P 423 104 512

RECEIPT FOR CERTIFIED MAIL

NO INSURANCE COVERAGE PROVIDED
NOT FOR INTERNATIONAL MAIL
(See Reverse)

☆U.S.G.P.O. 1989-234-555

Sent to
Mr. Randy Thompson
Street and No.
Environmental Dept.
FL Crushed Stone Company
P.O., State and ZIP Code
P. O. Box 490300
Leesburg, FL 34749-0300

Postage	$
Certified Fee	
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt showing to whom and Date Delivered	
Return Receipt showing to whom, Date, and Address of Delivery	
TOTAL Postage and Fees	$

Postmark or Date
mailed: 6/13/90
AC 27-118674
PSD-FL-091

PS Form 3800, June 1985

● **SENDER:** Complete items 1 and 2 when additional services are desired, and complete items 3 and 4.

Put your address in the "RETURN TO" Space on the reverse side. Failure to do this will prevent this card from being returned to you. The return receipt fee will provide you the name of the person delivered to and the date of delivery. For additional fees the following services are available. Consult postmaster for fees and check box(es) for additional service(s) requested.

1. ☒ Show to whom delivered, date, and addressee's address. *(Extra charge)*
2. ☐ Restricted Delivery *(Extra charge)*

3. Article Addressed to:
Mr. Randy Thompson
Environmental Dept.
FL Crushed Stone Company
P. O. Box 490300
Leesburg, FL 34749-0300

4. Article Number
P 423 104 512

Type of Service:
☐ Registered ☐ Insured
☒ Certified ☐ COD
☐ Express Mail ☐ Return Receipt for Merchandise

Always obtain signature of addressee or agent and DATE DELIVERED.

5. Signature — Addressee
X

6. Signature — Agent
X

7. Date of Delivery

8. Addressee's Address *(ONLY if requested and fee paid)*

PS Form **3811**, Apr. 1989 ★U.S.G.P.O. 1989-238-815 **DOMESTIC RETURN RECEIPT**

File Copy

Florida Department of Environmental Regulation

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

Bob Martinez, Governor   Dale Twachtmann, Secretary   John Shearer, Assistant Secretary

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
NOTICE OF PERMIT AMENDMENT

Mr. Randy Thompson
Environmental Department
Florida Crushed Stone Company
Post Office Box 490300
Leesburg, Florida 34749-0300

June 13, 1990

Enclosed is an amendment for construction permits Nos. AC 27-118674 and PSD-FL-091 for Florida Crushed Stone Company to conduct performance tests on the cement kiln while burning tire derived fuel with coal at the existing facility located approximately 3.5 miles NW of Brooksville, Hernando County, Florida. This amendment is issued pursuant to Section 403, Florida Statutes.

Any party to this amendment has the right to seek judicial review of the amendment pursuant to Section 120.68, Florida Statutes, 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 Office of General Counsel, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400; 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 30 days from the date this amendment is filed with the Clerk of the Department.

Executed in Tallahassee, Florida.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION

CH Fancy

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

Copy furnished to:

B. Thomas, SW District
J. Koogler, P.E., K&A
C. Shaver, NPS
J. Harper, EPA
Reading File
Bruce Mitchell } 6-13-90

CERTIFICATE OF SERVICE

The undersigned duly designated deputy clerk hereby certifies that this NOTICE OF PERMIT AMENDMENT and all copies were mailed before the close of buisness on 6-13-90.

FILING AND ACKNOWLEDGEMENT FILED, on this date, pursuant to §120.52(9), Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.

Clerk

6-13-90
Date

Final Determination

The construction permit amendment request has been reviewed by the Department. Public Notice of the Department's Intent to Issue was published in The Tampa Tribune on May 4, 1990. The letter amendment and attachments were available for public inspection at the DER's Southwest District and Bureau of Air Regulation (Bureau) offices.

A comment was received on the proposed action from Mr. Bruce Mitchell, with the Bureau, in an Interoffice Memorandum. The comment identified mercury as a pollutant of concern in Florida and the need to conduct tests for it. Therefore, the following will be added to No. 4 of the letter amendment:

Pollutant/Pollutant Category	Test Method
• Mercury	EPA Method 101 or 101A

Attachment to be incorporated:

12. Interoffice Memorandum from Mr. Bruce Mitchell dated May 17, 1990.

The Bureau will incorporate the change into the appropriate area of the letter amendment, as reflected in the final determination. It is recommended that the letter amendment be issued as drafted, with the above revision and attachment incorporated. This letter amendment shall be attached to construction permits Nos. AC 27-118674 and PSD-FL-091, and shall become a part of the permits.

THE TAMPA TRIBUNE

Published Daily
Tampa, Hillsborough County, Florida

State of Florida
County of Hillsborough } ss.

RECEIVED

Before the undersigned authority personally appeared James L. Gonnering, who on oath says that he is Assistant Comptroller of The Tampa Tribune, a daily newspaper published at Tampa in Hillsborough County, Florida; that the attached copy of advertisement being a LEGAL NOTICE DER-BAQM

in the matter of ISSUE A PERMIT AMENDMENT

was published in said newspaper in the issues of May 4, 1990

Affiant further says that the said The Tampa Tribune is a newspaper published at Tampa, in said Hillsborough County, Florida, and that the said newspaper has heretofore been continuously published in said Hillsborough County, Florida, each day and has been entered as second class mail matter at the post office in Tampa, in said Hillsborough 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.

Sworn to and subscribed before me, this 10 *day of* May *A.D. 19*90

Debra Lynne Bouchard

(Seal)

Notary Public, State of Florida
My Commission Expires Jan. 6, 1993
Bonded Thru Troy Fain - Insurance Inc.

The Department of Environmental Regulation hereby gives notice of its intent to issue a permit amendment to FCSC (Florida Crushed Stone Company), Environmental Department, P.O. Box 490300, Leesburg, Florida 34749-0300, to conduct a performance test on the cement kiln while burning tire derived fuel (TDF) with coal at 15% of the total (100%) Btu heat input (i.e., TDF @ 15% and coal @ 85%). The purpose of this amendment is to allow FCSC to obtain the data necessary to determine whether the cement kiln is capable of accommodating TDF under the cement kiln's present physical configuration and what regulations the cement kiln will be subject to if it is to be permitted to burn TDF with coal. The proposed project will occur at the applicant's existing facility located approximately 3.5 miles NW of Brooksville, Hernando County, Florida. The Department is issuing this intent to issue for the reasons stated in the proposed letter amendment to the construction permit No. AC 27-118674 and PSD permit No. PSD-FL-091.

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 fourteen (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 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 Office
4520 Oak Fair Boulevard
Tampa, Florida 33610-7347

Any person may send written comments on the proposed action to Mr. C. H. Fancy at the Department's Tallahassee address. All comments mailed within 14 days of the publication of this notice will be considered in the Department's final determination.

2642 5/4/90

ATTACHMENT 12

For Routing To Other Than The Addressee

To: ______ Location: ______
To: ______ Location: ______
To: ______ Location: ______
From: ______ Date: ______

State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

Interoffice Memorandum

TO: Florida Crushed Stone File: AC 27-118674

FROM: Bruce Mitchell

DATE: May 17, 1990

SUBJ: Comments - Public Notice

Due to the concerns about mercury in Florida, I recommend that FCS perform emissions tests for this highly toxic pollutant, both prior to burning TDF and during the TDF trial burn.

BM/plm

Florida Department of Environmental Regulation

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

Bob Martinez, Governor　Dale Twachtmann, Secretary　John Shearer, Assistant Secretary

June 6, 1990

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Randy Thompson
Environmental Department
Florida Crushed Stone Company
Post Office Box 490300
Leesburg, Florida 34749-0300

Dear Mr. Thompson:

Re: Amendment to Construction Permit No. AC 27-118674 and PSD Permit No. PSD-FL-091 to Conduct Performance Test(s) on the Cement Kiln While Burning Tire Derived Fuel (TDF) with Coal.

The Department has reviewed the request that you provided on March 14, 1990. We have also considered the Department's legal authority to allow you to conduct the requested performance test(s). Paragraph 403.061(15), Florida Statutes (F.S.) authorizes the Department to consult with any person proposing to construct, install, or otherwise acquire a pollution control device or system concerning the efficacy of such device or system, or the pollution problem which may be related to the source, device, or system. Paragraph 403.061(16), F.S., authorizes the Department to encourage voluntary cooperation by persons in order to achieve the purposes of the state environmental control act. Paragraph 403.061(18), F.S., authorizes the Department to encourage and conduct studies, investigations, and research relating to the causes and control of pollution. Florida Administrative Code (F.A.C.) Rule 17-2.250(5) authorizes the Department to consider variations in industrial equipment and make allowances for excess emissions that provide practical regulatory controls consistent with the public interest.

In accordance with the provisions of Paragraphs 403.061(15), (16) and (18), F.S., and F.A.C. Rule 17-2.250(5), you are hereby authorized to performance test the cement kiln while burning TDF with coal at 15% of the total (100%) Btu heat input (i.e., TDF @ 15% and coal @ 85%). The purpose of this activity is to obtain the data necessary to determine whether the cement kiln is capable of accommodating TDF with coal under the cement kiln's present physical configuration and what regulations the cement kiln will be subject to if it is to be permitted to burn TDF with coal.

The performance test(s) shall be subject to the following conditions:

1. The permittee shall notify, in writing, the Department's Southwest District and Bureau of Air Regulation (BAR) offices at least 15 days prior to commencement of the performance test(s). A written report shall be submitted to these offices within 45 days upon completion of the last test run.

2. Prior to or after conducting tests on TDF and coal (Post-tests), performance tests (Pre-tests) shall be conducted while firing 100% coal for all of the identified pollutants and pollutant categories in order to establish background levels, unless performance tests have already been conducted and the results can be provided to the Department. These tests, "Pre-tests" (i.e., coal only), shall be compared to the post-tests (TDF and coal) to determine if:

   a) PSD review is required, which includes a construction permit application package and appropriate processing fee; or,

   b) the current construction and PSD permits can be amended to allow the use of TDF with coal.

3. All post-test results shall be compared to "actual emissions" for PSD review purposes (see Region IV, U.S. EPA's letter dated April 4, 1990).

4. The contents of Dr. John B. Koogler's letter received March 14, 1990, are adopted by reference, with exceptions to part A, of which the following pollutants/pollutant categories will also be tested for:

Pollutant/Pollutant Category	Test Method
o Metals (continued)	
Barium	EPA Method 5
Copper	
Nickel	
Iron	
Vanadium	
o PCDDs and PCDFs	EPA Method 23
o PAHs (polynuclear aromatic hydrocarbons)	Modified Method 5
o Benzene	EPA Method 18
o Mercury	EPA Method 101 or 101A

5. An ultimate analysis of the particulate filter(s) shall be required. Also, an ultimate analysis of a representative sample(s) from the baghouse hopper shall be required.

6. This authorized performance test(s) shall not result in the release of objectionable odors pursuant to F.A.C. Rule 17-2.620(2).

7. Performance testing shall immediately cease upon the occurrence of a valid environmental complaint by a citizen or other party, or a nuisance or danger to public health or welfare. Performance testing shall not resume until appropriate measures to correct the problem have been implemented.

8. The performance test(s) shall be conducted under the direct supervision and responsible charge of a professional engineer registered in Florida.

9. This Department action is just to authorize the performance tests on the cement kiln while firing coal and TDF only. The firing of TDF after the last performance test run is completed will be deemed a violation of the current permits, AC 27-118674 and PSD-FL-091.

10. Complete documentation of any TDF usage in the cement kiln shall be required (i.e., start-up and testing).

11. The Department shall be notified in writing on the date of the last test run completion.

12. From the initial date of using TDF, which shall be documented in writing to the Department, the permittee shall be limited to 45 days to stabilize the cement kiln and to submit notification of performance testing. If additional time is needed, the permittee shall provide the Department with documentation of the progress accomplished to date and shall identify what is left to be done in order to achieve stabilization of the cement kiln for performance testing purposes.

13. Attachments (see Attachment Section) are incorporated.

The Department has relied on the information referenced in the attachments and conversations with representatives of the FCSC, U.S. EPA-Region IV, and Department of Interior's National Park Service in authorizing this permit letter amendment to the construction permit No. AC 27-118674 and PSD permit No. PSD-FL-091.

A copy of this letter and its attachments shall be attached to the construction permit No. AC 27-118674 and PSD permit No. PSD-FL-091.

Sincerely,

Dale Twachtmann
Secretary

DT/plm

Attachments

c: B. Thomas, SW Dist.
J. Koogler, P.E., K&A
C. Shaver, NPS-Air
J. Harper, EPA

Attachment Section

1. Final Emissions Test Report of April, 1988, for the Modesto Energy Company's Waste Tire to Energy Facility, Westley, California, received January 18, 1989. Confidential;
2. Federal Register, Volume 52, No. 167, issued August 28, 1987; pages 32597-32600; "Assessment of Zinc and Zinc Oxide as Potentially Toxic Air Pollutants;"
3. "Engineering Study on Burning a Mixture of Coal and Rubber Tire Chips at the United Power Association Elk River Power Station;" Milos Tomaides and Alan Trowbridge; MPCA Reg. #06054;
4. "Measurement of Polynuclear Aromatic Hydrocarbons and Metals from Burning Tire Chips for Supplementary Fuel," by John Drabek and Jay Willenberg, both with the State of Washington Department of Ecology, presented to the 1987 TAPPI Env. Conf., April 26-29, 1987, in Portland, Oregon;
5. "Rubber Tires, A Hazardous Fuel?," by William deBoisblane with the Bay Area AQD, dated March 6, 1985;
6. "Conversion of Scrap Tires to Energy and Its Environmental Issues," by Mark W. Hope with Waste Recovery, Inc., presented to APCA Int. Speciality Conf., October 9-12, 1988;
7. Federal Register, Volume 54, No. 243, issued December 20, 1989; pages 52190-52201; "Standards of Performance for New Stationary Sources; 40 CFR 60, Appendix A - Addition of Methods for Measurement of PCDDs and PCDFs, and Hydrogen Chloride Emissions from Stationary Sources;
8. Dr. John B. Koogler's letter received January 25, 1990;
9. Dr. John B. Koogler's letter received February 6, 1990;
10. Dr. John B. Koogler's letter received March 14, 1990; and,
11. Ms. Jewell A. Harper's letter dated April 4, 1990, and received April 9, 1990.
12. Interoffice Memorandum from Mr. Bruce Mitchell dated May 17, 1990.

For Routing To Other Than The Addressee

To: ______________________ Location: ______________
To: ______________________ Location: ______________
To: ______________________ Location: ______________
From: ____________________ Date: __________________

State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

Interoffice Memorandum

TO: Dale Twachtmann

for FROM: Steve Smallwood

DATE: June 6, 1990

SUBJ: Amendment to Construction Permits: AC 27-118674
PSD-FL-091

Cement Kiln
Florida Crushed Stone Company

Attached for your approval and signature is a letter prepared by the Bureau of Air Regulation that will amend the above referenced construction permits. The amendment will allow the company to conduct emissions tests while burning coal and tire derived fuel in the cement kiln. The existing facility is located approximately 3.5 miles NW of Brooksville, Hernando County, Florida.

The amendment is not controversial. I recommend your approval and signature.

SS/BM/plm

Attachment

RECEIVED
JUN 6 1990
Office of the Secretary

For Routing To Other Than The Addressee

To: ______________________ Location: ______________
To: ______________________ Location: ______________
To: ______________________ Location: ______________
From: ____________________ Date: __________________

State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

Interoffice Memorandum

TO: Florida Crushed Stone File: AC 27-118674

FROM: Bruce Mitchell

DATE: May 17, 1990

SUBJ: Comments - Public Notice

Due to the concerns about mercury in Florida, I recommend that FCS perform emissions tests for this highly toxic pollutant, both prior to burning TDF and during the TDF trial burn.

BM/plm

KOOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES
4014 NW THIRTEENTH STREET
GAINESVILLE, FLORIDA 32609
904/377-5822 ▪ FAX 377-7158

KA 307-90-01

November 6, 1991

RECEIVED
NOV 07 1991
Division of Air
Resources Management

Mr. C. H. Fancy
Florida Department of
Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Subject: Nitrogen Oxides Emission Measurements
Florida Crushed Stone Company
Cement/Power/Lime Plant
Brooksville, Florida

Dear Mr. Fancy:

Enclosed are two copies of our report entitled, NITROGEN OXIDES EMISSION RATES UNDER BASELINE AND SHREDDED TDF FIRING CONDITIONS, which describes the results of testing conducted by Koogler & Associates on October 14-16, 1991, at the Florida Crushed Stone Company CPL plant in Brooksville, Florida.

If you have any questions concerning the enclosed report, please do not hesitate to contact me.

Very truly yours,

KOOGLER & ASSOCIATES

John B. Koogler, Ph.D., P.E.

JBK:wa
Enc.

c: Mr. Chi-Sun Lee, FDER, Tampa ✓
Mr. Larry Sellers, Holland & Knight ✓
Mr. Thomas Mountain, FCS ✓
Mr. J. P. Subramani, Ortell, Hoffman, Fernandez & Cole ✓
Mr. Charles Hetrick, Hernando County ✓

DEPARTMENT OF ENVIRONMENTAL REGULATION

ROUTING AND TRANSMITTAL SLIP

ACTION NO

ACTION DUE DATE

1. TO: (NAME, OFFICE, LOCATION) Bruce Mitchell — Initial — Date

2. — Initial — Date

3. (904) 377-5822 Mason Joye — Initial — Date

4. — Initial — Date

REMARKS:

The only thing I found questionable was the 30 min~~s~~ runs they did for stack gas flow + moisture measurements. 17-2 requires 60 min runs. I have talked with Mr. Lee of SW District + he will be getting in touch with Koogler to get their explanation.

