.99	134.62	234.61	657.80	0.00	892.41
24	99.67	122.71	222.38	655.67	0.00	878.05
25	95.19	157.01	252.20	626.18	0.00	878.38
26	105.14	118.50	223.64	684.74	0.00	908.38
27	99.82	134.27	234.09	647.05	0.00	881.14
28	73.99	118.88	192.87	456.30	0.00	649.17
29	111.86	156.35	268.21	665.01	0.00	933.22
30	140.88	144.51	285.39	831.29	0.00	1116.68
31	131.82	145.54	277.36	757.24	0.00	1034.60
TOTAL	3127.13	3929.55	7056.68	20836.05	30.69	27923.42
PERCENT			25.27%	74.62%	0.11%	100.00%



Wheelabrator Ridge Energy Inc.

3131 K-Ville Avenue
Auburndale, FL 33823
Tel. 813-665-2255
Fax. 813-665-0400

January 23, 1996

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JAN 29 1996

**BUREAU OF
AIR REGULATION**

State of Florida
Department of Environmental Protection
Chief Bureau of Air Regulation
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Re: Ridge Generating Station
Air Permit #AC53-206244, PSD-FL-183
AIRS Number 1050216
Emissions Unit Identification Number 001

Dear Sir:

In accordance with 40 C.F.R. 60.50a(d), 60.59a(b)(14), and 60.59a(m), enclosed please find data summarizing the daily weight of MSW and other fuels fired during the Fourth Quarter 1995. Our percentage of MSW combusted continues to be under 30%, so we remain subject only to the record keeping and reporting requirements for co-fired combustors under the MWC NSPS, 40 C.F.R. Part 60, Subpart Ea.

If you have any questions regarding this submittal, please contact Chuck Davis at (941) 665-2255.

Sincerely,

Rodney Williams
Plant Manager

cc: EPA Region IV
B. Proses, DEP S.W. District
Ridge File 6.2.1.3

Certification # P 597 437 479

cc: J. Reynolds, BAR

WHEELABRATOR RIDGE ENERGY

OCTOBER '95 STATS

			MSW PROCESSED		TOTAL MSW PROCESSED	OTHER FUELS PROCESSED		TOTAL PROCESSED
			YARDWASTE TONS	TIRES TONS	TONS	WOOD TONS	PROPANE TONS	TONS
SUN	OCT	1	132.71	105.03	237.74	786.70	1.90	1026.34
MON	OCT	2	0.00	0.00	0.00	0.00	0.00	0.00
TUE	OCT	3	0.00	0.00	0.00	0.00	0.00	0.00
WED	OCT	4	0.00	0.00	0.00	0.00	0.00	0.00
THU	OCT	5	0.00	0.00	0.00	0.00	0.00	0.00
FRI	OCT	6	0.00	0.00	0.00	0.00	1.27	1.27
SAT	OCT	7	129.55	23.67	153.22	788.09	15.83	957.14
SUN	OCT	8	156.05	67.13	223.18	951.11	0.00	1174.29
MON	OCT	9	89.98	41.54	131.52	543.15	14.56	689.23
TUE	OCT	10	115.22	62.10	177.32	690.97	15.31	883.60
WED	OCT	11	103.02	89.04	192.06	604.90	8.86	805.82
THU	OCT	12	143.89	115.19	259.08	838.38	0.00	1097.46
FRI	OCT	13	144.75	121.55	266.30	838.42	0.00	1104.72
SAT	OCT	14	154.18	124.57	278.75	894.26	0.00	1173.01
SUN	OCT	15	136.46	109.08	245.54	794.58	0.00	1040.12
MON	OCT	16	173.76	48.73	222.49	1003.86	0.63	1226.98
TUE	OCT	17	148.91	76.65	225.56	839.61	0.00	1065.17
WED	OCT	18	144.30	86.34	230.64	831.36	0.00	1062.00
THU	OCT	19	110.72	93.05	203.77	631.94	10.13	845.84
FRI	OCT	20	130.73	93.34	224.07	759.08	0.00	983.15
SAT	OCT	21	127.17	79.77	206.94	743.73	0.00	950.67
SUN	OCT	22	122.76	94.18	216.94	721.30	0.00	938.24
MON	OCT	23	147.64	93.46	241.10	862.93	2.53	1106.56
TUE	OCT	24	134.66	147.17	281.83	792.30	0.00	1074.13
WED	OCT	25	121.68	102.59	224.27	719.27	0.00	943.54
THU	OCT	26	118.11	134.29	252.40	660.97	0.00	913.37
FRI	OCT	27	111.95	125.41	237.36	646.22	2.53	886.11
SAT	OCT	28	108.34	139.54	247.88	628.27	1.27	877.42
SUN	OCT	29	142.10	168.76	310.86	824.47	0.00	1135.33
MON	OCT	30	72.35	67.97	140.32	417.47	14.17	571.96
TUE	OCT	31	101.04	108.40	209.44	576.67	0.00	786.11
TOTAL			3322.02	2518.55	5840.57	19390.02	88.99	25319.58
PERCENT					23.07%	76.58%	0.35%	100.00%

WHEELABRATOR RIDGE ENERGY

NOVEMBER '95 STATS

			MSW PROCESSED		TOTAL MSW PROCESSED TONS	OTHER FUELS PROCESSED		TOTAL PROCESSED TONS
			YARDWASTE TONS	TIRES TONS		WOOD TONS	PROPANE TONS	
WED	NOV	1	133.46	127.67	261.13	765.94	0.00	1027.07
THU	NOV	2	169.51	145.36	314.87	981.16	0.00	1296.03
FRI	NOV	3	109.89	115.37	225.26	642.71	6.96	874.93
SAT	NOV	4	174.33	88.71	263.04	1029.22	0.00	1292.26
SUN	NOV	5	144.31	112.26	256.57	858.19	0.00	1114.76
MON	NOV	6	111.01	93.76	204.77	674.82	0.00	879.59
TUE	NOV	7	52.45	50.33	102.78	320.72	7.60	431.10
WED	NOV	8	35.36	30.79	66.15	217.69	10.76	294.60
THU	NOV	9	160.23	111.39	271.62	985.59	0.00	1257.21
FRI	NOV	10	125.51	127.82	253.33	788.59	0.00	1041.92
SAT	NOV	11	134.23	125.30	259.53	852.99	0.00	1112.52
SUN	NOV	12	156.62	115.88	272.50	999.79	0.00	1272.29
MON	NOV	13	140.38	120.30	260.68	910.26	0.00	1170.94
TUE	NOV	14	78.55	97.52	176.07	511.34	0.00	687.41
WED	NOV	15	95.46	86.78	182.24	609.92	1.27	793.43
THU	NOV	16	35.78	10.95	46.73	228.95	18.99	294.67
FRI	NOV	17	76.35	76.76	153.11	509.05	3.95	666.11
SAT	NOV	18	63.03	83.82	146.85	423.61	15.83	586.29
SUN	NOV	19	17.47	24.21	41.68	117.87	6.96	166.51
MON	NOV	20	59.53	77.98	137.51	400.23	0.00	537.74
TUE	NOV	21	95.49	119.30	214.79	649.93	0.00	864.72
WED	NOV	22	86.31	108.35	194.66	576.92	0.00	771.58
THU	NOV	23	57.46	70.81	128.27	384.16	0.00	512.43
FRI	NOV	24	87.15	116.25	203.40	585.45	0.00	788.85
SAT	NOV	25	96.79	128.10	224.89	647.25	0.00	872.14
SUN	NOV	26	38.44	64.36	102.80	257.22	0.00	360.02
MON	NOV	27	68.56	93.81	162.37	457.18	0.00	619.55
TUE	NOV	28	104.16	115.82	219.98	720.81	0.00	940.79
WED	NOV	29	102.40	138.71	241.11	714.92	0.00	956.03
THU	NOV	30	115.55	137.08	252.63	805.27	0.00	1057.90
TOTAL			2925.78	2915.55	5841.33	18627.74	72.32	24541.39
PERCENT					23.80%	75.90%	0.29%	100.00%

WHEELABRATOR RIDGE ENERGY

DECEMBER '95 STATS

			MSW PROCESSED		TOTAL MSW PROCESSED	OTHER FUELS PROCESSED		TOTAL PROCESSED
			YARDWASTE TONS	TIRES TONS	TONS	WOOD TONS	PROPANE TONS	TONS
FRI	DEC	1	120.98	38.88	159.86	828.96	0.00	988.82
SAT	DEC	2	91.23	124.12	215.35	628.41	0.00	843.76
SUN	DEC	3	80.80	108.05	188.85	559.56	0.00	748.41
MON	DEC	4	50.91	74.80	125.71	352.88	1.90	480.49
TUE	DEC	5	65.56	101.87	167.43	458.80	18.36	644.59
WED	DEC	6	102.45	146.98	249.43	743.86	0.00	993.29
THU	DEC	7	95.03	131.82	226.85	698.49	0.00	925.34
FRI	DEC	8	74.57	128.31	202.88	554.33	0.00	757.21
SAT	DEC	9	71.11	117.76	188.87	530.56	0.00	719.43
SUN	DEC	10	55.24	91.33	146.57	413.74	0.00	560.31
MON	DEC	11	85.89	139.11	225.00	671.21	0.00	896.21
TUE	DEC	12	92.39	143.41	235.80	724.41	0.00	960.21
WED	DEC	13	80.81	139.00	219.81	635.59	0.00	855.40
THU	DEC	14	79.89	142.24	222.13	627.58	0.00	849.71
FRI	DEC	15	103.85	159.67	263.52	812.75	0.00	1076.27
SAT	DEC	16	90.42	123.73	214.15	699.12	1.90	915.17
SUN	DEC	17	96.37	134.53	230.90	751.78	0.00	982.68
MON	DEC	18	84.94	47.20	132.14	656.71	0.00	788.85
TUE	DEC	19	0.00	0.00	0.00	0.00	0.00	0.00
WED	DEC	20	60.61	58.90	119.51	469.08	12.66	601.25
THU	DEC	21	83.50	129.28	212.78	664.90	2.53	880.21
FRI	DEC	22	76.58	155.55	232.13	633.00	0.00	865.13
SAT	DEC	23	35.26	57.86	93.12	290.24	0.52	383.88
SUN	DEC	24	73.37	89.56	162.93	603.93	0.00	766.86
MON	DEC	25	60.88	104.68	165.56	494.80	0.00	660.36
TUE	DEC	26	33.45	56.89	90.34	270.84	0.00	361.18
WED	DEC	27	72.61	67.34	139.95	590.74	0.00	730.69
THU	DEC	28	121.62	135.97	257.59	988.25	0.00	1245.84
FRI	DEC	29	100.08	124.77	224.85	822.90	0.00	1047.75
SAT	DEC	30	6.29	12.11	18.40	51.58	8.86	78.84
SUN	DEC	31	49.10	112.32	161.42	404.65	5.70	571.77
TOTAL			2295.79	3198.04	5493.83	17633.65	52.43	23179.91
PERCENT					23.70%	76.07%	0.23%	100.00%

WHEELABRATOR RIDGE ENERGY

FEBRUARY 1996 STATS

ALL QUANTITIES IN TONS

	MSW PROCESSED		TOTAL	OTHER FUELS PROCESSED		
			MSW			TOTAL
DAY	YARDWASTE	TIRES	PROCESSED	WOOD	PROPANE	PROCESSED
1	71.85	159.22	231.07	711.15	0.00	942.22
2	46.27	90.38	136.65	449.68	0.00	586.33
3	75.63	143.36	218.99	722.96	0.00	941.95
4	37.53	94.14	131.67	358.75	0.00	490.42
5	101.93	189.07	291.00	964.10	0.00	1255.10
6	79.05	169.56	248.61	746.36	0.00	994.97
7	63.96	171.48	235.44	610.32	0.00	845.76
8	48.48	127.64	176.12	475.91	0.00	652.03
9	69.06	161.93	230.99	663.83	0.00	894.82
10	56.82	124.81	181.63	542.33	0.00	723.96
11	62.84	110.02	172.86	600.04	0.00	772.90
12	74.93	144.08	219.01	706.65	0.00	925.66
13	61.44	120.10	181.54	607.75	0.63	789.92
14	96.30	119.55	215.85	928.09	0.00	1143.94
15	63.63	105.39	169.02	590.64	0.00	759.66
16	73.13	120.00	193.13	647.55	0.00	840.68
17	110.55	153.22	263.77	976.34	0.00	1240.11
18	109.24	121.74	230.98	959.80	0.00	1190.78
19	86.04	142.06	228.10	746.48	0.00	974.58
20	79.43	162.12	241.55	694.99	0.00	936.54
21	87.67	91.04	178.71	757.62	0.00	936.33
22	82.97	143.20	226.17	696.68	0.00	922.85
23	64.73	94.15	158.88	531.13	0.00	690.01
24	48.34	87.80	136.14	396.76	6.33	539.23
25	82.36	122.97	205.33	674.29	0.00	879.62
26	69.55	133.91	203.46	564.20	0.00	767.66
27	78.23	121.68	199.91	631.79	0.00	831.70
28	67.77	104.52	172.29	552.22	1.40	723.11
29	14.25	22.15	36.40	112.54	0.00	148.94
30	0.00	0.00	0.00	0.00	0.00	0.00
31						
TOTAL	2063.97	3651.29	5715.26	18620.96	8.37	24341.78
PERCENT			23.48%	76.50%	0.03%	100.01%

PERCENT TOTAL MAY NOT EQUAL 100.00% DUE TO ROUNDING.

Company: Wheelabrator Ridge Energy Inc.
Facility ID Number: 1050216
Permit Issue date: February 14, 1997

Facility: Ridge Generating Station; Auburndale, Florida
Permit Number: AC 53-206244/PSD-FL-183

Specific Condition No.	Current Language	Proposed Revised Language	Rationale for Revision																																																																		
2	The RGS facility shall be allowed to operate at a maximum capacity of 50 Megawatts (approximately equivalent to 630 MMBtu/hr) for 8,760 hours per year. [Rule 62-210.200(223), F.A.C.]	The RGS facility shall be allowed to operate at a maximum capacity of 50 Megawatts based on a 24-hour block average basis for 8,760 hours per year (50 megawatts is equivalent to approximately 630 MMBtu/hr). [Rule 62-210.200(223), F.A.C.]	Establishes an averaging time for determining compliance with this requirement making the requirement more practically enforceable. It does not change the currently permitted heat input or emission rates.																																																																		
3	Fuel for firing the RGS boiler shall consist only of wood, yard wastes, landfill gas, and up to 16.1 percent tires (percent by weight equivalent to 40 percent tires based on heat content and based on a 24-hour block average). The 16.1 percent tire weight limitation is equivalent to a tire firing rate of 18,505 pounds of tires per hour. Propane may be used as a startup, shutdown, and combustion stabilization fuel and shall not exceed an annual capacity factor of 10 percent of total heat input. [Rule 62-210.200(223), F.A.C.]	Fuel for firing the RGS boiler shall consist only of wood, yard wastes, landfill gas, and tires. The tire firing rate shall be limited to 18,505 pounds of tires per hour, based on a 24-hour block average. Propane may be used as a startup, shutdown, and combustion stabilization fuel and shall not exceed an annual capacity factor of 10 percent of total heat input. [Rule 62-210.200(223), F.A.C.]	The lb/hr tire-firing rate and averaging time is sufficient to demonstrate compliance with this requirement. This makes the requirement more practically enforceable. The lb/hr value was calculated using the 16.1% value, therefore, both limitations are not required. It does not change the currently permitted tire firing rate or emission rates.																																																																		
5	The RGS boiler exhaust gases shall not exceed the limits [Rule 62-212.400, F.A.C.]: <table><tr><th>Pollutant</th><th>lb/hr</th><th>Tons/yr</th></tr><tr><td>SO₂</td><td>65.0</td><td>284.7 (30-day rolling avg. CEMS)</td></tr><tr><td>NO_x</td><td>90.0</td><td>394.2 (30 day rolling avg. CEMS)</td></tr><tr><td>CO</td><td>200.0</td><td>876.0 (30 day rolling avg. CEMS)</td></tr><tr><td>VOC</td><td>22.1</td><td>96.8 (EPA Meth. 25A if required)</td></tr><tr><td>HCl</td><td>5.0</td><td>21.9 (EPA Meth. 26 if required)</td></tr><tr><td>Hg</td><td>0.022</td><td>0.096 (EPA Meth. 101A if required)</td></tr><tr><td>Pb</td><td>0.25</td><td>1.1 (EPA Meth. 12 if required)</td></tr><tr><td>Be</td><td>0.0063</td><td>0.028 (EPA Meth. 104 if required)</td></tr><tr><td>VE</td><td>10% opacity (EPA Meth. 9 annual)</td><td></td></tr><tr><td>PM/PM₁₀</td><td>0.0080 gr/ SCF (corrected to 7% O₂) (EPA Meth. 5 if required).</td><td></td></tr></table>	Pollutant	lb/hr	Tons/yr	SO ₂	65.0	284.7 (30-day rolling avg. CEMS)	NO _x	90.0	394.2 (30 day rolling avg. CEMS)	CO	200.0	876.0 (30 day rolling avg. CEMS)	VOC	22.1	96.8 (EPA Meth. 25A if required)	HCl	5.0	21.9 (EPA Meth. 26 if required)	Hg	0.022	0.096 (EPA Meth. 101A if required)	Pb	0.25	1.1 (EPA Meth. 12 if required)	Be	0.0063	0.028 (EPA Meth. 104 if required)	VE	10% opacity (EPA Meth. 9 annual)		PM/PM ₁₀	0.0080 gr/ SCF (corrected to 7% O ₂) (EPA Meth. 5 if required).		The RGS boiler exhaust gases shall not exceed the limits [Rule 62-212.400, F.A.C.]: <table><tr><th>Pollutant</th><th>lb/hr</th><th>Tons/yr</th></tr><tr><td>SO₂</td><td>65.0</td><td>284.7 (30-day rolling avg. CEMS)</td></tr><tr><td>NO_x</td><td>90.0</td><td>394.2 (30 day rolling avg. CEMS)</td></tr><tr><td>CO</td><td>200.0</td><td>876.0 (30 day rolling avg. CEMS)</td></tr><tr><td>VOC</td><td>22.1</td><td>96.8 (EPA Meth. 25A if required)</td></tr><tr><td>HCl</td><td>5.0</td><td>21.9 [EPA Meth. 26 or Meth. 26A (modified) if required]</td></tr><tr><td>Hg</td><td>0.022</td><td>0.096 (EPA Meth. 101A or Meth. 29 if required)</td></tr><tr><td>Pb</td><td>0.25</td><td>1.1 [EPA Meth. 12 or Meth. 29 if required]</td></tr><tr><td>Be</td><td>0.0063</td><td>0.028 (EPA Meth. 104 or Meth. 29 if required)</td></tr><tr><td>VE</td><td>10% opacity (6-minute average COMS)</td><td></td></tr><tr><td>PM/PM₁₀</td><td>0.0080 gr/ SCF (corrected to 7% O₂) [EPA Meth. 5 if required].</td><td></td></tr></table>	Pollutant	lb/hr	Tons/yr	SO ₂	65.0	284.7 (30-day rolling avg. CEMS)	NO _x	90.0	394.2 (30 day rolling avg. CEMS)	CO	200.0	876.0 (30 day rolling avg. CEMS)	VOC	22.1	96.8 (EPA Meth. 25A if required)	HCl	5.0	21.9 [EPA Meth. 26 or Meth. 26A (modified) if required]	Hg	0.022	0.096 (EPA Meth. 101A or Meth. 29 if required)	Pb	0.25	1.1 [EPA Meth. 12 or Meth. 29 if required]	Be	0.0063	0.028 (EPA Meth. 104 or Meth. 29 if required)	VE	10% opacity (6-minute average COMS)		PM/PM ₁₀	0.0080 gr/ SCF (corrected to 7% O ₂) [EPA Meth. 5 if required].		Allows the use of the EPA-approved methods for determining compliance using stack testing. These methods are acceptable by FDEP since they have been adopted by reference in state regulations [Rules 62-297.401, F.A.C. and 62-204.800, F.A.C.] The facility is required to use a continuous emission monitoring system for determining compliance with the VE limitation; therefore, an annual observation (Method 9) test is not required.
Pollutant	lb/hr	Tons/yr																																																																			
SO ₂	65.0	284.7 (30-day rolling avg. CEMS)																																																																			
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Company: Wheelabrator Ridge Energy Inc.
Facility ID Number: 1050216
Permit Issue date: February 14, 1997

Facility: Ridge Generating Station; Auburndale, Florida
Permit Number: AC 53-206244/PSD-FL-183

Specific Condition No.	Current Language	Proposed Revised Language	Rationale for Revision
6	Visible emissions from the ash handling area vent filter, the lime silo vent filter, and the fuel transfer building vent filter shall not exceed 10 percent opacity. [Rule 62-212.400, F.A.C.]	Visible emissions from the lime silo vent filter shall not exceed 10 percent opacity. [Rule 62-212.400, F.A.C.]	The vents and filters were installed on the ash handling area and fuel transfer building to exhaust particulate matter from these work areas for employee health and safety. Operational experience has shown that the vent/filter systems are ineffective in capturing the particulate matter generated inside the buildings and that the generation of particulate matter inside the buildings is not sufficient to be an employee health and safety issue. Any particulate matter emissions from these buildings are fugitive emissions through open doors and windows. For these reasons, it is requested that the ash handling area vent and filter and the fuel transfer building vent and filter be deleted from the permit as emission points.

5/18

~~sal~~

John Reynolds

Subj: Ridge

I have talked to Steve Smallwood about this. It seems to me that we could change permit, by a simple amendment, to allow for 40% ties.

As the BACT was to be re-evaluated slightly tighter Dm, HC's CO emissions could be ass. incl.

lets discuss

Clay

I never saw the original or the \$250 check.



April 27, 1995

Mr. Clair Fancy, P.E.
Chief, Bureau of Air Regulation
Florida Department of Environmental Protection
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Re: Ridge Generating Station
Permit Number AC53-206244 PSD-FL-183
Request for Permit Amendment

Dear Mr. Fancy:

Ridge Generating Station L.P. requests that Specific Condition #3 of the subject permit be amended to increase Ridge Generating Station's permitted tire firing capacity from 20 percent to 40 percent by heat input. Enclosed is the \$250.00 fee required to process this request.

Department approval to conduct special testing at 40% tires was received on February 9, 1995. Testing was conducted at the 40% heat input level during the first week of March, 1995. Test results clearly indicate that the facility emission limits can be met at the increased tire firing rate. Enclosed is data summarizing stack test results at 40% tires/60% wood and at 20% tires/80% wood.

Since increasing the percentage of tires combusted from 20% to 40% (heat input basis) does not result in any of the regulated air pollutants exceeding their maximum allowable BACT emission limits in the permit, it is appropriate to process this request as a permit amendment. Pursuant to Rule 62-212.200 (Definitions) (2) ("Actual Emissions"), (b) "The Department may presume that source specific allowable emissions for a source are equivalent to the actual emissions of the source provided that, for any air pollutant that is regulated by the EPA under the Clean Air Act, such source specific allowable emissions limits are federally enforceable." Rule 62-212.200 (Definitions), (2) ("Actual Emissions"), (c) states that "for a source which has not completed start-up and testing on a particular date, actual emissions shall equal the potential emissions at the source on that date."

The Facility has not completed start-up and testing, since the comprehensive emissions test program required by Specific Condition #8 of the subject permit has not yet been completed. The emission limits in the permit are federally enforceable. The potential emissions are the federally enforceable limits in the permit. The test data demonstrates that all of the federally enforceable BACT emission limits in the permit would be met. There are both operational and environmental benefits to burning a higher percentage of tires. Therefore, the facility's allowable emissions are its current "actual emissions."

Since the facility is not requesting an increase in any of the allowable emission limits, the requested change does not result in a "net emissions increase." If there is not a "net emissions increase," the proposed change in the method of operations is not a "modification." Therefore, the Department can process the requested change as an amendment to the permit.

Based on the above, it is requested that specific Condition #3 of the subject permit be amended to read as follows:

Fuel for firing the RGS boiler shall consist only of wood, landfill gas, and up to 16.1 percent tires by weight (equivalent to 40 percent tires based on heat content). The 16.1 percent tire weight limitation is equivalent to 18,505 pounds of tires per hour. Propane may be used as a startup, shutdown, and combustion stabilization fuel.

Thank you for your early response to this request. This change is important to the Facility now because it will improve current operational flexibility and efficiency. It will also help to more rapidly alleviate the tire disposal problem in Florida. Facility representatives would be very happy to meet with you if you have questions related to this submittal or if you require additional information. Please do not hesitate to contact Gary Aguinaga at (813) 665-2255.

Sincerely,



Rodney Williams
Plant Manager

Certification # P 013 080 037

cc: B. Proses (DEP, SW District)
W. Ferguson
F. Ferraro
M. Killeen
C. Aguinaga
S. Smallwood

Wheelabrator Ridge Energy, Inc. - Summary of Results

Condition I - 80% Wood/20% Tires at 100% Load

February/March 1995

POLLUTANT	UNITS	TEST RESULT				PERMIT LIMIT	COMMENT
		Rep. 1	Rep. 2	Rep. 3	Average*		
Particulate/PM10	lb/hr	2.2	2.0	1.1	1.8	12.6	
Sulfur Dioxide	lb/hr	68.9	40.6	33.2	47.6	109.4	
Nitrogen Oxides	lb/hr	82.4	86.6	84.3	84.4	94.5	
Carbon Monoxide	lb/hr	58.0	72.8	46.8	59.2	315.0	
Non-Methane Hydrocarbon	lb/hr	3.2	2.7	1.3	2.4	22.1	
Hydrogen Chloride	lb/hr	0.1	0.5	0.1	0.2	5	Rep. 1 & 3 were Non-Detect
Mercury	lb/hr	8.0E-04	8.7E-04	8.7E-04	8.5E-04	0.022	Rep. 1,2 & 3 were Non-Detect
Lead	lb/hr	1.8E-03	8.8E-03	5.6E-04	3.7E-03	0.25	
Beryllium	lb/hr	1.9E-05	1.9E-05	1.8E-05	1.9E-05	0.0063	Rep. 1,2 & 3 were Non-Detect

* - Non Detect values used in averages for worst case.

Condition III - 60% Wood/40% Tires at 100% Load

February/March 1995

POLLUTANT	UNITS	TEST RESULT				PERMIT LIMIT	COMMENT
		Rep. 1	Rep. 2	Rep. 3	Average*		
Particulate/PM10	lb/hr	0.43	2.0	1.82	1.4	12.6	
Sulfur Dioxide	lb/hr	74.2	87.3	56.9	72.8	109.4	
Nitrogen Oxides	lb/hr	78.1	77.0	82.2	79.1	94.5	
Carbon Monoxide	lb/hr	56.6	64.3	63.7	61.5	315.0	
Non-Methane Hydrocarbon	lb/hr	1.5	0.9	1.3	1.2	22.1	
Hydrogen Chloride	lb/hr	0.1	0.2	0.2	0.2	5	
Mercury	lb/hr	9.1E-04	9.0E-04	8.0E-04	8.7E-04	0.022	Rep. 1,2 & 3 were Non-Detect
Lead	lb/hr	4.0E-03	6.1E-04	2.2E-04	1.6E-03	0.25	
Beryllium	lb/hr	1.8E-05	1.8E-05	1.8E-05	1.8E-05	0.0063	Rep. 1,2 & 3 were Non-Detect

* - Non Detect values used in averages for worst case.

a:\feb95.wk4

RIDGE GENERATING STATION, L.P.

3131 K-VILLE AVENUE
AUBURNDALE, FL 33823
(813) 665-2255

BARNETT BANK
AUBURNDALE, FLORIDA 33823
[REDACTED]

0102859

1152

April 28, 1995

PAY TO THE ORDER OF Florida Department of Environmental Protection \$ 250.00

Two-hundred and fifty 00/100 ----- DOLLARS

MEMO Air Permit Amendment Request

RC Williams

[REDACTED]



July 27, 1995

Mr. A. A. Linero
Bureau of Air Regulation
Florida Department of Environmental Protection
2600 Blair Stone Road
Tallahassee, FL 32399-2400

RECEIVED

AUG 2 1995

Bureau of
Air Regulation

Re: Ridge Generating Station
Permit Number AC53-206244 PSD-FL-183(A)
AIRS Number 1050216
Proof of Publication

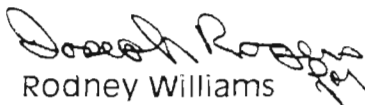
Dear Mr. Linero:

As stated in my letter of July 24, 1995, the Facility has published the Department's "Notice of Intent to Issue Permit". The Notice was published in the Lakeland Ledger on Saturday, July 22, 1995. Attached is the original Affidavit of Publication from the Ledger.

We look forward to receiving your final authorization to proceed with the interim air pollution limits allowing the Facility to burn up to 16.9 percent tires (40 percent of heat input) with a sulfur dioxide limit of 72 pounds per hour on a 30-day rolling average, following the 14-day period which will end on August 5, 1995.

If there are any questions or concerns regarding this submittal, please contact Chuck Davis at (941) 665-2255.

Sincerely,


Rodney Williams
Plant Manager

/lc

Attachment

cc: C. Davis
M. Killeen
F. Ferraro
W. Ferguson
S. Smallwood (D & M)
J. Rogers

Al said
Kamani will
handle final

BEST AVAILABLE COPY

AFFIDAVIT OF PUBLICATION

JUL 27 1995

THE LEDGER
Lakeland, Polk County, Florida

WHEELABRATOR RIDGE ENERGY INC.

Case No.....

STATE OF FLORIDA)
COUNTY OF POLK)

Before the undersigned authority personally appeared Robert Lee, who on oath says that he is Classified Manager of The Ledger, a daily newspaper published in Polk County, Florida; that the attached copy of advertisement, being a

..Notice of Intent.....

in the matter of

PSD-FL-183(A).....

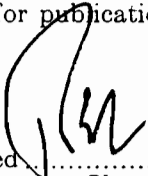
in the

Court, was published in said newspaper in the issues of

July 22;

1995

Affiant further says that said The Ledger is a newspaper published at Lakeland, in said Polk County, Florida, and that the said newspaper has heretofore been continuously published in said Polk County, Florida, daily, and has been entered as second class matter at the post office in Lakeland, in said Polk County, Florida, for a period of one year next preceding the first publication of the attached copy of advertisement; and affiant further says that he has neither paid nor promised any person, firm or corporation any discount, rebate, commission or refund for the purpose of securing this advertisement for publication in the said newspaper.

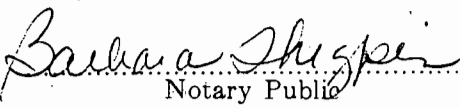
Signed  Classified Advertising Manager

by Robert E. Lee who is personally known to me

Sworn to and subscribed before me this 22nd

day of July A.D. 19 95

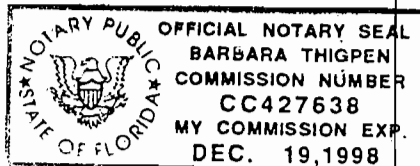
(Seal)


Notary Public

BARBARA THIGPEN

My Commission Expires

Wheelabrator
Ridge



STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOTICE OF INTENT TO ISSUE
PERMIT AMENDMENT
PSD-FL-183(A)
AC63-206244

The Department of Environmental Protection (Department) gives notice of its intent to issue a permit amendment to Wheelabrator Ridge Energy, Inc., 3131 K-Ville Avenue, Auburndale, Florida 33823. This recently constructed and permitted facility consists of a stoke boiler which combusts waste wood, landfill gas, and up to 50 megawatts of electric power. The amendment will allow the facility to burn up to 46.9 percent tires (40 percent of heat input). Emissions of acid gases, metals, and particulate matter are controlled by a lime spray dryer/fabric filter and a selective non-catalytic reduction unit. Recent testing showed that emissions when burning 15 percent tires will be within the permit limits. Additionally, the applicant has agreed to reduce its interim sulfur dioxide emission limit from 109.4 pounds per hour to 72 pounds per hour.

A person whose substantial interests are affected by the Department's proposed permitting decision may petition for an administrative proceeding (hearing) in accordance with Section 120.57, Florida Statutes (F.S.). The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 2600 Blair Stone Road, Tallahassee, Florida 32399-2400, within 14 days of publication of this notice. Petitioners shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. Failure to file a petition within this time period shall constitute a waiver of any right such person may have to request an administrative determination (hearing) under Section 120.57, F.S.

The Petition shall contain the following information: (a) The name, address, and telephone number of each petitioner, the applicant's name and address, the Department Permit File Number and the county in which the project is proposed; (b) A statement of how and when each petitioner received notice of the Department's action or proposed action; (c) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action; (d) A statement of the material facts disputed by the petitioner; (e) A statement of facts which the petitioner contends warrants reversal or modification of the Department's action or proposed action; (f) A statement of which rules or statutes the petitioner contends require reversal or modification of the Department's action or proposed action; and (g) A statement of the relief sought by the petitioner stating precisely the action the petitioner wants the Department to take with respect to the Department's action or proposed action.

A petition submitted administratively to the process designed for formal agency action. Accordingly, the Department's final action may be different from the position stated by it in this notice. Persons whose substantial interests will be affected by any decision of the Department with regard to the application/request have the right to petition to become a party to these proceedings. The petition must conform to the requirements specified above and be filed (received) within 14 days of publication of this notice in the Office of General Counsel at the above address of the Department. Failure to petition within the allowed time frame constitutes a waiver of any right such person has to request a hearing under Section 120.57, F.S., and to participate as a party to this proceeding. Any subsequent intervention will only be at the approval of the presiding officer upon motion filed pursuant to Rule 28-5.207, Florida Administrative Code.

The application/request is available for public inspection during normal business hours, 8:00 a.m. to 5:00 p.m., Monday through Friday, except legal holidays, at:

Department of Environmental Protection
Bureau of Air Regulation
111 S. Magnolia Drive, Suite 4
Tallahassee, Florida 32301

Department of Environmental Protection
Central District
Suite 2008
7825 Baymeadows Way
Jacksonville, Florida 32256-7577

Any person may send written comments on the proposed action to Administrator, New Source Review Section at the Department of Environmental Protection, Bureau of Air Regulations, Mail Station 5505, 3600 Blair Stone Road, Tallahassee, Florida 32399-2400. All comments received within 14 days of the publication of this notice will be considered in the Department's final determination.
F93-7-22: 1995

F 93



Wheelabrator Ridge Energy Inc.

al's

3131 K-ville Avenue
Auburndale, FL 33823
Tel. 813-665-2255
Fax 813-665-0400

RECEIVED

JUL 20 1995

Bureau of
Air Regulation

July 17, 1995

State of Florida
Department of Environmental Protection
Chief Bureau of Air Regulation
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Re: Ridge Generating Station--Request for Permit Amendment to Increase
Tire Burning
Air Permit #AC53-206244, PSD-FL-183

Attn: Mr. A. Linero

Dear Mr. Linero:

Pursuant to Facility correspondence dated April 17, 1995 and June 29, 1995, Department correspondence of July 3, 1995, and subsequent verbal communication with the Department, the Facility is willing to accept a revised SO₂ permit limit on an interim basis. It is our understanding that the Department will amend the subject permit to allow the combustion of 40% tires by heat input (approximately 16.9% by weight) with an interim SO₂ emission limit of 72 lb/hr, based on a 30-day rolling average.

It is also our understanding that if the CEMS data generated during this interim period demonstrates that higher SO₂ permit limits are justified, then the Department will consider this data prior to establishing a final permit limit for SO₂.

We look forward to your early favorable reply. Upon receipt, we will publish the required 14-day public notice.

If you have any questions concerning this submittal, please do not hesitate to contact Gary Aguinaga at (941) 665-2255, or Matt Killeen at (603) 929-3420.

Sincerely,

Rodney Williams

Rodney Williams
Plant Manager

cc: F. Ferraro
G. Aguinaga
J. Rogers

M. Killeen
C. Davis
J. Goodwin

John
Not exactly!
Cost effectiveness
of additional removal
need to reduce effect
of 40% tires are
still issues. al

Certification #P 013 080 055



Wheelabrator Ridge Energy Inc.

3131 K-Ville Avenue
Auburndale, FL 33823
Tel. 813-665-2255
Fax. 813-665-0400

April 17, 1995

State of Florida
Department of Environmental Protection
Chief Bureau of Air Regulation
2600 Blair Stone Road
Tallahassee, FL 32399-2400

RECEIVED
APR 20 1995
Bureau of
Air Regulation

Re: Ridge Generating Station
Air Permit #AC53-206244, PSD-FL-183

Dear Sir:

In accordance with 40 C.F.R. 60.50a(d), 60.59a(b)(14), and 60.59a(m), enclosed please find data summarizing the daily weight of MSW and other fuels fired during the First Quarter 1995. Our percentage of MSW combusted continues to be under 30%, so we remain subject only to the record keeping and reporting requirements for co-fired combustors under the MWC NSPS, 40 C.F.R. Part 60, Subpart Ea.

Note that the table contains entries for MSW ("yard waste" and "tires") and non-MSW ("wood" and "propane"). Most of the material in the "wood" category is mulch. This mulch is produced off-site by contract suppliers from various sources of wood, including land-clearing waste, construction and demolition debris, pallets, yard waste, and other woody materials. Although the counties and other producers use part of the mulch, the mulch that cannot be used or marketed is sent to the Ridge facility. Since this mulch is a useful product and not a waste material, it is not MSW, and it has been listed separate from the MSW.

If you have any questions regarding this submittal, please contact Gary Aguinaga at (813) 665-2255.

Sincerely,

Rodney Williams
Plant Manager

cc: EPA Region IV
B. Proses, DEP S.W. District

Certification # P 013 080 035

WHEELABRATOR RIDGE ENERGY

JANUARY '95 STATS

13-Apr

MSW PROCESSED			TOTAL MSW PROCESSED TONS	OTHER FUELS PROCESSED		TOTAL PROCESSED TONS
		YARDWASTE TONS		WOOD TONS	PROPANE TONS	
SUN	1	79.77	160.21	945.52	0.00	1105.73
MON	2	67.72	145.37	802.72	0.00	948.09
TUE	3	80.11	159.81	949.53	0.00	1109.34
WED	4	74.11	157.52	878.51	4.43	1040.46
THU	5	72.50	158.21	859.42	0.63	1018.26
FRI	6	43.20	65.11	512.03	15.83	592.97
SAT	7	69.68	164.96	825.92	0.00	990.88
SUN	8	5.12	12.34	70.58	0.00	82.92
MON	9	1.20	1.62	16.55	17.09	35.26
TUE	10	59.22	132.42	816.40	0.00	948.82
WED	11	73.08	155.88	1007.54	0.00	1163.42
THU	12	70.92	141.24	977.75	0.00	1118.99
FRI	13	74.72	122.49	1030.07	0.00	1152.56
SAT	14	58.61	129.38	808.06	0.00	937.44
SUN	15	73.20	133.44	804.25	0.00	937.69
MON	16	56.76	115.80	623.59	0.00	739.39
TUE	17	61.04	128.67	670.72	0.00	799.39
WED	18	82.26	150.78	903.78	0.00	1054.56
THU	19	64.47	150.36	708.32	0.63	859.31
FRI	20	81.51	162.20	895.60	0.00	1057.80
SAT	21	68.19	169.25	749.24	0.63	919.12
SUN	22	47.82	125.75	651.31	0.00	777.06
MON	23	42.79	100.74	582.83	7.60	691.17
TUE	24	55.00	129.80	749.14	0.00	878.94
WED	25	60.09	136.99	818.44	0.00	955.43
THU	26	35.45	89.63	482.79	6.33	578.75
FRI	27	0.00	0.00	0.00	0.00	0.00
SAT	28	12.07	43.31	164.42	12.03	219.76
SUN	29	42.64	59.43	647.36	0.00	749.43
MON	30	51.91	129.90	788.09	0.00	917.99
TUE	31	39.14	83.23	594.33	13.93	691.49
WED						
THU						
FRI						
SAT						

MTD	MTD	1704.28	1954.18	3658.46	21334.83	79.13	25072.42
	%FUELS			14.59%	85.09%	0.32%	100.00%

MSW			TOTAL MSW PROCESSED TONS	OTHER FUELS		TOTAL PROCESSED TONS
		YARDWASTE TONS		WOOD TONS	PROPANE TONS	
WK	1	487.09	1011.19	5773.65	20.89	6805.73
WK	2	342.88	695.38	4726.94	17.09	5439.41
WK	3	487.43	1010.50	5355.50	1.27	6367.27
WK	4	253.21	626.21	3448.94	25.95	4101.10
WK	5	133.69	315.20	2029.78	13.93	2358.91
MTD		1704.28	3658.46	21334.83	79.13	25072.42
	%FUELS		14.59%	85.09%	0.32%	100.00%
	1stQTD	1704.28	3658.46	21334.83	79.13	25072.42

BEST AVAILABLE COPY
WHEELABRATOR RIDGE ENERGY
FEBUARY '95 STATS

13-Apr

		MSW PROCESSED		TOTAL	OTHER FUELS PROCESSED		TOTAL
		YARDWASTE	TIRES	MSW	WOOD	PROPANE	PROCESSED
		TONS	TONS	PROCESSED	TONS	TONS	TONS
				TONS			
SUN							
MON							
TUE							
WED	1	37.56	24.67	62.23	570.28	8.32	640.83
THU	2	51.97	46.88	98.85	789.11	0.00	887.96
FRI	3	74.13	48.40	122.53	1125.61	0.00	1248.14
SAT	4	71.57	80.01	151.58	1086.66	0.63	1238.87
SUN	5	76.37	87.21	163.58	1171.54	0.00	1335.12
MON	6	70.00	102.61	172.61	1073.83	0.00	1246.44
TUE	7	75.07	91.68	166.75	1151.46	0.00	1318.21
WED	8	80.59	95.81	176.40	1236.16	0.00	1412.56
THU	9	82.29	84.86	167.15	1262.33	0.00	1429.48
FRI	10	56.34	54.38	110.72	864.26	2.53	977.51
SAT	11	41.12	56.90	98.02	630.70	18.36	747.08
SUN	12	29.62	92.13	121.75	1181.85	0.00	1303.60
MON	13	26.02	101.45	127.47	1038.38	0.00	1165.85
TUE	14	21.93	99.74	121.67	874.93	0.09	996.69
WED	15	22.73	85.83	108.56	907.14	0.00	1015.70
THU	16	28.00	83.84	111.84	1117.19	3.17	1232.20
FRI	17	26.31	75.23	101.54	1049.84	19.03	1170.41
SAT	18	15.27	56.82	72.09	609.43	13.95	695.47
SUN	19	79.06	105.22	184.28	1072.13	29.13	1285.54
MON	20	74.32	103.69	178.01	1007.84	24.69	1210.54
TUE	21	65.52	106.11	171.63	888.47	28.53	1088.63
WED	22	76.51	105.54	182.05	1037.49	0.00	1219.54
THU	23	30.22	31.87	62.09	409.73	11.39	483.21
FRI	24	80.55	77.69	158.24	1092.21	0.00	1250.45
SAT	25	88.63	44.60	133.23	1201.86	0.00	1335.09
SUN	26	118.64	94.27	212.91	1133.17	0.00	1346.08
MON	27	124.52	39.69	164.21	1189.39	0.00	1353.60
TUE	28	86.39	17.41	103.80	825.20	24.42	953.42
WED							
THU							
FRI							
SAT							

MTD	MTD	1711.26	2094.54	3805.80	27598.18	184.24	31588.22
	%FUELS			12.05%	87.37%	0.58%	100.00%
		MSW		TOTAL	OTHER FUELS		TOTAL
		YARDWASTE	TIRES	MSW	WOOD	PROPANE	PROCESSED
		TONS	TONS	PROCESSED	TONS	TONS	TONS
				TONS			
WK	1	235.24	199.96	435.20	3571.65	8.95	4015.80
WK	2	481.79	573.45	1055.24	7390.27	20.89	8466.40
WK	3	169.87	595.04	764.91	6778.77	36.24	7579.92
WK	4	494.81	574.72	1069.53	6709.73	93.74	7873.00
WK	5	329.55	151.37	480.92	3147.76	24.42	3653.10
MTD		1711.26	2094.54	3805.80	27598.18	184.24	31588.22
	%FUELS			13.17%	86.36%	0.46%	100.00%
	1stQTD	3415.54	4048.72	7464.26	48933.01	263.36	56660.63

BEST AVAILABLE COPY
WHEELABRATOR RIDGE ENERGY
MARCH '95 STATS

13-Apr

		MSW PROCESSED		TOTAL MSW PROCESSED	OTHER FUELS PROCESSED		TOTAL PROCESSED
		YARDWASTE TONS	TIRES TONS	TONS	WOOD TONS	PROPANE TONS	TONS
SUN							
MON							
TUE							
WED	1	105.41	149.94	255.35	1006.83	0.00	1262.18
THU	2	104.37	144.99	249.36	996.93	0.00	1246.29
FRI	3	114.28	119.51	233.79	1091.53	0.00	1325.32
SAT	4	106.27	80.31	186.58	1015.03	7.60	1209.21
SUN	5	232.61	105.46	338.07	1061.85	0.00	1399.92
MON	6	198.90	52.74	251.64	907.92	18.99	1178.55
TUE	7	204.42	119.43	323.85	933.16	0.00	1257.01
WED	8	196.79	163.27	360.06	898.34	0.63	1259.03
THU	9	202.67	153.89	356.56	925.13	0.63	1282.32
FRI	10	203.29	106.53	309.82	928.00	3.18	1241.00
SAT	11	184.56	105.39	289.95	842.51	0.00	1132.46
SUN	12	65.17	106.80	171.97	1015.72	0.00	1187.69
MON	13	72.25	90.52	162.77	1126.08	0.00	1288.85
TUE	14	75.49	105.50	180.99	1176.66	0.00	1357.65
WED	15	73.85	85.12	158.97	1151.06	0.00	1310.03
THU	16	79.62	97.54	177.16	1241.06	0.00	1418.22
FRI	17	67.63	102.57	170.20	1054.16	0.00	1224.36
SAT	18	67.64	104.30	171.94	1054.20	0.00	1226.14
SUN	19	84.99	55.73	140.72	378.86	22.79	542.37
MON	20	218.59	102.88	321.47	974.36	0.00	1295.83
TUE	21	224.89	99.50	324.39	1002.46	0.00	1326.85
WED	22	209.97	100.40	310.37	935.93	0.00	1246.30
THU	23	206.27	98.83	305.10	919.47	0.00	1224.57
FRI	24	147.01	76.79	223.80	655.28	8.23	887.31
SAT	25	206.40	106.04	312.44	920.06	0.00	1232.50
SUN	26	72.12	105.48	177.60	1086.12	0.00	1263.72
MON	27	69.60	92.27	161.87	1048.28	0.00	1210.15
TUE	28	70.10	78.43	148.53	1055.73	5.70	1209.96
WED	29	63.53	74.94	138.47	956.77	4.43	1099.67
THU	30	65.78	75.46	141.24	990.75	11.00	1142.99
FRI	31	85.83	72.12	157.95	1292.60	0.00	1450.55
SAT							

MTD	MTD	4080.31	3132.68	7212.99	30642.83	83.18	37939.00
	%FUELS			19.01%	80.77%	0.22%	100.00%

		MSW		TOTAL MSW PROCESSED	OTHER FUELS		TOTAL PROCESSED
		YARDWASTE TONS	TIRES TONS	TONS	WOOD TONS	PROPANE TONS	TONS
WK	1	430.32	494.75	925.07	4110.33	7.60	5043.00
WK	2	1423.25	806.71	2229.96	6496.90	23.43	8750.29
WK	3	501.65	692.35	1194.00	7818.94	0.00	9012.94
WK	4	1298.12	640.17	1938.29	5786.42	31.02	7755.73
WK	5	426.96	498.70	925.66	6430.25	21.13	7377.04
MTD		4080.31	3132.68	7212.99	30642.83	83.18	37939.00
	%FUELS			15.52%	84.12%	0.37%	100.00%
	1stQTD	7495.85	7181.40	14677.25	79575.84	346.54	94599.63



Department of Environmental Protection

Lawton Chiles
Governor

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Virginia B. Wetherell
Secretary

March 2, 1995

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Rodney Williams
Plant Manager
Wheelabrator Ridge Energy, Inc.
3131 K-Ville Avenue
Auburndale, Florida 33823

Dear Mr. Williams:

This provides notice that no petitions were filed during the 14-day period following publication of your proposed testing schedule. Accordingly, Wheelabrator Ridge Energy, Inc., is authorized to proceed with testing as outlined in the Department's letter dated February 9, 1995. As indicated in that letter, your construction permit will be amended following receipt of the emissions testing program results and upon receipt of the required permit amendment fee.

If there are any further questions regarding this matter, please call Al Linero or John Reynolds of our staff at 904-488-1344.

Sincerely,

Howard L. Rhodes, Director
Division of Air Resources
Management

HLR/jr/t

cc: B. Thomas, SWD
L. Novak, Polk County
M. Harley, DEP
J. Harper, EPA
S. Smallwood, D&M
M. Killeen, WREI

April 4, 1995

Mr. A. A. Linero
Bureau of Air Regulation
Florida Department of Environmental Protection
2600 Blair Stone Road
Tallahassee, FL 32399-2400

RECEIVED
APR 11 1995
Bureau of
Air Regulation

Re: Ridge Generating Station
Permit Number AC53-206244 PSD-FL-183
Affidavit of Publication

Dear Mr. Linero:

Enclosed for your files please find the original Affidavit of Publication for the legal notice published in the Lakeland Ledger on February 11, 1995 regarding special testing at Ridge Generating Station. This is provided as a follow-up to our submittal of February 11, 1995 which contained an original copy of the legal notice to serve as proof of publication until the affidavit was available.

If there are any questions regarding this submittal, please contact Gary Aguinaga at (813) 665-2255.

Sincerely,


Rodney Williams
Plant Manager

/lc

Attachment

cc: G. Aguinaga
B. Proses (DEP, SW)
M. Killeen
W. Ferguson
J. Rogers

Certification #P013 080 032

AFFIDAVIT OF PUBLICATION

THE LEDGER

Lakeland, Polk County, Florida

Case No

STATE OF FLORIDA)
COUNTY OF POLK)

Before the undersigned authority personally appeared Robert Lee, who on oath says that he is Classified Manager of The Ledger, a daily newspaper published in Polk County, Florida; that the attached copy of advertisement, being a

...Notice of Intent.....

in the matter of

Special Testing

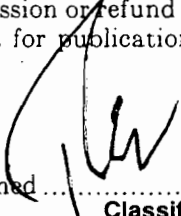
in the

Court, was published in said newspaper in the issues of

February 11;

1995.....

Affiant further says that said The Ledger is a newspaper published at Lakeland, in said Polk County, Florida, and that the said newspaper has heretofore been continuously published in said Polk County, Florida, daily, and has been entered as second class matter at the post office in Lakeland, in said Polk County, Florida, for a period of one year next preceding the first publication of the attached copy of advertisement; and affiant further says that he has neither paid nor promised any person, firm or corporation any discount, rebate, commission or refund for the purpose of securing this advertisement for publication in the said newspaper.

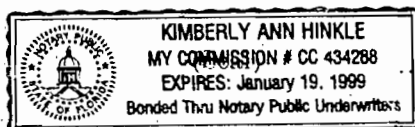
Signed 

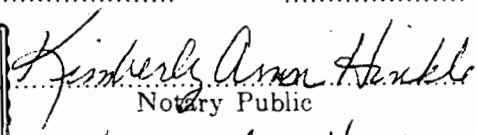
Classified Advertising Manager

by Robert E. Lee who is
personally known to me

Sworn to and subscribed before me this 11th

day of February A.D. 19 95




Notary Public

My Commission Expires Kimberly Ann Hinkle
Wheelabrator Ridge Energy Inc.
Acct. 21673

STATE OF FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION NOTICE OF INTENT TO ALLOW SPECIAL TESTING Polk County

The Department of Environmental Protection gives notice of its intent to allow special testing at the Wheelabrator Ridge Energy, Inc., facility located off State Road 542 and Taylor Road near Auburndale, Polk County, Florida. The special testing is scheduled to commence on or about March 1, 1995, and April 1, 1995 and should last approximately 10 days each time. The facility proposes to increase the percentage of tires burned from the currently permitted 20% tires/80% wood, to 40% tires/60% wood for the duration of these special testing periods. This change is not expected to result in any additional impact to the environment.

A person whose substantial interests are affected by the Department's proposed action may petition for an administrative proceeding (hearing) in accordance with Section 120.57, F.S. The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at: 2600 Blair Stone Road, Tallahassee, Florida 32399-2400, within 14 days of publication of this notice. Petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. Failure to file a petition within this time period shall constitute a waiver of any right such person may have to request an administrative determination (hearing) under Section 120.57, F.S.

The Petition shall contain the following information: (a) The name, address, and telephone number of each petitioner; (b) A statement of how and when each petitioner received notice of the Department's action or proposed action; (c) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action; (d) A statement of the material facts disputed by Petitioner; if any; (e) A statement of facts which petitioner contends warrant reversal or modification of the Department's action or proposed action; (f) A statement of which rules or statutes petitioner contends require reversal or modification of the Department's action or proposed action; and, (g) A statement of the relief sought by petitioner, stating precisely the action petitioner wants the Department to take with respect to the Department's action or proposed action.

If a petition is filed, the administrative hearing process is designed to formulate agency action. Accordingly, the Department's final action may be different from the position taken by it in this Notice. Persons whose substantial interests will be affected by any decision of the Department with regard to the application have the right to petition to become a party to the proceeding. The petition must conform to the requirements specified above and be filed (received) within 14 days of publication of this notice in the Office of General Counsel at the above address of the Department. Failure to petition within the allowed time frame constitutes a waiver of any right such person has to request a hearing under Section 120.57, F.S., and to participate as a party to this proceeding. Any subsequent intervention will only be at the approval of the presiding officer upon motion filed pursuant to Rule 28-5.207, Florida Administrative Code.

Any person may send written comments on the proposed action to Mr. A.A. Linero, at the Department's Tallahassee address. All comments received within 14 days of the publication of this notice will be considered.

K524 - 2-11-1995

K524

COPY



Wheelabrator Ridge Energy Inc.

3131 K-Ville Avenue
Auburndale, FL 33823
Tel. 813-665-2255
Fax. 813-665-0400

March 20, 1995

RECEIVED
MAR 23 1995

Florida Department of Environmental Protection
Southwest District
3804 Coconut Palm Drive
Tampa, FL 33619

Bureau of
Air Regulation

Attn: Mr. Bill Proses

Subject: Ridge Generating Station
Air Permit #AC53-206244

Dear Sir:

The Department is notified that Ridge Generating Station has scheduled its annual Relative Accuracy Test Audit (RATA) to be performed on April 21, 1995. The RATA will be performed by Entropy, Inc. at the conclusion of the scheduled quarterly stack test event.

If there are any questions or concerns, please call Gary Aguinaga at (813) 665-2255.

Sincerely,

Rodney Williams
Plant Manager

/lc

cc: Chief Bureau of Air Regulation
EPA Region IV
F. Ferraro
J. Goodwin
J. Rogers
G. Aguinaga
Ridge File 6.2.1

Fed Ex #4288782492

General Partners



DECKER ENERGY-RIDGE, INC.



WHEELABRATOR POLK INC.

RECEIVED

400 North New York Avenue, Suite 101
Winter Park, Florida 32789
Tel. 407-628-8900
Fax. 407-628-8535

AUG 26 1992

August 24, 1992

Bureau of
Air Regulation

Florida Department of Environmental Regulation
Division of Air Resources Management
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Attention: Mr. Preston Lewis, P.E.
Bureau of Air Regulation

Re: Ridge Generating Station, Polk County
DER File No. AC 53-206244, PSD-FL-183

Dear Mr. Lewis:

On July 29, 1992, Ridge Generating Station Limited Partnership (RGSLP) received the Revised Technical Evaluation and Preliminary Determination and the proposed permit for the Ridge Generating Station. This letter summarizes our comments on these documents. We have arranged our comments in the order in which they appear in the document. In addition, we have also attached a marked-up version of the documents which clearly illustrates the revisions that we are requesting. The basis for the requested revisions is provided below.

1. Revised Technical Evaluation and Preliminary Determination, Page 3, Paragraph 1

Requested Revisions

The words "urea or" should be inserted between the words "injecting" and "ammonia" in the last line.

Basis

As discussed in the Application, either urea or ammonia will be used as a reagent in the SNCR system, depending upon which vendor is selected. Since a final decision on the SNCR vendor has not been made, it would be more accurate to list both options in the Technical Evaluation.

2. Proposed Permit, Page 6 of 9, Specific Condition 5

a. Comment

Based upon discussions between Steve Smallwood and John Reynolds, it is our understanding that the numbers in the column titled "Basis (lb/MMBTU)" are not permit limits that are to be used for determining compliance. The permit limits are those numbers that are found in

the columns titled "Lbs/hr*" and "Tons/yr." If our understanding on this issue is incorrect, it is essential that the averaging period specified in specific Condition 5 also apply to the numbers in the "Lb/MMBTU" column. This could easily be accomplished by adding the asterisk to the title of that column as well.

b. Requested Revision

The titles of the last two columns should be revised to read "Limits (Lbs/hr)*" and "Limits (Tons/yr)".

Basis

This revision would avoid future potential confusion related to which values listed in the Condition are the "Limits" which shall not be exceeded versus those that are intended to be used simply as a "Basis" for calculation purposes.

c. Requested Revision

The word "test" in the last line of Specific Condition 5 should be deleted and replaced with the phrase "the emissions testing program."

Basis

This change would make it clear that future decisions related to revisions of the emissions limits and averaging periods would be based on the results of the comprehensive emissions testing program rather than some other unspecified test.

3. Proposed Permit, Page 6 of 9, Specific Condition 6

Comment

It was our understanding, based on our meeting of July 1, 1992, that it was not the intention of the Department to require ambient ammonia monitoring throughout the operational life of the facility. It was our understanding that ambient monitoring for ammonia would be required during an initial testing program and that a decision on the long term need for, and method of, future ammonia monitoring would be based upon the results of the Test Program.

Requested Revision

The last sentence of Specific Condition 6 should be deleted and replaced with the following sentence: "The results of the monitoring program shall be discussed in the Emissions Testing Program report. The need for and method of additional ammonia monitoring will be determined by the Department based on the results of the emissions testing program."

Basis

This revision would make it clear that a decision on the long term monitoring requirements will be based on the results of the test program. If those results indicate that long term monitoring is warranted, then it can be required. If, however, those results indicate that long term monitoring is not warranted, then it would not be prudent or justifiable to require it. It is clearly more appropriate to make a final decision based upon facility specific data.

As we have discussed, although we do not believe that ammonia emissions will be problematic at this facility, we are sensitive to the issues you have had to face with other types of facilities. Therefore, we are willing to install a monitor on a temporary basis, for the duration of the testing program. We do not believe, however, that it is appropriate to require the permanent installation and operation of an ammonia monitor at this facility when you consider the source of potential ammonia emissions and the proposed automated control system.

4. Proposed Permit, Page 6 of 9, Specific Condition 7

Requested Revision

The words "fly ash silo" should be deleted from the first line of the condition and replaced with the words "ash handling area."

Basis

As discussed on Pages 3-7 and 3-8 of the Application Report, two alternative methods of handling/storing combined ash were initially being considered. In our March 19, 1992 letter to C.E. Fancy, we indicated that the ash silo alternative had been replaced by an ash handling building containing "roll-on roll-off" containers. The requested

revision is proposed to avoid any confusion related to the ash handling area vent filter.

5. Proposed Permit, Page 7 of 9, Specific Condition 8

a. Requested Revision

Delete the requirement for stack emission tests at 50 percent.

Basis

We request that the requirement for testing at 50 percent be deleted because that load level will not constitute a normal operating condition. RGSLP will always attempt to maintain the facility at as close to full load as possible. There may be times such as with wet fuel, when the facility is operating at a boiler capacity in the range of 75 percent. However, the facility will not be operated continuously at a load as low as 50 percent because it would be uneconomical to operate at that level. Since a 50 percent load range will not be representative of facility operation, it is not appropriate to require stack emissions testing at that level. The Emissions Testing Program Report will include CEM data covering the transition periods of start-up and shut-down.

b. Requested Revision

Insert the following sentence in the fifth line on Page 7 following the word "startup" and preceding the next sentence beginning "The following EPA...": "The first firing of wood, tires or landfill gas will constitute initial startup."

Basis

The requested revision would clarify what we believe your intent to be with regard to initial startup.

6. Proposed Permit, Page 7 of 9, Specific Condition 9

Requested Revision

The words "initial compliance test" should be deleted from the sixth line and replaced with the words "emissions testing program."

Basis

This clarification is desirable to deal with emissions testing requirements in a consistent manner throughout the Permit.

7. Proposed Permit, Page 8 of 9, Specific Condition 16

Comment

We believe that the meaning of the phrase "revised BACT application" could be misconstrued and, therefore, the meaning should be clarified. Based on our discussions on this topic, it is our understanding that the Department agrees that the control systems proposed represent the best available control technology. The Department has proposed a two step process to establish the final emissions limits and averaging periods, with the final limits being established based on the results of the Emissions Testing Program. We believe that this is an excellent approach for this facility.

We also understand that the Department would like economic information related to the selected control systems and we are willing to provide that information to the Department. It is imperative, however, that the permit clearly indicates that the additional BACT related information is being submitted for the purpose of establishing final emissions limits and averaging periods and not for the purpose of re-evaluating the selected control systems. While we believe that the last statement on page 8 of 9 (Specific Condition 17) makes that point, we believe that potential future confusion should be avoided by making several additional clarifying revisions.

Requested Revision

The last four words in Specific Condition 16, "a revised BACT application," should be deleted and the following words should be inserted, "proposed final BACT emissions limits and averaging periods based on a statistical analysis of the emissions testing program data. Economic information shall also be submitted for the selected control equipment, as described in the attached BACT determination."

Basis

As discussed in the comment above, this revision would clarify the nature and intent of the required supplemental BACT information.

8. Proposed Permit, Page 8 of 9, Specific Condition 17

Requested Revision

The first sentence in the condition should be revised to read: "Within 90 days of receipt of the proposed revised BACT emissions limits and other..."

Basis

This will clarify the nature and intended use of the additional BACT related data to be submitted.

9. BACT Determination, Page 1 of 4, Maximum Allowable Emissions Table

Requested Revisions

The value for VOC's in the columns titled "Proposed by RGS" and "Proposed by DER" should be "96.8" rather than the value of "96.6" as currently shown. Similarly, the value for Hg in the same columns should be "0.097" rather than the "0.1" currently shown.

Basis

These revisions are required to be consistent with the Application, the Revised Technical Evaluation and Preliminary Determination, and the proposed permit.

10. BACT Determination, Page 3 of 4

Requested Revisions

The following changes should be made in the section entitled "BACT Determination Rationale." The first phrase on line one, "Irrespective of control technology economics," should be deleted. The second sentence of the first paragraph, beginning with the word "However" and ending with the word "time" should be deleted. The second paragraph should be merged with the revised first paragraph and the following should be added as a new paragraph:

"The permit also requires the permittee to submit economic information related to the selected control equipment. This submittal shall include information on the total installed capital cost of each system (consisting of total direct costs and total indirect costs) and the total annual cost of each system

(consisting of direct costs, indirect costs, and recovery credits if any). The total annual costs will be used to estimate a cost effectiveness for the installed control systems in terms of dollars per ton of pollutant removed."

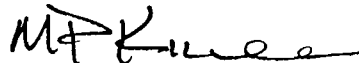
Basis

Similar to the explanation for the requested revision of Specific Condition No. 16, we are requesting this revision to more clearly define the purpose and content of the supplemental BACT related information to be submitted.

We appreciate the time and thought that have gone into the Department's consideration of the Ridge Generating Station permit application to date and would appreciate your further consideration of the comments in this letter. We believe that the requested revisions are minor in nature but are important clarifications that will avoid future potential confusion related to the permit.

Again, we appreciate the efforts of you and your staff and we would be happy to discuss any of the proposed revisions with you.

Sincerely,



Matthew P. Killeen
Senior Environmental Engineer

MPK141:ga

Attachment

cc: J. Reynolds (FDER)
S. Smallwood (D&M)
R. Stone
M. Whiting

ATTACHMENT A

PROPOSED REVISIONS

MARKED-UP COPY

UREA OR

reduction (SNCR) which reduces NO_x to elemental nitrogen by injecting ammonia into the boiler furnace. X

Since the hours of operation under each of the three scenarios are unknown, and since other fuel mix percentages will also occur, projections of maximum proposed annual emissions would have to be based on the maximums for these anticipated fuel mix cases. The applicant's estimated actual emissions for three anticipated fuel mix scenarios (based on heat input percentages using the applicant's proposed emission limits) are tabulated below.

	100% Wood		80% Wood 20% Tires		75% Wood/15% Tires 10% Landfill Gas		PSD Level
	lbs/hr	tons/yr	lbs/hr	tons/yr	lbs/hr	tons/yr	tons/yr
PM/PM ₁₀	12.6	55.2	12.6	55.2	12.6	55.2	25/10
SO ₂	69.4	304.0	109.4	479.2	92.5	405.2	40
NO _x	94.5	413.9	94.5	413.9	94.5	413.9	40
CO	315.0	1,379.7	315.0	1,379.7	315.0	1,379.7	100
VOC	22.1	96.8	22.1	96.8	22.1	96.8	40
NH ₃	17.8	78.0	17.8	78.0	17.8	78.0	-
C ₆ H ₆	5.0	21.9	5.0	21.9	5.0	21.9	-
HCHO	1.7	7.5	1.7	7.5	1.7	7.5	-
HCL	5.0	22.1	5.0	22.1	5.0	22.1	-
Pb	0.25	1.1	0.25	1.1	0.25	1.1	0.6
Zn	0.63	2.8	0.63	2.8	0.63	2.8	-
Hg	0.02	0.097	0.02	0.097	0.02	0.097	0.1
Be	.0063	0.03	.0063	0.03	.0063	0.03	.0004

III. Rule Applicability

The construction permit application is subject to review under Chapter 403, Florida Statutes, and Florida Administrative Code (F.A.C.) Chapters 17-2 and 17-4. The proposed facility is subject to the provisions of F.A.C. Rule 17-2.500, Prevention of Significant Deterioration (PSD). The facility is located in an area classified as attainment for all regulated air pollutants. Proposed emissions of PM/PM₁₀, SO₂, NO_x, CO, VOC, Pb, and Be equal or exceed the significant levels set forth in Table 500-2 of F.A.C. Rule 17-2.500. Preconstruction review must include a determination of Best Available Control Technology (BACT), good-engineering practice stack height, ambient impact analysis, impact on soils, vegetation and visibility. Applicable emission limit rules are F.A.C. Rules 17-2.660, Table 660-1, Section 60.40b, Subpart Db, 60.43b (c)(1), (f) and (g), 60.44b (d), Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units. For the ash handling system and lime silo, applicable rules are F.A.C. Rules 17-2.610(2) and (3). The above rules would dictate limits except that BACT limits are more stringent and therefore apply.

PERMITTEE:
Ridge Generating Station, L.P.

Permit Number: AC 53-206244
PSD-FL-183
Expiration Date: December 31, 1995

SPECIFIC CONDITIONS:

5. Initially, the RGS boiler exhaust gases shall not exceed the limits shown below. Following completion of the emission testing program required in Specific Condition No. 8, these limits may be revised.

Pollutant	Basis (lb/MMBTU)	LIMITS ↓ (Lbs/hr*)	LIMITS ↓ (Tons/yr)
PM/PM ₁₀	0.02	12.6	55.2
SO ₂	0.17	109.4	479.2
NO _x	0.15	94.5	413.9
CO	0.50	315.0	1,379.7
VOC	0.035	22.1	96.8
HCL	0.008	5.0	22.1
Hg	0.000035	0.022	0.097
Pb	0.0004	0.25	1.1
Be	0.00001	0.0063	0.03

*Based on 24 hour average. The feasibility of establishing startup/shutdown limits, hourly limits, or rolling average limits in addition to or in lieu of the above limits will be determined after analysis of test data.

THE EMISSIONS TESTING PROGRAM

6. SNCR chemical injection into the boiler exhaust gases shall be provided by an automated control system as described in the application. Ammonia emissions shall be continuously monitored at a prevailing downwind location on the RGS property line by commercially available ambient monitoring equipment. The monitoring data shall be collected and reported for the entire operating period from the initial startup to the time that the emissions test program is completed. ~~Thereafter, the monitoring data shall be collected and stored and made available to the Department upon request.~~

7. Visible emissions from the RGS boiler stack, the fly ash silo vent filter, and the lime silo vent filter shall not exceed 10 percent opacity. HANDLING AREA

8. In lieu of the usual compliance test requirement, the RGS facility shall, at least six months prior to initial startup of the RGS facility, propose for Department approval a comprehensive emissions testing program representative of the full range of facility operation as stated in the application. It will include continuous emission monitoring (CEM) stack data for SO₂, NO_x and

THE RESULTS OF THE MONITORING PROGRAM SHALL BE DISCUSSED IN THE EMISSIONS TESTING PROGRAM REPORT. THE NEED FOR AND METHOD OF ADDITIONAL AMMONIA MONITORING WILL BE DETERMINED BY THE DEPARTMENT BASED ON THE RESULTS OF THE EMISSIONS TESTING PROGRAM.

PERMITTEE:
Ridge Generating Station, L.P.

Permit Number: AC 53-206244

PSD-FL-183

Expiration Date: December 31, 1995

THE FIRST FIRING OF WOOD, TIRES OR LANDFILL GAS
WILL CONSTITUTE INITIAL STARTUP.

SPECIFIC CONDITIONS:

CO, and stack emission tests for each limited pollutant at ~~50~~ ⁷⁵ percent, and 100 percent of permitted capacity for wood and tires. The emissions testing program shall be completed and results submitted as required in Specific Condition No. 16 within fifteen months after the initial startup. The following EPA test methods or other methods approved by the Department shall be followed:

<u>Pollutant</u>	<u>Test Method</u>
VE	9
PM/PM ₁₀	5 (front half only)
SO ₂	6C
NO _x	7E
CO	10
VOC	25A
HCl	26
Hg	101A
Pb	12
Be	104

EMISSIONS TESTING PROGRAM

9. As part of the required emissions testing program, the permittee shall sample the RGS boiler stack for the following pollutants after proposing acceptable test methods to the Department's Bureau of Air Regulation in Tallahassee. The results of these additional tests shall be reported in lbs/hr and ug/m3 along with the ~~initial compliance test results~~: Ammonia, Arsenic, Cadmium, Chromium (total), Chromium VI, Zinc Oxide, Benzene, Sulfuric Acid, Polychlorinated Biphenyls (PCBs), Dioxins/Furans.

10. Continuous monitoring equipment shall be installed and operated to measure and record generator output, furnace temperature, stack opacity, and SO₂, NO_x and CO emissions. The tire feed rate in pounds per hour shall be monitored continuously by a commercially available weight detecting system with recording capability, or another method approved by the Department. The tire feed rate data shall be maintained and provided to the Department upon request.

11. Fugitive emissions from the RGS material receiving, processing, storage and transfer operations shall be determined according to EPA Method 22 over a 3-day period that is representative of typical operation. Results of the fugitive emissions survey shall be reported along with the results of the emissions testing program.

12. All reasonable precautions set forth in F.A.C. Rule 17-2.610(3), as well as all measures proposed by the permittee in

PERMITTEE:

Ridge Generating Station, L.P.

Permit Number: AC 53-206244

PSD-FL-183

Expiration Date: December 31, 1995

SPECIFIC CONDITIONS:

the application, shall be taken by the permittee to prevent fugitive emissions.

13. In the event of any malfunction resulting in failure of emission control equipment or any malfunction of process equipment resulting in emissions exceeding limits set forth in Specific Condition No. 5, the operator shall immediately stop the feeding of tires into the boiler and shall use propane firing, if necessary, to maintain a minimum of 1800 degrees F in the combustion zone until all tires in the system have been combusted. No tires may be refeed into the boiler following the malfunction until the emission control equipment has been put into proper working order.

14. Whenever the baghouse bypass is activated during an on-line operating situation for any reason, the permittee shall, within 24 hours, provide the Department's Southwest District Office with a complete report of the circumstances and reasons for the occurrence, indicating the amounts of pollutants estimated to have been discharged during the bypass period.

15. No pollutants shall be discharged from the RGS facility which cause or contribute to an objectionable odor (F.A.C. Rule 17-2.620(2)).

16. Results of the emissions testing program and other required submittals shall be submitted to the Department's Southwest District office and the Department's Bureau of Air Regulation office in Tallahassee within fifteen months after initial startup of the RGS facility. Sampling facilities, methods, and reporting shall be in accordance with F.A.C. Rule 17-2.700 and 40 CFR 60, Appendix A. The Department's Southwest District office shall be notified at least 30 days prior to each emission test conducted in the testing program. Along with the submittal to the Department's Bureau of Air Regulation office, the permittee shall include a

~~revised BACT application~~ PROPOSED FINAL BACT EMISSIONS LIMITS AND AVERAGING PERIODS BASED ON A STATISTICAL ANALYSIS OF THE EMISSIONS TESTING PROGRAM DATA.

17. Within 90 days of receipt of the ~~revised BACT application~~ and other required submittals, the Department's Bureau of Air Regulation in Tallahassee shall revise the BACT determination and permit limits and conditions as appropriate with the goal of allowing the RGS facility to be operated in an environmentally responsible manner. Revisions may include additional emission limits for other air pollutants as well as separate limits for specific operating conditions. Except for mercury abatement, the BACT control technology would not be revised in the Department's final BACT determination.

ECONOMIC INFORMATION SHALL ALSO BE SUBMITTED FOR THE SELECTED CONTROL EQUIPMENT, AS DISCUSSED IN THE ATTACHED BACT DETERMINATION.

Best Available Control Technology (BACT) Determination
Ridge Generating Station
Polk County

The applicant proposes to construct a 50 MW power generation facility to be named the Ridge Generating Station and located near Auburndale in Polk County, Florida. The facility will consist of a solid fuel boiler, steam turbine, generator and associated equipment. Fuel for the facility will consist of a mixture of waste wood, scrap tires, and landfill gas.

A BACT determination is required for all regulated air pollutants emitted in amounts equal to or greater than the significant emission rates listed in Table 500-2 of Florida Administrative Code (F.A.C.) Rule 17-2.500. Maximum annual emissions proposed by the applicant are tabulated below and in the Technical Evaluation and Preliminary Determination. Maximum allowable emissions as determined from the BACT determination are listed below in tons per year (based on burning 80% wood/20% tires):

<u>Pollutant</u>	<u>Maximum Allowable Emissions</u> (tons per year)		<u>PSD Level</u>
	<u>Proposed by RGS</u>	<u>Proposed by DER</u>	
PM/PM ₁₀	55.2	55.2	25/10
SO ₂	479.2	275.9*	40
NO _x	413.9	303.5*	40
CO	1,379.7	579.5*	100
VOC	96.68	96.68	40
HCL	22.1	22.1	-
Hg	~~0.1~~ 0.097	~~0.1~~ 0.097	0.1
Pb	1.1	1.1	0.6
Be	0.03	0.03	0.0004

*Limits not to be enforced until final determination based on emission testing program.

Date of Receipt of a Complete Application

April 6, 1992

BACT Determination Requested by Applicant

Control Technology: Spray Dryer-Absorber/Fabric Filter
Selective Noncatalytic Reduction (SNCR)
Combustion Efficiency

Emission Limits: PM/PM₁₀ 0.02 lb/MMBTU
SO₂ 0.17 lb/MMBTU

- (d) The social and economic impact of the application of such technology.

The EPA currently stresses that BACT should be determined using the "top-down" approach. The first step in this approach is to determine for the emission source in question the most stringent control available for a similar or identical source or source category. If it is shown that this level of control is technically or economically infeasible for the source in question, then the next most stringent level of control is determined and similarly evaluated. This process continues until the BACT level under consideration cannot be eliminated by any substantial or unique technical, environmental, or economic objections.

BACT Determination Rationale

~~Irrespective of control technology economics,~~ The Department believes that the applicant has selected the best control technology available based on a review of the literature and permit requirements for similar facilities. However, the applicant's final BACT proposal should include a detailed analysis of the economic justification for the control systems selected, since all of the economic data will be available by that time. X
X
X

A review of EPA's BACT/LAER Clearinghouse indicates that there are no existing sources using the fuel mix proposed for the RGS facility. Since there are significant differences between existing wood/tire burning units and the proposed RGS facility, and since this facility is the first of its kind, the only reasonable approach would involve a two-step procedure for the BACT determination and permit; a preliminary followed by a final determination based on the results of the required emissions testing program. This two-step procedure will require that the applicant propose final enforceable BACT limits and permit conditions and that the Department issue a final BACT determination with permit revisions as indicated by the emissions testing results. Therefore, the Department has proposed enforceable initial emission limits and target emission limits for SO₂, NO_x and CO that are to be adjusted as necessary and made enforceable following completion of an emissions testing program. The target limits are based on the more stringent permit limits listed in the BACT/LAER Clearinghouse data.

Details of the Analysis May be Obtained by Contacting: X

Preston Lewis, P.E., BACT Coordinator
Department of Environmental Regulation
Bureau of Air Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

INSERT "A" (ATTACHED)

INSERT A

The permit also requires the permittee to submit economic information related to the selected control equipment. This submittal shall include information on the total installed capital cost of each system (consisting of total direct costs and total indirect costs) and the total annual cost of each system (consisting of direct costs, indirect costs, and recovery credits if any). The total annual costs will be used to estimate a cost effectiveness for the installed control systems in terms of dollars per ton of pollutant removed.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET, N.E.
ATLANTA, GEORGIA 30365

AUG 27 1992

RECEIVED

SEP 3 1992

Division of
Resources

4APT-AEB

Mr. Clair H. Fancy, P.E., Chief
Bureau of Air Regulation
Florida Department of Environmental
Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

RE: Ridge Generating Station, L.P. (PSD-FL-183)

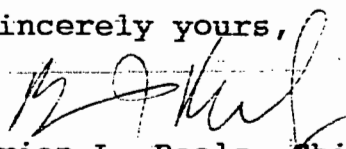
Dear Mr. Fancy:

This is to acknowledge receipt of your revised preliminary determination and draft Prevention of Significant Deterioration (PSD) permit for the above referenced facility, by your letter dated July 24, 1992. The applicant proposes to construct a stoker boiler to combust waste wood, scrap tires, and landfill gas, while generating approximately 50 megawatts of electrical power.

Your determination proposes the use of a spray dryer absorber/fabric filter to limit particulate, acid gas, and heavy metal emissions, selective noncatalytic reduction (SNCR) to limit NO_x emissions, and combustion efficiency to limit CO and VOC emissions.

We have reviewed the package as submitted and have no adverse comments. Thank you for the opportunity to review and comment on this package. If you have any questions or comments, please contact either Mr. Gregg Worley or Mr. Scott Davis of my staff at (404) 347-5014.

Sincerely yours,


Brian L. Beals, Chief
Source Evaluation Unit
Air, Pesticides, and Toxics
Management Division



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET, N.E.
ATLANTA, GEORGIA 30365

4APT-AE

JUL 15 1992

RECEIVED

JUL 20 1992

Bureau of
Air Regulation

Mr. Clair H. Fancy, P.E., Chief
Bureau of Air Regulation
Florida Department of Environmental
Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

RE: Ridge Generating Station, L. P. (PSD-FL-183)

Dear Mr. Fancy:

This is to acknowledge receipt of your preliminary determination and draft Prevention of Significant Deterioration (PSD) permit for the above referenced facility by letter dated June 22, 1992. The applicant proposes to construct a stoker boiler to combust wood waste, tires, and landfill gas while generating approximately 45 MW of electrical power. We have reviewed the package as requested and have the following comments.

Best available control technology (BACT), as determined by your agency for this source consists of a spray dryer absorber in conjunction with a fabric filter for the control of particulates, heavy metals, and acid gases. In addition, selective non-catalytic reduction (SNCR) will be utilized for the control of NO_x emissions while combustion controls will be utilized for CO and VOC emissions. We concur with your determination of BACT.

The modelling performed by the applicant included the use of MESOPUFF II to address long range impacts on the Chassahowitzka Wilderness Area. In addressing cumulative impacts on the Class I Area, sources greater than 20 km from the area were modelled using MESOPUFF II, while sources within 20 km of the area were modelled using ISC (a guideline model). EPA's current guidance, however, requires that a guideline model be used for sources within 50 km of the area. For future applications, please ensure that the use of MESOPUFF II is consistent with EPA guidance.

Thank you for the opportunity to review and comment on this package. If you have any questions concerning modelling, please contact Mr. Lew Nagler of my staff at (404) 347-5014. Any other questions may be directed to Mr. Gregg Worley of my staff, also at (404) 347-5014.

Sincerely yours,

Reginald S. Barnes for

Jewell A. Harper, Chief
Air Enforcement Branch
Air, Pesticides, and Toxics
Management Division

cc: G. Reynolds
C. Holladay
B. Chonac, su Dist.
C. Shaver, NPS
M. Whiting
BGF/PL



United States Department of the Interior



FISH AND WILDLIFE SERVICE
75 Spring Street, S.W.
Atlanta, Georgia
30303

June 12, 1992

RECEIVED

JUN 18 1992

Mr. C. H. Fancy
Chief, Bureau of Air Regulation
Florida Department of
Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Division of Air
Resources Management

Dear Mr. Fancy:

We have completed our review of the material that you sent us regarding Ridge Generating Station Limited Partnership's (RGSLP) proposal to construct and operate a 45-MW electric power generating station in Polk County. The Ridge Generating Station would be located near Lakeland, approximately 100 km southeast of the Chassahowitzka Wilderness Area (WA), a Class I air quality area administered by the Fish and Wildlife Service. The facility would consist of one boiler designed to burn a mixture of fuels including wood, tires, and landfill gas. This fuel mix would result in significant emissions of sulfur dioxide (SO_2), nitrogen oxides, volatile organic compounds, particulate matter, lead, and beryllium. Based on concerns we have expressed in previous letters to you regarding increment consumption at the Chassahowitzka WA, we are particularly concerned about SO_2 emissions from the proposed facility.

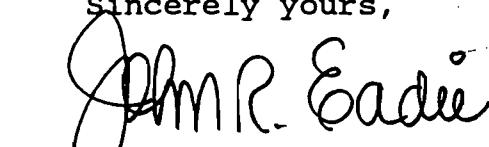
We were pleased to see that you required RGSLP to perform extensive SO_2 increment modeling analyses for the Chassahowitzka WA. Following consultations with us, RGSLP performed long range transport modeling using MESOPUFF II to evaluate their impact alone, plus their impact combined with other SO_2 increment-consuming sources, on the wilderness area. After reviewing the results of the modeling analyses, we are satisfied that the proposed Ridge Generating Station would not contribute significantly to an increment exceedance at the Chassahowitzka WA.

In addition, we agree that the proposed dry scrubber/baghouse and selective noncatalytic reduction systems represent best available control technology to minimize emissions from the boiler. Regarding the air quality related values analyses, RGSLP sufficiently addressed potential impacts to vegetation, soils and visibility in the wilderness area. However, RGSLP

failed to address potential impacts to freshwater creeks and related wildlife in the wilderness area from acid deposition. Nevertheless, based on the distance from the Chassahowitzka WA and the modeling results, we do not anticipate that resources will be adversely affected by emissions from the proposed facility.

We appreciate your continued cooperation in requiring applicants to adequately assess the impacts of new emissions on the resources in our Class I areas. If you have any further questions regarding our comments on the Ridge Generating Station application, please contact Ms. Tonnio Maniero of our Air Quality Office in Denver at 303/969-2071.

Sincerely yours,


for James W. Pulliam, Jr.
Regional Director

cc:

Ms. Jewell Harper, Chief
Air Enforcement Branch
Air, Pesticides and Toxic Management Division
U.S. EPA, Region 4
345 Courtland Street, NE
Atlanta, Georgia 30365



Department of Environmental Protection

Lawton Chiles
Governor

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Virginia B. Wetherell
Secretary

December 12, 1995

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Rodney Williams
Plant Manager
Wheelabrator Ridge Energy, Inc.
3131 K-Ville Avenue
Auburndale, Florida 33823

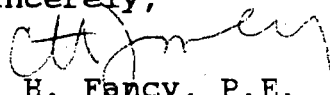
Dear Mr. Williams:

RE: Revised BACT Limits (PSD-FL-183)

Enclosed is a draft of the revised permit limits proposed by the Department as required by Specific Condition No. 17 of the subject permit along with the basis for the revised limits. After we receive your preliminary comments, we will finalize the permit conditions and send the proposed final permit to you. At that time you will need to publish a notice as you have for prior notices concerning this permit. As before, the Department's final action will be issued after the 30-day comment period expires.

If you have questions, please contact me or Al Linero at 904-488-1344.

Sincerely,


C. H. Fancy, P.E.
Chief
Bureau of Air Regulation

Enclosures

CHF/JR

c: W. Thomas, SWD
R. Harwood, Polk County
J. Harper, EPA
J. Bunyak, NPS
S. Smallwood, P.E.

DRAFT

Best Available Control Technology (BACT) Determination Ridge Generating Station Polk County (REVISED FOR FINAL PERMIT LIMITS)

In 1992 the Department issued a permit to construct a 50 MW power generation facility named the Ridge Generating Station (RGS) and located near Auburndale in Polk County, Florida. The facility consists of a solid fuel boiler, steam turbine, generator and associated equipment. Fuel for the facility consists of a mixture of waste wood and scrap tires.

A BACT determination was required for all regulated air pollutants emitted in amounts equal to or greater than the significant emission rates listed in Table 500-2 of Florida Administrative Code (F.A.C.) Rule 17-2.500. The Department issued the construction permit with preliminary emission limits under the condition that final emission limits would be established following completion of a comprehensive emissions testing program conducted by the permittee. This revised BACT determination is pursuant to that permit condition.

The permittee proposed final emission limits based on a statistical analysis of the comprehensive test program results covering the period from September 1, 1994, through April 30, 1995. During this period, the full range of permitted fuels were fired ranging from 100% wood-0% tires to 60% wood-40% tires. Compared to those proposed limits below are the current "interim" permitted limits based on maximum emissions for the worst case fuel mix of 60% wood-40% tires. Also shown are the average actual and maximum emissions determined by the Department from the RGS data for operation under the worst-case condition of firing 60% wood-40% tires at 90-100% of permitted capacity (45-50 MW) during the period from March 1, 1995 through April 30, 1995.

Pollutant	Maximum Allowable Emissions (All Fuels)				60% Wood-40% Tires			Vs. 0% TIRES	
	RGS Proposed Final*		Interim Permitted		Test Program Actuals			@ 45-50 MW	
	lb/hr	tons/yr	lb/hr	tons/yr	lb/hr	lb/hr	tons/yr	lb/hr	tons/yr
					Avg.	Max. 1-hr	Avg.	Avg.	avg.
PM/PM10	12.6	55.2	12.6	55.2	1.2~	2.1~	5.3~		
SO2	96.0	420.5	72.0**	315.4	75.0^	213.5^	328.5^	48.2	211.1
NOx	94.5	413.9	94.5	413.9	83.2^	153.1^	364.4^	88.0	385.4
CO	230.0	1,007.4	315.0	1,379.7	76.4^	447.2^	334.6^	70.4	308.4
VOC	22.1	96.8	22.1	96.8	1.4~	1.7~	6.1~		905.0
HCL	5.0	22.1	5.0	22.1	0.4~	0.7~	1.8~		
Hg	0.022	0.097	0.022	0.097	8.6~"	9.1~"	37.7~"		
Pb	0.25	1.1	0.25	1.1	9.3~"	40.0~"	40.7~"		
Be	0.0063	0.03	0.0063	0.03	1.8~'	1.8~'	7.9~'		

* Based on 24 hr. block averages of CEMS data over 8 month period.

** 30-day rolling average (amended for firing of 60% wood-40% tires).

~ Based on averages of two quarterly manual stack tests.

^ Based on total CEMS average for worst-case operation over 2 month period.

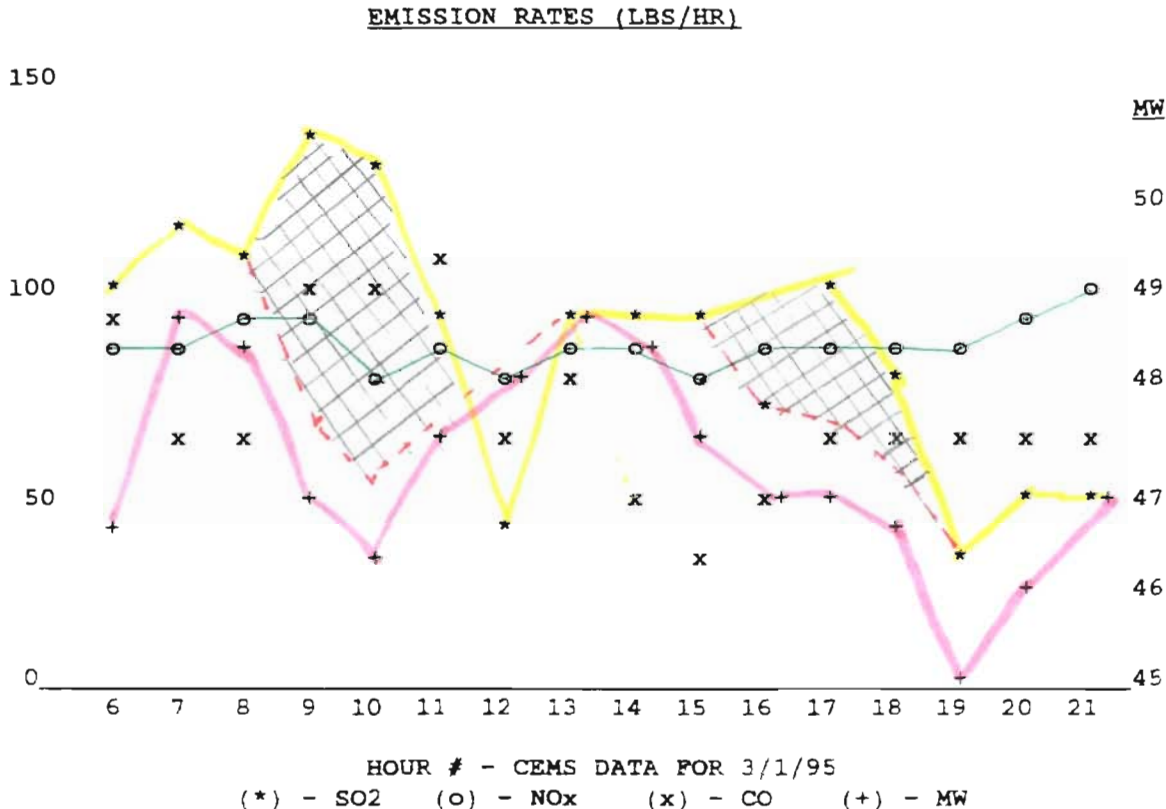
" Multiply by 0.0001.

' Multiply by 0.00001.

DRAFT BACT
FOR REVIEW/COMMENTS
CONTENTS SUBJECT TO CHANGE

DRAFT
FOR REVIEW/COMMENTS
CONTENTS SUBJECT TO CHANGE

The SO₂ emissions varied greatly compared to the fluctuations in NO_x emissions, indicating far better response and control for the SNCR system relative to the Spray Dryer-Absorber/Fabric Filter system. Wide variation in CO emissions occurred but this was expected due to the nature of the feed. The response of the SO₂ control system appears to lag considerably behind changes in megawatts produced. This can be seen below from the operating data for the longest sustained operating period at 90-100% of capacity while firing 60% wood-40% tires (about 16 hours). Other operating cycles of less duration showed similar variations:



In establishing initial limits based on 24-hour averages, the Department did not know that the fluctuation in emissions would be great enough to justify longer-term averages in setting final limits. Also, it was not known initially that periods of continuous operation of the RGS boiler at full capacity would be so short relative to boilers firing more conventional fuels. For these reasons, the Department has proposed final emission limits based on 30-day rolling averages. Listed below are the 30-day rolling averages calculated by the Department for the worst case condition (60% wood-40% tires), assuming that no interruptions had occurred in normal operation during the 30 days following initial firing with 40% tires through the final day of the test program on April 30.

DRAFT BACT
FOR REVIEW/COMMENTS
CONTENTS SUBJECT TO CHANGE

30-DAY ROLLING AVERAGE EMISSION RATE (LBS/HR) 4 INCLUDES
FOR 3/30/95 - 4/30/95 (60% WOOD-40% TIRES) ALL DATA

<u>DATE</u>	<u>SO2</u>	<u>NOx</u>	<u>CO</u>
3/30	57.9	80.1	98.4
3/31	57.1	80.3	99.0
4/1	57.9	80.8	101.6
4/2		BOILER DOWN	
4/3		" "	
4/4		" "	
4/5		" "	
4/6		" "	
4/7		" "	
4/8		" "	
4/9		" "	
4/10	57.3*	79.1*	101.3*
4/11	56.3	78.1	99.1
4/12	56.9	76.3	98.6
4/13	56.4	74.5	95.3
4/14	54.8	73.5	94.3
4/15	54.3	72.8	95.7
4/16	53.1	71.7	95.5
4/17	52.6	70.7	93.8
4/18	52.7	69.9	91.1
4/19	53.9	69.6	89.6
4/20	53.6	68.7	88.6
4/21	52.6	68.2	89.4
4/22	52.4	67.7	89.7
4/23	52.7	67.6	89.9
4/24	52.3	67.0	92.1
4/25	51.7	67.1	95.3
4/26	52.1	67.8	95.7
4/27	51.3	67.1	94.7
4/28		BOILER DOWN	
4/29		" "	
4/30	51.6*	66.5*	93.9*

* Assumes that operation was essentially continuous over the previous 30 days.

DRAFT BACT
FOR REVIEW/COMMENTS
CONTENTS SUBJECT TO CHANGE

The Department believes that final BACT emission limits should be based on the highest of the above CEMS data plus a margin for compliance. The following shows how these final limits for SO₂ and NO_x compare on the basis of heat input with the 40 CFR 60 Subpart Db limits for boilers:

<u>Pollutant</u>	<u>Highest 30-DRA</u>	<u>Final Limit 30-DRA</u>		<u>Subpart Db</u>
	<u>lb/hr</u>	<u>lb/hr</u>	<u>lb/MMBTU*</u>	<u>lb/MMBTU</u>
SO ₂	57.9	65.0	0.10	0.5 (oil>0.5%S)
NO _x	80.8	90.0	0.14	0.3 (gas-wood-MSW)
PM	2.1^	4.0^	0.006^	0.1 (>30% wood)
VE	-	10% opacity		20% opacity

* Based on an average factor for MMBTU/MW of 12.8. This is presented for comparison only and is not a limit to be enforced.

^ Not a 30-DRA. EPA Method 5 test to be required if VE exceeded.

It should be noted that the final SO₂ limit is about 10% below the revised interim limit of 72 lb/hr and about 13% below the 75 lb/hr "continuous operation" average for 90-100% capacity utilization during the 60%-40% test period. This assumes that normal operation will follow the same pattern shown during the test program and will average less than 90-100% of full capacity on a continuous basis. If for some reason the plant operates at substantially higher average rates, the permittee has the capability of increasing lime injection rates to further control SO₂ emissions.

All of the final BACT emission limits are presented in the following table. In view of the extremely low emissions of VOCs, HCl, Hg, Pb, and Be relative to the interim limits, and the fact no control measures appear to be warranted for them at this time, the Department accepts the permittee's proposal to maintain the interim limits as the final limits for these pollutants. The Department found insufficient justification for including final limits for other pollutants such as ammonia, arsenic, benzene, cadmium, chromium, PCBs, dioxins/furans, zinc oxide, and sulfuric acid.

<u>Pollutant</u>	<u>Final BACT Limit</u>	<u>Basis for Compliance</u>
SO ₂	65.0 lb/hr	30-Day Rolling Average CEMS*
NO _x	90.0 lb/hr	30-Day Rolling Average CEMS*
CO	114.0 lb/hr	30-Day Rolling Average CEMS*
PM/PM ₁₀	4.0 lb/hr	EPA Method 5 if VE>10%
VOC	22.1 lb/hr	EPA Method 25A^--only if requested
HCl	5.0 lb/hr	EPA Method 26^--only if requested
Hg	0.022 lb/hr	EPA Method 101A^--only if requested
Pb	0.25 lb/hr	EPA Method 12^--only if requested
Be	0.0063 lb/hr	EPA Method 104^--only if requested
VE	10% Opacity	EPA Method 9--annual basis

* A new 30-day rolling average emission rate is calculated each steam generating unit operating day as the average of all of the hourly emission data for the preceding 30 steam generating unit operating days.

^ As performed during test program.

DRAFT BACT
FOR REVIEW/COMMENTS
CONTENTS SUBJECT TO CHANGE

Contact For Further Information:

John Reynolds
Permit Engineer
Bureau of Air Regulation
2600 Blair Stone Road
Tallahassee, FL 32399-2400
Telephone 904-488-1344

Recommended By:

C.H. Fancy, P.E., Chief
Bureau of Air Regulation

Date

Approved By:

Howard L. Rhodes, P.E., Director
Division of Air Resources Management

Date



February 11, 1995

RECEIVED
FEB 13 1995
Bureau of
Air Regulation

Mr. Clair Fancy, P.E.
Chief, Bureau of Air Regulation
Florida Department of Environmental Protection
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Re: Ridge Generating Station
Permit Number AC53-206244 PSD-FL-183
Proof of Publication

Dear Mr. Fancy:

As required by your letter of February 9, 1995, the Facility has published the Department's "Notice of Intent to Allow Special Testing" scheduled to commence on or about March 1, 1995. The Notice was published in the Lakeland Ledger on Saturday, February 11, 1995. Enclosed is a copy of the notice, which serves as proof of publication.

We look forward to receiving your final authorization to proceed with testing following the 14-day period, which will end on February 25, 1995. If there are any questions or concerns regarding this submittal, please contact Gary Aguinaga at (813) 665-2255.

Sincerely,

Rodney Williams
Plant Manager

/lc

Attachment

cc: G. Aguinaga
M. Harley (DEP)
M. Killeen
F. Ferraro
W. Ferguson
S. Smallwood (D & M)
J. Rogers

J. Reynolds
B. Thomas, SWD
G. Harper, EPA
S. Noval, T&E Co.

thing you couldn't change."

Maxcy's wife, Laura, died last June. The couple had two daughters, Patricia and Laura Jean Maxcy Kuykendall, who lives in Austin, Texas. The Maxcys had nine grandchildren.

State Agriculture Commissioner Bob Crawford will induct the new members at the 17th-annual Hall of Fame banquet in the Special Events Center at the fairgrounds. For ticket information, call Tom Hughes at 621-7821.

Jun	382.40	382.70	381.80
Aug	386.40	386.40	385.80
Oct			
Dec	394.40	394.60	393.50
Feb			
Apr			
Jun			
Aug			
Oct			
Dec			

Est. sales 13,000. Thu.'s sales 21,381
Thu.'s open int 170,209

SILVER

5,000 troy oz.	Open	High	Low
Feb	474.0	474.0	474.0
Mar	475.0	477.0	474.0
Apr			
May	481.0	482.5	479.5
Jul	487.0	487.5	485.0
Sep	492.0	493.0	491.5
Dec	501.0	502.5	499.0
Jan			
Mar			
May			
Jul			
Sep			
Dec			

Est. sales 21,000. Thu.'s sales 34,052
Thu.'s open int 140,745
02-10-95 1503

space within the Highland City area and with a fifteen mile radius to be used as the HRS District XIV Administrative Headquarters. The bids shall be for existing space and must be within the described boundaries. The overall boundaries are to be within a fifteen mile radius from the intersection of Tillery Road and Highway 540 in Highland City, Florida as determined by the prepared document in the bid specification form.

The department desires a ten (10) year lease with twenty (20) and one (1) year optional renewal periods. The occupancy date for this lease is March 31, 1996. This lease is to be a FULL SERVICE LEASE.

Program requirements will be discussed at a MANDATORY pre-proposal conference held at 1:00 P.M. on 3/10/95 in the conference room at 270 Bartow Municipal Airport, Bartow, Florida 33830. BIDS FROM PARTIES NOT ATTENDING THIS MANDATORY PRE-PROPOSAL CONFERENCE WILL NOT BE ACCEPTED FOR CONSIDERATION.

Information and/or Bid Specifications will be available beginning 2/13/95 8:00 A.M. from the undersigned. Please refer to lease number 590.2504.

Bob Russell GSM
Steven Kiffer FSM
Department of Health and Rehabilitative Services
322 Bartow Municipal Airport
Bartow, Florida 33830
(813) 534-0845

Sealed bids will be received by the undersigned at the address below until 3:00 P.M. on 5/5/95. Bids will be opened immediately thereafter in conference room.

Bob Russell GSM
Steven Kiffer FSM
Department of Health and Rehabilitative Services
270 Bartow Municipal Airport
Bartow, Florida 33830
K-495 - 2-10; 2-11; 2-12; 2-17; 2-18; 2-19; 1995

STATE OF FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION NOTICE OF INTENT TO ALLOW SPECIAL TESTING Polk County

The Department of Environmental Protection gives notice of its intent to allow special testing at the Wheelabrator Ridge Energy, Inc., facility located off State Road 542 and Taylor Road near Auburndale, Polk County, Florida. The special testing is scheduled to commence on or about March 1, 1995, and April 1, 1995 and should last approximately 10 days each time. The facility proposes to increase the percentage of fires burned from the currently permitted 20% tires/80% wood, to 40% tires/60% wood for the duration of these special testing periods. This change is not expected to result in any additional impact to the environment.

A person whose substantial interests are affected by the Department's proposed action may petition for an administrative proceeding (hearing) in accordance with Section 120.57, F.S. The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 2600 Blair Stone Road, Tallahassee, Florida 32399-2400, within 14 days of publication of this notice. Petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. Failure to file a petition within this time period shall constitute a waiver of any right such person may have to request an administrative determination (hearing) under Section 120.57, F.S.

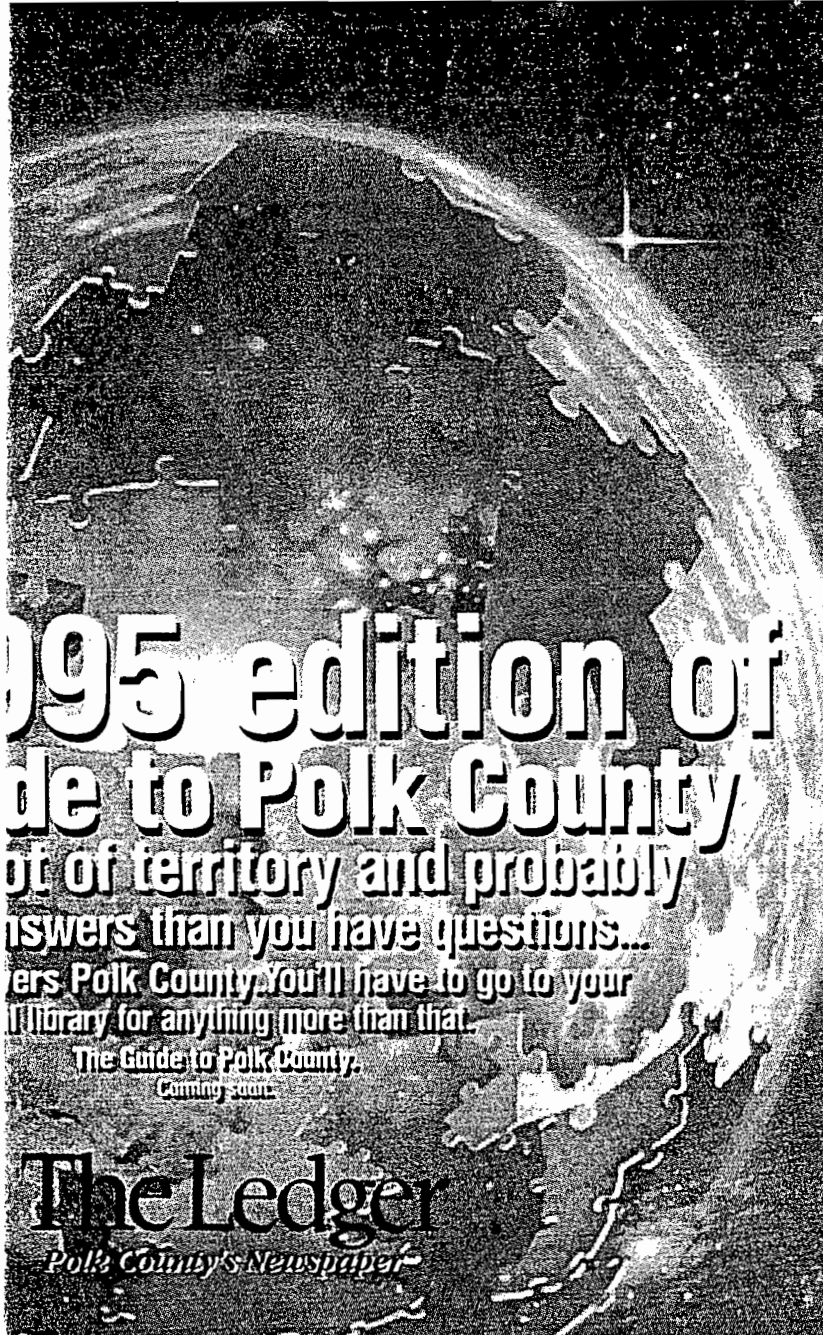
The Petition shall contain the following information:

- (a) The name, address, and telephone number of each petitioner;
- (b) A statement of how and when each petitioner received notice of the Department's action or proposed action;
- (c) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action;
- (d) A statement of the material facts disputed by Petitioner; if any;
- (e) A statement of facts which petitioner contends warrant reversal or modification of the Department's action or proposed action;
- (f) A statement of which rules or statutes petitioner contends require reversal or modification of the Department's action or proposed action; and,
- (g) A statement of the relief sought by petitioner, stating precisely the action petitioner wants the Department to take with respect to the Department's action or proposed action.

If a petition is filed, the administrative hearing process is designed to formulate agency action. Accordingly, the Department's final action may be different from the position taken by it in this Notice. Persons whose substantial interests will be affected by any decision of the Department with regard to the application have the right to petition to become a party to the proceeding. The petition must conform to the requirements specified above and be filed (received) within 14 days of publication of this notice in the Office of General Counsel at the above address of the Department. Failure to petition within the allowed time frame constitutes a waiver of any right such person has to request a hearing under Section 120.57, F.S., and to participate as a party to this proceeding. Any subsequent intervention will only be at the approval of the presiding officer upon motion filed pursuant to Rule 28-5.207, Florida Administrative Code.

Any person may send written comments on the proposed action to Mr. A.A. Linero, at the Department's Tallahassee address. All comments received within 14 days of the publication of this notice will be considered.

K524 - 2-11; 1995



**1995 edition of
Guide to Polk County**
Not of territory and probably
answers than you have questions...
ers Polk County. You'll have to go to your
Library for anything more than that.

The Guide to Polk County.
Coming soon

The Ledger
Polk County's Newspaper



Department of Environmental Protection

Lawton Chiles

Governor

Twin Towers Office Building

2600 Blair Stone Road

Tallahassee, Florida 32399-2400

February 9, 1995

Virginia B. Wetherell

Secretary

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Rodney Williams
Plant Manager
Wheelabrator Ridge Energy, Inc.
3131 K-Ville Avenue
Auburndale, Florida 33823

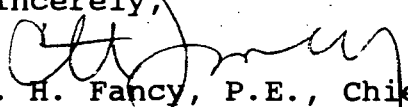
Dear Mr. Williams:

Pursuant to your February 2 letter, the Department proposes that Wheelabrator Ridge Energy, Inc., conduct the next two scheduled quarterly stack tests as outlined in your letter and the revised Comprehensive Emissions Testing Program Protocol (to the extent that the Alternate Sampling Procedure requests previously submitted may be approved by the Department prior to testing). This will involve an additional test while burning 40% tires/60% wood during the February test and deleting the 20% tires/80% wood condition (to be replaced by 40% tires/60% wood) for the final quarterly test). This proposed authorization is pursuant to Paragraphs 403.061(15), (16), and (18), and 403.516(1), Florida Statutes, and Florida Administrative Code Rule 62-4.080.

Upon receipt of the emissions testing program results in accordance with Specific Condition No. 16 of the subject construction permit, and, upon receipt of the required fee, the Department will process the permit amendment request. Before conducting these quarterly tests under the revised conditions, you must publish the enclosed Notice of Intent to Allow Special Testing in a local newspaper of general circulation in order to provide an opportunity for public comment or hearing, if required. The final authorization cannot be issued until after the 14 day period has expired.

If there are any questions regarding this letter, please contact Mr. A. A. Linero or Mr. John Reynolds of our staff at 904-488-1344.

Sincerely,


C. H. Fancy, P.E., Chief
Bureau of Air Regulation

CHF/jr/bjb
Enclosure

cc: B. Thomas, SWD
J. Harper, EPA

L. Novak, Polk County
S. Smallwood, D&M

M. Harley, DEP
M. Killeen, WREI

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
NOTICE OF INTENT TO ALLOW SPECIAL TESTING

Polk County

The Department of Environmental Protection gives notice of its intent to allow special testing at the Wheelabrator Ridge Energy, Inc., facility located off State Road 542 and Taylor Road near Auburndale, Polk County, Florida. The special testing is scheduled to commence on or about March 1, 1995, and April 1, 1995 and should last approximately 10 days each time. The facility proposes to increase the percentage of tires burned from the currently permitted 20% tires/80% wood, to 40% tires/60% wood for the duration of these special testing periods. This change is not expected to result in any additional impact to the environment.

A person whose substantial interests are affected by the Department's proposed action may petition for an administrative proceeding (hearing) in accordance with Section 120.57, F.S. The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 2600 Blair Stone Road, Tallahassee, Florida 32399-2400, within 14 days of publication of this notice. Petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. Failure to file a petition within this time period shall constitute a waiver of any right such person may have to request an administrative determination (hearing) under Section 120.57, F.S.

The Petition shall contain the following information; (a) The name, address, and telephone number of each petitioner, (b) A statement of how and when each petitioner received notice of the Department's action or proposed action; (c) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action; (d) A statement of the material facts disputed by Petitioner, if any; (e) A statement of facts which petitioner contends warrant reversal or modification of the Department's action or proposed action; (f) A statement of which rules or statutes petitioner contends require reversal or modification of the Department's action or proposed action; and, (g) A statement of the relief sought by petitioner, stating precisely the action petitioner wants the Department to take with respect to the Department's action or proposed action.

If a petition is filed, the administrative hearing process is designed to formulate agency action. Accordingly, the Department's final action may be different from the position taken by it in this Notice. Persons whose substantial interests will be affected by any decision of the Department with regard to the application have the right to petition to become a party to the proceeding. The

petition must conform to the requirements specified above and be filed (received) within 14 days of publication of this notice in the Office of General Counsel at the above address of the Department. Failure to petition within the allowed time frame constitutes a waiver of any right such person has to request a hearing under Section 120.57, F.S., and to participate as a party to this proceeding. Any subsequent intervention will only be at the approval of the presiding officer upon motion filed pursuant to Rule 28-5.207, Florida Administrative Code.

Any person may send written comments on the proposed action to Mr. A. A. Linero, at the Department's Tallahassee address. All comments received within 14 days of the publication of this notice will be considered.



Department of Environmental Protection

Lawton Chiles
Governor

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Virginia B. Wetherell
Secretary

February 6, 1995

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Rodney Williams
Plant Manager
Wheelabrator Ridge Energy, Inc.
3131 K-Ville Avenue
Auburndale, Florida 33823

Dear Mr. Williams:

RE: Construction Permit PSD-FL-183 (AC 53-206244)
Authorization to Allow Special Tests Using 40% Tires/60% Wood

K.T. 2/4
PLEASE TYPE
AND GIVE TO AL
ASAP MONDAY MORN.
2/6 OK TX, JR

nat Pursuant to your February 2 letter, the Department hereby *proposes* ~~authorizes~~ Wheelabrator Ridge Energy, Inc., to conduct the next two scheduled quarterly stack tests as outlined in your letter and the revised Comprehensive Emissions Testing Program Protocol (to the extent that the Alternate Sampling Procedure requests previously submitted may be approved by the Department prior to testing). This will involve an additional test while burning 40% tires/60% wood during the February test and deleting the 20% tires/80% wood condition (to be replaced by 40% tires/60% wood) for the final quarterly test). This ~~authorization~~ *proposes* is pursuant to Paragraphs 403.061(15), (16), and (18), and 403.516(1), Florida Statutes, and Florida Administrative Code Rule 62-4.080.

Upon receipt of the emissions testing program results in accordance with Specific Condition No. 16 of the subject construction permit, and, upon receipt of the required ~~\$250-permit modification fee~~, the Department will process the permit amendment request. Before conducting these quarterly tests under the revised conditions, you must publish the enclosed Notice of Intent to Allow Special Testing in a local newspaper of general circulation in order to provide an opportunity for public comment. *The final authorization cannot be issued until after the 14 day has expired*

If there are any questions regarding this letter, please contact Mr. A. A. Linero or Mr. John Reynolds of our staff at 904-488-1344.

Sincerely,

CTF
Howard L. Rhodes, P. E.
Director
Division of Air Resources
Management

HLR/jr/bjb
Enclosure

cc: B. Thomas, SWD
S. Smallwood, D&M

L. Novak, Polk County
M. Killeen, WREI

J. Harper, EPA
M. Harkey



February 2, 1995

Mr. Clair Fancy, P.E.
Chief, Bureau of Air Regulation
Florida Department of Environmental Protection
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Re: Ridge Generating Station
Permit Number AC53-206244 PSD-FL-183
Request for Permit Amendment

Dear Mr. Fancy:

Thank you for meeting with us on December 15, 1994 to discuss the potential future use of other acceptable fuels at the Ridge Generating Station (RGS). Based on the feedback that we received at that meeting, we have decided to focus our initial attention on increasing the tire component of the fuel mix. We are proposing to increase the percentage of tires, such that the maximum heat input associated with tires would be increased from 20 percent to 40 percent. The purpose of this letter is to request your authorization to modify the approved Comprehensive Emissions Testing Program Protocol and to obtain your approval to increase the tire component of the fuel mix to 40 percent (on a heat input basis) contingent upon a demonstration that the existing permit limits can be met. We are not requesting any modifications to the emissions limitations to accommodate this change.

Discussion

Although we plan to consider various alternative fuels that may be acceptable for future use, we believe the best course of action for now is to increase the percentage of tires in the fuel mix that is authorized in the subject permit. The permit currently limits tire firing to 9.0 percent by weight which is equivalent to 20 percent based on heat input to the boiler. We are proposing to increase tire firing to 16.1 percent by weight which is equivalent to 40 percent based on heat input. The 16.1 percent weight limitation is equivalent to a tire firing rate of 18,505 pounds of tires per hour. The calculation of the relationship between heat input and weight is based on actual fuel analysis data from RGS. The calculations are summarized in Attachment A.

Based on our operating experience at RGS, we are confident that an increase in tire firing is technically feasible. In addition, based on the results of the first two emissions testing events, we believe that RGS can increase the tire firing to 40 percent and continue to operate within the existing emissions limitations. We propose to modify our comprehensive emissions testing program to demonstrate that the facility emission limits can be met with the increased tire firing. The approved Comprehensive Emissions Testing Program Protocol currently includes an initial stack test and three additional quarterly stack tests. The initial stack test was conducted during August/September, 1994, and the first quarterly stack test was conducted during November, 1994. The next quarterly stack test is proposed to begin during the week of February 20, 1995 and be concluded on or about March 3, 1995. The final quarterly stack test is currently scheduled for April, 1995.

Under the approved protocol, the February quarterly test will consist of testing for each of the pollutants identified in the permit. It will be conducted at 100 percent capacity, while firing 80 percent wood/20 percent tire feed and while firing 100 percent wood feed. We are requesting authorization to add an additional test condition, which would consist of testing for each pollutant while firing 60 percent wood/40 percent tire feed. We are also requesting authorization to delete the 80 percent wood/20 percent tire feed condition during the final quarterly stack test and replace it with a 60 percent wood/40 percent tire feed condition. A revised Comprehensive Emissions Testing Program Protocol is provided as Attachment B. A description of the revisions has been added to summarize the proposed revisions to this document, and the revisions are marked by a line in the margin of each revised page.

As indicated above, we believe that the emissions limits in the subject permit can be met when firing 40 percent tire feed. Attachment C includes summary tables which contain the stack testing results from the initial and first quarterly testing events. The additional testing, described above, will be used to demonstrate compliance with the emission limits when firing 60 percent wood/40 percent tires.

We are requesting an amendment to the permit which will allow us to fire up to 40 percent tires (on a heat input basis), as soon as the stack test data from the February/March test demonstrates compliance with the emission limits in the permit. We are requesting that the amendment be issued along with the authorization to amend the testing protocol. The amendment could contain a condition which required the submittal of a successful demonstration and approval by the department before RGS could increase the percentage of tires in the fuel mix.

In a related matter, RGS has been seeking approvals for three Alternate Sampling Procedure requests. Our most recent submittal on this issue was sent to Mr. M. Harley, P.E., DEP on January 6, 1995, and he has informed us by telephone that he has all the information he needs to make a decision. The requests were made in order to utilize methodologies which will result in lower detection limits for arsenic, beryllium and lead emissions, as well as set forth procedures for performing ammonia and PCB sampling for which there are currently no FDEP

approved methods. The testing time frames specified in our request are based on our assumption that these procedures will be allowed. If these methods are not allowed, RGS will use the methods currently approved by Mr. Harley; however, the testing periods will have to be extended by another seven days. Therefore, we are anxious to resolve this issue before the February testing begins.

As we discussed in our earlier meeting, the timing of these activities is important to RGS. Therefore, your timely review and response will be greatly appreciated. If you have questions related to this request or need any additional information, please call me at (813) 665-2255 or call Matt Killeen at 1-800-682-0026.

Sincerely,


Rodney Williams
Plant Manager

/lc

Attachments

cc: G. Aguinaga
W. Ferguson
M. Killeen
S. Smallwood



June 29, 1995

State of Florida
Department of Environmental Protection
Chief Bureau of Air Regulation
2600 Blair Stone Road
Tallahassee, FL 32399-2400

RECEIVED

JUL 6 1995

*actually
July 5*

Re: Ridge Generating Station
Air Permit #AC53-206244, PSD-FL-183

Bureau of
Air Regulation

Dear Sir:

Pursuant to Specific Conditions #8 and #16 of the subject permit, please find enclosed the Comprehensive Emissions Testing Program and Revised BACT Analysis Report for Ridge Generating Station.

The report consists of four volumes. Volume I contains a description of the test program, stack emissions test summary data, proposed final emissions limits, and Revised BACT Analysis. Volume I also contains a section addressing the ambient ammonia monitoring program, as required by Specific Condition #6 of the subject permit. Volume II contains the text and Appendix A of the initial and first quarterly stack test reports. Volume III contains the text and Appendix A of the second and final quarterly stack test reports. Volume IV contains the long-term CEMS data.

Please feel free to contact Gary Aguinaga at (941) 665-2255 or John Goodwin at (603) 929-3491 if you have any questions or concerns regarding this submittal, or if you would like to arrange a meeting to discuss the submittal.

Sincerely,

Rodney Williams
Plant Manager

cc: B. Proses, DEP S.W. District
EPA Region IV (w/o Attachments)
G. Aguinaga (Volume I Only)
J. Goodwin (Volume I Only)
T. Porter (w/o Attachments)
M. Killéen (w/o Attachments)
J. Rogers (w/o Attachments)

/lc

**COMPREHENSIVE EMISSIONS TESTING PROGRAM
AND REVISED BACT ANALYSIS REPORT**

for

**RIDGE GENERATING STATION
3131 K-VILLE AVENUE
AUBURNDALE, POLK COUNTY, FL 33823**

**PSD-FL-183
FDEP AC 53-206244**

Submitted by

WHEELABRATOR ENVIRONMENTAL SYSTEMS, INC.

**LIBERTY LANE
HAMPTON, NH 03842**

for

RIDGE GENERATING STATION LIMITED PARTNERSHIP

REVISION DESCRIPTION

COMPREHENSIVE EMISSIONS TESTING PROGRAM REPORT

REVISION NUMBER	DATE OF REVISION	REVISION DESCRIPTION(S)

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- A. Manual Stack Test Data Analysis
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- C. Revised BACT Cost Analysis

Volume II

Initial Stack Test Report (Text and Appendix A)
First Quarterly Stack Test Report (Text and Appendix A)

Volume III

Second Quarterly Stack Test Report (Text and Appendix A)
Final Quarterly Stack Test Report (Text and Appendix A)

Volume IV

Long Term CEM Data Analysis
Long Term CEM Data

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EXECUTIVE SUMMARY

A comprehensive emission test program was conducted over the first year of facility operation. The comprehensive emission test program consisted of three separate elements: quarterly stack emissions tests, long term CEM data collection and continuous ambient ammonia monitoring program. Quarterly stack tests were initiated in August 1994 and completed on April 20, 1995. Long term CEM data collection began on September 1, 1994 and was completed on April 30, 1995. Ambient ammonia monitoring was conducted throughout the first year as well. The stack test and long term CEM data were analyzed statistically to determine if changes were warranted to the initial permit limits. Ambient ammonia monitoring program data were evaluated to determine if long term permanent monitoring is necessary or warranted.

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CEM

A complete description of the test program is contained in Section 3.0 of the report including process operations, testing and data collection methods, and the ambient monitoring program. Section 4.0 provides a summary of the stack test and ammonia monitoring program results. Section 5.0 provides a description of the data analyses statistics, the stack test and long term CEM data analyses results, and appropriate proposed revised emission limits. The revised BACT cost analysis is presented in Section 6.0.

A summary of the test program results is as follows:

- Stack Emission Tests - Quarterly stack test results for all permit limited emissions which include VOC, HCl, Hg, Pb, and Be were below the initial permit limits. These low test results may reflect the lower than expected levels of construction/demolition waste (C/D) wood fuel fired during the first year of operation. Consequently, revised permit limits are not proposed or warranted for these pollutants at this time. ✓
- Long Term CEM Data - The CEM data analyses confirmed that 24 hour block averaging period is appropriate. The proposed lb/hr emission rate limits, based on a 24 hour block average, for SO₂, NO_x, and CO are appropriate to represent the full range of boiler loads, fuel compositions, and operating conditions. Based on the existing power contract, daily boiler load cycles will continue. The longer averaging time allows for the necessary adjustments to be made to the control systems for steady state operation at reduced loads. The lb/hour emission limits provide the most direct and accurate calculation of actual emission rates at reduced loads as well.

The statistical analyses results at the 99% upper confidence level (UCL) provided the basis to propose lower revised limits for SO₂ and CO while confirming a revision to the initial NO_x emission limit is not warranted.

Lower SO₂ emissions may be attributed to lower than expected supply of C/D waste wood. Lower CO emissions indicate that co-firing high Btu tires with lower Btu wood fuel improves combustion efficiency.

Average final proposed revised limits based on 24-hour block averages are as follows: SO₂ - 96 lb/hr, NO_x - 94.5 lbs/hr, and CO - 230 lb/hr. The proposed limits would represent BACT for this type of facility, based on actual performance.

- Ambient Ammonia Monitoring - The ambient ammonia monitoring program results demonstrated that actual and predicted ambient ammonia impacts from the facility were not measurable. Additionally, the predicted impacts were well below the FDEP air toxic No Threat Levels for all operating conditions. Maximum predicted impacts were less than 16 ppb, well below the measurement capability of any commercially available ambient ammonia monitoring equipment. Based on these results, long term permanent ammonia monitoring is not warranted and should not be incorporated in the final permit.

1.0 Introduction

In accordance with Specific Condition 8 of Florida Department of Environmental Protection (FDEP) Permit AC 53-206244 and PSD Permit FL-183, a Comprehensive Emissions Testing Program was performed at Ridge Generating Station (RGS). The Comprehensive Emissions Test Program included an initial stack test and three additional quarterly stack tests, long term CEM data collection and ambient ammonia monitoring.

Specific Condition 5 of the permit specified initial emission limits for Particulate Matter (PM), Sulfur Dioxide (SO₂), Nitrogen Oxides (NO_x), Carbon Monoxide (CO), Volatile Organic Compounds (VOC), Hydrogen Chloride (HCl), Mercury (Hg), Lead (Pb) and Beryllium (Be). Specific Condition 5 also includes provisions for revising the initial emission limits or modifying the averaging periods based on the results of the comprehensive emissions test program.

Additionally, Specific Condition 6 of the permit required the collection of ambient ammonia monitoring data at a downwind location. The results were to be included in the emissions testing program report to determine if permanent monitoring is required.

In accordance with Specific Condition 16, the results of the comprehensive emissions test program were to be incorporated into the final BACT cost analysis with the proposal of final emission limits.

This Comprehensive Emissions Test Program and Revised BACT Analysis Report provides all the information and submittals required in Specific Conditions 5, 6, 8 and 16 of FDEP Permit AC 53-206244 and PSD Permit FL-183.

2.0 Facility Description

Ridge Generating Station (RGS) is located off of State Road 542 and Taylor Road near Auburndale, Polk County, Florida. RGS is an electric power generation facility with a permitted capacity of 50 megawatts at a maximum continuous rating (MCR) based on heat input of 630 million Btu per hour and approximate steamflow of 345K lbs/hr. The boiler is a conventional wood-fired boiler with waterwall construction which is permitted to fire wood, tires and landfill gas.

The quarterly test programs were performed with wood loading to the boiler at a rate of 60-100 percent of the heat input and tire loading up to 40 percent of the heat input. Propane was fired for startup/shutdown periods and for combustion stabilization. The landfill gas supply was not available during the emissions testing program, but is expected to be available during the first quarter of 1996.

Wood fuel is obtained from independent contractors, and includes the following materials: construction and demolition material, forest residuals/land clearing material, industrial wood wastes, bagasse and wood derived from residential yard waste. The wood is processed (chipped) both onsite and offsite, stockpiled, then reclaimed and delivered to the boiler in a 3-inch nominal processed form. Tires are received both whole and chipped, and processed to 3-inch nominal material. Two covered conveyors separately transport the processed fuels to feed bins located at the boiler front.

The air pollution control system for this facility consists of a spray dryer absorber (SDA) and fabric filter (FF) to control acid gases, metals and particulate matter. In addition, a combination of combustion controls and selective noncatalytic reduction (SNCR) is utilized to control NO_x emissions from the boiler. The SDA system is equipped with redundant slakers and multiple atomizers for the addition of the lime slurry for acid gas control. The FF is designed for collection of flyash at all boiler loads. A pulse jet type bag cleaning system cleans the bags and directs the flyash to the ash removal system.

An Altech Continuous Emissions Monitoring System (CEMS) is located at the FF outlet to continuously monitor sulfur dioxide (SO₂), nitrogen oxides (NO & NO₂), Carbon Monoxide (CO), Oxygen (O₂), Moisture, opacity and flue gas volumetric flowrate for compliance purposes. SO₂, NO_x and CO concentrations are measured in parts per million (wet) and converted to lbs/hr utilizing the values obtained for flue gas volumetric flow and molecular weight. O₂, CO₂, and moisture concentrations are measured in percent by volume.

3.0 Comprehensive Emissions Test Program Description

A Comprehensive Emissions Test Program was conducted at the RGS facility. The test program commenced after the facility went through a shakedown period and was considered to be in normal operation. The test program was conducted in accordance with the comprehensive emissions test program protocol approved by the FDEP on November 23, 1993. The emissions test program consisted of three separate tasks; stack emissions tests, long term CEM data collection and ambient ammonia monitoring.

3.1 Test Program Schedule

Table 3-1 outlines the key dates involved in the comprehensive emissions test program.

**TABLE 3-1
TEST PROGRAM SCHEDULE**

ACTIVITY	DATE(S)
Initial Facility Startup (first firing of solid fuel)	3/30/94
Initial Stack Test Program	8/16/94 - 9/1/94
Begin Long Term CEM Data Collection	9/1/94
First Quarterly Stack Test Program	11/9/94 - 11/18/94
Second Quarterly Stack Test Program	2/21/95 - 3/3/95
Final Quarterly Stack Test Program	4/18/95 - 4/20/95
End Long Term CEM Data Collection	4/30/95
Submit Comprehensive Emissions Test Program and Revised BACT Analysis Report	6/30/95

3.2 Initial and Quarterly Stack Emissions Test Program

3.2.1 Objective

The objective of the stack emission tests was to collect data to evaluate compliance with the initial emission limits as well as to establish proposed final emission limits for the "limited" pollutants (i.e. those with emission limits established in Specific Condition 5 of the permit). Stack test data were also collected for the "additional" pollutants which were identified in Specific Condition 9 of the permit. The permit required testing for these pollutants, but did not include specific

emission limitations. Emission rates were determined for the limited pollutants listed in Table 3-2 and the additional pollutants listed in Table 3-3. Visible and fugitive emissions were determined in accordance with EPA Methods 9 & 22 during the initial quarterly test program. Results of the visible and fugitive emissions testing are presented in Sections 2 and 4 of the Initial Quarterly Stack Test Report located in Volume II.

3.2.2 Process Operating Conditions

The Comprehensive Emissions Test Program included an initial stack test and three quarterly stack tests. The initial test program consisted of stack emissions testing for each limited and additional pollutant at 100 percent maximum continuous rating (MCR) based on heat input while operating at both 80 percent wood/20 percent tire feed (based on heat input) and 100 percent wood feed. The first quarterly stack test program consisted of testing for each limited pollutant at 75 and 100 percent MCR, as well as testing for the additional pollutants at 100 percent MCR while operating at 80 percent wood/20 percent tire feed. The second quarterly stack test program consisted of testing for each limited and additional pollutant at 100 percent MCR while operating on 80 percent wood/20 percent tire feed, 60 percent wood/40 percent tire feed and 100 percent wood feed. The final quarterly stack test program consisted of testing for each limited and additional pollutant at 100 percent MCR while operating at 60 percent wood/40 percent tire feed. Table 3-4 details the boiler conditions during the stack emissions tests.

During the initial and additional quarterly stack tests, wood waste and biomass were the primary fuels found as construction/demolition waste wood supplies were limited. Additionally, tire fuel consisted primarily of the tires taken from the State of Florida cleanup of the Green Swamp near Polk City.

Process information was collected by the Bailey distributed control system throughout each of the quarterly emissions test programs. Process measurements are provided in hourly averages during each test period and can be found in the appropriate Sections of the quarterly stack test reports which can be found in Volumes II and III.

The statistical analysis of the manual stack test data was performed in units of lb/hr and lb/mmBtu. The lb/mmBtu data was calculated by taking the lb/hr data and dividing it by the boiler heat input (mmBtu/hr). The boiler heat input was calculated by taking the hourly average feed rates of wood and tires (lb/hr) and utilizing the heating value of the wood and tires (mmBtu/lb of fuel) obtained from analysis of daily composite samples. The fuel analysis summary tables can be found in Section 3 of each of the quarterly test reports located in

Volumes II and III. The process data tables located in the quarterly reports also contain hourly average boiler heat input. The boiler heat input utilized for a particular test run was obtained from an average of the hourly process data for the duration of the individual test run.

**TABLE 3-2
TEST METHODS AND PERMIT LIMITED POLLUTANTS**

Pollutant	EPA Test Method	# Runs	Run Duration	Location	Initial Permit Limit (24 hour average)
PM/PM10	5*	3	120 Min	Stack	12.6 lb/hr
SO ₂	6C	3	60 Min	Stack	109.4 lb/hr
NO _x	7E	3	60 Min	Stack	94.5 lb/hr
CO	10	3	60 Min	Stack	315.0 lb/hr
VOC	25A	3	60 Min	Stack	22.1 lb/hr
HCl	26*	3	120 Min	Stack	5.0 lb/hr
Hg	101A	3	120 Min	Stack	0.022 lb/hr
Pb	12**	3	120 Min	Stack	0.25 lb/hr
Be	104**	3	120 Min	Stack	0.0063 lb/hr

**TABLE 3-3
TEST METHODS AND ADDITIONAL POLLUTANTS**

Pollutant	EPA Test Method	# Runs	Run Duration	Location
Ammonia (NH ₃)	26A(mod.)*	3	120 Min	Stack
Arsenic (As)	108**	3	60 Min.	Stack
Cd, Cr & Zn (as ZnO)	MM**	3	120 Min	Stack
Chromium VI (Cr ⁺⁶)	40 CFR 266 App. IX, 3.2	3	120 Min	Stack
Benzene	18	3	60 Min	Stack
Sulfuric Acid (H ₂ SO ₄)	8	3	120 Min	Stack
PCB's	23***	3	180 Min	Stack
Dioxins/Furans	23***	3	180 Min	Stack

- * - Particulate, HCl and NH₃ sampled in accordance with a combined EPA M26A sampling train during the Feb/Mar 1995 and Apr 1995 quarterly test programs based on the FDEP February 17, 1995 alternate sampling method approval.
- ** - All metals (except Hg and Cr⁺⁶) sampled in accordance with 40 CFR 266 Appendix IX, Section 3.1 during the Feb/Mar 1995 and Apr 1995 quarterly test programs based on the FDEP February 17, 1995 alternate sampling method approval..
- *** - PCB's and Dioxins/Furans sampled in separate trains during the 1994 quarterly test programs and in a combined train during the 1995 quarterly test programs.

**TABLE 3-4
STACK EMISSIONS TESTING BOILER CONDITIONS***

TEST CONDITION	IA	I	II	III
Percent Boiler Capacity (%)	75	100	100	100
Generator Output (MW)	37.5	50	50	50
Total Heat Input (mmBtu/hr)	473	630	630	630
Steam Flow (Klb/hr)**	259	345	345	345
Fuel Feed (Heat Input)				
• Wood (%)	80	80	100	60
• Tires (%)	20	20	-	40
Fuel Feed (weight) ***				
• Wood (lb/hr)	96,355	128,473	160,591	96,355
• Tires (lb/hr)	6,939	9,252	-	18,505
Stack Emissions Testing				
• Initial Quarterly (Aug/Sep 1994)	-	Table 4-1	Table 4-1	-
	-	Table 4-2	Table 4-2	-
• First Quarterly (Nov 1994)	Table 4-1	Table 4-1	-	-
	-	Table 4-2	-	-
• Second Quarterly (Feb/Mar 1995)	-	Table 4-1	Table 4-1	Table 4-1
	-	Table 4-2	Table 4-2	Table 4-2
• Final Quarterly (April 1995)	-	-	-	Table 4-1
	-	-	-	Table 4-2

* - During the stack emissions testing, actual boiler conditions were maintained within 10% of the values listed in this table.

** - Actual determination of percent load was based on heat input.

*** - Fuel feed rates were revised to reflect the results of actual sampling of Wheelabrator Ridge Energy's fuel suppliers' product. The actual average Higher Heating Values (HHV's) of WRE fuels are 3923 Btu/lb and 13,618 Btu/lb for wood and tires, respectively, as opposed to 5450 Btu/lb and 14,000 Btu/lb which are the HHV's used for the design of the facility.

3.2.3 Sampling and Analytical Procedures

All stack emissions tests were performed in accordance with the approved Comprehensive Emissions Test Program Protocol submitted October 29, 1993 (revised February 1, 1995). The Protocol was revised to reflect the change in sampling methodologies pursuant to the FDEP February 17, 1995 alternate sampling method approval order. Specifically, EPA reference methods as outlined in 40 CFR 60 Appendix A and 40 CFR 266 Appendix IX were followed. The specific methods performed are outlined in Tables 3-2 and 3-3 for each pollutant. EPA reference methods 1 through 4 were performed in support of each isokinetic test.

During the initial quarterly test program, visible emissions from the RGS boiler stack, ash handling area vent filter, lime silo vent filter and fuel transfer building vent filter were determined in accordance with EPA Method 9. Fugitive emissions from the material receiving, processing, and storage operations were determined in accordance with EPA Method 22 over a three day period during normal operation.

3.3 Long Term CEMS Data Collection Program

3.3.1 Objective

The objective of the long term CEMS data collection was to evaluate the feasibility of establishing revised SO₂, NO_x and CO emission limits and averaging times. In addition, the feasibility of establishing separate startup and shutdown limits and/or additional hourly or rolling average limits were to be evaluated.

3.3.2 Process Operating Conditions

Two separate operating conditions were evaluated using the long term CEMS data, to differentiate startup/shutdown/malfunction periods from normal operations. The first operating condition included all hours of facility operation while the second included only periods of startup, shutdown and malfunction. Startup periods were defined as the period of time when propane firing or solid fuel feed starts and boiler steam flow is less than 20 percent MCR (69 Klb/hr of steam). Shutdown periods were defined as the period of time after which solid fuel feed has been stopped or propane firing commences and the boiler steam flow is less than 20 percent MCR. For purposes of CEM data analysis, Startup/Shutdown/Malfunction periods were identified as a single operational period. During the long term CEMS data collection period, accurate records were kept identifying normal operation and startup/shutdown/malfunction periods.

3.3.3 CEM Data Collection

Long term CEM data collection started on September 1, 1994. CEM data was reviewed periodically to identify invalid data due to routine CEM maintenance events, unexpected problems requiring corrective action and 40 CFR 60 Appendix F daily calibration out-of-control periods. Invalid CEM data was flagged to be excluded from the long term data analyses. Additionally, hourly averages were assigned appropriate boiler operational status flags for the data analyses phase.

CEM data quality assurance included the performance of daily calibrations and adjustments in accordance with 40 CFR 60.13 requirements and conducting quarterly cylinder gas audits (CGA's) in accordance with 40 CFR 60 Appendix F procedures.

Hourly CEM averages in lbs/hr and ppm dry corrected to 7% oxygen (ppmdc) were downloaded to spreadsheets for the long term CEM data analyses.

3.4 Ambient Ammonia Monitoring Program

Specific Condition 6 of the permit required ammonia concentrations to be monitored at a prevailing downwind location on the property line by commercially available ambient monitoring equipment. A TECO Model 17 chemiluminescence ambient ammonia analyzer, data logger and chart recorder supplied by Wheelabrator Clean Air Systems, Altech measurement division, was installed in a climate controlled shelter at the Northwest corner of the RGS property to comply with this condition. A meteorological station capable of measuring and recording wind speed and wind direction was installed as a part of the ambient ammonia monitoring program.

Despite repeated modifications by the ambient ammonia monitoring system supplier and the instrument manufacturer, Thermo Environmental Instruments, the ambient ammonia monitor failed repeatedly and was unable to provide adequate ammonia data due to the high ambient humidity of the facility location.

A thorough investigation failed to locate an ambient ammonia monitoring system that was successfully operating at concentrations in the same order of magnitude as attempted at the RGS facility. Therefore, it was concluded and identified to the FDEP that the measurement of ambient ammonia in the ppb range with a commercially available monitor was not technically feasible.

In lieu of continuous monitoring data, daily ammonia measurements were performed for the duration of the emissions test program. The daily measurements were conducted using a Sensidyne gas detector tube system with a detection limit of 0.5 ppm. Additionally, ambient ammonia impacts were

calculated using actual ammonia data from the initial and quarterly stack testing and the air modelling analyses results from the PSD permit application.

The calculation of ambient ammonia impacts from the stack test results were incorporated into the revised Comprehensive Emissions Test Program Protocol as a formal substitute for the continuous ambient ammonia monitoring data collection. This was based on discussions throughout the first year of operation with FDEP representatives regarding the technical limitations of commercially available ambient ammonia monitoring systems. The complete details of the ambient ammonia monitoring problems were outlined in correspondence to the FDEP on November 28, 1994 and January 30, 1995.

4.0 Summary of Emission Test Program Results

4.1 Permit Limited Pollutants

As required in Specific Condition 8 of the permit, stack emissions tests were performed in order to verify compliance with the initial limitations as found in Table 3-2. Table 4-1 presents the results for the initial and quarterly emissions tests which verify compliance with the initial permit limits.

4.2 Additional Pollutants

Stack testing was also performed for the additional pollutants outlined in Table 3-3. As requested in Specific Condition 9 of the subject permit, Tables 4-2 presents the additional pollutant emission results from each of the quarterly emissions tests in units of lbs/hr and ug/dscm.

As a minor note, Ammonia and Sulfuric Acid test results from the February/March 1995 Condition I test program have been reported but not included in the statistical analyses. The results indicated abnormally high levels of ammonia slip. The SNCR vendor was on-site immediately following the test program and identified small debris in the SNCR reagent injection distribution module flowmeters. This condition resulted in overfeeding of the concentrated urea based reagent creating excess ammonia slip. The flowmeters were immediately cleaned by the SNCR vendor. Subsequent periodic inspections confirm that this was an isolated problem. Additionally, high ammonia slip levels biased the sulfuric acid analyses since high levels of free ammonia are a known method interferent.

4.3 Ambient Ammonia Monitoring

The daily ambient ammonia measurements conducted throughout the emission test program failed to detect ammonia. All measurements were below the 0.5 ppm detection limit. Results of the daily measurements were recorded in plant log books. Since ammonia has never been detected, the actual daily results have not been included in this report.

In accordance with the revised Comprehensive Emissions Test Program Protocol, ambient ammonia impacts were calculated using the stack test data and the PSD permit application ammonia modelling analysis. As noted in Section 4.2, the February/March 1995 Condition I ammonia test data was found to be an SNCR upset condition. However, the data was included in the ambient ammonia impact analysis to demonstrate that ammonia impacts remained well below FDEP No Threat Levels and ambient monitoring detection levels even during abnormal SNCR operation. A full description of the ambient impact calculations is provided in Appendix B. The stack test ammonia emissions during the entire test program under normal SNCR operating conditions ranged from 3.9 to 37.0 lbs/hr with an average of 10.0

TABLE 4-1

PERMIT LIMITED POLLUTANT SUMMARY

80% WOOD/20% TIRES @ 100% → 75%

100% WOOD @ 100%

60% WOOD/40% TIRES @ 100%

POLLUTANT	TEST CONDITION/DATE								CURRENT PERMIT LIMIT
	I			IA	II		III		
	8/94	11/94	2/95	11/94	8/94	2/95	2/95	4/95	
PM (lb/hr)	2.0	3.2	1.8	6.1	1.1	1.2	1.4	1.0	12.6
SO2 (lb/hr)	44.1	30.7	47.6	61.9	0.3	5.4	72.8	55.6	109.4
NOx (lb/hr)	82.3	71.5	84.4	69.3	79.5	82.3	79.1	82.9	94.5
CO (lb/hr)	68.6	97.4	59.2	43.3	81.1	65.2	61.5	47.4	315.0
VOC (lb/hr)	0.1	2.5	2.4	2.0	0.5	1.3	1.2	1.6	22.1
HCl (lb/hr)	0.3	1.7	0.2	1.4	0.3	0.3	0.2	0.6	5.0
Hg (lb/hr)	0.00199	0.00219	0.00085	0.00080	0.00283	0.00087	0.00087	0.00084	0.022
Pb (lb/hr)	0.0014	0.00203	0.0037	0.0024	0.0010	0.0048	0.0016	0.0003	0.25
Be (lb/hr)	0.000005	0.000005	0.000019	0.000005	0.000005	0.000018	0.000018	0.000018	0.0063

Note: All values represent test condition averages for the respective quarterly test program.
Non-Detect values were used in averaging for worst case.

CONSIDER
ONLY III FOR SO₂
SINCE 60/40 → HIGHEST
EMISSIONS

TABLE 4-2

ADDITIONAL POLLUTANT SUMMARY

POLLUTANT	UNITS	TEST CONDITION/DATE						
		I			II		III	
		8/94	11/94	2/95	8/94	2/95	2/95	4/95
Ammonia	lb/hr	8.17	4.8	68.6	4.0	30.9	9.3	9.6
	ug/dscm	16500	9647	136967	8437	60000	17767	18900
Arsenic	lb/hr	0.000044	0.00034	0.00019	0.000048	0.00018	0.00018	0.00018
	ug/dscm	0.092	0.22	0.39	0.1	0.35	0.36	0.35
Benzene	lb/hr	0.80	0.05	0.030	0.83	0.58	0.23	0.091
	ug/dscm	1581	88.4	55.1	1788	1147	433.6	182
Cadmium	lb/hr	0.00013	0.00048	0.00066	0.00014	0.00033	0.00011	0.00009
	ug/dscm	0.27	0.98	1.38	0.30	0.67	0.21	0.18
Hex. Chromium	lb/hr	0.00037	0.00033	0.00044	0.00037	0.00034	0.00037	0.00030
	ug/dscm	0.77	0.70	0.87	0.81	0.68	0.73	0.60
Chromium	lb/hr	0.00080	0.00048	0.00077	0.00023	0.00035	0.00022	0.00038
	ug/dscm	1.65	0.99	1.61	0.48	0.70	0.43	0.77
Total PCB	lb/hr	8.6E-07	7.5E-07	9.0E-07	6.6E-07	6.7E-07	8.0E-07	0.00000
	ug/dscm	1.75	0.00	0.0019	0.0015	0.0014	0.0015	0.00
Total PCDD/PCDF	lb/hr	1.7E-06	7.5E-06	7.0E-07	5.9E-07	5.6E-07	1.0E-07	0.00001
	ug/dscm	0.0036	0.02	0.0028	0.0013	0.00114	0.0002	0.02
Sulfuric Acid Mist	lb/hr	2.2	5.4	84.1	12.1	19	20.1	22.50000
	ug/dscm	4453	11410.00	167333	26100	33633	38366.7	44033.00
Zinc (as Zinc Oxide)	lb/hr	0.019	0.034	0.036	0.0041	0.0200	0.015	0.021
	ug/dscm	37.97	70.1	74.6	8.8	39.7	29.4	41.4

Note: All values represent test condition averages for the respective quarterly test program.
Non-Detect values were used in averaging for worst case.

lbs/hr during normal SNCR operation. Table 4-3 summarizes the results of the ambient impact analysis during normal SNCR operation.

**TABLE 4-3
AMBIENT AMMONIA IMPACT ANALYSIS SUMMARY**

AVERAGING PERIOD	PREDICTED AMBIENT NH ₃ CONCENTRATIONS - µg/m ³			
	PREDICTED PERMIT APPLICATION	COMPLIANCE TEST*		FDEP NO THREAT LEVEL
		Highest	Average	
8 Hour	2.0	4.1	1.1	180
24 Hour	0.7	1.49	0.40	43.2
Annual	0.07	0.14	0.038	1.0
* - Conservatively calculated using the highest test run and average result from the 100% MCR test condition.				

The results of the ambient ammonia impact analysis show that under a wide range of boiler operating conditions, ammonia emission rates remained very low. Consequently, predicted ambient impacts remain an order of magnitude below the FDEP Air Toxics No Threat Level.

The low ammonia emission rate results are directly attributed to the operating flexibility and automatic control configuration of the Selective Non-Catalytic Reduction (SNCR) NO_x control system. SNCR reagent injection is controlled directly through feedback from the NO_x CEM ensuring compliance with the NO_x emission limit without overfeeding reagent. Consequently, high ammonia slip conditions are minimized.

The results of the ambient ammonia impact analysis and daily ammonia measurement clearly indicate that permanent ambient ammonia monitoring is not necessary or warranted after the first year of facility operation. Therefore, Wheelabrator formally requests that this condition be deleted from the final permit pursuant to discussions with FDEP representatives.

5.0 Emission Data Analysis and Revised Limits

5.1 General Approach

In accordance with Specific Conditions 5, 16 and 17 of the permit, the results of the comprehensive emission testing program are to be used to demonstrate compliance with the initial permit limits and to evaluate the feasibility of proposing revised emission limits and/or averaging times for the operating permit. Specifically, the manual stack testing results from the initial compliance and subsequent quarterly stack testing were used to evaluate the feasibility of establishing revised limits for VOC, HCl, Hg, Pb and Be.

re: stack tests
for SO₂ not
used

SO₂, NO_x and CO CEM data collected from September 1, 1994 through April 30, 1995 have been analyzed to propose final CEM emission limits and averaging times. The long term CEM data analyses results, in conjunction with the air pollution control equipment annualized costs, has been incorporated in the revised BACT analysis presented in Section 6.0 of this report.

In general, both the manual stack test results and long term CEM data were evaluated using routine summary statistics by calculating the mean and standard deviation. From the summary statistics for each data set the upper 99% confidence level was calculated to evaluate the feasibility of establishing revised emission limits.

The collection and analyses of stack test data and CEM data over the first year of operation generally accounted for emission variations related to the full range of fuel types, fuel firing combinations and boiler operating profiles and conditions. However, during the first year of operation, construction/ demolition (C/D) derived waste wood fuel supplies were lower than anticipated. For long term boiler operation the fuel ratios ranged from 60-100% of boiler heat input for wood and 0-40% of boiler heat input for tires.

5.2 Stack Test Data Statistical Analysis

Results from the initial compliance and subsequent quarterly manual stack testing were statistically analyzed to evaluate the feasibility of establishing revised limits for VOC, HCl, Hg, Pb and Be. In addition, manual stack test results for those additional pollutants without emission limits were also analyzed using the same procedure in the event that limits for these pollutants might be included in the operating permit. Results of the statistical evaluation for the additional pollutants may be found in Appendix A.

The following procedure was followed to evaluate the manual stack test results.

- When results were below the method detection limit, the detection limit was used in the statistical analyses to present worst case.

- The sample ($\bar{x}$) mean and standard deviation (s) were calculated from the data.
- The single tail 99% upper confidence limit was determined using the Student t Test.

In accordance with the test protocol, the Student t Test 99% upper confidence limit was established as the basis for evaluating the feasibility of revising emission limits to account for the very low number of test results, the heterogeneity of the fuel and test method precision and bias. The 99% upper confidence limit typically provides reasonable assurance that any revised final emission limits will not be exceeded for the term of the operating permit as determined by periodic manual stack testing.

The Student t Test confidence limit determination is the standard confidence limit determination calculation used for small sample populations.

The Student t 99% upper confidence limit equation is:

$$CL_{99} = \bar{x} + t_{99} \times s, \text{ where:}$$

$$CL_{99} = \text{Student t upper 99\% confidence limit}$$

$$\bar{x} = \text{Mean of test results}$$

$$s = \text{Standard deviation of test results}$$

$$t_{99} = \text{Standard Student t value for 99\% confidence interval for } n-1 \text{ degree of freedom (no of results - 1)}$$

Table 5-1 provides the results of the statistical analyses of the manual stack test results for VOC, HCl, Hg, Pb and Be.

TABLE 5-1
MANUAL STACK TEST DATA STATISTICAL ANALYSIS

Pollutant	Units	Mean	Standard Deviation	Student t value	99% Confidence Limit
		($\bar{x}$)	(s)	(t_{99})	(CL_{99})
VOC	lb/hr	1.5	0.9	2.500	3.6
HCl	lb/hr	0.6	0.6	2.500	2.1
Hg	lb/hr	.0014	.0014	2.500	.0048
Pb	lb/hr	.0022	.0027	2.500	.0088
Be	lb/hr	.000011	.0000069	2.500	.000029

The statistical analysis indicates that emissions of these pollutants at the mean and 99% upper confidence limit are well below the current permit limits. The initial permit limits for these parameters were based on conservative estimates of the potential emissions associated with the full range of fuels that could be combusted at the facility. Importantly, the application, demonstrated that these limits are protective of the human health and the environment. The low test results may reflect the lower than expected levels of construction/demolition waste wood fuel fired during the first year of operation. Consequently, revised permit limits are not proposed or warranted for these pollutants at this time.

5.3 Data Analysis and Emission Limits for SO₂, NO_x and CO

The long term CEM data for SO₂, NO_x and CO emissions was collected from September 1, 1994 through April 30, 1995. This data was reduced to hourly averages in both lbs/hour and ppm @ 7% O₂. The hourly averages were identified as either startup/shutdown/malfunction (S/S/M) or normal operating (NO) boiler conditions. Two separate data sets were analyzed statistically. The first data set consisted of all CEM hourly averages including S/S/M and NO boiler conditions to evaluate revised permit limits based on the full range of boiler operating conditions. The second data set consisted of S/S/M periods only and was used to evaluate the feasibility of proposing separate emission limits for S/S/M periods. At this time, separate S/S/M limits are not being proposed due to the short duration of these events.

All periods of invalid CEM data downtime and/or boiler downtime were excluded from the statistical evaluation. Minimum data capture of 75% was utilized in the calculation of the various averaging times. The CEM hourly data were analyzed as follows:

1. Hourly data was checked visually for normality using frequency distribution plots and found to have normal distributions. Consequently, no data transformations were necessary for the statistical analyses.
2. The data set was evaluated to determine the effect of averaging times on data variability and maximum emission rates. The hourly data was reduced as follows:
 - SO₂ Data - 8 and 24 hour block and rolling averages
 - NO_x Data - 8 and 24 hour block and rolling averages
 - CO Data - 8 and 24 hour block and rolling averages

Hourly CEM data specific to S/S/M were evaluated in 3 hour rolling and block averages. Eight hour block and rolling averages were not considered for S/S/M periods because the duration of S/S/M events was too short for an 8 hour average to be meaningful.

3. Routine statistics were performed on the hourly data and all averaging times. Data means and standard deviations were calculated.
4. The 99% upper confidence limit was calculated using the Student t distribution. The final averaging time data sets selected for each pollutant were analyzed using the following equation:

$$CI_{99} = \bar{x} + t_{99} \times s, \text{ where:}$$

$$CI_{99} = 99\% \text{ one tailed upper confidence limit}$$

$$\bar{x} = \text{Mean of the averaging time data set}$$

$$s = \text{Standard deviation of the data set}$$

$$t_{99} = \text{Student t value from Student t table}$$

To be consistent with the existing permit, the proposed revised BACT permit limits for SO₂, NO_x and CO are presented in lbs/hr based on a 24 hour block average. This averaging time was confirmed to be appropriate to represent the full range of boiler loads, fuel composition and operating conditions encountered during the first year of operation as well as anticipated operation in the future. The 24 hour averaging period allows for short term and daily

variation in fuels, minor upset conditions appropriately corrected by plant operators and normal automatic boiler and air pollution control system responses to changing operating conditions. Additionally, based on the existing power contract, daily boiler load cycles will continue to be encountered. The longer averaging time allows for adjustments to be made to the automatic control systems necessary for steady state operation at reduced loads.

The full data set in ppm dry @ 7% Oxygen (ppmdc) was also analyzed and the results provided in Volume IV. Alternative limits based on the ppmdc data set are not being proposed since the lb/hr units are more accurate over the full range of boiler loads. This is primarily due to the high bias in the diluent correction with the higher oxygen levels encountered at lower boiler operating loads. The resulting higher corrected ppmdc values do not correlate as well with actual mass emission rates.

Additionally, CEM data calculated in lb/mmBtu were not incorporated in the long term data analyses because total boiler heat input cannot be accurately determined at the normal reduced boiler load operating periods. At the higher boiler operating loads of 75-100% of maximum rated capacity (MCR) boiler heat input can be accurately calculated using total net steam flow enthalpy and the design boiler efficiency. This calculation can be made since the actual boiler efficiency closely approximates design efficiency at 75-100% MCR. At reduced loads, actual boiler efficiency is more difficult to calculate and correlate to the design efficiency since these boiler types are designed principally for continuous operation at or near 100% MCR. Thus the lb/mmBtu emission rate calculation ($\text{lbs/hour} \div \text{total heat input [mmBtu/hr]}$) becomes less representative of actual mass emission rates. Emission rates in lb/hr are directly calculated from the CEM data and stack gas flowrate monitors and is, therefore, more accurate throughout the full range of boiler loads.

The statistical analysis results for the long term CEM data are summarized in Table 5-2 below:

**TABLE 5-2
LONG TERM CEM DATA ANALYSIS RESULTS***

Pollutant	Mean	Standard Deviation	Student t value	99% Upper Confidence Limit	Current Permit Limit
	($\bar{x}$)	(s)	(t_{99})	(CL_{99})	
SO ₂ (lb/hr)	51.6	18.9	2.358	96.1	109.4
NO _x (lb/hr)	70.0	11.5	2.358	96.9	94.5
CO (lb/hr)	119.8	46.8	2.358	230.2	315.0

* - Based on 24 hour block average.

The CEM data analysis results at the 99% Upper Confidence Limit (UCL) indicate the following:

- SO₂ emissions at the 99% UCL are below the initial permit limit of 109.4 lbs/hr. As previously mentioned, this may be attributed to the lower than expected C/D waste wood fuel supplies encountered during the first year of operation.
- NO_x emissions at the 99% UCL are very close to the initial permit limit of 94.5 lb/hr. This was expected since NO_x emissions are generally insensitive to fuel types and the conservative design of the SNCR system provides maximum responsiveness to changing boiler conditions.
- CO emissions at the 99% UCL are well below the initial permit limit of 315 lbs/hr and is probably due to the combustion stabilizing affect of co-firing tires with a much higher Btu value than that of waste wood.

Based on this statistical analyses and in accordance with the criteria in the Comprehensive Emissions Test Program Protocol, proposed revised limits for SO₂, NO_x and CO based on 24 hour block averages are as follows:

- SO₂ - 96 lb/hr
- NO_x - 94.5 lb/hr
- CO - 230 lb/hr

The proposed revised limits are lower than the initial permit limits for SO₂ and CO and remain the same for NO_x. These proposed limits also represent the revised BACT limits for this facility.

6.0 BACT Cost Analyses

In accordance with Specific Condition 16 and the initial BACT determination, a revised BACT analysis is being submitted as part of the comprehensive emissions test program report. The revised BACT analysis includes proposed final enforceable BACT limits for SO₂, NO_x and CO, as well as a detailed cost analyses of the installed air pollution control systems. The revised BACT cost analysis is limited to SO₂ and NO_x.

The final proposed enforceable CEM limits represent the lowest level of emissions continuously achievable for the operating life of the facility which reflect the top control technologies selected in the initial BACT determination. Selection of the final emission limits based on the 99% upper confidence limit statistic ensures that any reported excess emission will not be the result of natural fuel variations given that the boiler and air pollution control systems are being operated in a normal manner at the design control efficiencies. A conservative approach was warranted since this is the first facility of this type that combusts wood, tires, and landfill gas simultaneously, and long term emission variations were unknown. Both the average 24 hour block average emission rates and the proposed revised BACT emission rates for SO₂ and NO_x have been used in conjunction with the design control efficiencies specified in the initial BACT application to calculate uncontrolled emissions for use in the BACT cost analyses.

The BACT cost analyses is specific for SO₂, and NO_x emissions since operating costs for these respective control technologies can be specifically defined. A cost analyses based on the final CO BACT emission limit is not meaningful because operating costs for the good combustion practice control technology cannot be accurately established.

The capital and operating costs associated with the NO_x and SO₂ best available control technologies is based on the actual construction cost and operating costs from May 1, 1994 through April 30, 1995.

Cost effectiveness has been calculated using the annualized costs (annualized capital and operating) and total annual tons of SO₂ and NO_x removed for the respective control technology, based on both the average 24 hour block average ($\bar{x}_{24}$) and revised BACT emission limit (BL). Annual tons of pollutant removal was calculated based on 100% annual boiler availability (8,760 hours/year). SO₂ and NO_x CEM data statistical results from the emission test period were used to calculate the revised BACT costs in accordance with the equations below.

- Annual Uncontrolled Emissions

$$E_a = \frac{8760 \times (\bar{x}_{24} \div (1 - RE/100))}{2000}, \text{ where:}$$

$$E_a = \text{Total annual uncontrolled emissions (tons/year)}$$

$$\bar{x}_{24} = \text{Average of 24-hour block averages (lbs/hr)}$$

IF $\bar{x}_{24}$ represents 80% removal

$$8760 \frac{\text{hr}}{\text{yr}} \times \frac{\text{ton}}{2000 \text{ lbs}} \times \frac{15}{85} \times \frac{1}{1.80}$$

RE = Air pollution control technology removal efficiency
(Thermal DeNOX = 40% and SDA/FF = 80%)

- Total Annual Tons of Emissions Removed

$$T_R = \frac{E_a - (8760 \text{ hours} \times \bar{x}_{24})}{2000}, \text{ where:}$$

T_R = Total annual emissions removed (tons/year)

E_a = Total annual uncontrolled emissions (tons/year)

$\bar{x}_{24}$ = Average of the 24-hour block averages (lbs/hr)

- The Cost Effectiveness was then calculated by the following equation

$$CE = C_a / T_R$$

CE = Cost Effectiveness - \$/ton removed

T_R = Total annual emissions removed

C_a = Total Annualized Costs

As discussed above, the same equations were also used to calculate the cost effectiveness based on the proposed revised BACT limits (BL) by substituting the BL values for $\bar{x}_{24}$ values. The complete revised BACT cost analysis can be found in Appendix C.

A summary of the BACT cost analysis is provided in Table 6-1.

TABLE 6-1
REVISED COST ANALYSIS SUMMARY

SEE APPENDIX "C"

	SO ₂	NO _x
Controlled Emission Rate (lb/hr)		
• 24 hour block average	54.9	72.5
• Revised BACT limit	96.1	94.5
Control Efficiency		
• %	80	40
Pollutant Removed (ton/yr)		
• 24 hour block average	961.85	211.70
• Revised BACT limit	1,683.67	275.94
Cost Effectiveness (\$/ton)		
• 24 hour block average	\$1,597	\$2,617
• Revised BACT limit	\$913	\$2,008

APPENDIX A

Manual Stack Test Data Analysis

Manual Stack Test Data Statistical Analysis

POLLUTANT	TEST CONDITION	TEST DATE	TEST RESULT (lbs/hr)			TEST RESULT (lb/mmBtu)			COMMENT
			Rep. 1	Rep. 2	Rep. 3	Rep. 1	Rep. 2	Rep. 3	
VOC (non-methane hydrocarbons)	I - 80% Wood/ 20% Tires	Aug/Sep 1994	0.1	0.1	0.2	1.8E-04	1.7E-04	3.1E-04	
		Nov 1994	2.0	2.8	2.6	3.9E-03	4.9E-03	5.0E-03	
		Feb/Mar 1995	3.2	2.7	1.3	6.8E-03	6.3E-03	2.6E-03	
	IA - 80/20 (75% Load)	Nov 1994	1.9	2.0	2.2	6.6E-03	9.2E-03	9.1E-03	
	II - 100% Wood	Aug/Sep 1994	0.8	0.6	0.2	1.8E-03	1.1E-03	4.2E-04	
		Feb/Mar 1995	1.3	1.2	1.4	2.4E-03	2.2E-03	2.5E-03	
	III - 60% Wood/ 40% Tires	Feb/Mar 1995	1.5	0.9	1.3	2.4E-03	1.2E-03	1.7E-03	
		April 1995	1.5	1.7	1.5	2.6E-03	3.0E-03	2.6E-03	
	Sample Mean =					1.5		3.3E-03	
	Sample Standard Deviation =					0.9		2.7E-03	
	Student t 99% Upper Confidence Limit =					3.6		9.9E-03	
Hydrogen Chloride	I - 80% Wood/ 20% Tires	Aug/Sep 1994	0.3	0.2	0.5	4.8E-04	3.5E-04	7.3E-04	
		Nov 1994	1.5	1.8	1.7	2.4E-03	3.1E-03	3.4E-03	
		Feb/Mar 1995	0.1	0.5	0.1	2.2E-04	1.1E-03	1.7E-04	Rep. 1 & 3 were Non Detect
	IA - 80/20 (75% Load)	Nov 1994	1.6	1.3	1.4	7.9E-03	4.2E-03	4.9E-03	
	II - 100% Wood	Aug/Sep 1994	0.2	0.3	0.3	3.6E-04	5.4E-04	5.5E-04	
		Feb/Mar 1995	0.2	0.4	0.3	3.5E-04	8.3E-04	5.0E-04	
	III - 60% Wood/ 40% Tires	Feb/Mar 1995	0.1	0.2	0.2	1.8E-04	3.0E-04	3.4E-04	
		April 1995	0.5	0.6	0.7	9.0E-04	9.7E-04	1.2E-03	
	Sample Mean =					0.6		1.5E-03	
	Sample Standard Deviation =					0.6		1.9E-03	
	Student t 99% Upper Confidence Limit =					2.1		6.3E-03	
Mercury	I - 80% Wood/ 20% Tires	Aug/Sep 1994	3.2E-04	9.6E-04	4.7E-03	7.1E-07	1.5E-06	7.9E-06	Rep. 2 was Non Detect
		Nov 1994	9.7E-04	9.9E-04	4.6E-03	1.7E-06	1.7E-06	8.7E-06	Rep. 1 & 2 were Non Detect
		Feb/Mar 1995	8.0E-04	8.7E-04	8.7E-04	1.8E-06	1.7E-06	1.8E-06	Rep. 1, 2 & 3 were Non Detect
	IA - 80/20 (75% Load)	Nov 1994	7.7E-04	7.9E-04	8.3E-04	3.0E-06	2.8E-06	4.5E-06	Rep. 1, 2 & 3 were Non Detect
	II - 100% Wood	Aug/Sep 1994	5.2E-03	2.2E-03	1.1E-03	9.2E-06	4.2E-06	2.0E-06	
		Feb/Mar 1995	8.4E-04	9.1E-04	8.6E-04	1.4E-06	1.5E-06	1.6E-06	Rep. 1, 2 & 3 were Non Detect
	III - 60% Wood/ 40% Tires	Feb/Mar 1995	9.1E-04	9.0E-04	8.0E-04	1.5E-06	1.5E-06	1.3E-06	Rep. 1, 2 & 3 were Non Detect
		April 1995	8.4E-04	8.4E-04	8.4E-04	1.5E-06	1.5E-06	1.4E-06	Rep. 1, 2 & 3 were Non Detect
	Sample Mean =					1.4E-03		2.8E-06	
	Sample Standard Deviation =					1.4E-03		2.4E-06	
	Student t 99% Upper Confidence Limit =					4.8E-03		8.8E-06	

NOTE: Non Detect values used for worst case analysis.

Manual Stack Test Data Statistical Analysis

POLLUTANT	TEST CONDITION	TEST DATE	TEST RESULT (lbs/hr)			TEST RESULT (lb/mmBtu)			COMMENT
			Rep. 1	Rep. 2	Rep. 3	Rep. 1	Rep. 2	Rep. 3	
Lead	I - 80% Wood/ 20% Tires	Aug/Sep 1994	2.1E-03	9.3E-04	1.3E-03	3.7E-06	1.6E-06	2.3E-06	Rep. 2 was Non Detect
		Nov 1994	1.6E-03	2.4E-03	2.1E-03	2.7E-06	4.6E-06	4.0E-06	
		Feb/Mar 1995	1.8E-03	8.8E-03	5.6E-04	4.0E-06	2.0E-06	1.4E-06	
	IA - 80/20 (75% Load)	Nov 1994	4.5E-03	9.1E-04	1.8E-03	1.9E-05	3.8E-06	7.1E-06	Rep. 2 was Non Detect
	II - 100% Wood	Aug/Sep 1994	9.5E-04	1.0E-03	1.0E-03	1.7E-06	2.2E-06	2.3E-06	Rep. 1, 2 & 3 were Non Detect
		Feb/Mar 1995	5.2E-04	1.1E-02	2.9E-03	1.1E-06	2.0E-05	5.3E-06	
	III - 60% Wood/ 40% Tires	Feb/Mar 1995	4.0E-03	6.1E-04	2.2E-04	6.1E-06	8.5E-07	3.3E-07	
		April 1995	2.9E-04	1.8E-04	3.0E-04	4.5E-07	2.8E-07	5.1E-07	Rep. 2 was Non-Detect
	Sample Mean =					2.2E-03		4.1E-06	
	Sample Standard Deviation =					2.7E-03		5.1E-06	
	Student t 99% Upper Confidence Limit =					8.8E-03		1.7E-05	
Beryllium	I - 80% Wood/ 20% Tires	Aug/Sep 1994	4.4E-06	4.9E-06	4.7E-06	7.8E-09	8.7E-09	8.3E-09	Rep. 1, 2 & 3 were Non Detect
		Nov 1994	4.6E-06	4.4E-06	4.8E-06	8.0E-09	7.5E-09	9.4E-09	Rep. 1, 2 & 3 were Non Detect
		Feb/Mar 1995	1.9E-05	1.9E-05	1.8E-05	4.2E-08	4.3E-08	4.4E-08	Rep. 1, 2 & 3 were Non Detect
	IA - 80/20 (75% Load)	Nov 1994	4.9E-06	4.7E-06	4.6E-06	2.0E-08	1.9E-08	1.7E-08	Rep. 1, 2 & 3 were Non Detect
	II - 100% Wood	Aug/Sep 1994	4.5E-06	4.6E-06	4.8E-06	8.1E-09	1.0E-08	1.1E-08	Rep. 1, 2 & 3 were Non Detect
		Feb/Mar 1995	1.8E-05	1.8E-05	1.8E-05	3.7E-08	3.3E-08	3.3E-08	Rep. 1, 2 & 3 were Non Detect
	III - 60% Wood/ 40% Tires	Feb/Mar 1995	1.8E-05	1.8E-05	1.8E-05	2.8E-08	2.5E-08	2.7E-08	Rep. 1, 2 & 3 were Non Detect
		April 1995	1.8E-05	1.8E-05	1.8E-05	2.8E-08	2.8E-08	3.1E-08	Rep. 1, 2 & 3 were Non Detect
	Sample Mean =					1.1E-05		2.2E-08	
	Sample Standard Deviation =					6.9E-06		1.3E-08	
	Student t 99% Upper Confidence Limit =					2.9E-05		5.4E-08	

NOTE: Non Detect values used for worst case analysis.