INFORMATION

☐ Review & Return
☐ Review & File
☐ Initial & Forward
☐

DISPOSITION

☐ Review & Respond
☐ Prepare Response
☐ For My Signature
☐ For Your Signature
☐ Let's Discuss
☐ Set Up Meeting
☐ Investigate & Report
☐ Initial & Forward
☐ Distribute
☐ Concurrence
☐ For Processing
☐ Initial & Return

FROM: Syed

DATE 12/23

PHONE

NITROGEN OXIDES EMISSION RATES UNDER BASELINE AND SHREDDED TDF FIRING CONDITIONS

FLORIDA CRUSHED STONE COMPANY CEMENT/POWER/LIME PLANT

BROOKSVILLE, FLORIDA

OCTOBER 14-16, 1991

KOOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES
4014 N.W. 13TH STREET
GAINESVILLE, FL 32609
(904) 377-5822

TABLE OF CONTENTS

APPENDIX

To the best of my knowledge, all applicable field and analytical procedures comply with Florida Department of Environmental Regulation requirements and all test data and plant operating data are true and correct.

John B. Koogler, PH.D., P.E.
State of Florida
Registration No. 12925

11/6/91
Date

SEAL

1.0 INTRODUCTION

The Florida Crushed Stone Company (FCS) operates a cement/power/lime (CPL) plant in Hernando County, northwest of Brooksville. The cement plant was permitted under Florida Department of Environmental Regulation (FDER) Air Construction Permit AC27-118674 and the facility was permitted under Permit PSD-FL-091.

In March 1990, FCS applied to FDER requesting approval to burn tire derived fuel (TDF) as a supplemental heat source in the cement kiln of the CPL plant. On June 6, 1990, FDER issued an amendment to the referenced permits authorizing performance tests on the cement plant while using TDF to supply up to 15 percent of the heat input to the kiln. In September 1990, the tests were conducted to measure air pollutant emissions from the CPL plant while the plant was operating under baseline conditions and with shredded TDF supplying up to 15 percent of the heat input to the plant. During this test period, the nitrogen oxides emission measurements were flawed by laboratory analyses. In September 1991, FCS requested approval from FDER to conduct additional tests with shredded TDF so that nitrogen oxides emissions could be measured. On October 9, 1991, FDER authorized FCS to conduct tests for nitrogen oxides under baseline conditions and while using shredded TDF to provide up to 15 percent of the heat input to the plant. These tests were conducted during the period October 14-16, 1991, and the results are reported herein.

The CPL plant consists of a Portland cement plant having a kiln feed rate of 123.5 tons per hour and a clinker production rate of 75 tons per hour, a power plant with a maximum permitted generating rate of 125 megawatts, and a lime calciner with a nominal production rate of 20 tons per hour. All three of the plants are normally fired with low-sulfur coal.

The approval granted by FDER on October 9, 1991, authorized two 24-hour test periods; one representing baseline or normal plant operating conditions and the second representing shredded TDF firing conditions. The baseline test was conducted during the period 0830 on October 14, 1991, through 0800 on October 15, 1991. The shredded TDF firing test was conducted during the period 0940 on October 15, 1991, through 0940 on October 16, 1991.

During the TDF test period, shredded TDF was used to provide 14.5 percent of the heat input to the cement plant; or approximately 33 MMBTU per hour heat input. The shredded TDF firing rate corresponding to this heat input averaged 1.0 tons per hour over the 24-hour TDF test period.

During the baseline period, the nitrogen oxides emission rate averaged 678.1 pounds per hour and during the shredded TDF test period, the nitrogen oxides emission rate averaged 654.0 pounds per hour. The results of the testing demonstrate that the use of shredded TDF has no effect on nitrogen oxides emissions from the CPL plant.

2.0 PROCESS DESCRIPTION

The Florida Crushed Stone CPL plant consists of a Portland cement plant, a power and a lime calciner. The Portland cement plant has a permitted kiln feed rate of 123.5 tons per hour and a clinker production rate of 75 tons per hour. The plant is normally fired with coal at a maximum rate of 10.0 tons per hour, resulting in a heat input rate of approximately 240 MMBTU per hour. During the baseline test period, the coal feed rate to the plant averaged 8.5 tons per hour (at 12550 BTU per pound) for an average heat input rate of 213.4 MMBTU per hour. During the shredded TDF test period, the coal feed rate averaged 8.1 tons per hour and the shredded TDF feed averaged 1.0 tons per hour for a total heat input rate of 236.4 MMBTU per hour. During both test periods, the kiln feed rate averaged approximately 120 tons per hour and the clinker production rate averaged approximately 78 tons per hour. The cement plant operating data for both test periods are summarized in Tables 1 and 2.

The CPL power plant has a maximum permitted generating capacity of 125 megawatts and a maximum permitted heat input of 1234 MMBTU per hour. During the baseline test period, the generating rate of the power plant averaged 100 megawatts and the coal feed rate averaged 37.1 tons per hour (a heat input rate of 931.2 MMBTU per hour). During the shredded TDF tests, the generating rate of the plant averaged 96 megawatts and the coal feed rate averaged 35.8 tons per hour (898.6 MMBTU per hour).

The lime calciner is an integral part of the power plant. During the baseline test period, the feed rate to the calciner averaged 25.9 tons per hour and the lime production rate 9.2 tons per hour. The coal feed rate to the calciner averaged 11.4 tons per hour for a heat input rate of 286.1 MMBTU per hour. During the shredded TDF test period, the feed rate to the calciner averaged 23.6 tons per hour and the lime production rate averaged 5.2 tons per hour. The coal feed rate to the lime plant averaged 8.2 tons per hour, or 205.8 MMBTU per hour.

The operating parameters of the power plant and lime plant during the two test periods are summarized in Tables 1 and 2.

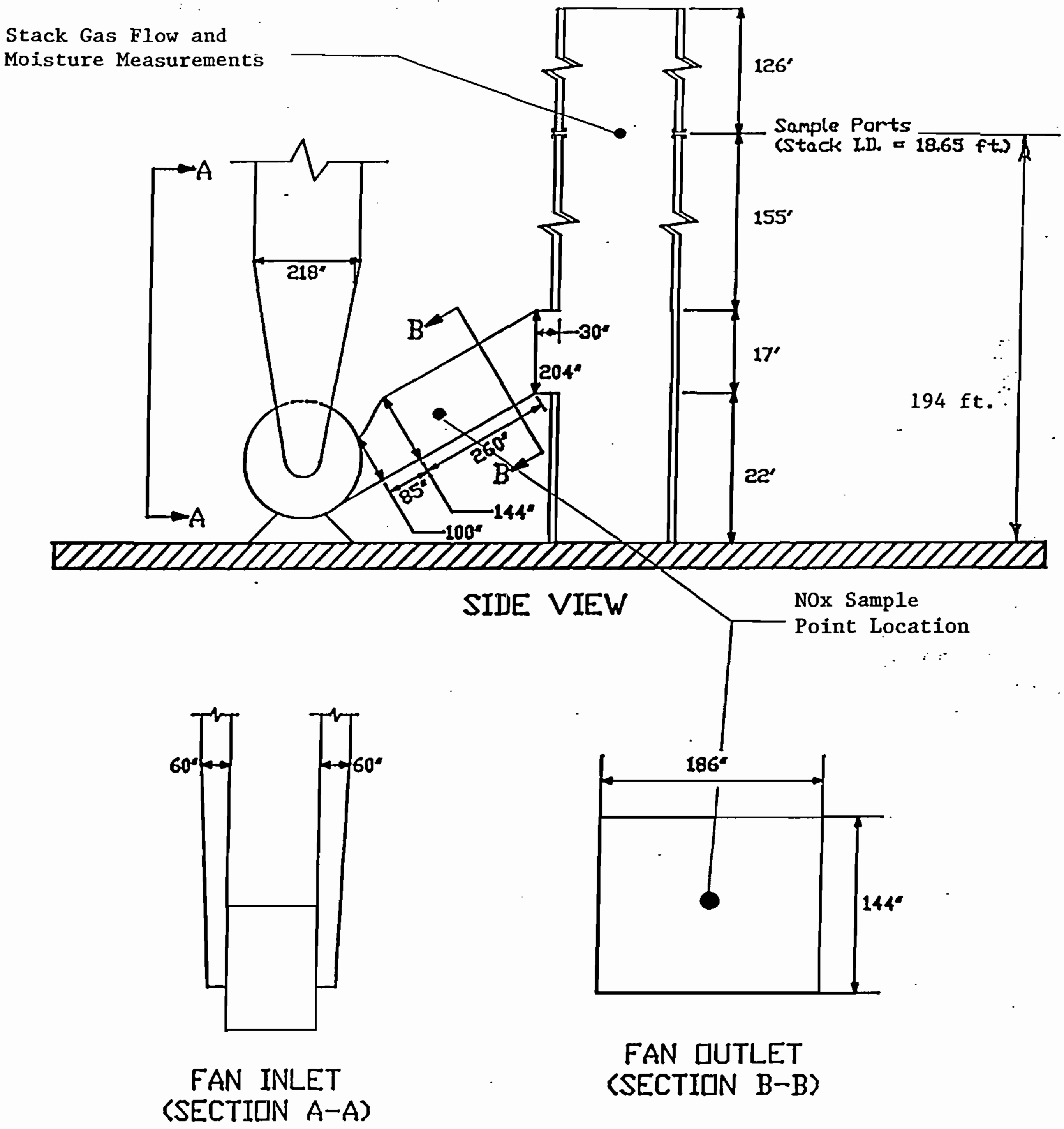
3.0 LOCATION OF SAMPLING PORTS

The locations of the sampling points are shown in Figure 1. Stack gas flow rate measurements were made through four sampling ports located at the 194-foot level of the stack and samples for determining the nitrogen oxides concentrations of the stack gas were made at a single point near the center of the duct between the CPL plant I.D. fan and the stack.

The four sampling ports used for measuring stack gas flow rates are located at 90° to one another in the 18.65-foot diameter stack, 155 feet above the point where the stack gases are introduced to the stack and 126 feet below the top of the stack. A total of 16 sampling points were used. The sampling points were located in accordance with criteria established by EPA test Method 1.

Stack gas moisture measurements were made through one of the sampling ports at the 194-foot level of the stack. The sample for determining the moisture content of the stack gas was taken at a single point near the center of the stack.

Measurements of the nitrogen oxides concentrations in the stack gas were made at a single point near the center of the 186-inch by 144-inch rectangular duct between the I.D. fan of the CPL plant and the stack.



<u>FIGURE 1</u>

SAMPLE POINT LOCATIONS

FLORIDA CRUSHED STONE
CPL PLANT

BROOKSVILLE, FLORIDA

4.0 TEST METHODS

The nitrogen oxides concentrations were continuously measured in accordance with EPA Test Method 7e. The sample of stack gas for the continuous analysis was collected from a single point in the rectangular duct between the CPL plant I.D. fan and the stack and transported to the chemiluminous analyzer through a heated teflon sample line. The sample gas stream was passed through an iced knock-out trap to remove water vapor before the gas stream was introduced to the NOx analyzer. The knock-out trap was cooled with a mixture of dry ice and ethylene glycol.

The stack gas flow rates were measured near the beginning of the baseline test period (0940 on October 14, 1991) between the baseline and TDF test periods (1015 on October 15, 1991) and near the end of the TDF period (0750 on October 16, 1991). The gas flow measurements were made in accordance with the EPA Test Method 2.

During the baseline and TDF test periods, the stack gas velocity head and stack gas temperature were measured every one-half hour at a single point near the center of the stack at the 194-foot level. These measurements were used in conjunction with the three complete stack gas flow measurements to estimate stack gas flow rate during each hour of the two test periods. These estimated gas flow rates were used to calculate hourly nitrogen oxides emission rates during the two test periods.

The stack gas moisture content was determined in accordance with EPA

Method 4 at three time periods corresponding as near as possible to the three stack gas flow rate measurements.

The oxygen and carbon dioxide concentrations in the stack gas were determined in accordance with EPA Method 3 periodically during the two 24-hour test periods. Additionally, the oxygen concentration measured by the Florida Crushed Stone continuous oxygen monitor was recorded periodically.

Stack gas flow rates and moisture measurements are summarized in Table 3.

5. SUMMARY OF RESULTS

The results of the nitrogen oxides emission measurements conducted during the period October 14-16, 1991 are summarized in Tables 1 and 2. During the baseline test period, the nitrogen oxides emission rate averaged 678.1 pounds per hour, compared with an allowable nitrogen oxides emission rate from the CPL plant of 1209 pounds per hour. During the shredded TDF test period, the nitrogen oxides emission rate averaged 654.0 pounds per hour.

During the baseline test, the cement kiln was fired with coal at a rate of 8.5 tons per hour and during the shredded TDF test period, the cement kiln was fired with a combination of coal and TDF. The coal feed rate during the TDF test was 8.1 tons per hour (203.3 MMBTU/hr) and the shredded TDF feed rate averaged 1.0 tons per hour (33.1 MMBTU/hr). The heat input rate supplied by TDF averaged 14.0 percent.

Field data sheets, field notes, records from the nitrogen oxides analyzer, plant operating data and the results of fuel analyses are included in the Appendix of the report. Also included in the Appendix is a sample of the calculations used to estimate the stack gas flow rate during each hour of the two 24-hour test periods.

SUMMARY OF BASELINE NOx EMISSION TEST DATA
FLORIDA CRUSHED STONE COMPANY
CPL - PLANT
OCTOBER 14-15, 1991

TABLE 1

					Cement Plant				Lime Plant			Power Plant	
Date Time(1)	NOx(2) (ppm as NO2)	Stack Gas Temp. (oF)	Stack Gas ΔH(3) (in. H20)	NOx(2) Emissions (lb/hr; NO2)	Kiln Feed (tph)	Coal Feed (tph)	TDF Feed (tph)	Clinker Production (tph)	Calciner Feed (tph)	Coal Feed (tph)	Lime Production (tph)	Coal Feed (tph)	Generation (Gross MW)
10/14/91											(4)		
0830	Start Test												
0830	118	ND	ND	472.1									
0900	132	ND	ND	530.7	119.7	8.7	0	77.8					
0930		313	0.66										
0942		308	0.64	Stack gas flow = 557,461 dscfm or 888,007 acfm									
1000	155	304	0.66	636.8	119.9	9.0	0	77.9	28	14.1		30.6	87.5
1030		302	0.68										
1100	160	306	0.74	684.4	120.3	8.5	0	78.2	24	13.9		30.2	87.2
1130		307	0.77										
1200	173	314	0.73	741.8	119.5	8.6	0	77.6	23	13.9		31.4	89.1
1230		363	0.71										
1300	159	370	0.70	687.2	117.5	8.3	0	76.4	23	13.8		35.4	125.0
1330		373	0.71										
1400	150	378	0.70	654.8	120.3	8.2	0	78.2	23	14.3		47.1	122.3
1430		380	0.72										
1500	127	377	0.72	553.4	116.7	8.2	0	75.8	21	14.2		47.3	123.3
1530		380	0.70										
1600	122	381	0.71	529.8	120.1	8.9	0	78.1	23	14.2		47.0	123.0
1630		379	0.71										
1700	158	373	0.70	686.9	119.0	8.6	0	77.3	26	14.2		47.9	120.1
1730		371	0.72										
1800	161	371	0.72	699.4	120.5	8.4	0	78.3	18	13.0		46.3	117.5
1830		374	0.68										
1900	170	413	0.70	750.3	119.8	8.3	0	77.9	25	12.1		45.6	118.6
1930		412	0.70										
2000	175	415	0.70	777.4	118.3	8.3	0	76.9	23	12.6		45.5	118.3
2030		417	0.72										
2100	180	417	0.70	794.6	119.2	8.3	0	77.5	29	10.4		45.4	115.7
2130		421	0.70										
2200	142	403	0.70	622.0	120.1	8.4	0	78.1	28	10.5		45.4	105.8
2230		401	0.70										
2300	161	397	0.70	704.3	121.3	8.4	0	78.8	33	9.4		31.4	87.9
2330		393	0.70										
2400	180	404	0.70	794.7	118.2	8.4	0	76.8	39	10.2		31.1	88.1

(CONTINUED)

TABLE 1 (CONTINUED)

SUMMARY OF BASELINE NOx EMISSION TEST DATA (CONTINUED)

					Cement Plant				Lime Plant			Power Plant	
Date Time(1)	NOx(2) (ppm as NO2)	Stack Gas Temp. (oF)	Stack Gas ΔH(3) (in. H20)	NOx(2) Emissions (lb/hr; NO2)	Kiln Feed (tph)	Coal Feed (tph)	TDF Feed (tph)	Clinker Production (tph)	Calciner Feed (tph)	Coal Feed (tph)	Lime Production (tph)	Coal Feed (tph)	Generation (Gross MW)
10/15/91											(5)		
0030		401	0.71										
0100	195	400	0.72	855.4	121.3	8.4	0	78.8	32	10.3		31.2	87.0
0130		388	0.70										
0200	ND	384	0.71	ND	121.5	8.4	0	79.0	43	9.5		31.1	87.5
0230		381	0.70										
0300	180	379	0.71	786.0	121.0	8.5	0	78.7	30	9.6		31.3	85.0
0330		378	0.72										
0400	163	380	0.71	712.1	119.2	8.5	0	77.5	22	8.8		31.3	86.1
0430		377	0.72										
0500	148	382	0.72	647.2	119.2	8.6	0	77.6	20	10.5		31.2	84.5
0530		382	0.72										
0600	132	380	0.71	574.5	118.8	8.6	0	77.2	14	6.4		32.3	81.8
0630		380	0.71										
0700	138	384	0.70	598.4	120.6	8.7	0	79.7	29	9.1		31.0	85.0
0730		361	0.70										
0800	End Test			ND	120.6	8.9	0	78.4	21	10.0		31.7	86.9
0830		392	0.72										
0900	ND	363	0.69	ND	121.2	8.6	1.0	78.8	25	9.3		30.8	88.5
1015		363	0.62	Stack Gas Flow = 544,236 dscfm or 908,002 acfm									
Avg				678.1	119.7	8.5	0	77.9	25.9	11.4	9.2(6)	37.1	100.1

(1) Time period beginning at time shown.
(2) NOx concentrations and emission rates are hourly averages for hour beginning at time shown.
(3) Stack gas velocity head.
(4) 258 tons of lime produced from 0001-2400 on 10/14/91; or 10.8 tph average.
(5) 145 tons of lime produced from 0001-2400 on 10/15/91; or 6.0 tph average.
(6) Average of 16 hours on 10/14/91 and 8 hours on 10/15/91.

SUMMARY OF TDF FIRING NOx EMISSION TEST DATA
FLORIDA CRUSHED STONE COMPANY
CPL - PLANT
OCTOBER 15-16, 1991

TABLE 2

					Cement Plant				Lime Plant			Power Plant	
Date Time(1)	NOx(2) (ppm as NO2)	Stack Gas Temp. (oF)	Stack Gas ΔH(3) (in. H20)	NOx(2) Emissions (lb/hr; NO2)	Kiln Feed (tph)	Coal Feed (tph)	TDF Feed (tph)	Clinker Production (tph)	Calciner Feed (tph)	Coal Feed (tph)	Lime Production (tph)	Coal Feed (tph)	Generation (Gross MW)
10/15/91											(4)		
0900	ND	363	0.69	ND	121.2	8.6	1.0	78.8	25	9.3		30.8	88.5
0940	Start Test												
0940	143	ND	ND	691.8	ND	ND	ND	ND	ND	ND		ND	ND
1000	118	404	0.85	563.4	120.6	8.3	1.0	78.4	31	9.6		30.5	86.6
1015		363	0.62	Stack gas flow = 544,236 dscfm or 908,002 acfm									
1030		406	0.79										
1100	138	404	0.84	685.6	118.8	8.6	1.0	77.2	25	10.8		31.7	88.1
1130		403	0.91										
1200	137	414	0.93	719.0	118.7	7.9	1.0	77.2	33	10.7		30.7	88.5
1230		431	1.00										
1300	143	430	1.00	770.9	120.7	8.0	1.0	78.5	26	10.8		46.1	119.6
1330		429	1.10										
1400	157	435	0.97	816.7	119.7	7.8	1.0	77.8	40	11.6		45.0	120.1
1430		434	0.94										
1500	150	442	0.93	785.3	119.3	7.9	1.0	77.5	35	11.0		42.9	112.4
1530		441	1.00										
1600	124	444	0.93	641.6	117.7	7.6	1.0	76.5	31	10.1		40.1	111.6
1630		451	0.88										
1700	123	435	0.98	640.6	117.4	7.9	1.0	76.3	23	10.0		41.4	110.0
1730		435	0.93										
1800	118	438	0.94	609.5	116.5	8.0	1.0	75.7	25	9.9		39.2	103.7
1830		432	0.93										
1900	120	432	0.94	623.2	121.2	8.0	1.0	78.8	30	10.0		39.8	104.6
1930		433	0.95										
2000	122	431	0.96	637.3	122.1	8.0	1.0	79.4	23	8.2		39.9	103.8
2030		432	0.95										
2100	117	424	0.98	608.7	118.5	8.0	1.0	77.0	23	7.6		41.3	102.2
2130		409	1.00										
2200	113	405	0.94	568.7	120.4	8.3	1.0	78.2	17	6.1		39.9	95.5
2230		392	0.96										
2300	124	387	0.89	619.5	120.7	8.2	1.0	78.5	10	5.5		34.4	86.2
2330		382	0.98										
2400	132	342	0.96	615.5	121.8	8.3	1.0	79.1	36	6.3		33.3	88.7

(CONTINUED)

TABLE 2 (CONTINUED)

SUMMARY OF TDF FIRING NOx EMISSION TEST DATA

Date Time(1)	NOx(2) (ppm as NO2)	Stack Gas Temp. (oF)	Stack Gas ΔH(3) (in. H2O)	NOx(2) Emissions (lb/hr; NO2)	Cement Plant Kiln Feed (tph)	Cement Plant Coal Feed (tph)	Cement Plant TDF Feed (tph)	Cement Plant Clinker Production (tph)	Lime Plant Calciner Feed (tph)	Lime Plant Coal Feed (tph)	Lime Plant Lime Production (tph)	Power Plant Coal Feed (tph)	Power Plant Generation (Gross MW)
10/16/91											(5)		
0030		320	0.85										
0100	134	311	0.80	601.7	120.7	8.0	1.0	78.5	10	7.1		32.1	87.2
0130		311	0.84										
0200	136	313	0.82	623.9	120.6	8.0	1.0	78.4	11	7.6		32.1	87.2
0230		319	0.85										
0300	150	328	0.87	701.5	120.8	8.0	1.0	78.5	24	7.4		31.9	86.5
0330		329	0.91										
0400	146	330	0.83	676.8	121.0	7.9	1.0	78.7	24	6.9		28.5	86.5
0430		325	0.84										
0500	136	335	0.88	634.7	119.6	7.7	1.0	77.8	27	7.2		33.3	87.8
0530		327	0.87										
0600	138	333	0.84	642.0	120.6	8.5	1.0	78.4	20	7.5		31.5	87.2
0630		320	0.91										
0700	130	327	0.84	595.7	121.0	8.1	1.0	78.7	16	3.4		32.4	88.1
0730		336	0.89										
0750		339	0.74	Stack gas flow = 606,401 dscfm or 974,282 acfm									
0800	139	339	0.76	611.5	119.1	8.3	1.0	77.4	1	8.5		32.4	87.1
0830		334	0.77										
0900	161	334	0.76	707.2	120.7	7.9	1.0	78.5	6	2.8		34.3	87.1
0940	End Test												
Avg				654.0	120.0	8.1	1.0	78.0	23.6	8.2	5.2(6)	35.8	95.8

(1) Time period beginning at time shown.
(2) NOx concentrations and emission rates are hourly averages for hour beginning at time shown.
(3) Stack gas velocity head.
(4) 145 tons of lime produced from 0001-2400 on 10/15/91; or 6.0 tph average.
(5) 98 tons of lime produced from 0001-2400 on 10/16/91; or 4.1 tph average.
(6) Average of 14.3 hours on 10/15/91 and 9.70 hours on 10/16/91.

TABLE 3

SUMMARY OF STACK GAS FLOW
AND STACK GAS MOISTURE MEASUREMENTS

FLA. CRUSHED STONE
C/P/L/ STACK
OCT. 14-16, 1991

DATE	TIME	Stack Gas Flow Rate (SCFMD)	Stack Gas Temperature (Deg F)	Stack Gas Moisture (%)	Particulate Matter Conc. (gr/dscf)	Particulate Matter Emission Rate (Lbs/Hr)
10/14/91	0942	557461	308.0	8.6	0.0000	0.00
10/15/91	1015	544236	363.0	6.0	0.0000	0.00
10/16/91	0750	606389	339.0	5.1	0.0000	0.00
Average		569362	336.7	6.6	0.0000	0.00

APPENDIX

EXAMPLE CALCULATIONS

NOx EMISSION RATE CALCULATION

STACK GAS FLOW RATE CALCULATION

Date	Time	Stack Temp(1) (^oF)	(^oR)	Velocity Head(2) ($"H_2O$)	Flow(3) (dscfm)	Factor(4)
10/14/91	0942	308	768	0.64	557461	25145
10/15/91	1015	363	823	0.62	544236	24093
10/16/91	0750	339	799	0.74	606389	24938
Avg						24725

(1) Average stack gas temperature during periods when stack gas flow measurements were made (^oF and ^oR, where $^oR = {}^oF + 460^o$)

(2) Average velocity head during period when stack gas flow measurements were made.

(3) Stack gas flow - See Table 3 and Appendix for calculations.

(4) Factor = Stack gas flow (dscfm)/$\sqrt{Ts \times \Delta H}$

where Ts = Stack gas temp (^oR)

ΔH = Stack gas velocity heat ($"H_2O$)

NOx Emission Rate

$$\text{NOx (lb/hr)} = \sqrt{Ts(^oR) \times \Delta H} \times \text{Average Factor} \times 60 \text{ min/hr}$$

$$\times \text{NOx (ppm)} \times 10^{-6} \times (46/385)\text{lbNOx/ft}^3$$

$$= \sqrt{Ts \times \Delta H} \times \text{NOx (ppm)} \times 0.178$$

EXAMPLE CALCULATION

(Data from Table 1, hour 1000-1100, 10/14/91)

Time	NOx (ppm)	Stack (°F)	Velocity Head ("H_2O)	NOx (lb/hr)
1000	155	304	0.66	636.8
1000		302	0.68	
1100		306	0.74	

Ts (avg) = 304°F

ΔH (avg) = 0.693 "H_2O

NOx = 155 ppm

$$\text{NOx (lb/hr)} = \sqrt{(304 + 460)(0.693)} \times 155 \times 0.178$$

$$= 636.8 \text{ lb/hr}$$

PLANT OPERATING DATA

BASELINE TESTS

KOOGLER & ASSOCIATES

CEMENT PLANT — BASELINE DATA (9:00 A.M 10/14 THRU 8:00 AM 10/15)

0/14/91	KILN FEED RATE	COAL FEED RATE	CLINKER PROD. RATE
9 A.M.	119.7 (TPH)	8.7 (TPH)	77.8 (TPH)
10	119.9	9.0	77.9
11	120.3	8.5	78.2
12	119.5	8.6	77.6
1 P.M.	117.5	8.3	76.4
2	120.3	8.2	78.2
3	116.7	8.2	75.8
4	120.1	8.9	78.1
5	119	8.6	77.3
6	120.5	8.4	78.3
7	119.8	8.3	77.9
8	118.3	8.3	76.9
9	119.2	8.3	77.5
10	120.1	8.4	78.1
11	121.3	8.4	78.8
12	118.2	8.4	76.8
0/15/91 1 A.M.	121.3	8.4	78.8
2	121.5	8.4	79.0
3	121.0	8.5	78.7
4	119.2	8.5	77.5
5	119.5	8.6	77.6
6	118.8	8.6	77.2
7	120.6	8.7	79.7
8	120.6	8.9	78.4
AVG.	119.8	8.5	77.9

Note: Heating Value of coal = 12550 BTU/lb for all CPL plants

HR ENDING	Lime Plant (TONS/HR) CALCINER COAL	(TONS/HR) POWER PLANT COAL	(MW) GENERATION - GROSS	Lime Plant (TONS/HR) CALCINER FEED	(TONS) LIME PRODUCTION
10/14 1000	14.1	30.6	89.5	28	258 TONS FOR CALENDER DAY 10/14/91. (MIDNIGHT-MIDNIGHT) AVG. = 10.8 TONS/HR
1100	13.9	30.2	87.2	24	
1200	13.9	31.4	89.1	23	
1300	13.8	35.4	125.0	23	
1400	14.3	47.1	122.3	23	
1500	14.2	47.3	123.3	21	
1600	14.2	47.0	123.0	23	
1700	14.2	47.9	120.1	26	
1800	13.0	46.3	117.5	18	
1900	12.1	45.6	118.6	25	
2000	12.6	45.4	118.3	23	
2100	10.4	45.4	115.7	29	
2200	10.5	45.4	105.8	28	
2300	9.4	31.4	87.9	33	
2400	10.2	31.1	88.1	39	
10/15 0100	10.3	31.2	87.0	32	
0200	9.5	31.1	87.5	43	
0300	9.6	31.8	85.0	30	
0400	8.8	31.3	86.1	22	
0500	10.5	31.2	84.5	20	
0600	6.4	32.3	81.8	14	
0700	9.1	31.0	85.0	29	
0800	10.0	31.7	86.9	21	
0900	9.3	30.8	88.5	25	

NOx DATA AND FIELD NOTES

BASELINE TESTS

OCTOBER 14-15, 1991

KOOGLER & ASSOCIATES

Chi-Sun Lee (FDER Observer)

10-14-91 CPL <u>Baseline</u> NOx Run (Method 7E)

zero air Reads 0   15 cm/HR.

High Cal. 196 ppm Reads 195 ppm

Mid Cal 60.6 ppm Reads 60.7 ppm

Low Cal 10.6 ppm Reads 10.4 ppm

0830 START In Stack @ <u>0830 reads</u> 115 ppm   250 ppm RANGE

Stack Temp. 340° O_2 9.5% CHART. SP. 15 cm/HR.

	<u>Tare</u>	<u>Final</u>	<u>Gain</u>
1st Imp	91.0	93.4	2.4
2	94.7	95.4	0.7
3	77.7	78.1	0.4
4	96.1	96.5	<u>0.4</u>
		TOTAL	3.9 gms gain

8.0% moisture

* 1) 196 ppm Cal. Gas at 0900 reads 196 ppm | zero reads 0

* 2) " " " " 1000 " 196 ppm | " " 0

0930 O_2 9.2% NOx CPL READ 118 ppm / NOx CEM READS 120 ppm

STACK 313° 0.66"

1000 " 304° 0.66"

1030 " 302° 0.68"

1100 " 306° 0.74" CO_2 8.6% O_2 ORSAT 19.4 - 8.6 = 9.8% O_2

* 3) zero gas reads 0

196 ppm cal gas reads 196 ppm

1130 Stack 307° 0.77"

1200 *4) Stack 314° 0.73" Zero Gas Reads 0

196 PPM Cal Reads 199 ppm

1228 - 1231 Knockout Impinger Froze-up - Zero Gas on for 3 minutes.

Kathy Liles } Hernando City
Carlene Carson } Observers

1230 Stack 363° 0.71"
1300 Zero Gas reads 0
196 ppm Cal gas reads 199
Stack 370° 0.70"
1330 STACK 373°F ΔH 0.71"
1400 O-gass Reads 0 : CALL.GASS Reads 192.5
STACK 378°F ΔH .70 CO_2 8.2% O_2 9.8 % } ORSAT

1430 STACK 380°F ΔH .72 14:25 CO_2 10.2% 14.6-10.2 = 4.4% O_2
22-10.2 11.8% O_2
1500 O gass Reads 0 CALL gass Reads 192.5
STACK 377°F ΔH .72 Ice Clogg 15:24 TO 15:26
1530 STACK 380°F ΔH .70
1530 CPL Reads NO_x 125 ppm SO_2 183 O_2 8.0
1600 O GASS Reads 0 CALL GASS Reads 211.5
STACK 381°F ΔH .71
00 C.P.L. NOx 123 SO_2 163 ppm O_2 7.9 %
1630 379°F ΔH .71 Dips on CALIB. GASS Show Internal CALIB. SW Transitions
O GASS Reads 0 CALL GASS Reads 196 ppm
1700 O GASS Reads 0 CALL GASS Reads 196 ppm
STACK 373 ΔH .70
1730 STACK 371 ΔH .72
1800 Zero Gas reads 0
196 ppm Cal gas read 195 ppm
Stack 371° ΔH 0.72"
1830 Stack 374° ΔH 0.68" CO_2 11.0% ORSAT O_2 ~~15.4~~ 19.8
= 8.8%

1900 Zero Gas reads 0 Stack Temp. 413 ΔH 0.70"
196 ppm cal gas reads 194 ppm
1930 Stack Temp. 412° ΔH 0.70"
2000 zero Gas reads 0 Stack Temp. 415 ΔH 0.70"
196 ppm Cal gas reads 194 ppm
2030 Stack Temp. 417° ΔH 0.72"
20.8
2045 **ORSAT** CO_2 10.8% O_2 10.0%
2100 Zero Gas reads 0 Stack Temp. 417° ΔH 0.70"
196 ppm Cal Gas reads 200 ppm
2130 Stack Temp. 421° ΔH 0.70"
2200 Zero Gas reads 0 Stack Temp. 403° ΔH 0.70"
196 ppm Cal Gas reads 195 ppm
2235 Impinger Plugged - Zero Gas until clear - then back to sampling at 2240.
2230 Stack Temp. 401° ΔH 0.70"
2300 Zero Gas reads 0 Stack Temp. 397° ΔH 0.70"
196 ppm Cal Gas reads 195 ppm
2330 Stack Temp. 393° ΔH 0.70"
19.8
2335 **ORSAT** CO_2 9.9% O_2 9.9%
2400 Zero Gas reads 0 Stack Temp. 404° ΔH 0.70"
196 ppm Cal Gas reads 195 ppm
-15-91
00:30 STACK 401 ΔH .71
01:00 O. GASS Reads 0 CAll GASS Reads 196
STACK 400 ΔH .72
01:30 STACK 388 ΔH .70
02:00 Zero GASS Reads 0 CALGASS Reads 197
STACK 384 ΔH .71

0230-0232 Cleaned out Ice clog

CPL 195 NOx 0248

0230 STACK 381°F ΔH .70

0300 Zero gass Reads 0 CAL gass Reads 90 Recal to 196
STACK 379°F ΔH .71 Cleaned out Ice

0330 STACK 378°F ΔH .72
CO_2 9.4 O_2 8.4

0400 Zero gass Reads 0 CAL gass Reads 175 Recal 196
STACK 380°F ΔH .71 Line voltage 116.0

0430 STACK 377 ΔH .72

Zero gass Reads 0 CAL gass Reads 200 117.5 Line voltage

0500 Zero gass Reads 0 CAL gas Reads 246 Recal 200
STACK 382 ΔH .70 116.8 Line voltage

0530 STACK 282 ΔH .72 Line voltage
Zero
0 gass Reads 0 CAL gass Reads 205 Recal 196 117.1 Line voltage

0600 Zero gass Reads CAL gass Reads 175 Recal 196 116.7

P clogged 610-611 STACK 380 ΔH .71 Changed SAMPLE pressure to -5

0630 Zero gass Reads CAL gass Reads 187.5 Recal to 196
STACK 378 ΔH .70 116.2 Line volts

0700 Zero gass Reads 0 CAL gass Reads 194
STACK 384 ΔH 0.70"

0715 ORSAT (CO_2 9.3%) (O_2 18.4 9.1%)

0730 Stack Temp. 361 ΔH 0.70"

0800 Zero Gas reads 0 Final Gas Checks
~~F~~196 ppm Cal Gas reads ~~60.2~~ 192 ppm
60.6 ppm Cal Gas reads. 60.2 ppm
10.6 ppm Cal Gas reads 10.7 ppm on 0-100 range
Zero Gas reads 0 ~~10.7 ppm on 0-100 ppm range~~