Manual Stack Test Data Statistical Analysis

POLLUTANT	TEST CONDITION	TEST DATE	TEST RESULT (lbs/hr)			TEST RESULT (lb/mmBtu)			COMMENT
			Rep. 1	Rep. 2	Rep. 3	Rep. 1	Rep. 2	Rep. 3	
Ammonia	I - 80% Wood/ 20% Tires	Aug/Sep 1994	5.1	5.6	13.8	1.0E-02	9.3E-03	2.5E-02	
		Nov 1994	5.9	4.3	4.1	1.1E-02	8.0E-03	9.7E-03	
		Feb/Mar 1995	----	----	----	----	----	----	
	II - 100% Wood	Aug/Sep 1994	4.2	4.0	3.9	9.1E-03	7.6E-03	8.2E-03	
		Feb/Mar 1995	----	37.0	24.8	----	8.7E-02	4.7E-02	Rep. 1 broken during shipment
	III - 60% Wood/ 40% Tires	Feb/Mar 1995	9.5	7.8	10.6	1.5E-02	1.3E-02	1.7E-02	
		April 1995	12.8	8.3	7.7	2.2E-02	1.3E-02	1.3E-02	Rep. 1, 2 & 3 were Non Detect
	Sample Mean =							1.9E-02	
	Sample Standard Deviation =							2.0E-02	
	Student t 99% Upper Confidence Limit =							7.1E-02	
Arsenic	I - 80% Wood/ 20% Tires	Aug/Sep 1994	4.4E-05	4.5E-05	4.4E-05	7.8E-08	8.0E-08	7.7E-08	Rep. 1, 2 & 3 were Non Detect
		Nov 1994	1.1E-04	7.7E-04	1.3E-04	1.9E-07	1.3E-06	2.5E-07	
		Feb/Mar 1995	1.9E-04	1.9E-04	1.8E-04	4.2E-07	4.3E-07	4.4E-07	Rep. 1, 2 & 3 were Non Detect
	II - 100% Wood	Aug/Sep 1994	4.7E-05	4.8E-05	4.8E-05	8.4E-08	1.1E-07	9.2E-08	Rep. 1, 2 & 3 were Non Detect
		Feb/Mar 1995	1.8E-05	1.8E-05	1.8E-05	3.7E-08	3.3E-08	3.3E-08	Rep. 1, 2 & 3 were Non Detect
	III - 60% Wood/ 40% Tires	Feb/Mar 1995	1.8E-04	1.8E-04	1.8E-04	2.7E-07	2.5E-07	2.7E-07	Rep. 1, 2 & 3 were Non Detect
		April 1995	1.8E-04	1.8E-04	1.8E-04	2.8E-07	2.8E-07	3.1E-07	Rep. 1, 2 & 3 were Non Detect
	Sample Mean =							2.5E-07	
	Sample Standard Deviation =							2.7E-07	
	Student t 99% Upper Confidence Limit =							9.5E-07	
Benzene	I - 80% Wood/ 20% Tires	Aug/Sep 1994	0.8	0.8	0.8	1.3E-03	1.4E-03	1.3E-03	Rep. 1, 2 & 3 were Non Detect
		Nov 1994	0.10	0.02	0.02	1.7E-04	3.7E-05	3.8E-05	Rep. 2 & 3 were Non Detect
		Feb/Mar 1995	0.03	0.02	0.04	6.7E-05	3.4E-05	6.3E-05	Rep. 1 was Non Detect
	II - 100% Wood	Aug/Sep 1994	0.9	0.8	0.8	1.7E-03	1.3E-03	1.4E-03	Rep. 1, 2 & 3 were Non Detect
		Feb/Mar 1995	0.2	0.0	1.5	3.7E-04	4.9E-05	3.1E-03	
	III - 60% Wood/ 40% Tires	Feb/Mar 1995	0.02	0.13	0.54	3.1E-05	2.0E-04	8.6E-04	Rep. 1 was Non Detect
		April 1995	0.1	0.1	0.1	1.5E-04	1.4E-04	1.6E-04	Rep. 1, 2 & 3 were Non Detect
	Sample Mean =							6.6E-04	
	Sample Standard Deviation =							8.2E-04	
	Student t 99% Upper Confidence Limit =							2.7E-03	

NOTE: Non Detect values used for worst case analysis.

Manual Stack Test Data Statistical Analysis

POLLUTANT	TEST CONDITION	TEST DATE	TEST RESULT (lbs/hr)			TEST RESULT (lb/mmBtu)			COMMENT
			Rep. 1	Rep. 2	Rep. 3	Rep. 1	Rep. 2	Rep. 3	
Cadmium	I - 80% Wood/ 20% Tires	Aug/Sep 1994	1.9E-04	1.2E-04	8.5E-05	3.4E-07	2.0E-07	1.5E-07	
		Nov 1994	1.3E-04	9.5E-04	3.6E-04	2.4E-07	1.8E-06	7.0E-07	
		Feb/Mar 1995	6.1E-04	1.2E-03	1.7E-04	1.3E-06	2.7E-06	4.2E-07	
	II - 100% Wood	Aug/Sep 1994	2.2E-04	1.0E-04	1.0E-04	4.5E-07	2.0E-07	2.0E-07	
		Feb/Mar 1995	1.1E-04	6.8E-04	2.1E-04	2.2E-07	1.2E-06	3.9E-07	
	III - 60% Wood/ 40% Tires	Feb/Mar 1995	1.3E-04	1.1E-04	8.5E-05	2.0E-07	1.5E-07	1.3E-07	
		April 1995	7.0E-05	1.2E-04	8.4E-05	1.1E-07	1.9E-07	1.5E-07	
	Sample Mean =							5.4E-07	
	Sample Standard Deviation =							6.7E-07	
	Student t 99% Upper Confidence Limit =							2.2E-06	
Hex. Chromium	I - 80% Wood/ 20% Tires	Aug/Sep 1994	3.7E-04	3.8E-04	3.7E-04	7.4E-07	7.4E-07	6.1E-07	Rep. 1, 2 & 3 were Non Detect
		Nov 1994	3.3E-04	3.4E-04	3.1E-04	6.7E-07	6.8E-07	7.3E-07	Rep. 1, 2 & 3 were Non Detect
		Feb/Mar 1995	5.9E-04	3.1E-04	4.1E-04	1.4E-06	5.9E-07	8.7E-07	Rep. 2 was Non Detect
	II - 100% Wood	Aug/Sep 1994	3.9E-04	4.0E-04	3.1E-04	7.3E-07	7.2E-07	5.6E-07	Rep. 1 & 3 were Non Detect
		Feb/Mar 1995	3.8E-04	3.3E-04	3.2E-04	7.7E-07	6.0E-07	5.9E-07	
	III - 60% Wood/ 40% Tires	Feb/Mar 1995	4.5E-04	3.4E-04	3.1E-04	6.8E-07	4.7E-07	4.6E-07	Rep. 3 was Non Detect
		April 1995	3.4E-04	4.4E-04	1.3E-04	5.4E-07	6.9E-07	2.2E-07	Rep. 1 & 3 were Non Detect
	Sample Mean =							6.7E-07	
	Sample Standard Deviation =							2.2E-07	
	Student t 99% Upper Confidence Limit =							1.2E-06	
Chromium	I - 80% Wood/ 20% Tires	Aug/Sep 1994	4.8E-04	1.0E-03	9.1E-04	8.6E-07	1.7E-06	1.6E-06	
		Nov 1994	3.8E-04	7.6E-04	3.1E-04	7.0E-07	1.4E-06	6.0E-07	
		Feb/Mar 1995	1.6E-03	5.2E-04	2.0E-04	3.5E-06	1.2E-06	4.9E-07	
	II - 100% Wood	Aug/Sep 1994	4.4E-04	6.2E-05	1.9E-04	9.0E-07	1.2E-07	3.8E-07	
		Feb/Mar 1995	3.1E-04	4.5E-04	2.9E-04	6.3E-07	8.2E-07	5.3E-07	
	III - 60% Wood/ 40% Tires	Feb/Mar 1995	2.5E-04	2.3E-04	1.7E-04	3.8E-07	3.2E-07	2.5E-07	
		April 1995	3.6E-04	3.5E-04	4.4E-04	5.6E-07	5.5E-07	7.6E-07	
	Sample Mean =							8.7E-07	
	Sample Standard Deviation =							7.4E-07	
	Student t 99% Upper Confidence Limit =							2.7E-06	

NOTE: Non Detect values used for worst case analysis.

Manual Stack Test Data Statistical Analysis

POLLUTANT	TEST CONDITION	TEST DATE	TEST RESULT (lbs/hr)			TEST RESULT (lb/mmBtu)			COMMENT
			Rep. 1	Rep. 2	Rep. 3	Rep. 1	Rep. 2	Rep. 3	
Total PCB	I - 80% Wood/ 20% Tires	Aug/Sep 1994	1.3E-06	6.5E-07	6.4E-07	2.7E-09	1.1E-09	1.0E-09	Rep. 1, 2 & 3 were Non Detect
		Nov 1994	6.1E-07	1.0E-06	6.4E-07	1.2E-09	2.1E-09	1.2E-09	Rep. 1 & 3 were Non Detect
		Feb/Mar 1995	7.0E-07	1.3E-06	7.4E-07	1.7E-09	2.3E-09	1.4E-09	Rep. 1 & 3 were Non Detect
	II - 100% Wood	Aug/Sep 1994	6.6E-07	6.7E-07	6.6E-07	1.2E-09	1.2E-09	1.3E-09	Rep. 1, 2 & 3 were Non Detect
		Feb/Mar 1995	6.7E-07	7.1E-07	6.4E-07	1.4E-09	1.5E-09	1.3E-09	Rep. 1, 2 & 3 were Non Detect
	III - 60% Wood/ 40% Tires	Feb/Mar 1995	6.1E-07	7.3E-07	9.1E-07	9.8E-10	1.2E-09	1.3E-09	Rep. 1 & 2 were Non Detect
		April 1995	8.3E-07	6.4E-07	6.6E-07	1.4E-09	1.0E-09	1.1E-09	Rep. 1, 2 & 3 were Non Detect
	Sample Mean =					7.6E-07		1.4E-09	
	Sample Standard Deviation =					2.0E-07		4.5E-10	
	Student t 99% Upper Confidence Limit =					1.3E-06		2.5E-09	
Total PCDD/PCDF	I - 80% Wood/ 20% Tires	Aug/Sep 1994	2.9E-06	1.6E-06	6.6E-07	5.9E-09	2.6E-09	1.2E-09	
		Nov 1994	1.1E-06	2.1E-05	5.2E-07	2.2E-09	4.5E-08	9.2E-10	
		Feb/Mar 1995	1.1E-06	2.1E-07	8.6E-07	2.6E-09	3.7E-10	1.6E-09	
	II - 100% Wood	Aug/Sep 1994	7.6E-07	6.8E-07	3.2E-07	1.4E-09	1.3E-09	7.1E-10	
		Feb/Mar 1995	1.6E-07	6.4E-07	8.8E-07	3.3E-10	1.4E-09	1.7E-09	
	III - 60% Wood/ 40% Tires	Feb/Mar 1995	4.3E-08	1.3E-07	1.3E-07	6.9E-11	2.1E-10	1.9E-10	
		April 1995	2.0E-05	6.0E-06	5.3E-06	3.3E-08	9.4E-09	9.3E-09	
	Sample Mean =					3.1E-06		5.8E-09	
	Sample Standard Deviation =					6.0E-06		1.2E-08	
	Student t 99% Upper Confidence Limit =					1.8E-05		3.5E-08	
Sulfuric Acid Mist	I - 80% Wood/ 20% Tires	Aug/Sep 1994	3.1	2.4	1.1	5.6E-03	4.3E-03	1.9E-03	
		Nov 1994	7.5	4.4	4.4	1.3E-02	8.5E-03	8.4E-03	
		Feb/Mar 1995	----	----	----	----	----	----	
	II - 100% Wood	Aug/Sep 1994	10.5	13.7	12.2	1.9E-02	2.6E-02	2.1E-02	
		Feb/Mar 1995	12.5	29.9	14.7	2.1E-02	5.0E-02	2.8E-02	
	III - 60% Wood/ 40% Tires	Feb/Mar 1995	15.9	23.9	20.5	2.3E-02	3.6E-02	3.2E-02	
		April 1995	45.2	11.5	10.9	7.5E-02	1.8E-02	1.8E-02	
	Sample Mean =					13.6		0.02	
	Sample Standard Deviation =					11.0		0.02	
	Student t 99% Upper Confidence Limit =					41.7		0.07	

NOTE: Non Detect values used for worst case analysis.

Manual Stack Test Data Statistical Analysis

POLLUTANT	TEST CONDITION	TEST DATE	TEST RESULT (lbs/hr)			TEST RESULT (lb/mmBtu)			COMMENT
			Rep. 1	Rep. 2	Rep. 3	Rep. 1	Rep. 2	Rep. 3	
Zinc (as Zinc Oxide)	I - 80% Wood/ 20% Tires	Aug/Sep 1994	2.7E-02	1.6E-02	1.4E-02	4.8E-05	2.7E-05	2.5E-05	
		Nov 1994	3.6E-02	4.0E-02	2.6E-02	6.7E-05	7.5E-05	5.0E-05	
		Feb/Mar 1995	2.6E-02	6.4E-02	1.8E-02	5.8E-05	1.4E-04	4.4E-04	
	II - 100% Wood	Aug/Sep 1994	4.9E-03	3.6E-03	3.9E-03	1.0E-05	7.0E-06	7.7E-06	
		Feb/Mar 1995	7.6E-03	4.3E-02	9.4E-03	1.5E-05	7.8E-05	1.7E-05	
	III - 60% Wood/ 40% Tires	Feb/Mar 1995	1.7E-02	1.4E-02	1.4E-02	2.6E-05	1.9E-05	2.0E-05	
		April 1995	2.0E-02	2.4E-02	1.9E-02	3.1E-05	3.8E-05	3.2E-05	
	Sample Mean =					2.1E-02		5.9E-05	
	Sample Standard Deviation =					1.5E-02		9.3E-05	
	Student t 99% Upper Confidence Limit =					5.9E-02		2.9E-04	

NOTE: Non Detect values used for worst case analysis.

Permit Limited Pollutant Summary

August/September 1994

Condition I - 80% Wood/20% Tires at 100% Load

POLLUTANT	UNITS	TEST RESULT				PERMIT LIMIT	COMMENT
		Rep. 1	Rep. 2	Rep. 3	Average*		
Particulate/PM10	lb/hr	1.3	2.6	2.2	2.0	12.6	
Sulfur Dioxide	lb/hr	17.6	43.5	71.3	44.1	109.4	
Nitrogen Oxides	lb/hr	77.9	87.4	81.6	82.3	94.5	
Carbon Monoxide	lb/hr	62.3	56.7	86.9	68.6	315.0	
Non-Methane Hydrocarbons	lb/hr	0.1	0.1	0.2	0.1	22.1	
Hydrogen Chloride	lb/hr	0.3	0.2	0.5	0.3	5	
Mercury	lb/hr	0.00032	0.00096	0.00470	0.00199	0.022	Rep. 2 was Non-Detect
Lead	lb/hr	0.0021	0.0009	0.0013	0.0014	0.25	Rep. 2 was Non-Detect
Beryllium	lb/hr	0.000004	0.000005	0.000005	0.000005	0.0063	Rep. 1, 2 & 3 were Non-Detect

* - Non Detect values used in averages for worst case.

Condition II - 100% Wood at 100% Load

POLLUTANT	UNITS	TEST RESULT				PERMIT LIMIT	COMMENT
		Rep. 1	Rep. 2	Rep. 3	Average*		
Particulate/PM10	lb/hr	1.0	1.0	1.4	1.1	12.6	
Sulfur Dioxide	lb/hr	0.0	1.0	0.0	0.3	109.4	
Nitrogen Oxides	lb/hr	78.7	80.8	78.9	79.5	94.5	
Carbon Monoxide	lb/hr	94.5	93.4	55.5	81.1	315.0	
Non-Methane Hydrocarbons	lb/hr	0.8	0.6	0.2	0.5	22.1	
Hydrogen Chloride	lb/hr	0.2	0.3	0.3	0.3	5	
Mercury	lb/hr	0.00520	0.00220	0.00110	0.00283	0.022	
Lead	lb/hr	0.0010	0.0010	0.0010	0.0010	0.25	Rep. 1, 2 & 3 were Non-Detect
Beryllium	lb/hr	0.000005	0.000005	0.000005	0.000005	0.0063	Rep. 1, 2 & 3 were Non-Detect

* - Non Detect values used in averages for worst case.

Permit Limited Pollutant Summary

November 1994

Condition I - 80% Wood/20% Tires at 100% Load

POLLUTANT	UNITS	TEST RESULT				PERMIT LIMIT	COMMENT
		Rep. 1	Rep. 2	Rep. 3	Average*		
Particulate/PM10	lb/hr	4.0	2.6	3.0	3.2	12.6	
Sulfur Dioxide	lb/hr	32.7	28.5	30.9	30.7	109.4	
Nitrogen Oxides	lb/hr	74.2	70.5	69.7	71.5	94.5	
Carbon Monoxide	lb/hr	56.1	79.0	157.0	97.4	315.0	
Non-Methane Hydrocarbons	lb/hr	2.0	2.8	2.6	2.5	22.1	
Hydrogen Chloride	lb/hr	1.5	1.8	1.7	1.7	5	
Mercury	lb/hr	0.00097	0.00099	0.0046	0.00219	0.022	Rep. 1 & 2 were Non-Detect
Lead	lb/hr	0.0016	0.0024	0.0021	0.00203	0.25	
Beryllium	lb/hr	0.000005	0.000004	0.000005	0.000005	0.0063	Rep. 1, 2 & 3 were Non-Detect

* - Non Detect values used in averages for worst case.

Condition IA - 80% Wood/20% Tires at 75% Load

POLLUTANT	UNITS	TEST RESULT				PERMIT LIMIT	COMMENT
		Rep. 1	Rep. 2	Rep. 3	Average*		
Particulate/PM10	lb/hr	1.6	12.6	4.2	6.1	12.6	
Sulfur Dioxide	lb/hr	34.8	40.9	110.0	61.9	109.4	
Nitrogen Oxides	lb/hr	73.8	70.3	63.9	69.3	94.5	
Carbon Monoxide	lb/hr	35.9	43.0	51.0	43.3	315.0	
Non-Methane Hydrocarbons	lb/hr	1.9	2.0	2.2	2.0	22.1	
Hydrogen Chloride	lb/hr	1.6	1.3	1.4	1.4	5	
Mercury	lb/hr	0.00077	0.00079	0.00083	0.00080	0.022	Rep. 1, 2 & 3 were Non-Detect
Lead	lb/hr	0.0045	0.00091	0.0018	0.0024	0.25	Rep. 2 was Non-Detect
Beryllium	lb/hr	0.000005	0.000005	0.000005	0.000005	0.0063	Rep. 1, 2 & 3 were Non-Detect

* - Non Detect values used in averages for worst case.

Permit Limited Pollutant Summary

February/March 1995

Condition I - 80% Wood/20% Tires at 100% Load

POLLUTANT	UNITS	TEST RESULT				PERMIT LIMIT	COMMENT
		Rep. 1	Rep. 2	Rep. 3	Average*		
Particulate/PM10	lb/hr	2.2	2.0	1.1	1.8	12.6	
Sulfur Dioxide	lb/hr	68.9	40.6	33.2	47.6	109.4	
Nitrogen Oxides	lb/hr	82.4	86.6	84.3	84.4	94.5	
Carbon Monoxide	lb/hr	58.0	72.8	46.8	59.2	315.0	
Non-Methane Hydrocarbons	lb/hr	3.2	2.7	1.3	2.4	22.1	
Hydrogen Chloride	lb/hr	0.1	0.5	0.1	0.2	5	Rep. 1 & 3 were Non-Detect
Mercury	lb/hr	0.00080	0.00087	0.00087	0.00085	0.022	Rep. 1, 2 & 3 were Non-Detect
Lead	lb/hr	0.0018	0.0088	0.0006	0.0037	0.25	
Beryllium	lb/hr	0.000019	0.000019	0.000018	0.000019	0.0063	Rep. 1, 2 & 3 were Non-Detect

* - Non Detect values used in averages for worst case.

Condition II - 100% Wood at 100% Load

POLLUTANT	UNITS	TEST RESULT				PERMIT LIMIT	COMMENT
		Rep. 1	Rep. 2	Rep. 3	Average*		
Particulate/PM10	lb/hr	0.6	1.5	1.5	1.2	12.6	
Sulfur Dioxide	lb/hr	5.7	0.0	10.6	5.4	109.4	
Nitrogen Oxides	lb/hr	85.2	83.9	77.8	82.3	94.5	
Carbon Monoxide	lb/hr	75.1	57.1	63.5	65.2	315.0	
Non-Methane Hydrocarbons	lb/hr	1.3	1.2	1.4	1.3	22.1	
Hydrogen Chloride	lb/hr	0.2	0.4	0.3	0.3	5	
Mercury	lb/hr	0.00084	0.00091	0.00086	0.00087	0.022	Rep. 1, 2 & 3 were Non-Detect
Lead	lb/hr	0.0005	0.0110	0.0029	0.0048	0.25	
Beryllium	lb/hr	0.000018	0.000018	0.000018	0.000018	0.0063	Rep. 1, 2 & 3 were Non-Detect

* - Non Detect values used in averages for worst case.

Permit Limited Pollutant Summary

February/March 1995

Condition III - 60% Wood/40% Tires at 100% Load

POLLUTANT	UNITS	TEST RESULT				PERMIT LIMIT	COMMENT
		Rep. 1	Rep. 2	Rep. 3	Average*		
Particulate/PM10	lb/hr	0.43	2.0	1.82	1.4	12.6	
Sulfur Dioxide	lb/hr	74.2	87.3	56.9	72.8	109.4	
Nitrogen Oxides	lb/hr	78.1	77.0	82.2	79.1	94.5	
Carbon Monoxide	lb/hr	56.6	64.3	63.7	61.5	315.0	
Non-Methane Hydrocarbons	lb/hr	1.5	0.9	1.3	1.2	22.1	
Hydrogen Chloride	lb/hr	0.1	0.2	0.2	0.2	5	
Mercury	lb/hr	0.00091	0.00090	0.00080	0.00087	0.022	Rep. 1, 2 & 3 were Non-Detect
Lead	lb/hr	0.0040	0.0006	0.0002	0.0016	0.25	
Beryllium	lb/hr	0.000018	0.000018	0.000018	0.000018	0.0063	Rep. 1, 2 & 3 were Non-Detect

* - Non Detect values used in averages for worst case.

Permit Limited Pollutant Summary

April 1995

Condition III - 60% Wood/40% Tires at 100% Load

POLLUTANT	UNITS	TEST RESULT				PERMIT LIMIT	COMMENT
		Rep. 1	Rep. 2	Rep. 3	Average*		
Particulate/PM10	lb/hr	0.67	0.29	2.1	1.0	12.6	
Sulfur Dioxide	lb/hr	35.8	51.7	79.2	55.6	109.4	
Nitrogen Oxides	lb/hr	83.3	84.2	81.3	82.9	94.5	
Carbon Monoxide	lb/hr	51.9	47.4	42.8	47.4	315.0	
Non-Methane Hydrocarbons	lb/hr	1.5	1.7	1.5	1.6	22.1	
Hydrogen Chloride	lb/hr	0.5	0.6	0.7	0.6	5	
Mercury	lb/hr	0.00084	0.00084	0.00084	0.00084	0.022	Rep. 1, 2 & 3 were Non-Detect
Lead	lb/hr	0.0003	0.0002	0.0003	0.0003	0.25	Rep 2 was Non-Detect
Beryllium	lb/hr	0.000018	0.000018	0.000018	0.000018	0.0063	Rep. 1, 2 & 3 were Non-Detect

* - Non Detect values used in averages for worst case.

Additional Pollutant Data Summary

August/September 1994

Condition I - 80% Wood/20% Tires at 100% Load

POLLUTANT	UNITS	TEST RESULT				COMMENT
		Rep. 1	Rep. 2	Rep. 3	Average*	
Ammonia	lb/hr	5.10	5.60	13.80	8.17	
	ug/dscm	10300	11700	27500	16500	
Arsenic	lb/hr	0.000044	0.000045	0.000044	0.000044	Rep. 1, 2 & 3 were Non-Detect
	ug/dscm	0.089	0.092	0.093	0.092	
Benzene	lb/hr	0.80	0.80	0.80	0.80	Rep. 1, 2 & 3 were Non-Detect
	ug/dscm	1581	1565	1598	1581	
Cadmium	lb/hr	0.00019	0.00012	0.00009	0.00013	
	ug/dscm	0.37	0.25	0.17	0.27	
Hex. Chromium	lb/hr	0.00037	0.00038	0.00037	0.00037	Rep. 1, 2 & 3 were Non-Detect
	ug/dscm	0.75	0.77	0.81	0.77	
Chromium	lb/hr	0.00048	0.00100	0.00091	0.00080	
	ug/dscm	0.97	2.11	1.86	1.65	
Total PCB	lb/hr	1.3E-06	6.5E-07	6.4E-07	8.6E-07	Rep. 2 & 3 were Non-Detect
	ug/dscm	2.64	1.29	1.32	1.75	
Total PCDD/PCDF	lb/hr	2.9E-06	1.6E-06	6.6E-07	1.7E-06	
	ug/dscm	0.0061	0.0033	0.0013	0.0036	
Sulfuric Acid Mist	lb/hr	3.1	2.4	1.1	2.2	
	ug/dscm	6360	4860	2140	4453	
Zinc (as Zinc Oxide)	lb/hr	0.027	0.016	0.014	0.019	
	ug/dscm	53.30	32.10	28.50	37.97	

* - Non Detect values used in averages for worst case.

Additional Pollutant Data Summary

August/September 1994

Condition II - 100% Wood at 100% Load

POLLUTANT	UNITS	TEST RESULT				COMMENT
		Rep. 1	Rep. 2	Rep. 3	Average*	
Ammonia	lb/hr	4.2	4.0	3.9	4.0	
	ug/dscm	8180	8610	8520	8437	
Arsenic	lb/hr	4.7E-05	4.8E-05	4.8E-05	4.8E-05	Rep. 1, 2 & 3 were Non-Detect
	ug/dscm	0.10	0.11	0.10	0.10	
Benzene	lb/hr	0.90	0.80	0.80	0.83	Rep. 1, 2 & 3 were Non-Detect
	ug/dscm	2026	1653	1685	1788	
Cadmium	lb/hr	0.00022	0.00010	0.00010	0.00014	
	ug/dscm	0.43	0.23	0.23	0.30	
Hex. Chromium	lb/hr	0.00039	0.00040	0.00031	0.00037	Rep. 1 & 3 were Non-Detect
	ug/dscm	0.89	0.89	0.67	0.81	
Chromium	lb/hr	0.00044	0.00006	0.00019	0.00023	
	ug/dscm	0.87	0.14	0.42	0.48	
Total PCB	lb/hr	6.6E-07	6.7E-07	6.6E-07	6.6E-07	Rep. 1, 2 & 3 were Non-Detect
	ug/dscm	0.0015	0.0016	0.0015	0.0015	
Total PCDD/PCDF	lb/hr	7.6E-07	6.8E-07	3.2E-07	5.9E-07	
	ug/dscm	0.0017	0.0015	0.0007	0.0013	
Sulfuric Acid Mist	lb/hr	10.5	13.7	12.2	12.1	
	ug/dscm	22400	29300	26600	26100	
Zinc (as Zinc Oxide)	lb/hr	0.0049	0.0036	0.0039	0.0041	
	ug/dscm	9.7	8.1	8.7	8.8	

* - Non Detect values used in averages for worst case.

Additional Pollutant Data Summary

November 1994

Condition I - 80% Wood/20% Tires at 100% Load

POLLUTANT	UNITS	TEST RESULT				COMMENT
		Rep. 1	Rep. 2	Rep. 3	Average*	
Ammonia	lb/hr	5.9	4.3	4.1	4.8	
	ug/dscm	11800	8970	8170	9647	
Arsenic	lb/hr	0.00011	0.00077	0.00013	0.00034	
	ug/dscm	0.23	0.16	0.26	0.22	
Benzene	lb/hr	0.10	0.02	0.02	0.05	Rep. 2 & 3 were Non-Detect
	ug/dscm	198.0	33.8	33.4	88.4	
Cadmium	lb/hr	0.00013	0.00095	0.00036	0.00048	
	ug/dscm	0.27	1.94	0.74	0.98	
Hex. Chromium	lb/hr	0.00033	0.00034	0.00031	0.00033	Rep. 1, 2 & 3 were Non-Detect
	ug/dscm	0.71	0.71	0.67	0.70	
Chromium	lb/hr	0.00038	0.00076	0.00031	0.00048	
	ug/dscm	0.79	1.54	0.63	0.99	
Total PCB	lb/hr	6.1E-07	1.0E-06	6.4E-07	7.5E-07	Rep. 1 & 3 were Non-Detect
	ug/dscm	0.0013	0.0021	0.0014	0.0016	
Total PCDD/PCDF	lb/hr	1.1E-06	2.1E-05	5.2E-07	7.5E-06	
	ug/dscm	0.0023	0.0439	0.0011	0.0158	
Sulfuric Acid Mist	lb/hr	7.5	4.4	4.4	5.4	
	ug/dscm	15500	9220	9510	11410	
Zinc (as Zinc Oxide)	lb/hr	0.036	0.040	0.026	0.034	
	ug/dscm	75.0	81.7	53.7	70.1	

* - Non Detect values used in averages for worst case.

Additional Pollutant Data Summary

February/March 1995

Condition I - 80% Wood/20% Tires at 100% Load

POLLUTANT	UNITS	TEST RESULT				COMMENT
		Rep. 1	Rep. 2	Rep. 3	Average*	
Ammonia	lb/hr	42.3	63.7	99.8	68.6	Data not used in statistical evaluation. Atypical SNCR operation during testing.
	ug/dscm	86900	129000	195000	136967	
Arsenic	lb/hr	0.00019	0.00019	0.00018	0.00019	Rep. 1, 2 & 3 were Non-Detect
	ug/dscm	0.41	0.40	0.37	0.39	
Benzene	lb/hr	0.030	0.020	0.040	0.030	Rep. 1 was Non-Detect
	ug/dscm	32.8	50.7	81.8	55.1	
Cadmium	lb/hr	0.00061	0.0012	0.00017	0.00066	
	ug/dscm	1.29	2.52	0.34	1.38	
Hex. Chromium	lb/hr	0.00059	0.00031	0.00041	0.00044	Rep. 2 was Non-Detect
	ug/dscm	1.21	0.58	0.83	0.87	
Chromium	lb/hr	0.0016	0.00052	0.0002	0.00077	
	ug/dscm	3.35	1.07	0.40	1.61	
Total PCB	lb/hr	7E-07	1E-06	7E-07	9E-07	Rep. 1 & 3 were Non-Detect
	ug/dscm	0.0015	0.0027	0.0014	0.0019	
Total PCDD/PCDF	lb/hr	1E-06	2E-07	9E-07	7E-07	
	ug/dscm	0.0024	0.0044	0.0017	0.0028	
Sulfuric Acid Mist	lb/hr	68.4	95.8	88.0	84.1	
	ug/dscm	137000	188000	177000	167333	
Zinc (as Zinc Oxide)	lb/hr	0.026	0.064	0.018	0.036	
	ug/dscm	53.9	133.0	37.0	74.6	

* - Non Detect values used in averages for worst case.

Additional Pollutant Data Summary

February/March 1995

Condition II - 100% Wood at 100% Load

POLLUTANT	UNITS	TEST RESULT				COMMENT
		Rep. 1	Rep. 2	Rep. 3	Average*	
Ammonia	lb/hr	---	37.0	24.8	30.9	
	ug/dscm	---	73400	46600	60000	
Arsenic	lb/hr	0.000018	0.000018	0.000018	0.000018	Rep. 1, 2 & 3 were Non-Detect
	ug/dscm	0.35	0.36	0.36	0.35	
Benzene	lb/hr	0.19	0.02	1.52	0.58	
	ug/dscm	373	47	3020	1147	
Cadmium	lb/hr	0.00011	0.00068	0.00021	0.00033	
	ug/dscm	0.21	1.38	0.41	0.67	
Hex. Chromium	lb/hr	0.00038	0.00033	0.00032	0.00034	
	ug/dscm	0.75	0.65	0.63	0.68	
Chromium	lb/hr	0.00031	0.00045	0.00029	0.00035	
	ug/dscm	0.61	0.91	0.57	0.70	
Total PCB	lb/hr	6.7E-07	7.1E-07	6.4E-07	6.7E-07	Rep. 1, 2 & 3 were Non-Detect
	ug/dscm	0.0014	0.0014	0.0013	0.0014	
Total PCDD/PCDF	lb/hr	1.6E-07	6.4E-07	8.8E-07	5.6E-07	
	ug/dscm	0.00034	0.00124	0.00183	0.00114	
Sulfuric Acid Mist	lb/hr	12.5	29.9	14.7	19.0	
	ug/dscm	24100	47900	28900	33633	
Zinc (as Zinc Oxide)	lb/hr	0.0076	0.0430	0.0094	0.0200	
	ug/dscm	14.7	85.9	18.6	39.7	

* - Non Detect values used in averages for worst case.

Additional Pollutant Data Summary

February/March 1995

Condition III - 60% Wood/40% Tires at 100% Load

POLLUTANT	UNITS	TEST RESULT				COMMENT
		Rep. 1	Rep. 2	Rep. 3	Average*	
Ammonia	lb/hr	9.5	7.8	10.6	9.3	
	ug/dscm	18200	15100	20000	17767	
Arsenic	lb/hr	0.00018	0.00018	0.00018	0.00018	Rep. 1, 2 & 3 were Non-Detect
	ug/dscm	0.36	0.36	0.36	0.36	
Benzene	lb/hr	0.02	0.13	0.54	0.23	Rep. 1 was Non-Detect
	ug/dscm	33.8	247	1020	433.6	
Cadmium	lb/hr	0.00013	0.00011	0.00009	0.00011	
	ug/dscm	0.26	0.21	0.17	0.21	
Hex. Chromium	lb/hr	0.00045	0.00034	0.00031	0.00037	Rep. 3 was Non-Detect
	ug/dscm	0.90	0.68	0.61	0.73	
Chromium	lb/hr	0.00025	0.00023	0.00017	0.00022	
	ug/dscm	0.50	0.46	0.34	0.43	
Total PCB	lb/hr	6E-07	7E-07	9E-07	8E-07	Rep. 1 & 2 were Non-Detect
	ug/dscm	0.0013	0.0014	0.0018	0.0015	
Total PCDD/PCDF	lb/hr	4E-08	1E-07	1E-07	1E-07	
	ug/dscm	0.00008	0.00024	0.00027	0.0002	
Sulfuric Acid Mist	lb/hr	15.9	23.9	20.5	20.1	
	ug/dscm	31700	44800	38600	38366.7	
Zinc (as Zinc Oxide)	lb/hr	0.017	0.014	0.014	0.015	
	ug/dscm	33.6	27.5	27.0	29.4	

* - Non Detect values used in averages for worst case.

Additional Pollutant Data Summary

April 1995

Condition III - 60% Wood/40% Tires at 100% Load

POLLUTANT	UNITS	TEST RESULT				COMMENT
		Rep. 1	Rep. 2	Rep. 3	Average*	
Ammonia	lb/hr	12.8	8.3	7.7	9.6	
	ug/dscm	24000	16800	15900	18900	
Arsenic	lb/hr	0.00018	0.00018	0.00018	0.00018	Rep. 1, 2 & 3 were Non-Detect
	ug/dscm	0.34	0.35	0.36	0.35	
Benzene	lb/hr	0.087	0.093	0.093	0.091	Rep. 1, 2 & 3 were Non-Detect
	ug/dscm	179	183	185	182	
Cadmium	lb/hr	0.00007	0.00012	0.00008	0.00009	Rep. 1 was Non-Detect
	ug/dscm	0.14	0.24	0.17	0.18	
Hex. Chromium	lb/hr	0.00034	0.00044	0.00013	0.00030	Rep. 1 & 3 were Non-Detect
	ug/dscm	0.69	0.86	0.25	0.60	
Chromium	lb/hr	0.00036	0.00035	0.00044	0.00038	
	ug/dscm	0.70	0.69	0.93	0.77	
Total PCB	lb/hr	8.3E-07	6.4E-07	6.6E-07	7.1E-07	Rep. 1, 2 & 3 were Non-Detect
	ug/dscm	0.0016	0.0013	0.0014	0.0014	
Total PCDD/PCDF	lb/hr	2.0E-05	6.0E-06	5.3E-06	1.0E-05	
	ug/dscm	0.039	0.012	0.011	0.021	
Sulfuric Acid Mist	lb/hr	45.2	11.5	10.9	22.5	
	ug/dscm	85600	23600	22900	44033	
Zinc (as Zinc Oxide)	lb/hr	0.020	0.024	0.019	0.021	
	ug/dscm	38.4	48.5	37.4	41.4	

* - Non Detect values used in averages for worst case.

APPENDIX B

Alternative Ammonia Monitoring Data Analysis

COMPREHENSIVE EMISSIONS TEST PROGRAM AMBIENT AMMONIA IMPACT ANALYSIS

Ambient ammonia impacts have been calculated using the PSD permit application ambient modelling results and actual ammonia emission rates from the comprehensive emissions test program. The PSD permit modelling analysis ambient impacts are based on a normalized emission rate of 1 gram per second (g/s). A scaling analysis is then performed where pollutant specific ambient impacts are calculated directly by scaling of the ambient impact calculated on 1 g/s normalized emission rate by the actual emission rate of the specific pollutant. The pollutant specific ambient impact calculated by scaling can then be compared directly to the ambient air quality standards or Florida DEP Air Toxics No Threat Levels. The scaling analysis is considered a valid approach as long as the values for stack exit velocity and gas temperature used in the PSD ambient modelling are equivalent or lower than the actual values determined during compliance tests. Lower stack exit velocities or gas temperatures used in the PSD modelling result in higher predicted ambient impacts and are considered conservative in this case because the predicted ambient impacts would be lower if the comprehensive emissions test program stack parameters were used.

Tables 1 through 4 summarize the PSD permit application ambient modelling and comprehensive emissions test program data, including stack parameters and predicted ambient ammonia concentrations. The intent is to demonstrate that actual average ammonia ambient impacts from Ridge Generating Station, using the comprehensive emissions test program test results, are significantly below the Air Toxics No Threat Level and current ambient ammonia monitoring measurement capabilities.

Table 1 shows that the PSD modelling stack exit velocity and temperature are lower than actual values obtained during the compliance test at full load (100% MCR) conditions. Table 2 summarizes the ammonia emission rates. During normal SNCR operation, the maximum single test run result was 37.0 lbs/hr with a comprehensive emissions test program average of 10.0 lbs/hr with boiler at full load or 100% MCR.

Table 3 summarizes PSD modelling results showing the maximum predicted normalized ambient concentrations using the normalized emission rate of 1 g/s. Ambient impacts were calculated from these normalized concentrations by scaling using the actual maximum single run and average ammonia emission rates from the comprehensive emissions test program. These scaling results are summarized in Table 4 and compared to the PSD modelling concentrations and Florida DEP Air Toxics No Threat Levels. The ambient concentrations for all averaging times calculated from the compliance test results, including the short term SNCR system operational problem experienced, are at least an order of magnitude below the Florida DEP No Threat Levels. Since the calculated ambient impacts from the scaling analysis are significantly below the No Threat Levels, it is apparent that a permanent ambient ammonia monitor isn't necessary to evaluate actual ambient impacts. Further, the predicted maximum ambient ammonia impacts of 4.1 and 11.1 $\mu\text{g}/\text{m}^3$ associated with the 8-hour averaging period convert to alternative concentrations of 5.8 and 15.7 ppb respectively. These extremely low concentration cannot be measured with any commercially available ambient monitoring equipment.

TABLE 1
STACK PARAMETERS

PARAMETER	PSD MODELLING		COMPLIANCE TEST
	MCR**	75% LOAD	MCR
Normalized Emission Rate g/s*	1.0	1.0	N/A
Stack Height, m	99.06	99.06	99.06
Stack Diameter, m	3.05	3.05	3.05
Exit Temperature, K	349.8	349.8	387.0
Exit Velocity, m/s	14.54	10.91	19.71

* Normalized Emission Rate used for model input. Modelled results are scaled using potential emission rates in the PSD permit application and actual emission rates from Compliance Testing.

** MCR = Maximum Continuous Rating at 100% Load

TABLE 2
NH₃ EMISSION RATES USED FOR CONVERSION
TO AMBIENT CONCENTRATIONS

	MCR	
	#/Hr	g/sec
Compliance Test		
Maximum Run	37.0*	4.66
Average	10.0*	1.26
Upset Condition		
Maximum Run	99.8	12.6
Average	68	8.6
PSD Permit		
Maximum	17.8	2.24

* Denotes values used in impact analyses.

TABLE 3
PSD MODELLING RESULTS*
PREDICTED MAXIMUM NORMALIZED CONCENTRATIONS
NORMALIZED EMISSION RATE = 1.0 g/s

		NORMALIZED CONCENTRATION - $\mu\text{g}/\text{m}^3$
AVERAGE	RECEPTOR RESOLUTION	MCR
8-Hour	250 m	0.765
	100 m	0.884**
24-Hour	250 m	0.301
	100 m	0.319**
Annual	250 m	0.030
	100 m	0.030**

* Summarized directly from PSD modelling report contained in permit application.

** Denotes values used in final PSD modelling impacts and for compliance test results scaling analyses.

AMBIENT IMPACTS USING ACTUAL EMISSION RATES

	NH ₃ AMBIENT CONCENTRATIONS - $\mu\text{g}/\text{m}^3$			
	PSD PERMIT APPLICATION	COMPLIANCE TEST		FL DEP NO THREAT LEVEL
AVERAGING TIME		Highest	Average	
8 Hour	2.0	4.1*	1.1*	180
		11.1**	7.6**	
24 Hour	0.7	1.49*	0.40*	43.2
		4.0**	2.7**	
Annual	0.07	0.14*	0.038*	1.0
		0.38**	0.26**	

* Conservatively calculated using highest single test run and average result from 100% MCR test conditions during normal SNCR system operation.

** Includes high ammonia slip due to SNCR reagent distribution system problem.

APPENDIX C

Revised BACT Cost Analysis

REVISED BACT COST ANALYSIS

The cost effectiveness (\$/ton of pollutant removed) of both the nitrogen oxides (NO_x) and sulfur dioxide (SO₂) control systems has been determined for the period of May 1994 through April 1995.

A cost effectiveness calculation for carbon monoxide (CO) was not prepared due to the inability to accurately estimate the operating costs associated with good combustion practice best control technology.

The methodology used to determine the cost effectiveness of NO_x and SO₂ control is presented in Table Nos. 1 through 6 attached hereto. Table Nos. 1 and 2 respectively, present a detailed breakdown of the capital investment associated with the NO_x and SO₂ control systems. Total capital investment is comprised of the cost of equipment and installation along with such indirect costs as engineering, construction management, training, start-up, performance testing, spare parts, and raw materials inventory. Equipment and installation costs include control equipment and all auxiliary systems needed to feed raw material, remove waste product, and otherwise properly operate the system. Total capital investment is \$6,331,184 for the SO₂ control system and \$1,447,575 for the NO_x control system.

Total capital investment is annualized based on a capital recovery period of twenty (20) years at a 12% interest rate. This term and rate are representative of the cost of funds used to finance the Ridge Generating Station.

Annualized cost of operations for the SO₂ and NO_x control systems are presented in Table Nos. 3 and 4 respectively. Costs are classified as either variable or fixed. Variable costs are those items whose total annual costs are affected by the hours of operation. Variable costs include operating labor, maintenance labor, raw materials, waste removal, and power consumption. Fixed costs are items whose total annual costs are unaffected by the hours of operation. Fixed costs include replacement parts, property taxes, insurance, overhead and administrative charges, annualized capital investment costs, and contract maintenance. The costs presented in Table Nos. 3 and 4 are for the period of May 1994 through April 1995. During this period, Ridge Generating Station operated 7,660 hours. The calculations presented in Table Nos. 3 and 4 result in the following fixed and variable costs.

	<u>SO₂</u> <u>Control</u> <u>System</u>	<u>NO_x</u> <u>Control</u> <u>System</u>
Variable Cost - \$/Hour	50.93	35.14
Fixed Cost - \$/Year	1,090,258	246,268

Table Nos. 5 and 6 present the cost effectiveness calculation for both the SO₂ and NO_x control systems for both the 24 hour block average and revised BACT limit emission rates. Total annual operating costs were calculated using the fixed and variable costs presented in Table Nos. 3 and 4 and assuming 8,760 hours of operation. The tons of pollutant removed was determined using the 24 hour block average and the revised BACT limit controlled emission rate in conjunction with the respective control efficiency. The values used and the resultant tons of pollutant removed are as follows:

	SO ₂	NO _x
Controlled Emission Rate (lb/hr)		
• 24 hour block average	54.9	72.5
• Revised BACT limit	96.1	94.5
Control Efficiency		
• %	80	40
Pollutant Removed (ton/yr)		
• 24 hour block average	961.85	211.70
• Revised BACT limit	1,683.67	275.94
Cost Effectiveness (\$/ton)		
• 24 hour block average	\$1,597	\$2,617
• Revised BACT limit	\$913	\$2,008

The cost effectiveness was calculated as follows:

$$\frac{\$}{\text{Tons of SO}_2} = \frac{(8,760 \text{ Hrs.} \times 50.93 \text{ \$/Hr.}) + 1,090,258}{(\text{Tons of SO}_2 \text{ Removed})}$$

$$\frac{\$}{\text{Tons of NO}_x} = \frac{(8,760 \text{ Hrs.} \times 35.14 \text{ \$/Hr.}) + 246,268}{(\text{Tons of NO}_x \text{ Removed})}$$

TABLE NO. 1

RIDGE GENERATING STATION

SULFUR DIOXIDE CONTROL SYSTEM
TOTAL CAPITAL INVESTMENT

EQUIPMENT COSTS

SCRUBBER MODULE AND LIME SILO	\$2,844,841
BAGHOUSE	\$1,313,174
ASH HANDLING SYSTEM	\$772,091
INSTRUMENTATION & CONTROLS	\$382,613
SO2 CEM	\$211,358
SUBTOTAL EQUIPMENT COSTS	<u>\$5,524,077</u>

DIRECT INSTALLATION COSTS

SITE PREPARATION, FOUNDATIONS AND SUPPORTS	\$153,319
HANDLING, ERECTION AND INSTALLATION OF ALL EQUIPMENT, ELECTRICAL INSTALLATION, PIPING AND MECHANICAL EQUIPMENT FOR THE COMPRESSED AIR, WATER, LIME AND ASH HANDLING SYSTEMS, FLUES AND INSULATION, PAINTING, ENCLOSURES, AREA LIGHTING, AND SITE FINISHES	<u>\$320,051</u>
SUBTOTAL DIRECT INSTALLATION COSTS	<u>\$473,370</u>

INDIRECT COSTS

DEVELOPMENT OF PROJECT	\$100,727
ENGINEERING	\$27,096
CONSTRUCTION MANAGEMENT	\$55,032
START UP	\$32,735
TRAINING	\$21,200
PERFORMANCE TESTING, WORKING CAPITAL, SPARE PARTS, AND INITIAL INVENTORY OF RAW MATERIALS	<u>\$96,947</u>
SUBTOTAL INDIRECT COSTS	<u>\$333,737</u>

TOTAL CAPITAL INVESTMENT	\$6,331,184

CAPITAL RECOVERY FACTOR	20 YEARS AT	12.00%	0.13388

ANNUALIZED CAPITAL INVESTMENT COST	\$847,611

TABLE NO. 2

RIDGE GENERATING STATION
NITROGEN OXIDE CONTROL SYSTEM
TOTAL CAPITAL INVESTMENT

SUPPLY AND INSTALLATION COSTS

SNCR EQUIPMENT INCLUDING PUMPS, INJECTORS, TANKS, & VALVES	\$981,229
INSTRUMENTATION & CONTROLS	\$191,306
NOx CEM	\$211,358
SUBTOTAL EQUIPMENT COSTS	<u>\$1,383,893</u>

INDIRECT COSTS

DEVELOPMENT OF PROJECT	\$23,564
ENGINEERING	\$6,340
CONSTRUCTION MANAGEMENT	\$12,877
START UP, TRAINING AND PERFORMANCE TESTING	\$15,400
WORKING CAPITAL, SPARE PARTS, AND INITIAL INVENTORY OF REAGENT & OTHER MATERIALS	<u>\$5,501</u>
SUBTOTAL INDIRECT COSTS	\$63,682

TOTAL CAPITAL INVESTMENT \$1,447,575

CAPITAL RECOVERY FACTOR 20 YEARS AT 12.00% 0.13388

ANNUALIZED CAPITAL INVESTMENT COST \$193,800

SFT INC
6/26/95

TABLE NO. 3

RIDGE GENERATING STATION
SULFUR DIOXIDE CONTROL SYSTEM
ANNUALIZED COST OF OPERATIONS
MAY 1994 - APRIL 1995

VARIABLE COSTS

LABOR	MANHOURS PER YEAR	\$/HR WITH BENEFITS	\$/YEAR
OPERATING LABOR			
OPERATOR	850	19.80	\$16,830
SUPERVISOR	182	33.00	\$6,006
MAINTENANCE LABOR			
OPERATOR	360	21.00	\$7,560
MATERIALS	TONS/YEAR	\$/TON	
LIME USED	1,173.25	84.80	\$99,492
POWER CONSUMPTION	KW	KWH	
SLURRY PUMPING	27		
RAW WATER PUMPING	4		
INDUCED DRAFT FAN	323		
BAGHOUSE HOPPER HEATERS	25		
ASH CONVEYING	35		
TOTAL	414	2,829,744	\$154,504
COMPRESSED AIR			<u>\$105,703</u>
TOTAL VARIABLE COSTS			\$390,095
ACTUAL HOURS OF OPERATION			7,660
UNIT VARIABLE COST			\$50.93 PER HOUR

FIXED COSTS

REPLACEMENT PARTS	\$48,147
CONTRACT MAINTENANCE	\$22,569
I&C CONSUMABLES	\$1,800
ALLOCATION FOR COST OF REPLACEMENT BAGS	\$50,515
OVERHEAD & ADMINISTRATIVE CHARGES	\$51,000
PROPERTY TAXES	\$57,180
INSURANCE	\$11,436
ANNUALIZED CAPITAL INVESTMENT	<u>\$847,611</u>
TOTAL FIXED COST	\$1,090,258

TABLE NO. 4

RIDGE GENERATING STATION
NITROGEN OXIDE CONTROL SYSTEM
ANNUALIZED COST OF OPERATIONS
MAY 1994 - APRIL 1995

VARIABLE COSTS

LABOR	MANHOURS PER YEAR	\$/HR WITH BENEFITS	\$/YEAR
OPERATING LABOR			
OPERATOR	425	19.80	\$8,415
SUPERVISOR	91	33.00	\$3,003
MAINTENANCE LABOR	100	26.00	\$2,600
OPERATOR			
MATERIALS	GALLONS	\$/GALLON	
REAGENT USED	274,388	0.90	\$246,949
POWER CONSUMPTION	KWH/YEAR	\$/KWH	
PUMPING AND HEATERS	20,848		
OTHER	11,826		
TOTAL	32,674	0.0546	\$1,784
COMPRESSED AIR			<u>\$6,383</u>
TOTAL VARIABLE COSTS			\$269,134
ACTUAL HOURS OF OPERATION			7,660
UNIT VARIABLE COST			\$35.14 PER HOUR

FIXED COSTS

REPLACEMENT PARTS	\$2,400
CONTRACT MAINTENANCE	\$5,300
I&C CONSUMABLES	\$600
OVERHEAD AND ADMINISTRATIVE CHARGES	\$27,692
PROPERTY TAXES	\$13,800
INSURANCE	\$2,676
ANNUALIZED CAPITAL INVESTMENT	<u>\$193,800</u>
TOTAL FIXED COST	\$246,268

TABLE NO. 5

RIDGE GENERATING STATION

CALCULATION OF COST EFFECTIVENESS
OF POLLUTION CONTROL SYSTEMS
(Based on 24 Hour Block Average Emissions)

SULFUR DIOXIDE CONTROL SYSTEM

HOURLY UNCONTROLLED EMISSIONS (Average 24 Hour Block Average)	274.5	LBS/HOUR
CONTROL EFFICIENCY	80.00%	
HOURLY CONTROLLED EMISSIONS	54.9	LBS/HOUR
ASSUMED HOURS OF OPERATION	8,760	HOURS/YEAR
SULFUR DIOXIDE REMOVED	961.85	TONS PER YEAR
ANNUALIZED COST OF SULFUR DIOXIDE REMOVAL		
FIXED COST	\$1,090,258	
VARIABLE COST		
\$/HOUR	\$50.93	
HOURS/YEAR	8,760	
	<u>446,113</u>	
TOTAL COST OF REMOVAL	\$1,536,372	
COST EFFECTIVENESS OF SULFUR DIOXIDE REMOVAL	1,597	PER TON

NITROGEN OXIDE CONTROL SYSTEM

HOURLY UNCONTROLLED EMISSIONS (Average 24 Hour Block Average)	120.8	LBS/HOUR
CONTROL EFFICIENCY	40.00%	
HOURLY CONTROLLED EMISSIONS	72.5	LBS/HOUR
ASSUMED HOURS OF OPERATION	8,760	HOURS/YEAR
NITROGEN OXIDE REMOVED	211.70	TONS PER YEAR
ANNUALIZED COST OF NITROGEN OXIDE REMOVAL		
FIXED COST	\$246,268	
VARIABLE COST		
\$/HOUR	\$35.14	
HOURS/YEAR	8,760	
	<u>307,783</u>	
TOTAL COST OF REMOVAL	\$554,050	
COST EFFECTIVENESS OF NITROGEN OXIDE REMOVAL	2,617	PER TON

TABLE NO. 6

RIDGE GENERATING STATION

CALCULATION OF COST EFFECTIVENESS
OF POLLUTION CONTROL SYSTEMS
(Based on Revised BACT Limit Emissions)

SULFUR DIOXIDE CONTROL SYSTEM

HOURLY UNCONTROLLED EMISSIONS (Revised BACT Limit)	480.5	LBS/HOUR
CONTROL EFFICIENCY	80.00%	
HOURLY CONTROLLED EMISSIONS	96.1	LBS/HOUR
ASSUMED HOURS OF OPERATION	8,760	HOURS/YEAR
SULFUR DIOXIDE REMOVED	1,683.67	TONS PER YEAR
ANNUALIZED COST OF SULFUR DIOXIDE REMOVAL		
FIXED COST	\$1,090,258	
VARIABLE COST		
\$/HOUR	\$50.93	
HOURS/YEAR	8,760	
	<u>446,113</u>	
TOTAL COST OF REMOVAL	\$1,536,372	
COST EFFECTIVENESS OF SULFUR DIOXIDE REMOVAL	913	PER TON

NITROGEN OXIDE CONTROL SYSTEM

HOURLY UNCONTROLLED EMISSIONS (Revised BACT Limit)	157.5	LBS/HOUR
CONTROL EFFICIENCY	40.00%	
HOURLY CONTROLLED EMISSIONS	94.5	LBS/HOUR
ASSUMED HOURS OF OPERATION	8,760	HOURS/YEAR
NITROGEN OXIDE REMOVED	275.94	TONS PER YEAR
ANNUALIZED COST OF NITROGEN OXIDE REMOVAL		
FIXED COST	\$246,268	
VARIABLE COST		
\$/HOUR	\$35.14	
HOURS/YEAR	8,760	
	<u>307,783</u>	
TOTAL COST OF REMOVAL	\$554,050	
COST EFFECTIVENESS OF NITROGEN OXIDE REMOVAL	2,008	PER TON



Jeb Bush
Governor

Department of Environmental Protection

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

David B. Struhs
Secretary

June 29, 1999

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. George D. Woodward, P.E.
Plant Manager
Wheelabrator Ridge Energy, Inc.
3131 K-Ville Avenue
Auburndale, Florida 33823

RE: DEP File No. AC53-206244 (PSD-FL-183A)
Permit Modification

Dear Mr. Woodward:

This is in response to your letter dated February 19, 1999 requesting changes to the subject construction permit. The permit is hereby modified as shown below:

SPECIFIC CONDITION NO. 5:

The RGS boiler exhaust gases shall not exceed the following limits [Rule 62-212.400, F.A.C.]:

Pollutant	lbs/hr	tons/yr	Basis for Compliance
SO ₂	65.0	284.7	30-day rolling average CEMS
NO _x	90.0	394.2	30-day rolling average CEMS
CO	200.0	876.0	30-day rolling average CEMS
VOC	22.1	96.8	EPA Method 25A if test required
HCl	5.0	21.9	EPA Method 26 or 26A if test required
Hg	0.022	0.096	EPA Method 29 or 101A if test required
Pb	0.25	1.1	EPA Method 12 or 29 if test required
Be	0.0063	0.028	EPA Method <u>29</u> or 104 if test required
VE	10% opacity		EPA Method 9 - annual
PM/PM ₁₀	0.0080 gr/SCF (corrected to 7% O ₂)		EPA Method 5 if test required

A person whose substantial interests are affected by the proposed permitting decision may petition for an administrative proceeding (hearing) under Sections 120.569 and 120.57 of the Florida Statutes. The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 3900 Commonwealth Boulevard, Mail Station #35, Tallahassee, Florida, 32399-3000. Petitions filed by the permit applicant or any of the parties listed below must be filed within fourteen days of receipt of this notice of intent. Petitions filed by any persons other than those entitled to written notice under Section 120.60(3) of the Florida Statutes must be filed within fourteen days of publication of the public notice or within fourteen days of receipt of this notice of intent, whichever occurs first. Under Section 120.60(3), however, any person who asked the Department for notice of agency action may file a petition within fourteen days of receipt of that notice, regardless of the date of publication. A petitioner shall mail a

"Protect, Conserve and Manage Florida's Environment and Natural Resources"

Printed on recycled paper.

copy of the petition to the applicant at the address indicated above at the time of filing. The failure of any person to file a petition within the appropriate time period shall constitute a waiver of that person's right to request an administrative determination (hearing) under Sections 120.569 and 120.57 F.S., or to intervene in this proceeding and participate as a party to it. Any subsequent intervention will be only at the approval of the presiding officer upon the filing of a motion in compliance with Rule 28-106.205 of the Florida Administrative Code.

A petition that disputes the material facts on which the Department's action is based must contain the following information: (a) The name and address of each agency affected and each agency's file or identification number, if known; (b) The name, address, and telephone number of the petitioner, the name, address, and telephone number of the petitioner's representative, if any, which shall be the address for service purposes during the course of the proceeding; and an explanation of how the petitioner's substantial interests will be affected by the agency determination; (c) A statement of how and when petitioner received notice of the agency action or proposed action; (d) A statement of all disputed issues of material fact. If there are none, the petition must so indicate; (e) A concise statement of the ultimate facts alleged, as well as the Rules and statutes which entitle the petitioner to relief; and (f) A demand for relief.

A petition that does not dispute the material facts upon which the Department's action is based shall state that no such facts are in dispute and otherwise shall contain the same information as set forth above, as required by Rule 28-106.301

Because the administrative hearing process is designed to formulate final agency action, the filing of a petition means that the Department's final action may be different from the position taken by it in this notice. Persons whose substantial interests will be affected by any such final decision of the Department on the application have the right to petition to become a party to the proceeding, in accordance with the requirements set forth above. Mediation is not available in this proceeding.

In addition to the above, a person subject to regulation has a right to apply for a variance from or waiver of the requirements of particular Rules, on certain conditions, under Section 120.542 F.S. The relief provided by this state statute applies only to state Rules, not statutes, and not to any federal regulatory requirements. Applying for a variance or waiver does not substitute or extend the time for filing a petition for an administrative hearing or exercising any other right that a person may have in relation to the action proposed in this notice of intent.

The application for a variance or waiver is made by filing a petition with the Office of General Counsel of the Department, 3900 Commonwealth Boulevard, Mail Station #35, Tallahassee, Florida 32399-3000. The petition must specify the following information: (a) The name, address, and telephone number of the petitioner; (b) The name, address, and telephone number of the attorney or qualified representative of the petitioner, if any; (c) Each Rule or portion of a Rule from which a variance or waiver is requested; (d) The citation to the statute underlying (implemented by) the Rule identified in (c) above; (e) The type of action requested; (f) The specific facts that would justify a variance or waiver for the petitioner; (g) The reason why the variance or waiver would serve the purposes of the underlying statute (implemented by the Rule); and (h) A statement whether the variance or waiver is permanent or temporary and, if temporary, a statement of the dates showing the duration of the variance or waiver requested.

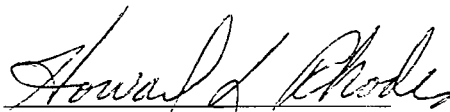
The Department will grant a variance or waiver when the petition demonstrates both that the application of the Rule would create a substantial hardship or violate principles of fairness, as each of those terms is defined in Section 120.542(2) F.S., and that the purpose of the underlying statute will be or has been achieved by other means by the petitioner.

Persons subject to regulation pursuant to any federally delegated or approved air program should be aware that Florida is specifically not authorized to issue variances or waivers from any requirements of any such federally delegated or approved program. The requirements of the program remain fully enforceable by the Administrator of the EPA and by any person under the Clean Air Act unless and until the Administrator separately approves any variance or waiver in accordance with the procedures of the federal program.

This Permit Amendment constitutes final agency action unless a petition is filed in accordance with the above paragraphs or unless a request for extension of time in which to file a petition is filed within the time specified for filing a petition which conforms to Rule 62-110.106, F.A.C. Upon timely filing of a petition or a request for an extension of time this Notice will not be effective until further Order of the Department.

If either a petition for administrative hearing or a request for extension of time is not timely filed with the Department, then this Permit Amendment shall constitute final agency action. Any party to this order would then have the right to seek judicial review pursuant to Rule 9.110, Florida Rules of Appellate Procedure, with the clerk of the Department of Environmental Protection in the Office of General Counsel, Mail Station #35, 3900 Commonwealth Boulevard, Tallahassee, Florida, 32399-3000; and by filing a copy of the notice of appeal accompanied by the applicable filing fees with the appropriate District Court of Appeal. The notice of appeal must be filed within thirty days after this order is filed with the clerk of the Department.

Executed in Tallahassee,



Howard L. Rhodes, Director
Division of Air Resources
Management

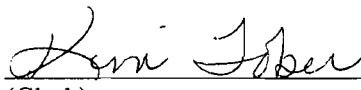
CERTIFICATE OF SERVICE

The undersigned duly designated deputy agency clerk hereby certifies that this Permit Modification was sent by certified mail (*) and copies were mailed by U.S. Mail before the close of business on 6-30-99 to the person(s) listed:

George D. Woodward, WESI *
Bill Thomas, SWD
Joe King, Polk County
Gregg Worley, EPA
John Bunyak, NPS

Clerk Stamp

FILING AND ACKNOWLEDGMENT FILED, on this date, pursuant to §120.52, Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.


(Clerk)

6-30-99
(Date)

Memorandum

Florida Department of Environmental Protection

TO: Howard Rhodes
Clair Fancy
THRU: Al Linero
FROM: John Reynolds
DATE: March 29, 1999

SUBJECT: Request for Amendment – Wheelabrator Ridge Energy PSD-FL-183

Attached is a permit amendment requested by Wheelabrator Ridge Energy for their tire and wood burning power generation facility in Auburndale. The amendment modifies and updates compliance test methods and makes minor changes to the language limiting the feed rate of tires. It also deletes two minor emission points that are no longer operated.

Your approval and signature is recommended for this minor amendment.



Wheelabrator Ridge Energy Inc.

A Waste Management Company
3131 K-Ville Avenue
Auburndale, FL 33823

Phone 941.665.2255
Fax 941.665.0400

RECEIVED

MAY 18 1999

**BUREAU OF
AIR REGULATION**

Certified Mail Z 075-834-366

May 11, 1999
Mr. John Reynolds
Mail Stop 5505
Department of Environmental Protection
Division of Air Resources Management
Bureau of Air Regulation
2600 Blair Stone Road
Tallahassee, FL 32399-2400

RE: Correction to Specific Condition 5; Revised Wheelabrator Ridge Energy - PSD
Permit AC53-206244(PSD-FL-183A) Modified March 31, 1999

Dear Mr Reynolds:

While reviewing the Proposed Title V and the March 31, 1999 modification made to the Wheelabrator Ridge Energy PSD permit I noticed an error in Specific Condition 5 of the PSD Permit.

The line for Be in the table of Specific Condition 5 reads:

Be	0.0063	0.028	EPA Method 104 if test required

This line should read:

Be	0.0063	0.028	EPA Method 29 or 104 if test required

This correction would make this line consistent with the Mercury (Hg) and Lead (Pb) lines of Specific Condition 5.

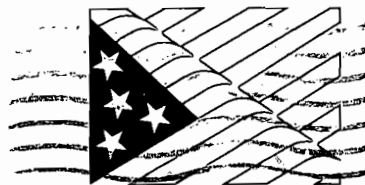
If you have any additional questions, please call John Neil at (941) 665-2255 Ext. 250.

Sincerely,

George D. Woodward, P.E.
Plant Manager

cc: G. Kissel (DEP Southwest District)
T. Porter (WESI)

Mrs. Lila B. Guth
513 W. Papaya Cir
Barefoot Bay, FL 32976



USA 19

MR. JOHN REYNOLDS
FLORIDA DEPT. OF ENVIRON. REGULATION
2600 BLAINE STONE RD
TALLAHASSEE, FL 32399-2400

SIR:

1/30/93

TO EXPRESS MY DISMAY
ABOUT THE LEVEL OF TOXIC
EMISSIONS THAT MACHO PRODUCTS
PUTS INTO THE AIR ANNUALLY.
I SEND THIS IN FORM OF A
DISTRESSED COMPLAINT.

i.e. (200 TONS ANNUALLY). NEW
INCINERATOR LEAVES 30 TONS
ANNUALLY.

Sincerely,
Lila B. Guth

A TAXPAYER
&
VOTER

↓
Mrs. Lila B. Guth
513 W. Papaya Cir.
Barefoot Bay, FL 32976



South end of
Catalytic Oxidizer

W/D#2354 716 7 N N N NL No. 2A54





Florida Department of Environmental Protection

Lawton Chiles
Governor

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Virginia B. Wetherell
Secretary

November 23, 1993

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

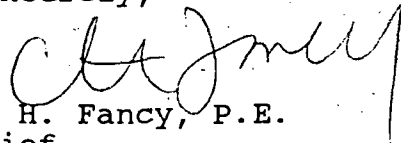
Mr. Matthew P. Killeen
Manager, Environmental Permits
Ridge Generating Station, L.P.
400 N. New York Avenue, Suite 101
Winter Park, Florida 32789

Dear Mr. Killeen:

RE: Ridge Generating Station/Polk County
Permit No. AC53-206244/PSD-FL-183

The Department reviewed the proposed protocol for the test program required by Specific Condition No. 8 of the subject permit. It appears that the proposed protocol sufficiently covers all testing requirements. Therefore, Ridge Generating Station is authorized to proceed with implementation of the test program. However, if it is later determined that the protocol will result in any deviation from the permit conditions, the permit shall dictate requirements unless the Department agrees that the deviation is justified.

Sincerely,


C. H. Fancy, P.E.
Chief
Bureau of Air Regulation

CHF/JR/bb

c: B. Thomas, SWD
R. Anders, Polk County
J. Harper, EPA
C. Shaver, NPS

**COMPREHENSIVE EMISSIONS TESTING
PROGRAM PROTOCOL**

for

RIDGE GENERATING STATION

3131 K-VILLE AVENUE

AUBURNDALE, POLK COUNTY, FL 33823

Revised 2/1/95



WHEELABRATOR ENVIRONMENTAL SYSTEMS, INC.

COMPREHENSIVE EMISSIONS TESTING PROGRAM PROTOCOL

for

RIDGE GENERATING STATION

3131 K-VILLE AVENUE

AUBURNDALE, POLK COUNTY, FL 33823

PSD-FL-183
FDEP AC 53-206244

Submitted by

WHEELABRATOR ENVIRONMENTAL SYSTEMS, INC.

LIBERTY LANE

HAMPTON, NH 03842

for

RIDGE GENERATING STATION LIMITED PARTNERSHIP

Revised 2/1/95

REVISION DESCRIPTION

COMPREHENSIVE EMISSIONS TESTING PROGRAM PROTOCOL

REVISION NUMBER	DATE OF REVISION	REVISION DESCRIPTION(S)
1	2/95	Revisions included: 1.) additional test condition of 60 percent wood feed/40 percent tire feed; Sections 1.0, 2.0, 4.1.2, 4.1.3, 4.2.2 & 6.1. 2.) detailed definition of Startup and Shutdown periods based on actual operation; Section 4.2.2. 3.) Ambient Ammonia concentration determination; Sections 3.3 & 4.3.

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- 1.0 General Emissions Test Program Description
- 2.0 Facility Description
- 3.0 Sampling Location Descriptions
 - 3.1 Fabric Filter Outlet (Stack)
 - 3.2 Fugitive
 - 3.3 Ambient
- 4.0 Detailed Emissions Test Program
 - 4.1 Stack Emissions Tests
 - 4.1.1 Objective
 - 4.1.2 Process Operating Conditions
 - 4.1.3 Sampling and Analytical Procedures
 - 4.2 Long Term CEMS Data Collection for BACT Determination
 - 4.2.1 Objective
 - 4.2.2 Process Operating Conditions
 - 4.2.3 Data Validation Procedures
 - 4.3 Ambient Ammonia Monitoring
- 5.0 Comprehensive Emissions Test Program Reporting
- 6.0 Proposed Emission Limit Determinations and BACT Analyses
 - 6.1 General Approach
 - 6.2 Determination of Manual Stack Test Emission Limits
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 - 6.4.1 Final BACT Emission Limit
 - 6.4.2 BACT Cost Analyses

APPENDICES

- A. Sample Location Drawings
- B. EPA Sampling Methodologies

1.0 General Emissions Test Program Description

In lieu of the usual compliance test requirement, a Comprehensive Emissions Testing Program will be performed at Ridge Generating Station. The Comprehensive Emissions Test Program will be representative of the full range of operation of the facility. The Comprehensive Emissions Test Program will include an initial stack test and three additional quarterly stack tests. The initial test program will consist of stack emissions testing for each limited and additional pollutant at 100 percent capacity while operating at both 80 percent wood/20 percent tire feed and 100 percent wood feed. The first additional quarterly program will consist of testing for each limited pollutant at 75 and 100 percent capacity, as well as testing for the additional pollutants at 100 percent capacity while operating on 80 percent wood/ 20 percent tire feed. The second additional quarterly program will consist of testing for each limited and additional pollutant at 100 percent capacity while operating on 80 percent wood/20 percent tire feed, 60 percent wood/40 percent tire feed and 100 percent wood feed. The final additional quarterly program will consist of testing for each limited and additional pollutant at 100 percent capacity while operating at 60 percent wood/40 percent tire feed.

2.0 Facility Description

The Ridge Generating Station located off State Road 542 and Taylor Road near Auburndale, Polk County, Florida is an electric power generation facility with a permitted capacity of 50 megawatts or 630 million Btu per hour. The boiler is a conventional wood-fired boiler with waterwall construction which will burn a mixture of wood, tires and landfill gas.

Wood loading to the boiler will be at a rate of 60-100 percent of the heat input. Tire loading to the boiler will be limited to 40 percent of the heat input. Landfill gas, when available, will represent 5-10 percent of the heat input. Propane is utilized for start-up, shutdown and combustion stabilization fuel.

Wood fuel is obtained from independent contractors, and includes the following materials: construction and demolition material, forest residuals/land clearing material, industrial wood wastes, bagasse and wood derived from residential yard waste. The wood is processed (chipped) both onsite and offsite, stockpiled then reclaimed and delivered to the boiler in a minus 2-inch processed form. Tires are received both whole and chipped and are free from dirt, metal rims and other foreign materials. Tires are processed to 3-inch nominal material. Two covered conveyors separately transport the processed fuels to feed bins located at the boiler front. Landfill gas will be obtained from Polk County's North Central Landfill.

A combination of combustion controls and selective noncatalytic reduction (SNCR) is utilized to control NO_x emissions from the boiler. The air pollution control system for this facility consists of a spray dryer absorber (SDA) and fabric filter (FF) to control acid gases, metals and particulate matter. The SDA system is equipped with redundant slakers and multiple atomizers for the addition of the lime slurry for acid gas control.

The FF is designed for collection of flyash at all boiler loads. A pulse jet type bag cleaning system will clean the bags and direct the flyash to the ash removal system.

An Altech Continuous Emissions Monitoring System (CEMS) is located at the FF outlet to continuously monitor sulfur dioxide (SO₂), nitrogen oxides (NO & NO₂), Carbon Monoxide (CO), and on a wet basis, Oxygen (O₂), Moisture, opacity and flue gas volumetric flowrate for compliance purposes. SO₂, NO_x and CO concentrations will be measured in parts per million and converted to lbs/hr utilizing the values obtained for flue gas volumetric flow and molecular weight. O₂, CO₂, and moisture concentrations will be measured in percent by volume.

3.0 Sampling Location Descriptions

3.1 Fabric Filter Outlet (Stack)

Exhaust gases from the Ridge Generating Station (RGS) boiler flow through ductwork to the spray dry absorber and subsequently to the fabric filter. The emissions test program will be performed at the outlet to the fabric filter upstream of the induced draft fan. The stack sampling location is a rectangular duct which is 107.5 inches wide by 84 inches deep which corresponds to an equivalent diameter of 94.3 inches. The stack test ports are located 211.7 inches or 2.3 diameters from the nearest upstream disturbance and 69 inches or 0.7 diameters from the nearest downstream disturbance. This location has sufficient straight run to meet EPA Method 1 sampling location requirements. Five test ports are situated equidistantly across the duct. The CEMS are also located at the FF outlet duct (see Appendix A for drawings).

3.2 Fugitive

During the initial emissions test program, fugitive emissions will be determined from the material receiving, processing, storage and transfer operations. In accordance with EPA Method 22, locations of potential fugitive emissions will be confirmed in the field prior to the start of an observation period.

3.3 Ambient

Based on Tampa, Florida wind measurements made at a height of 22 feet above ground level, the most common near-surface wind direction in the vicinity of the RGS facility is a direction from east to west. Wind rose data for the years 1982 through 1986 were used for this determination. This same wind rose data was used in the PSD modeling evaluation. As a result of this information, Ammonia concentrations will be monitored at a location west of the stack near the fenceline of the RGS property (see Appendix A for location).

4.0 Detailed Emissions Test Program

A Comprehensive Emissions Test Program will be conducted at the Ridge Generating Station facility located off State Road 542 and Taylor Road near Auburndale, Polk County, Florida. The test program will commence after the facility has had a shakedown period and is considered to be in normal operation. The emissions test program will consist of the following three efforts.

4.1 Stack Emissions Tests

4.1.1 Objective

The objective of the stack emission tests is to collect data to evaluate compliance with the current emission limits as well as to establish proposed emission limits for the current limited pollutants and assess limits for any additional pollutants. In addition to the limited pollutants listed in Table 4-1, emission rates of the additional pollutants listed in Table 4-2 will also be determined. The initial test program will include certification of the CEMS and the quarterly test programs will include cylinder gas audits of the CEMS. Visible and fugitive emissions at the RGS facility will be determined at the locations and in accordance with the EPA Methods found in Table 4-3. The visible and fugitive emissions testing will only be performed during the initial test program.

4.1.2 Process Operating Conditions

The Comprehensive Emissions Test Program will include an initial stack test and three additional quarterly stack tests. The initial stack test program will consist of stack emissions testing for each limited and additional pollutant at 100 percent capacity while operating at both 80 percent wood/20 percent tire feed and 100 percent wood feed. The first additional quarterly program will consist of testing for each limited pollutant at 75 and 100 percent capacity, as well as testing for the additional pollutants at 100 percent capacity while operating at 80 percent wood/20 percent tire feed. The second additional quarterly program will consist of testing for each limited and additional pollutant at 100 percent capacity while operating on 80 percent wood/20 percent tire feed, 60 percent wood/40 percent tire feed and 100 percent wood feed. The final additional quarterly program will consist of testing for each limited and additional pollutant at 100 percent capacity while operating at 60 percent wood/40 percent tire feed. Table 4-4 details the boiler conditions during the stack emissions tests.

Process information will be collected by the Bailey distributed control system throughout the emissions test program. Process measurements will be provided in hourly averages during each test period.

**TABLE 4-1
LIMITED POLLUTANTS**

Pollutant	EPA Test Method	# Runs	Run Duration	Location	Initial BACT Limitation (24 hour average)
PM/PM10	26A*	3	120 Min	Stack	12.6 lb/hr
SO ₂	6C	3	60 Min	Stack	109.4 lb/hr
NO _x	7E	3	60 Min	Stack	94.5 lb/hr
CO	10	3	60 Min	Stack	315.0 lb/hr
VOC	25A	3	60 Min	Stack	22.1 lb/hr
HCl	26A*	3	120 Min	Stack	5.0 lb/hr
Hg	101A	3	120 Min	Stack	0.022 lb/hr
Pb	MM**	3	120 Min	Stack	0.25 lb/hr
Be	MM**	3	120 Min	Stack	0.0063 lb/hr

* - Particulate, HCl and NH₃ sampled in accordance with a combined EPA M26A sampling train.

** - All metals (except Hg and Cr⁺⁶) sampled in accordance with 40 CFR 266 Appendix IX, Section 3.1.

**TABLE 4-2
ADDITIONAL POLLUTANTS**

Pollutant	EPA Test Method	# Runs	Run Duration	Location
Ammonia (NH ₃)	26A(mod.)*	3	120 Min	Stack
As, Cd, Cr & Zn (as ZnO)	MM**	3	120 Min	Stack
Chromium VI (Cr ⁺⁶)	40 CFR 266 App. IX, 3.2	3	120 Min	Stack
Benzene	18	3	60 Min	Stack
Sulfuric Acid (H ₂ SO ₄)	8	3	120 Min	Stack
PCB's Total mono-deca Congeners	23***	3	180 Min	Stack
Dioxins/Furans	23***	3	180 Min	Stack

* - Particulate, HCl and NH₃ sampled in accordance with a combined EPA M26A sampling train.

** - All metals (except Hg and Cr⁺⁶) sampled in accordance with 40 CFR 266 Appendix IX, Section 3.1.

*** - PCDD/PCDF's and PCB's sampled in accordance with a combined EPA M23 sampling train.

TABLE 4-3
VISIBLE/FUGITIVE EMISSIONS

PROCESS/LOCATION	EPA TEST METHOD	TEST DURATION	FDEP LIMITATION
Boiler Stack	9	60 Mins.	10%
Ash Handling Vent Filter	9	60 Mins.	10%
Lime Silo Vent Filter	9	60 Mins.	10%
Fuel Transfer Bldg. Vent Filter	9	60 Mins.	10%*
Receiving	22	3 Days	N/A
Processing	22	3 Days	N/A
Transfer	22	3 Days	N/A
Storage	22	3 Days	N/A

* This limitation will be confirmed prior to the test.

TABLE 4-4
STACK EMISSIONS TESTING BOILER CONDITIONS*

	75% LOAD	100% LOAD	100% LOAD	100% LOAD
Generator Output (MW)	37.5	50	50	50
Total Heat Input (MMBtu/hr)	473	630	630	630
Steam Flow (Klb/hr)**	259	345	345	345
Fuel Feed (Heat Input)				
• Wood (%)	80	80	100	60
• Tires (%)	20	20	-	40
Fuel Feed (weight) ***				
• Wood (lb/hr)	96,355	128,473	160,591	96,355
• Tires (lb/hr)	6,939	9,252	-	18,505
Stack Emissions Testing				
• Aug/Sep 1994	-	Table 4-1	Table 4-1	-
	-	Table 4-2	Table 4-2	-
• Additional Quarterly Tests				
- November 1994	Table 4-1	Table 4-1	-	-
	-	Table 4-2	-	-
- 1 Quarter (February 1995?)	-	Table 4-1	Table 4-1	Table 4-1
	-	Table 4-2	Table 4-2	Table 4-2
- 1 Quarter (April 1995?)	-	-	-	Table 4-1
	-	-	-	Table 4-2

* - During the stack emissions testing, actual boiler conditions will be maintained within 10% of the values listed in this table.

** - Actual determination of percent load will be based on steam flow.

*** - Fuel feed rates were revised to reflect the actual sampling of the WRE fuel suppliers' product. The actual average Higher Heating Values (HHV's) of WRE fuels are 3923 Btu/lb and 13,618 Btu/lb for wood and tires, respectively, as opposed to 5450 Btu/lb and 14,000 Btu/lb which are the HHV's used for the design of the facility.

The process data that will be collected will consist of the following:

1. Boiler Measurements
 - a. Wood feed, ton/hr
 - b. Tire feed, ton/hr
 - c. Landfill gas, KPPH
 - d. Propane, KPPH
 - e. Generator Output, MW
 - f. Steam production, klb/hr
 - g. Furnace temperature, °F
 - h. Furnace draft, inches H₂O
 - i. Superheater outlet steam temperature, °F
 - j. Superheater outlet steam pressure, psig
 - k. Feed water flow, klb/hr
 - l. Economizer water outlet temperature, °F
 - m. Primary air heater gas outlet temperature, °F
2. Spray Dryer Absorber Measurements
 - a. SDA inlet flue gas temperature, °F
 - b. SDA outlet flue gas temperature, °F
 - c. Lime slurry concentrations, %
 - d. Dilution water flow, gpm
 - e. SDA total slurry flow, gpm
3. Fabric Filter Measurements
 - a. FF outlet flue gas temperature, °F
 - b. FF pressure differential, inches H₂O
4. Hourly Plant CEM Data - SO₂, NO_x, CO, opacity, stack gas volumetric flow

All test runs will be performed under normal, non-upset feed and operating conditions in order to obtain quality data. The wood and tire feed will represent the normal range of conditions for the facility. The following upset or atypical process conditions will be considered valid reasons for delaying or interrupting the testing:

1. Feed stoppage
2. Fan outage
3. Ash conveyor system shutdown
4. Turbine trip
5. Steam flow variation more than $\pm 10\%$ of setpoint
6. SDA malfunction
7. FF malfunction
8. SNCR Malfunction

4.1.3 Sampling and Analytical Procedures

The stack emissions tests will be performed in accordance with EPA reference methods as outlined in 40 CFR 60 Appendix A and 40 CFR 266 Appendix IX. The specific methods to be performed are outlined in Tables 4-1 and 4-2 for each pollutant. EPA reference methods 1 through 4 will be performed in support of each isokinetic test. Copies of the individual test methods can be found in Appendix B.

Visible emissions from the RGS boiler stack, ash handling area vent filter, lime silo vent filter and fuel transfer building vent filter will be determined in accordance with EPA method 9. Fugitive emissions from the material receiving, processing, and storage operations will be determined in accordance with EPA method 22 over a three day period during normal operation.

4.2 Long Term CEMS Data Collection for BACT Determination

4.2.1 Objective

The objective of the long term CEMS data collection is to establish final SO₂, NO_x and CO emission limits and averaging times. In addition, the feasibility of establishing emission limits specific to startup and shutdown periods will be evaluated. The CEMS consists of an Altech Model MCS 100 analyzer to continuously measure SO₂, NO_x, CO, O₂, CO₂ and moisture. Opacity will be determined continuously by a TECO Model 400 monitor. Stack gas volumetric flow will be determined by a Kurz Model 4500 flow monitor.

4.2.2 Process Operating Conditions

During the long term CEMS data collection, three operational periods will be identified. These three periods will be normal operation, startup and shutdown. Normal operation will be considered operation between 70 and 100 percent capacity with all equipment outlined in section 4.1.2 operating correctly. During normal operation the fuel ratios will range from 60-100 percent wood to 0-40 percent tires. Startup periods will be defined as the period of time when propane firing or solid fuel feed starts and boiler steam flow is less than 20 percent capacity. Shutdown periods will be defined as the period of time after which solid fuel feed has been stopped or propane firing commences and the boiler steam flow is less than 20 percent capacity. A shutdown may be the result of a malfunction or scheduled maintenance. During the long term CEMS data collection period, accurate records will be kept of normal operation, startup and shutdown periods.

4.2.3 Data Validation Procedures

A quality assurance/quality control (QA/QC) program will be followed in order to assure valid data is recorded during the long term CEMS data collection period. This program will include an initial CEMS certification (RATA), daily calibrations and subsequent cylinder gas audits (CGA) to include stack gas volumetric flow monitor calibrations. This QA/QC program will be performed in accordance with 40 CFR 60 Appendix B Performance Specifications 1, 2, 4 and 6 and Appendix F Procedure 1.

4.3 Ambient Ammonia Monitoring

Ambient ammonia concentrations will be monitored at the Northwest corner fenceline of the RGS facility which has been determined to be the prevailing downwind location (see Appendix A). The ammonia monitor will be a TECO Model 17 chemiluminescence ammonia analyzer with converter, data logger and chart recorder. The equipment will be housed in a climate controlled shelter. The data will be collected from the initial startup through to the completion of the emissions test program. A meteorological station capable of measuring and recording wind speed and wind direction will be part of the ambient ammonia monitoring program. The Comprehensive Emissions Test Program report will include a discussion of this data and a recommendation related to the continuation of the ambient ammonia monitoring program.

In the event that the current commercially available ambient monitoring equipment is not capable of reliably measuring ambient ammonia concentrations, then ambient ammonia concentrations will be calculated by scaling of the PSD modelling of ammonia concentrations using the actual stack ammonia emission rates determined during each of the quarterly test programs.

5.0 Comprehensive Emissions Test Program Reporting

A Comprehensive Emissions Test Report will be submitted to the Florida Department of Environmental Protection - Southwest District Office within 15 months of initial startup of the facility. This report will include results of the stack emissions testing, long term CEMS data collection, ambient ammonia concentrations and the proposed emission limit determinations with revised BACT analyses.

Due to the amount of data which will be contained in the Comprehensive Emissions Test Report, a number of volumes will be needed. A sample would be to have Volume 1 contain a discussion of the overall test program, summary tables of the results of all efforts to include stack emissions tests, long term CEM data and ambient ammonia results as well as a discussion of the proposed BACT limitations. Volumes 2-5 would contain the stack emission test reports for the initial and quarterly testing. Volumes 6 and 7 would contain the long term CEM data.

The stack emissions test report will include at a minimum a list of relevant personnel present during testing, a summary of results, description of the test procedures used, description of the source and its operation during testing, test location description, example calculations, raw field data, laboratory analyses with chain of custody documentation, copies of the EPA test methods and equipment calibrations.

The summary tables will contain average test results in units of standard, the corresponding permit limitations, as well as the process data recorded during each test run. Individual test run averages will be in the following units where applicable: lbs/hr, gr/dscf @ 12% CO₂ and 7% O₂, ng/m³ @ 12% CO₂ and 7% O₂ and ppm @ 12% CO₂ and 7% O₂.

6.0 Proposed Emission Limit Determinations and BACT Analyses

6.1 General Approach

In accordance with PSD Permit Conditions 5, 16 and 17, the results of the comprehensive emission testing program will be used to establish compliance with the initial permit limits and to evaluate the feasibility of proposing revised emission limits and/or averaging times for the operating permit. Specifically, the manual stack testing results from the initial compliance and subsequent quarterly stack testing will be used to evaluate revised limits for VOC, HCl, Hg, Pb and Be.

Long term SO₂, NO_x and CO data from the plant CEMS will be analyzed to propose final CEM emission limits and averaging times. In addition, the feasibility of establishing emission limits specific to startup and shutdown periods will be evaluated. The long term CEM data analyses results, in conjunction with the air pollution control equipment annualized costs, will be incorporated in the revised BACT application proposing final SO₂, NO_x and CO emission limits. Generally, both the manual stack test results and long term CEM data will be evaluated using several statistical analyses techniques. These techniques will include:

- routine summary statistics (mean, standard deviation),
- time series plots to examine trends in emissions over time and to identify data anomalies,
- normality testing and frequency distribution plots to evaluate distribution of data, and
- determining maximum estimated emissions based on appropriate statistical mean standard deviation and confidence level.

It should be noted that analyses of the long term CEM data will appropriately account for emission variations that are directly related to variations in fuel composition. For long term normal boiler operations the fuel ratios will range from 60-100% wood to 0-40% tires, and the final emission limits proposed as a result of the emission test program will account for these variations.

6.2 Determination of Manual Stack Test Emission Limits

Results from the initial compliance and subsequent quarterly manual stack testing will be analyzed to propose final limits for the following permit limited pollutants: total volatile organics (VOC), Hydrogen Chloride (HCl), Mercury (Hg), Lead (Pb) and Beryllium (Be). Manual stack test results from the non-limited pollutants will be analyzed using the same procedure in the event that limits for these pollutants might be included in the operating permit.

The following procedure will be followed to develop proposed emission limits from the manual stack test results:

- When results are below the method detection limit, the detection limit will be used in the statistical analyses.
- The sample ($\bar{x}$) mean and standard deviation (s) will be calculated from all data.
- The single tail 99% upper confidence limit will be determined using the Student t Test.
- The proposed emission limit will set at the 99% single tailed upper confidence limit.

The Student t Test 99% upper confidence limit has been established as the basis for the proposed or new emission limits due to the very low number of test results that will be used in the analyses, the heterogeneity of the fuel, sampling analytical method precision and bias limits. The 99% upper confidence limit will provide the assurance that the final emission limits will not be exceeded for the term of the operating permit if periodic manual stack testing is required.

The Student t Test confidence limit determination is the standard confidence limit determination calculation used for small sample populations.

The Student t 99% upper confidence limit equation is:

$$CL_{99} = \bar{x} + t_{99} \times s, \text{ where:}$$

$$CL_{99} = \text{Student t upper 99\% confidence limit}$$

- $\bar{x}$ = Mean of test results
- s = Standard deviation of test results
- t_{99} = Standard Student t value for 99% confidence interval for n-1 degree of freedom (no of results - 1)

6.3 Long Term CEM Emission Limit Determinations

The long term data for SO₂, NO_x and CO will be reduced to hourly averages in both lbs/hour and ppm @ 7% O₂. Hourly averages will be segregated into startup/shutdown and normal operating periods. These boiler operating conditions will be evaluated separately to determine appropriate revised emission limits. The CEM hourly data will be analyzed as follows:

1. Time series plots will be developed to visually examine trends in SO₂, NO_x and CO emissions over time and to identify data gaps or anomalies.
2. Data anomalies identified in time series plots will be compared to actual wood/tire fuel ratios for the concurrent time periods. If frequent or extensive anomalies are found that directly correlate to specific wood/tire firing ratios, then the affected hourly averages will be separated and the data set evaluated independently in accordance with steps 3-7 below.
3. Hourly data will be tested for normality using the Shapiro-Wilke Normality Test statistic. Since environmental data tends to be high tailed where there are many data values grouped together and a few larger values, using the natural logarithm (ln) of the data will provide a more normal distribution. Therefore, raw hourly data and logarithms of the hourly data will be tested for normality. It is important to establish the normality of the data because probability statistics such as the confidence limit depend on the underlying sample data to be normally distributed.
4. To evaluate the effect of averaging times on data variability and maximum emission rates, both the raw and ln transformed hourly data will be reduced as follows:
 - SO₂ Data - 24 hour block and rolling averages
 - NO_x Data - 24 hour block and rolling averages
 - CO Data - 24 and 8 hour block and rolling averages

Raw hourly CEM data collected during startup and shutdown periods will be evaluated in 3 and 8 hour rolling and block averages.

5. Routine statistics will be performed in the raw and ln hourly data, and averaging times. Data means and standard deviations will be calculated. For ln data, the geometric mean and standard deviation will be calculated.
6. Distribution of the various normal and ln averaging times will be tested for normality using the Shapiro-Wilke Normality Test statistic. The raw or ln averaging time that is more normally distributed will be selected as the averaging time for the proposed emission limit.
7. The 99% upper confidence limit using the Student t distribution will be calculated using the final averaging time data sets selected for each emission using the following equation:

$$CI_{99} = \bar{x} + t_{99} \times s, \text{ where:}$$

$$CI_{99} = 99\% \text{ one tailed upper confidence limit}$$

$$\bar{x} = \text{Mean of the averaging time data set}$$

$$s = \text{Standard deviation of the data set}$$

$$t_{99} = \text{Student t value from Student t table}$$

The 99% upper confidence limit will be proposed as the final CEM emission limits.

The statistical and averaging times evaluated for boiler startup/shutdown periods will be used to calculate the 99% upper confidence limit for these data. As necessary, specific startup/shutdown emission limits will be proposed for the operating permit.

6.4 Revised BACT Analyses

In accordance with Specific Condition 16 and the initial BACT determination, a revised BACT application will be submitted with the emissions test program report. The revised BACT application will include proposed final enforceable BACT limits for SO₂, NO_x and CO and detailed cost analyses of the installed air pollution control systems. As determined in the initial BACT determination, the revised BACT application will be limited to SO₂, NO_x and CO emissions where BACT/LAER clearinghouse data was used as the basis for the target emission limits for these emissions.

6.4.1 Final BACT Emission Limit

The final emission limits for SO₂, NO_x and CO determined in CEM data analyses will not be used for the revised BACT determination cost analyses since there is a distinct difference between an enforceable "not to exceed" permit emission limit and the hourly average emission used to calculate annual emission reductions. These final proposed (upper 99% confidence limit) enforceable limits will represent the lowest level of emissions continuously achievable for the operating life of the facility which reflect the top control technologies selected in the initial BACT determination. Selection of the final emission limits at the 99% upper confidence limit will ensure that any reported excess emission will not be the result of natural fuel variations given that the boiler and air pollution control systems are being operated in a normal manner at the design control efficiencies. A conservative approach is warranted since this is the first facility of this type that will be combusting wood and tires simultaneously, and long term emission variations are unknown. The average 24 hour block average emissions rates for SO₂ and NO_x will be used in conjunction with the design control efficiencies specified in the initial BACT application to calculate uncontrolled emissions for use as necessary in the BACT cost analyses.

6.4.2 BACT Cost Analyses

The BACT cost analyses will be specific for SO₂, and NO_x emissions since operating costs for the respective best control technologies can be specifically defined. A cost analyses based on the final CO BACT emission limit will not be meaningful because operating costs for the good combustion practice best control technology cannot be accurately defined.

The capital and operating costs associated with the NO_x and SO₂ best available control technologies will be based on the actual construction cost and from operating costs over the first year of facility operation. Construction costs will include all costs associated with turnkey operation such as design, equipment purchase, and installation. Operating costs will include reagent usage, energy costs and routine repair and maintenance.

Cost effectiveness will be calculated using the annualized costs (annualized capital and operating) and total annual tons of SO₂ and NO_x removed for the respective best control technology. Annual tons of pollutant removal will be calculated based on 100% annual boiler availability (8,760 hours/year). The average of the 24-block average and

SO₂ and NO_x CEM data from the emission test period will be used to calculate the annual uncontrolled pollutant emissions in accordance with the following equation:

$$E_a = \frac{8760 \times (\bar{x}_{24} \div (1 - RE/100))}{2000}, \text{ where:}$$

E_a = Total annual uncontrolled emission (tons/year)

$\bar{x}_{24}$ = Average of 24-hour block averages (lbs/hr)

RE = Air pollution control technology removal Efficiency (Thermal DeNO_x = 40% and SDA/FF = 80%)

The total annual tons of pollutant removed will be calculated as follows:

$$T_R = \frac{E_a - (8760 \text{ hours} \times \bar{x}_{24})}{2000}, \text{ where:}$$

T_R = Total annual emissions removed (tons/year)

E_a = Total annual uncontrolled emissions (tons/year)

$\bar{x}_{24}$ = Average of the 24-hour block averages (lbs/hr)

The cost effectiveness is then calculated by the following equation:

$$CE = C_a / T_R$$

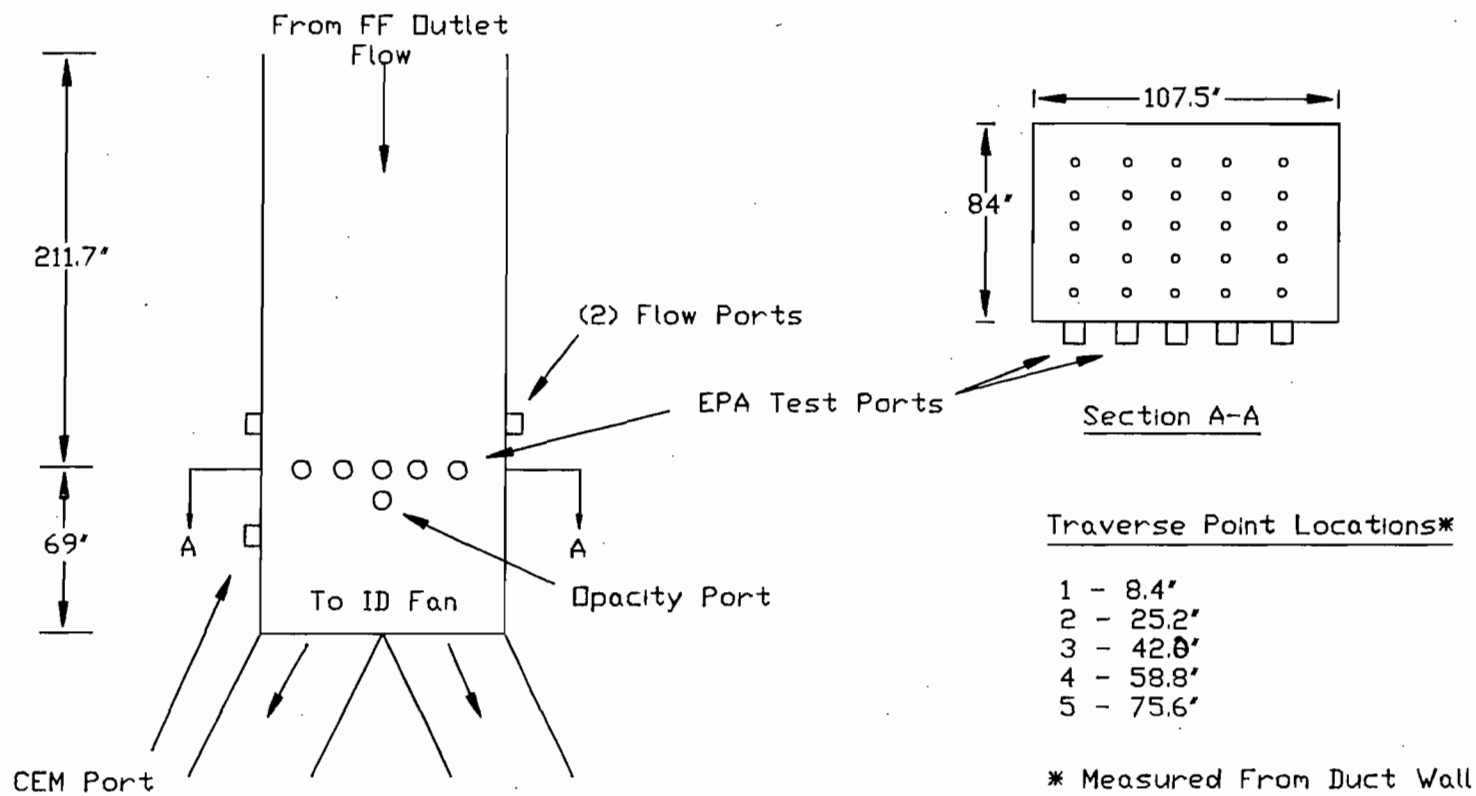
CE = Cost Effectiveness - \$/ton removed

T_R = Total annual emissions removed

C_a = Total Annualized Costs

APPENDIX A

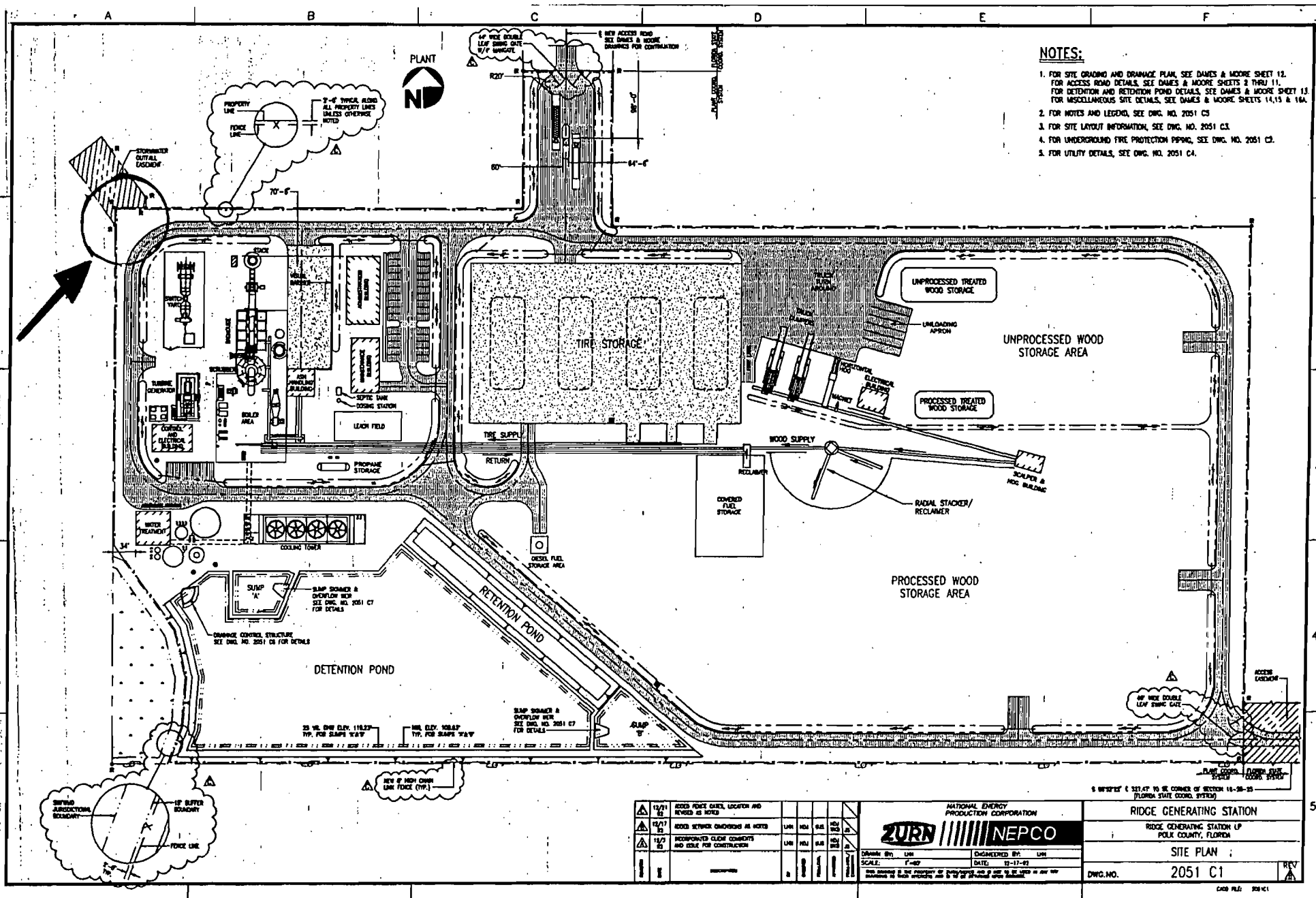
Sample Location Drawings



Stack Location Schematic

Not Drawn to Scale

AMBIENT AMMONIA MONITOR LOCATION



APPENDIX B

EPA Sampling Methodologies

EPA METHOD 26A

Particulate, Hydrogen Chloride & Ammonia

EPA Method 26A
Particulate, Hydrogen Chloride, and Ammonia

Sample Collection. Samples will be withdrawn isokinetically from the source using an EPA Method 26A combined sampling train. The sampling train will consist of a glass nozzle, a heated glass probe with a type S pitot tube attached, a filter, five chilled impingers, and a metering console. The particulate sample will be collected on a Pallflex 2500QAT-UP quartz filter maintained at a temperature of $248^{\circ}\text{F} \pm 25^{\circ}\text{F}$. The first and second impingers will each contain 100 ml of 0.1 N H_2SO_4 , the third and fourth will each contain 100 mL of 0.1 N sodium hydroxide (NaOH), and the fifth will contain preweighed silica gel.

Sample Recovery. The filter will be removed from the filter holder and placed in a 250 mL glass jar. The H_2SO_4 and NaOH reagents will be returned to the original 1,000 mL and 500 mL glass jars, weighed, the weight recorded on the labels, and the liquid levels marked. The silica gel will be returned to the original tared container, weighed, and the weight recorded on the label. The volume of water vapor condensed in the impingers and the volume of water vapor collected in the silica gel will be summed and entered into moisture content calculations.

The nozzle, probe, and front half of the filter holder will be rinsed with acetone into a 500 mL glass jar. The back half of the filter holder and the first and second impingers along with the connecting glassware will be rinsed with DI water into the glass jar containing the H_2SO_4 reagent. The third and fourth impingers along with the connecting glassware will be rinsed with DI water into the glass jar containing the NaOH reagent.

Sample Analysis. EPA Method 5 analytical procedures will be used to analyze the filter and front half acetone rinse for particulate. An aliquot of the H_2SO_4 reagent and associated DI water rinse will be analyzed for hydrogen chloride using ion chromatography as outlined in the method. An aliquot of the H_2SO_4 reagent and associated DI water rinse will be analyzed for ammonia using ion-specific electrode.

Method 26A—Determination of Hydrogen Halide and Halogen Emissions From Stationary Sources—Isokinetic Method

1. Applicability, Principle, Interferences, Precision, Bias, and Stability

1.1 Applicability. This method is applicable for determining emissions of hydrogen halides (HX) [hydrogen chloride (HCl), hydrogen bromide (HBr), and hydrogen fluoride (HF)] and halogens (X₂) [chlorine (Cl₂) and bromine (Br₂)] from stationary sources. This method collects the emission sample isokinetically and is therefore particularly suited for sampling at sources, such as those controlled by wet scrubbers, emitting acid particulate matter (e.g., hydrogen halides dissolved in water droplets). (Note: Mention of trade names or specific products does not constitute endorsement by the Environmental Protection Agency.)

1.2 Principle. Gaseous and particulate pollutants are withdrawn isokinetically from the source and collected in an optional cyclone, on a filter, and in absorbing solutions. The cyclone collects any liquid droplets and is not necessary if the source emissions do not contain them; however, it is preferable to include the cyclone in the sampling train to protect the filter from any moisture present. The filter collects other particulate matter including halide salts. Acidic and alkaline absorbing solutions collect the gaseous hydrogen halides and halogens, respectively. Following sampling of emissions containing liquid droplets, any halides/halogens dissolved in the liquid in

the cyclone and on the filter are vaporized to gas and collected in the impingers by pulling conditioned ambient air through the sampling train. The hydrogen halides are solubilized in the acidic solution and form chloride (Cl⁻), bromide (Br⁻), and fluoride (F⁻) ions. The halogens have a very low solubility in the acidic solution and pass through to the alkaline solution where they are hydrolyzed to form a proton (H⁺), the halide ion, and the hypohalous acid (HClO or HBrO). The halide ions in the separate solutions are measured by ion chromatography (IC). If desired, the particulate matter recovered from the filter and the probe is analyzed following the procedures in Method 5.

1.3 Interferences. Volatile materials, such as chlorine dioxide (ClO₂) and ammonium chloride (NH₄Cl), which produce halide ions upon dissolution during sampling are potential interferences. Interferents for the halide measurements are the halogen gases which disproportionate to a hydrogen halide and an hypohalous acid upon dissolution in water. The use of acidic rather than neutral or basic solutions for collection of the hydrogen halides greatly reduces the dissolution of any halogens passing through this solution. High concentrations of nitrogen oxides (NO_x) may produce sufficient nitrate (NO₃⁻) to interfere with measurements of very low Br⁻ levels.

1.4 Precision and Bias. The method has a measurable negative bias below 20 ppm HCl. Similar bias for the other hydrogen halides is possible.

1.5 Sample Stability. The collected Cl⁻ samples can be stored for up to 4 weeks for analysis for HCl and Cl₂.

1.6 Detection Limit. The in-stack detection limit for HCl is approximately 0.02 µg per liter of stack gas; the analytical detection limit for HCl is 0.1 µg/ml. Detection limits for the other analytes should be similar.

2. Apparatus

2.1 Sampling. The sampling train is shown in Figure 26A-1; the apparatus is similar to the Method 5 train where noted as follows:

2.1.1 Probe Nozzle. Borosilicate or quartz glass; constructed and calibrated according to Method 5, sections 2.1.1 and 5.1, and coupled to the probe liner using a Teflon® union; a stainless steel nut is recommended for this union. When the stack temperature exceeds 210 °C (410 °F), a one-piece glass nozzle/liner assembly must be used.

2.1.2 Probe Liner. Same as Method 5, section 2.1.2, except metal liners shall not be used. Water-cooling of the stainless steel sheath is recommended at temperatures exceeding 500 °C.

2.1.3 Pitot Tube, Differential Pressure Gauge, Filter Heating System, Metering System, Barometer, Gas Density Determination Equipment. Same as Method 5, sections 2.1.3, 2.1.4, 2.1.6, 2.1.8, 2.1.9, and 2.1.10.

2.1.4 Cyclone (Optional). Glass. Use of the cyclone is required only when the sample gas stream is saturated with moisture; however, the cyclone is recommended to protect the filter from any moisture droplets

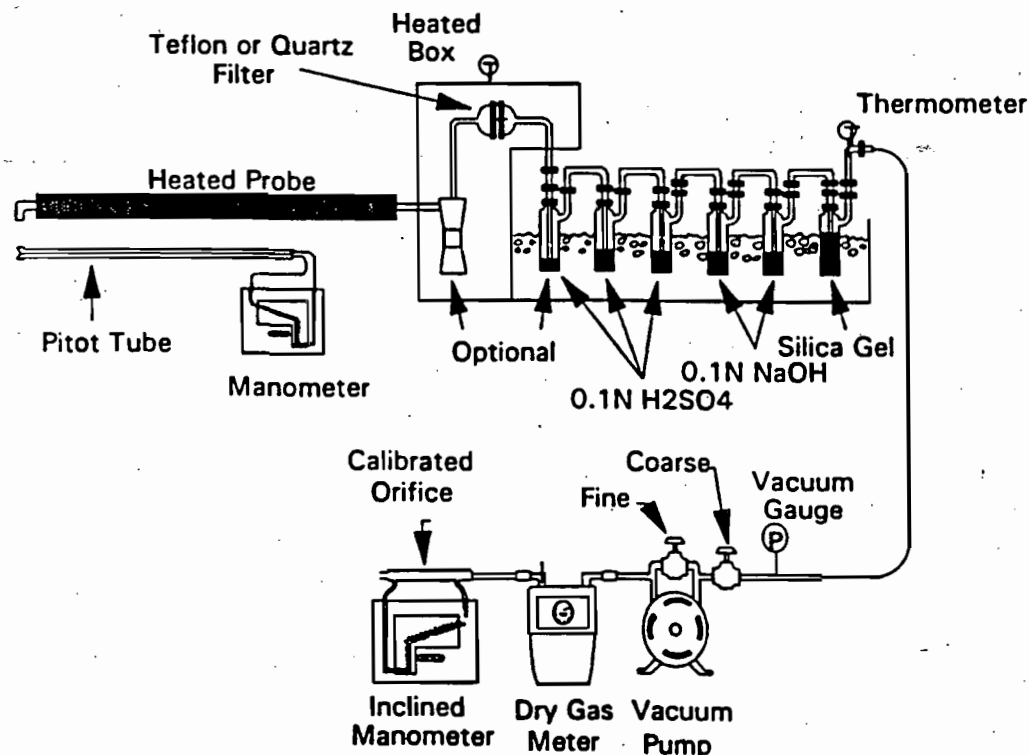


Figure 26A-1. Sampling train.

present.

2.1.5 Filter Holder. Borosilicate glass, with a Teflon® filter support and a sealing gasket. The sealing gasket shall be constructed of Teflon® or equivalent materials. The holder design shall provide a positive seal against leakage at any point along the filter circumference. The holder shall be attached immediately to the outlet of the cyclone.

2.1.6 Impinger Train. The following system shall be used to determine the stack gas moisture content and to collect the hydrogen halides and halogens: five or six impingers connected in series with leak-free ground glass fittings or any similar leak-free noncontaminating fittings. The first impinger shown in Figure 26A-1 (knockout or condensate impinger) is optional and is recommended as a water knockout trap for use under high moisture conditions. If used, this impinger should be constructed as described below for the alkaline impingers, but with a shortened stem, and should contain 50 ml of 0.1 N H₂SO₄. The following two impingers (acid impingers which each contain 100 ml of 0.1 N H₂SO₄) shall be of the Greenburg-Smith design with the standard tip (Method 5, section 2.1.7). The next two impingers (alkaline impingers which each contain 100 ml of 0.1 N NaOH) and the last impinger (containing silica gel) shall be of the modified Greenburg-Smith design (Method 5, section 2.1.7). The condensate, acid, and alkaline impingers shall contain known quantities of the appropriate absorbing reagents. The last impinger shall contain a known weight of silica gel or equivalent desiccant.

2.1.7 Ambient Air Conditioning Tube (Optional). Tube tightly packed with approximately 150 g of fresh 8 to 20 mesh sodium hydroxide-coated silica, or equivalent, (Ascarite II® has been found suitable) to dry and remove acid gases from the ambient air used to remove moisture from the filter and cyclone, when the cyclone is used. The inlet and outlet ends of the tube should be packed with at least 1-cm thickness of glass wool or filter material suitable to prevent escape of fines. Fit one end with flexible tubing, etc. to allow connection to probe nozzle following the test run.

2.2 Sample Recovery. The following items are needed:

2.2.1 Probe-Liner and Probe-Nozzle Brushes, Wash Bottles, Glass Sample Storage Containers, Petri Dishes, Graduated Cylinder or Balance, and Rubber Policeman. Same as Method 5, sections 2.2.1, 2.2.2, 2.2.3, 2.2.4, 2.2.5, and 2.2.7.

2.2.2 Plastic Storage Containers. Screw-cap polypropylene or polyethylene containers to store silica gel. High-density polyethylene bottles with Teflon screw cap liners to store impinger reagents, 1-liter.

2.2.3 Funnels. Glass or high-density polyethylene, to aid in sample recovery.

2.3 Analysis. For analysis, the following equipment is needed:

2.3.1 Volumetric Flasks. Class A, various sizes.

2.3.2 Volumetric Pipettes. Class A, assortment, to dilute samples to calibration range of the ion chromatograph (IC).

2.3.3 Ion Chromatograph. Suppressed or nonsuppressed, with a conductivity detector and electronic integrator operating in the peak area mode. Other detectors, a strip chart recorder, and peak heights may be used.

3. Reagents

Unless otherwise indicated, all reagents must conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society (ACS reagent grade). When such specifications are not available, the best available grade shall be used.

3.1 Sampling.

3.1.1 Water. Deionized, distilled water that conforms to American Society of Testing and Materials (ASTM) Specification D1193-77, Type 3.

3.1.2 Acidic Absorbing Solution, 0.1 N Sulfuric Acid (H₂SO₄). To prepare 1 L, slowly add 2.80 ml of concentrated H₂SO₄ to about 900 ml of water while stirring, and adjust the final volume to 1 L using additional water. Shake well to mix the solution.

3.1.3 Alkaline Absorbing Solution, 0.1 N Sodium Hydroxide (NaOH). To prepare 1 L, dissolve 4.00 g of solid NaOH in about 900 ml of water and adjust the final volume to 1 L using additional water. Shake well to mix the solution.

3.1.4 Filter. Quartz-fiber or Teflon® mat (e.g., Pallflex® TX40H45) filter.

3.1.5 Silica Gel, Crushed Ice, and Stopcock Grease. Same as Method 5, sections 3.1.2, 3.1.4, and 3.1.5, respectively.

3.2 Sample Recovery.

3.2.1 Water. Same as Section 3.1.1.

3.2.2 Acetone. Same as Method 5, Section 3.2.

3.3 Sample Analysis.

3.3.1 Water. Same as section 3.1.1.

3.3.2 Reagent Blanks. A separate blank solution of each absorbing reagent should be prepared for analysis with the field samples. Dilute 200 ml of each absorbing solution (250 ml of the acidic absorbing solution, if a condensate impinger is used) to the same final volume as the field samples using the blank sample of rinse water. If a particulate determination is conducted, collect a blank sample of acetone.

3.3.3 Halide Salt Stock Standard Solutions. Prepare concentrated stock solutions from reagent grade sodium chloride (NaCl), sodium bromide (NaBr), and sodium fluoride (NaF). Each must be dried at 110 °C for 2 or more hours and then cooled to room temperature in a desiccator immediately before weighing. Accurately weigh 1.6 to 1.7 g of the dried NaCl to within 0.1 mg, dissolve in water, and dilute to 1 liter. Calculate the exact Cl⁻ concentration using Equation 26A-1.

$$\mu\text{g Cl}^-/\text{ml} = \text{g of NaCl} \times 10^3 \times 35.453/58.44 \text{ Eq. 26A-1}$$

In a similar manner, accurately weigh and solubilize 1.2 to 1.3 g of dried NaBr and 2.2 to 2.3 g of NaF to make 1-liter solutions. Use Equations 26A-2 and 26A-3 to calculate the Br⁻ and F⁻ concentrations.

$$\mu\text{g Br}^-/\text{ml} = \text{g of NaBr} \times 10^3 \times 79.904/102.90 \text{ Eq. 26A-2}$$

$$\mu\text{g F}^-/\text{ml} = \text{g of NaF} \times 10^3 \times 18.998/41.99 \text{ Eq. 26A-3}$$

Alternately, solutions containing a nominal certified concentration of 1000 mg/L NaCl are commercially available as convenient stock solutions from which standards can be made by appropriate volumetric dilution. Refrigerate the stock standard solutions and store no longer than 1 month.

3.3.4 Chromatographic Eluent. Effective eluents for nonsuppressed ion chromatography using a resin- or silica-based weak ion exchange column are a 4 mM potassium hydrogen phthalate solution, adjusted to a pH of 4.0 using a saturated sodium borate solution, and a mM 4-hydroxy benzoate solution, adjusted to a pH of 8.6 using 1 N sodium hydroxide. An effective eluent for suppressed ion chromatography is a solution containing 3 mM sodium bicarbonate and 2.4 mM sodium carbonate. Other dilute solutions buffered to a similar pH that contain no ions interfering with the chromatographic analysis may be used. If, when using suppressed ion chromatography, the "water dip" resulting from sample injection is interfering with the chlorine peak, use a 2 mM sodium hydroxide/2.4 mM sodium bicarbonate eluent.

4. Procedure

Because of the complexity of this method, testers and analysts should be trained and experienced with the procedures to ensure reliable results.

4.1 Sampling.

4.1.1 Pretest Preparation. Follow the general procedure given in Method 5, section 4.1.1, except the filter need only be desiccated and weighed if a particulate determination will be conducted.

4.1.2 Preliminary Determinations. Same as Method 5, section 4.1.2.

4.1.3 Preparation of Sampling Train.

Follow the general procedure given in Method 5, section 4.1.3, except for the following variations:

Add 50 ml of 0.1 N H₂SO₄ to the condensate impinger, if used. Place 100 ml of 0.1 N H₂SO₄ in each of the next two impingers. Place 100 ml of 0.1 N NaOH in each of the following two impingers. Finally, transfer approximately 200–300 g of preweighed silica gel from its container to the last impinger. Set up the train as in Figure 26A-1. When used, the optional cyclone is inserted between the probe liner and filter holder and located in the heated filter box.

4.1.4 Leak-Check Procedures. Follow the leak-check procedures given in Method 5, sections 4.4.1 (Pretest Leak-Check), 4.1.4.2 (Leak-Checks During the Sample Run), and 4.1.4.3 (Post-Test Leak-Check).

4.1.5 Train Operation. Follow the general procedure given in Method 5, section 4.1.5. Maintain a temperature around the filter and (cyclone, if used) of 120±14 °C (248±25 °F). For each run, record the data required on a data sheet such as the one shown in Method 5, Figure 5-2. If the condensate impinger becomes too full, it may be emptied, recharged with 50 ml of 0.1 N H₂SO₄, and replaced during the sample run. The condensate emptied must be saved and included in the measurement of the volume of moisture collected and included in the

sample for analysis. The additional 50 ml of absorbing reagent must also be considered in calculating the moisture. After the impinger is reinstalled in the train, conduct a leak-check as described in Method 5, section 4.1.4.2.

4.1.6 Post-Test Moisture Removal (Optional). When a cyclone is included in the sampling train, perform the following procedure. Upon completion of the test run, connect the ambient air conditioning tube at the probe inlet and operate the train with the filter heating system at $120 \pm 14^\circ\text{C}$ ($248 \pm 25^\circ\text{F}$) at a low flow rate (e.g., $\Delta H = 1$ in. H_2O) to vaporize any liquid and hydrogen halides in the cyclone or on the filter and pull them through the train into the impingers. After 30 minutes, turn off the flow, remove the conditioning tube, and examine the cyclone and filter for any visible moisture. If moisture is visible, repeat this step for 15 minutes.

4.2 Sample Recovery. Allow the probe to cool. When the probe can be handled safely, wipe off all the external surfaces of the tip of the probe nozzle and place a cap loosely over the tip. Do not cap the probe tip tightly while the sampling train is cooling down because this will create a vacuum in the filter holder, drawing water from the impingers into the holder. Before moving the sampling train to the cleanup site, remove the probe, wipe off any silicone grease, and cap the open outlet of the impinger train, being careful not to lose any condensate that might be present. Wipe off any silicone grease and cap the filter or cyclone inlet. Remove the umbilical cord from the last impinger and cap the impinger. If a flexible line is used

between the first impinger and the filter holder, disconnect it at the filter holder and let any condensed water drain into the first impinger. Wipe off any silicone grease and cap the filter holder outlet and the impinger inlet. Ground glass stoppers, plastic caps, serum caps, Teflon[®] tape, Parafilm[®], or aluminum foil may be used to close these openings. Transfer the probe and filter/impinger assembly to the cleanup area. This area should be clean and protected from the weather to minimize sample contamination or loss. Inspect the train prior to and during disassembly and note any abnormal conditions. Treat samples as follows:

4.2.1 Container No. 1 (Optional; Filter Catch for Particulate Determination). Same as Method 5, section 4.2, Container No. 1.

4.2.2 Container No. 2 (Optional; Front-Half Rinse for Particulate Determination). Same as Method 5, section 4.2, Container No. 2.

4.2.3 Container No. 3 (Knockout and Acid Impinger Catch for Moisture and Hydrogen Halide Determination). Disconnect the impingers. Measure the liquid in the acid and knockout impingers to ± 1 ml by using a graduated cylinder or by weighing it to ± 0.5 g by using a balance. Record the volume or weight of liquid present. This information is required to calculate the moisture content of the effluent gas. Quantitatively transfer this liquid to a leak-free sample storage container. Rinse these impingers and connecting glassware (and tubing, if used) with water and add these rinses to the storage container. Seal the container, shake to mix, and label. The fluid level should be marked so that if

any sample is lost during transport, a correction proportional to the lost volume can be applied. Retain rinse water and acidic absorbing solution blanks and analyze with the samples.

4.2.4 Container No. 4 (Alkaline Impinger Catch for Halogen and Moisture Determination). Measure and record the liquid in the alkaline impingers as described in section 4.2.3. Quantitatively transfer this liquid to a leak-free sample storage container. Rinse these two impingers and connecting glassware with water and add these rinses to the container. Seal the container, shake to mix, and label; mark the fluid level. Retain alkaline absorbing solution blank and analyze with the samples.

4.2.5 Container No. 5 (Silica Gel for Moisture Determination). Same as Method 5, section 4.2, Container No. 3.

4.2.6 Container Nos. 6 through 9 (Reagent Blanks). Save portions of the absorbing reagents (0.1 N H_2SO_4 and 0.1 N NaOH) equivalent to the amount used in the sampling train; dilute to the approximate volume of the corresponding samples using rinse water directly from the wash bottle being used. Also, save a portion of the rinse water alone and a portion of the acetone equivalent to the amount used to rinse the front half of the sampling train. Place each in a separate, prelabeled sample container.

4.2.7 Prior to shipment, recheck all sample containers to ensure that the caps are well-secured. Seal the lids of all containers around the circumference with Teflon[®] tape. Ship all liquid samples upright and all particulate filters with the particulate catch facing upward.

4.3 Sample Preparation and Analysis. Note the liquid levels in the sample containers and confirm on the analysis sheet whether or not leakage occurred during transport. If a noticeable leakage has occurred, either void the sample or use methods, subject to the approval of the Administrator, to correct the final results.

4.3.1 Container Nos. 1 and 2 and Acetone Blank (Optional; Particulate Determination). Same as Method 5, section 4.3.

4.3.2 Container No. 5. Same as Method 5, section 4.3 for silica gel.

4.3.3 Container Nos. 3 and 4 and Absorbing Solution and Water Blanks. Quantitatively transfer each sample to a volumetric flask or graduated cylinder and dilute with water to a final volume within 50 ml of the largest sample.

4.3.3.1 The IC conditions will depend upon analytical column type and whether suppressed or nonsuppressed IC is used. Prior to calibration and sample analysis, establish a stable baseline. Next, inject a sample of water, and determine if any Cl^- , Br^- , or F^- appears in the chromatogram. If any of these ions are present, repeat the load/injection procedure until they are no longer present. Analysis of the acid and alkaline absorbing solution samples requires separate standard calibration curves; prepare each according to section 5.2. Ensure adequate baseline separation of the analytes.

4.3.3.2 Between injections of the appropriate series of calibration standards, inject in duplicate the reagent blanks and the field samples. Measure the areas or heights

of the Cl^- , Br^- and F^- peaks. Use the average response to determine the concentrations of the field samples and reagent blanks using the linear calibration curve. If the values from duplicate injections are not within 5 percent of their mean, the duplicate injections shall be repeated and all four values used to determine the average response. Dilute any sample and the blank with equal volumes of water if the concentration exceeds that of the highest standard.

4.4 Audit Sample Analysis. Audit samples must be analyzed subject to availability.

5. Calibration

Maintain a laboratory log of all calibrations.

5.1 Probe Nozzle, Pitot Tube, Dry Gas Metering System, Probe Heater, Temperature Gauges, Leak-Check of Metering System, and Barometer. Same as Method 5, sections 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, and 5.7, respectively.

5.2 Ion Chromatograph. To prepare the calibration standards, dilute given amounts (1.0 ml or greater) of the stock standard solutions to convenient volumes, using 0.1 N H_2SO_4 or 0.1 N NaOH, as appropriate. Prepare at least four calibration standards for each absorbing reagent containing the three stock solutions such that they are within the linear range of the field samples. Using one of the standards in each series, ensure adequate baseline separation for the peaks of interest. Inject the appropriate series of calibration standards, starting with the lowest concentration standard first both before and after injection of the quality control check sample, reagent blanks, and

field samples. This allows compensation for any instrument drift occurring during sample analysis. Determine the peak areas, or height, of the standards and plot individual values versus halide ion concentrations in $\mu\text{g/l}$. Draw a smooth curve through the points. Use linear regression to calculate a formula describing the resulting linear curve.

6. Quality Control

Same as Method 5, Section 4.4.

7. Quality Assurance

7.1 Applicability. When the method is used to demonstrate compliance with a regulation, a set of two audit samples shall be analyzed.

7.2 Audit Procedure. The available audit samples are chloride solutions. Concurrently analyze the two audit samples and a set of compliance samples in the same manner to evaluate the technique of the analyst and the standards preparation. The same analyst, analytical reagents, and analytical system shall be used both for compliance samples and the Environmental Protection Agency (EPA) audit samples.

7.3 Audit Sample Availability. Audit samples will be supplied only to enforcement agencies for compliance tests. Audit samples may be obtained by writing the Source Test Audit Coordinator (MD-77B), Quality Assurance Division, Atmospheric Research and Exposure Assessment Laboratory, U.S. Environmental Protection Laboratory, Research Triangle Park, NC 27711 or by calling the Source Test Audit Coordinator

(STAC) at (919) 541-7834. The request for the audit samples should be made at least 30 days prior to the scheduled compliance sample analysis.

7.4 Audit Results. Calculate the concentrations in mg/dscm using the specified sample volume in the audit instructions. Include the results of both audit samples, their identification numbers, and the analyst's name with the results of the compliance determination samples in appropriate reports to the EPA regional office or the appropriate enforcement agency. (NOTE: Acceptability of results may be obtained immediately by reporting the audit results in mg/dscm and compliance results in total $\mu\text{g HCl/sample}$ to the responsible enforcement agency.) The concentrations of the audit samples obtained by the analyst shall agree within 10 percent of the actual concentrations. If the 10 percent specification is not met, reanalyze the compliance samples and audit samples, and include initial and reanalysis values in the test report. Failure to meet the 10 percent specification may require retests until the audit problems are resolved.

8. Calculations

Retain at least one extra decimal figure beyond those contained in the available data in intermediate calculations, and round off only the final answer appropriately.

8.1 Nomenclature. Same as Method 5, section 6.1. In addition:

B_x = Analysis of reagent blank, $\mu\text{g halide ion (Cl}^-, \text{Br}^-, \text{F}^-)/\text{ml}$.

C = Concentration of hydrogen halide (HX) or halogen (X_2), dry basis, mg/dscm.

m_{HX} = Mass of HCl, HBr, or HF in sample, μg .

m_{X_2} = Mass of Cl_2 or Br_2 in sample, μg .

S_x = Analysis of sample, $\mu\text{g halide ion (Cl}^-, \text{Br}^-, \text{F}^-)/\text{ml}$.

V_s = Volume of filtered and diluted sample, ml.

8.2 Average Dry Gas Meter Temperature and Average Orifice Pressure Drop. See data sheet (Figure 5-2 of Method 5).

8.3 Dry Gas Volume. Calculate $V_{m(std)}$ and adjust for leakage, if necessary, using the equation in section 6.3 of Method 5.

8.4 Volume of Water Vapor and Moisture Content. Calculate the volume of water vapor $V_{m(wat)}$ and moisture content B_w from the data obtained in this method (Figure 5-2 of Method 5); use Equations 5-2 and 5-3 of Method 5.

8.5 Isokinetic Variation and Acceptable Results. Use Method 5, sections 6.11 and 6.12.

8.6 Acetone Blank Concentration, Acetone Wash Blank Residue Weight, Particulate Weight, and Particulate Concentration. For particulate determination.

8.7 Total $\mu\text{g HCl, HBr, or HF Per Sample}$.
 $m_{HX} = K V_s (S_x - B_x)$ Eq. 26A-4

where: $K_{HCl} = 1.028 (\mu\text{g HCl}/\mu\text{g-mole})/(\mu\text{g Cl}^-/\mu\text{g-mole})$.

$K_{HBr} = 1.013 (\mu\text{g HBr}/\mu\text{g-mole})/(\mu\text{g Br}^-/\mu\text{g-mole})$.

$K_{HF} = 1.053 (\mu\text{g HF}/\mu\text{g-mole})/(\mu\text{g F}^-/\mu\text{g-mole})$.

8.8 Total $\mu\text{g Cl}_2$ or Br_2 Per Sample.
 $m_{X_2} = 2 V_s (S_x - B_x)$ Eq. 26A-5

8.9 Concentration of Hydrogen Halide or Halogen in Flue Gas.

$C = K m_{HX} X_2 / V_{m(std)}$ Eq. 26A-6
 where: $K = 10^{-3} \text{ mg}/\mu\text{g}$

8.10 Stack Gas Velocity and Volumetric Flow Rate. Calculate the average stack gas velocity and volumetric flow rate, if needed, using data obtained in this method and the equations in sections 5.2 and 5.3 of Method 2.

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EPA METHODS 6C, 7E, 10 & 25A

Sulfur Dioxide, Nitrogen Oxides, Carbon Monoxide & Total Hydrocarbons (VOC)

Method 6C—Determination of Sulfur Dioxide Emissions From Stationary Sources (Instrumental Analyzer Procedure)

1. Applicability and Principle

1.1 Applicability. This method is applicable to the determination of sulfur dioxide (SO₂) concentrations in controlled and uncontrolled emissions from stationary sources only when specified within the regulations.

1.2 Principle. A gas sample is continuously extracted from a stack, and a portion of the sample is conveyed to an instrumental analyzer for determination of SO₂ gas concentration using an ultraviolet (UV), nondispersive infrared (NDIR), or fluorescence analyzer. Performance specifications and test procedures are provided to ensure reliable data.

2. Range and Sensitivity

2.1 Analytical Range. The analytical range is determined by the instrumental design. For this method, a portion of the analytical range is selected by choosing the span of the monitoring system. The span of the monitoring system shall be selected such that the pollutant gas concentration equivalent to the emission standard is not less than 30 percent of the span. If at any time during a run the measured gas concentration exceeds the span, the run shall be considered invalid.

2.2 Sensitivity. The minimum detectable limit depends on the analytical range, span, and signal-to-noise ratio of the measurement system. For a well designed system, the minimum detectable limit should be less than 2 percent of the span.

3. Definitions

3.1 Measurement System. The total equipment required for the determination of gas concentration. The measurement system consists of the following major subsystems:

3.1.1 Sample Interface. That portion of a system used for one or more of the following: sample acquisition, sample transport, sample conditioning, or protection of the analyzers from the effects of the stack effluent.

3.1.2 Gas Analyzer. That portion of the system that senses the gas to be measured and generates an output proportional to its concentration.

3.1.3 Data Recorder. A strip chart recorder, analog computer, or digital recorder for recording measurement data from the analyzer output.

3.2 Span. The upper limit of the gas concentration measurement range displayed on the data recorder.

3.3 Calibration Gas. A known concentration of a gas in an appropriate diluent gas.

3.4 Analyzer Calibration Error. The difference between the gas concentration exhibited by the gas analyzer and the known concentration of the calibration gas when the calibration gas is introduced directly to the analyzer.

3.5 Sampling System Bias. The difference between the gas concentrations exhibited by the measurement system when a known concentration gas is introduced at the outlet of the sampling probe and when the same gas is introduced directly to the analyzer.

3.6 Zero Drift. The difference in the measurement system output reading from the initial calibration response at the zero concentration level after a stated period of operation during which no unscheduled maintenance, repair, or adjustment took place.

3.7 Calibration Drift. The difference in the measurement system output reading from the initial calibration response at a mid-range calibration value after a stated period of operation during which no unscheduled maintenance, repair, or adjustment took place.

3.8 Response Time. The amount of time required for the measurement system to display 95 percent of a step change in gas concentration on the data recorder.

3.9 Interference Check. A method for detecting analytical interferences and excessive biases through direct comparison of gas concentrations provided by the measurement system and by a modified Method 6 procedure. For this check, the modified Method 6 samples are acquired at the sample by-pass discharge vent.

3.10 Calibration Curve. A graph or other systematic method of establishing the relationship between the analyzer response and the actual gas concentration introduced to the analyzer.

4. Measurement System Performance Specifications

4.1 Analyzer Calibration Error. Less than ± 2 percent of the span for the zero, mid-range, and high-range calibration gases.

4.2 Sampling System Bias. Less than ± 5 percent of the span for the zero, and mid- or high-range calibration gases.

4.3 Zero Drift. Less than ± 3 percent of the span over the period of each run.

4.4 Calibration Drift. Less than ± 3 percent of the span over the period of each run.

4.5 Interference Check. Less than ± 7 percent of the modified Method 6 result for each run.

5. Apparatus and Reagents

5.1 Measurement System. Any measurement system for SO₂ that meets the specifications of this method. A schematic of an acceptable measurement system is shown in Figure 6C-1. The essential components of the measurement system are described below:

5.1.1 Sample Probe. Glass, stainless steel, or equivalent, of sufficient length to traverse the sample points. The sampling probe shall be heated to prevent condensation.

5.1.2 Sample Line. Heated (sufficient to prevent condensation) stainless steel or Teflon tubing, to transport the sample gas to the moisture removal system.

5.1.3 Sample Transport Lines. Stainless steel or Teflon tubing, to transport the sample from the moisture removal system to the sample pump, sample flow rate control, and sample gas manifold.

5.1.4 Calibration Valve Assembly. A three-way valve assembly, or equivalent, for blocking the sample gas flow and introducing calibration gases to the measurement system at the outlet of the sampling probe when in the calibration mode.

5.1.5 Moisture Removal System. A refrigerator-type condenser or similar device (e.g., permeation dryer), to remove condensate continuously from the sample gas while maintaining minimal contact between the condensate and the sample gas. The moisture removal system is not necessary for analyzers that can measure gas concentrations on a wet basis; for these analyzers, (1) heat the sample line and all interface components up to the inlet of the analyzer sufficiently to prevent condensation, and (2) determine the moisture content and correct the measured gas concentrations to a dry basis using appropriate methods, subject to the approval of the Administrator. The determination of sample moisture content is not necessary for pollutant analyzers that measure concentrations on a wet basis when (1) a wet basis CO₂ analyzer operated according to Method 3A is used to obtain simultaneous measurements, and (2) the pollutant/CO₂ measurements are used to determine emissions in units of the standard.

5.1.6 Particulate Filter. An in-stack or heated (sufficient to prevent water condensation) out-of-stack filter. The filter shall be borosilicate or quartz glass wool, or glass fiber mat. Additional filters at the inlet or outlet of the moisture removal system and inlet of the analyzer may be used to prevent accumulation of particulate material in the measurement system and extend the useful life of the

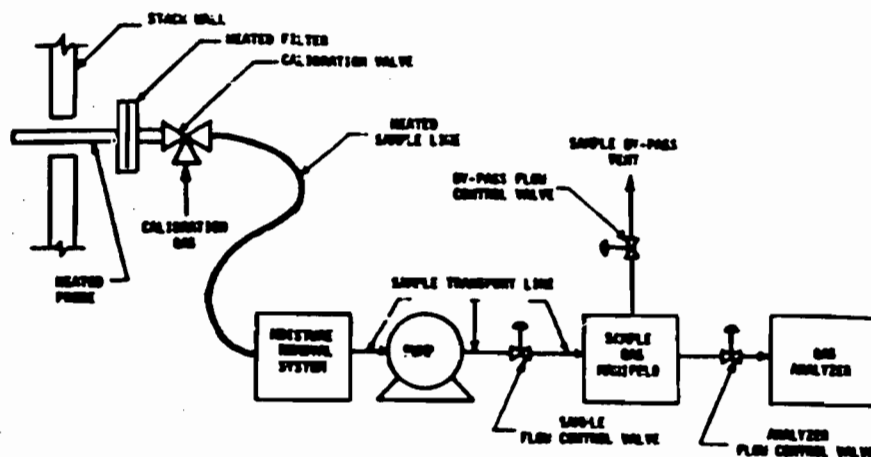


Figure 6C-1. Recirculation system schematic.

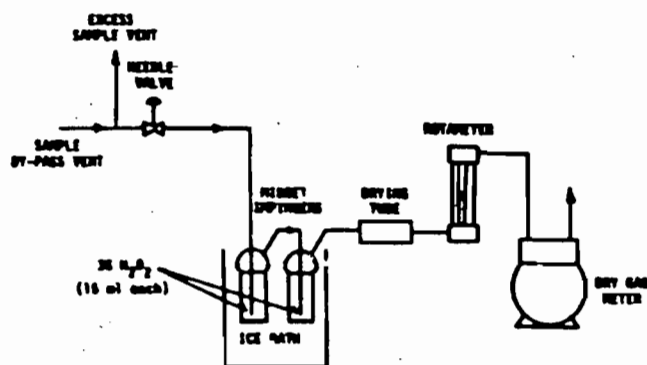


Figure 6C-2. Interference check sampling train.

components. All filters shall be fabricated of materials that are nonreactive to the gas being sampled.

5.1.7 Sample Pump. A leak-free pump, to pull the sample gas through the system at a flow rate sufficient to minimize the response time of the measurement system. The pump may be constructed of any material that is nonreactive to the gas being sampled.

5.1.8 Sample Flow Rate Control. A sample flow rate control valve and rotameter, or equivalent, to maintain a constant sampling rate within 10 percent.

(Note: The tester may elect to install a back-pressure regulator to maintain the sample gas manifold at a constant pressure in order to protect the analyzer(s) from overpressurization, and to minimize the need for flow rate adjustments.)

5.1.9 Sample Gas Manifold. A sample gas manifold, to divert a portion of the sample gas stream to the analyzer, and the remainder to the by-pass discharge vent. The sample gas manifold should also include provisions for introducing

calibration gases directly to the analyzer. The manifold may be constructed of any material that is nonreactive to the gas being sampled.

5.1.10 Gas Analyzer. A UV or NDIR absorption or fluorescence analyzer, to determine continuously the SO₂ concentration in the sample gas stream. The analyzer shall meet the applicable performance specifications of Section 4. A means of controlling the analyzer flow rate and a device for determining proper sample flow rate (e.g., precision rotameter, pressure gauge downstream of all flow controls, etc.) shall be provided at the analyzer.

(Note: Housing the analyzer(s) in a clean, thermally-stable, vibration-free environment will minimize drift in the analyzer calibration.)

5.1.11 Data Recorder. A strip chart recorder, analog computer, or digital recorder, for recording measurement data. The data recorder resolution (i.e., readability) shall be 0.5 percent of span. Alternatively, a digital or analog meter

having a resolution of 0.5 percent of span may be used to obtain the analyzer responses and the readings may be recorded manually. If this alternative is used, the readings shall be obtained at equally spaced intervals over the duration of the sampling run. For sampling run durations of less than 1 hour, measurements at 1-minute intervals or a minimum of 30 measurements, whichever is less restrictive, shall be obtained. For sampling run durations greater than 1 hour, measurements at 2-minute intervals or a minimum of 96 measurements, whichever is less restrictive, shall be obtained.

5.2 Method 6 Apparatus and Reagents.

The apparatus and reagents described in Method 6, and shown by the schematic of the sampling train in Figure 6C-2, to conduct the interference check.

5.3 SO₂ Calibration Gases. The calibration gases for the gas analyzer shall be SO₂ in N₂ or SO₂ in air. Alternatively, SO₂/CO₂, SO₂/O₂, or SO₂/CO₂/O₂ gas mixtures in N₂ may be used. For fluorescence-based analyzers, the O₂ and CO₂ concentrations of the calibration gases as introduced to the analyzer shall be within 1 percent (absolute) O₂ and 1 percent (absolute) CO₂ of the O₂ and CO₂ concentrations of the effluent samples as introduced to the analyzer. Alternatively, for fluorescence-based analyzers, use calibration blends of SO₂ in air and the nomographs provided by the vendor to determine the quenching correction factor (the effluent O₂ and CO₂ concentrations must be known). Use three calibration gases as specified below:

5.3.1 High-Range Gas. Concentration equivalent to 80 to 100 percent of the span.

5.3.2 Mid-Range Gas. Concentration equivalent to 40 to 60 percent of the span.

5.3.3 Zero Gas. Concentration of less than 0.25 percent of the span. Purified ambient air may be used for the zero gas by passing air through a charcoal filter, or through one or more impingers containing a solution of 3 percent H₂O₂.

6. Measurement System Performance Test Procedures

Perform the following procedures before measurement of emissions (Section 7).

6.1 Calibration Gas Concentration Verification. There are two alternatives for establishing the concentrations of calibration gases. Alternative Number 1 is preferred.

6.1.1 Alternative Number 1—Use of calibration gases that are analyzed following the Environmental Protection Agency Traceability Protocol Number 1 (see Citation 1 in the Bibliography). Obtain

a certification from the gas manufacturer that Protocol Number 1 was followed.

6.1.2 Alternative Number 2—Use of calibration gases not prepared according to Protocol Number 1. If this alternative is chosen, obtain gas mixtures with a manufacturer's tolerance not to exceed ± 2 percent of the tag value. Within 6 months before the emission test, analyze each of the calibration gases in triplicate using Method 6. Citation 2 in the Bibliography describes procedures and techniques that may be used for this analysis. Record the results on a data sheet (example is shown in Figure 6C-3). Each of the individual SO₂ analytical results for each calibration gas shall be within 5 percent (or 5 ppm, whichever is greater) of the triplicate set average; otherwise, discard the entire set, and repeat the triplicate analyses. If the average of the triplicate analyses is within 5 percent of the calibration gas manufacturer's cylinder tag value, use the tag value; otherwise, conduct at least three additional analyses until the results of six consecutive runs agree with 5 percent (or 5 ppm, whichever is greater) of their average. Then use this average for the cylinder value.

6.2 Measurement System Preparation.

Assemble the measurement system by following the manufacturer's written instructions for preparing and preconditioning the gas analyzer and, as applicable, the other system components. Introduce the calibration gases in any sequence, and make all necessary adjustments to calibrate the analyzer and the data recorder. Adjust system components to achieve correct sampling rates.

6.3 Analyzer Calibration Error. Conduct the analyzer calibration error check by introducing calibration gases to the measurement system at any point upstream of the gas analyzer as follows:

6.3.1 After the measurement system has been prepared for use, introduce the zero, mid-range, and high-range gases to the analyzer. During this check, make no adjustments to the system except those necessary to achieve the correct calibration gas flow rate at the analyzer. Record the analyzer responses to each calibration gas on a form similar to Figure 6C-4.

Note: A calibration curve established prior to the analyzer calibration error check may be used to convert the analyzer response to the equivalent gas concentration introduced to the analyzer. However, the same correction procedure shall be used for all effluent and calibration measurements obtained during the test.

FIGURE 6C-3—ANALYSIS OF CALIBRATION GASES

Date _____ Analytic method used _____

	Gas concentration (indicate units)		
	Zero *	Mid-range *	High-range *
Sample run:			
1 _____			
2 _____			
3 _____			
Average _____			
Maximum percent deviation _____			

* Average must be less than 0.25 percent of span.
 * Average must be 50 to 60 percent of span.
 * Average must be 80 to 90 percent of span.

FIGURE 6C-4—ANALYZER CALIBRATION DATA

Source Identification: _____ Analyzer calibration data for sampling runs: _____
 Test personnel: _____ Span: _____
 Date: _____

	Cylinder value (indicate units)	Analyzer calibration response (indicate units)	Absolute difference (indicate units)	Difference (percent of span)
Zero gas _____				
Mid-range gas _____				
High-range gas _____				

FIGURE 6C-5—SYSTEM CALIBRATION BIAS AND DRIFT DATA

Source Identification: _____ Run number: _____
 Test personnel: _____ Span: _____
 Date: _____

	Analyzer calibration response	Initial values		Final values		Drift (percent of span)
		System calibration response	System cal. bias (percent of span)	System calibration response	System cal. bias (percent of span)	
Zero gas _____						
Upscale gas _____						

$$\text{System Calibration Bias} = \frac{\text{System Cal. Response} - \text{Analyzer Cal. Response}}{\text{Span}} \times 100$$

6.3.2 The analyzer calibration error check shall be considered invalid if the gas concentration displayed by the analyzer exceeds ± 2 percent of the span for any of the calibration gases. If an invalid calibration is exhibited, take corrective action, and repeat the analyzer calibration error check until acceptable performance is achieved.

6.4 Sampling System Bias Check.

Perform the sampling system bias check by introducing calibration gases at the calibration valve installed at the outlet of the sampling probe. A zero gas and either the mid-range or high-range gas, whichever most closely approximates the effluent concentrations, shall be used for this check as follows:

6.4.1 Introduce the upscale calibration gas, and record the gas concentration

displayed by the analyzer on a form similar to Figure 6C-5. Then introduce zero gas, and record the gas concentration displayed by the analyzer. During the sampling system bias check, operate the system at the normal sampling rate, and make no adjustments to the measurement system other than those necessary to achieve proper calibration gas flow rates at the analyzer. Alternately introduce the zero and upscale gases until a stable response is achieved. The tester shall determine the measurement system response time by observing the times required to achieve a stable response for both the zero and upscale gases. Note the longer of the two times as the response time.

6.4.2 The sampling system bias check shall be considered invalid if the difference between the gas concentrations displayed by the measurement system for the analyzer calibration error check and for the sampling system bias check exceeds ± 5 percent of the span for either the zero or upscale calibration gas. If an invalid calibration is exhibited, take corrective action, and repeat the sampling system bias check until acceptable performance is achieved. If adjustment to the analyzer is required, first repeat the analyzer calibration error check, then repeat the sampling system bias check.

7. Emission Test Procedure

7.1 Selection of Sampling Site and Sampling Points. Select a measurement site and sampling points using the same criteria that are applicable to Method 6.

7.2 Interference Check Preparation. For each individual analyzer, conduct an interference check for at least three runs during the initial field test on a particular source category. Retain the results, and report them with each test performed on that source category.

If an interference check is being performed, assemble the modified Method 6 train (flow control valve, two midjet impingers containing 3 percent H₂O₂, and dry gas meter) as shown in Figure 6C-2. Install the sampling train to obtain a sample at the measurement system sample by-pass discharge vent. Record the initial dry gas meter reading.

7.3 Sample Collection. Position the sampling probe at the first measurement point, and begin sampling at the same rate as used during the sampling system bias check. Maintain constant rate sampling (i.e., ± 10 percent) during the entire run. The sampling time per run shall be the same as for Method 6 plus twice the system response time. For each run, use only those measurements obtained after twice response time of the measurement system has elapsed, to determine the

average effluent concentration. If an interference check is being performed, open the flow control valve on the modified Method 6 train concurrent with the initiation of the sampling period, and adjust the flow to 1 liter per minute (± 10 percent).

[Note: If a pump is not used in the modified Method 6 train, caution should be exercised in adjusting the flow rate since overpressurization of the impingers may cause leakage in the impinger train, resulting in positively biased results].

7.4 Zero and Calibration Drift Tests.

Immediately preceding and following each run, or if adjustments are necessary for the measurement system during the run, repeat the sampling system bias check procedure described in Section 6.4 (Make no adjustments to the measurement system until after the drift checks are completed.) Record and analyzer's responses on a form similar to Figure 6C-5.

7.4.1 If either the zero or upscale calibration value exceeds the sampling system bias specification, then the run is considered invalid. Repeat both the analyzer calibration error check procedure (Section 6.3) and the sampling system bias check procedure (Section 6.4) before repeating the run.

7.4.2 If both the zero and upscale calibration values are within the sampling system bias specification, then use the average of the initial and final bias check values to calculate the gas concentration for the run. If the zero or upscale calibration drift value exceeds the drift limits, based on the difference between the sampling system bias check responses immediately before and after the run, repeat both the analyzer calibration error check procedure (Section 6.3) and the sampling system bias check procedure (Section 6.4) before conducting additional runs.

7.5 Interference Check (if performed). After completing the run, record the final dry gas meter reading, meter temperature, and barometric pressure. Recover and analyze the contents of the midjet impingers, and determine the SO₂ gas concentration using the procedures of Method 6. (It is not necessary to analyze EPA performance audit samples for Method 6.) Determine the average gas concentration exhibited by the analyzer for the run. If the gas concentrations provided by the analyzer and the modified Method 6 differ by more than 7 percent of the modified Method 6 result, the run is invalidated.

8. Emission Calculation

The average gas effluent concentration is

determined from the average gas concentration displayed by the gas analyzer, and is adjusted for the zero and upscale sampling system bias checks, as determined in accordance with Section 7.4. The average gas concentration displayed by the analyzer may be determined by integration of the area under the curve for chart recorders, or by averaging all of the effluent measurements. Alternatively, the average may be calculated from measurements recorded at equally spaced intervals over the entire duration of the run. For sampling run durations of less than 1 hour, measurements at 1-minute intervals or a minimum of 30 measurements, whichever is less restrictive, shall be used. For sampling run durations greater than 1 hour, measurements at 2-minute intervals or a minimum of 96 measurements, whichever is less restrictive, shall be used. Calculate the effluent gas concentration using Equation 6C-1.

$$C_{\text{avg}} = (C - C_o) \frac{C_{\text{ma}}}{C_{\text{u}} - C_o}$$

Eq. 6C-1

Where:

C_{gas} = Effluent gas concentration, dry basis, ppm.

$\bar{C}$ = Average gas concentration indicated by gas analyzer, dry basis, ppm.

C_o = Average of initial and final system calibration bias check responses for the zero gas, ppm.

C_m = Average of initial and final system calibration bias check responses for the upscale calibration gas, ppm.

C_{ma} = Actual concentration of the upscale calibration gas, ppm.

9. Bibliography

1. Tracesability Protocol for Establishing True Concentrations of Gases Used for Calibrations and Audits of Continuous Source Emission Monitors: Protocol Number 1. U.S. Environmental Protection Agency, Quality Assurance Division. Research Triangle Park, NC. June 1978.
2. Westlin, Peter R. and J. W. Brown. Methods for Collecting and Analyzing Gas Cylinder Samples. Source Evaluation Society Newsletter. 3(3):5-15. September 1978.

METHOD 7E

Method 7E—Determination of Nitrogen Oxides Emissions From Stationary Sources (Instrumental Analyzer Procedure)

1. Applicability and Principle

1.1 Applicability. This method is applicable to the determination of nitrogen oxides (NO_x) concentrations in emissions from stationary sources only when specified within the regulations.

1.2 Principle. A gas sample is continuously extracted from a stack, and a portion of the sample is conveyed to an instrumental chemiluminescent analyzer for determination of NO_x concentration. Performance specifications and test procedures are provided to ensure reliable data.

2. Range and Sensitivity

Same as Method 6C, Sections 2.1 and 2.2.

3. Definitions

3.1 Measurement System. The total equipment required for the determination of NO_x concentration. The measurement system consists of the following major subsystems:

3.1.1 Sample Interface, Gas Analyzer, and Data Recorder. Same as Method 6C, Sections 3.1.1, 3.1.2, and 3.1.3.

3.1.2 NO₂ to NO Converter. A device that converts the nitrogen dioxide (NO₂) in the sample gas to nitrogen oxide (NO).

3.2 Span, Calibration Gas, Analyzer Calibration Error, Sampling System Bias, Zero Drift, Calibration Drift, and Response Time. Same as Method 6C, Sections 3.2 through 3.8.

3.3 Interference Response. The output response of the measurement system to a component in the sample gas, other than the gas component being measured.

4. Measurement System Performance Specifications

Same as Method 6C, Sections 4.1 through 4.4.

5. Apparatus and Reagents

5.1 Measurement System. Any measurement system for NO_x that meets the specifications of this method. A schematic of an acceptable measurement system is shown in Figure 6C-1 of Method 6C. The essential components of the measurement system are described below:

5.1.1 Sample Probe, Sample Line, Calibration Valve Assembly, Moisture Removal System, Particulate Filter, Sample Pump, Sample Flow Rate Control,

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Sample Gas Manifold, and Data Recorder. Same as Method 6C, Sections 5.1.1 through 5.1.9, and 5.1.11.

5.1.2 NO₂ to NO Converter. That portion of the system that converts the nitrogen dioxide (NO₂) in the sample gas to nitrogen oxide (NO). An NO₂ to NO converter is not necessary if data are presented to demonstrate that the NO₂ portion of the exhaust gas is less than 5 percent of the total NO_x concentration.

5.1.3 NO_x Analyzer. An analyzer based on the principles of chemiluminescence, to determine continuously the NO_x concentration in the sample gas stream. The analyzer shall meet the applicable performance specifications of Section 4. A means of controlling the analyzer flow rate and a device for determining proper sample flow rate (e.g., precision rotameter, pressure gauge downstream of all flow controls, etc.) shall be provided at the analyzer.

5.2 NO_x Calibration Gases. The calibration gases for the NO_x analyzer shall be NO in N₂. Three calibration gases, as specified in Sections 5.3.1 through 5.3.3, of Method 6C, shall be used. Ambient air may be used for the zero gas.

6. Measurement System Performance Test Procedures

Perform the following procedures before measurement of emissions (Section 7).

6.1 Calibration Gas Concentration Verification. Follow Section 6.1 of Method 6C, except if calibration gas analysis is required, use Method 7, and change all 5 percent performance values to 10 percent (or 10 ppm, whichever is greater).

6.2 Interference Response. Conduct an interference response test of the analyzer prior to its initial use in the field. Thereafter, recheck the measurement system if changes are made in the instrumentation that could alter the interference response (e.g., changes in the gas detector). Conduct the interference response in accordance with Section 5.4 of Method 20.

6.3 Measurement System Preparation, Analyzer Calibration Error, and Sample System Bias Check. Follow Sections 6.2 through 6.4 of Method 6C.

6.4 NO₂ to NO Conversion Efficiency. Unless data are presented to demonstrate that the NO₂ concentration within the sample stream is not greater than 5 percent of the NO_x concentration, conduct an NO₂ to NO conversion efficiency test in accordance with Section 5.6 of Method 20.

7. Emission Test Procedure

7.1 Selection of Sampling Site and Sampling Points. Select a measurement site and sampling points using the same criteria that are applicable to tests performed using Method 7.

7.2 Sample Collection. Position the sampling probe at the first measurement point, and begin sampling at the same rate as used during the system calibration drift test. Maintain constant rate sampling (i.e., ± 10 percent) during the entire run. The sampling time per run shall be the same as the total time required to perform a run using Method 7, plus twice the system response time. For each run, use only those measurements obtained after twice the response time of the measurement system has elapsed, to determine the average effluent concentration.

7.3 Zero and Calibration Drift Test. Follow Section 7.4 of Method 6C.

8. Emission Calculation

Follow Section 8 of Method 6C.

9. Bibliography

Same as bibliography of Method 6C.

Method 10—Determination of Carbon Monoxide Emissions From Stationary Sources

1. Principle and Applicability

1.1 Principle. An integrated or continuous gas sample is extracted from a sampling point and analyzed for carbon monoxide (CO) content using a Luft-type nondispersive infrared analyzer (NDIR) or equivalent.

1.2 Applicability. This method is applicable for the determination of carbon monoxide emissions from stationary sources only when specified by the test procedures for determining compliance with new source performance standards. continuous or an integrated sample is to be used.

2. Range and Sensitivity

2.1 Range. 0 to 1,000 ppm.

2.2 Sensitivity. Minimum detectable concentration is 20 ppm for a 0 to 1,000 ppm span.

3. Interferences

Any substance having a strong absorption of infrared energy will interfere to some extent. For example, discrimination ratios for water (H₂O) and carbon dioxide (CO₂) are 3.5 percent H₂O per 7 ppm CO and 10 percent CO₂ per 10 ppm CO, respectively, for devices measuring in the 1,500 to 3,000 ppm range. For devices measuring in the 0 to 100 ppm range, interference ratios can be as high as 3.5 percent H₂O per 25 ppm CO and 10 percent CO₂ per 50 ppm CO. The use of silica gel and ascarite traps will alleviate the major interference problems. The measured gas volume must be corrected if these traps are used.

4. Precision and Accuracy

4.1 Precision. The precision of most NDIR analyzers is approximately ± 2 percent of span.

4.2 Accuracy. The accuracy of most NDIR analyzers is approximately ± 5 percent of span after calibration.

5. Apparatus

5.1 Continuous Sample (Figure 10-1).

5.1.1 Probe. Stainless steel or sheathed Pyrex glass, equipped with a filter to remove particulate matter.

[Footnote] Mention of trade names or specific products does not constitute endorsement by the Environmental Protection Agency.

5.1.2 Air-Cooled Condenser or

Equivalent. To remove any excess moisture.

5.2 Integrated Sample (Figure 10-2).

5.2.1 Probe. Stainless steel or sheathed Pyrex glass, equipped with a filter to remove particulate matter.

5.2.2 Air-Cooled Condenser or Equivalent. To remove any excess moisture.

5.2.3 Valve. Needle valve, or equivalent, to adjust flow rate.

5.2.4 Pump. Leak-free diaphragm type, or equivalent, to transport gas.

5.2.5 Rate Meter. Rotameter, or equivalent, to measure a flow range from 0 to 1.0 liter per min (0.035 cfm).

5.2.6 Flexible Bag. Tedlar, or equivalent, with a capacity of 60 to 90 liters (2 to 3 ft³). Leak-test the bag in the laboratory before using by evacuating bag with a pump followed by a dry gas meter. When evacuation is complete, there should be no flow through the meter.

5.2.7 Pitot Tube. Type S, or equivalent, attached to the probe so that the sampling rate can be regulated proportional to the stack gas velocity when velocity is varying with the time or a sample traverse is conducted.

5.3 Analysis (Figure 10-3).

5.3.1 Carbon Monoxide Analyzer. Nondispersive infrared spectrometer, or equivalent. This instrument should be demonstrated, preferably by the manufacturer, to meet or exceed manufacturer's specifications and those described in this method.

5.3.2 Drying Tube. To contain approximately 200 g of silica gel.

5.3.3 Calibration Gas. Refer to section 6.1.

5.3.4 Filter. As recommended by NDIR manufacturer.

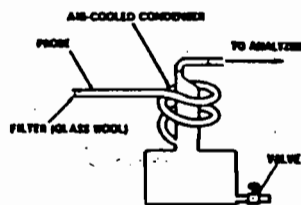


Figure 10-1. Continuous sampling train.

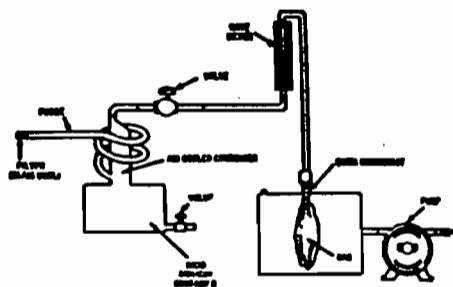


Figure 10-2. Integrated gas sampling train.

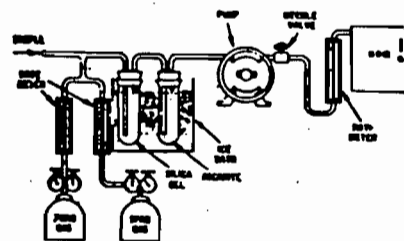


Figure 10-3. Analytical equipment.

5.3.5 CO₂ Removal Tube. To contain approximately 500 g of ascarite.

5.3.6 Ice Water Bath. For ascarite and silica gel tubes.

5.3.7 Valve. Needle valve, or equivalent, to adjust flow rate.

5.3.8 Rate Meter. Rotameter or equivalent to measure gas flow rate of 0 to 1.0 liter per min (0.035 cfm) through NDIR.

5.3.9 Recorder (optional). To provide permanent record of NDIR readings.

6. Reagents

6.1 Calibration Gases. Known concentration of CO in nitrogen (N₂) for instrument span, prepurified grade of N₂ for zero, and two additional concentrations corresponding approximately to 60 percent and 30 percent span. The span concentration shall not exceed 1.5 times the applicable source performance standard. The calibration gases shall be certified by the manufacturer to be within ± 2 percent of the specified concentration.

6.2 Silica Gel. Indicating type, 6 to 16 mesh, dried at 175°C (347°F) for 2 hours.

6.3 Ascarite. Commercially available.

7. Procedure

7.1 Sampling.

7.1.1 Continuous Sampling. Set up the equipment as shown in Figure 10-1 making sure all connections are leak free. Place the probe in the stack at a sampling point and purge the sampling line. Connect the analyzer and begin drawing sample into the analyzer. Allow 5 minutes for the system to stabilize, then record the analyzer reading as required by the test procedure. (See section 7.2 and 8). CO₂ content of the gas may be determined by using the Method 3 integrated sample procedure, or by weighing the ascarite CO₂ removal tube and computing CO₂ concentration from the gas volume sampled and the weight gain of the tube.

7.1.2 Integrated Sampling. Evacuate the flexible bag. Set up the equipment as shown in Figure 10-2 with the bag disconnected. Place the probe in the stack and purge the sampling line. Connect the

bag, making sure that all connections are leak free. Sample at a rate proportional to the stack velocity. CO₂ content of the gas may be determined by using the Method 3 integrated sample procedures, or by weighing the ascarite CO₂ removal tube and computing CO₂ concentration from the gas volume sampled and the weight gain of the tube.

7.2 CO Analysis. Assemble the apparatus as shown in Figure 10-3, calibrate the instrument, and perform other required operations as described in section 8. Purge analyzer with N₂ prior to introduction of each sample. Direct the sample stream through the instrument for the test period, recording the readings. Check the zero and span again after the test to assure that any drift or malfunction is detected. Record the sample data on Table 10-1.

8. Calibration

Assemble the apparatus according to Figure 10-3. Generally an instrument requires a warm-up period before stability is obtained. Follow the manufacturer's instructions for specific procedure. Allow a minimum time of 1 hour for warm-up. During this time check the sample conditioning apparatus, i.e., filter, condenser, drying tube, and CO₂ removal tube, to ensure that each component is in good operating condition. Zero and calibrate the instrument according to the manufacturer's procedures using, respectively, nitrogen and the calibration gases.

TABLE 10-1—FIELD DATA

Comments	
Location.....	
Test.....	
Date.....	
Operator.....	
Clock time	Rotameter setting, liters per minute (cubic feet per minute)

9. Calculation

Calculate the concentration of carbon monoxide in the stack using Equation 10-1.

$$C_{CO \text{ stack}} = C_{CO \text{ NDIR}}(1 - F_{CO_2}) \quad \text{Eq. 10-1}$$

Where:

CCO stack = Concentration of CO in stack, ppm by volume (dry basis).

CCO NDIR = Concentration of CO measured by NDIR analyzer, ppm by volume (dry basis).

FCO₂ = Volume fraction of CO₂ in sample, i.e., percent CO₂ from Orsat analysis divided by 100.

10. Alternative Procedures

10.1 Interference Trap. The sample conditioning system described in Method 10A, sections 2.1.2 and 4.2, may be used as an alternative to the silica gel and ascarite traps.

11. Bibliography

- McElroy, Frank, The Intertech NDIR-CO Analyzer, Presented at 11th Methods Conference on Air Pollution, University of California, Berkeley, CA. April 1, 1970.
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- MSA LIRA Infrared Gas and Liquid Analyzer Instruction Book, Mine Safety Appliances Co., Technical Products Division, Pittsburgh, PA.
- Models 215A, 315A, and 415A Infrared Analyzers, Beckman Instruments, Inc., Beckman Instructions 1635-B, Fullerton, CA. October 1967.
- Continuous CO Monitoring System, Model A5611, Intertech Corp., Princeton, NJ.
- UNOR Infrared Gas Analyzers, Bendix Corp., Roncerverte, WV

ADDENDA

A. PERFORMANCE SPECIFICATIONS FOR NDIR CARBON MONOXIDE ANALYZERS

Range (minimum).....	0-1000 ppm.
Output (minimum).....	0-10mV.
Minimum detectable sensitivity.	20 ppm.
Rise time, 90 percent (maximum).	30 seconds.
Fall time, 90 percent (maximum).	30 seconds.
Zero drift (maximum).....	10% in 8 hours.
Span drift (maximum).....	10% in 8 hours.
Precision (minimum).....	±2% of full scale.
Noise (maximum).....	±1% of full scale.
Linearity (maximum deviation).....	2% of full scale.
Interference rejection ratio.....	CO ₂ —1000 to 1, H ₂ O—50 to 1.

B. Definitions of Performance Specifications.

Range—The minimum and maximum measurement limits.