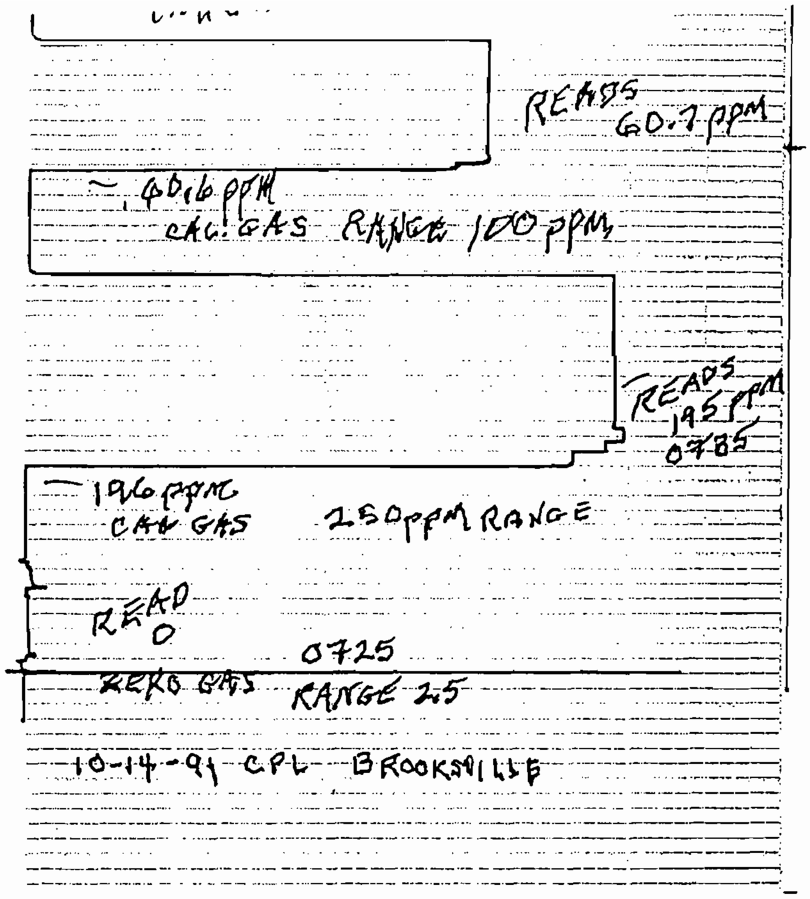
0830 Stack Temp. 392° ΔH 0.72"
Run Over at 0835 10-15-91

10-15-91 RUN 1 FINAL MOISTURE RUN

Samp.	Tare	Final	Gain
1	93,4	95,3	1.9
2	95.4	95,2	-0,2
3	78.1	78.6	0.5
4	96.5	97.0 (Next 95.4 Run)	0.5
		Total	2.7 gms

6% Moisture

21.715 ft^3
19.625
2.090 $ft.^3$



READS 60.7 ppm

~ 40.6 ppm
CAL GAS RANGE 100 ppm

READS 195 ppm
0785

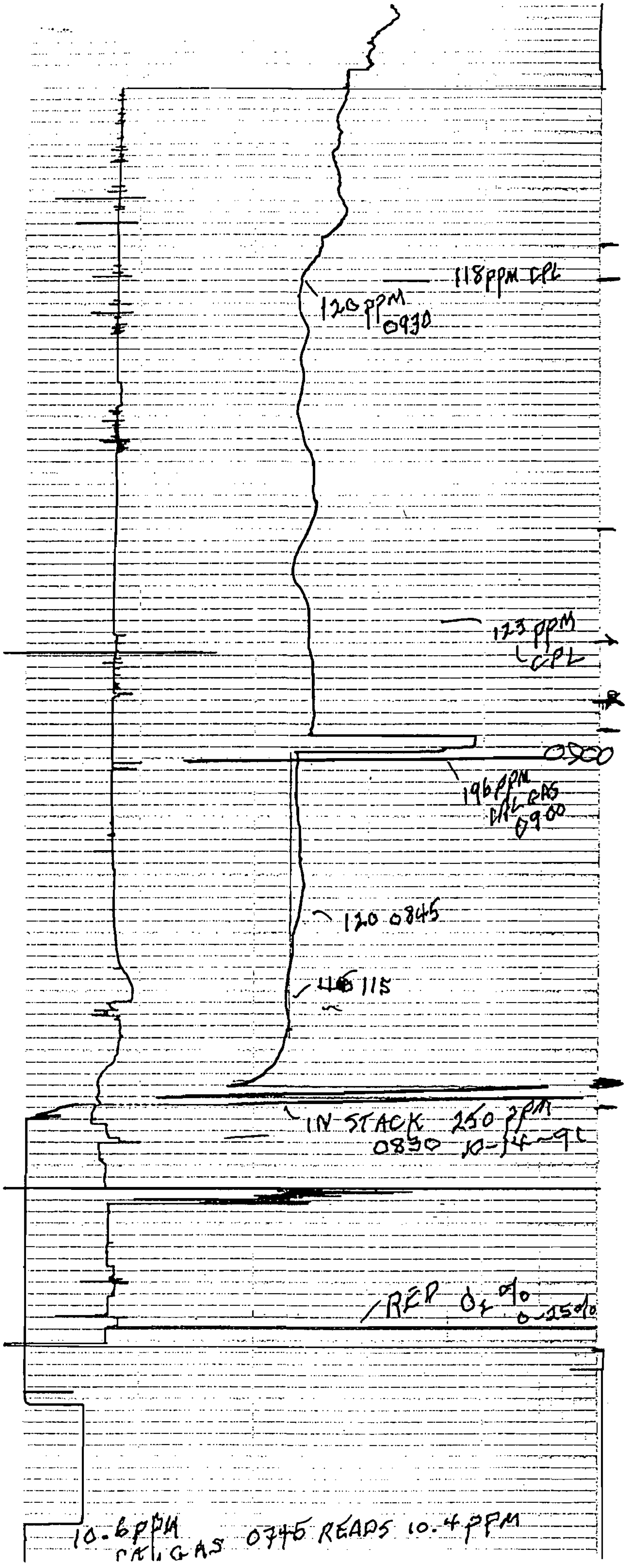
~ 196 ppm
CAL GAS 250 ppm RANGE

READ 0

0725

ZERO GAS RANGE 25

10-14-91 CPL BROOKSVILLE



118ppm CPL

120 ppm 0930

123 ppm CPL

0900

196 ppm CAL GAS 0900

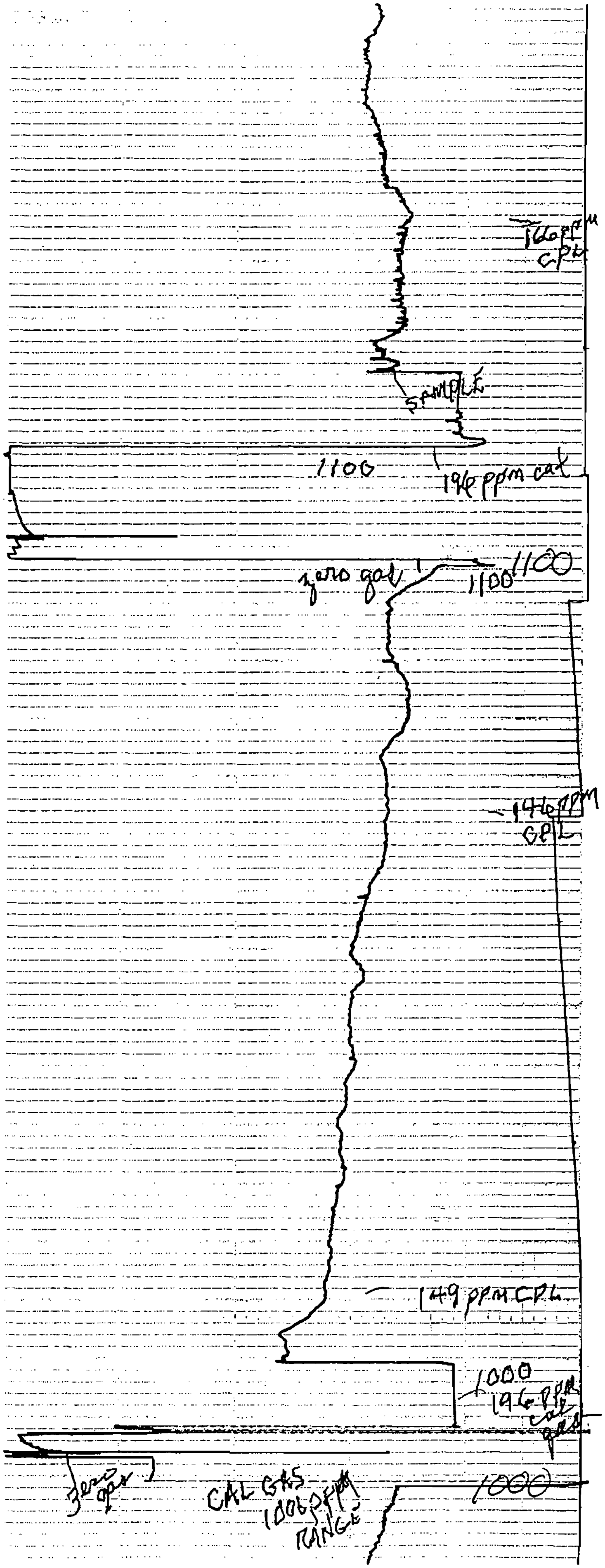
120 0845

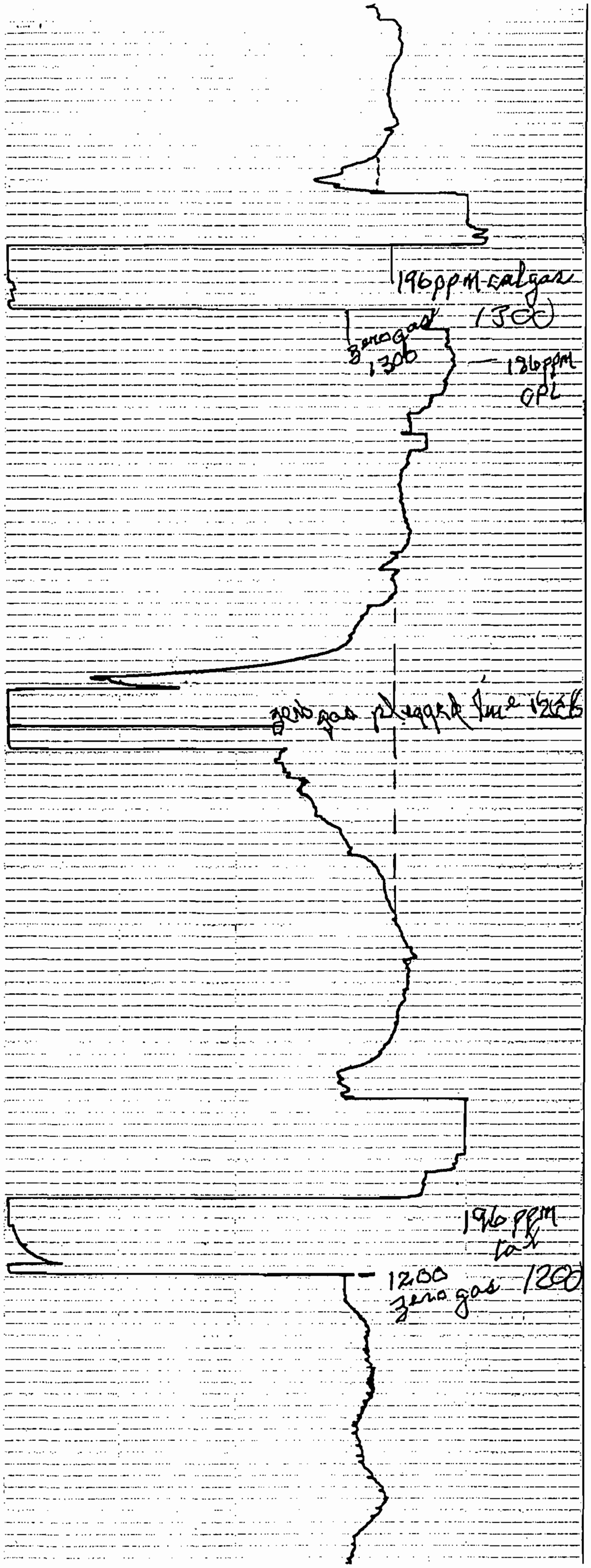
~~48~~ 115

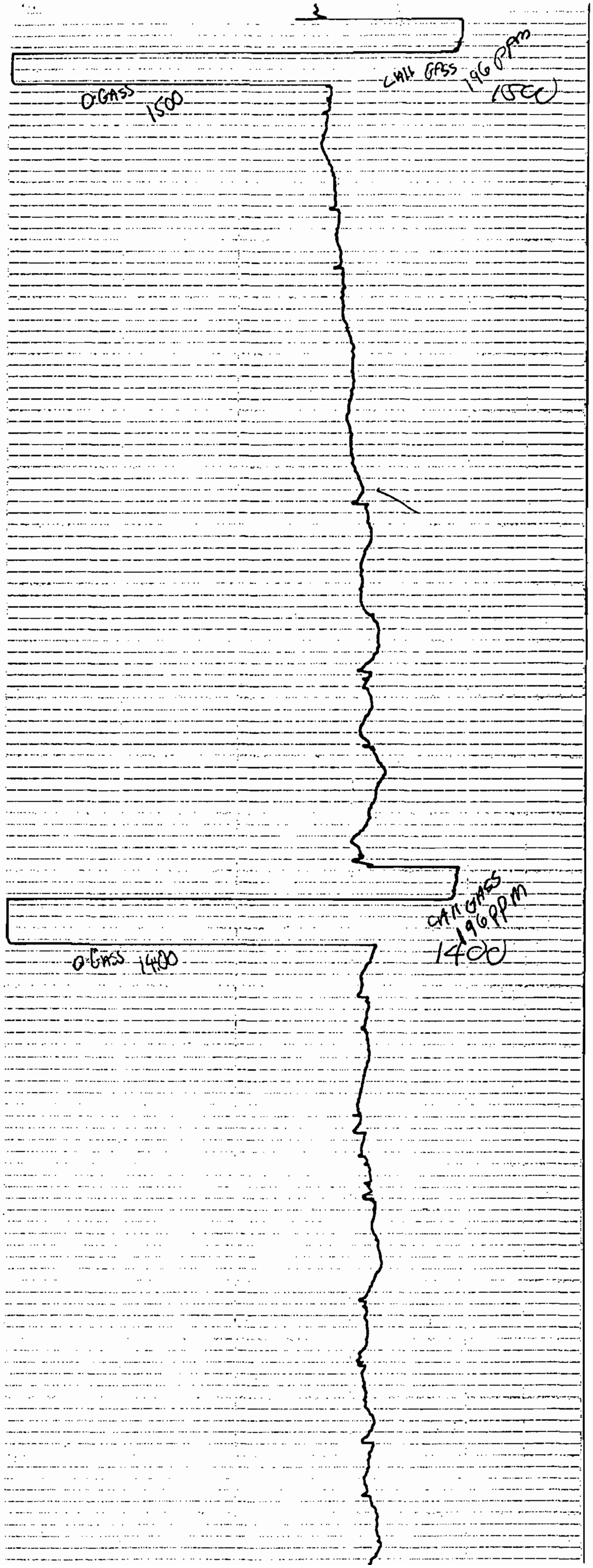
IN STACK 250 PPM 0830 10-14-96

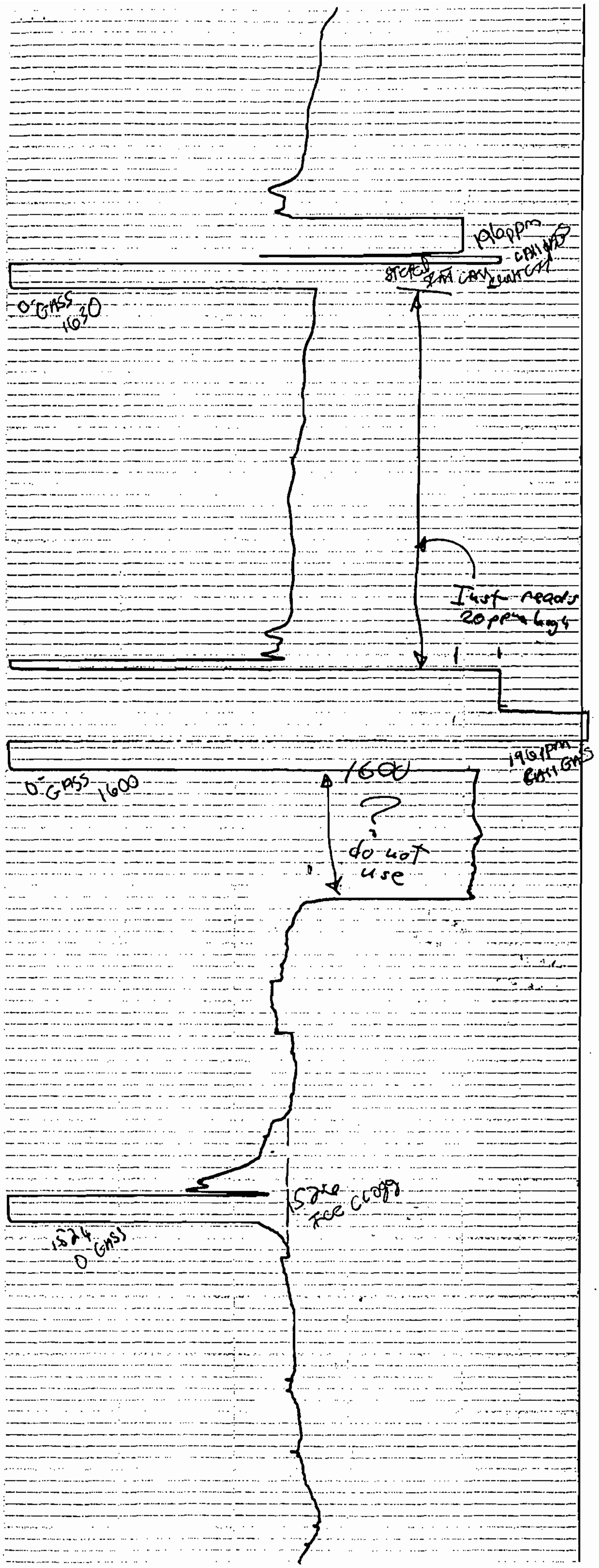
REP O2 % 0-25%

10.6 PPM CAL GAS 0745 READS 10.4 PPM


166ppm CPL
SAMPLE
1100
196 ppm cal
zero gal
1100
1100
146 PPM CPL
149 PPM CPL
1000
196 PPM cal gas
zero gas
CAL GAS 1000 PPM RANGE
1000


196ppM calgas
1300
zero gas 1300
186ppM OPL
zero gas plugged line 1256
196 ppM cal
1200 zero gas
1200


0 GASS 1500
CALL GASS 196 ppm 1500
CAL GASS 196 PPM 1400
0 GASS 1400



1916ppm CAL GAS

STORED 2 FT CAN [illegible]

0 GASS 1630

Inst reads 20ppm high

1961ppm CAL GAS

0 GASS 1600

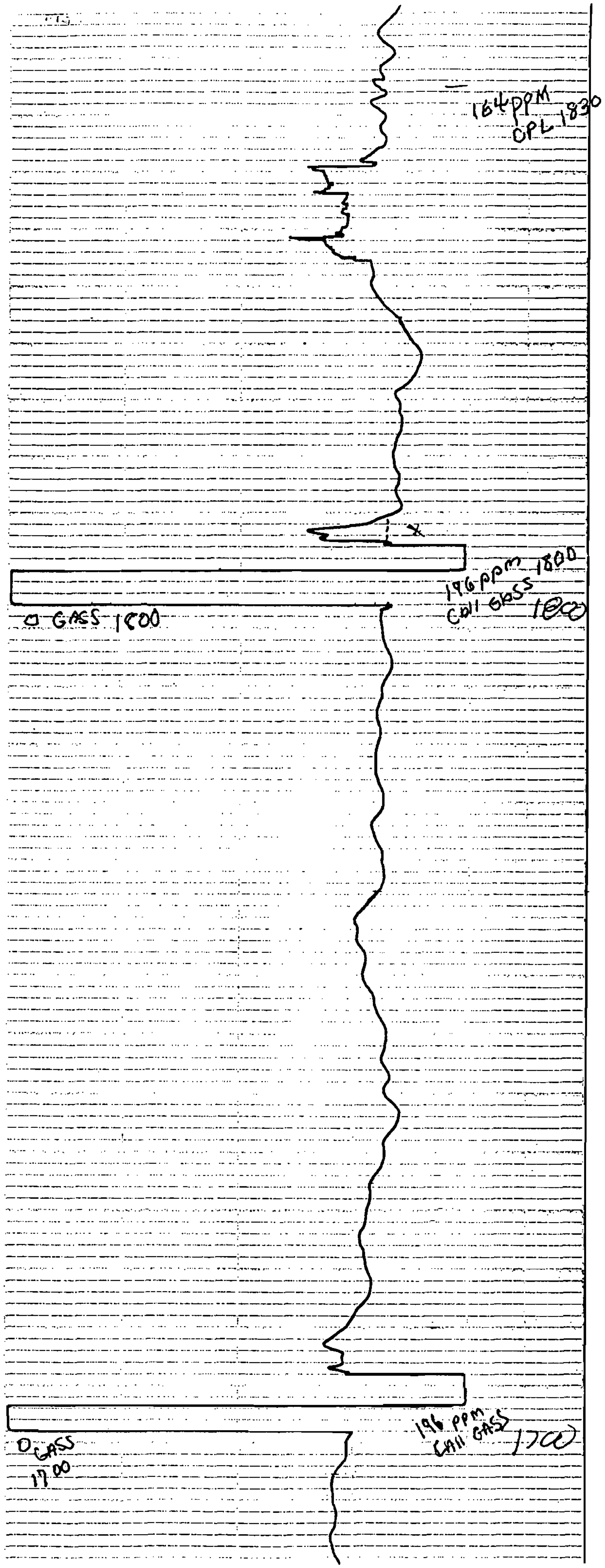
1600

?

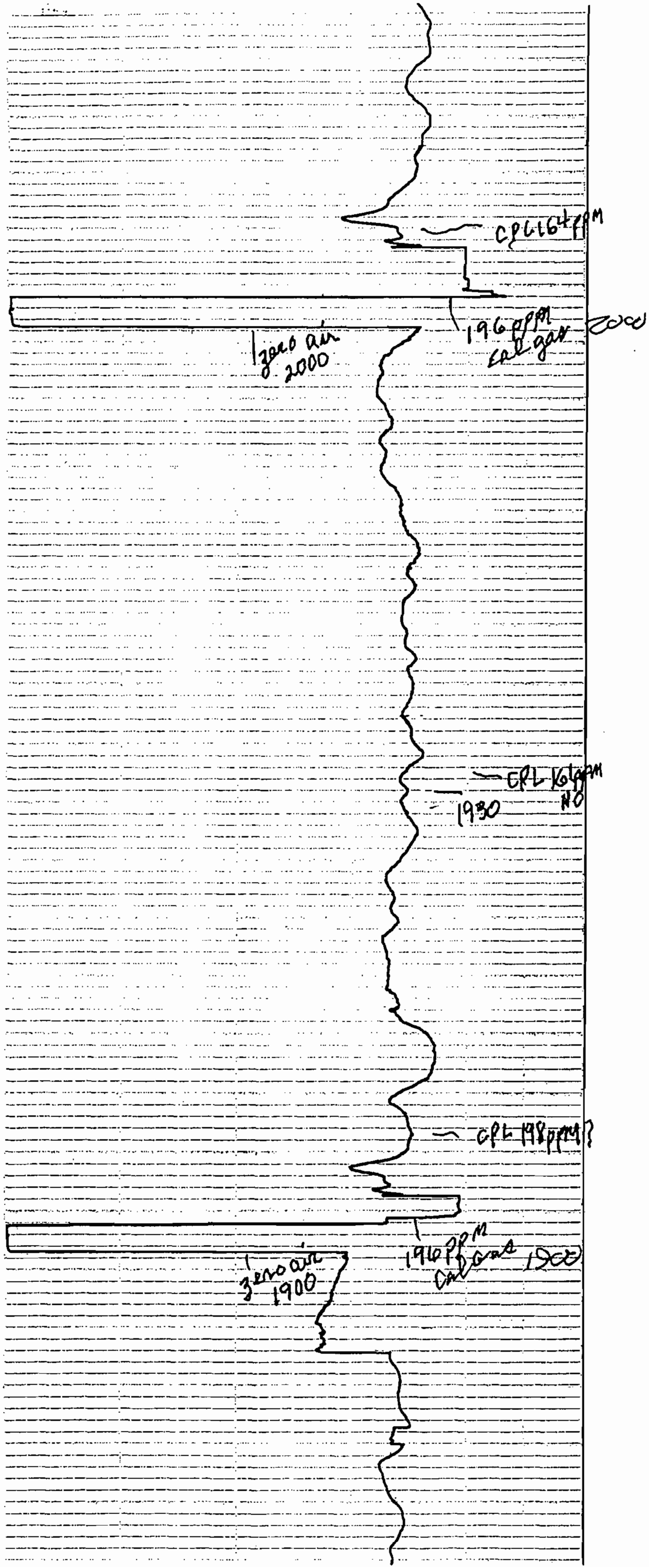
do not use

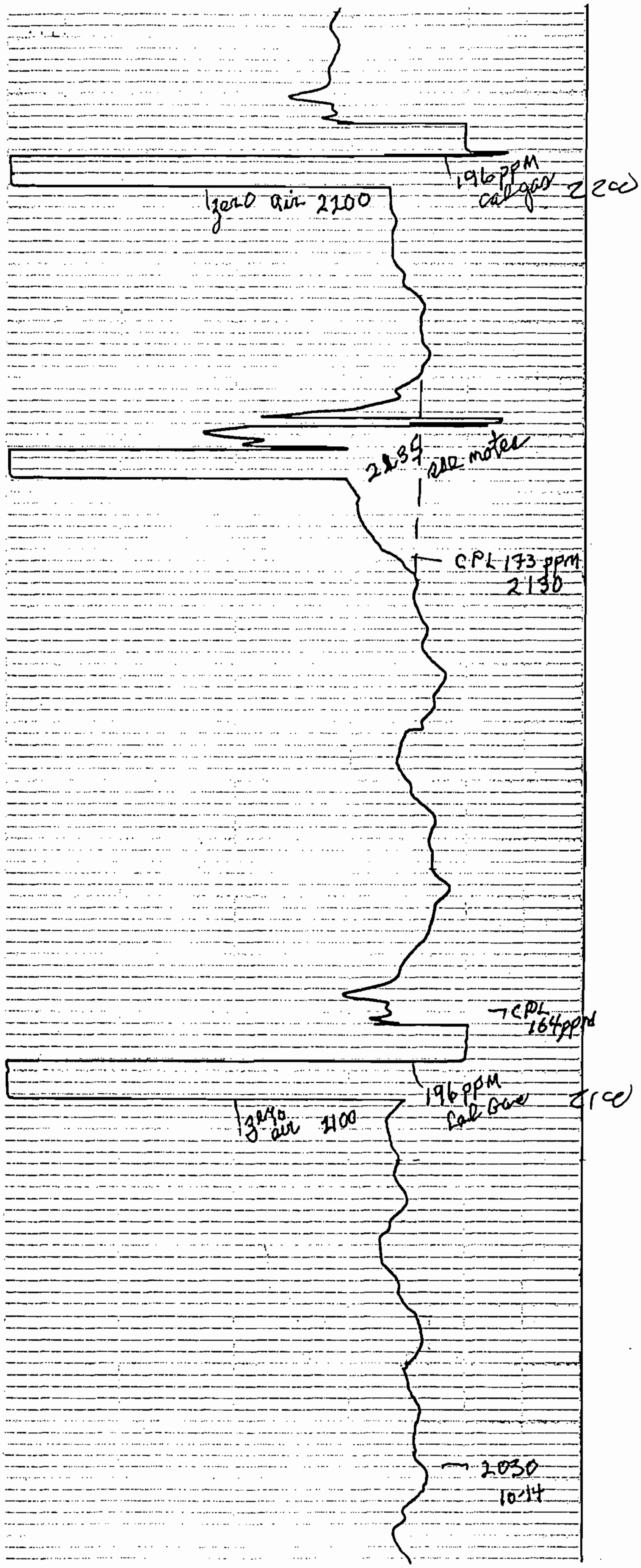
1524 fee clogg

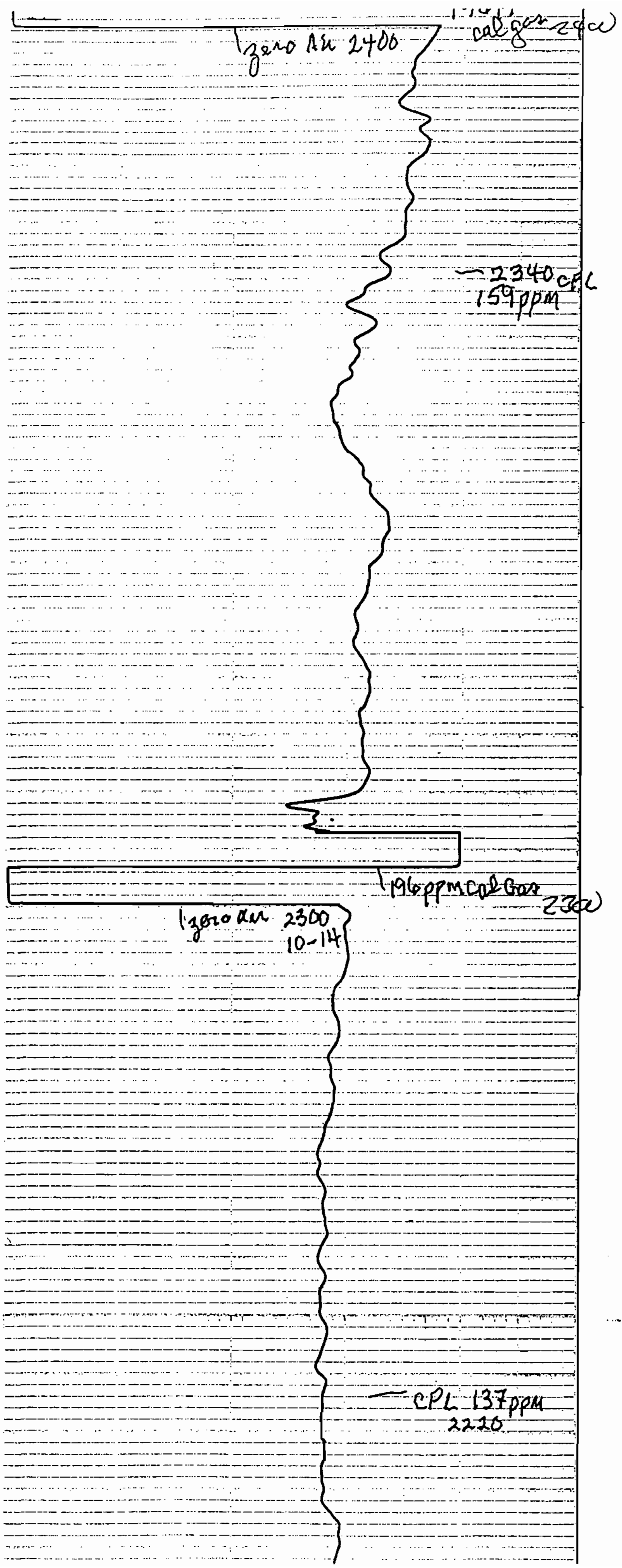
1524 0 GASS



164 ppM
CPL 1830
X
196 ppm 1800
Cal GASS
1800
0 GASS 1800
196 PPM
CAll GASS
1700
0 GASS
1700


CPL 164 PPM
196 PPM cal gas 2000
zero air 2000
CPL 161 PPM NO
1930
CPL 198 PPM?
196 PPM cal gas 1900
zero air 1900