Output—Electrical signal which is proportional to the measurement; intended for connection to readout or data processing devices. Usually expressed as millivolts or milliamps full scale at a given impedance.

Full scale—The maximum measuring

limit for a given range.

Minimum detectable sensitivity—The smallest amount of input concentration that can be detected as the concentration approaches zero.

Accuracy—The degree of agreement between a measured value and the true value; usually expressed as ± percent of full scale.

Time to 90 percent response—The time interval from a step change in the input concentration at the instrument inlet to a reading of 90 percent of the ultimate recorded concentration.

Rise Time (90 percent)—The interval between initial response time and time to 90 percent response after a step increase in the inlet concentration.

Fall Time (90 percent)—The interval between initial response time and time to 90 percent response after a step decrease in the inlet concentration.

Zero Drift—The change in instrument output over a stated time period, usually 24 hours, of unadjusted continuous operation when the input concentration is zero; usually expressed as percent full scale.

Span Drift—The change in instrument output over a stated time period, usually 24 hours, of unadjusted continuous operation when the input concentration is a stated upscale value; usually expressed as percent full scale.

Precision—The degree of agreement between repeated measurements of the same concentration, expressed as the average deviation of the single results from the mean.

Noise—Spontaneous deviations from a mean output not caused by input concentration changes.

Linearity—The maximum deviation between an actual instrument reading and the reading predicted by a straight line drawn between upper and lower calibration points.

Method 25A—Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer
 |s60xA_Meth_25A

1. Applicability and Principle

1.1 Applicability. This method applies to the measurement of total gaseous organic concentration of vapors consisting primarily of alkanes, alkenes, and/or arenes (aromatic hydrocarbons). The concentration is expressed in terms of propane (or other appropriate organic calibration gas) or in terms of carbon.

1.2 Principle. A gas sample is extracted from the source through a heated sample line, if necessary, and glass fiber filter to a flame ionization analyzer (FIA). Results are reported as volume concentration equivalents of the calibration gas or as carbon equivalents.

2. Definitions

2.1 Measurement System. The total equipment required for the determination of the gas concentration. The system consists of the following major subsystems:

2.1.1 Sample Interface. That portion of the system that is used for one or more of the following: sample acquisition, sample transportation, sample conditioning, or protection of the analyzer from the effects of the stack effluent.

2.1.2 Organic Analyzer. That portion of the system that senses organic concentration and generates an output proportional to the gas concentration.

2.2 Span Value. The upper limit of a gas concentration measurement range that is specified for affected source categories in the applicable part of the regulations. The span value is established in the applicable regulation and is usually 1.5 to 2.5 times the applicable emission limit. If no span value is provided, use a span value equivalent to 1.5 to 2.5 times the expected concentration. For convenience, the span value should correspond to 100 percent of the recorder scale.

2.3 Calibration Gas. A known concentration of a gas in an appropriate diluent gas.

2.4 Zero Drift. The difference in the measurement system response to a zero level calibration gas before and after a stated period of operation during which no unscheduled maintenance, repair, or adjustment took place.

2.5 Calibration Drift. The difference in the measurement system response to a mid-level calibration gas before and after a stated period of operation during which no unscheduled maintenance, repair or adjustment took place.

2.6 Response Time. The time interval from a step change in pollutant concentration at the inlet to the emission measurement system to the time at which 95 percent of the corresponding final value is reached as displayed on the recorder.

2.7 Calibration Error. The difference between the gas concentration indicated by the measurement system and the known concentration of the calibration gas.

3. Apparatus

A schematic of an acceptable measurement system is shown in Figure 25A-1. The essential components of the measurement system are described below:

3.1 Organic Concentration Analyzer. A flame ionization analyzer (FIA) capable of meeting or exceeding the specifications in this method.

3.2 Sample Probe. Stainless steel, or equivalent, three-hole rake type. Sample holes shall be 4 mm in diameter or smaller and located at 16.7, 50, and 83.3 percent of the equivalent stack diameter. Alternatively, a single opening probe may be used so that a gas sample is collected from the centrally located 10 percent area of the stack cross-section.

3.3 Sample Line. Stainless steel or Teflon* tubing to transport the sample gas to the analyzer. The sample line should be heated, if necessary, to prevent condensation in the line.

Footnote * Mention of trade names or specific products does not constitute endorsement by the Environmental Protection Agency.

3.4 Calibration Valve Assembly. A three-way valve assembly to direct the zero and calibration gases to the analyzers is recommended. Other methods, such as

quick-connect lines, to route calibration gas to the analyzers are applicable.

3.5 Particulate Filter. An in-stack or an out-of-stack glass fiber filter is recommended if exhaust gas particulate loading is significant. An out-of-stack filter should be heated to prevent any condensation.

3.6 Recorder. A strip-chart recorder, analog computer, or digital recorder for recording measurement data. The minimum data recording requirement is one measurement value per minute. Note: This method is often applied in highly explosive areas. Caution and care should be exercised in choice of equipment and installation.

4. Calibration and Other Gases

Gases used for calibrations, fuel, and combustion air (if required) are contained in compressed gas cylinders. Preparation of calibration gases shall be done according to the procedure in Protocol No. 1, listed in Citation 2 of Bibliography. Additionally, the manufacturer of the cylinder should provide a recommended shelf life for each calibration gas cylinder over which the concentration does not change more than ± 2 percent from the certified value. For calibration gas values not generally available (i.e., organics between 1 and 10 percent by volume), alternative methods for preparing calibration gas mixtures, such as dilution systems, may be used with prior approval of the Administrator.

Calibration gases usually consist of propane in air or nitrogen and are determined in terms of the span value. Organic compounds other than propane can be used following the above guidelines and making the appropriate corrections for

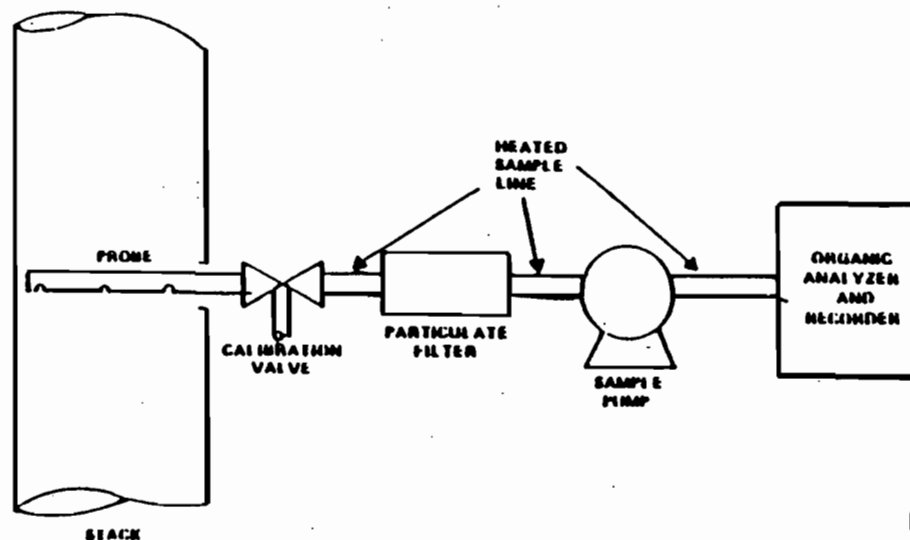


Figure 25A-1 Organic Concentration Measurement System.

response factor.

4.1 Fuel. A 40 percent H₂/60 percent He or 40 percent H₂/60 percent N₂ gas mixture is recommended to avoid an oxygen synergism effect that reportedly occurs when oxygen concentration varies significantly from a mean value.

4.2 Zero Gas. High purity air with less than 0.1 parts per million by volume (ppmv) of organic material (propane or carbon equivalent) or less than 0.1 percent of the span value, whichever is greater.

4.3 Low-level Calibration Gas. An organic calibration gas with a concentration equivalent to 25 to 35 percent of the applicable span value.

4.4 Mid-level Calibration Gas. An organic calibration gas with a concentration equivalent to 45 to 55 percent of the applicable span value.

4.5 High-level Calibration Gas. An organic calibration gas with a concentration equivalent to 80 to 90 percent of the applicable span value.

5. Measurement System Performance Specifications

5.1 Zero Drift. Less than ± 3 percent of the span value.

5.2 Calibration Drift. Less than ± 3 percent of span value.

5.3 Calibration Error. Less than ± 5 percent of the calibration gas value.

6. Pretest Preparations

6.1 Selection of Sampling Site. The location of the sampling site is generally specified by the applicable regulation or purpose of the test; i.e., exhaust stack, inlet line, etc. The sample port shall be located at least 1.5 meters or 2 equivalent diameters upstream of the gas discharge to the atmosphere.

6.2 Location of Sample Probe. Install the sample probe so that the probe is centrally located in the stack, pipe, or duct and is sealed tightly at the stack port connection.

6.3 Measurement System Preparation. Prior to the emission test, assemble the measurement system following the manufacturer's written instructions in preparing the sample interface and the organic analyzer. Make the system operable.

FLA equipment can be calibrated for almost any range of total organics concentrations. For high concentrations of organics (> 1.0 percent by volume as propane) modifications to most commonly available analyzers are necessary. One accepted method of equipment modification is to decrease the size of the sample to the analyzer through the use of a smaller

diameter sample capillary. Direct and continuous measurement of organic concentration is a necessary consideration when determining any modification design.

6.4 Calibration Error Test. Immediately prior to the test series, (within 2 hours of the start of the test) introduce zero gas and high-level calibration gas at the calibration valve assembly. Adjust the analyzer output to the appropriate levels, if necessary. Calculate the predicted response for the low-level and mid-level gases based on a linear response line between the zero and high-level responses. Then introduce low-level and mid-level calibration gases successively to the measurement system. Record the analyzer responses for low-level and mid-level calibration gases and determine the differences between the measurement system responses and the predicted responses. These differences must be less than 5 percent of the respective calibration gas value. If not, the measurement system is not acceptable and must be replaced or repaired prior to testing. No adjustments to the measurement system shall be conducted after the calibration and before the drift check (Section 7.3). If adjustments are necessary before the completion of the test series, perform the drift checks prior to the required adjustments and repeat the calibration following the adjustments. If multiple electronic ranges are to be used, each additional range must be checked with a mid-level calibration gas to verify the multiplication factor.

6.5 Response Time Test. Introduce zero gas into the measurement system at the calibration valve assembly. When the system output has stabilized, switch quickly to the high-level calibration gas. Record the time from the concentration change to the measurement system response equivalent to 95 percent of the step change. Repeat the test three times and average the results.

7. Emission Measurement Test Procedure

7.1 Organic Measurement. Begin sampling at the start of the test period, recording time and any required process information as appropriate. In particular, note on the recording chart periods of process interruption or cyclic operation.

7.2 Drift Determination. Immediately following the completion of the test period and hourly during the test period, reintroduce the zero and mid-level calibration gases, one at a time, to the measurement system at the calibration valve assembly. (Make no adjustments to the measurement system until after both the zero and calibration drift checks are made.) Record the analyzer response. If

the drift values exceed the specified limits, invalidate the test results preceding the check and repeat the test following corrections to the measurement system. Alternatively, recalibrate the test measurement system as in Section 6.4 and report the results using both sets of calibration data (i.e., data determined prior to the test period and data determined following the test period).

8. Organic Concentration Calculations

Determine the average organic concentration in terms of ppmv as propane or other calibration gas. The average shall be determined by the integration of the output recording over the period specified in the applicable regulation.

If results are required in terms of ppmv as carbon, adjust measured concentrations using Equation 25A-1.

$$C_c = K C_{meas} \quad \text{Eq. 25A-1}$$

Where:

C_c = Organic concentration as carbon, ppmv.

C_{meas} = Organic concentration as measured, ppmv.

K = Carbon equivalent correction factor, $K = 2$ for ethane. $K = 3$ for propane. $K = 4$ for butane. K = Appropriate response factor for other organic calibration gases.

9. Bibliography

1. Measurement of Volatile Organic Compounds—Guideline Series. U.S. Environmental Protection Agency. Research Triangle Park, NC. Publication No. EPA-450/2-78-041. June 1978. p. 46-54.

2. Traceability Protocol for Establishing True Concentrations of Gases Used for Calibration and Audits of Continuous Source Emission Monitors (Protocol No. 1). U.S. Environmental Protection Agency, Environmental Monitoring and Support Laboratory. Research Triangle Park, NC. June 1978.

3. Gasoline Vapor Emission Laboratory Evaluation—Part 2. U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards. Research Triangle Park, NC. EMB Report No. 75-GAS-6. August 1975.

EPA METHOD 101A

Mercury

METHOD 101A—DETERMINATION OF PARTICULATE AND GASEOUS MERCURY EMISSIONS FROM SEWAGE SLUDGE INCINERATORS

INTRODUCTION

This method is similar to Method 101, except acidic potassium permanganate solution is used instead of acidic iodine monochloride for collection.

1. Applicability and Principle—1.1 Applicability. This method applies to the determination of particulate and gaseous mercury (Hg) emissions from sewage sludge incinerators and other sources as specified in the regulations.

1.2 Principle. Particulate and gaseous Hg emissions are withdrawn isokinetically from the source and collected in acidic potassium permanganate (KMnO₄) solution. The Hg collected (in the mercuric form) is reduced to elemental Hg, which is then aerated from the solution into an optical cell and measured by atomic absorption spectrophotometry.

2. Range and Sensitivity—2.1 Range. After initial dilution, the range of this method is 20 to 800 ng Hg/ml. The upper limit can be extended by further dilution of the sample.

2.2 Sensitivity. The sensitivity of the method depends on the recorder/spectrophotometer combination selected.

3. Interfering Agents—3.1 Sampling. Excessive oxidizable organic matter in the stack gas prematurely depletes the KMnO₄ solution and thereby prevents further collection of Hg.

3.2 Analysis. Condensation of water vapor on the optical cell windows causes a positive interference.

4. Precision—Based on eight paired-train tests, the within-laboratory standard deviation was estimated to be 4.8 µg Hg/ml in the concentration range of 50 to 130 µg Hg/ml.

5. Apparatus—5.1 Sampling Train and Sample Recovery. Same as Method 101, Sections 5.1 and 5.2, respectively, except for the following variations:

5.1.1 Probe Liner. Same as Method 101, Section 5.1.2, except that if a filter is used ahead of the impingers, the tester must use the probe heating system to minimize the condensation of gaseous Hg.

5.1.2 Filter Holder (Optional). Borosilicate glass with a rigid stainless-steel wire-screen filter support (do not use glass frit supports) and a silicone rubber or Teflon gasket, designed to provide a positive seal against leakage from outside or around the filter. The filter holder must be equipped with a filter heating system capable of maintaining a temperature around the filter holder of 120 ± 14°C (248 ± 25° F) during sampling to minimize both water and gaseous Hg condensation. The tester may use a filter in cases where the stream contains large quantities of particulate matter.

5.2 Analysis. The apparatus needed for analysis is the same as Method 101, Sections 5.3 and 5.4, except as follows:

5.2.1 Volumetric Pipets. Class A: 1-, 2-, 3-, 4-, 5-, 10-, and 20-ml.

5.2.2 Graduated Cylinder. 25-ml.

5.2.3 Steam Bath.

6. Reagents—Use ACS reagent-grade chemicals or equivalent, unless otherwise specified.

6.1 Sampling and Recovery. The reagents used in sampling and recovery are as follows:

6.1.1 Water. Deionized distilled, meeting ASTM Specifications for Type 1 Reagent Water—ASTM Test Method D1193-77 (incorporated by reference—see §61.18). If high concentrations of organic matter are not expected to be present, the analyst may eliminate the KMnO₄ test for oxidizable organic matter. Use this water in all dilutions and solution preparations.

6.1.2 Nitric Acid (HNO₃), 50 Percent (V/V). Mix equal volumes of concentrated HNO₃ and deionized distilled water, being careful to slowly add the acid to the water.

6.1.3 Silica Gel. Indicating type, 6- to 16-mesh. If previously used, dry at 175° C (350° F) for 2 hr. The tester may use new silica gel as received.

6.1.4 Filter (Optional). Glass fiber filter, without organic binder, exhibiting at least 99.95 percent efficiency on 0.3 µm dioctyl phthalate smoke particles. The tester may use the filter in cases where the gas stream contains large quantities of particulate matter, but he should analyze blank filters for Hg content.

6.1.5 Sulfuric Acid (H₂SO₄), 10 Percent (V/V). Add and mix 100 ml of concentrated H₂SO₄ with 900 ml of deionized distilled water.

6.1.6 Absorbing Solution, 4 Percent KMnO₄ (W/V). Prepare fresh daily. Dissolve 40 g of KMnO₄ in sufficient 10 percent H₂SO₄ to make 1 liter. Prepare and store in glass bottles to prevent degradation.

6.2 Analysis. The reagents needed for analysis are listed below:

6.2.1 Tin (II) Solution. Prepare fresh daily and keep sealed when not being used. Completely dissolve 20 g of tin (II) chloride (or 25 g of tin (II) sulfate) crystals (Baker Analyzed reagent grade or any other brand that will give a clear solution) in 25 ml of concentrated HCl. Dilute to 250 ml with deionized distilled water. Do not substitute HNO₃, H₂SO₄, or other strong acids for the HCl.

6.2.2 Sodium Chloride—Hydroxylamine Solution. Dissolve 12 g of sodium chloride and 12 g of hydroxylamine sulfate (or 12 g of hydroxylamine hydrochloride) in deionized distilled water and dilute to 100 ml.

6.2.3 Hydrochloric Acid (HCl), 8 N. Dilute 67 ml of concentrated HNO₃ to 100 ml with deionized distilled water (slowly add the HCl to the water).

6.2.4 Nitric Acid, 15 Percent (V/V). Dilute 15 ml of concentrated HNO₃ to 100 ml with deionized distilled water.

6.2.5 Mercury Stock Solution, 1 mg Hg/ml. Prepare and store all mercury standard solutions in borosilicate glass containers. Completely dissolve 0.1354 g of mercury (II) chloride in 75 ml of deionized distilled water. Add 100 ml of concentrated HNO₃ and adjust the volume to exactly 100 ml with deionized distilled water. Mix thoroughly. This solution is stable for at least 1 month.

6.2.6 Intermediate Mercury Standard Solution, 10 µg Hg/ml. Prepare fresh weekly. Pipet 5.0 ml of the mercury stock solution (Section 6.2.5) into a 500-ml volumetric flask and add 20 ml of 15 percent HNO₃ solution. Adjust the volume to exactly 500 ml with deionized distilled water. Thoroughly mix the solution.

6.2.7 Working Mercury Standard Solution, 200 ng Hg/ml. Prepare fresh daily. Pipet 5.0 ml from the "Intermediate Mercury Standard Solution" (Section 6.2.6) in 250-ml volumetric flask. Add 5 ml of 4 percent KMnO₄ absorbing solution and 5 ml 15 percent HNO₃. Adjust the volume to exactly 250 ml with deionized distilled water. Mix thoroughly.

6.2.8 Potassium Permanganate, 5 Percent (W/V). Dissolve 5 g of KMnO₄ in deionized distilled water and dilute to 100 ml.

6.2.9 Filter. Whatman No. 40 or equivalent.

7. Procedure—7.1 Sampling. The sampling procedure is the same as Method 101, except for changes due to the use of KMnO₄ instead of ICl absorbing solution and possible use of a filter. These changes are as follows:

7.1.1 Preliminary Determinations. Preliminary determinations are the same as those given in Method 101, Section 7, except for the absorbing solution depletion. In this method, high oxidizable organic content may make it impossible to sample for the desired minimum time. This problem is indicated by the complete bleaching of the purple color of the KMnO₄ solution. In these cases, the tester may divide sample run into two or more subruns to insure that the absorbing solution will not be depleted. In cases where an excess water condensation is encountered, collect two runs to make one sample.

7.1.2 Preparation of Sampling Train. The preparation of the sampling train is the same as that given in Method 101, Section 7.1.3, except for the cleaning of the glassware [probe, filter holder (if used),

impingers, and connectors] and the charging of the first three impingers. In this method, clean all the glass components by rinsing with 50 percent HNO₃, tap water, 8 N HCl tap water, and finally deionized distilled water. Then place 50 ml of 4 percent KMnO₄ in the first impinger and 100 ml each of the second and third impingers.

If a filter is used, use a pair of tweezers to place the filter in the filter holder. Be sure to center the filter and place the gaske proper position to prevent the sample stream from by-passing the filter. Check filter for tears after assembly is complete. Be sure also to set the filter heating system at the desired operating temperature at the sampling train has been assembled.

7.1.3 Sampling Train Operation. In addition to the procedure given in Method 101, Section 7.1.5, maintain a temperature around the filter (if applicable) of 120 ± 2°C (248 ± 25° F).

7.2 Sample Recovery. Begin proper cleanup procedure as soon as the probe is moved from the stack at the end of the sampling period. Allow the probe to cool. While it can be safely handled, wipe off any external particulate matter near the tip of probe nozzle and place a cap over it. Do not cap off the probe tip tightly while the sampling train is cooling because the resulting vacuum would draw liquid out from the impingers.

Before moving the sample train to cleanup site, remove the probe from train, wipe off the silicone grease, and the open outlet of the probe. Be careful to lose any condensate that might be present. Wipe off the silicone grease from the impinger. Use either ground-glass spacers, plastic caps, or serum caps to close these openings.

Transfer the probe, impinger assembly, and (if applicable) filter assembly to a clean-up area that is clean, protected from the wind, and free of Hg contamination. The ambient air in laboratories located in the immediate vicinity of Hg-using facilities is not normally free of Hg contamination.

Inspect the train before and during assembly, and note any abnormal conditions. Treat the sample as follows:

7.2.1 Container No. 1 (Impinger, Probe, and Filter Holder). Use a graduated cylinder; measure the liquid in the first three impingers to within ± 1 ml. Record the volume of liquid present (e.g., see Figure 5-3 of Method 5 in Part 60 of 40 CFR). This information is needed to calculate the moisture content of the effluent gas. (Use only graduated cylinder and glass storage bottles that have been precleaned as in Section 7.1.2.) Place the contents of the first three impingers into a 1000-ml glass sample bottle.

(NOTE: If a filter is used, remove the filter from its holder, as outlined under "Container No. 3" below.)

Taking care that dust on the outside of the probe or other exterior surfaces does not get into the sample, quantitatively recover the Hg (and any condensate) from the probe nozzle, probe fitting, probe liner and front half of the filter holder (if applicable) as follows: Rinse these components with a total of 250 to 400 ml of fresh 4 percent KMnO_4 solution; add all washings to the 1000-ml glass sample bottle; remove any residual brown deposits on the glassware using the minimum amount of 8 N HCl required; and add this HCl rinse to this sample container.

After all washings have been collected in the sample container, tighten the lid on the container to prevent leakage during shipment to the laboratory. Mark the height of the fluid level to determine whether leakage occurs during transport. Label the container to clearly identify its contents.

7.2.2. Container No. 2 (Silica Gel). Note the color of the indicating silica gel to determine whether it has been completely spent and make a notation of its condition. Transfer the silica gel from its impinger to its original container and seal. The tester may use as aids a funnel to pour the silica gel and a rubber policeman to remove the silica gel from the impinger. It is not necessary to remove the small amount of particles that may adhere to the impinger wall and are difficult to remove. Since the gain in weight is to be used for moisture calculations, do not use any water or other liquids to transfer the silica gel. If a balance is available in the field, weigh the spent silica gel (or silica gel plus impinger) to the nearest 0.5 g; record this weight.

7.2.3 Container No. 3 (Filter). If a filter was used, carefully remove it from the filter holder, place it in a 100-ml glass sample bottle, and add 20 to 40 ml of 4 percent KMnO_4 . If it is necessary to fold the filter, be sure that the particulate cake is inside the fold. Carefully transfer to the 150-ml sample bottle any particulate matter and filter fibers that adhere to the filter holder gasket by using a dry Nylon bristle brush and a sharp-edged blade. Seal the container. Label the container to clearly identify its contents. Mark the height of the fluid level to determine whether leakage occurs during transport.

7.2.4 Container No. 4 (Filter Blank). If a filter was used, treat an unused filter from the same filter lot used for sampling in the same manner as Container No. 3.

7.2.5 Container No. 5 (Absorbing Solution Blank). For a blank, place 500 ml of 4 percent KMnO_4 absorbing solution in a 1000-ml sample bottle. Seal the container.

7.3 Sample Preparation. Check liquid level in each container to see if liquid was

lost during transport. If a noticeable amount of leakage occurred, either void the sample or use methods subject to the approval of the Administrator to account for the losses. Then follow the procedures below.

7.3.1 Containers No. 3 and No. 4 (Filter and Filter Blank). If a filter was used, place the contents, including the filter, of Containers No. 3 and No. 4 in separate 250-ml beakers and heat the beakers on a steam bath until most of the liquid has evaporated. Do not take to dryness. Add 20 ml of concentrated HNO_3 to the beakers, cover them with a glass, and heat on a hot plate at 70°C for 2 hours. Remove from the hot plate and filter the solution through Whatman No. 40 filter paper. Save the filtrate for Hg analysis. Discard the filter.

7.3.2 Container No. 1 (Impingers, Probe, and Filter Holder). Filter the contents of Container No. 1 through Whatman 40 filter paper to remove the brown MnO_2 precipitate. Wash the filter with 50 ml of 4 percent KMnO_4 absorbing solution and add this wash to the filtrate. Discard the filter. Combine the filtrates from Containers No. 1 and No. 3 (if applicable), and dilute to a known volume with deionized distilled water. Mix thoroughly.

7.3.3 Container No. 5 (Absorbing Solution Blank). Treat this container as described in Section 7.3.2. Combine this filtrate with the filtrate with Container No. 4 and dilute to a known volume with deionized distilled water. Mix thoroughly.

7.4 Analysis. Calibrate the spectrophotometer and recorder and prepare the calibration curve as described in Sections 8.1 and 8.2. Then repeat the procedure used to establish the calibration curve with appropriately sized aliquots (1 to 10 ml) of the samples (from Sections 7.3.2 and 7.3.3) until two consecutive peak heights agree within ± 3 percent of their average value. If the 10-ml sample is below the detectable limit, use a larger aliquot (up to 20 ml), but decrease the volume of water added to the aeration cell accordingly to prevent the solution volume from exceeding the capacity of the aeration bottle. If the peak maximum of a 1.0-ml aliquot is off scale, further dilute the original sample to bring the Hg concentration into the calibration range of the spectrophotometer. If the Hg content of the absorbing solution and filter blank is below the working range of the analytical method, use zero for the blank.

Run a blank and standard at least after every five samples to check the spectrophotometer calibration; recalibrate as necessary.

It is also recommended that at least one sample from each stack test be checked by the Method of Standard Additions to confirm that matrix effects have not interfered in the analysis.

8. Calibration and Standards.—The calibration and standards are the same as Method 101, Section 8, except for the following variations:

8.1 Optical Cell Heating System Calibration. Same as method 101, Section 8.2, except use a 25-ml graduated cylinder to add 25 ml of deionized distilled water to the bottle section of the aeration cell.

8.2 Spectrophotometer and Recorder Calibration. The mercury response may be measured by either peak height or peak area. (NOTE: the temperature of the solution affects the rate at which elemental Hg is released from a solution and, consequently, it

affects the shape of the absorption curve (area) and the point of maximum absorbance (peak height). To obtain reproducible results, all solutions must be brought to room temperature before use.) Set the spectrophotometer wave length at 253.7 nm and make certain the optical cell is at the minimum temperature that will prevent water condensation.

Then set the recorder scale as follows: Using a 25-ml graduated cylinder, add 25 ml of deionized distilled water to the aeration cell bottle and pipet 5.0 ml of the working mercury standard solution into the aeration cell. (NOTE: Always add the Hg-containing solution to the aeration cell after the 25 ml of deionized distilled water.) Place a Teflon-coated stirring bar in the bottle. Add 5 ml of the 4 percent KMnO_4 absorbing solution followed by 5 ml of 15 percent HNO_3 , and 5 ml of 5 percent KMnO_4 to the aeration bottle and mix well. Now, attach the bottle section to the bubbler section of the aeration cell and make certain that (1) the aeration cell exit arm stopcock (Figure 101-3 of Method 101) is closed (so that Hg will not prematurely enter the optical cell when the reducing agent is being added) and (2) there is no flow through the bubbler. Add 5 ml of sodium chloride hydroxylamine in 1-ml increments until the solution is colorless. Now add 5 ml of tin (II) solution to the aeration bottle through the side arm. Stir the solution for 15 seconds, turn on the recorder, open the aeration cell exit arm stopcock, and immediately initiate aeration with continued stirring. Determine the maximum absorbance of the standard and set this value to read 90 percent of the recorder full scale.

9. Calculations—9.1 Dry Gas Volume, Volume of Water Vapor and Moisture Content, Stack Gas Velocity, Isokinetic Variation and Acceptable Results, and Determination of Compliance. Same as Method 101, Sections 9.1, 9.2, 9.3, 9.6, and 9.7, respectively, except use data obtained from this test.

9.2 Total Mercury. For each source sample, correct the average maximum absorbance of the two consecutive samples whose peak heights agreed within ± 3 percent of their average for the contribution of the field blank. Then calculate the total Hg content in μg in each sample. Correct for any dilutions made to bring the sample into the working range of the spectrophotometer.

9.3 Mercury Emission Rate. Calculate the Hg emission rate R in g/day for continuous operations using Equation 101A-1. For cyclic operations, use only the time per day each stack is in operation. The total Hg emission rate from a source will be the summation of results from all stacks.

$$R = K \frac{m_{\text{Hg}} V A (86,400 \times 10^{-9})}{[V_{\text{stack}} + V_{\text{blank}}](T/P)}$$

Eq. 101A-1

Where:

m_{Hg} = Total Hg content in each sample, μg .
 V = Average stack gas velocity, m/sec (fps).
 A = Stack cross-sectional area, m^2 (ft^2).
 $86,400$ = Conversion factor, sec/day.
 10^{-9} = Conversion factor, g/ μg .
 V_{stack} = Dry gas sample volume at standard conditions, corrected for leakage (if any), m^3 (ft^3).

V_{std} = Volume of water vapor at standard conditions, m³ (ft³).

T_s = Absolute average stack gas temperature, °K (°R).

P_s = Absolute stack gas pressure, mm Hg (in. Hg).

K = 0.3858 °K/mm Hg for metric units.
= 17.64 °R/in. Hg for English units.

10. Bibliography. 1. Same as Method 101, Section 10.

2. Mitchell, W. J., M. R. Midgett, J. C. Suggs, and D. Albrinck.

Test Methods to Determine the Mercury Emissions from Sludge Incineration Plants. U.S. Environmental Protection Agency, Research Triangle Park, North Carolina. Publication No. EPA-600/4-79-058. September 1979.

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Determination of Metals Emissions in Exhaust Gases

2.2.9 Quality Assurance (QA)

Proper calibration, maintenance, and operation of the CEMS is the responsibility of the owner or operator. The owner or operator must establish a QA program to evaluate and monitor CEMS performance. As a minimum, the QA program must include:

2.2.9.1 A daily calibration check for each monitor. The calibration must be adjusted if the check indicates the instrument's CD exceeds 1 ppm. The gases shall be injected as close to the probe as possible to provide a check of the entire sampling system. If an alternative calibration procedure is desired (e.g., direct injections or gas cells), subject to Administrator approval, the adequacy of this alternative procedure may be demonstrated during the initial 7-day CD test. Periodic comparisons of the two procedures are suggested.

2.2.9.2 A daily system audit. The audit must include a review of the calibration check data, an inspection of the recording system, an inspection of the control panel warning lights, and an inspection of the sample transport and interface system (e.g., flowmeters, filters), as appropriate.

2.2.9.3 A quarterly CE test. Quarterly RA tests may be substituted for the CE test when approved by the Director on a case-by-case basis.

2.2.9.4 An annual performance specification test.

2.2.10 Alternative Measurement Technique

The regulations allow gas conditioning systems to be used in conjunction with unheated HC CEMs during an interim period. This gas conditioning may include cooling to not less than 40 °F and the use of condensate traps to reduce the moisture content of sample gas entering the FID to less than 2 percent. The gas conditioning system, however, must not allow the sample gas to bubble through the condensate as this would remove water soluble organic compounds. All components upstream of the conditioning system should be heated as described in section 2.2.4 to minimize operating and maintenance problems.

2.2.11 References

1. Measurement of Volatile Organic Compounds-Guideline Series. U.S. Environmental Protection Agency, Research Triangle Park, North Carolina, 27711, EPA-450/2-78-041, June 1978.

2. Traceability Protocol for Establishing True Concentrations of Gases Used for Calibration and Audits of Continuous Source Emission Monitors (Protocol No. 1). U.S. Environmental Protection Agency ORD/EMSL, Research Triangle Park, North Carolina, 27711, June 1978.

3. Gasoline Vapor Emission Laboratory Evaluation-Part 2. U.S. Environmental Protection Agency, OAQPS, Research Triangle Park, North Carolina, 27711, EMB Report No. 76-GAS-6, August 1975.

Section 3.0 SAMPLING AND ANALYTICAL METHODS**3.1 Methodology for the Determination of Metals Emissions in Exhaust Gases from Hazardous Waste Incineration and Similar Combustion Processes****3.1.1 Applicability and Principle**

3.1.1.1 Applicability. This method is being developed for the determination of total chromium (Cr), cadmium (Cd), arsenic (As), nickel (Ni), manganese (Mn), beryllium (Be), copper (Cu), zinc (Zn), lead (Pb), selenium (Se), phosphorus (P), thallium (Tl), silver (Ag), antimony (Sb), barium (Ba), and mercury (Hg) stack emissions from hazardous waste incinerators and similar combustion processes. This method may also be used for the determination of particulate emissions following the procedures and precautions described. Modifications to the sample recovery and analysis procedures described in this protocol for the purpose of determining particulate emissions may potentially impact the front-half mercury determination. Mercury emissions should be determined using EPA method 101A given in 40 CFR part 61.

3.1.1.2 Principle. The stack sample is withdrawn isokinetically from the source, with particulate emissions collected in the probe and on a heated filter and gaseous emissions collected in a series of chilled impingers containing an aqueous solution of dilute nitric acid combined with dilute hydrogen peroxide in each of two impingers, and acidic potassium permanganate solution in each of two impingers. Sampling train components are recovered and digested in separate front- and back-half fractions. Materials collected in the sampling train are digested with acid solutions to dissolve organics and to remove organic constituents that may create analytical interferences. Acid digestion is performed using conventional Parr® Bomb or microwave digestion techniques. The nitric acid and hydrogen

peroxide impinger solution, the acidic potassium permanganate impinger solution, the HCl rinse solution, and the probe rinse and digested filter solutions are analyzed for mercury by cold vapor atomic absorption spectroscopy (CVAAS). The nitric acid and hydrogen peroxide solution and the probe rinse and digested filter solutions of the train catches are analyzed for Cr, Cd, Ni, Mn, Be, Cu, Zn, Pb, Se, P, Tl, Ag, Sb, Ba, and As by inductively coupled argon plasma emission spectroscopy (ICAP) or atomic absorption spectroscopy (AAS). Graphite furnace atomic absorption spectroscopy (GFAAS) is used for analysis of antimony, arsenic, cadmium, lead, selenium, and thallium, if these elements require greater analytical sensitivity than can be obtained by ICAP. Additionally, if desired, the tester may use AAS for analyses of all metals if the resulting in-stack method detection limits meet the goal of the testing program. For convenience, aliquots of each digested sample Fraction 1A plus Fraction 2A can be combined proportionally with respect to the original Fraction 1 (normally diluted to 300 ml following digestion and prior to analysis) section 3.1.5.3.3; and concentrated Fraction 2A (normally diluted to 150 ml following digestion and prior to analysis) section 3.1.5.3.4.1 or 3.1.5.3.4.2 for a single analytical determination. The efficiency of the analytical procedure is quantified by the analysis of spiked quality control samples containing each of the target metals and/or other quality assurance measures, as necessary, including actual sample matrix effects checks.

3.1.2 Range, Sensitivity, Precision, and Interferences

3.1.2.1 Range. For the analyses described in this methodology and for similar analyses, the ICAP response is linear over several orders of magnitude. Samples containing metal concentrations in the nanograms per milliliter (ng/ml) to micrograms per milliliter (µg/ml) range in the analytical finish solution can be analyzed using this technique. Samples containing greater than approximately 50 µg/ml of chromium, lead, or arsenic should be diluted to that level or lower for final analysis. Samples containing greater than approximately 20 µg/ml of cadmium should be diluted to that level before analysis.

3.1.2.2 Analytical Sensitivity. ICAP analytical detection limits for the sample solutions (based on SW-846, method 6010) are approximately as follows: Sb (32 ng/ml), As (53 ng/ml), Ba (2 ng/ml), Be (0.3 ng/ml), Cd (4 ng/ml), Cr (7 ng/ml), Cu (6 ng/ml), Pb

(42 ng/ml), Mn (2 ng/ml), Ni (15 ng/ml), P (75 ng/ml), Se (75 ng/ml), Ag (7 ng/ml), Tl (40 ng/ml), and Zn (2 ng/ml). The actual method detection limits are sample dependent and may vary as the sample matrix may affect the limits. The analytical detection limits for analysis by direct aspiration AAS (based on SW-846, Method 7000 series) are approximately as follows: Sb (200 ng/ml), As (2 ng/ml), Ba (100 ng/ml), Be (5 ng/ml), Cd (5 ng/ml), Cr (50 ng/ml), Cu (20 ng/ml), Pb (100 ng/ml), Mn (10 ng/ml), Ni (40 ng/ml), Se (2 ng/ml), Ag (10 ng/ml), Tl (100 ng/ml), and Zn (5 ng/ml). The detection limit for mercury by CVAAS is approximately 0.2 ng/ml. The use of GFAAS can give added sensitivity compared to the use of direct aspiration AAS for the following metals: Sb (3 ng/ml), As (1 ng/ml), Be (0.2 ng/ml), Cd (0.1 ng/ml), Cr (1 ng/ml), Pb (1 ng/ml), Se (2 ng/ml), and Tl (1 ng/ml).

Using (1) the procedures described in this method, (2) the analytical detection limits described in the previous paragraph, (3) a volume of 300 ml, Fraction 1, for the front half and 150 ml, Fraction 2A, for the back-half samples, and (4) a stack gas sample volume of 1.25 m³, the corresponding instack method detection limits are presented in Table A-1 and calculated as shown:

$$\frac{A \times B}{C} = D$$

where:

A = analytical detection limit, $\mu\text{g/ml}$.

B = volume of sample prior to aliquot for analysis, ml.

C = stack sample volume, dscm (dsm³).

D = in-stack detection limit, $\mu\text{g/m}^3$.

Values in Table 3.1-1 are calculated for the front and back half and/or the total train.

To ensure optimum sensitivity in obtaining the measurements, the concentrations of target metals in the solutions are suggested to be at least ten times the analytical detection limits. Under certain conditions, and with greater care in the analytical procedure, this concentration can be as low as approximately three times the analytical detection limit. In all cases, on at least one sample (run) in the source test and for each metal analyzed, repetitive analyses, method of standard additions (MSA), serial dilution, or matrix spike addition, etc., shall be used to establish the quality of the data.

Actual in-stack method detection limits will be determined based on actual source sampling parameters and analytical results as described above. If required, the method in-stack detection limits can be made more sensitive than those shown in Table A-1 for a specific test by using one or more of the following options:

- A 1-hour sampling run may collect a stack gas sampling volume of about 1.25 m³. If the sampling time is increased and 5 m³ are collected, the in-stack method detection limits would be one fourth of the values

shown in Table A-1 (this means that with this change, the method is four times more sensitive than a 1-hour run. Larger sample volumes (longer runs) would make it even more sensitive).

- The in-stack detection limits assume that all of the sample is digested (with exception of the aliquot for mercury) and the final liquid volumes for analysis are 300 ml, Fraction 1 for the front half and 150 ml, Fraction 2A, for the back-half sample. If the front-half volume is reduced from 300 ml to 30 ml, the front-half in-stack detection limits would be one tenth of the values shown above (ten times more sensitive). If the back-half volume is reduced from 150 ml to 25 ml, the in-stack detection limits would be one sixth of the above values. Matrix effects checks are necessary on analyses of samples and typically are of greater significance for samples that have been concentrated to less than the normal original sample volume. Reduction to a volume of less than 25 ml may not allow redissolving of the residue and may increase interference by other compounds.

- When both of the above two improvements are used on one sample at the same time, the resultant improvements are multiplicative. For example, where stack gas volume is increased by a factor of five and the total liquid sample digested volume of both the front and back halves is reduced by a factor of six, the in-stack method detection limit is reduced by a factor of thirty (the method is thirty times more sensitive).

TABLE 3. 1-1—IN-STACK METHOD DETECTION LIMITS (ug/m³) FOR TRAIN FRACTIONS USING ICAP AND AAS

Metal	Front-half fraction 1 probe and filter	Back-half fraction 2 impingers 1-3	Back-half fractions "Hg, only" impingers 4-6	Total train
Antimony	7.7 (0.7)*	3.8 (0.4)*		11.5 (1.1)*
Arsenic	12.7 (0.3)*	6.4 (0.1)*		19.1 (0.4)*
Barium	0.5	0.3		0.8
Beryllium	0.07 (0.05)*	0.04 (0.03)*		0.11 (0.08)*
Cadmium	1.0 (0.02)*	0.5 (0.01)*		1.5 (0.03)*
Chromium	1.7 (0.2)*	0.8 (0.1)*		2.5 (0.3)*
Copper	1.4	0.7		2.1
Lead	10.1 (0.2)*	5.0 (0.1)*		15.1 (0.3)*
Manganese	0.5 (0.2)*	0.2 (0.1)*		0.7 (0.3)*
Mercury	0.6**	3.0**	2.0**	5.6**
Nickel	3.8	1.8		5.4
Phosphorus	18	9		27
Selenium	18 (0.5)*	9 (0.3)*		27 (0.8)*
Silver	1.7	0.9		2.6
Thallium	9.6 (0.2)*	4.8 (0.1)*		14.4 (0.3)*
Zinc	0.5	0.3		0.8

(*) * Detection limit when analyzed by GFAAS.

(**) Detection limit when analyzed by CVAAS, estimated for Back Half and Total Train.

NOTE: Actual method in-stack detection limits will be determined based on actual source sampling parameters and analytical results as described earlier in this section.

• Conversely, reducing stack gas sample volume and increasing sample liquid volume will increase in-stack detection limits (the method would then be less sensitive). The front-half and back-half samples (Fractions 1A plus and 2A) can be combined proportionally (see section 3.1.1.2 of this methodology) prior to analysis. The resultant liquid volume (excluding the mercury fractions, which must be analyzed separately) is recorded. Combining the sample as described does not allow determination (whether front or back half) of where in the train the sample was captured. The in-stack method detection limit then becomes a single value for all metals except mercury, for which the contribution of the mercury fractions must be considered.

• The above discussion assumes no blank correction. Blank corrections are discussed later in this method.

3.1.2.3 Precision. The precisions (relative standard deviation) for each metal detected in a method development test at a sewage sludge incinerator, are as follows: Sb (12.7%), As (13.5%), Ba (20.6%), Cd (11.5%), Cr (11.2%), Cu (11.5%), Pb (11.6%), P (14.6%), Se (15.3%), Ti (12.3%), and Zn (11.8%). The precision for nickel was 7.7% for another test conducted at a source simulator. Beryllium, manganese, and silver were not detected in the tests; however, based on the analytical sensitivity of the ICAP for these metals, it is assumed that their precisions should be similar to those for the other metals, when detected at similar levels.

3.1.2.4 Interferences. Iron can be a spectral interference during the analysis of arsenic, chromium, and cadmium by ICAP. Aluminum can be a spectral interference during the analysis of arsenic and lead by ICAP. Generally, these interferences can be

reduced by diluting the sample, but this increases the method detection limit (in-stack detection limit). Refer to EPA method 6010 (SW-846) or the other analytical methods used for details on potential interferences for this method. The analyst must eliminate or reduce interferences to acceptable levels. For all GFAAS analyses, matrix modifiers should be used to limit interferences, and standards should be matrix matched.

3.1.3 Apparatus

3.1.3.1 Sampling Train. A schematic of the sampling train is shown in Figure 3.1-1. It is similar to the 40 CFR part 60, appendix A method 5 train. The sampling train consists of the following components:

3.1.3.1.1 Probe Nozzle (Probe Tip) and Borosilicate or Quartz Glass Probe Liner. Same as method 5, sections 2.1.1 and 2.1.2, except that glass nozzles are required unless an alternate probe tip prevents the possibility of contamination or interference of the sample with its materials of construction. If a probe tip other than glass is used, no correction (because of any effect on the sample by the probe tip) of the stack sample test results can be made.

3.1.3.1.2 Pitot Tube and Differential Pressure Gauge. Same as method 2, sections 2.1 and 2.2, respectively.

3.1.3.1.3 Filter Holder. Glass, same as method 5, section 2.1.5, except that a Teflon filter support or other non-metallic, non-contaminating support must be used to replace the glass frit.

3.1.3.1.4 Filter Heating System. Same as method 5, section 2.1.6.

3.1.3.1.5 Condenser. The following system shall be used for the condensation and

collection of gaseous metals and for determining the moisture content of the stack gas. The condensing system should consist of four to seven impingers connected in series with leak-free ground glass fittings or other leak-free, non-contaminating fittings. The first impinger is optional and is recommended as a moisture knockout trap for use during test conditions which require such a trap. The first impinger shall be appropriately-sized, if necessary, for an expected large moisture catch and generally constructed as described for the first impinger in method 5, paragraph 2.1.7. The second impinger (or the first HNO₃/H₂O₂ impinger) shall also be constructed as described for the first impinger in method 5. The third impinger (or the second HNO₃/H₂O₂ impinger) shall be the same as the Greenburg Smith impinger with the standard tip described as the second impinger in method 5, paragraph 2.1.7. All other impingers used in the methods train are the same as the first HNO₃/H₂O₂ impinger described in this paragraph. In summary, the first impinger which may be optional as described in this methodology shall be empty, the second and third shall contain known quantities of a nitric acid/hydrogen peroxide solution (section 3.1.4.2.1), the fourth shall be empty, the fifth and sixth shall contain a known quantity of acidic potassium permanganate solution (section 3.1.4.2.2), and the last impinger shall contain a known quantity of silica gel. A thermometer capable of measuring to within 1°C (2°F) shall be placed at the outlet of the last impinger. When the moisture knockout impinger is not needed, it is removed from the train and the other impingers remain the same. If mercury analysis is not to be performed, the potassium permanganate impingers and the empty impinger preceding them are removed.

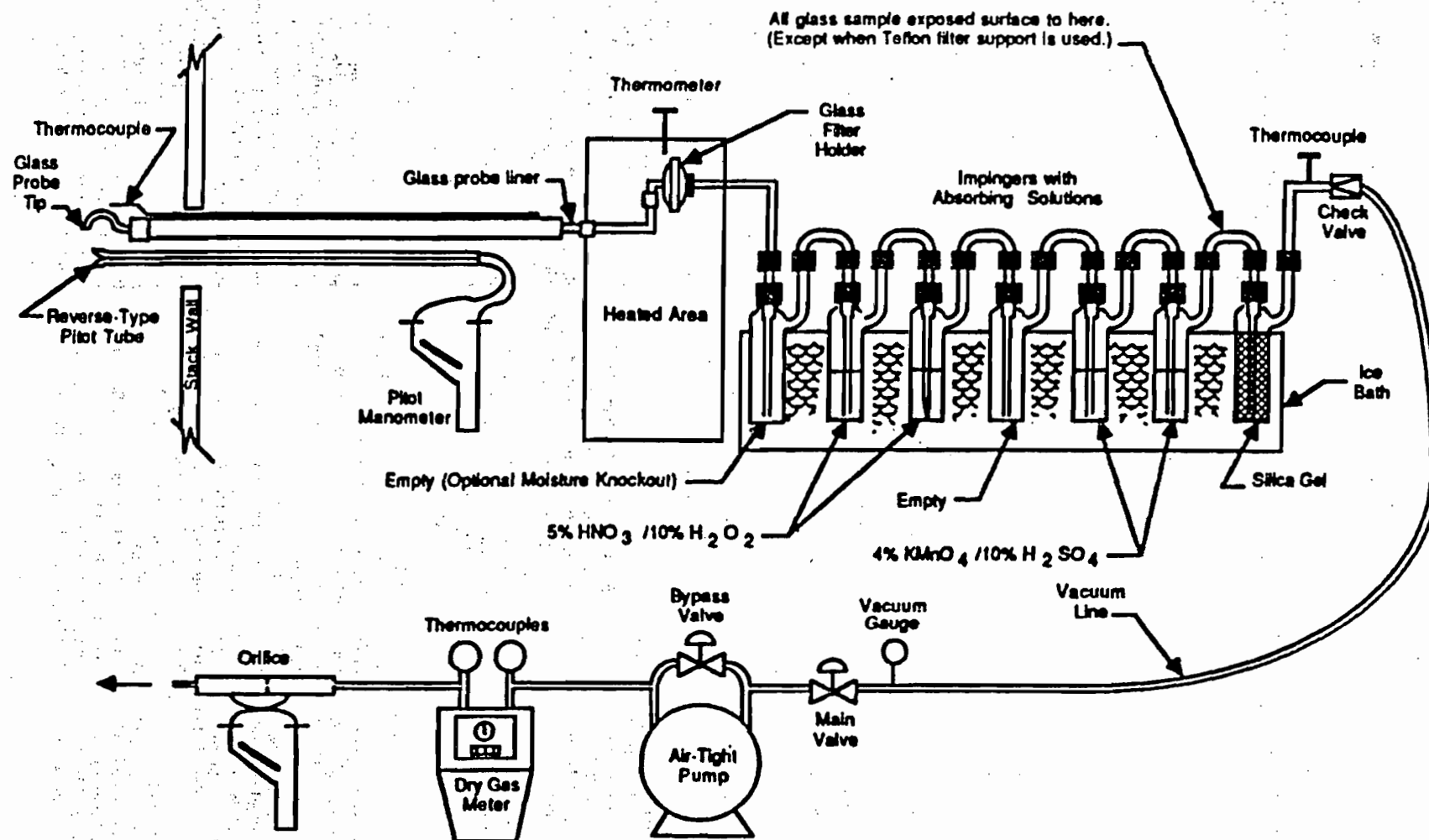


Figure 3.1-1 Schematic of multiple metals sampling train configuration.

3.1.3.1.8 Metering System, Barometer, and Gas Density Determination Equipment. Same as method 5, sections 2.1.8 through 2.1.10, respectively.

3.1.3.1.7 Teflon Tape. For capping openings and sealing connections, if necessary, on the sampling train.

3.1.3.2 Sample Recovery. Same as method 5, sections 2.2.1 through 2.2.8 (Nonmetallic Probe-Liner and Probe-Nozzle Brushes or Swabs, Wash Bottles, Sample Storage Containers, Petri Dishes, Glass Graduated Cylinder, Plastic Storage Containers, Funnel and Rubber Policeman, and Glass Funnel), respectively, with the following exceptions and additions:

3.1.3.2.1 Nonmetallic Probe-Liner and Probe-Nozzle Brushes or Swabs. For quantitative recovery of materials collected in the front half of the sampling train: Description of acceptable all-Teflon component brushes or swabs is to be included in EPA's Emission Measurement Technical Information Center (EMTIC) files.

3.1.3.2.2 Sample Storage Containers. Glass bottles with Teflon-lined caps which are non-reactive to the oxidizing solutions, with a capacity of 1000- and 500-ml, shall be used for KMnO_4 -containing samples and blanks. Polyethylene bottles may be used for other sample types.

3.1.3.2.3 Graduated Cylinder. Glass or equivalent.

3.1.3.2.4 Funnel. Glass or equivalent.

3.1.3.2.5 Labels. For identification of samples.

3.1.3.2.6 Polypropylene Tweezers and/or Plastic Gloves. For recovery of the filter from the sampling train filter holder.

3.1.3.3 Sample Preparation and Analysis. For the analysis, the following equipment is needed:

3.1.3.3.1 Volumetric Flasks, 100-ml, 250-ml, and 1000-ml. For preparation of standards and sample dilution.

3.1.3.3.2 Graduated Cylinders. For preparation of reagents.

3.1.3.3.3 Parr® Bombs or Microwave Pressure Relief Vessels with Capping Station (GEM Corporation model or equivalent).

3.1.3.3.4 Beakers and Watchglasses. 250-ml beakers for sample digestion with watchglasses to cover the tops.

3.1.3.3.5 Ring Stands and Clamps. For securing equipment such as filtration apparatus.

3.1.3.3.6 Filter Funnels. For holding filter paper.

3.1.3.3.7 Whatman 541 Filter Paper (or equivalent). For filtration of digested samples.

3.1.3.3.8 Disposable Pasteur Pipets and Bulbs.

3.1.3.3.9 Volumetric Pipets.

3.1.3.3.10 Analytical Balance. Accurate to within 0.1 mg.

3.1.3.3.11 Microwave or Conventional Oven. For heating samples at fixed power levels or temperatures.

3.1.3.3.12 Hot Plates.

3.1.3.3.13 Atomic Absorption Spectrometer (AAS). Equipped with a background corrector.

3.1.3.3.14 Graphite Furnace Attachment. With antimony, arsenic, cadmium, lead,

selenium, thallium hollow cathode lamps (HCLs) or electrodeless discharge lamps (EDLs). (Same as EPA SW-846 methods 7041 (antimony), 7060 (arsenic), 7131 (cadmium), 7421 (lead), 7740 (selenium), and 7841 (thallium).)

3.1.3.3.13.2 Cold Vapor Mercury Attachment. With a mercury HCL or EDL. The equipment needed for the cold vapor mercury attachment includes an air recirculation pump, a quartz cell, an aerator apparatus, and a heat lamp or desiccator tube. The heat lamp should be capable of raising the ambient temperature at the quartz cell by 10 °C such that no condensation forms on the wall of the quartz cell. (Same as EPA method 7470.)

3.1.3.3.14 Inductively Coupled Argon Plasma Spectrometer. With either a direct or sequential reader and an alumina torch. (Same as EPA method 8010.)

3.1.4 Reagents

The complexity of this methodology is such that to obtain reliable results, the testers (including analysts) should be experienced and knowledgeable in source sampling, in handling and preparing (including mixing) reagents as described, and using adequate safety procedures and protective equipment in performing this method, including sampling, mixing reagents, digestions, and analyses. Unless otherwise indicated, it is intended that all reagents conform to the specifications established by the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available; otherwise, use the best available grade.

3.1.4.1 Sampling. The reagents used in sampling are as follows:

3.1.4.1.1 Filters. The filters shall contain less than 1.3 $\mu\text{g}/\text{in}^2$ of each of the metals to be measured. Analytical results provided by filter manufacturers are acceptable. However, if no such results are available, filter blanks must be analyzed for each target metal prior to emission testing. Quartz fiber or glass fiber (which meet the requirement of containing less than 1.3 $\mu\text{g}/\text{in}^2$ of each metal) filters without organic binders shall be used. The filters should exhibit at least 99.95 percent efficiency (<0.05 percent penetration) on 0.3 micron dioctyl phthalate smoke particles. The filter efficiency test shall be conducted in accordance with ASTM Standard Method D2986-71 (incorporated by reference). For particulate determination in sources containing SO_2 or SO_3 , the filter material must be of a type that is unreactive to SO_2 or SO_3 , as described in EPA method 5. Quartz fiber filters meeting these requirements are recommended for use in this method.

3.1.4.1.2 Water. To conform to ASTM Specification D193.77, Type II (incorporated by reference). If necessary, analyze the water for all target metals prior to field use. All target metal concentrations should be less than 1 ng/ml.

3.1.4.1.3 Nitric Acid, Concentrated. Baker Insta-analyzed or equivalent.

3.1.4.1.4 Hydrochloric Acid, Concentrated. Baker Insta-analyzed or equivalent.

3.1.4.1.5 Hydrogen Peroxide, 30 Percent (V/V).

3.1.4.1.6 Potassium Permanganate.

3.1.4.1.7 Sulfuric Acid, Concentrated.

3.1.4.1.8 Silica Gel and Crushed Ice. Same as method 5, sections 3.1.2 and 3.1.4, respectively.

3.1.4.2 Pretest Preparation for Sampling Reagents.

3.1.4.2.1 Nitric Acid (HNO_3)/Hydrogen Peroxide (H_2O_2) Absorbing Solution, 5 Percent HNO_3 /10 Percent H_2O_2 . Carefully with stirring, add 50 ml of concentrated HNO_3 to a 1000-ml volumetric flask containing approximately 500 ml of water, and then, carefully with stirring, add 333 ml of 30 percent H_2O_2 . Dilute to volume (1000 ml) with water. Mix well. The reagent shall contain less than 2 ng/ml of each target metal.

3.1.4.2.2 Acidic Potassium Permanganate (KMnO_4) Absorbing Solution, 4 Percent KMnO_4 (W/V), 10 Percent H_2SO_4 (V/V). Prepare fresh daily. Mix carefully, with stirring, 100 ml of concentrated H_2SO_4 into 800 ml of water, and add water with stirring to make a volume of 1 L. This solution is 10 percent H_2SO_4 (V/V). Dissolve, with stirring, 40 g of KMnO_4 into 10 percent H_2SO_4 (V/V) and add 10 percent H_2SO_4 (V/V) with stirring to make a volume of 1 L: this is the acidic potassium permanganate absorbing solution. Prepare and store in glass bottles to prevent degradation. The reagent shall contain less than 2 ng/ml of Hg.

Precaution: To prevent autocatalytic decomposition of the permanganate solution, filter the solution through Whatman 541 filter paper. Also, due to the potential reaction of the potassium permanganate with the acid, there may be pressure buildup in the sample storage bottle; these bottles shall not be fully filled and shall be vented both to relieve potential excess pressure and prevent explosion due to pressure buildup. Venting is required, but should not allow contamination of the sample; a No. 70-72 hole drilled in the container cap and Teflon liner has been used.

3.1.4.2.3 Nitric Acid, 0.1 N. With stirring, add 6.3 ml of concentrated HNO_3 (70 percent) to a flask containing approximately 900 ml of water. Dilute to 1000 ml with water. Mix well. The reagent shall contain less than 2 ng/ml of each target metal.

3.1.4.2.4 Hydrochloric Acid (HCl), 8 N. Make the desired volume of 8 N HCl in the following proportions. Carefully with stirring, add 690 ml of concentrated HCl to a flask containing 250 ml of water. Dilute to 1000 ml with water. Mix well. The reagent shall contain less than 2 ng/ml of Hg.

3.1.4.3 Glassware Cleaning Reagents.

3.1.4.3.1 Nitric Acid, Concentrated. Fisher ACS grade or equivalent.

3.1.4.3.2 Water. To conform to ASTM Specifications D1193-77, Type II.

3.1.4.3.3 Nitric Acid, 10 Percent (V/V). With stirring, add 500 ml of concentrated HNO_3 to a flask containing approximately 4000 ml of water. Dilute to 5000 ml with water. Mix well. Reagent shall contain less than 2 ng/ml of each target metal.

3.1.4.4 Sample Digestion and Analysis Reagents.

3.1.4.4.1 Hydrochloric Acid, Concentrated.

3.1.4.4.2 Hydrofluoric Acid, Concentrated.

3.1.4.4.3 Nitric Acid, Concentrated. Baker Insta-analyzed or equivalent.

3.1.4.4.4 Nitric Acid, 50 Percent (V/V). With stirring, add 125 ml of concentrated HNO_3 to 100 ml of water. Dilute to 250 ml with water. Mix well. Reagent shall contain less than 2 ng/ml of each target metal.

3.1.4.4.5 Nitric Acid, 5 Percent (V/V). With stirring, add 50 ml of concentrated HNO_3 to 800 ml of water. Dilute to 1000 ml with water. Mix well. Reagent shall contain less than 2 ng/ml of each target metal.

3.1.4.4.6 Water. To conform to ASTM Specifications D1193-77, Type II.

3.1.4.4.7 Hydroxylamine Hydrochloride and Sodium Chloride Solution. See EPA method 7470 for preparation.

3.1.4.4.8 Stannous Chloride. See method 7470.

3.1.4.4.9 Potassium Permanganate, 5 Percent (W/V). See method 7470.

3.1.4.4.10 Sulfuric Acid, Concentrated.

3.1.4.4.11 Nitric Acid, 50 Percent (V/V).

3.1.4.4.12 Potassium Persulfate, 5 Percent (W/V). See Method 7470.

3.1.4.4.13 Nickel Nitrate, $\text{Ni}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$.

3.1.4.4.14 Lanthanum, Oxide, La_2O_3 .

3.1.4.4.15 AAS Grade Hg Standard, 1000 $\mu\text{g}/\text{ml}$.

3.1.4.4.16 AAS Grade Pb Standard, 1000 $\mu\text{g}/\text{ml}$.

3.1.4.4.17 AAS Grade As Standard, 1000 $\mu\text{g}/\text{ml}$.

3.1.4.4.18 AAS Grade Cd Standard, 1000 $\mu\text{g}/\text{ml}$.

3.1.4.4.19 AAS Grade Cr Standard, 1000 $\mu\text{g}/\text{ml}$.

3.1.4.4.20 AAS Grade Sb Standard, 1000 $\mu\text{g}/\text{ml}$.

3.1.4.4.21 AAS Grade Ba Standard, 1000 $\mu\text{g}/\text{ml}$.

3.1.4.4.22 AAS Grade Be Standard, 1000 $\mu\text{g}/\text{ml}$.

3.1.4.4.23 AAS Grade Cu Standard, 1000 $\mu\text{g}/\text{ml}$.

3.1.4.4.24 AAS Grade Mn Standard, 1000 $\mu\text{g}/\text{ml}$.

3.1.4.4.25 AAS Grade Ni Standard, 1000 $\mu\text{g}/\text{ml}$.

3.1.4.4.26 AAS Grade P Standard, 1000 $\mu\text{g}/\text{ml}$.

3.1.4.4.27 AAS Grade Se Standard, 1000 $\mu\text{g}/\text{ml}$.

3.1.4.4.28 AAS Grade Ag Standard, 1000 $\mu\text{g}/\text{ml}$.

3.1.4.4.29 AAS Grade Tl Standard, 1000 $\mu\text{g}/\text{ml}$.

3.1.4.4.30 AAS Grade Zn Standard, 1000 $\mu\text{g}/\text{ml}$.

3.1.4.4.31 AAS Grade Al Standard, 1000 $\mu\text{g}/\text{ml}$.

3.1.4.4.32 AAS Grade Fe Standard, 1000 $\mu\text{g}/\text{ml}$.

3.1.4.4.33 The metals standards may also be made from solid chemicals as described in EPA Method 200.7, EPA SW-846 Method 7470 or Standard Methods for the Analysis of Water and Wastewater, 15th Edition. Method 303F should be referred to for additional information on mercury standards.

3.1.4.4.34 Mercury Standards and Quality Control Samples. Prepare fresh weekly a 10 $\mu\text{g}/\text{ml}$ intermediate mercury standard by adding 5 ml of 1000 $\mu\text{g}/\text{ml}$ mercury stock solution to a 500-ml volumetric flask; dilute with stirring to 500 ml by first carefully adding 20 ml of 15 percent HNO_3 and then adding water to the 500-ml volume. Mix well.

Prepare a 200 ng/ml working mercury standard solution fresh daily: Add 5 ml of the 10 $\mu\text{g}/\text{ml}$ intermediate standard to a 250-ml volumetric flask and dilute to 250 ml with 5 ml of 4 percent KMnO_4 , 5 ml of 15 percent HNO_3 , and then water. Mix well. At least six separate aliquots of the working mercury standard solution should be used to prepare the standard curve. These aliquots should contain 0.0, 1.0, 2.0, 3.0, 4.0, and 5.0 ml of the working standard solution containing 0, 200, 400, 600, 800, and 1000 ng mercury, respectively. Quality control samples should be prepared by making a separate 10 $\mu\text{g}/\text{ml}$ standard and diluting until in the range of the calibration.

3.1.4.4.35 ICAP Standards and Quality Control Samples. Calibration standards for ICAP analysis can be combined into four different mixed standard solutions as shown below.

MIXED STANDARD SOLUTIONS FOR ICAP ANALYSIS

Solution	Elements
I. _____	As, Ba, Cd, Mn, Pb, Se, Zn.
II. _____	Ba, Cu, Fe.
III. _____	Al, Cr, Ni.
IV. _____	Ag, P, Sb, Tl.

Prepare these standards by combining and diluting the appropriate volumes of the 1000 $\mu\text{g}/\text{ml}$ solutions with 5 percent nitric acid. A minimum of one standard and a blank can be used to form each calibration curve. However, a separate quality control sample spiked with known amounts of the target metals in quantities in the midrange of the calibration curve should be prepared. Suggested standard levels are 25 $\mu\text{g}/\text{ml}$ for Al, Cr, and Pb, 15 $\mu\text{g}/\text{ml}$ for Fe, and 10 $\mu\text{g}/\text{ml}$ for the remaining elements. Standards containing less than 1 $\mu\text{g}/\text{ml}$ of metal should be prepared daily. Standards containing greater than 1 $\mu\text{g}/\text{ml}$ of metal should be stable for a minimum of 1 to 2 weeks.

3.1.4.4.36 Graphite Furnace AAS Standards. Antimony, arsenic, cadmium, lead, selenium, and thallium. Prepare a 10 $\mu\text{g}/\text{ml}$ standard by adding 1 ml of 1000 $\mu\text{g}/\text{ml}$ standard to a 100-ml volumetric flask. Dilute with stirring to 100 ml with 10 percent nitric acid. For graphite furnace AAS, the standards must be matrix matched. Prepare a 100 ng/ml standard by adding 1 ml of the 10 $\mu\text{g}/\text{ml}$ standard to a 110-ml volumetric flask and dilute to 100 ml with the appropriate matrix solution. Other standards should be prepared by dilution of the 100 ng/ml standards. At least five standards should be used to make up the standard curve. Suggested levels are 0, 10, 50, 75, and 100 ng/ml. Quality control samples should be prepared by making a separate 10 $\mu\text{g}/\text{ml}$ standard and diluting until it is in the range of the samples. Standards containing less than 1 $\mu\text{g}/\text{ml}$ of metal should be prepared daily. Standards containing greater than 1 $\mu\text{g}/\text{ml}$ of metal should be stable for a minimum of 1 to 2 weeks.

3.1.4.4.3 Matrix Modifiers.

3.1.4.4.37.1 Nickel Nitrate, 1 Percent (V/V). Dissolve 4.956 g of $\text{Ni}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$ in

approximately 50 ml of water in a 100-ml volumetric flask. Dilute to 100 ml with water.

3.1.4.4.37.2 Nickel Nitrate, 0.1 Percent (V/V). Dilute 10 ml of the 1 percent nickel nitrate solution from section 4.4.37.1 above to 100 ml with water. Inject an equal amount of sample and this modifier into the graphite furnace during AAS analysis for As.

3.1.4.4.37.3 Lanthanum. Carefully dissolve 0.5864 g of La_2O_3 in 10 ml of concentrated HNO_3 and dilute the solution by adding it with stirring to approximately 50 ml of water, and then dilute to 100 ml with water. Mix well. Inject an equal amount of sample and this modifier into the graphite furnace during AAS analysis for Pb.

3.1.5 Procedure

3.1.5.1 Sampling. The complexity of this method is such that, to obtain reliable results, testers and analysts should be trained and experienced with the test procedures, including source sampling, reagent preparation and handling, sample handling, analytical calculations, reporting, and descriptions specifically at the beginning of and throughout section 3.1.4 and all other sections of this methodology.

3.1.5.1.1 Pretest Preparation. Follow the same general procedure given in method 5, section 4.1.1, except that, unless particulate emissions are to be determined, the filter need not be desiccated or weighed. All sampling train glassware should first be rinsed with hot tap water and then washed in hot soapy water. Next, glassware should be rinsed three times with tap water, followed by three additional rinses with water. All glassware should then be soaked in a 10 percent (V/V) nitric acid solution for a minimum of 4 hours, rinsed three times with water, rinsed a final time with acetone, and allowed to air dry. All glassware openings where contamination can occur should be covered until the sampling train is assembled for sampling.

3.1.5.1.2 Preliminary Determinations.

Same as method 5, section 4.1.2.

3.1.5.1.3 Preparation of Sampling Train. Follow the same general procedures given in method 5, section 4.1.3, except place 100 ml of the nitric acid/hydrogen peroxide solution (section 3.1.4.2.1) in each of the two $\text{HNO}_3/\text{H}_2\text{O}_2$ impingers as shown in Figure 3.1-1 (normally the second and third impingers), place 100 ml of the acidic potassium permanganate absorbing solution (section 3.1.4.2.2) in each of the two permanganate impingers as shown in Figure A-1, and transfer approximately 200 to 300 g of preweighed silica gel from its container to the last impinger. Alternatively, the silica gel may be weighed directly in the impinger just prior to train assembly.

Several options are available to the tester based on the sampling requirements and conditions. The use of an empty first impinger can be eliminated if the moisture to be collected in the impingers will be less than approximately 100 ml. If necessary, use as applicable to this methodology the procedure described in section 7.1.1 of EPA method 101A, 40 CFR part 61, appendix B, to maintain the desired color in the last permanganate impinger.

Retain for reagent blanks volumes of the nitric acid/hydrogen peroxide solution per section 3.1.5.2.9 of this method and of the acidic potassium permanganate solution per section 3.1.5.2.10. These reagent blanks should be labeled and analyzed as described in section 3.1.7. Set up the sampling train as shown in Figure 3.1-1, or if mercury analysis is not to be performed in the train, then it should be modified by removing the two permanganate impingers and the impinger preceding the permanganate impingers. If necessary to ensure leak-free sampling train connections and prevent contamination Teflon tape or other non-contaminating material should be used instead of silicone grease.

Precaution: Extreme care should be taken to prevent contamination within the train. Prevent the mercury collection reagent (acidic potassium permanganate) from contacting any glassware of the train which is washed and analyzed for Mn. Prevent hydrogen peroxide from mixing with the acidic potassium permanganate.

Mercury emissions can be measured, alternatively, in a separate train which measures only mercury emissions by using EPA method 101A with the modifications described below (and with the further modification that the permanganate containers shall be processed as described in the precaution in section 3.1.4.2.2 and the note in section 3.1.5.2.5 of this methodology). This alternative method is applicable for measurement of mercury emissions, and it may be of special interest to sources which must measure both mercury and manganese emissions.

Section 7.2.1 of method 101A shall be modified as follows after the 250 to 400-ml KMnO_4 rinse:

To remove any precipitated material and any residual brown deposits on the glassware following the permanganate rinse, rinse with approximately 100 ml of deionized distilled water, and add this water rinse carefully assuring transfer of all loose precipitated materials from the three permanganate impingers into the permanganate Container No. 1. If no visible deposits remain after this water rinse, do not rinse with 8 N HCl. However, if deposits do remain on the glassware after this water rinse, wash the impinger surfaces with 25 ml of 8 N HCl, and place the wash in a separate sample container labeled Container No. 1.A. containing 200 ml of water as follows. Place 200 ml of water in a sample container labeled

Container No. 1.A. Wash the impinger walls and stem with the HCl by turning the impinger on its side and rotating it so that the HCl contacts all inside surfaces. Use a total of only 25 ml of 8 N HCl for rinsing *all permanganate impingers combined*. Rinse the first impinger, then pour the actual rinse used for the first impinger into the second impinger for its rinse, etc. Finally, pour the 25 ml of 8 N HCl rinse carefully with stirring into Container No. 1.A. Analyze the HCl rinse separately by carefully diluting with stirring the contents of Container No. 1.A. to 500 ml with deionized distilled water. Filter (if necessary) through Whatman 40 filter paper, and then analyze for mercury according to section 7.4, except limit the aliquot size to a maximum of 10 ml. Prepare and analyze a water diluted blank 8 N HCl sample by using the same procedure as that used by Container No. 1.A., except add 5 ml of 8 N HCl with stirring to 40 ml of water, and then dilute to 100 ml with water. Then analyze as instructed for the sample from Container No. 1.A. Because the previous separate permanganate solution rinse (section 7.2.1) and water rinse (as modified in these guidelines) have the capability to recover a very high percentage of the mercury from the permanganate impingers, the amount of mercury in the HCl rinse in Container No. 1.A. may be very small, possibly even insignificantly small. However, add the total of any mercury analyzed and calculated for the HCl rinse sample Container No. 1.A. to that calculated from the mercury sample from section 7.3.2 which contains the separate permanganate rinse (and water rinse as modified herein) for calculation of the total sample mercury concentration.

3.1.5.1.4 Leak-Check Procedures. Follow the leak-check procedures given in method 5, section 4.1.4.1 (Pretest Leak-Check), section 4.1.4.2 (Leak-Checks During the Sample Run), and section 4.1.4.3 (Post-Test Leak-Checks).

3.1.5.1.5 Sampling Train Operation. Follow the procedures given in method 5, section 4.1.5. For each run, record the data required on a data sheet such as the one shown in Figure 5-2 of method 5.

3.1.5.1.6 Calculation of Percent Isokinetic. Same as method 5, section 4.1.6.

3.1.5.2 Sample Recovery. Begin cleanup procedures as soon as the probe is removed from the stack at the end of a sampling period.

The probe should be allowed to cool prior to sample recovery. When it can be safely handled, wipe off all external particulate

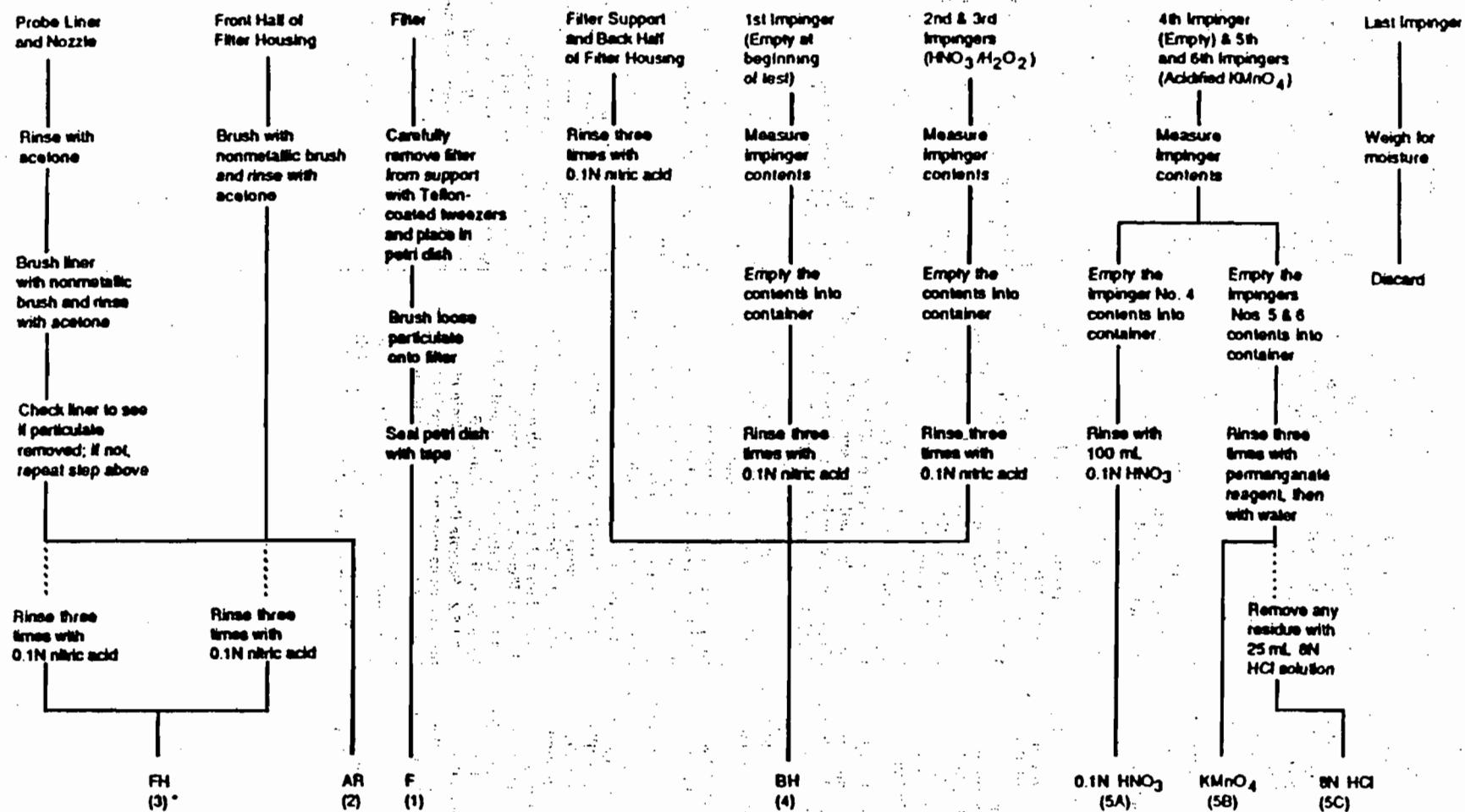
matter near the tip of the probe nozzle and place a rinsed, non-contaminating cap over the probe nozzle to prevent losing or gaining particulate matter. Do not cap the probe tip tightly while the sampling train is cooling. This normally causes a vacuum to form in the filter holder, thus causing the undesired result of drawing liquid from the impingers into the filter.

Before moving the sampling train to the cleanup site, remove the probe from the sampling train and cap the open outlet. Be careful not to lose any condensate that might be present. Cap the filter inlet where the probe was fastened. Remove the umbilical cord from the last impinger and cap the impinger. Cap off the filter holder outlet and impinger inlet. Use noncontaminating caps, whether ground-glass stoppers, plastic caps, serum caps, or Teflon tape to close these openings.

Alternatively, the train can be disassembled before the probe and filter holder/oven are completely cooled, if this procedure is followed: Initially disconnect the filter holder outlet/impinger inlet and loosely cap the open ends. Then disconnect the probe from the filter holder or cyclone inlet and loosely cap the open ends. Cap the probe tip and remove the umbilical cord as previously described.

Transfer the probe and filter-impinger assembly to a cleanup area that is clean and protected from the wind and other potential causes of contamination or loss of sample. Inspect the train before and during disassembly and note any abnormal conditions. The sample is recovered and treated as follows (see schematic in Figure 3.1-2). Ensure that all items necessary for recovery of the sample do not contaminate it.

3.1.5.2.1 Container No. 1 (Filter). Carefully remove the filter from the filter holder and place it in its identified petri dish container. Acid-washed polypropylene or Teflon coated tweezers or clean, disposable surgical gloves rinsed with water and dried should be used to handle the filters. If it is necessary to fold the filter, make certain the particulate cake is inside the fold. Carefully transfer the filter and any particulate matter or filter fibers that adhere to the filter holder gasket to the petri dish by using a dry (acid-cleaned) nylon bristle brush. Do not use any metal-containing materials when recovering this train. Seal the labeled petri dish.



* Number in parentheses indicates container number

4308-440

Figure 3.1-2 Sample recovery scheme.

3.1.5.2.2 Container No. 2 (Acetone Rinse).

Note: Perform section 3.1.5.2.2 only if determination of particulate emissions are desired in addition to metals emissions. If only metals emissions are desired, skip section 3.1.5.2.2 and go to section 3.1.5.2.3. Taking care to see that dust on the outside of the probe or other exterior surfaces does not get into the sample, quantitatively recover particulate matter and any condensate from the probe nozzle, probe fitting (plastic such as Teflon, polypropylene, etc. fittings are recommended to prevent contamination by metal fittings; further, if desired, a single glass piece consisting of a combined probe tip and probe liner may be used, but such a single glass piece is *not* a requirement of this methodology), probe liner, and front half of the filter holder by washing these components with 100 ml of acetone and placing the wash in a glass container.

Note: The use of exactly 100 ml is necessary for the subsequent blank correction procedures. Distilled water may be used instead of acetone when approved by the Administrator and shall be used when specified by the Administrator; in these cases, save a water blank and follow the Administrator's directions on analysis. Perform the acetone rinses as follows: Carefully remove the probe nozzle and clean the inside surface by rinsing with acetone from a wash bottle and brushing with a nonmetallic brush. Brush until the acetone rinse shows no visible particles, after which make a final rinse of the inside surface with acetone.

Brush and rinse the sample-exposed, inside parts of the fitting with acetone in a similar way until no visible particles remain.

Rinse the probe liner with acetone by tilting and rotating the probe while squirting acetone into its upper end so that all inside surfaces will be wetted with acetone. Allow the acetone to drain from the lower end into the sample container. A funnel may be used to aid in transferring liquid washings to the container. Follow the acetone rinse with a nonmetallic probe brush. Hold the probe in an inclined position, squirt acetone into the upper end as the probe brush is being pushed with a twisting action through the probe; hold a sample container underneath the lower end of the probe, and catch any acetone and particulate matter which is brushed through the probe three times or more until none remains in the probe liner on visual inspection. Rinse the brush with acetone, and quantitatively collect these washings in the sample container. After the brushing, make a final acetone rinse of the probe as described above.

It is recommended that two people clean the probe to minimize sample losses. Between sampling runs, keep brushes clean and protected from contamination.

Clean the inside of the front half of the filter holder by rubbing the surfaces with a nonmetallic nylon bristle brush and rinsing with acetone. Rinse each surface three times or more if needed to remove visible particulate. Make a final rinse of the brush and filter holder. After all acetone washings and particulate matter have been collected in the sample container tighten the lid on the sample container so that acetone will not

leak out when it is shipped to the laboratory. Mark the height of the fluid level to determine whether or not leakage occurred during transport. Label the container clearly to identify its contents.

3.1.5.2.3 Container No. 3 (Probe Rinse). Keep the probe assembly clean and free from contamination as described in section 3.1.5.2.2 of this method during the 0.1 N nitric acid rinse described below. Rinse the probe nozzle and fitting probe liner, and front half of the filter holder thoroughly with 100 ml of 0.1 N nitric acid and place the wash into a sample storage container.

Note: The use of exactly 100 ml is necessary for the subsequent blank correction procedures. Perform the rinses as applicable and generally as described in method 12, section 5.2.2. Record the volume of the combined rinse. Mark the height of the fluid level on the outside of the storage container and use this mark to determine if leakage occurs during transport. Seal the container and clearly label the contents. Finally, rinse the nozzle, probe liner, and front half of the filter holder with water followed by acetone and discard these rinses.

3.1.5.2.4 Container No. 4 (Impingers 1 through 3, $\text{HNO}_3/\text{H}_2\text{O}_2$ Impingers and Moisture Knockout Impinger, when used, Contents and Rinses). Due to the potentially large quantity of liquid involved, the tester may place the impinger solutions from impingers 1 through 3 in more than one container. Measure the liquid in the first three impingers volumetrically to within 0.5 ml using a graduated cylinder. Record the volume of liquid present. This information is required to calculate the moisture content of the sampled flue gas. Clean each of the first three impingers, the filter support, the back half of the filter housing, and connecting glassware by thoroughly rinsing with 100 ml of 0.1 N nitric acid using the procedure as applicable and generally as described in method 12, section 5.2.4.

Note: The use of exactly 100 ml of 0.1 N nitric acid rinse is necessary for the subsequent blank correction procedures. Combine the rinses and impinger solutions, measure and record the volume. Mark the height of the fluid level on the outside of the container to determine if leakage occurs during transport. Seal the container and clearly label the contents.

3.1.5.2.5 Container Nos. 5A, 5B, and 5C. 5A (0.1 N HNO_3), 5B ($\text{KMnO}_4/\text{H}_2\text{SO}_4$ absorbing solution), and 5C (8 N HCl rinse and dilution). (As described previously at the end of section 3.1.3.1.5 of this method, if mercury is not being measured in this train, then impingers 4, 5, and 6, as shown in Figure 3.1-2, are not necessary and may be eliminated.) Pour all the liquid, if any, from the impinger which was empty at the start of the run and which immediately precedes the two permanganate impingers (normally impinger No. 4) into a graduated cylinder and measure the volume to within 0.5 ml. This information is required to calculate the moisture content of the sampled flue gas. Place the liquid in Sample Container No. 5A. Rinse the impinger (No. 4) with 100 ml of 0.1 N HNO_3 and place this into Container No. 5A.