196 ppM cal gas
2200
zero air 2100
2134 see notes
CPL 173 ppm 2130
CPL 164 ppm
196 ppM Cal Gas
2100
zero air 2100
2030
10-14



cal gas 2400

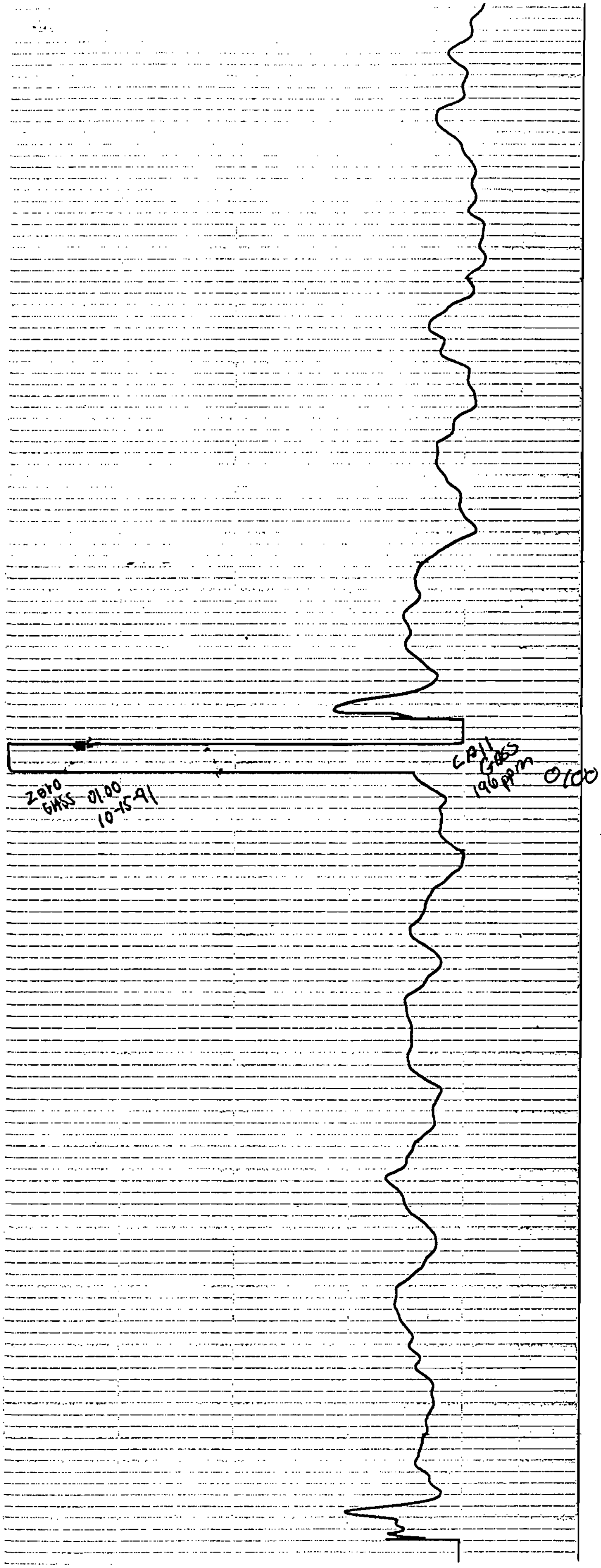
zero Air 2400

2340 CPL
159ppm

196ppm Cal Gas 2300

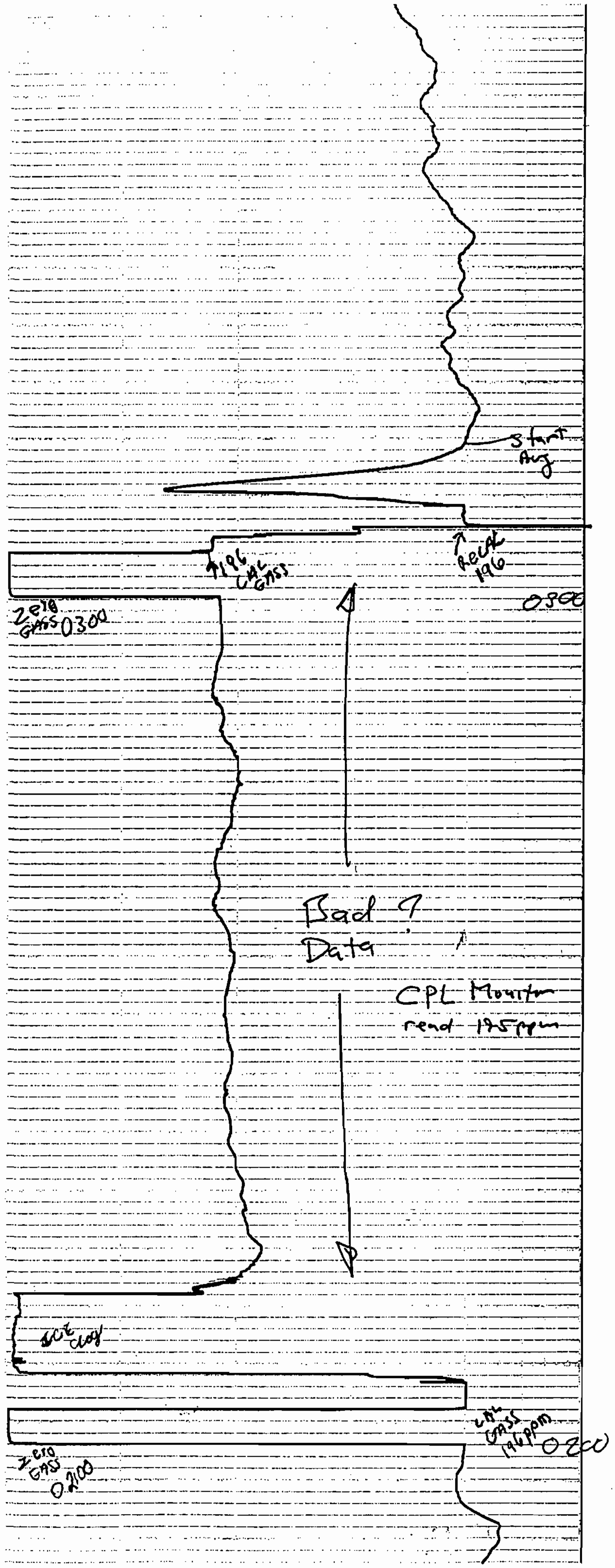
zero Air 2300
10-14

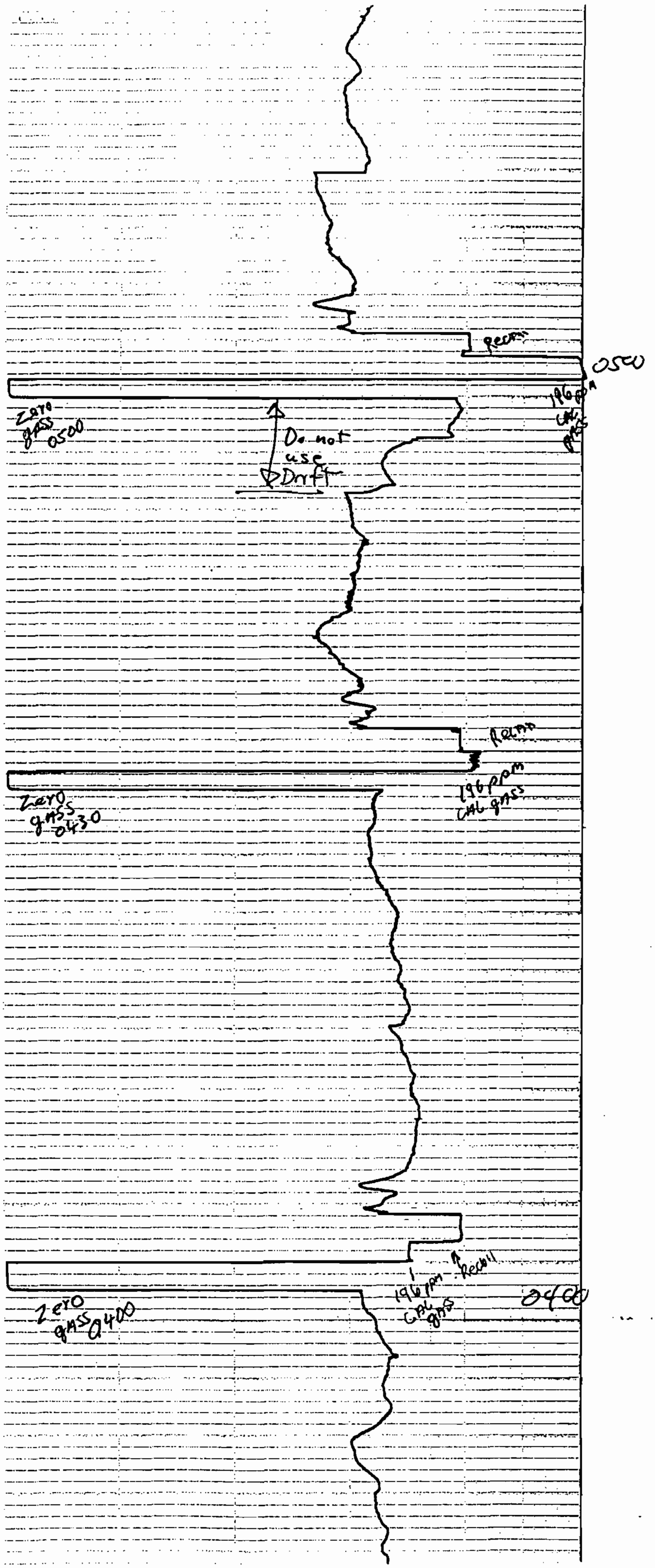
CPL 137ppm
2220

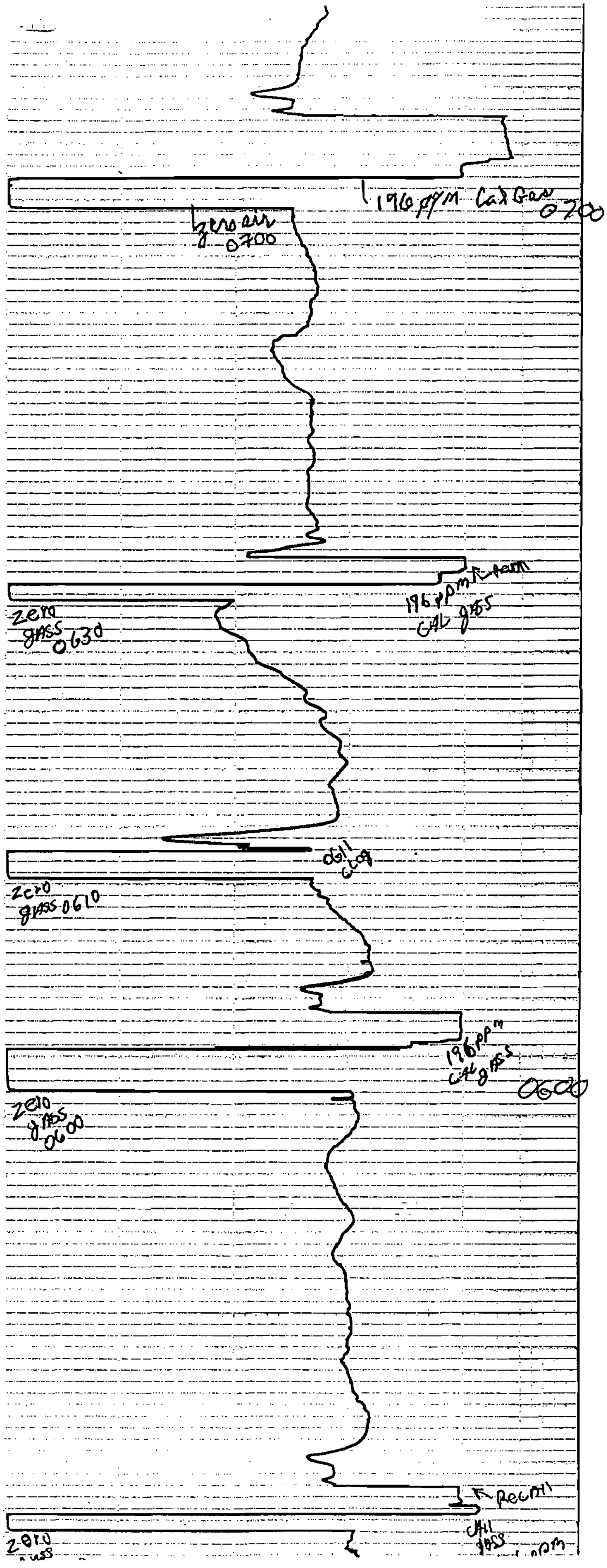


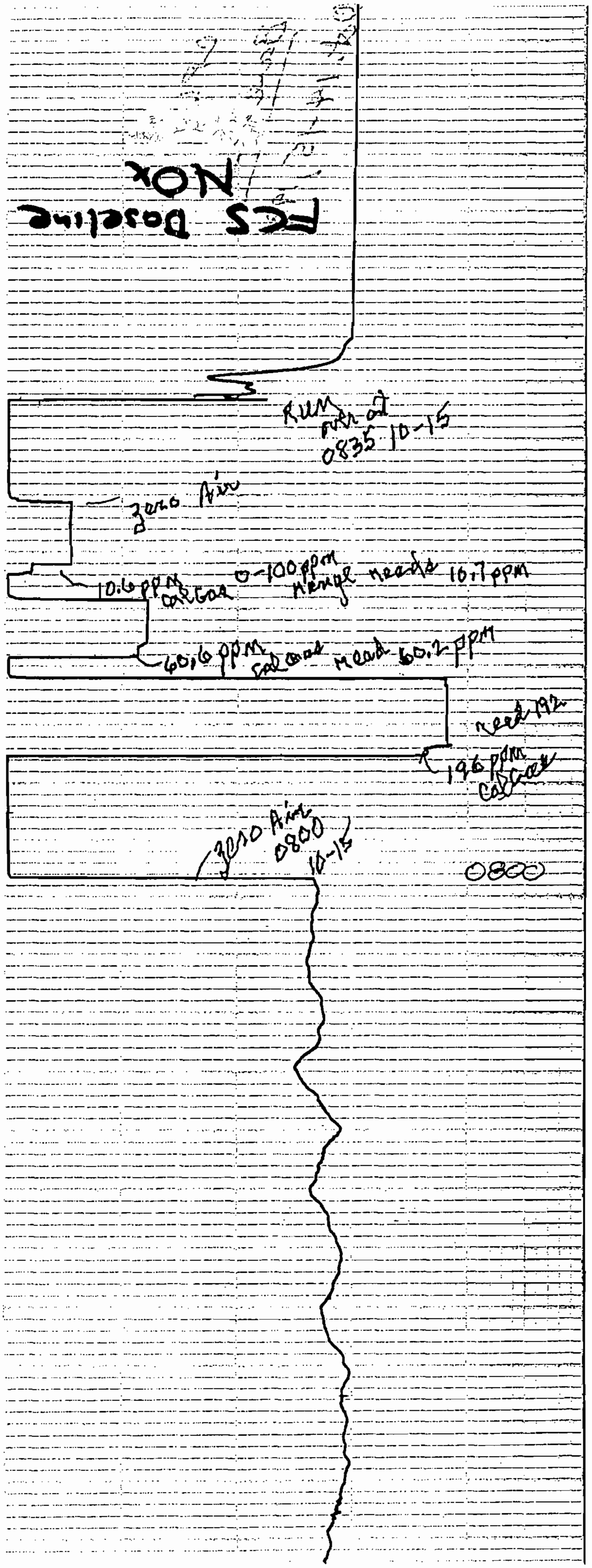
ZERO
GASS 01.00
10-15-91

CAll
GASS
196ppm 0100


Start Avg
196 CAL GASS
RECAL 196
0300
Zero GASS 0300
Bad ? Data
CPL Monitor read 175ppm
ICE clog
CAL GASS 196ppm
0200
Zero GASS 0200


Recal
0530
196 ppm CAL gass
Zero gass 0500
Do not use Drift
Recal
196 ppm CAL gass
Zero gass 0430
Recal
196 ppm CAL gass
0400
Zero gass 0400


196 ppm Cal Gas 0700
zero air 0700
196 ppm ← Recal
CAL gass
zero gass 0630
cal gas
zero gass 0610
196 ppm cal gass
0600
zero gass 0600
← Recal
cal gass
ppm
zero
gass


FCS Baseline NOx
RUN over at 0835 10-15
Zero Air
10.6 ppm calgas 0-100 ppm range reads 10.7 ppm
60.6 ppm calgas read 60.2 ppm
read 192
196 ppm calgas
Zero Air 0800 10-15
0800

PLANT OPERATING DATA

TDF TESTS

KOOGLER & ASSOCIATES

CEMENT PLANT – TEST DATA (9:00 A.M. 10/15 THRU 9:00 A.M. 10/16)

	① KILN FEED RATE	② COAL FEED RATE	④ CLINKER PROD. RATE
10/15/91 9 A.M.	121.2 TPH	8.6 TPH	78.8 TPH
10	120.6	8.3	78.4
11	118.8	8.6	77.2
12	118.7	7.9	77.2
1 P.M.	120.7	8.0	78.5
2	119.7	7.8	77.8
3	119.3	7.9	77.5
4	117.7	7.6	76.5
5	117.4	7.9	76.3
6	116.5	8.0	75.7
7	121.2	8.0	78.8
8	122.1	8.0	79.4
9	118.5	8.0	77.0
10	120.4	8.3	78.2
11	120.7	8.2	78.5
12	121.8	8.3	79.1
10/16/91 1 A.M.	120.7	8.0	78.5
2	120.6	8.0	78.4
3	120.8	8.0	78.5
4	121.0	7.9	78.7
5	119.6	7.7	77.8
6	120.6	8.5	78.4
7	121.0	8.1	78.7
8	119.1	8.3	77.4
9	120.7	7.9	78.5
AVG.	119.98	8.1	77.99

	⑥ (TONS/HR) CALCINER COAL	⑧ (TONS/HR) POWER PLANT COAL	⑨ (MW) GENERATION-GROSS	⑤ (TONS/HR) CALCINER FEED	(TONS) LIME PRODUCTION
HR ENDING 0900	9.3	30.8	88.5	25	
5/91 1000	9.6	30.5	86,6	31	145 TONS FOR CALENDER DAY 10/15/91 (MIDNIGHT-MIDNIGHT) AVG = 6 TONS/HR
1100	10.8	31,7	88,1	25	
1200	10.7	30.7	88.5	33	
1300	10.8	46.1	119.6	26	
1400	11.6	45.0	120.1	40	
1500	11.0	42.9	112.4	35	
1600	10.1	40.1	111.6	31	
1700	10.0	41.4	110.0	23	
1800	9.9	39.2	103.7	25	
1900	10.0	39.8	104.6	30	
2001	8.2	39.9	103.8	23	
2100	7.6	41.3	102.2	23	
2200	6.1	39.9	95.5	17	
2300	5.5	34.4	86.2	10	
2400	6.3	33.3	88.7	36	
16/91 0100	7.1	32,1	87.2	10	98 TONS FOR CALENDER DAY 10/16/91. (MIDNIGHT-MIDNIGHT) AVG = 4 TONS/HR
0200	7.6	32.1	87,2	11	
0300	7.4	31,9	86.5	24	
0400	6.9	28.5	86.5	28	
0500	7.2	33.3	87.8	27	
0600	7.5	31.5	87.2	20	
0700	3.4	32.4	88,1	16	
0800	8.5	32,4	87,1	1	
0900	2.8	34.3	87.1	6	

Telephone
(904) 725-2040
FAX
(904) 727-9720

SOUTHEASTERN CHEMISTS' LABORATORIES
P.O. Box 8917
Jacksonville, FL 32239

Report Date: October 24, 1991

Laboratory Marks: Job # 33263 Date Sampled: October 16, 1991

Sample of: Shredded Tire Date Received: October 17, 1991

Client: Koogler & Assoc. 4014 NW 13th Street Gainesville, FL

Sample Marks: FL Crushed Stone Company

CERTIFICATE OF ANALYSIS

Parameters	Method	Results	Analyst	Date/Time
Ash	D482	4.82%	KMS	10/21/91/11:00
BTU/lb (as received)	D240	16,536	KMS	10/23/91/10:30
Sulfur	D129	0.78%	KMS	10/23/91/13:30

All samples analyzed in accordance with EPA, ASTM, or other approved methods.