Pour all the liquid from the two permanganate impingers into a graduated

cylinder and measure the volume to within 0.5 ml. This information is required to calculate the moisture content of the sampled flue gas. Place this KMnO_4 absorbing solution stack sample from the two permanganate impingers into Container No. 5B. Using 100 ml total of fresh acidified potassium permanganate solution, rinse the two permanganate impingers and connecting glass pieces a minimum of three times and place the rinses into Container No. 5B, carefully ensuring transfer of all loose precipitated materials from the two impingers into Container No. 5B. Using 100 ml total of water, rinse the permanganate impingers and connecting glass pieces a minimum of three times, and place the rinses into Container 5B, carefully ensuring transfer of all loose precipitated material, if any, from the two impingers into Container No. 5B. Mark the height of the fluid level on the outside of the bottle to determine if leakage occurs during transport. See the following note and the precaution in paragraph 3.1.4.2.2 and properly prepare the bottle and clearly label the contents.

Note: Due to the potential reaction of the potassium permanganate with the acid, there may be pressure buildup in the sample storage bottles. These bottles shall not be completely filled and shall be vented to relieve potential excess pressure. Venting is required. A No. 70-72 hole drilled in the container cap and Teflon liner has been used.

If no visible deposits remain after the above described water rinse, do not rinse with 8 N HCl. However, if deposits do remain on the glassware after this water rinse, wash the impinger surfaces with 25 ml of 8 N HCl, and place the wash in a separate sample container labeled Container No. 5C containing 200 ml of water as follows: Place 200 ml of water in a sample container labeled Container No. 5C. Wash the impinger walls and stem with the HCl by turning the impinger on its side and rotating it so that the HCl contacts all inside surfaces. Use a total of only 25 ml of 8 N HCl for rinsing both permanganate impingers combined. Rinse the first impinger, then pour the actual rinse used for the first impinger into the second impinger for its rinse. Finally, pour the 25 ml of 8 N HCl rinse carefully with stirring into Container No. 5C. Mark the height of the fluid level on the outside of the bottle to determine if leakage occurs during transport.

3.1.5.2.6 Container No. 6 (Silica Gel). Note the color of the indicating silica gel to determine whether it has been completely spent and make a notation of its condition. Transfer the silica gel from its impinger to its original container and seal. The tester may use a funnel to pour the silica gel and a rubber policeman to remove the silica gel from the impinger.

The small amount of particles that may adhere to the impinger wall need not be removed. Do not use water or other liquids to transfer the silica gel since weight gained in the silica gel impinger is used for moisture calculations. Alternatively, if a balance is available in the field, record the weight of the spent silica gel (or silica gel plus impinger) to the nearest 0.5 g.

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3.1.5.2.7 Container No. 7 (Acetone Blank). If particulate emissions are to be determined, at least once during each field test, place a 100-ml portion of the acetone used in the sample recovery process into a labeled container for use in the front-half field reagent blank. Seal the container.

3.1.5.2.8 Container No. 8A (0.1 N Nitric Acid Blank). At least once during each field test, place 300 ml of the 0.1 N nitric acid solution used in the sample recovery process into a labeled container for use in the front-half and back-half field reagent blanks. Seal the container. **Container No. 8B (water blank).** At least once during each field test, place 100 ml of the water used in the sample recovery process into a labeled Container No. 8B. Seal the container.

3.1.5.2.9 Container No. 9 (5% Nitric Acid/10% Hydrogen Peroxide Blank). At least once during each field test, place 200 ml of the 5% nitric acid/10% hydrogen peroxide solution used as the nitric acid impinger reagent into a labeled container for use in the back-half field reagent blank. Seal the container.

3.1.5.2.10 Container No. 10 (Acidified Potassium Permanganate Blank). At least once during each field test, place 100 ml of the acidified potassium permanganate

solution used as the impinger solution and in the sample recovery process into a labeled container for use in the back-half field reagent blank for mercury analysis. Prepare the container as described in section 3.1.5.2.5.

Note: Due to the potential reaction of the potassium permanganate with the acid, there may be pressure buildup in the sample storage bottles. These bottles shall not be completely filled and shall be vented to relieve potential excess pressure. Venting is required. A No. 70-72 hole drilled in the container cap and Teflon liner has been used.

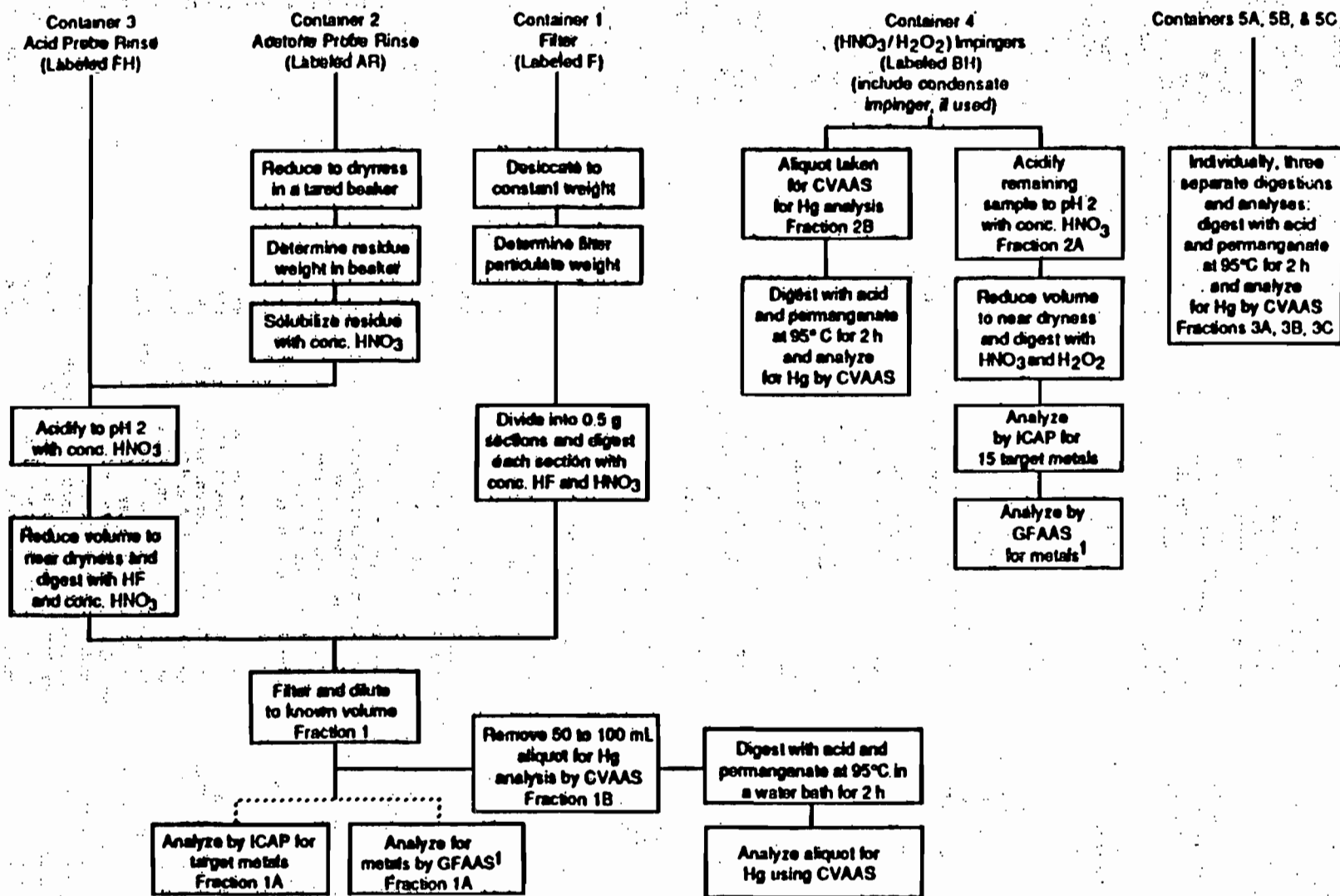
3.1.5.2.11 Container No. 11 (8 N HCl Blank). At least once during each field test, perform both of the following: Place 200 ml of water into a sample container. Pour 25 ml of 8N HCl carefully with stirring into the 200 ml of water in the container. Mix well and seal the container.

3.1.5.2.12 Container No. 12 (Filter Blank). Once during each field test, place three unused blank filters from the same lot as the sampling filters in a labeled petri dish. Seal the petri dish. These will be used in the front-half field reagent blank.

3.1.5.3 Sample Preparation. Note the level of the liquid in each of the containers and determine if any sample was lost during

shipment. If a noticeable amount of leakage has occurred, either void the sample or use methods, subject to the approval of the Administrator, to correct the final results. A diagram illustrating sample preparation and analysis procedures for each of the sample train components is shown in Figure 3.1-3.

3.1.5.3.1 Container No. 1 (Filter). If particulate emissions are being determined, then desiccate the filter and filter catch without added heat and weigh to a constant weight as described in section 4.3 of method 5. For analysis of metals, divide the filter with its filter catch into portions containing approximately 0.5 g each and place into the analyst's choice of either individual microwave pressure relief vessels or Parr® Bombs. Add 6 ml of concentrated nitric acid and 4 ml of concentrated hydrofluoric acid to each vessel. For microwave heating, microwave the sample vessels for approximately 12-15 minutes in intervals of 1 to 2 minutes at 600 Watts. For conventional heating, heat the Parr Bombs at 140°C (285°F) for 6 hours. Cool the samples to room temperature and combine with the acid digested probe rinse as required in section 3.1.5.3.3, below.



¹ Analysis by AAS for metals found at less than 2 µg/mL in digestate solution, if desired. Or analyze for each metal by AAS, if desired.

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Figure 3.1-3 Sample preparation and analysis scheme.

Notes: 1. Suggested microwave heating times are approximate and are dependent upon the number of samples being digested. Twelve to 15 minute heating times have been found to be acceptable for simultaneous digestion of up to 12 individual samples. Sufficient heating is evidenced by solvent reflux within the vessel.

2. If the sampling train uses an optional cyclone, the cyclone catch should be prepared and digested using the same procedures described for the filters and combined with the digested filter samples.

3.1.5.3.2 Container No. 2 (Acetone Rinse). Note the level of liquid in the container and confirm on the analysis sheet whether leakage occurred during transport. If a noticeable amount of leakage has occurred, either void the sample or use methods, subject to the approval of the Administrator, to correct the final results. Measure the liquid in this container either volumetrically to ± 1 ml or gravimetrically to ± 0.5 g. Transfer the contents to an acid-cleaned, tared 250-ml beaker and evaporate to dryness at ambient temperature and pressure. If particulate emissions are being determined, desiccate for 24 hours without added heat, weigh to a constant weight according to the procedures described in section 4.3 of method 5, and report the results to the nearest 0.1 mg. Redissolve the residue with 10 ml of concentrated nitric acid and, carefully with stirring, quantitatively combine the resultant sample including all liquid and any particulate matter with Container No. 3 prior to beginning the following section 3.1.5.3.3.

3.1.5.3.3 Container No. 3 (Probe Rinse). The pH of this sample shall be 2 or lower. If the pH is higher, the sample should be acidified to pH 2 by the careful addition with stirring of concentrated nitric acid. The sample should be rinsed into a beaker with water and the beaker should be covered with a ribbed watchglass. The sample volume should be reduced to approximately 20 ml by heating on a hot plate at a temperature just below boiling. Digest the sample in microwave vessels or Parr® Bombs by quantitatively transferring the sample to the vessel or bomb, by carefully adding the 6 ml of concentrated nitric acid and 4 ml of concentrated hydrofluoric acid and then continuing to follow the procedures described in section 3.1.5.3.1; then combine the resultant sample directly with the acid digested portions of the filter prepared previously in section 3.1.5.3.1. The resultant combined sample is referred to as Fraction 1 precursor. Filter the combined solution of the acid digested filter and probe rinse samples using Whatman 541 filter paper. Dilute to 300 ml (or the appropriate volume for the expected metals concentration) with water. This dilution is Fraction 1. Measure and record the volume of the Fraction 1 solution to within 0.1 ml. Quantitatively remove a 50-ml aliquot and label as Fraction 1A. Label the remaining 250-ml portion as Fraction 1B. Fraction 1A is used for ICAP or AAS analysis. Fraction 1B is used for the determination of front-half mercury.

3.1.5.3.4 Container No. 4 (Impingers 1-3). Measure and record the total volume of this sample (Fraction 2) to within 0.5 ml. Remove a 75- to 100-ml aliquot for mercury analysis

and label as Fraction 2B. Label the remaining portion of Container No. 4 as aliquot Fraction 2A. Aliquot Fraction 2A defines the volume of 2A prior to digestion. All of the aliquot Fraction 2A is digested to produce concentrated Fraction 2A. Concentrated Fraction 2A defines the volume of 2A after digestion which is normally 150 ml. Only concentrated Fraction 2A is analyzed for metals (except that it is not analyzed for mercury). The Fraction 2B aliquot should be prepared and analyzed for mercury as described in section 3.1.5.4.3. Aliquot Fraction 2A shall be pH 2 or lower. If necessary, use concentrated nitric acid, by careful addition and stirring, to lower aliquot Fraction 2A to pH 2. The sample should be rinsed into a beaker with water and the beaker should be covered with a ribbed watchglass. The sample volume should be reduced to approximately 20 ml by heating on a hot plate at a temperature just below boiling. Next follow either the conventional or microwave digestion procedures described in sections 3.1.5.3.4.1 and 3.1.5.3.4.2, below.

3.1.5.3.4.1 Conventional Digestion Procedure. Add 30 ml of 50 percent nitric acid and heat for 30 minutes on a hot plate to just below boiling. Add 10 ml of 3 percent hydrogen peroxide and heat for 20 more minutes. Add 50 ml of hot water and heat the sample for an additional 20 minutes. Cool, filter the sample, and dilute to 150 ml (or the appropriate volume for the expected metals concentrations) with water. This dilution is concentrated Fraction 2A. Measure and record the volume of the Fraction 2A solution to within 0.1 ml.

3.1.5.3.4.2 Microwave Digestion Procedure. Add 10 ml of 50 percent nitric acid and heat for 9 minutes in intervals of 1 to 2 minutes at 600 Watts. Allow the sample to cool. Add 10 ml of 3 percent hydrogen peroxide and heat for 2 more minutes. Add 50 ml of hot water and heat for an additional 5 minutes. Cool, filter the sample, and dilute to 150 ml (or the appropriate volume for the expected metals concentrations) with water. This dilution is concentrated Fraction 2A. Measure and record the volume of the Fraction 2A solution to within 0.1 ml.

Note: All microwave heating times given are approximate and are dependent upon the number of samples being digested at a time. Heating times as given above have been found acceptable for simultaneous digestion of up to 12 individual samples. Sufficient heating is evidenced by solvent reflux within the vessel.

3.1.5.3.5 Container Nos. 5A, 5B, and 5C (Impingers 4, 5, and 6). Keep these samples separate from each other and measure and record the volumes of 5A and 5B separately to within 0.5 ml. Dilute sample 5C to 500 ml with water. These samples 5A, 5B, and 5C are referred to respectively as Fractions 3A, 3B, and 3C. Follow the analysis procedures described in section 3.1.5.4.3.

Because the permanganate rinse and water rinse have the capability to recover a high percentage of the mercury from the permanganate impingers, the amount of mercury in the HCl rinse (Fraction 3C) may be very small, possibly even insignificantly small. However, as instructed in this method, add the total of any mercury measured in and

calculated for the HCl rinse (Fraction 3C) to that for Fractions 1B, 2B, 3A, and 3B for calculation of the total sample mercury concentration.

3.1.5.3.6 Container No. 6 (Silica Gel). Weigh the spent silica gel (or silica gel plus impinger) to the nearest 0.5 g using a balance. (This step may be conducted in the field.)

3.1.5.4 Sample Analysis. For each sampling train, seven individual samples are generated for analysis. A schematic identifying each sample and the prescribed sample preparation and analysis scheme is shown in Figure 3.1-3. The first two samples, labeled Fractions 1A and 1B, consist of the digested samples from the front half of the train. Fraction 1A is for ICAP or AAS analysis as described in sections 3.1.5.4.1 and/or 3.1.5.4.2. Fraction 1B is for determination of front-half mercury as described in section 3.1.5.4.3.

The back half of the train was used to prepare the third through seventh samples. The third and fourth samples, labeled Fractions 2A and 2B, contain the digested samples from the moisture knockout, if used, and HNO₃/H₂O₂ Impingers 1 through 3. Fraction 2A is for ICAP or AAS analysis. Fraction 2B will be analyzed for mercury.

The fifth through seventh samples, labeled Fractions 3A, 3B, and 3C, consist of the impinger contents and rinses from the empty and permanganate impingers 4, 5, and 6. These samples are analyzed for mercury as described in section 3.1.5.4.3. The total back-half mercury catch is determined from the sum of Fraction 2B and Fractions 3A, 3B, and 3C.

3.1.5.4.1 ICAP Analysis. Fraction 1A and Fraction 2A are analyzed by ICAP using EPA SW-846 method 6010 or method 200.7 (40 CFR 136, appendix C). Calibrate the ICAP, and set up an analysis program as described in method 6010 or method 200.7. The quality control procedures described in section 3.1.7.3.1 of this method shall be followed. Recommended wavelengths for use in the analysis are listed below:

Element	Wavelength (nm)
Aluminum	308.215
Antimony	206.833
Arsenic	193.696
Barium	455.403
Beryllium	313.042
Cadmium	226.502
Chromium	267.716
Copper	324.754
Iron	259.940
Lead	220.353
Manganese	257.610
Nickel	231.604
Phosphorus	214.914
Selenium	196.026
Silver	328.068
Thallium	190.864
Zinc	213.856

The wavelengths listed are recommended because of their sensitivity and overall acceptance. Other wavelengths may be substituted if they can provide the needed sensitivity and are treated with the same corrective techniques for spectral interference.

[Appendix IX]

Initially, analyze all samples for the desired target metals (except mercury) plus iron and aluminum. If iron and aluminum are present in the sample, the sample may have to be diluted so that each of these elements is at a concentration of less than 50 ppm to reduce their spectral interferences on arsenic, cadmium, chromium, and lead.

Note. When analyzing samples in a hydrofluoric acid matrix, an alumina torch should be used; since all front-half samples will contain hydrofluoric acid, use an alumina torch.

3.1.5.4.2 AAS by Direct Aspiration and/or Graphite Furnace. If analysis of metals in Fraction 1A and Fraction 2A using graphite furnace or direct aspiration AAS is desired,

Table 3.1-2 should be used to determine which techniques and methods should be applied for each target metal. Table 3.1-2 should also be consulted to determine possible interferences and techniques to be followed for their minimization. Calibrate the instrument according to section 3.1.6.3 and follow the quality control procedures specified in section 3.1.7.3.2.

TABLE 3.1-2—APPLICABLE TECHNIQUES, METHODS, AND MINIMIZATION OF INTERFERENCE FOR AAS ANALYSIS

Metal	Technique	SW-846 Method No.	Wavelength (nm)	Interferences	
				Cause	Minimization
Sb.....	Aspiration.....	7040	217.6	1000 mg/mL Pb, Ni, Cu, or acid.....	Use secondary wavelength of 231.1 nm; match sample & standards' acid concentration or use nitrous oxide/acetylene flame.
Sb.....	Furnace.....	7041	217.6	High Pb.....	Secondary wavelength or Zeeman correction.
As.....	Furnace.....	7060	193.7	Arsenic volatilization.....	Spiked samples and add nickel nitrate solution to digestates prior to analysis.
Ba.....	Aspiration.....	7080	553.6	Aluminum.....	Use Zeeman background correction.
Be.....	Aspiration.....	7090	234.9	Calcium.....	High hollow cathode current and narrow band set.
Be.....	Furnace.....	7091	234.9	Barium ionization.....	2 mL of KC1 per 100 mL of sample.
Cd.....	Aspiration.....	7130	228.8	500 ppm A1.....	Add 0.1% fluoride.
Cd.....	Furnace.....	7131	228.8	High Mg and Si.....	Use method of standard additions.
Cr.....	Aspiration.....	7190	357.9	Be in optical path.....	Optimize parameters to minimize effects.
Cr.....	Furnace.....	7191	357.9	Absorption and light scattering.....	Background correction is required.
Cu.....	Aspiration.....	7210	324.7	As above.....	As above.
Fe.....	Aspiration.....	7380	248.3	Excess chloride.....	Ammonium phosphate used as a matrix modifier.
Pb.....	Aspiration.....	7420	283.3	Pipet tips.....	Use cadmium-free tips.
Pb.....	Furnace.....	7421	283.3	Alkali metal.....	KC1 ionization suppressant in samples and standards.
Mn.....	Aspiration.....	7460	279.5	Absorption and scatter.....	Consult manufacturer's literature.
Ni.....	Aspiration.....	7520	232.0	Absorption and scatter.....	All calcium nitrate for a known constant effect and to eliminate effect of phosphate.
Se.....	Furnace.....	7740	196.0	200 mg/L Ca and P.....	Consult manufacturer's manual.
Ag.....	Aspiration.....	7760	328.1	Absorption and scatter.....	Great care taken to avoid contamination.
Ti.....	Aspiration.....	7840	276.8	AgC1 insoluble.....	Background correction required.
Ti.....	Furnace.....	7841	276.8	Viscosity.....	Matrix modifier, add 10 μ L of phosphorus acid to 1 mL of prepared sample in sampler cup.
Zn.....	Aspiration.....	7950	213.9	Hydrochloric acid or chloride.....	Background correction required.
				High Si, Cu, & P.....	Background correction required.
				Contamination.....	Matrix matching or nitrous-oxide/acetylene flame.
					Sample dilution or use 352.3 nm line.
					Spike samples and reference materials and add nickel nitrate to minimize volatilization.
					Background correction is required and Zeeman background correction can be useful.
					Avoid hydrochloric acid unless silver is in solution as a chloride complex.
					Sample and standards monitored for aspiration rate.
					Background correction is required. Hydrochloric acid should not be used.
					Background correction is required. Verify that losses are not occurring for volatilization by spiked samples or standard addition; Palladium is a suitable matrix modifier.
					Strontium removes Cu and phosphate.
					Great care taken to avoid contamination.

3.1.5.4.3 Cold Vapor AAS Mercury Analysis. Fraction 1B, Fraction 2B, and Fractions 3A, 3B, and 3C should be analyzed separately for mercury using cold vapor atomic absorption spectroscopy following the method outlined in EPA SW-846 method 7470 or in Standard Methods for Water and Wastewater Analysis, 15th Edition, Method 303F. Set up the calibration curve (zero to 1000 ng) as described in SW-846 method 7470 or similar to method 303F, using 300-ml BOD bottles instead of Erlenmeyers. Dilute separately, as described below, a 1 ml to 10 ml aliquot of each original sample to 100 ml with water. Record the amount of the aliquot used for dilution to 100 ml. If no prior knowledge exists of the expected amount of

mercury in the sample, a 5-ml aliquot is suggested for the first dilution to 100 ml and analysis. To determine the stack emission value for mercury, the amount of the aliquot of the sample used for dilution and analysis is dependent on the amount of mercury in the aliquot: The total amount of mercury in the aliquot used for analysis shall be less than 1 μ g, and within the range (zero to 1000 ng) of the calibration curve. Place each sample aliquot into a separate 300-ml BOD bottle and add enough Type II water to make a total volume of 100 ml. Then analyze the 100 ml for mercury by adding to it sequentially the sample preparation solutions and performing the sample preparation and analysis as described in the procedures of SW-846

method 7470 or method 303F. If, during the described analysis, the reading maximum(s) are off-scale (because the aliquot of the original sample analyzed contained more mercury than the maximum of the calibration range) including the analysis of the 100-ml dilution of the 1-ml aliquot of the original sample causing a reading maximum which is off-scale, then perform the following: Dilute the original sample (or a portion of it) with 0.15% HNO₃ in water (1.5 ml concentrated HNO₃ per liter aqueous solution) so that when a 1-ml to 10-ml aliquot of the dilution of the original sample is then further diluted to 100 ml in the BOD bottle, and analyzed by the procedures described above, it will yield an

analysis within the range of the calibration curve.

3.1.6 Calibration

Maintain a laboratory log of all calibrations.

3.1.6.1 Sampling Train Calibration. Calibrate the sampling train components according to the indicated sections of method 5: Probe Nozzle (section 5.1); Pitot Tube (section 5.2); Metering System (section 5.3); Probe Heater (section 5.4); Temperature Gauges (section 5.5); Leak-Check of the Metering System (section 5.6); and Barometer (section 5.7).

3.1.6.2 Inductively Coupled Argon Plasma Spectrometer Calibration. Prepare standards as outlined in section 3.1.4.4. Profile and calibrate the instrument according to the instrument manufacturer's recommended procedures using the above standards. The instrument calibration should be checked once per hour. If the instrument does not reproduce the concentrations of the standard within 10 percent, the complete calibration procedures should be performed.

3.1.6.3 Atomic Absorption Spectrometer—Direct Aspiration, Graphite Furnace and Cold Vapor Mercury Analyses. Prepare the standards as outlined in section 3.1.4.4. Calibrate the spectrometer using these prepared standards. Calibration procedures are also outlined in the EPA methods referred to in Table 3.1-2 and in SW-846 Method 7470 or Standard Methods for Water and Wastewater, 15th Edition, method 303F (for mercury). Each standard curve should be run in duplicate and the mean values used to calculate the calibration line. The instrument should be recalibrated approximately once every 10 to 12 samples.

3.1.7 Quality Control

3.1.7.1 Sampling, Field Reagent Blanks. When analyzed, the blank samples in Container Numbers 7 through 12 produced previously in sections 3.1.5.2.7 through 3.1.5.2.12, respectively, shall be processed, digested, and analyzed as follows: Digest and process one of the filters from Container No. 12 per section 3.1.5.3.1, 100 ml from Container No. 7 per section 3.1.5.3.2, and 100 ml from Container No. 8A per section 3.1.5.3.3. This produces Fraction Blank 1A and Fraction Blank 1B from Fraction Blank 1. (If desired, the other two filters may be digested separately according to section 3.1.5.3.1, diluted separately to 300 ml each, and analyzed separately to produce a blank value for each of the two additional filters. If these analyses are performed, they will produce two additional values for each of Fraction Blank 1A and Fraction Blank 1B. The three Fraction Blank 1A values will be calculated as three values of M_{fb} in Equation 3 of section 3.1.8.4.3, and then the three values shall be totalled and divided by 3 to become the value M_{fb} to be used in the computation of M_i by Equation 3. Similarly, the three Fraction Blank 1B values will be calculated separately as three values, totalled, averaged, and used as the value for M_{fb} in Equation 8 of section 3.1.8.5.3. The analyses of the two extra filters are optional and are not a requirement of this method, but if the analyses are performed, the results must be considered as described above.) Combine 100

ml of Container No. 8A with 200 ml of the contents of Container No. 9 and digest and process the resultant volume per section 3.1.5.3.4. This produces concentrated Fraction Blank 2A and Fraction Blank 2B from Fraction Blank 2. A 100-ml portion of Container No. 8A is Fraction Blank 3A. Combine 100 ml of the contents of Container No. 10 with 33 ml of the contents of Container No. 8B. This produces Fraction Blank 3B (use 400 ml as the volume of Fraction Blank 3B when calculating the blank value. Use the actual volumes when calculating all the other blank values). Dilute 225 ml of the contents of Container No. 11 to 500 ml with water. This produces Fraction Blank 3C. Analyze Fraction Blank 1A and Fraction Blank 2A per section 3.1.5.4.1 and/or 3.1.5.4.2. Analyze Fraction Blank 1B, Fraction Blank 2B, and Fraction Blanks 3A, 3B, and 3C per section 3.1.5.4.3. The analysis of Fraction Blank 1A produces the front-half reagent blank correction values for the metals except mercury; the analysis of Fraction Blank 1B produces the front-half reagent blank correction value for mercury. The analysis of concentrated Fraction Blank 2A produces the back-half reagent blank correction values for the metals except mercury, while separate analysis of Fraction Blanks 2B, 3A, 3B, and 3C produce the back-half reagent blank correction value for mercury.

3.1.7.2 An attempt may be made to determine if the laboratory reagents used in section 3.1.5.3 caused contamination. They should be analyzed by the procedures in section 3.1.5.4. The Administrator will determine whether the laboratory blank reagent values can be used in the calculation of the stationary source test results.

3.1.7.3 Quality Control of Samples. The following quality control samples should be analyzed.

3.1.7.3.1 ICAP Analysis. Follow the quality control shown in section 8 of method 6010. For the purposes of a three-run test series, these requirements have been modified to include the following: Two instrument check standard runs, two calibration blank runs, one interference check sample at the beginning of the analysis (must be within 25% or analyze by the method of standard additions), one quality control sample to check the accuracy of the calibration standards (must be within 25% of calibration), and one duplicate analysis (must be within 10% of average or repeat all analyses).

3.1.7.3.2 Direct Aspiration and/or Graphite Furnace AAS Analysis for antimony, arsenic, barium, beryllium, cadmium, copper, chromium, lead, nickel, manganese, mercury, phosphorus, selenium, silver, thallium, and zinc. All samples should be analyzed in duplicate. Perform a matrix spike on at least one front-half sample and one back-half sample or one combined sample. If recoveries of less than 75 percent or greater than 125 percent are obtained for the matrix spike, analyze each sample by the method of standard additions. A quality control sample should be analyzed to check the accuracy of the calibration standards. The results must be within 10% or the calibration repeated.

3.1.7.3.3 Cold Vapor AAS Analysis for Mercury. All samples should be analyzed in

duplicate. A quality control sample should be analyzed to check the accuracy of the calibration standards (within 15% or repeat calibration). Perform a matrix spike on one sample from the nitric impinger portion (must be within 25% or samples must be analyzed by the method of standard additions).

Additional information on quality control can be obtained from EPA SW-846 method 7470 or in Standard Methods for the Examination of Water and Wastewater, 15th Edition, method 303F.

3.1.8 Calculations

3.1.8.1 Dry Gas Volume. Using the data from this test, calculate $V_{m(tdg)}$, the dry gas sample volume at standard conditions as outlined in Section 6.3 of Method 5.

3.1.8.2 Volume of Water Vapor and Moisture Content. Using the data obtained from this test, calculate the volume of water vapor $V_{w(tdg)}$ and the moisture content B_w of the stack gas. Use Equations 5-2 and 5-3 of Method 5.

3.1.8.3 Stack Gas Velocity. Using the data from this test and Equation 2-9 of Method 2, calculate the average stack gas velocity.

3.1.8.4 Metals (Except Mercury) in Source Sample.

3.1.8.4.1 Fraction 1A, Front Half, Metals (except Hg). Calculate separately the amount of each metal collected in Fraction 1 of the sampling train using the following equation:

$$M_{fh} = C_{s1} F_d V_{soln,1} \quad \text{Eq. 1}^*$$

where:

M_{fh} = total mass of each metal (except Hg) collected in the front half of the sampling train (Fraction 1), μg .

C_{s1} = concentration of metal in sample Fraction 1A as read from the standard curve ($\mu\text{g}/\text{ml}$).

F_d = dilution factor (F_d = the inverse of the fractional portion of the concentrated sample in the solution actually used in the instrument to produce the reading C_{s1} . For example, when 2 ml of Fraction 1A are diluted to 10 ml, $F_d = 5$).

$V_{soln,1}$ = total volume of digested sample solution (Fraction 1), ml.

3.1.8.4.2 Fraction 2A, Back Half, Metals (except Hg). Calculate separately the amount of each metal collected in Fraction 2 of the sampling train using the following equation:

$$M_{bh} = C_{s2} F_a V_a \quad \text{Eq. 2}^*$$

where:

M_{bh} = total mass of each metal (except Hg) collected in the back half of the sampling train (Fraction 2), μg .

C_{s2} = concentration of metal in sample concentrated Fraction 2A, as read from the standard curve ($\mu\text{g}/\text{ml}$).

F_a = aliquot factor, volume of Fraction 2 divided by volume of aliquot Fraction 2A (see section 3.1.5.3.4).

V_a = total volume of digested sample solution (concentrated Fraction 2A), ml (see section 3.1.5.3.4.1 or 3.1.5.3.4.2, as applicable).

3.1.8.4.3 Total Train, Metals (except Hg). Calculate the total amount of each of the

* If Fractions 1A and 2A are combined, proportional aliquots must be used. Appropriate changes must be made in Equations 1-3 to reflect this approach.

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quantified metals collected in the sampling train as follows:

$$M_i = (M_{in} - M_{nb}) + (M_{bh} - M_{bb}) \quad \text{Eq. 3}$$

where:

M_i = total mass of each metal (separately stated for each metal) collected in the sampling train, μg .

M_{nb} = blank correction value for mass of metal detected in front-half field reagent blank, μg .

M_{bb} = blank correction value for mass of metal detected in back-half field reagent blank, μg .

Note: If the measured blank value for the front half (m_{nb}) is in the range 0.0 to A μg (where A μg equals the value determined by multiplying 1.4 μg per square inch (1.4 $\mu\text{g}/\text{in}^2$) times the actual area in square inches (in^2) of the filter used in the emission sample) m_{nb} may be used to correct the emission sample value (m_i); if m_{nb} exceeds A μg , the greater of the two following values (either I. or II.) may be used:

- I. A μg , or
- II. the lesser of (a) m_{nb} or (b) 5 percent of m_{nb} .

If the measured blank value for the back half (m_{bb}) is in the range of 0.0 to 1 μg , m_{bb} may be used to correct the emission sample value (m_i); if m_{bb} exceeds 1 μg , the greater of the two following values may be used: 1 μg or 5 percent of m_{bb} .

3.1.8.5 Mercury in Source Sample.

3.1.8.5.1 Fraction 1B, Front Half, Hg.

Calculate the amount of mercury collected in the front half, Fraction 1, of the sampling train using the following equation:

$$Hg_{n1} = \frac{Q_{n1}}{V_{n1}} \times V_{soln.1} \quad \text{Eq. 4}$$

where:

Hg_{n1} = total mass of mercury collected in the front half of the sampling train (Fraction 1), μg .

Q_{n1} = quantity of mercury in analyzed sample, μg .

$V_{soln.1}$ = total volume of digested sample solution (Fraction 1), ml.

V_{n1} = volume of Fraction 1B analyzed, ml. See the following notice.

Note: V_{n1} is the actual amount of Fraction 1B analyzed. For example, if 1 ml of Fraction 1B were diluted to 100 ml to bring it into the proper analytical range, and 1 ml of the 100-ml dilution were analyzed, V_{n1} would be 0.01 ml.

3.1.8.5.2 Fraction 2B and Fractions 3A, 3B, and 3C, Back Half, Hg. Calculate the amount of mercury collected in Fractions 2 using Equation 5 and in Fractions 3A, 3B, and 3C using Equation 6. Calculate the total amount of mercury collected in the back half of the sampling train using Equation 7.

$$Hg_{bb2} = \frac{Q_{bb2}}{V_{n2}} \times V_{soln.2} \quad \text{Eq. 5}$$

where:

Hg_{bb2} = total mass of mercury collected in Fraction 2, μg .

Q_{bb2} = quantity of mercury in analyzed sample, μg .

$V_{soln.2}$ = total volume of Fraction 2, ml.

V_{n2} = volume of Fraction 2B analyzed, ml (see the following note).

Note: V_{n2} is the actual amount of Fraction 2B analyzed. For example, if 1 ml of Fraction 2B were diluted to 10 ml to bring it into the proper analytical range, and 5 ml of the 10-ml dilution was analyzed, V_{n2} would be 0.5.

Use Equation 6 to calculate separately the back-half mercury for Fractions 3A, then 3B, then 3C.

$$Hg_{bb2(A,B,C)} = \frac{Q_{bb2(A,B,C)}}{V_{n2(A,B,C)}} \times V_{soln.2(A,B,C)} \quad \text{Eq. 6}$$

where:

$Hg_{bb2(A,B,C)}$ = total mass of mercury collected separately in Fraction 3A, 3B, or 3C, μg .

$Q_{bb2(A,B,C)}$ = quantity of mercury in separately analyzed samples, μg .

$V_{n2(A,B,C)}$ = volume of Fraction 3A, 3B, or 3C analyzed, ml (see Note in sections 3.1.8.5.1 and 3.1.8.5.2, and calculate similarly).

$V_{soln.2(A,B,C)}$ = total volume of Fraction 3A, 3B, or 3C, ml.

$$Hg_{bb} = Hg_{bb2} + Hg_{bb3A} + Hg_{bb3B} + Hg_{bb3C} \quad \text{Eq. 7}$$

where:

Hg_{bb} = total mass of mercury collected in the back half of the sampling train, μg .

3.1.8.5.3 Total Train Mercury Catch.

Calculate the total amount of mercury collected in the sampling train using Equation 8.

$$Hg_t = (Hg_{n1} - Hg_{nb}) + (Hg_{bb} - Hg_{bbb}) \quad \text{Eq. 8}$$

where:

Hg_t = total mass of mercury collected in the sampling train, μg .

Hg_{nb} = blank correction value for mass of mercury detected in front-half field reagent blank, μg .

Hg_{bbb} = blank correction value for mass of mercury detected in back-half field reagent blanks, μg .

Note: If the total of the measured blank values ($Hg_{nb} + Hg_{bbb}$) is in the range of 0 to 6 μg , then the total may be used to correct the emission sample value ($Hg_{n1} + Hg_{bb}$); if it exceeds 6 μg , the greater of the following two values may be used: 6 μg or 5 percent of the emission sample value ($Hg_{n1} + Hg_{bb}$).

3.1.8.6 Metal Concentration of Stack Gas. Calculate each metal separately for the cadmium, total chromium, arsenic, nickel, manganese, beryllium, copper, lead, phosphorus, thallium, silver, barium, zinc, selenium, antimony, and mercury concentrations in the stack gas (dry basis, adjusted to standard conditions) as follows:

$$C_i = K_i(M_i/V_{m(gas)}) \quad \text{Eq. 9}$$

where:

C_i = concentration of each metal in the stack gas, mg/dscm.

$K_i = 10^{-2} \text{mg}/\mu\text{g}$.

M_i = total mass of each metal collected in the sampling train, μg ; (substitute Hg, for M_i for the mercury calculation).

$V_{m(gas)}$ = volume of gas sample as measured by the dry gas meter, corrected to dry standard conditions, dscm.

3.1.8.7 Isokinetic Variation and Acceptable Results. Same as method 5, sections 6.11 and 6.12, respectively.

3.1.9 Bibliography

3.1.9.1 Method 303F in Standard Methods for the Examination of Water and Wastewater, 15th Edition, 1980. Available from the American Public Health Association, 1015 18th Street NW., Washington, DC 20036.

3.1.9.2 EPA Methods 6010, 7000, 7041, 7060, 7131, 7421, 7470, 7740, and 7841. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods SW-846, Third Edition, September 1988. Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, Washington, DC 20460.

3.1.9.3 EPA Method 200.7, Code of Federal Regulations, title 40, part 136, appendix C, July 1, 1987.

3.1.9.4 EPA Methods 1 through 5, and 12 Code of Federal Regulations, title 40, part 60, appendix A, July 1, 1987.

3.1.9.5 *Determination of Hexavalent Chromium Emissions from Stationary Sources (Method Cr⁶⁺)*

3.2.1 Applicability and Principle

3.2.1.1 Applicability. This method applies to the determination of hexavalent chromium (Cr^{6+}) emissions from hazardous waste incinerators, municipal waste combustors, sewage sludge incinerators, and boilers and industrial furnaces. With the approval of the Administrator, this method may also be used to measure total chromium. The sampling train, constructed of Teflon components, has only been evaluated at temperatures less than 300 °F. Trains constructed of other materials, for testing at higher temperatures, are currently being evaluated.

3.2.1.2 Principle. For incinerators and combustors, the Cr^{6+} emissions are collected

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Determination of Hexavalent Chromium Emissions from Stationary Sources

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quantified metals collected in the sampling train as follows:

$$M_t = (M_m - M_{nb}) + (M_{bh} - M_{bnb}) \quad \text{Eq. 3}$$

where:

M_t = total mass of each metal (separately stated for each metal) collected in the sampling train, μg .

M_{nb} = blank correction value for mass of metal detected in front-half field reagent blank, μg .

M_{bnb} = blank correction value for mass of metal detected in back-half field reagent blank, μg .

Note: If the measured blank value for the front half (m_{nb}) is in the range 0.0 to $A \mu\text{g}$ (where $A \mu\text{g}$ equals the value determined by multiplying $1.4 \mu\text{g}$ per square inch ($1.4 \mu\text{g}/\text{in}^2$) times the actual area in square inches (in^2) of the filter used in the emission sample) m_{nb} may be used to correct the emission sample value (m_m); if m_{nb} exceeds $A \mu\text{g}$, the greater of the two following values (either I. or II.) may be used:

- I. $A \mu\text{g}$, or
- II. the lesser of (a) m_{nb} or (b) 5 percent of m_m .

If the measured blank value for the back half (m_{bnb}) is in the range of 0.0 to $1 \mu\text{g}$, m_{bnb} may be used to correct the emission sample value (m_{bh}); if m_{bnb} exceeds $1 \mu\text{g}$, the greater of the two following values may be used: $1 \mu\text{g}$ or 5 percent of m_{bh} .

3.1.8.5 Mercury in Source Sample.

3.1.8.5.1 Fraction 1B, Front Half, Hg. Calculate the amount of mercury collected in the front half, Fraction 1, of the sampling train using the following equation:

$$Hg_m = \frac{Q_m}{V_{soln.1}} \times V_{soln.1} \quad \text{Eq. 4}$$

where:

Hg_m = total mass of mercury collected in the front half of the sampling train (Fraction 1), μg .

Q_m = quantity of mercury in analyzed sample, μg .

$V_{soln.1}$ = total volume of digested sample solution (Fraction 1), ml.

V_{FB} = volume of Fraction 1B analyzed, ml. See the following notice.

Note: V_{FB} is the actual amount of Fraction 1B analyzed. For example, if 1 ml of Fraction 1B were diluted to 100 ml to bring it into the proper analytical range, and 1 ml of the 100-ml dilution were analyzed, V_{FB} would be 0.01 ml.

3.1.8.5.2 Fraction 2B and Fractions 3A, 3B, and 3C, Back Half, Hg. Calculate the amount of mercury collected in Fractions 2 using Equation 5 and in Fractions 3A, 3B, and 3C using Equation 6. Calculate the total amount of mercury collected in the back half of the sampling train using Equation 7.

$$Hg_{bh2} = \frac{Q_{bh2}}{V_{FB}} \times V_{soln.2} \quad \text{Eq. 5}$$

where:

Hg_{bh2} = total mass of mercury collected in Fraction 2, μg .

Q_{bh2} = quantity of mercury in analyzed sample, μg .

$V_{soln.2}$ = total volume of Fraction 2, ml.

V_{FB} = volume of Fraction 2B analyzed, ml (see the following note).

Note: V_{FB} is the actual amount of Fraction 2B analyzed. For example, if 1 ml of Fraction 2B were diluted to 10 ml to bring it into the proper analytical range, and 5 ml of the 10-ml dilution was analyzed, V_{FB} would be 0.5.

Use Equation 6 to calculate separately the back-half mercury for Fractions 3A, then 3B, then 3C.

$$Hg_{bh3(A,B,C)} = \frac{Q_{bh3(A,B,C)}}{V_{FB(A,B,C)}} \times V_{soln.3(A,B,C)} \quad \text{Eq. 6}$$

where:

$Hg_{bh3(A,B,C)}$ = total mass of mercury collected separately in Fraction 3A, 3B, or 3C, μg .

$Q_{bh3(A,B,C)}$ = quantity of mercury in separately analyzed samples, μg .

$V_{FB(A,B,C)}$ = volume of Fraction 3A, 3B, or 3C analyzed, ml (see Note in sections 3.1.8.5.1 and 3.1.8.5.2, and calculate similarly).

$V_{soln.3(A,B,C)}$ = total volume of Fraction 3A, 3B, or 3C, ml.

$Hg_{bh} = Hg_{bh2} + Hg_{bh3A} + Hg_{bh3B} + Hg_{bh3C}$ Eq. 7

where:

Hg_{bh} = total mass of mercury collected in the back half of the sampling train, μg .

3.1.8.5.3 Total Train Mercury Catch.

Calculate the total amount of mercury collected in the sampling train using Equation 8.

$$Hg_t = (Hg_m - Hg_{nb}) + (Hg_{bh} - Hg_{bnb}) \quad \text{Eq. 8}$$

where:

Hg_t = total mass of mercury collected in the sampling train, μg .

Hg_{nb} = blank correction value for mass of mercury detected in front-half field reagent blank, μg .

Hg_{bnb} = blank correction value for mass of mercury detected in back-half field reagent blanks, μg .

Note: If the total of the measured blank values ($Hg_{nb} + Hg_{bnb}$) is in the range of 0 to $6 \mu\text{g}$, then the total may be used to correct the emission sample value ($Hg_m + Hg_{bh}$); if it exceeds $6 \mu\text{g}$, the greater of the following two values may be used: $6 \mu\text{g}$ or 5 percent of the emission sample value ($Hg_m + Hg_{bh}$).

3.1.8.6 Metal Concentration of Stack Gas.

Calculate each metal separately for the cadmium, total chromium, arsenic, nickel, manganese, beryllium, copper, lead, phosphorus, thallium, silver, barium, zinc, selenium, antimony, and mercury concentrations in the stack gas (dry basis, adjusted to standard conditions) as follows:

$$C_s = K_s(M_t/V_{gas(dscm)}) \quad \text{Eq. 9}$$

where:

C_s = concentration of each metal in the stack gas, mg/dscm .

$K_s = 10^{-3} \text{ mg}/\mu\text{g}$.

M_t = total mass of each metal collected in the sampling train, μg ; (substitute Hg, for M, for the mercury calculation).

$V_{gas(dscm)}$ = volume of gas sample as measured by the dry gas meter, corrected to dry standard conditions, dscm.

3.1.8.7 Isokinetic Variation and Acceptable Results. Same as method 5, sections 6.11 and 6.12, respectively.

3.1.9 Bibliography

3.1.9.1 Method 303F in Standard Methods for the Examination of Water and Wastewater, 15th Edition, 1980. Available from the American Public Health Association, 1015 18th Street NW., Washington, DC 20036.

3.1.9.2 EPA Methods 6010, 7000, 7041, 7060, 7131, 7421, 7470, 7740, and 841. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods SW-846, Third Edition, September 1988. Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, Washington, DC 20460.

3.1.9.3 EPA Method 200.7, Code of Federal Regulations, title 40, part 136, appendix C, July 1, 1987.

3.1.9.4 EPA Methods 1 through 5, and 12 Code of Federal Regulations, title 40, part 60, appendix A, July 1, 1987.

3.2 Determination of Hexavalent Chromium Emissions from Stationary Sources (Method Cr*)

3.2.1 Applicability and Principle

3.2.1.1 Applicability. This method applies to the determination of hexavalent chromium (Cr^{+6}) emissions from hazardous waste incinerators, municipal waste combustors, sewage sludge incinerators, and boilers and industrial furnaces. With the approval of the Administrator, this method may also be used to measure total chromium. The sampling train, constructed of Teflon components, has only been evaluated at temperatures less than 300°F . Trains constructed of other materials, for testing at higher temperatures, are currently being evaluated.

3.2.1.2 Principle. For incinerators and combustors, the Cr^{+6} emissions are collected

isokinetically from the source. To eliminate the possibility of Cr^{6+} reduction between the nozzle and impinger, the emission samples are collected with a recirculatory train where the impinger reagent is continuously recirculated to the nozzle. Recovery procedures include a post-sampling purge and filtration. The impinger train samples are analyzed for Cr^{6+} by an ion chromatograph equipped with a post-column reactor and a visible wavelength detector. The IC/PCR separates the Cr^{6+} as chromate (CrO_4^{2-}) from other components in the sample matrices that may interfere with the Cr^{6+} -specific diphenylcarbazide reaction that occurs in the post-column reactor. To increase sensitivity for trace levels of chromium, a preconcentration system is also used in conjunction with the IC/PCR.

3.2.2 Range, Sensitivity, Precision, and Interference

3.2.2.1 Range. Employing a preconcentration procedure, the lower limit of the detection range can be extended to 18 nanograms per dry standard cubic meter (ng/dscm) with a 3 dscm gas sample (0.1 ppb in

solution). With sample dilution, there is no upper limit.

3.2.2.2 Sensitivity. A minimum detection limit of 8 ng/dscm with a 3 dscm gas sample can be achieved by preconcentration (0.05 ppb in solution).

3.2.2.3 Precision. The precision of the IC/PCR with sample preconcentration is 5 to 10 percent. The overall precision for sewage sludge incinerators emitting 120 ng/dscm of Cr^{6+} and 3.5 $\mu\text{g}/\text{dscm}$ of total chromium is 25% and 9% for Cr^{6+} and total chromium, respectively; for hazardous waste incinerators emitting 300 ng/dscm of Cr^{6+} it is 20 percent.

3.2.2.4 Interference. Components in the sample matrix may cause Cr^{6+} to convert to trivalent chromium (Cr^{3+}) or cause Cr^{3+} to convert to Cr^{6+} . A post-sampling nitrogen purge and sample filtration are included to eliminate many of these interferences. The chromatographic separation of Cr^{6+} using ion chromatography reduces the potential for other metals to interfere with the post-column reaction. For the IC/PCR analysis, only compounds that coelute with Cr^{6+} and affect the diphenylcarbazide reaction will cause

interference. Periodic analysis of deionized (DI) water blanks is used to demonstrate that the analytical system is essentially free from contamination. Sample cross-contamination that can occur when high-level and low-level samples or standards are analyzed alternately is eliminated by thorough purging of the sample loop. Purging can easily be achieved by increasing the injection volume of the samples to ten times the size of the sample loop.

3.2.3 Apparatus

3.2.3.1 Sampling Train. Schematics of the recirculating sampling trains employed in this method are shown in Figures 3.2-1 and 3.2-2. The recirculatory train is readily assembled from commercially available components. All portions of the train in contact with the sample are either glass, quartz, Tygon, or Teflon, and are to be cleaned as per subsection 3.2.5.1.1.

The metering system is identical to that specified by Method 5 (see section 3.8.1); the sampling train consists of the following components:

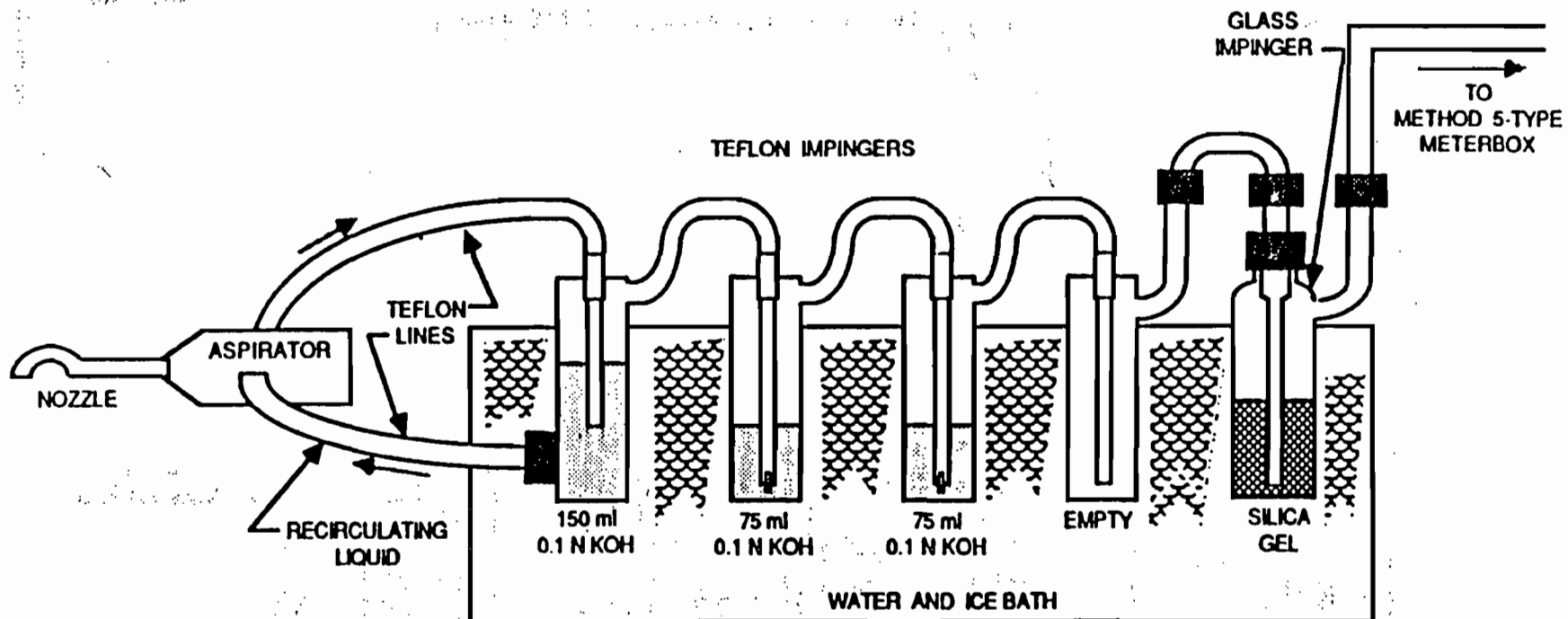


Figure 3.2-1 Schematic of recirculatory impinger train with aspirator assembly.

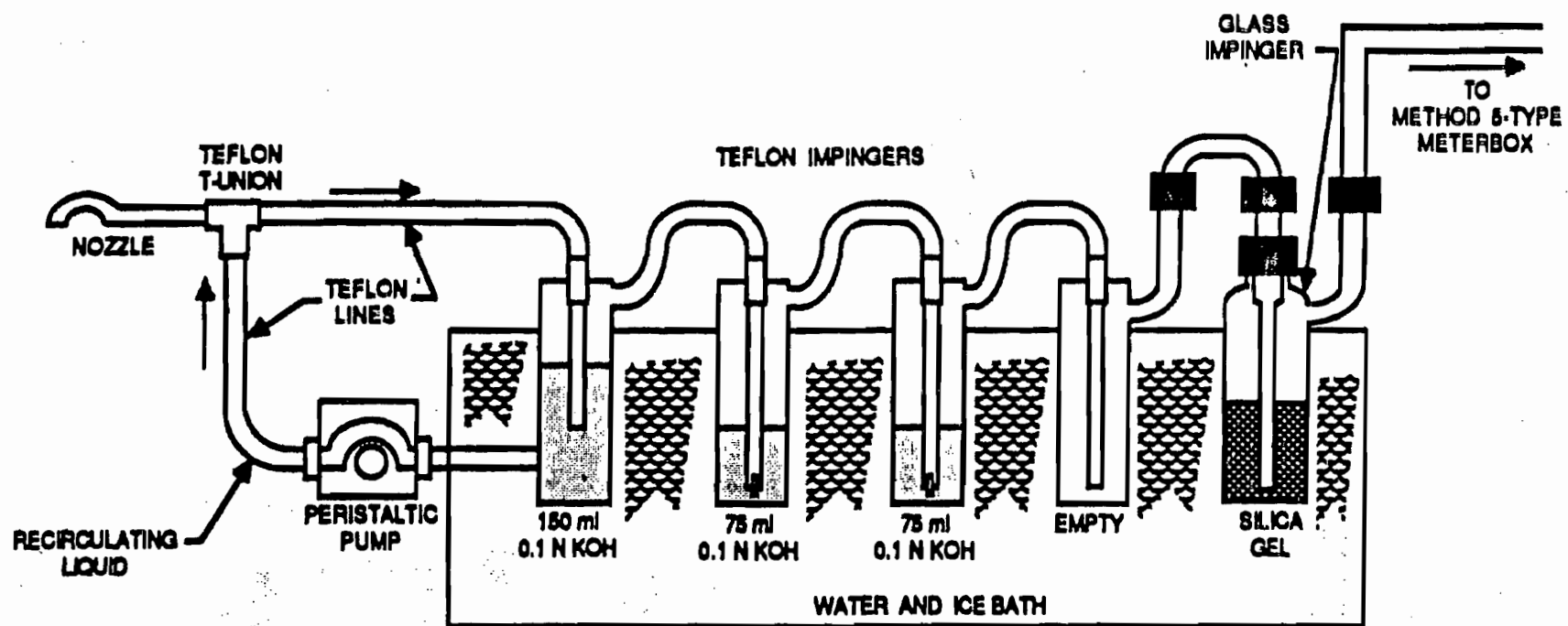


Figure 3.2-2 Schematic of recirculatory impinger train with pump/sprayer assembly.

3.2.3.1.1 Probe Nozzle. Glass or Teflon with a sharp, tapered leading edge. The angle of taper shall be $\leq 30^\circ$ and the taper shall be on the outside to preserve a constant internal diameter. The probe nozzle shall be of the button-hook or elbow design, unless otherwise specified by the Administrator.

A range of nozzle sizes suitable for isokinetic sampling should be available, e.g., 0.32 to 1.27 cm ($\frac{1}{8}$ to $\frac{1}{2}$ in) (or larger if higher volume sample trains are used) inside diameter (ID) nozzles in increments of 0.18 cm ($\frac{1}{8}$ in). Each nozzle shall be calibrated according to the procedures outlined in section 3.2.8.

3.2.3.1.2 Teflon Aspirator or Pump/Sprayer Assembly. Teflon aspirator capable of recirculating absorbing reagent at 50 ml/min while operating at 0.75 cfm. Alternatively, a pump/sprayer assembly may be used instead of the Teflon aspirator. A Teflon union-T is connected behind the nozzle to provide the absorbing reagent/sample gas mix; a peristaltic pump is used to recirculate the absorbing reagent at a flow rate of at least 50 ml/min. Teflon fittings, Teflon ferrules, and Teflon nuts are used to connect a glass or Teflon nozzle, recirculating line, and sample line to the Teflon aspirator

or union-T. Tygon, C-flex** or other suitable inert tubing for use with peristaltic pump.

3.2.3.1.3 Teflon Sample Line. Teflon, $\frac{3}{8}$ " outside diameter (OD) and $\frac{1}{4}$ " inside diameter (ID), or $\frac{1}{2}$ " OD x $\frac{3}{8}$ " ID, of suitable length to connect aspirator (or T-union) to first Teflon impinger.

3.2.3.1.4 Teflon Recirculation Line. Teflon, $\frac{1}{4}$ " O.D. and $\frac{1}{8}$ " I.D., of suitable length to connect first impinger to aspirator (or T-union).

3.2.3.1.5 Teflon Impingers. Four Teflon Impingers: Teflon tubes and fittings, such as made by Saville** can be used to construct impingers 2" diameter by 12" long, with vacuum-tight $\frac{3}{8}$ " O.D. Teflon compression fittings. Alternatively, standard glass impingers that have been Teflon-lined, with Teflon stems and U-tubes, may be used. Inlet fittings on impinger top to be bored through to accept $\frac{3}{8}$ " O.D. tubing as impinger stem. The second and third $\frac{3}{8}$ " OD Teflon stem has a $\frac{1}{4}$ " OD Teflon tube, 2" long, inserted at its end to duplicate the effects of the Greenburg-Smith impinger stem. The first impinger stem should extend 2" from impinger bottom, high enough in the impinger reagent to prevent air

*Note: Mention of trade names or specific product does not constitute endorsement by the Environmental Protection Agency.

from entering recirculating line; the second and third impinger stems should extend to $\frac{1}{2}$ " from impinger bottom. The first impinger should include a $\frac{1}{4}$ " O.D. Teflon compression fitting for recirculation line. The fourth impinger serves as a knockout impinger.

3.2.3.1.6 Glass Impinger. Silica gel impinger. Vacuum-tight impingers, capable of containing 400 g of silica gel, with compatible fittings. The silica gel impinger will have a modified stem ($\frac{1}{2}$ " ID at tip of stem).

3.2.3.1.7 Thermometer, (identical to that specified by Method 5) at the outlet of the silica gel impinger, to monitor the exit temperature of the gas.

3.2.3.1.8 Metering System, Barometer, and Gas Density Determinations Equipment. Same as method 5, sections 2.1.8 through 2.1.10, respectively.

3.2.3.2 Sample Recovery. Clean all items for sample handling or storage with 10% nitric acid solution by soaking, where possible, and rinse thoroughly with DI water before use.

3.2.3.2.1 Nitrogen Purge Line. Inert tubing and fittings capable of delivering 0 to 1 scf/min (continuously adjustable) of nitrogen gas to the impinger train from a standard gas cylinder (see Figure 3.2.3). Standard $\frac{1}{8}$ -inch Teflon tubing and compression fittings in conjunction with an adjustable pressure regulator and needle valve may be used.

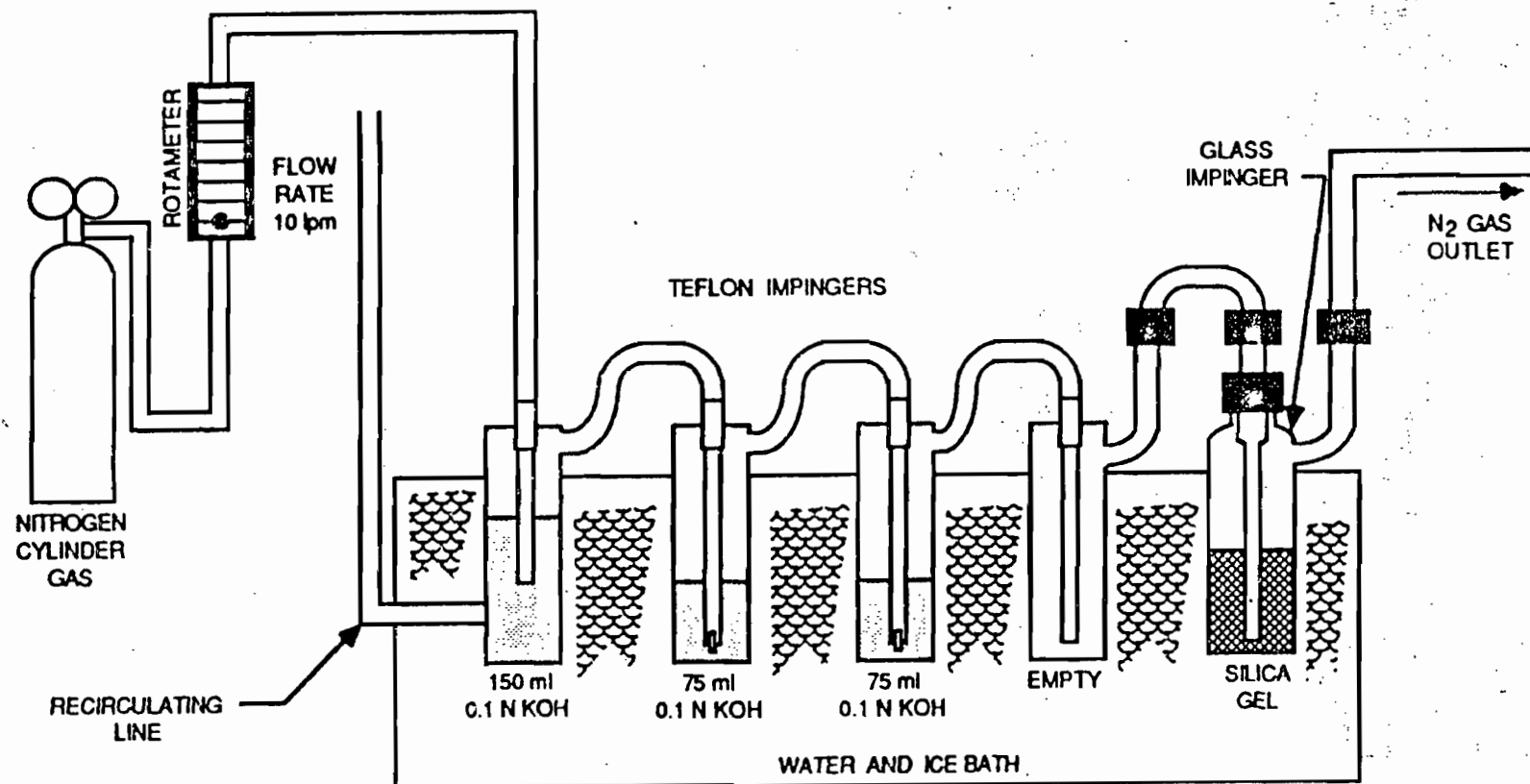


Figure 3.2-3 Schematic of post test nitrogen-purge system.

3.2.3.2.2 Wash bottles. Two polyethylene wash bottles, for DI water and nitric rinse solution.

3.2.3.2.3 Sample Storage Containers. Polyethylene, with leak-free screw cap, 500-ml or 1000-ml.

3.2.3.2.4 1000-ml Graduated Cylinder.

3.2.3.2.5 Plastic Storage Containers. Air tight containers to store silica gel.

3.2.3.2.6 Funnel and Rubber Policeman. To aid in transfer of silica gel from impinger to storage container; not necessary if silica gel is weighed directly in the impinger.

3.2.3.2.7 Balance.

3.2.3.3 Sample Preparation for Analysis. Sample preparation prior to analysis includes purging the sample train immediately following the sample run, and filtering the recovered sample to remove particulate matter immediately following recovery.

3.2.3.3.1 Beakers, Funnels, Volumetric Flasks, Volumetric Pipets, and Graduated Cylinders. Assorted sizes, Teflon or glass, for preparation of samples, sample dilution, and preparation of calibration standards. Prepare initially following procedure described in section 3.2.5.1.3 and rinse between use with 0.1 N HNO₃ and DI water.

3.2.3.3.2 Filtration Apparatus. Teflon, or equivalent, for filtering samples, and Teflon filter holder. Teflon impinger components have been found to be satisfactory as a sample reservoir for pressure filtration using nitrogen.

3.2.3.4 Analysis.

3.2.3.4.1 IC/PCR System. High performance liquid chromatograph pump, sample injection valve, post-column reagent delivery and mixing system, and a visible detector, capable of operating at 520 nm, all with a non-metallic (or inert) flow path. An electronic recording integrator operating in the peak area mode is recommended, but other recording devices and integration techniques are acceptable provided the repeatability criteria and the linearity criteria for the calibration curve described in section 3.2.5.5 can be satisfied. A sample loading system will be required if preconcentration is employed.

3.2.3.4.2 Analytical Column. A high performance ion chromatograph (HPIC) non-metallic column with anion separation characteristics and a high loading capacity designed for separation of metal chelating compounds to prevent metal interference. Resolution described in section 3.2.5.4 must be obtained. A non-metallic guard column with the same ion-exchange material is recommended.

3.2.3.4.3 Preconcentration Column. An HPIC non-metallic column with acceptable anion retention characteristics and sample loading rates as described in section 3.2.5.5.

3.2.3.4.4 0.45 µm filter cartridge. For the removal of insoluble material. To be used just prior to sample injection/analysis.

3.2.4 Reagents

All reagents should, at a minimum, conform to the specifications established by the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available. All prepared reagents should be checked by IC/PCR analysis for Cr⁶⁺ to ensure that contamination is below the analytical

detection limit for direct injection or, if selected, preconcentration. If total chromium is also to be determined, the reagents should also be checked by the analytical technique selected to ensure that contamination is below the analytical detection limit.

3.2.4.1 Sampling.

3.2.4.1.1 Water. Deionized water. It is recommended that water blanks be checked prior to preparing sampling reagents to ensure that the Cr⁶⁺ content is less than the analytical detection limit.

3.2.4.1.2 Potassium Hydroxide, 0.1 N. Add 5.6 gm of KOH(s) to approximately 900 ml of DI water and let dissolve. Dilute to 1000 ml with DI water.

Note: At sources with high concentrations of acids and/or SO₂, the concentration of KOH should be increased to 0.5 N to ensure that the pH of the solution is above 8.5 after sampling.

3.2.4.1.3 Silica Gel and Crushed Ice. Same as Method 5, sections 3.1.2 and 3.1.4, respectively.

3.2.4.2 Sample Recovery. The reagents used in sample recovery are as follows:

3.2.4.2.1 Water. Same as subsection 3.2.4.1.1.

3.2.4.2.2 Nitric Acid, 0.1 N. Add 6.3 ml of concentrated HNO₃ (70 percent) to a graduated cylinder containing approximately 900 ml of DI water. Dilute to 1000 ml with DI water, and mix well.

3.2.4.2.3 pH Indicator Strip. pH indicator capable of determining pH of solution between the pH range of 7 and 12, at 0.5 pH intervals.

3.2.4.3 Sample Preparation

3.2.4.3.1 Water. Same as subsection 3.2.4.1.1.

3.2.4.3.2 Nitric Acid, 0.1 N. Same as subsection 3.2.4.2.2.

3.2.4.3.3 Filters. Acetate membrane, or equivalent, filters with 0.45 micrometer or smaller pore size to remove insoluble material.

3.2.4.4 Analysis.

3.2.4.4.1 Chromatographic Eluent. The eluent used in the analytical system is ammonium sulfate based. It is prepared by adding 6.5 ml of 29 percent ammonium hydroxide (NH₄OH) and 33 grams of ammonium sulfate ((NH₄)₂SO₄) to 500 ml of DI water. The mixture should then be diluted to 1 liter with DI water and mixed well. Other combinations of eluents and/or columns may be employed provided peak resolution, as described in section 3.2.5.4, repeatability and linearity, as described in section 3.2.6.2, and analytical sensitivity are acceptable.

3.2.4.4.2 Post-Column Reagent. An effective post-column reagent for use with the chromatographic eluent described in section 3.2.4.4.1 is a diphenylcarbazine (DPC) based system. Dissolve 0.5 g of 1,5-diphenylcarbazine (DPC) in 100 ml of ACS grade methanol. Add to 500 ml of degassed DI water containing 50 ml of 96 percent spectrophotometric grade sulfuric acid. Dilute to 1 liter with degassed DI water.

3.2.4.4.3 Cr⁶⁺ Calibration Standard. Prepare Cr⁶⁺ standards from potassium dichromate (K₂Cr₂O₇, FW 294.19). To prepare a 1000 µg/ml Cr⁶⁺ stock solution, dissolve 2.829 g of dry K₂Cr₂O₇ in 1 liter of DI water. To prepare working standards, dilute the

stock solution to the chosen standard concentrations for instrument calibration with 0.05 N KOH to achieve a matrix similar to the actual field samples.

3.2.4.4.4 Performance Audit Sample. A performance audit sample shall be obtained from the Quality Assurance Division of EPA and analyzed with the field samples. The mailing address to request audit samples is: U.S. Environmental Protection Agency, Atmospheric Research and Exposure Assessment Laboratory, Quality Assurance Division, Source Branch, Mail Drop 77-A, Research Triangle Park, North Carolina 27711.

The audit sample should be prepared in a suitable sample matrix at a concentration similar to the actual field samples.

3.2.5 Procedure

Safety First—Wear Safety Glasses at All Times During This Test Method

3.2.5.1 Sampling. The complexity of this method is such that to obtain reliable results, testers should be trained and experienced with test procedures.

3.2.5.1.1 Pretest Preparation. All components shall be maintained and calibrated according to the procedures described in APTD-0576, unless otherwise specified herein.

Rinse all sample train components from the glass nozzle up to the silica gel impinger and sample containers with hot tap water followed by washing with hot soapy water. Next, rinse the train components and sample containers three times with tap water followed by three rinses with DI water. All the components and containers should then be soaked overnight, or a minimum of 4 hours, in a 10 percent (v/v) nitric acid solution, then rinsed three times with DI water. Allow the components to air dry prior to covering all openings with Parafilm, or equivalent.

3.2.5.1.2 Preliminary Determinations. Same as method 5, section 4.1.2.

3.2.5.1.3 Preparation of Sampling Train. Measure 300 ml of 0.1 N KOH into a graduated cylinder (or tare-weighted precleaned polyethylene container). Place approximately 150 ml of the 0.1 N KOH reagent in the first Teflon impinger. Split the rest of the 0.1 N KOH between the second and third Teflon impingers. The next Teflon impinger is left dry. Place a preweighed 200- to 400-g portion of indicating silica gel in the final glass impinger. (For sampling periods in excess of two hours, or for high moisture sites, 400-g of silica gel is recommended.)

Retain reagent blanks of the 0.1 N KOH equal to the volumes used with the field samples.

3.2.5.1.4 Leak-Check Procedures. Follow the leak-check procedures given in Method 5, section 4.1.4.1 (Pretest Leak-Check), Section 4.1.4.2 (Leak-Checks During the Sample Run), and Section 4.1.4.3 (Post-Test Leak-Checks).

3.2.5.1.5 Sampling Train Operation. Follow the procedures given in method 5, section 4.1.5. The sampling train should be iced down with water and ice to ensure heat transfer with the Teflon impingers.

Note: If the gas to be sampled is above 200 °F, it may be necessary to wrap three or

four feet of the Teflon sample and recirculating lines inside the ice bath to keep the recirculated reagent cool enough so it does not turn to steam.

For each run, record the data required on a data sheet such as the one shown in Figure 5.2 of method 5.

At the end of the sampling run, determine the pH of the reagent in the first impinger using a pH indicator strip. The pH of the solution shall be greater than 8.5.

3.2.5.1.6 Calculation of Percent Isokinetic. Same as method 5, section 4.1.6.

3.2.5.2 Post-Test Nitrogen Purge. The nitrogen purge is used as a safeguard against the conversion of hexavalent chromium to the trivalent oxidation state. The purge is effective in the removal of SO_2 from the impinger contents.

Attach the nitrogen purge line to the input of the impinger train. Check to ensure the output of the impinger train is open, and that the recirculating line is capped off. Open the nitrogen gas flow slowly and adjust the delivery rate to 10 L/min. Check the recirculating line to ensure that the pressure is not forcing the impinger reagent out through this line. Continue the purge under these conditions for one-half hour, periodically checking the flow rate.

3.2.5.3 Sample Recovery. Begin cleanup procedures as soon as the train assembly has been purged at the end of the sampling run. The probe assembly may be disconnected from the sample train prior to sample purging.

The probe assembly should be allowed to cool prior to sample recovery. Disconnect the umbilical cord from the sample train. When the probe assembly can be safely handled, wipe off all external particulate matter near the tip of the nozzle, and cap the nozzle prior to transporting the sample train to a cleanup area that is clean and protected from the wind and other potential causes of contamination or loss of sample. Inspect the train before and during disassembly and note any abnormal conditions.

3.2.5.3.1 Container No. 1 (Impingers 1 through 3). Disconnect the first impinger from the second impinger and disconnect the recirculation line from the aspirator or peristaltic pump. Drain the Teflon impingers into a pre-cleaned graduated cylinder or tare-weighted pre-cleaned polyethylene sample

container and measure the volume of the liquid to within 1 ml or 1 g. Record the volume of liquid present as this information is required to calculate the moisture content of the flue gas sample. If necessary, transfer the sample from the graduated cylinder to a pre-cleaned polyethylene sample container. With DI water, rinse four times the insides of the glass nozzle, the aspirator, the sample and recirculation lines, the impingers, and the connecting tubing, and combine the rinses with the impinger solution in the sample container.

3.2.5.3.2 Container No. 2 (HNO_3 rinse optional for total chromium). With 0.1 N HNO_3 , rinse three times the entire train assembly, from the nozzle to the fourth impinger and combine the rinses into a separate pre-cleaned polyethylene sample container for possible total chromium analysis. Repeat the rinse procedure a final time with DI water, and discard the water rinses. Mark the height of the fluid level on the container or, alternatively if a balance is available, weigh the container and record the weight to permit determination of any leakage during transport. Label the container clearly to identify its contents.

3.2.5.3.3 Container No. 3 (Silica Gel). Note the color of the indicating silica gel to determine if it has been completely spent. Quantitatively transfer the silica gel from its impinger to the original container, and seal the container. A funnel and a rubber policeman may be used to aid in the transfer. The small amount of particulate that may adhere to the impinger wall need not be removed. Do not use water or other liquids to transfer the silica gel. Alternatively, if a balance is available in the field, record the weight of the spent silica gel (or the silica gel plus impinger) to the nearest 0.5 g.

3.2.5.3.4 Container No. 4 (0.1 N KOH Blank). Once during each field test, place a volume of reagent equal to the volume placed in the sample train into a pre-cleaned polyethylene sample container, and seal the container. Mark the height of the fluid level on the container or, alternatively if a balance is available, weigh the container and record the weight to permit determination of any leakage during transport. Label the container clearly to identify its contents.

3.2.5.3.5 Container No. 5 (DI Water Blank). Once during each field test, place a

volume of DI water equal to the volume employed to rinse the sample train into a pre-cleaned polyethylene sample container, and seal the container. Mark the height of the fluid level on the container or, alternatively if a balance is available, weigh the container and record the weight to permit determination of any leakage during transport. Label the container clearly to identify its contents.

3.2.5.3.6 Container No. 6 (0.1 N HNO_3 Blank). Once during each field test if total chromium is to be determined, place a volume of 0.1 N HNO_3 reagent equal to the volume employed to rinse the sample train into a pre-cleaned polyethylene sample container, and seal the container. Mark the height of the fluid level on the container or, alternatively if a balance is available, weigh the container and record the weight to permit determination of any leakage during transport. Label the container clearly to identify its contents.

3.2.5.4 Sample Preparation. For determination of Cr^{+6} , the sample should be filtered *immediately following recovery* to remove any insoluble matter. Nitrogen gas may be used as a pressure assist to the filtration process (see Figure Cr^{+6} -4).

Filter the entire impinger sample through a 0.45-micrometer acetate filter (or equivalent), and collect the filtrate in a 1000-ml graduated cylinder. Rinse the sample container with DI water three separate times, pass these rinses through the filter, and add the rinses to the sample filtrate. Rinse the Teflon reservoir with DI water three separate times, pass these rinses through the filter, and add the rinses to the sample. Determine the final volume of the filtrate and rinses and return them to the rinsed polyethylene sample container. Label the container clearly to identify its contents. Rinse the Teflon reservoir once with 0.1 N HNO_3 and once with DI water and discard these rinses.

If total chromium is to be determined, quantitatively recover the filter and residue and place them in a vial. (The acetate filter may be digested with 5 ml of 70 percent nitric acid; this digestion solution may then be diluted with DI water for total chromium analysis.)

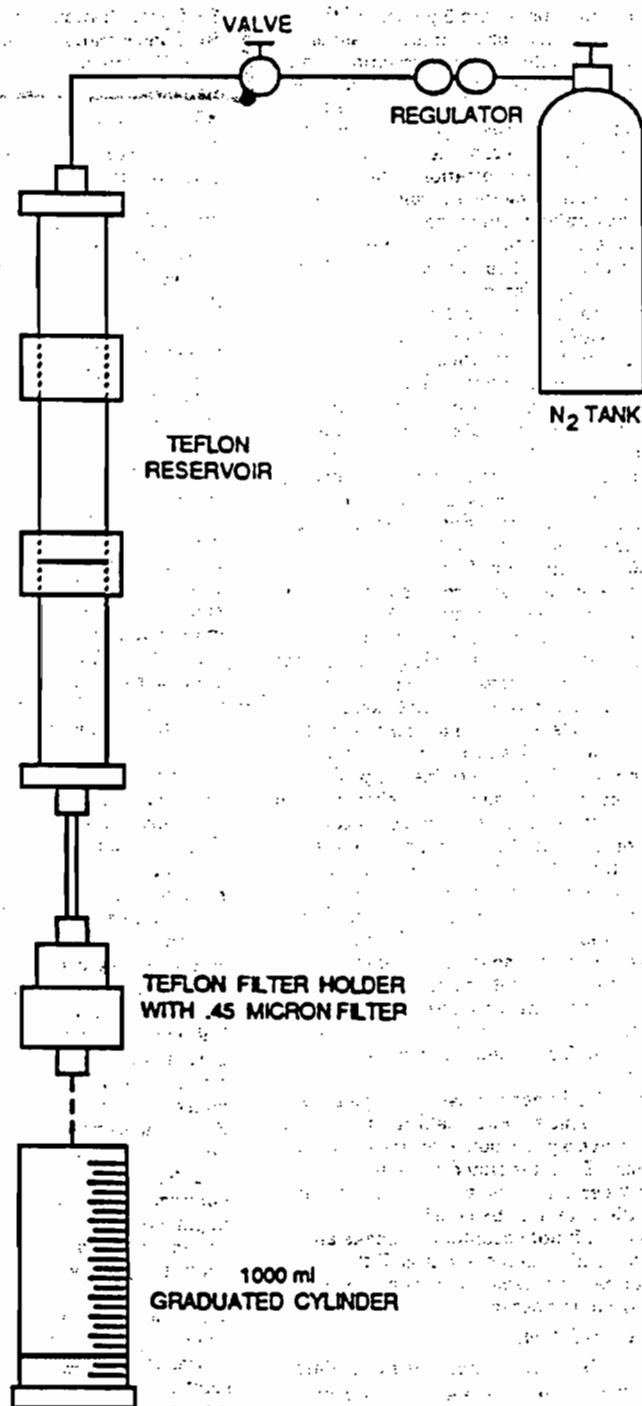


Figure 3.2-4 Schematic of sample filter system.

Note: If the source has a large amount of particulate in the effluent stream, testing teams may wish to filter the sample twice, once through a 2 to 5-micrometer filter, and then through the 0.45-micrometer filter.

3.2.5.4.1 Container 2 (HNO₃ rinse, optional for total chromium). This sample shall be analyzed in accordance with the selected procedure for total chromium analysis. At a minimum, the sample should be subjected to a digestion procedure sufficient to solubilize all chromium present.

3.2.5.4.2 Container 3 (Silica Gel). Weigh the spent silica gel to the nearest 0.5 g using a balance. (This step may be conducted in the field.)

3.2.5.5 Sample analysis. The Cr⁺⁺ content of the sample filtrate is determined by ion chromatography coupled with a post-column reactor (IC/PCR). To increase sensitivity for trace levels of chromium, a preconcentration system is also used in conjunction with the IC/PCR.

Prior to preconcentration and/or analysis, all field samples will be filtered through a 0.45-μ filter. This filtration should be conducted just prior to sample injection/analysis.

The preconcentration is accomplished by selectively retaining the analyte on a solid absorbent (as described in 3.2.3.4.3), followed by removal of the analyte from the absorbent. The sample is injected into a sample loop of the desired size (repeated loadings or larger size loop for greater sensitivity) and the Cr⁺⁺ is collected on the resin bed of the column. When the injection valve is switched, the eluent displaces the concentrated Cr⁺⁺ sample moving it off the preconcentration column and onto the IC anion separation column. After separation from other sample components, Cr⁺⁺ forms a specific complex in the post-column reactor with a diphenylcarbazide reaction solution, and the complex is then detected by visible absorbance at a wavelength of 520 nm. The amount of absorbance measured is proportional to the concentration of the Cr⁺⁺ complex formed. The IC retention time and absorbance of the Cr⁺⁺ complex is compared with known Cr⁺⁺ standards analyzed under identical conditions to provide both qualitative and quantitative analyses.

Prior to sample analysis, establish a stable baseline with the detector set at the required attenuation by setting the eluent flowrate at approximately 1 ml/min and post-column reagent flowrate at approximately 0.5 ml/min.

Note: As long as the ratio of eluent flowrate to PCR flowrate remains constant, the standard curve should remain linear. Inject a sample of DI water to ensure that no Cr⁺⁺ appears in the water blank.

First, inject the calibration standards prepared, as described in section 3.2.4.4.4, to cover the appropriate concentration range, starting with the lowest standard first. Next, inject, in duplicate, the performance audit sample, followed by the 0.1 N KOH field blank and the field samples. Finally, repeat the injection of the calibration standards to allow for compensation of instrument drift. Measure areas or heights of the Cr⁺⁺/DPC complex chromatogram peak. The response for replicate, consecutive injections of

samples must be within 5 percent of the average response, or the injection should be repeated until the 5 percent criterion can be met. Use the average response (peak areas or heights) from the duplicate injections of calibration standards to generate a linear calibration curve. From the calibration curve, determine the concentration of the field samples employing the average response from the duplicate injections.

The results for the analysis of the performance audit sample must be within 10 percent of the reference value for the field sample analysis to be valid.

3.2.6 Calibration. Maintain a written log of all calibration activities.

3.2.6.1 Sample Train Calibration. Calibrate the sample train components according to the indicated sections of method 5: Probe Nozzle (section 5.1); Pitot Tube (section 5.2); Metering System (section 5.3); Temperature Gauges (section 5.5); Leak-Check of the Metering System (section 5.6); and Barometer (section 5.7).

3.2.6.2 Calibration Curve for the IC/PCR. Prepare working standards from the stock solution described in section 3.2.4.4.4 by dilution with a DI water solution to approximate the field sample matrix. Prepare at least four standards to cover one order of magnitude that bracket the field sample concentrations. Run the standards with the field samples as described in section 3.2.5.5. For each standard, determine the peak areas (recommended) or the peak heights, calculate the average response from the duplicate injections, and plot the average response against the Cr⁺⁺ concentration in μg/L. The individual responses for each calibration standard determined before and after field sample analysis must be within 5 percent of the average response for the analysis to be valid. If the 5 percent criteria is exceeded, excessive drift and/or instrument degradation may have occurred, and must be corrected before further analyses are performed.

Employing linear regression, calculate a predicted value for each calibration standard with the average response for the duplicate injections. Each predicted value must be within 7 percent of the actual value for the calibration curve to be considered acceptable. If not acceptable, remake and/or rerun the calibration standards. If the calibration curve is still unacceptable, reduce the range of the curve.

3.2.7 Calculations

3.2.7.1 Dry Gas Volume. Using the data from the test, calculate $V_{m(tot)}$, the dry gas sample volume at standard conditions as outlined in Section 6.3 of Method 5.

3.2.7.2 Volume of Water Vapor and Moisture Content. Using the data from the test, calculate $V_{w(tot)}$ and $B_{w(tot)}$, the volume of water vapor and the moisture content of the stack gas, respectively, using Equations 5-2 and 5-3 of Method 5.

3.2.7.3 Stack Gas Velocity. Using the data from the test and Equation 2-9 of Method 2, calculate the average stack gas velocity.

3.2.7.4 Total μg Cr⁺⁺ per Sample. Calculate as described below:

$$m = (S - B) \times V_s \times d$$

where:

m = Mass of Cr⁺⁺ in the sample, μg.

S = Concentration of sample, μg Cr⁺⁺/ml.
 B = Concentration of blank, μg Cr⁺⁺/ml.
 V_s = Volume of sample after filtration, ml.
 d = Dilution factor (1 if not diluted).

3.3 Measurement of HCl and Cl₂

3.3.1 Isokinetic HCl/Cl₂ Emission Sampling Train (Method 0050)

3.3.1.1 Scope and Application.

3.3.1.1.1 This method describes the collection of hydrogen chloride (HCl, CAS Registry Number 7647-01-0) and chlorine (Cl₂, CAS Registry Number 7782-50-5) in stack gas emission samples from hazardous waste incinerators' municipal waste combustors, and boilers and industrial furnaces. The collected samples are analyzed using Method 9057. This method collects the emission sample isokinetically and is therefore particularly suited for sampling at sources such as those controlled by wet scrubbers, emitting acid particulate matter (e.g., HCl dissolved in water droplets). A midjet impinger train sampling method designed for sampling sources of HCl/Cl₂ emissions not in particulate form is presented in method 0051.

3.3.1.1.2 This method is not acceptable for demonstrating compliance with HCl emission standards less than 20 ppm.

3.3.1.1.3 This method may also be used to collect samples for subsequent determination of particulate emissions (by EPA method 5, reference 1) following the additional sampling procedures described.

3.3.1.2 Summary of Method.

3.3.1.2.1 Gaseous and particulate pollutants are withdrawn from an emission source and are collected by an optional cyclone, on a filter, and in absorbing solutions. The cyclone collects any liquid droplets and is not necessary if the source emissions do not contain liquid droplets. The Teflon mat or quartz-fiber filter collects other particulate matter including chloride salts. Acidic and alkaline absorbing solutions collect gaseous HCl and Cl₂, respectively. Following sampling of emissions containing liquid droplets, any HCl/Cl₂ dissolved in the liquid in the cyclone and/or on the filter is vaporized and ultimately collected in the impingers by pulling Ascarite II[®] conditioned ambient air through the sampling train. In the acidified water absorbing solution, the HCl gas is solubilized and forms chloride (Cl⁻) ions. The Cl₂ gas present in the emission has a very low solubility in acidified water and passes through to the alkaline absorbing solution where it undergoes hydrolysis to form a proton (H⁺), Cl⁻, and hypochlorous acid (HClO). The Cl⁻ ions in the separate solutions are measured by ion chromatography (method 9057). If desired, the particulate matter recovered from the filter and the probe is analyzed following the procedures in EPA Method 5 (reference 1).

3.3.1.3 Interferences.

3.3.1.3.1 Volatile materials which produce chloride ions upon dissolution during sampling are obvious interferences in the measurement of HCl. One interferant for HCl is atomic chlorine (Cl₂) gas which disproportionates to HCl and hypochlorous acid (HClO) upon dissolution in water. Cl₂ gas exhibits a low solubility in water,

EPA METHOD 18

Benzene

Method 18—Measurement of Gaseous Organic Compound Emissions by Gas Chromatography
Introduction

This method should not be attempted by persons unfamiliar with the performance characteristics of gas chromatography, nor by those persons who are unfamiliar with source sampling. Particular care should be exercised in the area of safety concerning choice of equipment and operation in potentially explosive atmospheres.

1. Applicability and Principle

1.1 Applicability. This method applies to the analysis of approximately 90 percent of the total gaseous organics emitted from an industrial source. It does not include techniques to identify and measure trace amounts of organic compounds, such as those found in building air and fugitive emission sources.

This method will not determine compounds that (1) are polymeric (high molecular weight), (2) can polymerize before analysis, or (3) have very low vapor pressures at stack or instrument conditions.

1.2 Principle.

The major organic components of a gas mixture are separated by gas chromatography (GC) and individually quantified by flame ionization, photoionization, electron capture, or other appropriate detection principles.

The retention times of each separated component are compared with those of known compounds under identical conditions. Therefore, the analyst confirms the identity and approximate concentrations of the organic emission components beforehand. With this information, the analyst then prepares or purchases commercially available standard mixtures to calibrate the GC under conditions identical to those of the samples. The analyst also determines the need for sample dilution to avoid detector saturation, gas stream filtration to eliminate particulate matter, and prevention of moisture condensation.

2. Range and Sensitivity

2.1 Range. The range of this method is from about 1 part per million (ppm) to the upper limit governed by GC detector saturation or column overloading. The upper limit can be extended by diluting the stack gases with an inert gas or by using smaller gas sampling loops.

2.2 Sensitivity. The sensitivity limit for a compound is defined as the minimum

detectable concentration of that compound, or the concentration that produces a signal-to-noise ratio of three to one. The minimum detectable concentration is determined during the presurvey calibration for each compound.

3. Precision and Accuracy

Gas chromatographic techniques typically provide a precision of 5 to 10 percent relative standard deviation (RSD), but an experienced GC operator with a reliable instrument can readily achieve 5 percent RSD. For this method, the following combined GC/operator values are required.

- 1. (a) Precision. Duplicate analyses are within 5 percent of their mean value.
- 1. (b) Accuracy. Analysis results of prepared audit samples are within 10 percent of preparation values.

4. Interferences

Resolution interferences that may occur can be eliminated by appropriate GC column and detector choice or by shifting the retention times through changes in the column flow rate and the use of temperature programming.

The analytical system is demonstrated to be essentially free from contaminants by periodically analyzing blanks that consist of hydrocarbon-free air or nitrogen.

Sample cross-contamination that occurs when high-level and low-level samples or standards are analyzed alternately, is best dealt with by thorough purging of the GC sample loop between samples.

To assure consistent detector response, calibration gases are contained in dry air. To adjust gaseous organic concentrations when water vapor is present in the sample, water vapor concentrations are determined for those samples, and a correction factor is applied.

5. Presurvey and Presurvey Sampling.

Perform a presurvey for each source to be tested. Refer to Figure 18-1. Some of the information can be collected from literature surveys and source personnel. Collect gas samples that can be analyzed to confirm the identities and approximate concentrations of the organic emissions.

5.1 Apparatus. This apparatus list also applies to Sections 6 and 7.

5.1.1 Teflon Tubing. (Mention of trade names or specific products does not constitute endorsement by the U.S. Environmental Protection Agency.) Diameter and length determined by connection requirements of cylinder regulators and the GC. Additional tubing is

necessary to connect the GC sample loop to the sample.

5.1.2 Gas Chromatograph. GC with suitable detector, columns, temperature-controlled sample loop and valve assembly, and temperature programmable oven, if necessary. The GC shall achieve sensitivity requirements for the compounds under study.

5.1.3 Pump. Capable of pumping 100 ml/min. For flushing sample loop.

5.1.4 Flowmeters. To measure flow rates.

5.1.5 Regulators. Used on gas cylinders for GC and for cylinder standards.

5.1.6 Recorder. Recorder with linear strip chart is minimum acceptable. Integrator (optional) is recommended.

5.1.7 Syringes. 0.5—ml, 1.0— and 10—microliter sizes, calibrated, maximum accuracy (gas tight), for preparing calibration standards. Other appropriate sizes can be used.

5.1.8 Tubing Fittings. To plumb GC and gas cylinders.

5.1.9 Septums. For syringe injections.

5.1.10 Glass Jars. If necessary, clean-colored glass jars with Teflon-lined lids for condensate sample collection. Size depends on volume of condensate.

5.1.11 Soap Film Flow Meter. To determine flow rates.

5.1.12 Tedlar Bags. 10— and 50-liter capacity, for preparation of standards.

5.1.13 Dry Gas Meter with Temperature and Pressure Gauges. Accurate to ± 2 percent, for preparation of gas standards.

5.1.14 Midget Impinger/Hot Plate Assembly. For preparation of gas standards.

5.1.15 Sample Flasks. For presurvey samples, must have gas-tight seals.

5.1.16 Adsorption Tubes. If necessary, blank tubes filled with necessary adsorbent (charcoal, Tenax, XAD-2, etc.) for presurvey samples.

5.1.17 Personnel Sampling Pump. Calibrated, for collecting adsorbent tube presurvey samples.

5.1.18 Dilution System. Calibrated, the dilution system is to be constructed following the specifications of an acceptable method.

5.1.19 Sample Probes. Pyrex or stainless steel, of sufficient length to reach centroid of stack, or a point no closer to the walls than 1 m.

5.1.20 Barometer. To measure barometric pressure.

5.2 Reagents.

5.2.1 Deionized Distilled Water.

5.2.2 Methylene Dichloride.

5.2.3 Calibration Gases. A series of standards prepared for every compound of interest.

5.2.4 Organic Compound Solutions. Pure

(99.9 percent), or as pure as can reasonably be obtained, liquid samples of all the organic compounds needed to prepare calibration standards.

5.2.5 Extraction Solvents. For extraction of adsorbent tube samples in preparation for analysis.

5.2.6 Fuel. As recommended by the manufacturer for operation of the GC.

5.2.7 Carrier Gas. Hydrocarbon free, as recommended by the manufacturer for operation of the detector and compatibility with the column.

5.2.8 Zero Gas. Hydrocarbon free air or nitrogen, to be used for dilutions, blank preparation, and standard preparation.

5.3 Sampling.

5.3.1 Collection of Samples with Glass Sampling Flasks. Presurvey samples can be collected in precleaned 250-ml double-ended glass sampling flasks. Teflon stopcocks, without grease, are preferred. Flasks should be cleaned as follows: Remove the stopcocks from both ends of the flasks, and wipe the parts to remove any grease. Clean the stopcocks, barrels, and receivers with methylene dichloride. Clean all glass ports with a soap solution, then rinse with tap and deionized distilled water. Place the flask in a cool glass annealing furnace and apply heat up to 500°C. Maintain at this temperature for 1 hour. After this time period, shut off and open the furnace to allow the flask to cool. Grease the stopcocks with stopcock grease and return them to the flask receivers. Purge the assembly with high-purity nitrogen for 2 to 5 minutes. Close off the stopcocks after purging to maintain a slight positive nitrogen pressure. Secure the stopcocks with tape.

Presurvey samples can be obtained either by drawing the gases into the previously evacuated flask or by drawing the gases into and purging the flask with a rubber suction bulb.

5.3.1.1 Evacuated Flask Procedure. Use a high-vacuum pump to evacuate the flask to the capacity of the pump; then close off the stopcock leading to the pump. Attach a 6-mm outside diameter (OD) glass tee to the flask inlet with a short piece of Teflon tubing. Select a 6-mm OD borosilicate sampling probe, enlarged at one end to a 12-mm OD and of sufficient length to reach the centroid of the duct to be sampled. Insert a glass wool plug in the enlarged end of the probe to remove particulate matter. Attach the other end of the probe to the tee with a short piece of Teflon tubing. Connect a rubber suction bulb to the third leg of the tee. Place the filter end of the probe at the centroid of the duct, or at a point no closer to the walls than 1 m, and purge the probe with the rubber suction bulb. After the probe is

completely purged and filled with duct gases, open the stopcock to the grab flask until the pressure in the flask reaches duct pressure. Close off the stopcock, and remove the probe from the duct. Remove the tee from the flask and tape the stopcocks to prevent leaks during shipment. Measure and record the duct temperature and pressure.

5.3.1.2 Purged Flask Procedure. Attach one end of the sampling flask to a rubber suction bulb. Attach the other end to a 6-mm OD glass probe as described in Section 5.3.1.1. Place the filter end of the probe at the centroid of the duct, or at a point no closer to the walls than 1 m, and apply suction with the bulb to completely purge the probe and flask. After the flask has been purged, close off the stopcock near the suction bulb, and then close the stopcock near the probe. Remove the probe from the duct, and disconnect both the probe and suction bulb. Tape the stopcocks to prevent leakage during shipment. Measure and record the duct temperature and pressure.

5.3.2 Flexible Bag Procedure. Tedlar or aluminized Mylar bags can also be used to obtain the presurvey sample. Use new bags, and leak check them before field use. In addition, check the bag before use for contamination by filling it with nitrogen or air, and analyzing the gas by GC at high sensitivity. Experience indicates that it is desirable to allow the inert gas to remain in the bag about 24 hours or longer to check for desorption of organics from the bag. Follow the leak check and sample collection procedures given in Section 7.1.

5.3.3 Determination of Moisture Content. For combustion or water-controlled processes, obtain the moisture content from plant personnel or by measurement during the presurvey. If the source is below 59°C, measure the wet bulb and dry bulb temperatures, and calculate the moisture content using a psychrometric chart. At higher temperatures, use Method 4 to determine the moisture content.

5.4 Determination of Static Pressure. Obtain the static pressure from the plant personnel or measurement. If a type S pitot tube and an inclined manometer are used, take care to align the pitot tube 90° from the direction of the flow. Disconnect one of the tubes to the manometer, and read the static pressure; note whether the reading is positive or negative.

5.5 Collection of Presurvey Samples with Adsorption Tube. Follow Section 7.4 for presurvey sampling.

6. Analysis Development

6.1 Selection of GC Parameters.

6.1.1 Column Choice. Based on the initial contact with plant personnel

concerning the plant process and the anticipated emissions, choose a column that provides good resolution and rapid analysis time. The choice of an appropriate column can be aided by a literature search, contact with manufacturers of GC columns, and discussion with personnel at the emission source.

Most column manufacturers keep excellent records of their products. Their technical service departments may be able to recommend appropriate columns and detector type for separating the anticipated compounds, and they may be able to provide information on interferences, optimum operating conditions, and column limitations.

Plants with analytical laboratories may also be able to provide information on appropriate analytical procedures.

6.1.2 Preliminary GC Adjustment. Using the standards and column obtained in Section 6.1.1, perform initial tests to determine appropriate GC conditions that provide good resolution and minimum analysis time for the compounds of interest.

6.1.3 Preparation of Presurvey Samples. If the samples were collected on an adsorbent, extract the sample as recommended by the manufacturer for removal of the compounds with a solvent suitable to the type of GC analysis. Prepare other samples in an appropriate manner.

6.1.4 Presurvey Sample Analysis. Before analysis, heat the presurvey sample to the duct temperature to vaporize any condensed material. Analyze the samples by the GC procedure, and compare the retention times against those of the calibration samples that contain the components expected to be in the stream. If any compounds cannot be identified with certainty by this procedure, identify them by other means such as GC/mass spectroscopy (GC/MS) or GC/infrared techniques. A GC/MS system is recommended.

Use the GC conditions determined by the procedures of Section 6.1.2 for the first injection. Vary the GC parameters during subsequent injections to determine the optimum settings. Once the optimum settings have been determined, perform repeat injections of the sample to determine the retention time of each compound. To inject a sample, draw sample through the loop at a constant rate (100 ml/min for 30 seconds). Be careful not to pressurize the gas in the loop. Turn off the pump and allow the gas in the sample loop to come to ambient pressure. Activate the sample valve, and record injection time, loop temperature, column temperature, carrier flow rate, chart speed,

and attenuator setting. Calculate the retention time of each peak using the distance from injection to the peak maximum divided by the chart speed. Retention times should be repeatable within 0.5 seconds.

If the concentrations are too high for appropriate detector response, a smaller sample loop or dilutions may be used for gas samples, and, for liquid samples, dilution with solvent is appropriate. Use the standard curves (Section 6.3) to obtain an estimate of the concentrations.

Identify all peaks by comparing the known retention times of compounds expected to be in the retention times of peaks in the sample. Identify any remaining unidentified peaks which have areas larger than 5 percent of the total using a GC/MS, or estimation of possible compounds by their retention times compared to known compounds, with confirmation by further GC analysis.

6.2 Calibration Standards. Prepare or obtain enough calibration standards so that there are three different concentrations of each organic compound expected to be measured in the source sample. For each organic compound, select those concentrations that bracket the concentrations expected in the source samples. A calibration standard may contain more than one organic compound. If available, commercial cylinder gases may be used if their concentrations have been certified by direct analysis.

If samples are collected in adsorbent tubes (charcoal, XAD-2, Tenax, etc.), prepare or obtain standards in the same solvent used for the sample extraction procedure. Refer to Section 7.4.3.

Verify the stability of all standards for the time periods they are used. If gas standards are prepared in the laboratory, use one or more of the following procedures.

6.2.1 Preparation of Standards from High Concentration Cylinder Standards. Obtain enough high concentration cylinder standards to represent all the organic compounds expected in the source samples.

Use these high concentration standards to prepare lower concentration standards by dilution, as shown by Figures 18-5 and 18-6.

To prepare the diluted calibration samples, calibrated rotameters are normally used to meter both the high concentration calibration gas and the diluent gas. Other types of flowmeters and commercially available dilution systems can also be used.

Calibrate each flowmeter before use by placing it between the diluent gas supply and suitably sized bubble meter, spirometer, or wet test meter. Record all

data shown on Figure 18-4. While it is desirable to calibrate the cylinder gas flowmeter with cylinder gas, the available quantity and cost may preclude it. The error introduced by using the diluent gas for calibration is insignificant for gas mixtures of up to 1,000 to 2,000 ppm of each organic component.

Once the flowmeters are calibrated, connect the flowmeters to the calibration and diluent gas supplies using 6-mm Teflon tubing. Connect the outlet side of the flowmeters through a connector to a leak-free Tedlar bag as shown in Figure 18-5. (See Section 7.1 for bag leak-check procedures.) Adjust the gas flow to provide the desired dilution, and fill the bag with sufficient gas for GC calibration. Be careful not to overfill and cause the bag to apply additional pressure on the dilution system. Record the flow rates of both flowmeters, and the laboratory temperature and atmospheric pressure. Calculate the concentration C_s in ppm of each organic in the diluted gas as follows:

$$C_s = \frac{10^6 (\bar{X} q_c)}{q_c + q_d} \quad \text{Eq. 18-1}$$

Where:

10^6 = Conversion to ppm.

$\bar{X}$ = Mole or volume fraction of the organic in the calibration gas to be diluted.

q_c = Flow rate of the calibration gas to be diluted.

q_d = Diluent gas flow rate.

Single-stage dilutions should be used to prepare calibration mixtures up to about 1:20 dilution factor.

For greater dilutions, a double dilution system is recommended, as shown in Figure 18-6. Fill the Tedlar bag with the dilute gas from the second stage. Record the laboratory temperature, barometric pressure, and static pressure readings. Correct the flow reading for temperature and pressure. Calculate the concentration C_s in ppm of the organic in the final gas mixture as follows:

$$C_s = 10^6 \bar{X} \left(\frac{q_{c1}}{q_{c1} + q_{d1}} \right) \left(\frac{q_{c2}}{q_{c2} + q_{d2}} \right) \quad \text{Eq. 18-2}$$

Where:

10^6 = Conversion to ppm.

$\bar{X}$ = Mole or volume fraction of the organic in the calibration gas to be diluted.

q_{c1} = Flow rate of the calibration gas to be diluted in stage 1.

q_{c2} = Flow rate of the calibration gas to be diluted in stage 2.

q_{d1} = Flow rate of diluent gas in stage 1.

q_{d2} = Flow rate of diluent gas in stage 2.

Further details of the calibration methods for flowmeters and the dilution system can be found in Citation 21 in the Bibliography.

6.2.2 Preparation of Standards from Volatile Materials. Record all data shown on Figure 18-3.

6.2.2.1 Gas Injection Technique. This procedure is applicable to organic compounds that exist entirely as a gas at ambient conditions. Evacuate a 10-liter Tedlar bag that has passed a leak-check (see Section 7.1), and meter in 5.0 liters of air or nitrogen through a dry gas meter that has been calibrated in a manner consistent with the procedure described in Section 5.1.1 of Method 5. While the bag is filling use a 0.5-ml syringe to inject a known quantity of "pure" gas of the organic compound through the wall of the bag, or through a septum-capped tee at the bag inlet. Withdraw the syringe needle, and immediately cover the resulting hole with a piece of masking tape. In a like manner, prepare dilutions having other concentrations. Prepare a minimum of three concentrations. Place each bag on a smooth surface, and alternately depress opposite sides of the bag 50 times to mix the gases. Record the average meter temperature and pressure, the gas volume and the barometric pressure. Record the syringe temperature and pressure before injection.

Calculate each organic standard concentration C_s in ppm as follows:

$$C_s = \frac{G_v \times 10^6 \frac{293}{T_s} \frac{P_s}{760}}{V_m \times \frac{293}{T_m} \frac{P_m}{760} \times \frac{1000}{G_v \times 10^3 \frac{P_s}{T_s} \frac{T_m}{P_m}}} \quad \text{Eq. 18-3}$$

Where:

G_v = Gas volume or organic compound injected, ml.

10⁻⁶ = Conversion to ppm.

P_s = Absolute pressure of syringe before injection, mm Hg.

T_s = Absolute temperature of syringe before injection, °K.

V_m = Gas volume indicated by dry gas meter, liters.

Y = Dry gas meter calibration factor, dimensionless.

P_m = Absolute pressure of dry gas meter, mm Hg.

T_m = Absolute temperature of dry gas meter, °K.

1000 = Conversion factor, ml/liter.

6.2.2.2 Liquid Injection Technique. Use the equipment shown in Figure 18-8. Calibrate the dry gas meter as described in Section 6.2.2.1 with a wet test meter or a spirometer. Use a water manometer for the pressure gauge and glass, Teflon, brass, or stainless steel for all connections. Connect a valve to the inlet of the 50-liter Tedlar bag.

To prepare the standards, assemble the equipment as shown in Figure 18-8, and leak-check the system. Completely evacuate the bag. Fill the bag with hydrocarbon-free air, and evacuate the bag again. Close the inlet valve.

Turn on the hot plate, and allow the water to reach boiling. Connect the bag to the impinger outlet. Record the initial meter reading, open the bag inlet valve, and open the cylinder. Adjust the rate so that the bag will be completely filled in approximately 15 minutes. Record meter pressure and temperature, and local barometric pressure.

Allow the liquid organic to equilibrate to room temperature. Fill the 1.0— or 10—microliter syringe to the desired liquid volume with the organic. Place the syringe needle into the impinger inlet using the septum provided, and inject the liquid into the flowing air stream. Use a needle of sufficient length to permit injection of the liquid below the air inlet branch of the tee. Remove the syringe.

When the bag is filled, stop the pump, and close the bag inlet valve. Record the final meter reading, temperature, and pressure.

Disconnect the bag from the impinger outlet, and either set it aside for at least 1 hour, or massage the bag to insure complete mixing.

Measure the solvent liquid density at room temperature by accurately weighing a known volume of the material on an analytical balance to the nearest 1.0 milligram. A ground-glass stoppered 25—mil volumetric flask or a glass-stoppered specific gravity bottle is suitable for weighing. Calculate the result in terms of g/ml. As an alternative, literature values of the density of the liquid

at 20 °C may be used.

Calculate each organic standard concentration C_s in ppm as follows:

$$C_s = \frac{L_v \rho (24.055 \times 10^6)}{V_m Y \frac{293}{T_m} \frac{P_m}{760} 1000}$$
$$= 6.24 \times 10^4 \frac{L_v \rho T_m}{H V_m Y P_m}$$

Eq. 18-4

Where:

L_v = Liquid volume of organic injected, ul.

ul = Liquid organic density as determined, g/ml.

M = Molecular weight of organic, g/g—mole.

24.055 = Ideal gas molar volume at 293 °K and 760 mm Hg, liters/g—mole.

10⁻⁶ = Conversion to ppm.

1000 = Conversion factor, ul/ml.

6.3 Preparation of Calibration Curves. Establish proper GC conditions, then flush the sampling loop for 30 seconds at a rate of 100 ml/min. Allow the sample loop pressure to equilibrate to atmospheric pressure, and activate the injection valve. Record the standard concentration, attenuator factor, injection time, chart speed, retention time, peak area, sample loop temperature, column temperature, and carrier gas flow rate. Repeat the standard injection until two consecutive injections give area counts within 5 percent of their average. The average value multiplied by the attenuator factor is then the calibration area value for the concentration.

Repeat this procedure for each standard. Prepare a graphical plot of concentration (C_s) versus the calibration area values. Perform a regression analysis, and draw the least squares line.

6.4 Relative Response Factors. The calibration curve generated from the standards for a single organic can usually be related to each of the individual GC response curves that are developed in the laboratory for all the compounds in the source. In the field, standards for that single organic can then be used to "calibrate" the GC for all the organics present. This procedure should first be confirmed in the laboratory by preparing and analyzing calibration standards containing multiple organic compounds.

6.5 Quality Assurance for Laboratory Procedures. Immediately after the

preparation of the calibration curves and prior to the presurvey sample analysis, the analysis audit described in 40 CFR Part 61, Appendix C, Procedure 2: "Procedure for Field Auditing GC Analysis," should be performed. The information required to document the analysis of the audit samples has been included on the example data sheets shown in Figures 18-3 and 18-7. The audit analyses should agree with the audit concentrations within 10 percent.

When available, the tester may obtain audit cylinders by contacting: U.S.

Environmental Protection Agency, Environmental Monitoring Systems Laboratory, Quality Assurance Division (MD-77), Research Triangle Park, North Carolina 27711. Audit cylinders obtained from a commercial gas manufacturer may be used provided that (a) the gas manufacturer certifies the audit cylinder in a manner similar to the procedure described in 40 CFR Part 61, Appendix B, Method 106, Section 5.2.3.1, and (b) the gas manufacturer obtains an independent analysis of the audit cylinders to verify this analysis. Independent analysis is defined as an analysis performed by an individual other than the individual who performs the gas manufacturer's analysis, while using calibration standards and analysis equipment different from those used for the gas manufacturer's analysis. Verification is complete and acceptable when the independent analysis concentration is within 5 percent of the gas manufacturer's concentration.

7. Final Sampling and Analysis Procedure

Considering safety (flame hazards) and the source conditions, select an appropriate sampling and analysis procedure (Section 7.1, 7.2, 7.3, or 7.4). In situations where a hydrogen flame is a hazard and no intrinsically safe GC is suitable, use the flexible bag collection technique or an adsorption technique. If the source temperature is below 100°C, and the organic concentrations are suitable for the detector to be used, use the direct interface method. If the source gases require dilution, use a dilution interface and either the bag sample or adsorption tubes. The choice between these two techniques will depend on the physical layout of the site, the source temperature, and the storage stability of the compounds if collected in the bag. Sample polar compounds by direct interfacing or dilution interfacing to prevent sample loss by adsorption on the bag.

7.1 Integrated Bag Sampling and Analysis.

7.1.1 Evacuated Container Sampling Procedure. In this procedure, the bags are filled by evacuating the rigid air-tight

containers that hold the bags. Use a field sample data sheet as shown in Figure 18-10. Collect triplicate sample from each sample location.

7.1.1.1 Apparatus.

7.1.1.1.1 Probe. Stainless steel, Pyrex glass, or Teflon tubing probe, according to the duct temperature, with 6.4-mm OD Teflon tubing of sufficient length to connect to the sample bag. Use stainless steel or Teflon unions to connect probe and sample line.

7.1.1.1.2 Quick Connects. Male (2) and female (2) of stainless steel construction.

7.1.1.1.3 Needle Valve. To control gas flow.

7.1.1.1.4 Pump. Leakless Teflon-coated diaphragm-type pump or equivalent. To deliver at least 1 liter/min.

7.1.1.1.5 Charcoal Adsorption Tube. Tube filled with activated charcoal, with glass wool plugs at each end, to adsorb organic vapors.

7.1.1.1.6 Flowmeter. 0 to 500—ml flow range; with manufacturer's calibration curve.

7.1.1.2 Sampling Procedure. To obtain a sample, assemble the sample train as shown in Figure 18-9. Leak check both the bag and the container. Connect the vacuum line from the needle valve to the Teflon sample line from the probe. Place the end of the probe at the centroid of the stack, or at a point no closer to the walls than 1 m, and start the pump with the needle valve adjusted to yield a flow of 0.5 liter/minute. After allowing sufficient time to purge the line several times, connect the vacuum line to the bag, and evacuate until the rotameter indicates no flow. Then position the sample and vacuum lines for sampling, and begin the actual sampling, keeping the rate proportional to the stack velocity. As a precaution, direct the gas exiting the rotameter away from sampling personnel. At the end of the sample period, shut off the pump, disconnect the sample line from the bag, and disconnect the vacuum line from the bag container. Record the source temperature, barometric pressure, ambient temperature, sampling flow rate, and initial and final sampling time on the data sheet shown in Figure 18-10. Protect the Tedlar bag and its container from sunlight. When possible, perform the analysis within 2 hours of sample collection.

7.1.2 Direct Pump Sampling Procedure. Follow 7.1.1, except place the pump and needle valve between the probe and the bag. Use a pump and needle valve constructed of stainless steel or some other material not affected by the stack gas. Leak check the system, and then purge with stack gas before the connecting to the previously evacuated bag.

7.1.3 Explosion Risk Area Bag Sampling Procedure. Follow 7.1.1 except replace the pump with another evacuated can (see Figure 18-9a). Use this method whenever there is a possibility of an explosion due to pumps, heated probes, or other flame producing equipment.

7.1.4 Other Modified Bag Sampling Procedures. In the event that condensation is observed in the bag while collecting the sample and a direct interface system cannot be used, heat the bag during collection, and maintain it at a suitably elevated temperature during all subsequent operations. (Note: Take care to leak check the system prior to the dilutions so as not to create a potentially explosive atmosphere.) As an alternative, collect the sample gas, and simultaneously dilute it in the Tedlar bag.

In the first procedure, heat the box containing the sample bag to the source temperature, provided the components of the bag and the surrounding box can withstand this temperature. Then transport the bag as rapidly as possible to the analytical area while maintaining the heating, or cover the box with an insulating blanket. In the analytical area, keep the box heated to source temperature until analysis. Be sure that the method of heating the box and the control for the heating circuit are compatible with the safety restrictions required in each area.

To use the second procedure, refill the Tedlar bag with a known quantity of inert gas. Meter the inert gas into the bag according to the procedure for the preparation of gas concentration standards of volatile liquid materials (Section 6.2.2.2), but eliminate the midjet impinger section. Take the partly filled bag to the source, and meter the source gas into the bag through heated sampling lines and a heated flowmeter, or Teflon positive displacement pump. Verify the dilution factors periodically through dilution and analysis of gases of known concentration.

7.1.5 Analysis of Bag Samples.

7.1.5.1 Apparatus. Same as Section 5. A minimum of three gas standards are required.

7.1.5.2 Procedure. Establish proper GC operating conditions as described in Section 6.3, and record all data listed in Figure 18-7. Prepare the GC so that gas can be drawn through the sample valve. Flush the sample loop with gas from one of the three calibration mixtures, and activate the valve. Obtain at least two chromatograms for the mixture. The results are acceptable when the peak areas from two consecutive injections agree to within 5 percent of their average. If they do not, run additional analyses or correct the analytical techniques until this

requirement is met. Then analyze the other two calibration mixtures in the same manner. Prepare a calibration curve as described in the same manner. Prepare a calibration curve as described in Section 6.3.

Analyze the source gas samples by connecting each bag to the sampling valve with a piece of Teflon tubing identified for that bag. Follow the specifications on replicate analyses specified for the calibration gases. Record the data listed in Figure 18-11. If certain items do not apply, use the notation "N.A." After all samples have been analyzed, repeat the analyses of the calibration gas mixtures, and generate a second calibration curve. Use an average of the two curves to determine the sample gas concentrations. If the two calibration curves differ by more than 5 percent from their mean value, then report the final results by comparison to both calibration curves.

7.1.6 Determination of Bag Water Vapor Content. Measure and record the ambient temperature and barometric pressure near the bag. From a water saturation vapor pressure table, determine and record the water vapor content as a decimal figure. (Assume the relative humidity to be 100 percent unless a lesser value is known.) If the bag has been maintained at an elevated temperature as described in Section 7.1.4, determine the stack gas water content by Method 4.

7.1.7 Quality Assurance. Immediately prior to the analysis of the stack gas samples, perform audit analyses as described in Section 6.5. The audit analyses must agree with the audit concentrations within 10 percent. If the results are acceptable, proceed with the analyses of the source samples. If they do not agree within 10 percent, then determine the reason for the discrepancy, and take corrective action before proceeding.

7.1.8 Emission Calculations. From the average calibration curve described in Section 7.1.5., select the value of C_s that corresponds to the peak area. Calculate the concentration C_c in ppm, dry basis, of each organic in the sample as follows:

$$C_c = \frac{C_s P_r T_i F_r}{P_i T_r (1 - B_{ws})} \quad \text{Eq. 18-5}$$

Where:

C_s = Concentration of the organic from the calibration curve, ppm.

P_r = Reference pressure, the barometric pressure or absolute sample loop pressure recorded during calibration, mm Hg.

T_i = Sample loop temperature at the time of sample analysis, °K.

Fr = Relative response factor (if applicable, see Section 6.4).

Pi = Barometric or absolute sample loop pressure at time of sample analysis, mm Hg.

Tr = Reference temperature, the temperature of the sample loop recorded during calibration, °K.

Bws = Water vapor content of the bag sample or stack gas, proportion by volume.

7.2 Direct Interface Sampling and Analysis Procedure. The direct interface procedure can be used provided that the moisture content of the gas does not interfere with the analysis procedure, the physical requirements of the equipment can be met at the site, and the source gas concentration is low enough that detector saturation is not a problem. Adhere to all safety requirements with this method.

7.2.1 Apparatus.

7.2.1.1 Probe. Constructed of stainless steel, Pyrex glass, or Teflon tubing as required by duct temperature, 6.4-mm OD, enlarged at duct end to contain glass wool plug. If necessary, heat the probe with heating tape or a special heating unit capable of maintaining duct temperature.

7.2.1.2 Sample Lines. 6.4-mm OD Teflon lines, heat-traced to prevent condensation of material.

7.2.1.3 Quick Connects. To connect sample line to gas sampling valve on GC instrument and to pump unit used to withdraw source gas. Use a quick connect or equivalent on the cylinder or bag containing calibration gas to allow connection of the calibration gas to the gas sampling valve.

7.2.1.4 Thermocouple Readout Device. Potentiometer or digital thermometer, to measure source temperature and probe temperature.

7.2.1.5 Heated Gas Sampling Valve. Of two-position, six-port design, to allow sample loop to be purged with source gas or to direct source gas into the GC instrument.

7.2.1.6 Needle Valve. To control gas sampling rate from the source.

7.2.1.7 Pump. Leakless Teflon-coated diaphragm-type pump or equivalent, capable of at least 1 liter/minute sampling rate.

7.2.1.8 Flowmeter. Of suitable range to measure sampling rate.

7.2.1.9 Charcoal Adsorber. To adsorb organic vapor collected from the source to prevent exposure of personnel to source gas.

7.2.1.10 Gas Cylinders. Carrier gas (helium or nitrogen), and oxygen and hydrogen for a flame ionization detector (FID) if one is used.

7.2.1.11 Gas Chromatograph. Capable of being moved into the field, with detector, heated gas sampling valve, column required to complete separation of desired components, and option for temperature programming.

7.2.1.12 Recorder/Integrator. To record results.

7.2.2 Procedure. To obtain a sample, assemble the sampling system as shown in Figure 18-12. Make sure all connections are tight. Turn on the probe and sample line heaters. As the temperature of the probe and heated line approaches the source temperature as indicated on the thermocouple readout device, control the heating to maintain a temperature of 0 to 3°C above the source temperature. While the probe and heated line are being heated, disconnect the sample line from the gas sampling valve, and attach the line from the calibration gas mixture. Flush the sample loop with calibration gas and analyze a portion of that gas. Record the results. After the calibration gas sample has been flushed into the GC instrument, turn the gas sampling valve to flush position, then reconnect the probe sample line to the valve. Place the inlet of the probe at the centroid of the duct, or at a point no closer to the walls than 1 m, and draw source gas into the probe, heated line, and sample loop. After thorough flushing, analyze the sample using the same conditions as for the calibration gas mixture. Repeat the analysis on an additional sample. Measure the peak areas for the two samples, and if they do not agree to within 5 percent of their mean value, analyze additional samples until two consecutive analyses meet this criteria. Record the data. After consistent results are obtained, remove the probe from the source and analyze a second calibration gas mixture. Record this calibration data and the other required data on the data sheet shown in Figure 18-11, deleting the dilution gas information.

[_Note: Take care to draw all samples, calibration mixtures, and audits through the sample loop at the same pressure.)

7.2.3 Determination of Stack Gas Moisture Content. Use Method 4 to measure the stack gas moisture content.

7.2.4 Quality Assurance. Same as Section 7.1.7. Introduce the audit gases in the sample line immediately following the probe.

7.2.5 Emission Calculations. Same as Section 7.1.8.

7.3 Dilution Interface Sampling and Analysis Procedure. Source samples that contain a high concentration of organic materials may require dilution prior to

analysis to prevent saturating the GC detector. The apparatus required for this direct interface procedure is basically the same as that described in the Section 7.2, except a dilution system is added between the heated sample line and the gas sampling valve. The apparatus is arranged so that either a 10:1 or 100:1 dilution of the source gas can be directed to the chromatograph. A pump of larger capacity is also required, and this pump must be heated and placed in the system between the sample line and the dilution apparatus.

7.3.1 Apparatus. The equipment required in addition to that specified for the direct interface system is as follows:

7.3.1.1 Sample Pump. Leakless Teflon-coated diaphragm-type that can withstand being heated to 120°C and deliver 1.5 liters/minute.

7.3.1.2 Dilution Pumps. Two Model A-150 Komhyr Teflon positive displacement type delivering 150 cc/minute, or equivalent. As an option, calibrated flowmeters can be used in conjunction with Teflon-coated diaphragm pumps.

7.3.1.3 Valves. Two Teflon three-way valves, suitable for connecting to 6.4-mm OD Teflon tubing.

7.3.1.4 Flowmeters. Two, for measurement of diluent gas, expected delivery flow rate to be 1,350 cc/min.

7.3.1.5 Diluent Gas with Cylinders and Regulators. Gas can be nitrogen or clean dry air, depending on the nature of the source gases.

7.3.1.6 Heated Box. Suitable for being heated to 120°C, to contain the three pumps, three-way valves, and associated connections. The box should be equipped with quick connect fittings to facilitate connection of: (1) The heated sample line from the probe, (2) the gas sampling valve, (3) the calibration gas mixtures, and (4) diluent gas lines. A schematic diagram of the components and connections is shown in Figure 18-13.

[_Note: Care must be taken to leak check the system prior to the dilutions so as not to create a potentially explosive atmosphere.)

The heated box shown in Figure 18-13 is designed to receive a heated line from the probe. An optional design is to build a probe unit that attaches directly to the heated box. In this way, the heated box contains the controls for the probe heaters, or, if the box is placed against the duct being sampled, it may be possible to eliminate the probe heaters. In either case, a heated Teflon line is used to connect the heated box to the gas sampling valve on

7.3.2 Procedure. Assemble the apparatus by connecting the heated box, shown in Figure 18-13, between the heated sample line from the probe and the gas sampling valve on the chromatograph. Vent the source gas from the gas sampling valve directly to the charcoal filter, eliminating the pump and rotameter. Heat the sample probe, sample line, and heated box. Insert the probe and source thermocouple to the centroid of the duct, or to a point no closer to the walls than 1 m. Measure the source temperature, and adjust all heating units to a temperature 0 to 3°C above this temperature. If this temperature is above the safe operating temperature of the Teflon components, adjust the heating to maintain a temperature high enough to prevent condensation of water and organic compounds. Verify the operation of the dilution system by analyzing a high concentration gas of known composition through either the 10:1 or 100:1 dilution stages, as appropriate. (If necessary, vary the flow of the diluent gas to obtain other dilution ratios.) Determine the concentration of the diluted calibration gas using the dilution factor and the calibration curves prepared in the laboratory. Record the pertinent data on the data sheet shown in Figure 18-11. If the data on the diluted calibration gas are not within 10 percent of the expected values, determine whether the chromatograph or the dilution system is in error, and correct it. Verify the GC operation using a low concentration standard by diverting the gas into the sample loop, bypassing the dilution system. If these analyses are not within acceptable limits, correct the dilution system to provide the desired dilution factors. Make this correction by diluting a high-concentration standard gas mixture to adjust the dilution ratio as required.

Once the dilution system and GC operations are satisfactory, proceed with the analysis of source gas, maintaining the same dilution settings as used for the standards. Repeat the analyses until two consecutive values do not vary by more than 5 percent from their mean value are obtained.

Repeat the analysis of the calibration gas mixtures to verify equipment operation. Analyze the two field audit samples using either the dilution system, or directly connect to the gas sampling valve as required. Record all data and report the results to the audit supervisor.

7.3.3 Determination of Stack Gas Moisture Content. Same as Section 7.2.3.

7.3.4 Quality Assurance. Same as Section 7.2.4.

7.3.5 Emission Calculations. Same as Section 7.2.5, with the dilution factor applied.

7.4 Adsorption Tube Procedure

(Alternative Procedure). It is suggested that the tester refer to the National Institute of Occupational Safety and Health (NIOSH) method for the particular organics to be sampled. The principal interferent will be water vapor. If water vapor is present at concentrations above 3 percent, silica gel should be used in front of the charcoal. Where more than one compound is present in the emissions, then develop relative adsorptive capacity information.

7.4.1 Additional Apparatus. In addition to the equipment listed in the NIOSH method for the particular organic(s) to be sampled, the following items (or equivalent) are suggested.

7.4.1.1 Probe (Optional). Borosilicate glass or stainless steel, approximately 6-mm ID, with a heating system if water condensation is a problem, and a filter (either in-stack or out-stack heated to stack temperature) to remove particulate matter. In most instances, a plug of glass wool is a satisfactory filter.

7.4.1.2 Flexible Tubing. To connect probe to adsorption tubes. Use a material that exhibits minimal sample adsorption.

7.4.1.3 Leakless Sample Pump. Flow controlled, constant rate pump, with a set of limiting (sonic) orifices to provide pumping rates from approximately 10 to 100 cc/min.

7.4.1.4 Bubble-Tube Flowmeter. Volume accuracy within ± 1 percent, to calibrate pump.

7.4.1.5 Stopwatch. To time sampling and pump rate calibration.

7.4.1.6 Adsorption Tubes. Similar to ones specified by NIOSH, except the amounts of adsorbent per primary/back-up sections are 800/200 mg for charcoal tubes and 1040/260 mg for silica gel tubes. As an alternative, the tubes may contain a porous polymer adsorbent such as Tenax GC or XAD-2.

7.4.1.7 Barometer. Accurate to 5 mm Hg, to measure atmospheric pressure during sampling and pump calibration.

7.4.1.8 Rotameter. 0 to 100 cc/min, to detect changes in flow rate during sampling.

7.4.2 Sampling and Analysis. It is suggested that the tester follow the sampling and analysis portion of the respective NIOSH method section entitled "Procedure." Calibrate the pump and limiting orifice flow rate through adsorption tubes with the bubble tube flowmeter before sampling. The sample system can be operated as a "recirculating loop" for this operation. Record the ambient temperature and barometric pressure. Then, during sampling, use the rotameter to verify that the pump and orifice sampling rate remains constant.

Use a sample probe, if required, to obtain the sample at the centroid of the duct, or at a point no closer to the walls than 1 m. Minimize the length of flexible tubing between the probe and adsorption tubes. Several adsorption tubes can be connected in series, if the extra adsorptive capacity is needed. Provide the gas sample to the sample system at a pressure sufficient for the limiting orifice to function as a sonic orifice. Record the total time and sample flow rate (or the number of pump strokes), the barometric pressure, and ambient temperature. Obtain a total sample volume commensurate with the expected concentration(s) of the volatile organic(s) present, and recommended sample loading factors (weight sample per weight adsorption media). Laboratory tests prior to actual sampling may be necessary to predetermine this volume. When more than one organic is present in the emissions, then develop relative adsorptive capacity information. If water vapor is present in the sample at concentrations above 2 to 3 percent, the adsorptive capacity may be severely reduced. Operate the gas chromatograph according to the manufacturer's instructions. After establishing optimum conditions, verify and document these conditions during all operations. Analyze the audit samples (see Section 7.4.4.3), then the emission samples. Repeat the analysis of each sample until the relative deviation of two consecutive injections does not exceed 5 percent.

7.4.3 Standards and Calibration. The standards can be prepared according to the respective NIOSH method. Use a minimum of three different standards; select the concentrations to bracket the expected average sample concentration. Perform the calibration before and after each day's sample analyses. Prepare the calibration curve by using the least squares method.

7.4.4 Quality Assurance.

7.4.4.1 Determination of Desorption Efficiency. During the testing program, determine the desorption efficiency in the expected sample concentration range for each batch of adsorption media to be used. Use an internal standard. A minimum desorption efficiency of 50 percent shall be obtained. Repeat the desorption determination until the relative deviation of two consecutive determinations does not exceed 5 percent. Use the average desorption efficiency of these two consecutive determinations for the correction specified in Section 7.4.4.5. If the desorption efficiency of the compound(s) of interest is questionable under actual sampling conditions, use of the Method of Standard Additions may be helpful to determine this value.

7.4.4.2 Determination of Sample Collection Efficiency. For the source samples, analyze the primary and backup portions of the adsorption tubes separately. If the backup portion exceeds 10 percent of the total amount (primary and backup), repeat the sampling with a larger sampling portion.

7.4.4.3 Analysis Audit. Immediately before the sample analyses, analyze the two audits in accordance with Section 7.4.2. The analysis audit shall agree with the audit concentration within 10 percent.

7.4.4.4 Pump Leak Checks and Volume Flow Rate Checks. Perform both of these checks immediately after sampling with all sampling train components in place. Perform all leak checks according to the manufacturer's instructions, and record the results. Use the bubble-tube flowmeter to measure the pump volume flow rate with the orifice used in the test sampling, and the result. If it has changed by more than 5 but less than 20 percent, calculate an average flow rate for the test. If the flow rate has changed by more than 20 percent, recalibrate the pump and repeat the sampling.

7.4.4.5 Calculations. All calculations can be performed according to the respective NIOSH method. Correct all sample volumes to standard conditions. If a sample dilution system has been used, multiply the results by the appropriate dilution ratio. Correct all results by dividing by the desorption efficiency (decimal value). Report results as ppm by volume, dry basis.

7.5 Reporting of Results. At the completion of the field analysis portion of the study, ensure that the data sheets shown in Figure 18-11 have been completed. Summarize this data on the data sheets shown in Figure 18-15.

8. Bibliography

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I. Name of company _____ Date _____
 Address _____
 Contacts _____ Phone _____
 Process to be sampled _____
 Duct or vent to be sampled _____

II. Process description _____

 Raw material _____

 Products _____

 Operating cycle
 Check: Batch _____ Continuous _____ Cyclic _____
 Timing of batch or cycle _____
 Best time to test _____

Figure 18-1. Preliminary survey data sheet.

III. Sampling site

A. Description
 Site description _____
 Duct shape and size _____
 Material _____
 Wall thickness _____ inches
 Upstream distance _____ inches diameter
 Downstream distance _____ inches diameter
 Size of port _____
 Size of access area _____
 Hazards _____ Ambient temp. _____ °F

B. Properties of gas stream
 Temperature _____ °C _____ °F, Data source _____
 Velocity _____, Data source _____
 Static pressure _____ inches H₂O, Data source _____
 Moisture content _____ %, Data source _____
 Particulate content _____, Data source _____
 Gaseous components
 N₂ _____ % Hydrocarbons _____ ppm
 O₂ _____ %
 CO _____ %
 CO₂ _____ %
 SO₂ _____ %
 Hydrocarbon components
 _____ ppm
 _____ ppm
 _____ ppm
 _____ ppm
 _____ ppm
 _____ ppm

Figure 18-1 (continued). Preliminary survey data sheet.

C. Sampling considerations
 Location to set up GC _____
 Special hazards to be considered _____
 Power available at duct _____
 Power available for GC _____
 Plant safety requirements _____
 Vehicle traffic rules _____
 Plant entry requirements _____
 Security agreements _____
 Potential problems _____

D. Site diagrams. (Attach additional sheets if required).

Figure 18-1 (continued). Preliminary survey data sheet.

Components to be analyzed	Expected concentration
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Suggested chromatographic column _____

Column flow rate _____ ml/min Head pressure _____ mm Hg
 Column temperature:
 Isothermal _____ °C
 Programmed from _____ °C to _____ °C at _____ °C/min
 Injection port/sample loop temperature _____ °C
 Detector temperature _____ °C
 Detector flow rates: Hydrogen _____ ml/min, head pressure _____ mm Hg
 Air/Oxygen _____ ml/min, head pressure _____ mm Hg

Chart speed _____ inches/minute

Compound data:

Compound	Retention time	Attenuation
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Figure 18-2. Chromatographic conditions data sheet.

Preparation of Standards in Tedlar Bags
and Calibration Curve

Standards Preparation Data:	Standards		
	Mixture #1	Mixture #2	Mixture #3
Organic:			
Bag number or identification			
Dry gas meter calibration factor			
Final meter reading (liters)			
Initial meter reading (liters)			
Metered volume (liters)			
Average meter temperature (°K)			
Average meter pressure, gauge (mm Hg)			
Average atmospheric pressure (mm Hg)			
Average meter pressure, absolute (mm Hg)			
Syringe temperature (°K)			
(Section 6.2.2.1)			
Syringe pressure, absolute (mm Hg)			
(Section 6.2.2.1)			
Volume of gas in syringe (ml)			
(Section 6.2.2.1)			
Density of liquid organic (g/ml)			
(Section 6.2.2.2)			
Volume of liquid in syringe (l)			
(Section 6.2.2.2)			
GC Operating Conditions:			
Sample loop volume (ml)			
Sample loop temperature (°C)			
Carrier gas flow rate (ml/min)			
Column temperature			
Initial (°C)			
Rate change (°C/min)			
Final (°C)			
Organic Peak Identification and Calculated Concentrations:			
Injection time (24-hr clock)			
Distance to peak (cm)			
Chart speed (cm/min)			
Organic retention time (min)			
Attenuation factor			
Peak height (mm)			
Peak area (mm ²)			
Peak area x attenuation factor (mm ²)			
Calculated concentration (ppm)			
(Equation 18-3 or 18-4)			

Plot peak area x attenuation factor against calculated concentration to obtain calibration curve.

Figure 18-3. Standards prepared in Tedlar bags and calibration curve.

Flowmeter Calibration

Flowmeter number or identification _____
Flowmeter type _____
Calibration device (x): Bubble meter _____ Spirometer _____ Wet test meter _____
Readings at laboratory conditions:
Laboratory temperature (T_{lab}) _____ °K
Laboratory barometric pressure (P_{lab}) _____ mm Hg

Flow data:

Flowmeter			Calibration device		
reading (as marked)	temp. (°K)	pressure (absolute)	time (min)	gas volume ^a	flow rate ^b

a = Volume of gas measured by calibration device, corrected to standard conditions (liters).

b = Calibration device gas volume/time.

Plot flowmeter reading against flow rate (standard conditions), and draw a smooth curve. If the flowmeter being calibrated is a rotameter or other flow device that is viscosity dependent, it may be necessary to generate a "family" of calibration curves that cover the operating pressure and temperature ranges of the flowmeter.

While the following technique should be verified before application, it may be possible to calculate flow rate readings for rotameters at standard conditions Q_{std} as follows:

$$Q_{std} = Q_{lab} \left(\frac{760 \times T_{lab}}{P_{lab} \times 273} \right)^{1/2}$$

Flow rate (laboratory conditions)	Flow rate (standard conditions)

Figure 18-4. Flowmeter calibration.

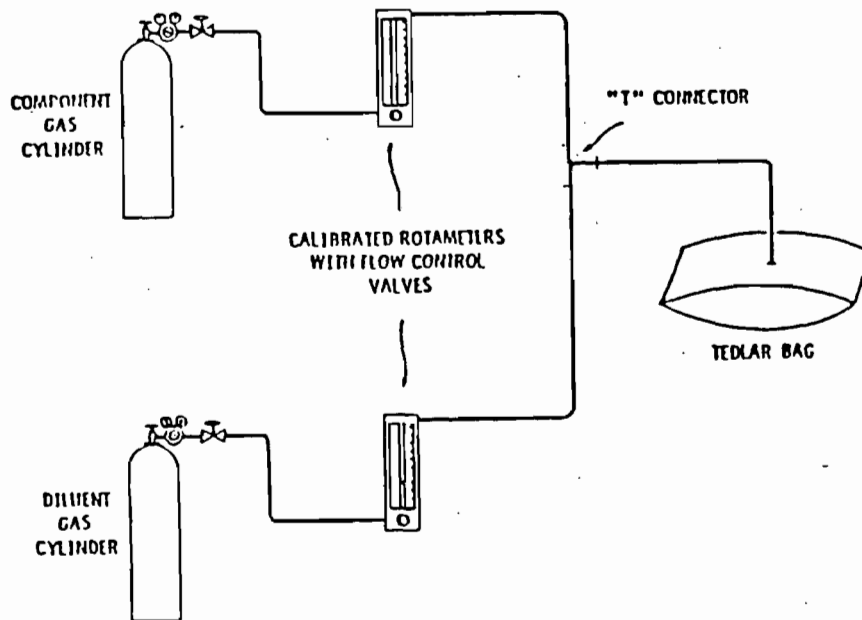


Figure 18-5. Single-stage calibration gas dilution system.

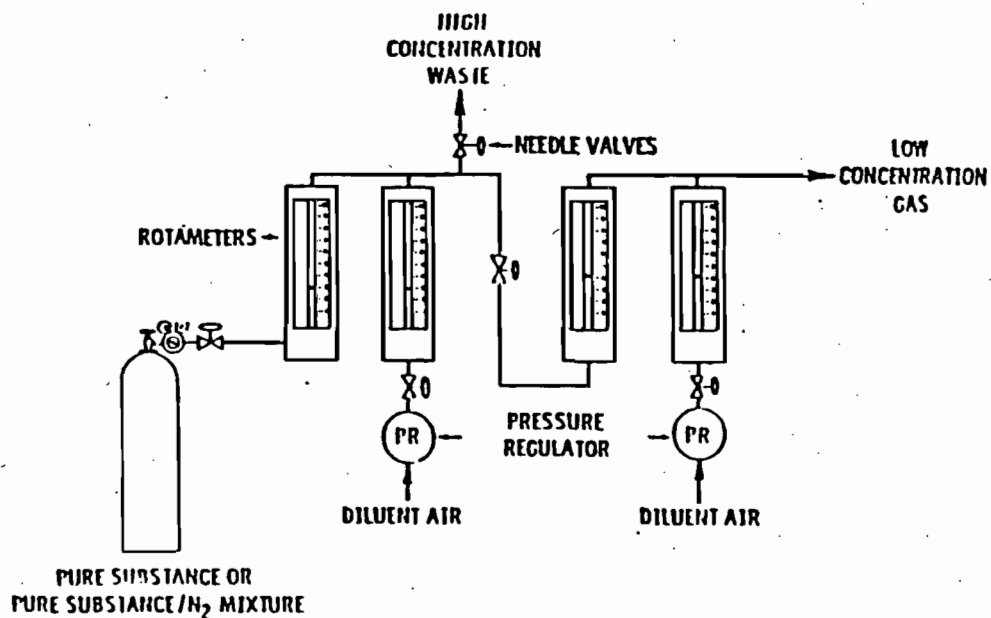


Figure 18-6. Two-stage dilution apparatus.

Preparation of Standards by Dilution of Cylinder Standard

Cylinder standard: Organic _____ Certified concentration _____ ppm

Standards Preparation Data: _____ Date _____

	Stage 1	Mixture 1	Mixture 2	Mixture 3
Standard gas flowmeter reading				
Diluent gas flowmeter reading				
Laboratory temperature (°C)				
Barometric pressure (mm Hg)				
Flowmeter gage pressure (mm Hg)				
Flow rate cylinder gas at standard conditions (ml/min)				
Flow rate diluent gas at standard conditions (ml/min)				
Calculated concentration (ppm)				
Stage 2 (if used)				
Standard gas flowmeter reading				
Diluent gas flowmeter reading				
Flow rate stage 1 gas at standard conditions (ml/min)				
Flow rate diluent gas at standard conditions (ml/min)				
Calculated concentration (ppm)				
GC Operating Conditions:				
Sample loop volume (ml)				
Sample loop temperature (°C)				
Carrier gas flow rate (ml/min)				
Column temperature:				
Initial (°C)				
Program rate (°C/min)				
Final (°C)				
Organic Peak Identification and Calculated Concentrations:				
Injection time (24-hr clock)				
Distance to peak (cm)				
Chart speed (cm/min)				
Retention time (min)				
Attenuation factor				
Peak area (mm ²)				
Peak area x attenuation factor				

Plot peak area x attenuation factor against calculated concentration to obtain calibration curve.

Figure 18-7. Standards prepared by dilution of cylinder standard.

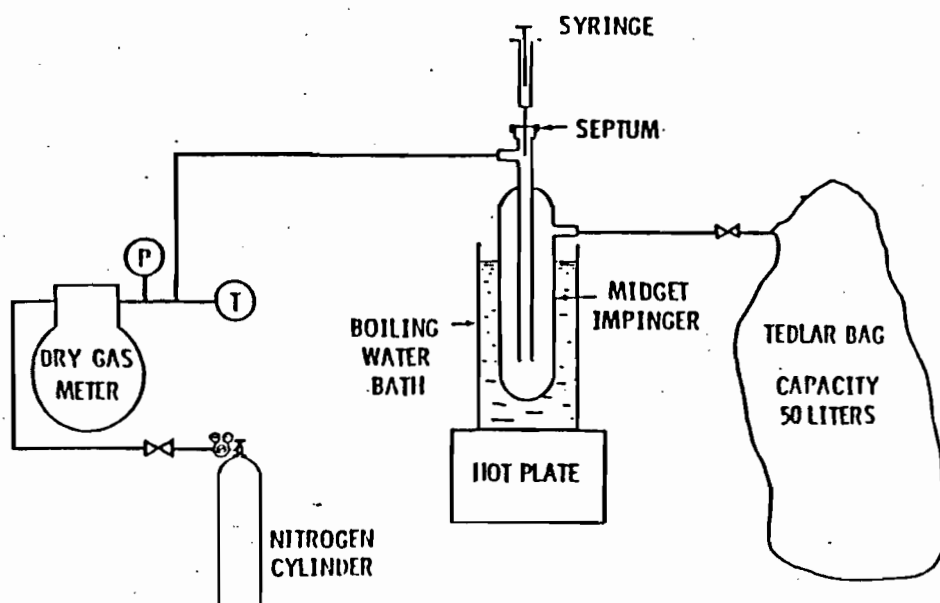


Figure 18-8. Apparatus for preparation of liquid materials.

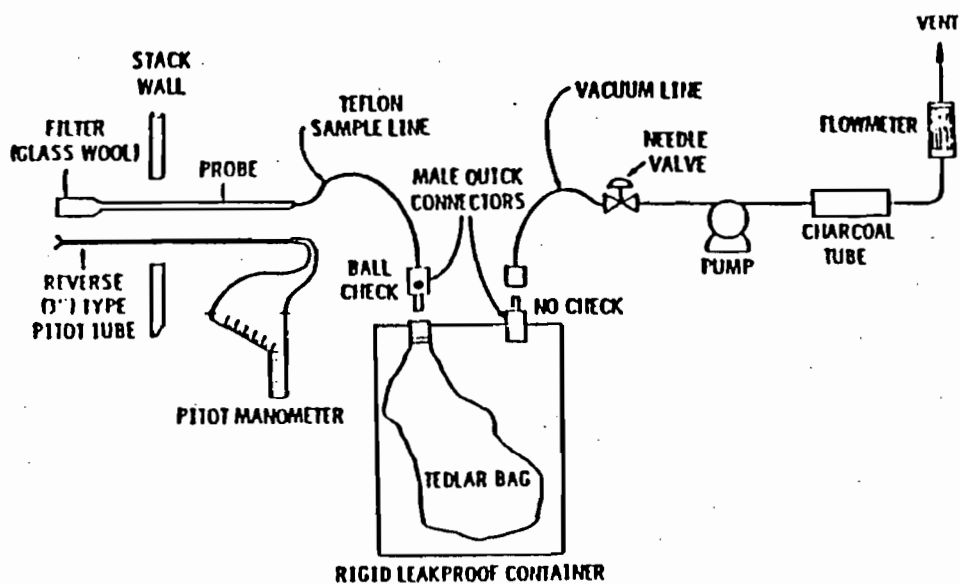


Figure 18-9. Integrated bag sampling train.

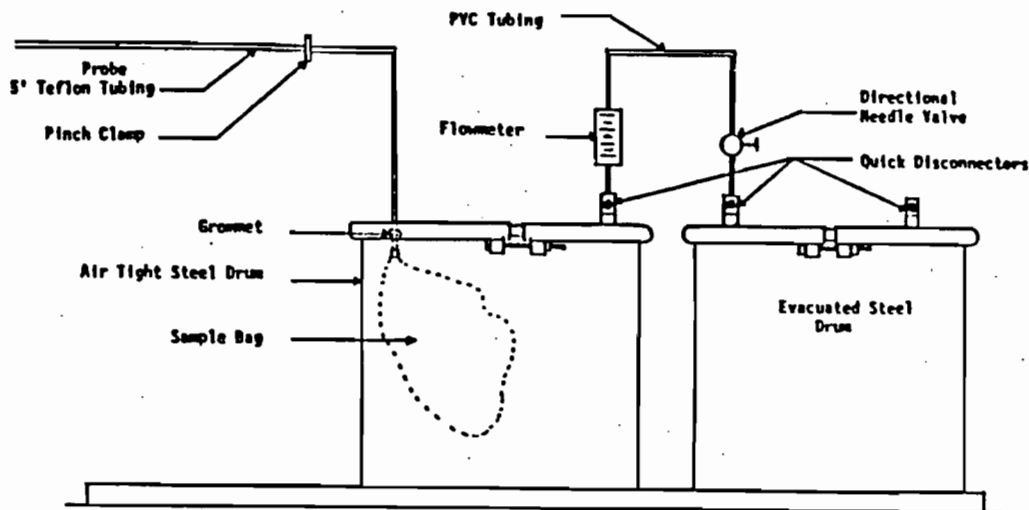


Figure 18-9a. Explosion risk gas sampling method.

Plant _____ Date _____
 Site _____

	Sample 1	Sample 2	Sample 3
Source temperature (°C)	_____	_____	_____
Barometric pressure (mm Hg)	_____	_____	_____
Ambient temperature (°C)	_____	_____	_____
Sample flow rate (appr.)	_____	_____	_____
Bag number	_____	_____	_____
Start time	_____	_____	_____
Finish time	_____	_____	_____

Figure 18-10. Field sample data sheet - Tedlar bag collection method.

Plant _____ Date _____
 Location _____

1. General information

Source temperature (°C) _____
 Probe temperature (°C) _____
 Ambient temperature (°C) _____
 Atmospheric pressure (mm) _____
 Source pressure ("Hg) _____
 Absolute source pressure (mm) _____
 Sampling rate (liter/min) _____
 Sample loop volume (ml) _____
 Sample loop temperature (°C) _____
 Columnar temperature:
 Initial (°C)/time (min) _____
 Program rate (°C/min) _____
 Final (°C)/time (min) _____
 Carrier gas flow rate (ml/min) _____
 Detector temperature (°C) _____
 Injection time (24-hour basis) _____
 Chart speed (mm/min) _____
 Dilution gas flow rate (ml/min) _____
 Dilution Gas used (symbol) _____
 Dilution ratio _____

Figure 18-11. Field analysis data sheets.

2. Field Analysis Data - Calibration Gas

Run No.	Time	Components	Area	Attenuation	A x A Factor	Conc. (ppm)

Run No.	Time	Components	Area	Attenuation	A x A Factor	Conc. (ppm)

Run No.	Time	Components	Area	Attenuation	A x A Factor	Conc. (ppm)

Figure 18-11 (continued). Field analysis data sheets.

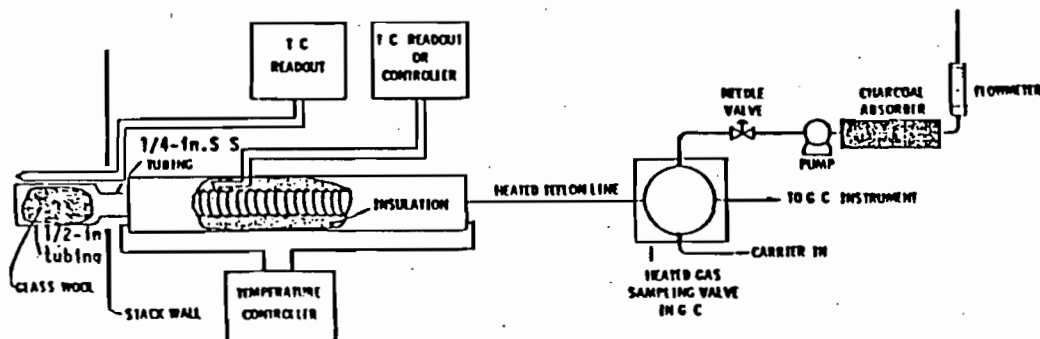


Figure 18-12. Direct interface sampling system.

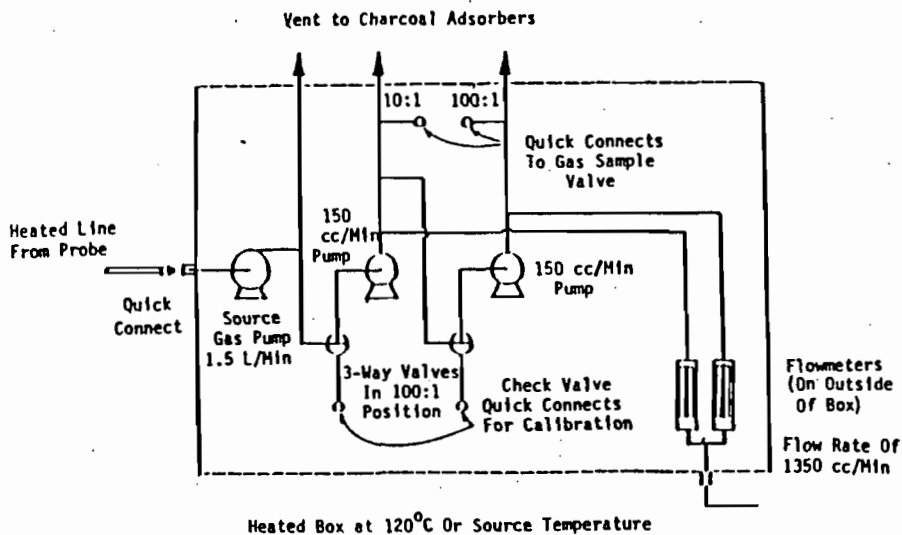


Figure 18-13. Schematic diagram of the heated box required for dilution of sample gas.

**GASEOUS ORGANIC SAMPLING AND ANALYSIS
CHECK LIST**

(Respond with initials or number as appropriate)

			Source sample 1	Source sample 2	Source sample 3
1. Presurvey data:					
A. Grab sample collected	☐				
B. Grab sample analyzed for composition	☐				
Method GC	☐	☐			
GC/MS	☐	☐			
Other	☐	☐			
C. GC-PID analysis performed	☐				
2. Laboratory calibration data:					
A. Calibration curves prepared	☐				
Number of components	☐	☐			
Number of concentrations/ component (3 required)	☐	☐			
B. Audit samples (optional):					
Analysis completed	☐				
Verified for concentration	☐				
OK obtained for field work	☐				
3. Sampling procedures:					
A. Method:					
Bag sample	☐	☐			
Direct interface	☐	☐			
Dilution interface	☐	☐			
B. Number of samples collected	☐				
4. Field analysis:					
A. Total hydrocarbon analysis performed	☐				
B. Calibration curve prepared	☐				
Number of components	☐	☐			
Number of concentrations per component (3 required)	☐	☐			

1. General information:	
Source temperature (°C)	_____
Probe temperature (°C)	_____
Ambient temperature (°C)	_____
Atmospheric pressure (mm Hg)	_____
Source pressure (mm Hg)	_____
Sampling rate (ml/min)	_____
Sample loop volume (ml)	_____
Sample loop temperature (°C)	_____
Sample collection time (24-hr basis)	_____
Column temperature:	
Initial (°C)	_____
Program rate (°C/min)	_____
Final (°C)	_____
Carrier gas flow rate (ml/min)	_____

Source sample 1	Source sample 2	Source sample 3
Detector temperature (°C)	_____	_____
Chart speed (cm/min)	_____	_____
Dilution gas flow rate (ml/min)	_____	_____
Diluent gas used (symbol)	_____	_____
Dilution ratio	_____	_____
Performed by (signature): _____		
Date: _____		

Figure 18-14. Sampling and analysis check.

Figure 18-14. Sampling and analysis sheet.

**GASEOUS ORGANIC SAMPLING AND ANALYSIS
DATA**

Plant _____
Date _____
Location _____

EPA METHOD 8

Sulfuric Acid

Method 8—Determination of Sulfuric Acid Mist and Sulfur Dioxide Emissions From Stationary Sources

1. Principle and Applicability

1.1 Principle. A gas sample is extracted isokinetically from the stack. The sulfuric acid mist (including sulfur trioxide) and the sulfur dioxide are separated, and both fractions are measured separately by the barium-thorin titration method.

1.2 Applicability. This method is applicable for the determination of sulfuric acid mist (including sulfur trioxide, and in the absence of other particulate matter) and sulfur dioxide emissions from stationary sources. Collaborative tests have shown that the minimum detectable limits of the method are 0.05 milligrams/cubic meter ($0.03 > 10^{-7}$ pounds/cubic foot) for sulfur trioxide and 1.2 mg/m^3 ($0.74 \times 10^{-7} \text{ lb/R}^3$) for sulfur dioxide. No upper limits have been established. Based on theoretical calculations for 200 milliliters of 3 percent hydrogen peroxide solution, the upper concentration limit for sulfur dioxide in a 1.0 m^3 (35.3 ft^3) gas sample is about $12,500 \text{ mg/m}^3$ ($7.7 \times 10^{-4} \text{ lb/R}^3$). The

upper limit can be extended by increasing the quantity of peroxide solution in the impingers.

Possible interfering agents of this method are fluorides, free ammonia, and dimethyl aniline. If any of these interfering agents are present (this can be determined by knowledge of the process), alternative methods, subject to the approval of the Administrator, U. S. E. P.A., are required.

Filterable particulate matter may be determined along with SO_3 and SO_2 (subject to the approval of the Administrator) by inserting a heated glass fiber filter between the probe and isopropanol impinger (see Section 2.1 of Method 6.) If this option is chosen, particulate analysis is gravimetric only; H_2SO_4 acid mist is not determined separately.

2. Apparatus

2.1 Sampling. A schematic of the sampling train used in this method is shown in Figure 8-1; it is similar to the Method 5 train except that the filter position is different and the filter holder

does not have to be heated. Commercial models of this train are available. For those who desire to build their own, however, complete construction details are described in APTD-0581. Changes from the APTD-0581 document and allowable modifications to Figure 8-1 are discussed in the following subsections.

The operating and maintenance procedures for the sampling train are described in APTD-0576. Since correct usage is important in obtaining valid results, all users should read the APTD-0576 document and adopt the operating and maintenance procedures outlined in it, unless otherwise specified herein. Further details and guidelines on operation and maintenance are given in Method 5 and should be read and followed whenever they are applicable.

2.1.1 Probe Nozzle. Same as Method 5, Section 2.1.1.

2.1.2 Probe Liner. Borosilicate or quartz glass, with a heating system to prevent visible condensation during sampling. Do not use metal probe liners.

2.1.3 Pitot Tube. Same as Method 5, Section 2.1.3.

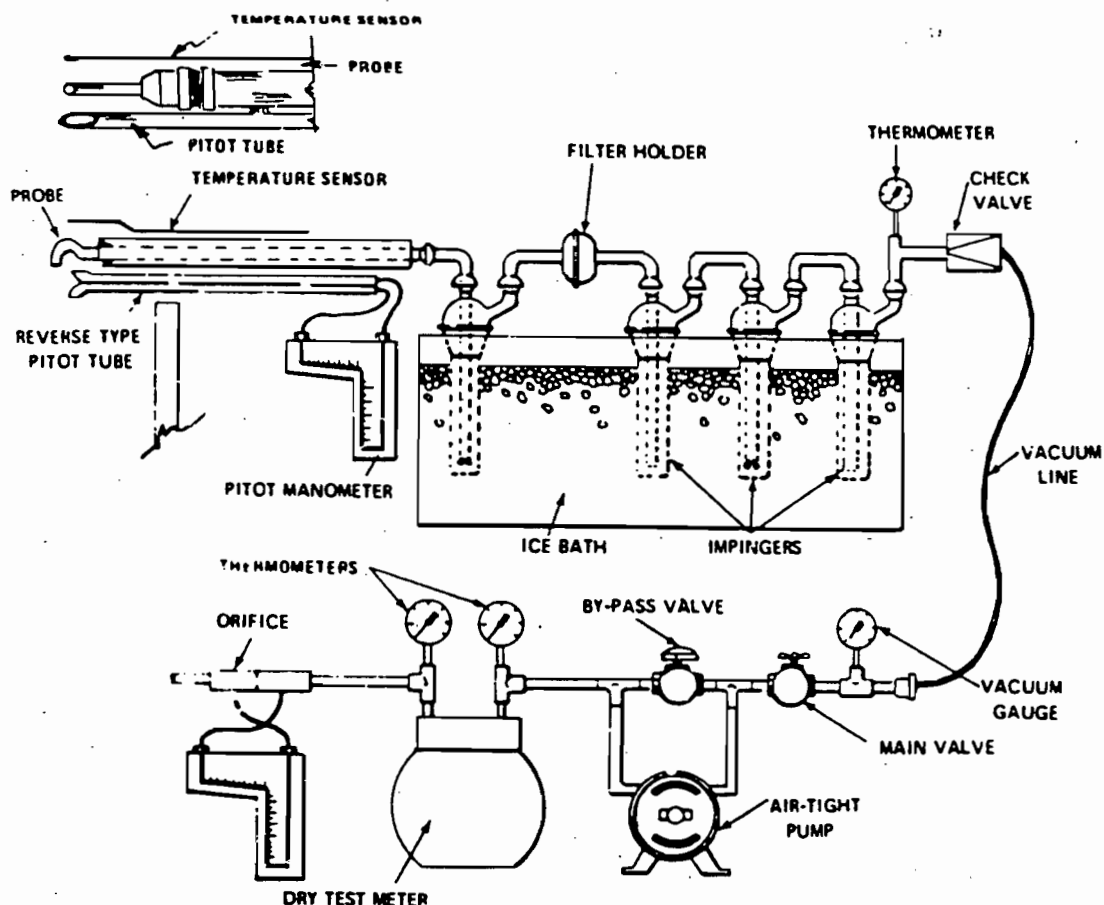


Figure 8-1. Sulfuric acid mist sampling train.

2.1.4 Differential Pressure Gauge. Same as Method 5, Section 2.1.4.

2.1.5 Filter Holder. Borosilicate glass, with a glass frit filter support and a silicone rubber gasket. Other gasket materials, e.g., Teflon or Viton, may be used subject to the approval of the Administrator. The holder design shall provide a positive seal against leakage from the outside or around the filter. The filter holder shall be placed between the first and second impingers. Note: Do not heat the filter holder.

2.1.6 Impingers. Four, as shown in Figure 8-1. The first and third shall be of the Greenburg-Smith design with standard tips. The second and fourth shall be of the Greenburg-Smith design, modified by replacing the insert with an approximately 13 millimeter (0.5 in.) ID glass tube, having an unobstructed tip located 13 mm (0.5 in.) from the bottom of the flask. Similar collection systems, which have been approved by the Administrator, may be used.

2.1.7 Metering System. Same as Method 5, Section 2.1.8.

2.1.8 Barometer. Same as Method 5, Section 2.1.9.

2.1.9 Gas Density Determination Equipment. Same as Method 5, Section 2.1.10.

2.1.10 Temperature Gauge. Thermometer, or equivalent, to measure the temperature of the gas leaving the impinger train to within 1°C (2°F).

2.2 Sample Recovery.

2.2.1 Wash Bottles. Polyethylene or glass, 500 ml. (two).

2.2.2 Graduated Cylinders. 250 ml, 1 liter. (Volumetric flasks may also be used).

2.2.3 Storage Bottles. Leak-free polyethylene bottles, 1000 ml size (two for each sampling run).

2.2.4 Trip Balance. 500-gram capacity, to measure to ± 0.5 g (necessary only if a moisture content analysis is to be done).

2.3 Analysis.

2.3.1 Pipettes. Volumetric 25 ml, 100 ml.

2.3.2 Burette. 50 ml.

2.3.3 Erlenmeyer Flask. 250 ml. (one for each sample, blank, and standard).

2.3.4 Graduated Cylinder. 100 ml.

2.3.5 Trip Balance. 500 g capacity, to measure to ± 0.5 g.

2.3.6 Dropping Bottle. To add indicator solution, 125-ml size.

3. Reagents

Unless otherwise indicated, all reagents are to conform to the specifications established by the Committee on Analytical Reagents of the American Chemical Society, where such specifications are

available. Otherwise, use the best available grade.

3.1 Sampling.

3.1.1 Filters. Same as Method 5, Section 3.1.1.

3.1.2 Silica Gel. Same as Method 5, Section 3.1.2.

3.1.3 Water. Deionized, distilled to conform to ASTM Specification D1193-77, Type 3 (incorporated by reference—see § 60.17). At the option of the analyst, the KMnO_4 test for oxidizable organic matter may be omitted when high concentrations of organic matter are not expected to be present.

3.1.4 Isopropanol. 80 Percent. Mix 800 ml of isopropanol with 200 ml of deionized, distilled water.

Note: Experience has shown that only A.C.S. grade isopropanol is satisfactory. Tests have shown that isopropanol obtained from commercial sources occasionally has peroxide impurities that will cause erroneously high sulfuric acid mist measurement. Use the following test for detecting peroxides in each lot of isopropanol: Shake 10 ml of the isopropanol with 10 ml of freshly prepared 10 percent potassium iodide solution. Prepare a blank by similarly treating 10 ml of distilled water. After 1 minute, read the absorbance on a spectrophotometer at 352 nanometers. If the absorbance exceeds 0.1, the isopropanol shall not be used. Peroxides may be removed from isopropanol by redistilling, or by passage through a column of activated alumina. However, reagent grade isopropanol with suitably low peroxide levels is readily available from commercial sources; therefore, rejection of contaminated lots may be more efficient than following the peroxide removal procedure.

3.1.5 Hydrogen Peroxide, 3 Percent. Dilute 100 ml of 30 percent hydrogen peroxide to 1 liter with deionized, distilled water. Prepare fresh daily.

3.1.6 Crushed Ice.

3.2 Sample Recovery.

3.2.1 Water. Same as 3.1.3.

3.2.2 Isopropanol, 80 Percent. Same as 3.1.4.

3.3 Analysis.

3.3.1 Water. Same as 3.1.3.

3.3.2 Isopropanol, 100 Percent.

3.3.3 Thorin Indicator.

1-(o-arsonophenylazo)-2-naphthol-3, 6-disulfonic acid, disodium salt, or equivalent. Dissolve 0.20 g in 100 ml of deionized, distilled water.

3.3.4 Barium Perchlorate (0.0100 Normal). Dissolve 1.95 g of barium perchlorate trihydrate ($\text{Ba}(\text{ClO}_4)_2 \cdot 3\text{H}_2\text{O}$) in 200 ml deionized, distilled water, and dilute to 1 liter with

isopropanol; 1.22 g of barium chloride dihydrate ($\text{BaCl}_2 \cdot 2\text{H}_2\text{O}$) may be used instead of the barium perchlorate.

Standardize with sulfuric acid as in Section 5.2. This solution must be protected against evaporation at all times.

3.3.5 Sulfuric Acid Standard (0.0100 N). Purchase or standardize to ± 0.0002 N against 0.0100 N NaOH that has previously been standardized against primary standard potassium acid phthalate.

3.3.6 Quality Assurance Audit Samples. Same as in Method 6, Section 3.3.6.

4. Procedure

4.1 Sampling.

4.1.1 Pretest Preparation. Follow the procedure outlined in Method 5, Section 4.1.1; filters should be inspected, but need not be desiccated, weighed, or identified. If the effluent gas can be considered dry, i.e., moisture free, the silica gel need not be weighed.

4.1.2 Preliminary Determinations.

Follow the procedure outlined in Method 5, Section 4.1.2.

4.1.3 Preparation of Collection Train.

Follow the procedure outlined in Method 5, Section 4.1.3 (except for the second paragraph and other obviously inapplicable parts) and use Figure 8-1 instead of Figure 5-1. Replace the second paragraph with: Place 100 ml of 80 percent isopropanol in the first impinger, 100 ml of 3 percent hydrogen peroxide in both the second and third impingers; retain a portion of each reagent for use as a blank solution. Place about 200 g of silica gel in the fourth impinger.

Note: If moisture content is to be determined by impinger analysis, weigh each of the first three impingers (plus absorbing solution) to the nearest 0.5 g and record these weights. The weight of the silica gel (or silica gel plus container) must also be determined to the nearest 0.5 g and recorded.

4.1.4 Pretest Leak-Check Procedure.

Follow the basic procedure outlined in Method 5, Section 4.1.4.1, noting that the probe heater shall be adjusted to the minimum temperature required to prevent condensation, and also that verbiage such as, "... plugging the inlet to the filter holder ..." shall be replaced by, "... plugging the inlet to the first impinger ..." The pretest leak-check is optional.

4.1.5 Train Operation. Follow the basic procedures outlined in Method 5, Section 4.1.5, in conjunction with the following special instructions. Data shall be recorded on a sheet similar to the one in Figure 8-1. The sampling rate shall not exceed 0.030 m^3/min (1.0 cfm) during the run.

Drain the ice bath and, with the probe

4.2.2 Container No. 2. If a moisture content analysis is to be done, weigh the second and third impingers (plus contents) to the nearest 0.5 g and record these weights. Also, weigh the spent silica gel

4.3.1 Container No. 1. Shake the container holding the isopropanol solution and the filter. If the filter breaks up, allow the fragments to settle for a few minutes before removing a sample. Pipette a 100—ml aliquot of this solution into a 250—ml Erlenmeyer flask, add 2 to 4 drops of thorin indicator, and titrate to a pink endpoint using 0.0100 N barium perchlorate. Repeat the titration with a second aliquot of sample and average the titration values. Replicate titrations must

Plant.....	Static pressure, mm Hg (in. Hg).....
Location.....	Ambient temperature.....
Operator.....	Barometer pressure.....
Date.....	Assumed moisture, %.....
Run No.....	Probe length, m (ft).....
Sample box No.....	Nozzle identification No.....
Meter box No.....	Average calibrated nozzle diameter, cm (in.).....
Meter & H ₂ O.....	Probed heater setting.....
C factor.....	Leak rate, m ³ /min. (ctm).....
Pitot tube coefficient Cp.....	Probe inner material.....
	Filter No.....