Respectfully submitted,

Charles M. Ged

Charles M. Ged
Laboratory Director
DER #900384G
HRS #E82250
HRS #82364

CMG/jk

NOx DATA AND FIELD NOTES

TDF TESTS

OCTOBER 15-16, 1991

KOOGLER & ASSOCIATES

FDER OBSERVERS
CHI-SUN LEE
SCOTT SHEPLAK

10-15-91 CPL Brooksville NO_x – TDF Run

NO_x CEM Calibration (10cm/hr.)

INITIAL CALS.

0835 Zero Air reads 0
10.6 ppm Cal Gas reads 10.5ppm 0-100 ppm range
60.6 ppm Cal Gas reads 60.5ppm 0-100 ppm range
196 ppm Cal Gas reads 197 ppm 0-250 ppm range

Start Run at 0942

1010 Stack Temp. 404° ΔH 0.85"
1020 Zero Gas reads 0. ~~196 ppm~~ Stack 411° ΔH 0.81"
196 Cal Gas reads 196 ppm

Moisture Run

Imp.	Tare	Final	Gain	2.023 ft³
1	95.3	95.5	0.2	1.2852
2	95.2	96.9	1.7	
3	78.6	78.8	0.2	= 6 % Moisture
4	95.4	95.9	0.5	
		TOTAL	2.6 gms	

1030 Stack Temp. 406° ΔH 0.79"
1045 Orsat ~~O_2~~ 8.4 % CO_2 O_2 9.8% 18.2

~~1100~~1105 Zero Gas reads 0. Stack Temp. 404° ΔH 0.84
196 ppm Cal Gas reads 193ppm
~~CPL Monit~~

10-15-91 TDF RUN

Kathy Liles (Hernando) County
visited + said Dr. J.E. Supremante
want 60.6 cal gas run also -

1130 Stack Temp. 403° ΔH 0.91"
1200 Zero Air Reads 0 Stack Temp. 414°
196 ppm Cal Gas Reads 193 ppm ΔH 0.93"
1230 Stack Temp. 431° ΔH 1.0"
1300 Zero Air Reads 0 Stack Temp. 436°
196 ppm Cal. Gas Reads 193 ppm ΔH 1.0"

1305 checked Ice trap for pluggage (zero air on during ck.)
1330 Stack Temp. 429° ΔH 1.10"
1400 Zero Gas Reads 0 Stack Temp. 435
196 ppm Cal. Gas Reads 193 ppm ΔH 0.97"
1430 Stack Temp. 434° ΔH 0.94"

~~8~~ 16.9%
Orsat CO_2 8.8% O_2 8.1%
1500 Zero Gas Reads 0 Stack Temp 442°
196 ppm Cal Gas Reads 198 ppm ΔH 0.93"
1530 Stack Temp. 441° ΔH 1.0"
1600 Zero Gas Reads 0 Stack Temp. 444°
196 ppm Cal Gas reads 195 ppm ΔH 0.93"
1630 Stack Temp. 451° ΔH 0.88"
1653 Zero Gas Reads 0 Stack Temp. 435°
196 ppm Cal Gas reads 193 ppm ΔH 0.98"
60.6 ppm Cal Gas reads 59 ppm
1730 Stack Temp. 435° ΔH 0.93"
1800 Zero Air reads 0 Stack Temp. 438°
196 ppm cal gas reads 193 ppm ΔH 0.94"
1830 Stack Temp. 432° ΔH 0.93"

10-15-91 TDF

1900 Zero Air reads 0 Stack Temp. 432°

196 ppm Cal Gas reads 194 ppm Δ H 0.94"

1930 STACK 433°F ΔH .95

2000 Zero gASS Reads 0 CAL gASS Reads 195

STACK 431°F ΔH .96

2030 STACK 432°F ΔH .95

2100 Zero gASS Reads 0 CAL gASS Reads 196

STACK Temp. 424°F ΔH .98

2130 STACK Temp 409 ΔH 1.00

2200 zero gASS Reads 0 CAL gASS Reads 196 STACK Temp. 405 ΔH .94

2230 STACK Temp 392°F ΔH = .96

2300 Zero gASS Reads 0 CAL gASS Reads 196 STACK Temp 387 ΔH .89

2330 STACK Temp 382 ΔH .98

-16-91 2400 Zero gASS Reads 0 CAL gASS Reads 196 STACK Temp 342 ΔH .96

0030 STACK Temp 320°F ΔH .85

0100 Zero gASS Reads 0 CAL. gASS Reads 196 STACK Temp 311 ΔH .80

0130 STACK Temp. 311°F ΔH .84

0200 Zero gASS Reads 0 CAL gASS Reads 195 STACK Temp 313 ΔH .82

0230 STACK Temp 319 ΔH .85

0300 Zero gASS Reads 0 CAL gASS Reads 194 STACK Temp. 328 ΔH .87

0330 STACK Temp. 329°F ΔH .91

0400 Zero gASS Reads 0 CAL gASS Reads 194 STACK Temp 330 ΔH .83

0430 STACK Temp 335°F ΔH .84

0500 Zero gASS Reads 0 CAL gASS Reads 196 STACK Temp 335 ΔH .88

0530 STACK Temp 327 ΔH = .87

0600 Zero gASS Reads 0 CAL gASS Reads 196 STACK Temp 333. ΔH .84

0630 STACK Temp 320 ΔH = .91

10-16-91

0700 Zero Air reads 0 — Stack Temp. 327°
196 ppm Cal Gas reads 196 — ΔH 0.84"

0730 Stack Temp. 336° ΔH 0.89"

0800 Zero air reads 0 — Stack Temp. 339°
196 ppm CalGas reads 196 ppm — ΔH 0.76"
60.6 ppm CalGas reads 59.9 ppm
10.6 ppm CalGas reads 10.1 ppm

FINAL CALS.

SAMPLING ON 250 ppm RANGE ⓐ 0817

KATHY LILES / HERNANDO COUNTY OBSERVED!

0830 Stack Temp. 334° ΔH 0.77"

0900 Zero air Reads 0 — Stack Temp. 334°
196 ppm CalGas reads 196 ppm — ΔH 0.76"

Moisture Run - Final TDF Run

Imp.	Tare	Final	Gain
1	95.5	~~96.8~~ 97.2	~~0.8~~ 1.7
2	96.9	96.9	0
3	78.8	79.1	0.3
4	95.9	96.3	~~0.8~~ 0.4
		TOTAL	2.4 gms

2.101 ft³

1045 RUN TDF OVER 10-16-91

1945 during Dip on NOX CPL Reads 156 ppm

SAmpbe volume .9 CFH (ByPASS)

1952 NOX 85 CpL 153

2000 Romoved Ice Clog In knock out Impingers / ByPASS 2.35

Dips on chart due To cleaning out Impingers

2010 To 2013 orsAT sAmpbe TAken Could not get orsAT To work

CPL $O_2 = 9.0\%$ NO = 147 ppm SO_2: 184 ppm

2100 CpL $O_2 = 8.9$ NO = 117 ppm $SO_2 = 181$ ppm NO 117

2200 CpL $O_2 = 9.9\%$ NO = 142 ppm SO_2 144 ppm

2300 CpL $O_2 = 9.8\%$ ~~ppm~~ NO = 129 ppm $SO_2 = 134$ ppm Cleared Ice Clog

Chamber pressure HAs droped From 29.5 To 29.25

0000 CpL O_2 10.0% NO 133 ppm SO_2 110 ppm Temp 398

0100 CpL O_2 9.7% NO 132 ppm SO_2 151 ppm Temp 364

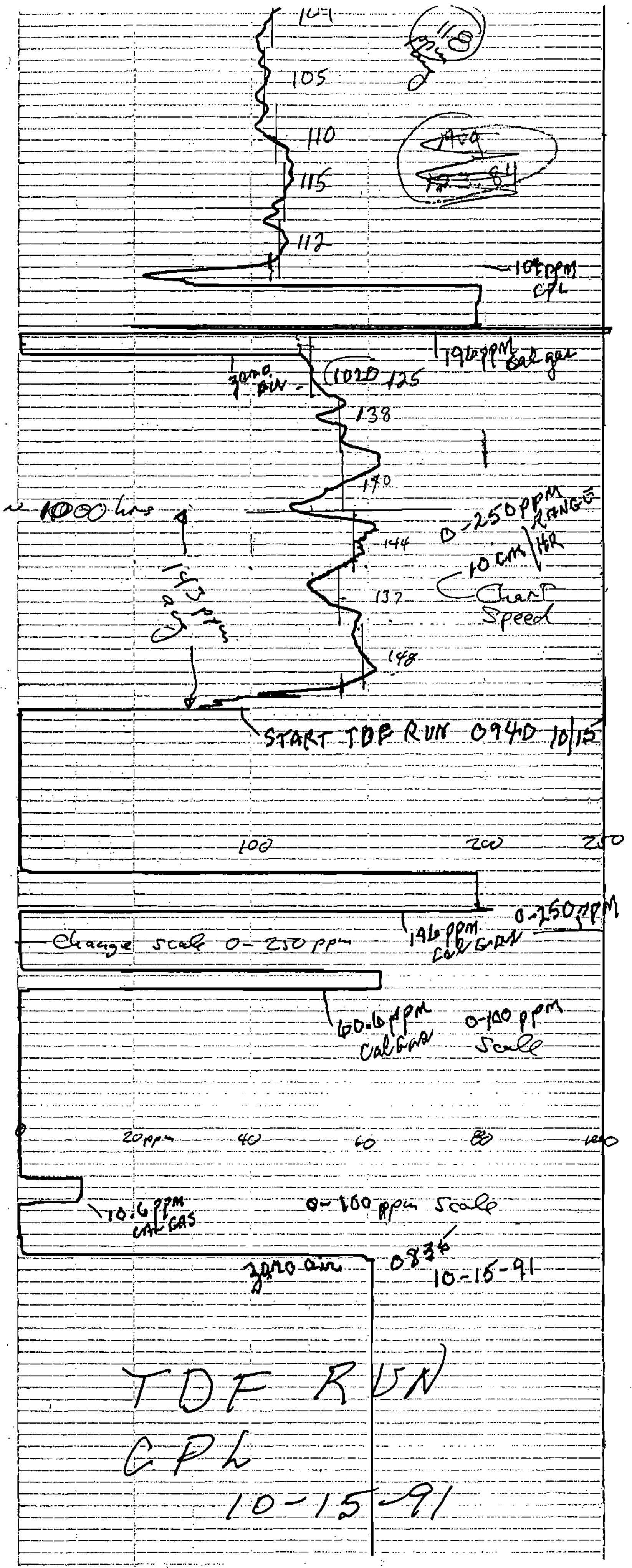
0200 CpL O_2 9.6% NO 134 ppm SO_2 137 ppm Temp 366