SCHEMATIC OF STACK CROSS SECTION

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agree within 1 percent or 0.2 ml, whichever is greater.

4.3.2 Container No. 2. Thoroughly mix the solution in the container holding the contents of the second and third impingers. Pipette a 10-ml aliquot of sample into a 250-ml Erlenmeyer flask. Add 40 ml of isopropanol, 2 to 4 drops of thorin indicator, and titrate to a pink endpoint using 0.0100 N barium perchlorate. Repeat the titration with a second aliquot of sample and average the titration values. Replicate titrations must agree within 1 percent or 0.2 ml, whichever is greater.

4.3.3 Blanks. Prepare blanks by adding 2 to 4 drops of thorin indicator to 100 ml of 80 percent isopropanol. Titrate the blanks in the same manner as the samples.

4.4 Quality Control Procedures. Same as in Method 5, Section 4.4.

4.5 Audit Sample Analysis. Same as in Method 6, Section 4.4.

5. Calibration

5.1 Calibrate equipment using the procedures specified in the following sections of Method 5: Section 5.3 (metering system); Section 5.5 (temperature gauges); Section 5.7 (barometer). Note that the recommended leak-check of the metering system, described in Section 5.6 of Method 5, also applies to this method.

5.2 Standardize the barium perchlorate solution with 25 ml of standard sulfuric acid, to which 100 ml of 100 percent isopropanol has been added.

6. Calculations

Note: Carry out calculations retaining at least one extra decimal figure beyond that of the acquired data. Round off figures after final calculation.

6.1 Nomenclature.

An = Cross-sectional area of nozzle, m² (ft²).

Bws = Water vapor in the gas stream, proportion by volume.

CH₂SO₄ = Sulfuric acid (including SO₃) concentration, g/dscm (lb/dscf).

CSO₂ = Sulfur dioxide concentration, g/dscm (lb/dscf).

I = Percent of isokinetic sampling.

N = Normality of barium perchlorate titrant, meq/ml.

Pbar = Barometric pressure at the sampling site, mm Hg (in. Hg).

Ps = Absolute stack gas pressure, mm Hg (in. Hg).

Pstd = Standard absolute pressure, 760 mm Hg (29.92 in. Hg).

Tm = Average absolute dry gas meter temperature (see Figure 8-2), °K (°R).

Ts = Average absolute stack gas temperature (see Figure 8-2), °K (°R).

Tstd = Standard absolute temperature, 293°K (528°R).

Va = Volume of sample aliquot titrated, 100 ml for H₂SO₄ and 10 ml for SO₂.

Vlc = Total volume of liquid collected in impingers and silica gel, ml.

Vm = Volume of gas sample as measured by dry gas meter, dcm (dcf).

Vm(std) = Volume of gas sample measured by the dry gas meter corrected to standard conditions, dscm (dscf).

vs = Average stack gas velocity, calculated by Method 2, Equation 2-9, using data obtained from Method 8, m/sec (ft/sec).

Vsoln = Total volume of solution in which the sulfuric acid or sulfur dioxide sample is contained, 250 ml or 1,000 ml, respectively.

Vt = Volume of barium perchlorate titrant used for the sample, ml.

Vtb = Volume of barium perchlorate titrant used for the blank, ml.

Y = Dry gas meter calibration factor.

DELTA H = Average pressure drop across orifice meter, mm (in.) H₂O.

Θ = Total sampling time, min.

13.6 = Specific gravity of mercury.

60 = sec/min.

100 = Conversion to percent.

6.2 Average Dry Gas Meter Temperature and Average Orifice Pressure Drop. See data sheet (Figure 8-2).

6.3 Dry Gas Volume. Correct the sample volume measured by the dry gas meter to standard conditions (20°C and 760 mm Hg or 68°F and 29.92 in. Hg) by using Equation 8-1.

$$V_{m(std)} = V_m Y \left(\frac{T_{std}}{T_m} \right) \frac{P_{std} + \left(\frac{\Delta H}{13.6} \right)}{P_{std}}$$

$$= K_1 V_m Y \frac{P_{std} + (\Delta H/13.6)}{T_m}$$

Equation 8-1

Where:

K1 = 0.3858 °K/mm Hg for metric units.

= 17.64 °R/in., Hg for English units.

Note: If the leak rate observed during any mandatory leak-checks exceeds the specified acceptable rate, the tester shall either correct the value of Vm in Equation 8-1 (as described in Section 6.3 of Method 5), or shall invalidate the test run.

6.4 Volume of Water Vapor and Moisture Content. Calculate the volume of water vapor using Equation 5-2 of Method 5; the weight of water collected in the impingers and silica gel can be directly converted to milliliters (the specific gravity of water is 1 g/ml). Calculate the moisture content of the stack gas, using Equation

5-3 of Method 5. The "Note" in Section 6.5 of Method 5 also applies to this method. Note that if the effluent gas stream can be considered dry, the volume of water vapor and moisture content need not be calculated.

6.5 Sulfuric Acid Mist (including SO₃) Concentration.

$$C_{H_2SO_4} = K_2 \frac{N(V_t - V_{tb}) \left(\frac{V_{soln}}{V_m} \right)}{V_{m(std)}}$$

Equation 8-2

Where:

K2 = 0.04904 g/milliequivalent for metric units.

= 1.081 x 10⁻⁴ lb/meq for English units.

6.6 Sulfur Dioxide Concentration.

$$C_{SO_2} = K_3 \frac{N(V_t - V_{tb}) \left(\frac{V_{soln}}{V_m} \right)}{V_{m(std)}}$$

Equation 8-3

Where:

K3 = 0.03203 g/meq for metric units.

= 7.061 x 10⁻⁵ lb/meq for English units.

6.7 Isokinetic Variation.

6.7.1 Calculation from Raw Data.

$$I = \frac{100 T_m [K_4 V_m + (V_m Y / T_m) (P_{std} + \Delta H / 13.6)]}{60 \theta v_s P_{std} A_n}$$

Eq. 8-4

Where:

K4 = 0.003464 mm Hg—m³/ml—°K for metric units.

= 0.002676 in. Hg—ft³/ml—°R for English units.

6.7.2 Calculation from Intermediate Values.

$$I = \frac{T_m V_{m(std)} P_{std} 100}{T_{std} v_s A_n P_{std} 60 (1 - B_{ws})}$$

$$= K_5 \frac{T_m V_{m(std)}}{P_{std} A_n \theta (1 - B_{ws})}$$

Equation 8-5

Where:

K5 = 4.320 for metric units.

= 0.09450 for English units

6.8 Acceptable Results. If 90 percent < I < 110 percent, the results are acceptable. If the results are low in comparison to the standards and I is beyond the acceptable range, the Administrator may opt to accept the results. Use Citation 4 in the Bibliography of Method 5 to make judgments. Otherwise, reject the results and repeat the test.

6.9 Stack Gas Velocity and Volumetric Flow Rate. Calculate the average stack gas velocity and volumetric flow rate, if needed, using data obtained in this method and equations in Sections 5.2 and 5.3 of Method 2.

6.10 Relative Error (RE) for QA Audit Samples. Same as in Method 6, Section 6.4.

7. Bibliography

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EPA METHOD 23

Tetra-Octa PCDD/PCDF's & Mono-Deca PCB's

EPA Method 23: PCDD/PCDF and PCB

Sample Collection. Samples for polychlorinated dibenzo-p-dioxins/polychlorinated dibenzofurans (PCDD/PCDF) and polychlorinated biphenyls (PCB) will be withdrawn isokinetically from the source using an EPA Method 23 sampling train. The sampling train will consist of a nickel-plated stainless steel nozzle, a heated borosilicate glass probe, a Whatman EPM2000 glass filter maintained at a temperature of $248^{\circ}\text{F} \pm 25^{\circ}\text{F}$, a water-cooled condenser, a sorbent trap containing XAD-2 resin, five chilled impingers and a metering console.

The water-cooled condenser and sorbent trap are arranged in a manner that allows the condensate to drain vertically through the trap. Gas entering the trap will be maintained at or below 68°F . The first impinger (optional knockout) will remain empty, the second and third impingers will each contain 100 mL of DI water, the fourth will remain empty, and the fifth will contain preweighed silica gel. Sealing greases will not be used on any portion of the sample train.

Sample Train Component Preparation.

Glassware. All glass parts of the sample train including the sorbent trap, will be precleaned before sampling according to the following procedures.

1. Soak in hot soapy water (Alconox) at 50°C or higher
2. Rinse three times with tap water
3. Rinse three times with DI water
4. Rinse three times with pesticide grade acetone
5. Rinse three times with pesticide grade methanol/methylene chloride
6. Bake at 450°F for 2 hours
7. Cap with Teflon tape or methylene chloride rinsed aluminum foil

The glassware will be capped with precleaned foil or Teflon tape until sample train assembly. Following sample recovery, the glassware will be reused at the same sampling location.

XAD-2 Resin. The XAD-2 resin is purchased precleaned from Supelco Chromatography Products. The sorbent trap will be charged with 20 to 30 grams of the precleaned resin. Care will be taken to ensure the resin is kept at temperatures below 120°F before and after sample collection to prevent resin decomposition. The period between charging the trap and use in the field will be as brief as possible and will not be allowed to exceed 14 days.

Sample Recovery. Recovery of the samples and assembly of the sample trains for reuse will be conducted in the dust-free environment of the sample recovery and field laboratory. The DI water reagent will be returned to the original 1,000 mL amber glass jar, weighed, the weight recorded on the label, and the liquid level marked. The volume of water vapor condensed in the impingers and the volume of water vapor collected in the XAD-2 resin and silica gel will be summed and entered into moisture content calculations.

The sample-exposed components of the sampling train up to the XAD-2 cartridge will be rinsed with acetone, methylene chloride, toluene, and finally with acetone (which will be discarded). The impingers will be rinsed with acetone and methylene chloride into a 500 mL amber glass jar. All samples will be stored at 40°F until analyzed. Sample containers from a typical run will include:

Container 1	Filter(s)
Container 2	Rinses of nozzle, probe, and front half of filter holder
Container 3	XAD-2 cartridge and resin
Container 4	Impinger contents
Container 5	Rinses of back half of filter holder, transfer line, and condenser
Container 6	Silica gel

Blanks of each solvent lot used at the test site will also be saved for potential analysis. Depending on the particulate loading and/or the flue gas moisture content, the actual number of containers from each sample run may vary.

One field blank will be recovered for the test location during the testing program. A field blank is a complete sampling train assembled in the same manner as those that collect samples, except that flue gas is not pulled through the train. The field blank train will be leak-checked the same number of times as a sampling train used during a run. The train will be placed at the sampling location for the duration of one run. The train is then returned to the laboratory and disassembled for recovery using the same procedure used to recover actual samples. The field blank will use a train that has previously been used to collect at least one actual sample from the test site.

Sample Analysis. The filter(s), XAD-2 resin, and acetone, methylene chloride, and toluene rinses up to the XAD-2 will be analyzed for PCDD/PCDF, according to EPA Method 23X. The filter(s), XAD-2 resin, acetone methylene chlorine, DI reagent, and impinger rinses with acetone and methylene chloride will be analyzed for PCB according to EPA Method 680 with high resolution. All extracts from one run will be combined and volume reduced to 1 mL resulting in one extract per run from which an aliquot will be taken for analysis.

Method 23—Determination of Polychlorinated Dibenzo-p-Dioxins and Polychlorinated Dibenzofurans From Stationary Sources

[Added by 56 FR 5760, February 13, 1991]

1. Applicability and Principle

1.1 Applicability. This method is applicable to the determination of

polychlorinated dibenzo-p-dioxins (PCDD's) and polychlorinated dibenzofurans (PCDF's) from stationary sources.

1.2 Principle. A sample is withdrawn from the gas stream isokinetically and collected in the sample probe, on a glass fiber filter, and on a packed column of adsorbent material. The sample cannot be separated into a particle vapor fraction. The PCDD's and PCDF's are extracted from the sample.

separated by high resolution gas chromatography, and measured by high resolution mass spectrometry.

2. Apparatus

2.1 Sampling. A schematic of the sampling train used in this method is shown in Figure 23-1. Sealing greases may not be used in assembling the train. The train is identical to that described in section 2.1 of Method 5 of this appendix with the following additions:

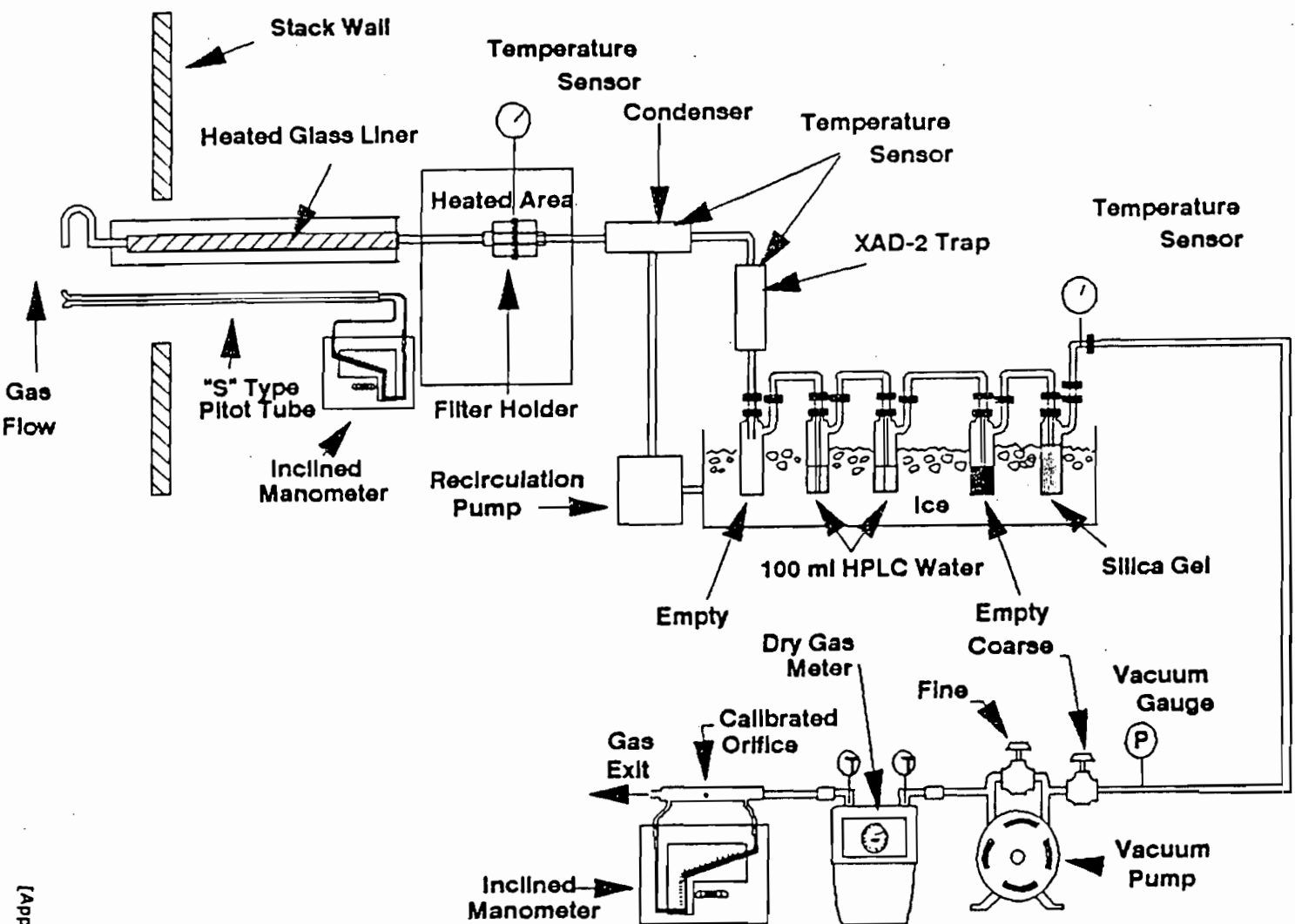


Figure 23.1 Sampling train

2.1.1 Nozzle. The nozzle shall be made of nickel, nickel-plated stainless steel, quartz, or borosilicate glass.

2.1.2 Sample Transfer Lines. The sample transfer lines, if needed, shall be heat traced, heavy walled TFE (½ in. OD with ¼ in. wall) with connecting fittings that are capable of forming leak-free, vacuum-tight connections without using sealing greases. The line shall be as short as possible and must be maintained at 120 °C.

2.1.1 Filter Support. Teflon or Teflon-coated wire.

2.1.2 Condenser. Glass, coil type with compatible fittings. A schematic diagram is shown in Figure 23-2.

2.1.3 Water Bath. Thermostatically controlled to maintain the gas temperature exiting the condenser at <20 °C (68 °F).

2.1.4 Adsorbent Module. Glass container to hold the solid adsorbent. A schematic diagram is shown in Figure 23-2. Other physical configurations of the resin trap/condenser assembly are acceptable. The connecting fittings shall form leak-free, vacuum tight seals. No sealant greases shall be used in the sampling train. A coarse glass frit is included to retain the adsorbent.

2.2 Sample Recovery.

2.2.1 Fitting Caps. Ground glass, Teflon tape, or aluminum foil (Section 2.2.6) to cap off the sample exposed sections of the train.

2.2.2 Wash Bottles. Teflon, 500-ml.

2.2.3 Probe-Liner Probe-Nozzle, and Filter-Holder Brushes. Inert bristle brushes with precleaned stainless steel or Teflon handles. The probe brush shall have extensions of stainless steel or Teflon, at least as long as the probe. The brushes shall be properly sized and shaped to brush out the nozzle, probe liner, and transfer line, if used.

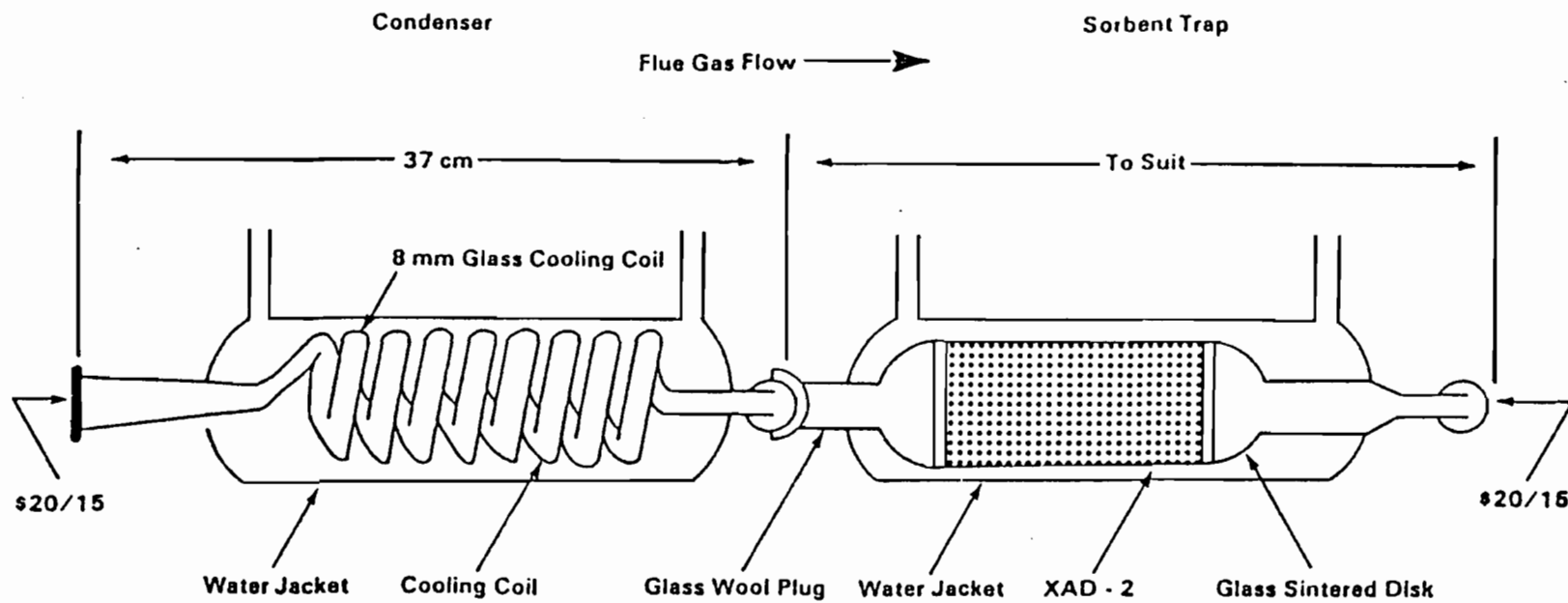


Figure 23.2. Condenser and adsorbent trap

2.2.4 Filler Storage Container. Sealed filter holder, wide-mouth amber glass jar with Teflon-lined cap, or glass petri dish.

2.2.5 Balance. Triple beam.

2.2.6 Aluminum Foil. Heavy duty, hexane-resistant.

2.2.7 Metal Storage Container. Air tight container to store silica gel.

2.2.8 Graduated Cylinder. Glass, 250-ml with 2-ml graduation.

2.2.9 Glass Sample Storage Container. Amber glass bottle for sample glassware washes, 500- or 1000-ml, with leak free Teflon-lined caps.

2.3 Analysis.

2.3.1 Sample Container. 125- and 250-ml flint glass bottles with Teflon-lined caps.

2.3.2 Test Tube. Glass.

2.3.3 Soxhlet Extraction Apparatus. Capable of holding 43 x 123 mm extraction thimbles.

2.3.4 Extraction Thimble. Glass, precleaned cellulosic, or glass fiber.

2.3.5 Pasteur Pipettes. For preparing liquid chromatographic columns.

2.3.6 Reacti-vials. Amber glass, 2-ml, silanized prior to use.

2.3.7 Rotary Evaporator. Buchi/Brinkman RE-121 or equivalent.

2.3.8 Nitrogen Evaporative Concentrator. N-Evap Analytical Evaporator Model III or equivalent.

2.3.9 Separatory Funnel. Glass, 2-liter.

2.3.10 Gas Chromatograph. Consisting of the following components:

2.3.10.1 Oven. Capable of maintaining the separation column at the proper operating temperature $\pm 1^\circ\text{C}$ and performing programmed increases in temperature at rates of at least $40^\circ\text{C}/\text{min}$.

2.3.10.2 Temperature Gauge. To monitor column oven, detector, and exhaust temperatures $\pm 1^\circ\text{C}$.

2.3.10.3 Flow System. Gas metering system to measure sample, fuel, combustion gas, and carrier gas flows.

2.3.10.4 Capillary Columns. A fused silica column, 60×0.25 mm inside diameter (ID), coated with DB-5 and a fused silica column, $30 \text{ m} \times 0.25$ mm ID coated with DB-225. Other column systems may be used provided that the user is able to demonstrate using calibration and performance checks that the column system is able to meet the specifications of section 6.1.2.2.

2.3.11. Mass Spectrometer. Capable of routine operation at a resolution of 1:10000 with a stability of ± 5 ppm.

2.3.12 Data System. Compatible with the mass spectrometer and capable of monitoring at least five groups of 25 ions.

2.3.13 Analytical Balance. To measure within 0.1 mg.

3. Reagents

3.1 Sampling.

3.1.1 Filters. Glass fiber filters, without organic binder, exhibiting at least 99.95 percent efficiency (<0.05 percent penetration) on 0.3-micron dioctyl phthalate smoke particles. The filter efficiency test shall be conducted in accordance with ASTM Standard Method D 2986-71 (Reapproved 1978) (incorporated by reference—see § 60.17).

3.1.1.1 Precleaning. All filters shall be cleaned before their initial use. Place a glass

extraction thimble and 1 g of silica gel and a plug of glass wool into a Soxhlet apparatus, charge the apparatus with toluene, and reflux for a minimum of 3 hours. Remove the toluene and discard it, but retain the silica gel. Place no more than 50 filters in the thimble onto the silica gel bed and top with the cleaned glass wool. Charge the Soxhlet with toluene and reflux for 16 hours. After extraction, allow the Soxhlet to cool, remove the filters, and dry them under a clean N_2 stream. Store the filters in a glass petri dish sealed with Teflon tape.

3.1.2 Adsorbent Resin. Amberlite XAD-2 resin. Thoroughly cleaned before initial use.

3.1.2.1 Cleaning Procedure. This procedure may be carried out in a giant Soxhlet extractor. An all-glass filter thimble containing an extra-course frit is used for extraction of XAD-2. The frit is recessed 10–15 mm above a crenelated ring at the bottom of the thimble to facilitate drainage. The resin must be carefully retained in the extractor cup with a glass wool plug and a stainless steel ring because it floats on methylene chloride. This process involves sequential extraction in the following order.

Solvent	Procedure
Water	Initial rinse: Place resin in a beaker, rinse once with water, and discard. Fill with water a second time, let stand overnight, and discard.
Water	Extract with water for 8 hours.
Methanol	Extract for 22 hours.
Methylene Chloride	Extract for 22 hours.
Toluene	Extract for 22 hours.

3.1.2.2 Drying.

3.1.2.2.1 Drying Column. Pyrex pipe, 10.2 cm ID by 0.8 m long, with suitable retainers.

3.1.2.2.2 Procedure. The adsorbent must be dried with clean inert gas. Liquid nitrogen from a standard commercial liquid nitrogen cylinder has proven to be a reliable source of large volumes of gas free from organic contaminants. Connect the liquid nitrogen cylinder to the column by a length of cleaned copper tubing, 0.95 cm ID, coiled to pass through a heat source. A convenient heat source is a water-bath heated from a steam line. The final nitrogen temperature should only be warm to the touch and not over 40°C . Continue flowing nitrogen through the adsorbent until all the residual solvent is removed. The flow rate should be sufficient to gently agitate the particles but not so excessive as the cause the particles to fracture.

3.1.2.3 Quality Control Check. The adsorbent must be checked for residual toluene.

3.1.2.3.1 Extraction. Weigh 1.0 g sample of dried resin into a small vial, add 3 ml of toluene, cap the vial, and shake it well.

3.1.2.3.2 Analysis. Inject a 2 μl sample of the extract into a gas chromatograph operated under the following conditions:

Column: 6 ft $\times$ $\frac{1}{8}$ in stainless steel containing 10 percent OV-101 on 100/120 Supelcoport.

Carrier Gas: Helium at a rate of 30 ml/min.

Detector: Flame ionization detector operated at a sensitivity of 4×10^{-11} A/mV.

Injection Port Temperature: 250°C .

Detector Temperature: 305°C .

Oven Temperature: 30°C for 4 min;

programmed to rise at $40^\circ\text{C}/\text{min}$ until it reaches 250°C ; return to 30°C after 17 minutes.

Compare the results of the analysis to the results from the reference solution. Prepare the reference solution by injection 2.5 μl of methylene chloride into 100 ml of toluene. This corresponds to 100 μg of methylene chloride per g of adsorbent. The maximum acceptable concentration is 1000 $\mu\text{g}/\text{g}$ of adsorbent. If the adsorbent exceeds this level, drying must be continued until the excess methylene chloride is removed.

3.1.2.4 Storage. The adsorbent must be used within 4 weeks of cleaning. After cleaning, it may be stored in a wide mouth amber glass container with a Teflon-lined cap or placed in one of the glass adsorbent modules tightly sealed with glass stoppers. If precleaned adsorbent is purchased in sealed containers, it must be used within 4 weeks after the seal is broken.

3.1.3 Glass Wool. Cleaned by sequential immersion in three aliquots of methylene chloride, dried in a 110°C oven, and stored in a methylene chloride-washed glass jar with a Teflon-lined screw cap.

3.1.4 Water. Deionized distilled and stored in a methylene chloride-rinsed glass container with a Teflon-lined screw cap.

3.1.5 Silica Gel. Indicating type, 6 to 16 mesh. If previously used, dry at 175°C (350°F) for two hours. New silica gel may be used as received. Alternately other types of desiccants (equivalent or better) may be used, subject to the approval of the Administrator.

3.1.6 Chromic Acid Cleaning Solution. Dissolve 20 g of sodium dichromate in 15 ml of water, and then carefully add 400 ml of concentrated sulfuric acid.

3.2 Sample Recovery.

3.2.2 Acetone. Pesticide quality.

3.2.2 Methylene Chloride. Pesticide quality.

3.2.3 Toluene. Pesticide quality.

3.3 Analysis.

3.3.1 Potassium Hydroxide. ACS grade, 2-percent (weight/volume) in water.

3.3.2 Sodium Sulfate. Granulated, reagent grade. Purify prior to use by rinsing with methylene chloride and oven drying. Store the cleaned material in a glass container with a Teflon-lined screw cap.

3.3.3 Sulfuric Acid. Reagent grade.

3.3.4 Sodium Hydroxide. 1.0 N. Weigh 40 g of sodium hydroxide into a 1-liter volumetric flask. Dilute to 1 liter with water.

3.3.5 Hexane. Pesticide grade.

3.3.6 Methylene Chloride. Pesticide grade.

3.3.7 Benzene. Pesticide Grade.

3.3.8 Ethyl Acetate.

3.3.9 Methanol. Pesticide Grade.

3.3.10 Toluene. Pesticide Grade.

3.3.11 Nonane. Pesticide Grade.

3.3.12 Cyclohexane. Pesticide Grade.

3.3.13 Basic Alumina. Activity grade 1, 100–200 mesh. Prior to use, activate the alumina by heating for 16 hours at 130°C .

before use. Store in a desiccator. Pre-activated alumina may be purchased from a supplier and may be used as received.

3.3.14 Silica Gel. Bio-Sil A. 100-200 mesh. Prior to use, activate the silica gel by heating for at least 30 minutes at 180 °C. After cooling, rinse the silica gel sequentially with methanol and methylene chloride. Heat the rinsed silica gel at 50 °C for 10 minutes, then increase the temperature gradually to 180 °C over 25 minutes and maintain it at this temperature for 90 minutes. Cool at room temperature and store in a glass container with a Teflon-lined screw cap.

3.3.15 Silica Gel Impregnated with Sulfuric Acid. Combine 100 g of silica gel with 44 g of concentrated sulfuric acid in a screw capped glass bottle and agitate thoroughly. Disperse the solids with a stirring rod until a uniform mixture is obtained. Store the mixture in a glass container with a Teflon-lined screw cap.

3.3.16 Silica Gel Impregnated with Sodium Hydroxide. Combine 39 g of 1 N sodium hydroxide with 100 g of silica gel in a screw capped glass bottle and agitate thoroughly. Disperse solids with a stirring rod until a uniform mixture is obtained. Store the mixture in glass container with a Teflon-lined screw cap.

3.3.17 Carbon/Celite. Combine 10.7 g of AX-21 carbon with 124 g of Celite 545 in a 250-ml glass bottle with a Teflon-lined screw cap. Agitate the mixture thoroughly until a uniform mixture is obtained. Store in the glass container.

3.3.18 Nitrogen. Ultra high purity.

3.3.19 Hydrogen. Ultra high purity.

3.3.20 Internal Standard Solution. Prepare a stock standard solution containing the isotopically labelled PCDD's and PCDF's at the concentrations shown in Table 1 under the heading "Internal Standards" in 10 ml of nonane.

3.3.21 Surrogate Standard Solution. Prepare a stock standard solution containing the isotopically labelled PCDD's and PCDF's at the concentrations shown in Table 1 under the heading "Surrogate Standards" in 10 ml of nonane.

3.3.22 Recovery Standard Solution. Prepare a stock standard solution containing the isotopically labelled PCDD's and PCDF's at the concentrations shown in Table 1 under the heading "Recovery Standards" in 10 ml of nonane.

4. Procedure

4.1 Sampling. The complexity of this method is such that, in order to obtain reliable results, testers should be trained and experienced with the test procedures.

4.1.1 Pretest Preparation.

4.1.1.1 Cleaning Glassware. All glass components of the train upstream of and including the adsorbent module, shall be cleaned as described in section 3A of the "Manual of Analytical Methods for the Analysis of Pesticides in Human and Environmental Samples." Special care shall be devoted to the removal of residual silicone grease sealants on ground glass connections of used glassware. Any residue shall be removed by soaking the glassware for several hours in a chromic acid cleaning solution prior to cleaning as described above.

4.1.1.2 Adsorbent Trasp. The traps must be loaded in a clean area to avoid contamination. They may not be loaded in the field. Fill a trap with 20 to 40 g of XAD-2. Follow the XAD-2 with glass wool and tightly cap both ends of the trap. Add 100 µl of the surrogate standard solution (section 3.3.21) to each trap.

4.1.1.3 Sample Train. It is suggested that all components be maintained according to the procedure described in APTD-0578.

4.1.1.4 Silica Gel. Weigh several 200 to 300 g portions of silica gel in an air tight container to the nearest 0.5 g. Record the total weight of the silica gel plus container, on each container. As an alternative, the silica gel may be weighed directly in its impinger or sampling holder just prior to sampling.

4.1.1.5 Filter. Check each filter against light for irregularities and flaws or pinhole leaks. Pack the filters flat in a clean glass container.

4.1.2 Preliminary Determinations. Same as section 4.1.2 of Method 5.

4.1.3 Preparation of Collection Train.

4.1.3.1 During preparation and assembly of the sampling train, keep all train openings where contamination can enter, sealed until just prior to assembly or until sampling is about to begin.

Note: Do not use sealant grease in assembling the train.

4.1.3.2 Place approximately 100 ml of water in the second and third impingers, leave the first and fourth impingers empty, and transfer approximately 200 to 300 g of preweighed silica gel from its container to the fifth impinger.

4.1.3.3 Place the silica gel container in a clean place for later use in the sample recovery. Alternatively, the weight of the silica gel plus impinger may be determined to the nearest 0.5 g and recorded.

4.1.3.4 Assemble the train as shown in Figure 23-1.

4.1.3.5 Turn on the adsorbent module and condenser coil recirculating pump and begin monitoring the adsorbent module gas entry temperature. Ensure proper sorbent temperature gas entry temperature before proceeding and before sampling is initiated. It is extremely important that the XAD-2 adsorbent resin temperature never exceed 50 °C because thermal decomposition will occur. During testing, the XAD-2 temperature must not exceed 20 °C for efficient capture of the PCDD's and PCDF's.

4.1.4 Leak-Check Procedure. Same as Method 5, section 4.1.4.

4.1.5 Sample Train Operation. Same as Method 5, section 4.1.5.

4.2 Sample Recovery. Proper cleanup procedure begins as soon as the probe is removed from the stack at the end of the sampling period. Seal the nozzle end of the sampling probe with Teflon tape or aluminum foil.

When the probe can be safely handled, wipe off all external particulate matter near the tip of the probe. Remove the probe from the train and close off both ends with aluminum foil. Seal off the inlet to the train with Teflon tape, a ground glass cap, or aluminum foil.

Transfer the probe and impinger assembly to the cleanup area. This area shall be clean and enclosed so that the chances of losing or contaminating the sample are minimized. Smoking, which could contaminate the sample, shall not be allowed in the cleanup area.

Inspect the train prior to and during disassembly and note any abnormal conditions, e.g., broken filters, colored impinger liquid, etc. Treat the samples as follows:

4.2.1 Container No. 1. Either seal the filter holder or carefully remove the filter from the filter holder and place it in its identified container. Use a pair of cleaned tweezers to handle the filter. If it is necessary to fold the filter, do so such that the particulate cake is inside the fold. Carefully transfer to the container any particulate matter and filter fibers which adhere to the filter holder gasket, by using a dry inert bristle brush and a sharp-edged blade. Seal the container.

4.2.2 Adsorbent Module. Remove the module from the train, tightly cap both ends, label it, cover with aluminum foil, and store it on ice for transport to the laboratory.

4.2.3 Container No. 2. Quantitatively recover material deposited in the nozzle, probe transfer lines, the front half of the filter holder, and the cyclone, if used, first, by brushing while rinsing three times each with acetone and then, by rinsing the probe three times with methylene chloride. Collect all the rinses in Container No. 2.

Rinse the back half of the filter holder three times with acetone. Rinse the connecting line between the filter and the condenser three times with acetone. Soak the connecting line with three separate portions of methylene chloride for 5 minutes each. If using a separate condenser and adsorbent trap, rinse the condenser in the same manner as the connecting line. Collect all the rinses in Container No. 2 and mark the level of the liquid on the container.

4.2.4 Container No. 3. Repeat the methylene chloride-rinsing described in Section 4.2.3 using toluene as the rinse solvent. Collect the rinses in Container No. 3 and mark the level of the liquid on the container.

4.2.5 Impinger Water. Measure the liquid in the first three impingers to within ±1 ml by using a graduated cylinder or by weighing it to within ±0.5 g by using a balance. Record the volume or weight of liquid present. This information is required to calculate the moisture content of the effluent gas.

Discard the liquid after measuring and recording the volume or weight.

4.2.7 Silica Gel. Note the color of the indicating silica gel to determine if it has been completely spent and make a mention of its condition. Transfer the silica gel from the fifth impinger to its original container and seal.

5. Analysis

All glassware shall be cleaned as described in section 3A of the "Manual of Analytical Methods for the Analysis of Pesticides in Human and Environmental Samples." All samples must be extracted [Appendix A, Method 23]

within 30 days of collection and analyzed within 45 days of extraction.

5.1 Sample Extraction.

5.1.1 Extraction System. Place an extraction thimble (section 2.3.4), 1 g of silica gel, and a plug of glass wool into the Soxhlet apparatus, charge the apparatus with toluene, and reflux for a minimum of 3 hours. Remove the toluene and discard it, but retain the silica gel. Remove the extraction thimble from the extraction system and place it in a glass beaker to catch the solvent rinses.

5.1.2 Container No. 1 (Filter). Transfer the contents directly to the glass thimble of the extraction system and extract them simultaneously with the XAD-2 resin.

5.1.3 Adsorbent Cartridge. Suspend the adsorbent module directly over the extraction thimble in the beaker (See section 5.1.1). The glass frit of the module should be in the up position. Using a Teflon squeeze bottle containing toluene, flush the XAD-2 into the thimble onto the bed of cleaned silica gel. Thoroughly rinse the glass module catching the rinsings in the beaker containing the thimble. If the resin is wet, effective extraction can be accomplished by loosely packing the resin in the thimble. Add the XAD-2 glass wool plug into the thimble.

5.1.4 Container No. 2 (Acetone and Methylene Chloride). Concentrate the sample to a volume of about 1-5 ml using the rotary evaporator apparatus, at a temperature of less than 37 °C. Rinse the sample container three times with small portions of methylene chloride and add these to the concentrated solution and concentrate further to near dryness. This residue contains particulate matter removed in the rinse of the train probe and nozzle. Add the concentrate to the filter and the XAD-2 resin in the Soxhlet apparatus described in section 5.1.1.

5.1.5 Extraction. Add 100 µl of the internal standard solution (Section 3.3.20) to the extraction thimble containing the contents of the adsorbent cartridge, the contents of Container No. 1, and the concentrate from section 5.1.4. Cover the contents of the extraction thimble with the cleaned glass wool plug to prevent the XAD-2 resin from floating into the solvent reservoir of the extractor. Place the thimble in the extractor, and add the toluene contained in the beaker to the solvent reservoir. Pour additional toluene to fill the reservoir approximately 2/3 full. Add Teflon boiling chips and assemble the apparatus. Adjust the heat source to cause the extractor to cycle three times per hour. Extract the sample for 18 hours. After extraction, allow the Soxhlet to cool. Transfer the toluene extract and three 10-ml rinses to the rotary evaporator. Concentrate the extract to approximately 10 ml. At this point the analyst may choose to split the sample in half. If so, split the sample, store one half for future use, and analyze the other according to the procedures in sections 5.2 and 5.3. In either case, use a nitrogen evaporative concentrator to reduce the volume of the sample being analyzed to near dryness. Dissolve the residue in 5 ml of hexane.

5.1.6 Container No. 3 (Toluene Rinse). Add 100 µl of the Internal Standard solution (section 3.3.2) to the contents of the container. Concentrate the sample to a

volume of about 1-5 ml using the rotary evaporator apparatus at a temperature of less than 37 °C. Rinse the sample container apparatus at a temperature of less than 37 °C. Rinse the sample container three times with small portions of toluene and add these to the concentrated solution and concentrate further to near dryness. Analyze the extract separately according to the procedures in sections 5.2 and 5.3, but concentrate the solution in a rotary evaporator apparatus rather than a nitrogen evaporative concentrator.

5.2 Sample Cleanup and Fractionation.

5.2.1 Silica Gel Column. Pack one end of a glass column, 20 mm x 230 mm, with glass wool. Add in sequence, 1 g silica gel, 2 g of sodium hydroxide impregnated silica gel, 1 g silica gel, 4 g of acid-modified silica gel, and 1 g of silica gel. Wash the column with 30 ml of hexane and discard it. Add the sample extract, dissolved in 5 ml of hexane to the column with two additional 5-ml rinses. Elute the column with an additional 90 ml of hexane and retain the entire eluate.

Concentrate this solution to a volume of about 1 ml using the nitrogen evaporative concentrator (section 2.3.7).

5.2.2 Basic Alumina Column. Shorten a 25-ml disposable Pasteur pipette to about 18 ml. Pack the lower section with glass wool and 12 g of basic alumina. Transfer the concentrated extract from the silica gel column to the top of the basic alumina column and elute the column sequentially with 120 ml of 0.5 percent methylene chloride in hexane followed by 120 ml of 35 percent methylene chloride in hexane. Discard the first 120 ml of eluate. Collect the second 120 ml of eluate and concentrate it to about 0.5 ml using the nitrogen evaporative concentrator.

5.2.3 AX-21 Carbon/Celite 545 Column. Remove the bottom 0.5 in. from the tip of a 9-ml disposable Pasteur pipette. Insert a glass fiber filter disk in the top of the pipette 2.5 cm from the constriction. Add sufficient carbon/celite mixture to form a 2 cm column. Top with a glass wool plug. In some cases AX-21 carbon fines may wash through the glass wool plug and enter the sample. This may be prevented by adding a celite plug to the exit end of the column. Rinse the column in sequence with 2 ml of 50 percent benzene in ethyl acetate, 1 ml of 50 percent methylene chloride in cyclohexane, and 2 ml of hexane. Discard these rinses. Transfer the concentrate in 1 ml of hexane from the basic alumina column to the carbon/celite column along with 1 ml of hexane rinse. Elute the column sequentially with 2 ml of 50 percent methylene chloride in hexane and 2 ml of 50 percent benzene in ethyl acetate and discard these eluates. Invert the column and elute in the reverse direction with 13 ml of toluene. Collect this eluate. Concentrate the eluate in a rotary evaporator at 50 °C to about 1 ml. Transfer the concentrate to a Reacti-vial using a toluene rinse and concentrate to a volume of 200 µl using a stream of N₂. Store extracts at room temperature, shielded from light, until the analysis is performed.

5.3 Analysis. Analyze the sample with a gas chromatograph coupled to a mass spectrometer (GC/MS) using the instrumental parameters in sections 5.3.1 and 5.3.2. Immediately prior to analysis, add a 20 µl

aliquot of the Recovery Standard solution from Table 1 to each sample. A 2 µl aliquot of the extract is injected into the GC. Sample extracts are first analyzed using the DB-5 capillary column to determine the concentration of each isomer of PCDD's and PCDF's (tetra-through octa-). If tetra-chlorinated dibenzofurans are detected in this analysis, then analyze another aliquot of the sample in a separate run, using the DB-225 column to measure the 2,3,7,8 tetra-chloro dibenzofuran isomer. Other column systems may be used, provided that the user is able to demonstrate using calibration and performance checks that the column system is able to meet the specifications of section 6.1.2.2.

5.3.1 Gas Chromatograph Operating Conditions.

5.3.1.1 Injector. Configured for capillary column, splitless, 250 °C.

5.3.1.2 Carrier Gas. Helium, 1-2 ml/min.

5.3.1.3 Oven. Initially at 150 °C. Raise by at least 40 °C/min to 190 °C and then at 3 °C/min up to 300 °C.

5.3.2 High Resolution Mass Spectrometer.

5.3.2.1 Resolution. 10000 m/e.

5.3.2.2 Ionization Mode. Electron Impact.

5.3.2.3 Source Temperature 250 °C.

5.3.2.4 Monitoring Mode. Selected ion monitoring. A list of the various ions to be monitored is summarized in Table 3.

5.3.2.5 Identification Criteria. The following identification criteria shall be used for the characterization of polychlorinated dibenzodioxins and dibenzofurans.

1. The integrated ion-abundance ratio (M/M+2 or M+2/M+4) shall be within 15 percent of the theoretical value. The acceptable ion-abundance ratio ranges for the identification of chlorine-containing compounds are given in Table 4.

2. The retention time for the analytes must be within 3 seconds of the corresponding ¹³C-labeled internal standard, surrogate or alternate standard.

3. The monitored ions, shown in Table 3 for a given analyte, shall reach their maximum within 2 seconds of each other.

4. The identification of specific isomers that do not have corresponding ¹³C-labeled standards is done by comparison of the relative retention time (RRT) of the analyte to the nearest internal standard retention time with reference (i.e., within 0.005 RRT units) to the comparable RRT's found in the continuing calibration.

5. The signal to noise ratio for all monitored ions must be greater than 2.5.

6. The confirmation of 2, 3, 7, 8-TCDD and 2, 3, 7, 8-TCDF shall satisfy all of the above identification criteria.

7. For the identification of PCDF's, no signal may be found in the corresponding PCDF channels.

5.3.2.6 Quantification. The peak areas for the two ions monitored for each analyte are summed to yield the total response for each analyte. Each internal standard is used to quantify the Indigenous PCDD's or PCDF's in its homologous series. For example, the ¹³C₁₂-2,3,7,8-tetra chlorinated dibenzodioxin is used to calculate the concentrations of all other tetra chlorinated isomers. Recoveries of the tetra- and penta- internal standards are

calculated using the $^{13}\text{C}_{12}$ -1,2,3,4-TCDD. Recoveries of the hexa- through octa- internal standards are calculated using $^{13}\text{C}_{12}$ -1,2,3,7,8,9-HxCDD. Recoveries of the surrogate standards are calculated using the corresponding homolog from the internal standard.

6. Calibration

Same as Method 5 with the following additions.

6.1 GC/MS System.

6.1.1 Initial Calibration. Calibrate the GC/MS system using the set of five standards shown in Table 2. The relative standard deviation for the mean response factor from each of the unlabeled analytes (Table 2) and of the internal, surrogate, and alternate standards shall be less than or equal to the values in Table 5. The signal to noise ratio for the GC signal present in every selected ion current profile shall be greater than or equal to 2.5. The ion abundance ratios shall be within the control limits in Table 4.

6.1.2 Daily Performance Check.

6.1.2.1 Calibration Check. Inject on μl of solution Number 3 from Table 2. Calculate the relative response factor (RRF) for each compound and compare each RRF to the corresponding mean RRF obtained during the initial calibration. The analyzer performance is acceptable if the measured RRF's for the labeled and unlabeled compounds for the daily run are within the limits of the mean values shown in Table 5. In addition, the ion abundance ratios shall be within the allowable control limits shown in Table 4.

6.1.2.2 Column Separation Check. Inject a solution of a mixture of PCDD's and PCDF's that documents resolution between 2,3,7,8-TCDD and other TCDD isomers. Resolution is defined as a valley between peaks that is less than 25 percent of the lower of the two peaks. Identify and record the retention time windows for each homologous series.

Perform a similar resolution check on the confirmation column to document the resolution between 2,3,7,8 TCDF and other TCDF isomers.

6.2 Lock Channels. Set mass spectrometer lock channels as specified in Table 3. Monitor the quality control check channels specified in Table 3 to verify instrument stability during the analysis.

7. Quality Control

7.1 Sampling Train Collection Efficiency Check. Add 100 μl of the surrogate standards in Table 1 to the adsorbent cartridge of each train before collecting the field samples.

7.2 Internal Standard Percent Recoveries. A group of nine carbon labeled PCDD's and PCDF's representing the tetra-through octachlorinated homologues, is added to every sample prior to extraction. The role of the internal standards is to quantify the native PCDD's and PCDF's present in the sample as well as to determine the overall method efficiency. Recoveries of the internal standards must be between 40 to 130 percent for the tetra-through hexachlorinated compounds while the range is 25 to 130 percent for the higher hepta- and octachlorinated homologues.

7.3 Surrogate Recoveries. The five surrogate compounds in Table 2 are added to

the resin in the adsorbent sampling cartridge before the sample is collected. The surrogate recoveries are measured relative to the internal standards and are a measure of collection efficiency. They are not used to measure native PCDD's and PCDF's. All recoveries shall be between 70 and 130 percent. Poor recoveries for all the surrogates may be an indication of breakthrough in the sampling train. If the recovery of all standards is below 70 percent, the sampling runs must be repeated. As an alternative, the sampling runs do not have to be repeated if the final results are divided by the fraction of surrogate recovery. Poor recoveries of isolated surrogate compounds should not be grounds for rejecting an entire set of the samples.

7.4 Toluene QA Rinse. Report the results of the toluene QA rinse separately from the total sample catch. Do not add it to the total sample.

8. Quality Assurance

8.1 Applicability. When the method is used to analyze samples to demonstrate compliance with a source emission regulation, an audit sample must be analyzed, subject to availability.

8.2 Audit Procedure. Analyze an audit sample with each set of compliance samples. The audit sample contains tetra through octa isomers of PCDD and PCDF. Concurrently, analyze the audit sample and a set of compliance samples in the same manner to evaluate the technique of the analyst and the standards preparation. The same analyst, analytical reagents, and analytical system shall be used both for the compliance samples and the EPA audit sample.

8.3 Audit Sample Availability. Audit samples will be supplied only to enforcement agencies for compliance tests. The availability of audit samples may be obtained by writing: Source Test Audit Coordinator (MD-77B), Quality Assurance Division, Atmospheric Research and Exposure Assessment Laboratory, U.S. Environmental Protection Agency, Research Triangle Park, NC 27711, or by calling the Source Test Audit Coordinator (STAC) at (919) 541-7834. The request for the audit sample must be made at least 30 days prior to the scheduled compliance sample analysis.

8.4 Audit Results. Calculate the audit sample concentration according to the calculation procedure described in the audit instructions included with the audit sample. Fill in the audit sample concentration and the analyst's name on the audit response form included with the audit instructions. Send one copy to the EPA Regional Office or the appropriate enforcement agency and a second copy to the STAC. The EPA Regional office or the appropriate enforcement agency will report the results of the audit to the laboratory being audited. Include this response with the results of the compliance samples in relevant reports to the EPA Regional Office or the appropriate enforcement agency.

9. Calculations

Same as Method 5, section 6 with the following additions.

9.1 Nomenclature.

Λ_{ci} = Integrated ion current of the noise at the retention time of the analyte.

Λ'_{ci} = Integrated ion current of the two ions characteristic of the internal standard i in the calibration standard.

Λ_{ci} = Integrated ion current of the two ions characteristic of compound i in the j th calibration standard.

Λ'_{ci} = Integrated ion current of the two ions characteristic of the internal standard i in the j th calibration standard.

Λ_{ci} = Integrated ion current of the two ions characteristic of surrogate compound i in the calibration standard.

Λ_i = Integrated ion current of the two ions characteristic of compound i in the sample.

Λ'_i = Integrated ion current of the two ions characteristic of internal standard i in the sample.

Λ_{rs} = Integrated ion current of the two ions characteristic of the recovery standard.

Λ_{ci} = Integrated ion current of the two ions characteristic of surrogate compound i in the sample.

C_i = Concentration of PCDD or PCDF i in the sample, pg/M^3 .

C_T = Total concentration of PCDD's or PCDF's in the sample, pg/M^3 .

m_{ci} = Mass of compound i in the calibration standard injected into the analyzer, pg .

m_{rs} = Mass of recovery standard in the calibration standard injected into the analyzer, pg .

m_{ci} = Mass of surrogate compound i in the calibration standard, pg .

RRF_i = Relative response factor.

RRF_{rs} = Recovery standard response factor.

RRF_{ci} = Surrogate compound response factor.

9.2 Average Relative Response Factor.

$$\text{RRF}_i = \frac{1}{n} \sum_{j=1}^n \frac{\Lambda_{ci} m'_{ci}}{\Lambda'_{ci} m_{ci}} \quad \text{Eq. 23-1}$$

9.3 Concentration of the PCDD's and PCDF's.

$$C_i = \frac{m_i \Lambda_i}{\Lambda'_i \text{RRF}_i V_{\text{std}}} \quad \text{Eq. 23-2}$$

9.4 Recovery Standard Response Factor.

$$\text{RRF}_{rs} = \frac{\Lambda_{ci} m_{rs}}{\Lambda_{rs} m_{ci}} \quad \text{Eq. 23-3}$$

9.5 Recovery of Internal Standards (R^*).

$$R^* = \frac{\Lambda'_i m_{rs}}{\Lambda_{rs} \text{RRF}_{rs} m'_i} \times 100\% \quad \text{Eq. 23-4}$$

9.6 Surrogate Compound Response Factor.

[Appendix A, Method 23]

$$RRF_s = \frac{\Lambda_d \cdot m_s}{\Lambda_{clb} \cdot m_d} \quad \text{Eq. 23-5}$$

9.7 Recovery of Surrogate Compounds (F_s).

$$R_s = \frac{\Lambda_s \cdot m_i}{\Lambda_i \cdot RRF_s \cdot m_s} \times 100\% \quad \text{Eq. 23-6}$$

9.8 Minimum Detectable Limit (MDL).

$$MDL = \frac{2.5 \Lambda_{cl} \cdot m_i}{\Lambda_d \cdot RRF_i} \quad \text{Eq. 23-7}$$

9.9 Total Concentration of PCDD's and PCDF's in the Sample.

$$C_{Tt} = \sum_{i=1}^n C_i \quad \text{Eq. 23-8}$$

Any PCDD's or PCDF's that are reported as nondetected (below the MDL) shall be counted as zero for the purpose of calculating the total concentration of PCDD's and PCDF's in the sample.

10. Bibliography

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TABLE 1.—COMPOSITION OF THE SAMPLE FORTIFICATION AND RECOVERY STANDARDS SOLUTIONS

Analyte	Concentration (pg/μl)
Internal Standards:	
¹³ C ₁₂ -2,3,7,8-TCDD	100
¹³ C ₁₂ -1,2,3,7,8-PeCDD	100
¹³ C ₁₂ -1,2,3,6,7,8-HxCDD	100
¹³ C ₁₂ -1,2,3,4,6,7,8-HpCDD	100
¹³ C ₁₂ -OCDD	100

TABLE 1.—COMPOSITION OF THE SAMPLE FORTIFICATION AND RECOVERY STANDARDS SOLUTIONS—Continued

Analyte	Concentration (pg/μl)
¹³ C ₁₂ -2,3,7,8-TCDF	100
¹³ C ₁₂ -1,2,3,7,8-PeCDF	100
¹³ C ₁₂ -1,2,3,6,7,8-HxCDF	100
¹³ C ₁₂ -1,2,3,4,6,7,8-HpCDF	100
Surrogate Standards:	
²¹ Cl ₂ -2,3,7,8-TCDD	100
²¹ Cl ₂ -1,2,3,4,7,8-HxCDD	100
²¹ Cl ₂ -2,3,4,7,8-PeCDF	100
²¹ Cl ₂ -1,2,3,4,7,8-HxCDF	100
²¹ Cl ₂ -1,2,3,4,7,8,9-HpCDF	100
Recovery Standards:	
¹³ C ₁₂ -1,2,3,4-TCDD	500
¹³ C ₁₂ -1,2,3,7,8,9-HxCDD	500

TABLE 2.—COMPOSITION OF THE INITIAL CALIBRATION SOLUTIONS

Compound	Concentrations (pg/μL)				
	Solution No.				
	1	2	3	4	5
Alternate Standard:					
¹³ C ₁₂ -1,2,3,7,8,9-HxCDF	2.5	5	25	250	500
Recovery Standards:					
¹³ C ₁₂ -1,2,3,4-TCDD	100	100	100	100	100
¹³ C ₁₂ -1,2,3,7,8,9-HxCDD	100	100	100	100	100

TABLE 3.—ELEMENTAL COMPOSITIONS AND EXACT MASSES OF THE IONS MONITORED BY HIGH RESOLUTION MASS SPECTROMETRY FOR PCDD'S AND PCDF'S

Descriptor No.	Accurate mass	Ion type	Elemental composition	Analyte
2	292.9825	LOCK	C ₇ F ₁₁	PFK
	303.9018	M	C ₁₂ H ₈ ²³ Cl ₂ O	TCDF
	305.8987	M+2	C ₁₂ H ₈ ²³ Cl ₂ O	TCDF
	315.9419	M	¹³ C ₁₂ H ₈ ²³ Cl ₂ O	TCDF (S)
	317.9389	M+2	¹³ C ₁₂ H ₈ ²³ Cl ₂ O	TCDF (S)
	319.8965	M	C ₁₂ H ₈ ²³ ClO ₂	TCDD
	321.8936	M+2	C ₁₂ H ₈ ²³ Cl ₂ O ₂	TCDD
	327.8847	M	C ₁₂ H ₈ ²³ Cl ₂ O ₂	TCDD (S)
	330.9792	QC	C ₇ F ₁₃	PFK
	331.9368	M	¹³ C ₁₂ H ₈ ²³ Cl ₂ O ₂	TCDD (S)
	333.9339	M+2	¹³ C ₁₂ H ₈ ²³ Cl ₂ O ₂	TCDD (S)
	339.8597	M+2	C ₁₂ H ₈ ²³ Cl ₃ ²³ ClO	PeCDF
	341.8567	M+4	C ₁₂ H ₈ ²³ Cl ₃ ²³ ClO	PeCDF
	351.9000	M+2	¹³ C ₁₂ H ₈ ²³ Cl ₃ ²³ ClO	PeCDF (S)
	353.8970	M+4	¹³ C ₁₂ H ₈ ²³ Cl ₃ ²³ ClO	PeCDF (S)
	355.8546	M+2	C ₁₂ H ₈ ²³ Cl ₃ ²³ ClO ₂	PeCDD
	357.8516	M+4	C ₁₂ H ₈ ²³ Cl ₃ ²³ ClO ₂	PeCDD
	367.8949	M+2	¹³ C ₁₂ H ₈ ²³ Cl ₃ ²³ ClO ₂	PeCDD (S)
	369.8919	M+4	¹³ C ₁₂ H ₈ ²³ Cl ₃ ²³ ClO ₂	PeCDD (S)
	375.8364	M+2	C ₁₂ H ₈ ²³ Cl ₃ ²³ ClO	HxCDFE
3	409.7974	M+2	C ₁₂ H ₈ ²³ Cl ₃ ²³ ClO	HxCDFE
	373.8208	M+2	C ₁₂ H ₈ ²³ Cl ₃ ²³ ClO	HxCDF
	375.8178	M+4	C ₁₂ H ₈ ²³ Cl ₃ ²³ ClO	HxCDF
	383.8639	M	¹³ C ₁₂ H ₈ ²³ Cl ₃ ²³ ClO	HxCDF (S)
	385.8610	M+2	¹³ C ₁₂ H ₈ ²³ Cl ₃ ²³ ClO	HxCDF (S)
	389.8157	M+2	C ₁₂ H ₈ ²³ Cl ₃ ²³ ClO ₂	HxCDD
	391.8127	M+4	C ₁₂ H ₈ ²³ Cl ₃ ²³ ClO ₂	HxCDD
	392.9760	LOCK	C ₆ F ₁₀	PFK

[Appendix A, Method 23]

TABLE 3.—ELEMENTAL COMPOSITIONS AND EXACT MASSES OF THE IONS MONITORED BY HIGH RESOLUTION MASS SPECTROMETRY FOR PCDD'S AND PCDF'S—Continued

Descriptor No.	Accurate mass	Ion type	Elemental composition	Analyte
4	401.8559	M+2	$^{13}\text{C}_{13}\text{H}_2^{35}\text{Cl}_6^{37}\text{ClO}_2$	HxCDD (S)
	403.8529	M+4	$^{13}\text{C}_{13}\text{H}_2^{35}\text{Cl}_6^{37}\text{Cl}_2\text{O}$	HxCDD (S)
	445.7555	M+4	$\text{C}_{12}\text{H}_5^{35}\text{Cl}_4^{37}\text{Cl}_2\text{O}$	OCDF
	430.9729	QC	C_9F_{17}	PFK
	407.7818	M+2	$\text{C}_{12}\text{H}^{35}\text{Cl}_5^{37}\text{ClO}$	HpCDF
	409.7789	M+4	$\text{C}_{12}\text{H}^{35}\text{Cl}_5^{37}\text{Cl}_2\text{O}$	HpCDF
	417.8253	M	$^{13}\text{C}_{12}\text{H}^{35}\text{Cl}_5\text{O}$	HpCDF (S)
	419.8220	M+2	$^{13}\text{C}_{12}\text{H}^{35}\text{Cl}_5^{37}\text{ClO}$	HpCDF (S)
	423.7766	M+2	$\text{C}_{12}\text{H}^{35}\text{Cl}_5^{37}\text{Cl}_2\text{O}$	HpCDD
	425.7737	M+4	$\text{C}_{12}\text{H}^{35}\text{Cl}_5^{37}\text{Cl}_2\text{O}_2$	HpCDD
	435.8169	M+2	$^{13}\text{C}_{12}\text{H}^{35}\text{Cl}_5^{37}\text{Cl}_2\text{O}_2$	HpCDD (S)
	437.8140	M+4	$^{13}\text{C}_{12}\text{H}^{35}\text{Cl}_5^{37}\text{Cl}_2\text{O}_2$	HpCDD (S)
	479.7165	M+4	$\text{C}_{12}\text{H}^{35}\text{Cl}_5^{37}\text{Cl}_2\text{O}$	NCPDE
	430.9729	LOCK	C_9F_{17}	PFK
	441.7428	M+2	$\text{C}_{12}^{35}\text{Cl}_5^{37}\text{ClO}$	OCDF
	443.7399	M+4	$\text{C}_{12}^{35}\text{Cl}_5^{37}\text{Cl}_2\text{O}$	OCDF
	457.7377	M+2	$\text{C}_{12}^{35}\text{Cl}_5^{37}\text{Cl}_2\text{O}_2$	OCDD
	459.7348	M+4	$\text{C}_{12}^{35}\text{Cl}_5^{37}\text{Cl}_2\text{O}_2$	OCDD
	469.7779	M+2	$^{13}\text{C}_{12}^{35}\text{Cl}_5^{37}\text{Cl}_2\text{O}_2$	OCDD (S)
	471.7750	M+4	$^{13}\text{C}_{12}^{35}\text{Cl}_5^{37}\text{Cl}_2\text{O}_2$	OCDD (S)
	513.6775	M+4	$\text{C}_{12}^{35}\text{Cl}_5^{37}\text{Cl}_2\text{O}_2$	DCDFE
	442.9728	QC	$\text{C}_{10}\text{F}_{11}$	PFK

(a) The following nuclidic masses were used:

H = 1.007825

C = 12.000000

 ^{13}C = 13.003355

F = 18.9984

O = 15.994915

 ^{35}Cl = 34.968853 ^{37}Cl = 36.965903

S = Labeled Standard

QC = Ion selected for monitoring instrument stability during the GC/MS analysis.

TABLE 4.—ACCEPTABLE RANGES FOR ION-ABUNDANCE RATIOS OF PCDD'S AND PCDF'S

No. of chlorine atoms	Ion type	Theoretical ratio	Control limits	
			Lower	Upper
4	M/M+2	0.77	0.65	0.89
5	M+2/ M+4	1.55	1.32	1.78
6	M+2/ M+4	1.24	1.05	1.43
6*	M/M+2	0.51	0.43	0.59
7*	M/M+2	0.44	0.37	0.51
7	M+2/ M+4	1.04	0.88	1.20
8	M+2/ M+4	0.89	0.76	1.02

* Used only for ^{13}C -HxCDF.* Used only for ^{13}C -HpCDF.

TABLE 5.—MINIMUM REQUIREMENTS FOR INITIAL AND DAILY CALIBRATION RESPONSE FACTORS

Compound	Relative response factors	
	Initial calibration RSD	Daily calibration % difference
Unlabeled		
Analytes:		
2,3,7,8-TCDD	25	25
2,3,7,8-TCDF	25	25
1,2,3,7,8- PeCDD	25	25
1,2,3,7,8- PeCDF	25	25

TABLE 5.—MINIMUM REQUIREMENTS FOR INITIAL AND DAILY CALIBRATION RESPONSE FACTORS—Continued

Compound	Relative response factors	
	Initial calibration RSD	Daily calibration % difference
2,3,4,7,8- PeCDF	25	25
1,2,4,5,7,8- HxCDD	25	25
1,2,3,6,7,8- HxCDD	25	25
1,2,3,7,8,9- HxCDD	25	25
1,2,3,4,7,8- HxCDF	25	25
1,2,3,6,7,8- HxCDF	25	25
1,2,3,7,8,9- HxCDF	25	25
2,3,4,6,7,8- HxCDF	25	25
1,2,3,4,8,7,8- HpCDD	25	25
1,2,3,4,6,7,8- HpCDF	25	25
OCDD	25	25
OCDF	30	30
Internal Standards:		
$^{13}\text{C}_{12}$ -2,3,7,8- TCDD	25	25
$^{13}\text{C}_{12}$ -1,2,3,7,8- PeCDD	30	30
$^{13}\text{C}_{12}$ - 1,2,3,6,7,8- HxCDD	25	25

TABLE 5.—MINIMUM REQUIREMENTS FOR INITIAL AND DAILY CALIBRATION RESPONSE FACTORS—Continued

Compound	Relative response factors	
	Initial calibration RSD	Daily calibration % difference
$^{13}\text{C}_{12}$ - 1,2,3,4,6,7,8- HpCDD	30	30
$^{13}\text{C}_{12}$ -OCDD	30	30
$^{13}\text{C}_{12}$ -2,3,7,8- TCDF	30	30
$^{13}\text{C}_{12}$ -1,2,3,7,8- PeCDF	30	30
$^{13}\text{C}_{12}$ - 1,2,3,6,7,8- HxCDF	30	30
$^{13}\text{C}_{12}$ - 1,2,3,4,6,7,8- HpCDF	30	30
Surrogate Standards:		
$^{37}\text{Cl}_4$ -2,3,7,8- TCDD	25	25
$^{13}\text{C}_{12}$ -2,3,4,7,8- PeCDF	25	25
$^{13}\text{C}_{12}$ - 1,2,3,4,7,8- HxCDD	25	25
$^{13}\text{C}_{12}$ - 1,2,3,4,7,8- HxCDF	25	25
$^{13}\text{C}_{12}$ - 1,2,3,4,7,8,9- HpCDF	25	25

[Appendix A, Method 23]

TABLE 5.—MINIMUM REQUIREMENTS FOR INITIAL AND DAILY CALIBRATION RESPONSE FACTORS—Continued

Compound	Relative response factors	
	Initial calibration RSD	Daily calibration % difference
Alternate Standard: 1,2,3,7,8,9-HxCDF	25	25

METHOD 24—DETERMINATION OF VOLATILE MATTER CONTENT, WATER CONTENT, DENSITY, VOLUME SOLIDS, AND WEIGHT SOLIDS OF SURFACE COATINGS

1. Applicability and Principle

1.1 Applicability. This method applies to the determination of volatile matter content, water content, density, volume solids, and weight solids of paint, varnish, lacquer, or related surface coatings.

1.2 Principle. Standard methods are used to determine the volatile matter content, water content, density, volume solids, and weight solids of the paint, varnish, lacquer, or related surface coatings.

2. Applicable Standard Methods

Use the apparatus, reagents, and procedures specified in the standard methods below:

2.1 ASTM D1475-60 (Reapproved 1980), Standard Test Method for Density of Paint, Varnish, Lacquer, and Related Products (incorporated by reference—see § 60.17).

2.2 ASTM D2369-81, Standard Test Method for Volatile Content of Coatings (incorporated by reference—see § 60.17).

2.3 ASTM D3792-79, Standard Test Method for Water Content of Water-Reducible Paints by Direct Injection into a Gas Chromatograph (incorporated by reference—see § 60.17).

2.4 ASTM D4017-81, Standard Test Method for Water in Paints and Paint Materials by the Karl Fischer Titration Method (incorporated by reference—see § 60.17).

3. Procedure

3.1 Volatile Matter Content. Use the procedure in ASTM D2369-81 (incorporated by reference—see § 60.17) to determine the volatile matter content (may include water) of the coating. Record the following information:

W_1 = Weight of dish and sample before heating, g.

W_2 = Weight of dish and sample after heating, g.

W_s = Sample weight, g.

Run analyses in pairs (duplicate sets) for each coating until the criterion in section 4.3 is met. Calculate the weight fraction of the volatile matter (W_v) for each analysis as follows:

$$W_v = \frac{W_1 - W_2}{W_s} \quad (\text{Eq. 24-1})$$

Record the arithmetic average (W_v).

3.2 Water Content. For waterborne (water reducible) coatings only, determine the weight fraction of water (W_w) using either "Standard Content Method Test for Water of Water-Reducible Paints by Direct Injection into a Gas Chromatograph" or "Standard Test Method for Water in Paint and Paint Materials by Karl Fischer Method." (These two methods are incorporated by reference—see § 60.17.) A waterborne coating is any coating which contains more than 5 percent water by weight in its volatile fraction. Run duplicate sets of determinations until the criterion in section 4.3 is met. Record the arithmetic average (W_w).

3.3 Coating Density. Determine the density (D_c , kg/liter) of the surface coating using the procedure in ASTM D1475-60 (Reapproved 1980) (incorporated by reference—see § 60.17).

Run duplicate sets of determinations for each coating until the criterion in section 4.3 is met. Record the arithmetic average (D_c).

3.4 Solids Content. Determine the volume fraction (V_s) solids of the coating by calculation using the manufacturer's formulation.

4. Data Validation Procedure

4.1 Summary. The variety of coatings that may be subject to analysis makes it necessary to verify the ability of the analyst and the analytical procedures to obtain reproducible results for the coatings tested. This is done by running duplicate analyses on each sample tested and comparing results with the within-laboratory precision statements for each parameter. Because of the inherent increased imprecision in the determination of the VOC content of waterborne coatings as the weight percent water increases, measured parameters for waterborne coatings are modified by the appropriate confidence limits based on between-laboratory precision statements.

4.2 Analytical Precision Statements. The within-laboratory and between-laboratory precision statements are given below:

	Within-laboratory	Between-laboratory
Volatile matter content, W_v	1.5 pct W_v	4.7 pct W_v
Water content, W_w	2.9 pct W_w	7.5 pct W_w
Density, D_c	0.001 kg/liter	0.002 kg/liter

4.3 Sample Analysis Criteria. For W_v and W_w , run duplicate analyses until the difference between the two values in a set is less than or equal to the within-laboratory pre-

cision statement for that parameter. For D_c , run duplicate analyses until each value in a set deviates from the mean of the set by no more than the within-laboratory precision statement. If after several attempts it is concluded that the ASTM procedures cannot be used for the specific coating with the established within-laboratory precision, the Administrator will assume responsibility for providing the necessary procedures for revising the method or precision statements upon written request to: Director, Emission Standards and Engineering Division, (MD-13) Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711.

4.4 Confidence Limit Calculations for Waterborne Coatings. Based on the between-laboratory precision statements, calculate the confidence limits for waterborne coatings as follows:

To calculate the lower confidence limit, subtract the appropriate between-laboratory precision value from the measured mean value for that parameter. To calculate the upper confidence limit, add the appropriate between-laboratory precision value to the measured mean value for that parameter. For W_v and D_c , use the lower confidence limits, and for W_w , use the upper confidence limit. Because V_s is calculated, there is no adjustment for the parameter.

5. Calculations

5.1 Nonaqueous Volatile Matter.

5.1.1 Solvent-borne Coatings.

$$W_n = W_v \quad \text{Eq. 24-2}$$

Where:

W_n = Weight fraction nonaqueous volatile matter, g/g.

5.1.2 Waterborne Coatings.

$$W_n = W_v - W_w \quad \text{Eq. 24-3}$$

5.2 Weight fraction solids.

$$W_s = 1 - W_v \quad \text{Eq. 24-4}$$

Where:

W_s = Weight solids, g/g.

METHOD 24A—DETERMINATION OF VOLATILE MATTER CONTENT AND DENSITY OF PRINTING INKS AND RELATED COATINGS

[Method 24A amended and corrected by 52 FR 34639, September 14, 1987]

1. Applicability and Principle

1.1 Applicability. This method applies to the determination of the volatile organic compound (VOC) content and density of solvent-borne (solvent reducible) printing inks or related coatings.

1.2 Principle. Separate procedures are used to determine the VOC weight fraction and density of the coating and the density of the solvent in the coating. The VOC weight fraction is determined by measuring the weight loss of a known sample quantity which has been heated for a specified length of time at a specified temperature. The density of both the coating and solvent are measured by a standard procedure. From this information, the VOC volume fraction is calculated.

[Appendix A, Method 24A]

ATTACHMENT C

SUMMARY OF STACK TEST RESULTS

SUMMARY OF STACK TEST RESULTS

The results of the initial and first quarterly stack testing events are summarized in the attached tables.

- Table 1 presents the August/September 1994 results for the 100% wood condition. The table presents the results of each test run and an average for each pollutant that has an emission limitation in the permit (i.e. limited pollutants). The permit limitation is also shown for comparison.
- Table 2 also presents the results for the August/September 1994 100% wood condition. However, it presents the results for the additional pollutants for which testing is required but no emission limits are established (i.e. additional pollutants).
- Table 3 presents the results of the August/September 1994 80% wood/20% tire feed condition for the limited pollutants.
- Table 4 presents the August/September 1994 results of the 80% wood/20% tire condition for the additional pollutants.
- Table 5 presents the results for the limited pollutants associated with the 80% wood/20% tire condition from the November 1994 test.
- Table 6 presents the November 1994 results of the 80% wood/20% tire condition for the additional pollutants.

In all cases, the measured emissions are well below the permit limits.

Table 1

**Limited Pollutants - Summary of Results
100% Wood Feed
August/September 1994**

Pollutant	Run No.	Emissions (lb/hr)	Permit Limitation (lb/hr)
Particulate/PM10	1	1.0	12.6
	2	1.0	
	3	1.4	
	Average	1.1	
Sulfur Dioxide (SO ₂)	1	0.0	109.4
	2	1.0	
	3	0.0	
	Average	0.3	
Nitrogen Oxides (NO _x)	1	78.7	94.5
	2	80.8	
	3	78.9	
	Average	79.5	
Carbon Monoxide (CO)	1	94.5	315.0
	2	93.4	
	3	55.5	
	Average	81.1	
Non-Methane Hydrocarbons (VOC)	1	0.8	22.1
	2	0.6	
	3	0.2	
	Average	0.5	
Hydrogen Chloride (HCl)	1	0.2	5.0
	2	0.3	
	3	0.3	
	Average	0.3	

Table 1 (cont.)

Pollutant	Run No.	Emissions (lb/hr)	Permit Limitation (lb/hr)
Mercury (Hg)	1	5.2 E-3	0.022
	2	2.2 E-3	
	3	1.1 E-3	
	Average	2.8 E-3	
Lead (Pb)	1	<9.5 E-4	0.25
	2	<1.0 E-3	
	3	<1.0 E-3	
	Average	<9.9 E-4	
Beryllium (Be)	1	<4.5 E-6	0.0063
	2	<4.6 E-6	
	3	<4.8 E-6	
	Average	<4.7 E-6	

Note: (<) - Detection Limits used in calculating averages.

Table 2

**Additional Pollutants - Summary of Results
100% Wood Feed
August/September 1994**

Pollutant	Run No.	Actual Emissions (lb/hr)	Projected Emissions (lb/hr)
Ammonia (NH ₃)	1	4.2	17.8
	2	4.0	
	3	3.9	
	Average	4.0	
Arsenic (As)	1	<4.7 E-5	1.9 E-2
	2	<4.8 E-5	
	3	<4.8 E-5	
	Average	<4.8 E-5	
Benzene	1	<0.9	5.0
	2	<0.8	
	3	<0.8	
	Average	<0.8	
Cadmium (Cd)	1	2.2 E-4	3.3 E-2
	2	1.0 E-4	
	3	1.0 E-4	
	Average	1.4 E-4	
Hexavalent Chromium (Cr ⁺⁶)	1	<3.9 E-4	1.6 E-2
	2	4.0 E-4	
	3	<3.1 E-4	
	Average	3.7 E-4	
Chromium (Cr)	1	4.4 E-4	N/A
	2	6.2 E-5	
	3	1.9 E-4	
	Average	2.3 E-4	

Table 2 (cont.)

Pollutant	Run No.	Actual Emissions (lb/hr)	Projected Emissions (lb/hr)
Total mono-deca PCB's	1	<6.6 E-7	N/A
	2	<6.7 E-7	
	3	<6.6 E-7	
	Average	<6.6 E-7	
Total 4-8 PCDD/PCDF	1	7.6 E-7	N/A
	2	6.8 E-7	
	3	3.2 E-7	
	Average	5.9 E-7	
Sulfuric Acid Mist (H ₂ SO ₄)	1	10.5	N/A
	2	13.7	
	3	12.2	
	Average	12.1	
Zinc (as ZnO)	1	4.9 E-3	0.63
	2	3.6 E-3	
	3	3.9 E-3	
	Average	4.1 E-3	

Note: (<) - Detection Limits used in calculating averages.
N/A - The application did not include a projected emission rate.

Table 3

**Limited Pollutants - Summary of Results
80% Wood/20% Tire Feed
August/September 1994**

Pollutant	Run No.	Emissions (lb/hr)	Permit Limitation (lb/hr)
Particulate/PM10	1	1.3	12.6
	2	2.6	
	3	2.2	
	Average	2.0	
Sulfur Dioxide (SO ₂)	1	17.6	109.4
	2	43.5	
	3	71.3	
	Average	44.1	
Nitrogen Oxides (NOx)	1	77.9	94.5
	2	87.4	
	3	81.6	
	Average	82.3	
Carbon Monoxide (CO)	1	62.3	315.0
	2	56.7	
	3	86.9	
	Average	68.6	
Non-Methane Hydrocarbons (VOC)	1	0.1	22.1
	2	0.1	
	3	0.2	
	Average	0.1	
Hydrogen Chloride (HCl)	1	0.3	5.0
	2	0.2	
	3	0.5	
	Average	0.3	

Table 3 (cont.)

Pollutant	Run No.	Emissions (lb/hr)	Permit Limitation (lb/hr)
Mercury (Hg)	1	3.2 E-4	0.022
	2	< 9.6 E-4	
	3	4.7 E-3	
	Average	2.0 E-3	
Lead (Pb)	1	2.1 E-3	0.25
	2	<9.3 E-4	
	3	1.3 E-3	
	Average	1.4 E-3	
Beryllium (Be)	1	<4.4 E-6	0.0063
	2	<4.9 E-6	
	3	<4.7 E-6	
	Average	<4.7 E-6	

Note: (<) - Detection Limits used in calculating averages.

Table 4

Additional Pollutants - Summary of Results
80% Wood/20% Tire Feed
August/September 1994

Pollutant	Run No.	Actual Emissions (lb/hr)	Projected Emissions (lb/hr)
Ammonia (NH ₃)	1	5.1	17.8
	2	5.6	
	3	13.8	
	Average	8.2	
Arsenic (As)	1	<4.4 E-5	1.9 E-2
	2	<4.5 E-5	
	3	<4.4 E-5	
	Average	<4.4 E-5	
Benzene	1	<0.8	5.0
	2	<0.8	
	3	<0.8	
	Average	<0.8	
Cadmium (Cd)	1	1.9 E-4	3.3 E-2
	2	1.2 E-4	
	3	8.5 E-5	
	Average	1.3 E-4	
Hexavalent Chromium (Cr ⁺⁶)	1	<3.7 E-4	1.6 E-2
	2	<3.8 E-4	
	3	<3.7 E-4	
	Average	<3.7 E-4	
Chromium (Cr)	1	4.8 E-4	N/A
	2	1.0 E-3	
	3	9.1 E-4	
	Average	8.0 E-4	

Table 4 (cont.)

Pollutant	Run No.	Actual Emissions (lb/hr)	Projected Emissions (lb/hr)
Total mono-deca PCB's	1	1.3 E-6	N/A
	2	<6.5 E-7	
	3	<6.4 E-7	
	Average	8.6 E-7	
Total 4-8 PCDD/PCDF	1	2.9 E-6	N/A
	2	1.6 E-6	
	3	6.6 E-7	
	Average	1.7 E-6	
Sulfuric Acid Mist (H ₂ SO ₄)	1	3.1	N/A
	2	2.4	
	3	1.1	
	Average	2.2	
Zinc (as ZnO)	1	2.7 E-2	0.63
	2	1.6 E-2	
	3	1.4 E-2	
	Average	1.9 E-2	

Note: (<) - Detection Limits used in calculating averages.
N/A - The application did not include a projected emission rate.

Table 5

**Limited Pollutants - Summary of Results
80% Wood/20% Tire Feed (100% Load)
November 1994**

Pollutant	Run No.	Emissions (lb/hr)	Permit Limitation (lb/hr)
Particulate/PM10	1	4.0	12.6
	2	2.6	
	3	3.0	
	Average	3.2	
Sulfur Dioxide (SO ₂)	1	32.7	109.4
	2	28.5	
	3	30.9	
	Average	30.7	
Nitrogen Oxides (NO _x)	1	74.2	94.5
	2	70.5	
	3	69.7	
	Average	71.5	
Carbon Monoxide (CO)	1	56.1	315.0
	2	79.0	
	3	157	
	Average	97.4	
Non-Methane Hydrocarbons (VOC)	1	2.0	22.1
	2	2.8	
	3	2.6	
	Average	2.5	
Hydrogen Chloride (HCl)	1	1.5	5.0
	2	1.8	
	3	1.7	
	Average	1.7	

Table 5 (cont.)

Pollutant	Run No.	Emissions (lb/hr)	Permit Limitation (lb/hr)
Mercury (Hg)	1	<9.7 E-4	0.022
	2	<9.9 E-4	
	3	4.6 E-3	
	Average	2.2 E-3	
Lead (Pb)	1	1.6 E-3	0.25
	2	2.4 E-3	
	3	2.1 E-3	
	Average	2.0 E-3	
Beryllium (Be)	1	<4.6 E-6	0.0063
	2	<4.4 E-6	
	3	<4.8 E-6	
	Average	<4.6 E-6	

Note: (<) - Detection Limits used in calculating averages.

Table 6

**Additional Pollutants - Summary of Results
80% Wood/20% Tire Feed (100% Load)
November 1994**

Pollutant	Run No.	Actual Emissions (lb/hr)	Projected Emissions (lb/hr)
Ammonia (NH ₃)	1	5.9	17.8
	2	4.3	
	3	4.1	
	Average	4.8	
Arsenic (As)	1	1.1 E-4	1.9 E-2
	2	7.7 E-4	
	3	1.3 E-4	
	Average	1.1 E-4	
Benzene	1	0.10	5.0
	2	<0.02	
	3	<0.02	
	Average	0.05	
Cadmium (Cd)	1	1.3 E-4	3.3 E-2
	2	9.5 E-4	
	3	3.6 E-5	
	Average	4.8 E-4	
Hexavalent Chromium (Cr ⁺⁶)	1	<3.3 E-4	1.6 E-2
	2	<3.4 E-4	
	3	<3.1 E-4	
	Average	<3.3 E-4	
Chromium (Cr)	1	3.8 E-4	N/A
	2	7.6 E-4	
	3	3.1 E-4	
	Average	4.8 E-4	

Table 6 (cont.)

Pollutant	Run No.	Actual Emissions (lb/hr)	Projected Emissions (lb/hr)
Total mono-deca PCB's	1	< 6.1 E-7	N/A
	2	1.0 E-6	
	3	< 6.4 E-7	
	Average	7.5 E-7	
Total 4-8 PCDD/PCDF	1	1.1 E-6	N/A
	2	2.1 E-5	
	3	5.2 E-7	
	Average	7.7 E-6	
Sulfuric Acid Mist (H ₂ SO ₄)	1	7.5	N/A
	2	4.4	
	3	4.4	
	Average	5.4	
Zinc (as ZnO)	1	3.6 E-2	0.63
	2	4.0 E-2	
	3	2.6 E-2	
	Average	3.4 E-2	

Note: (<) - Detection Limits used in calculating averages.

N/A - The application did not include a projected emission rate.