0300 CpL O_2 9.7% NO 134 ppm SO_2 133 ppm Temp 381

0400 CpL " 9.5 " 152 " 171 Temp 383

0500 CpL " 9.7 " 186 " 176 " 387

0600 CpL " 9.8 " 105 " 163 " 386



118

~~Avg~~

~~124.84~~

~104ppm CPL

196ppm Cal gas

zero air

1020

~1000 hrs

143 avg ppm

0-250ppm RANGE

10 cm/HR Chart Speed

START TDF RUN 0940 10/15

0-250ppM

Change scale 0-250ppm

196 ppm Cal GAS

60.6 ppm Cal GAS

0-100 ppm Scale

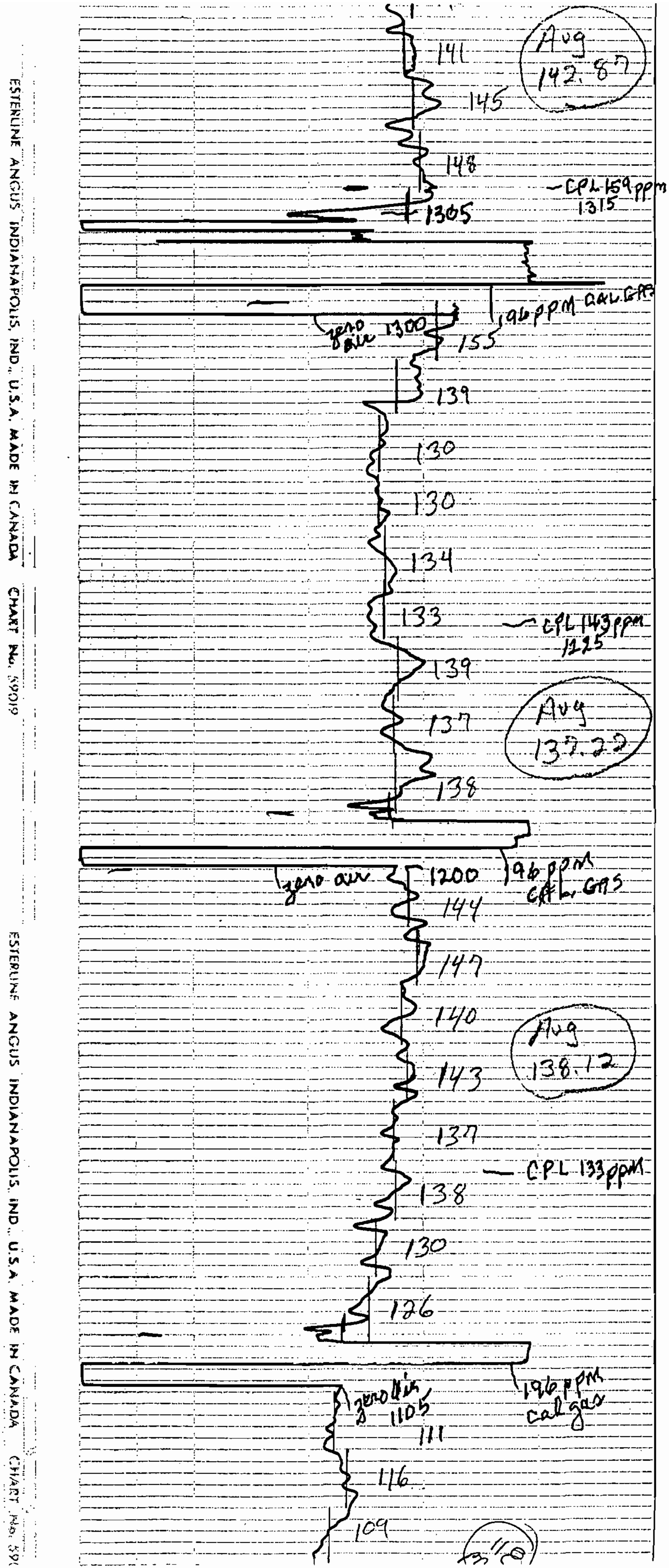
10.6 ppm CAL GAS

0-100 ppm Scale

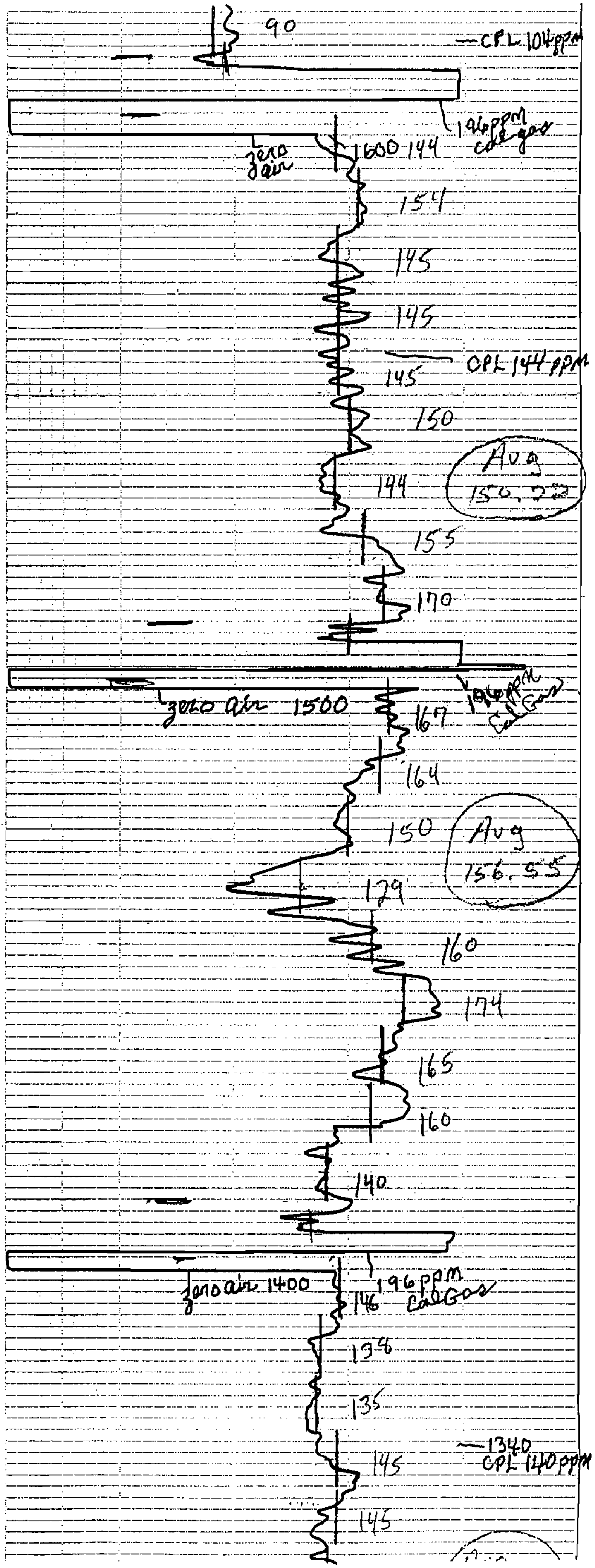
zero air

0836
10-15-91

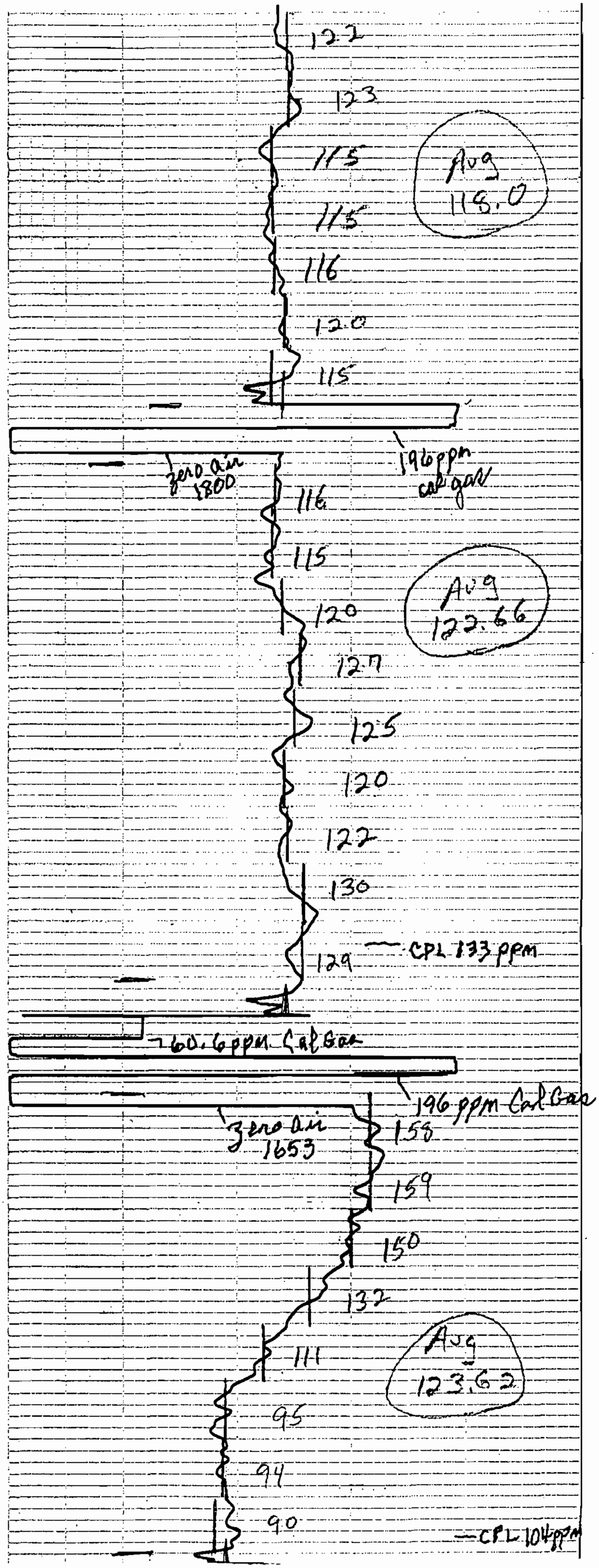
TDF RUN
CPL
10-15-91

ESTERLINE ANGUS INDIANAPOLIS, IND., U.S.A. MADE IN CANADA CHART No. 5901
141
Avg 142.87
145
148
CPL 159 ppm 1315
1305
196 ppm CAL GAS
zero air 1300
155
139
130
130
134
133
CPL 143 ppm 1225
139
137
Avg 137.22
138
196 ppm CAL GAS
zero air
1200
144
147
140
Avg 138.12
143
137
CPL 133 ppm
138
130
126
ESTERLINE ANGUS INDIANAPOLIS, IND., U.S.A. MADE IN CANADA CHART No. 590
196 ppm cal gas
zero air 1105
111
116
109

US INDIANAPOLIS, IND., U.S.A. MADE IN CANADA CHART No. 5901P ESTERLINE ANGUS INDIANAPOLIS, IND., U.S.A. MADE IN CANADA CHART No. 5901P



A. MADE IN CANADA CHART No. 59019 ESTERLINE ANGUS INDIANAPOLIS, IND., U.S.A. MADE IN CANADA CHART No. 59019 ESTERLINE ANGUS INDI



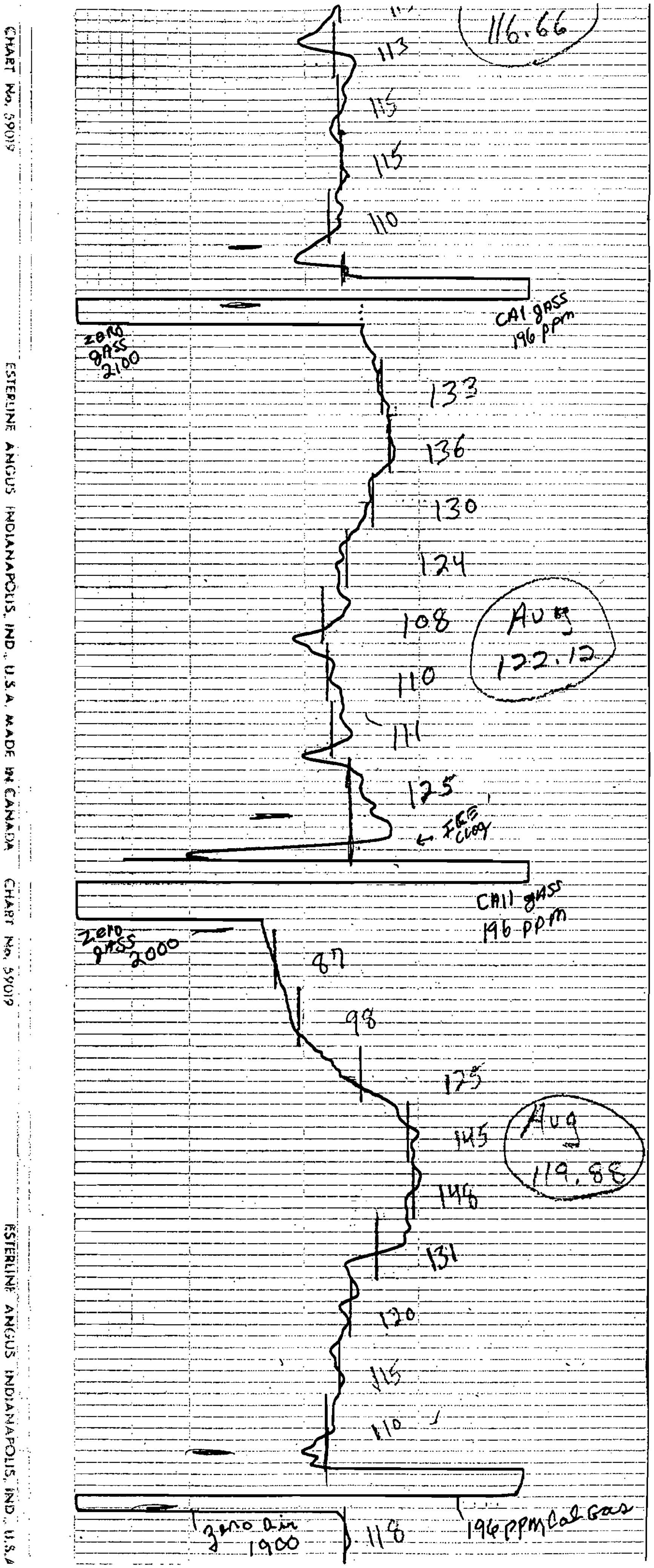
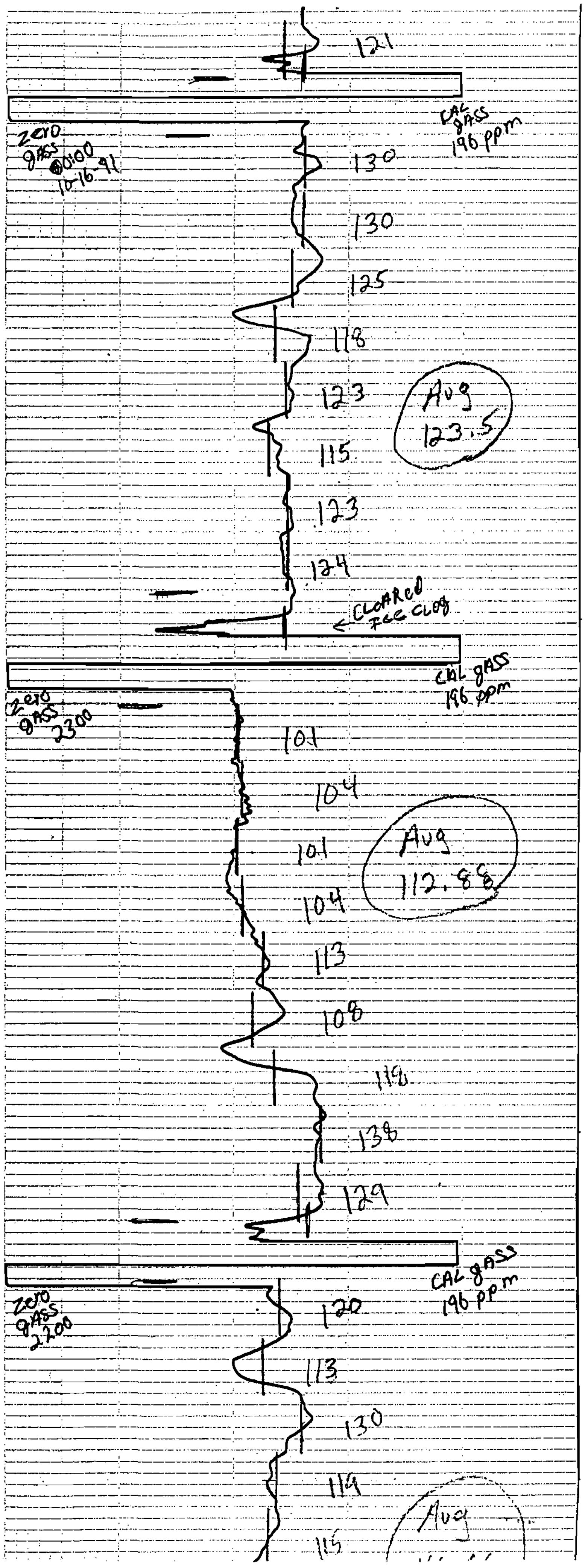
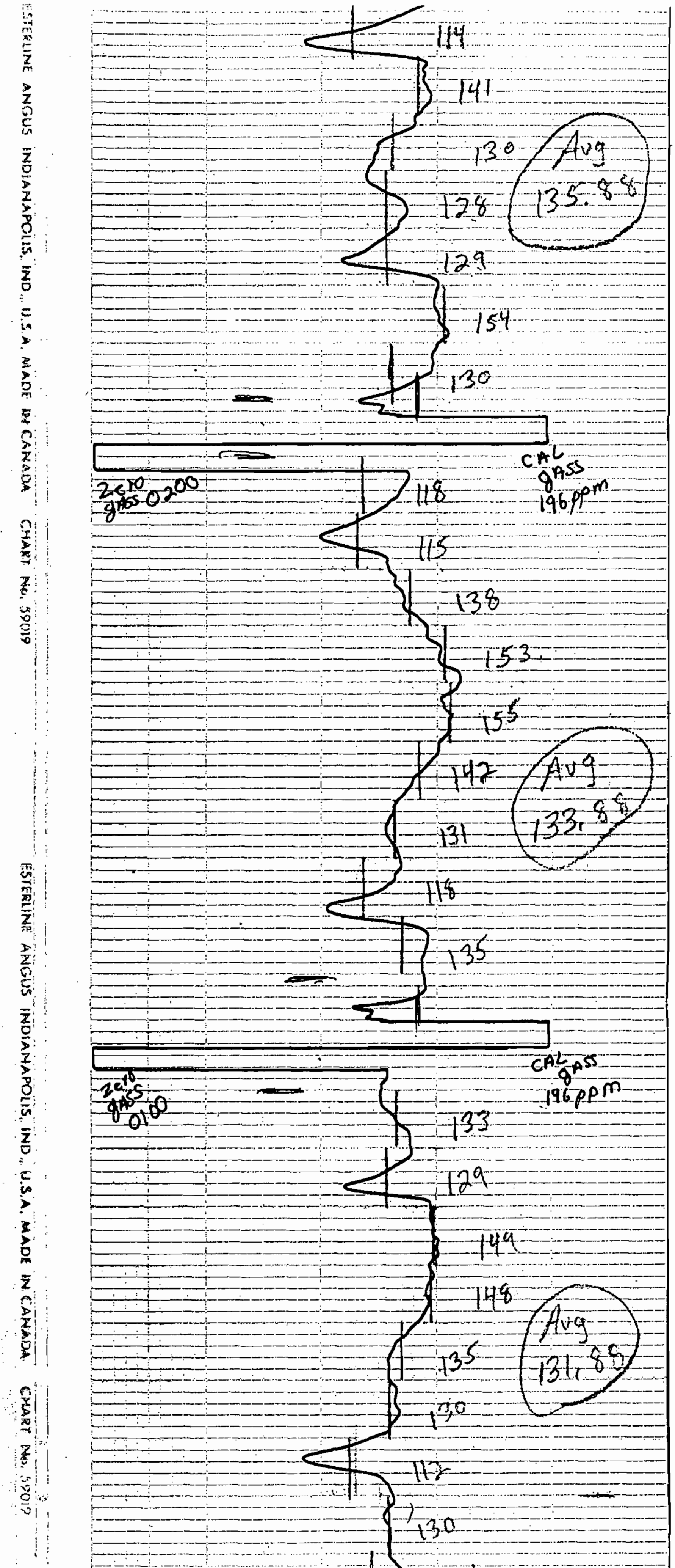


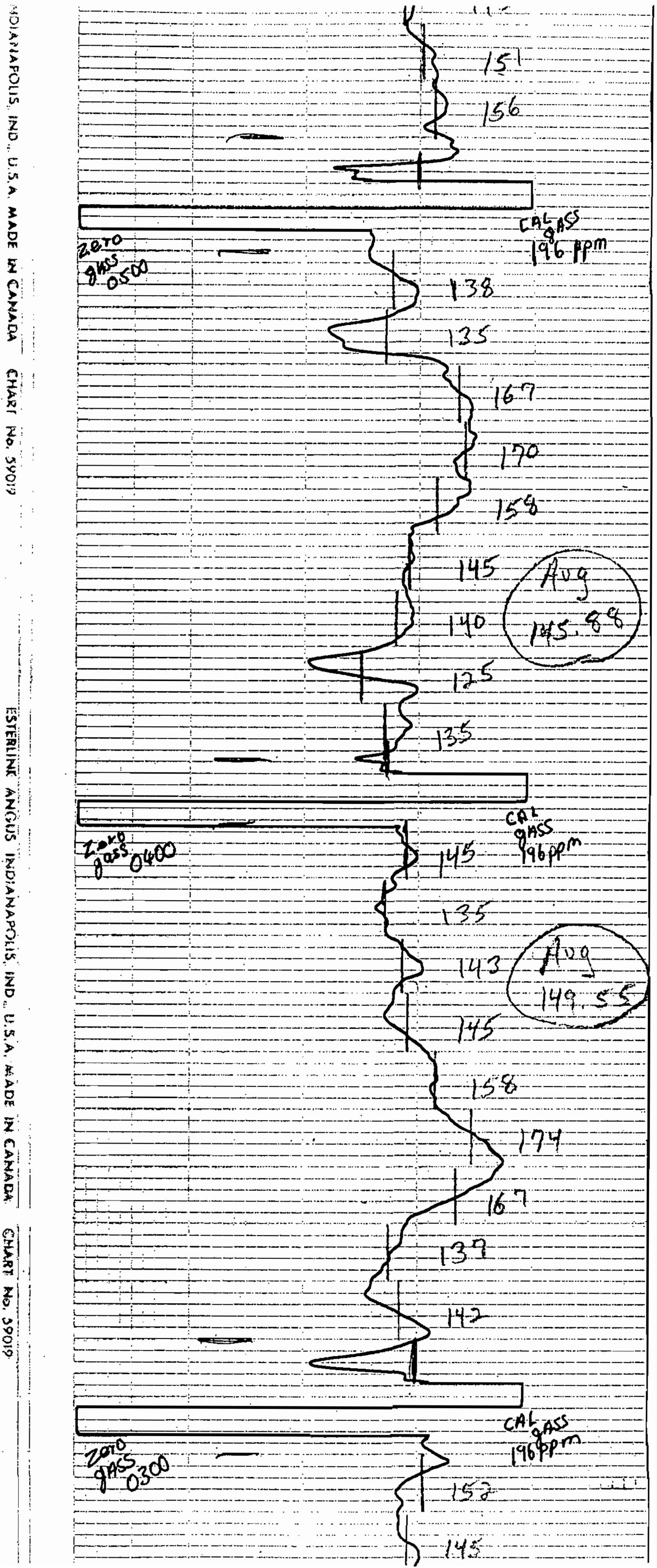
CHART No. 5901P
ESTERLINE ANGUS INDIANAPOLIS, IND. U.S.A. MADE IN CANADA
CHART No. 5901P
ESTERLINE ANGUS INDIANAPOLIS, IND. U.S.A.
116.66
113
115
115
110
CAl gass 196 ppm
zero gass 2100
133
136
130
124
108
110
111
125
Aug 122.12
← ice clog
CAll gass 196 ppm
zero gass 2000
87
98
125
145
148
131
120
115
110
Aug 119.88
zero air 1900
118
196 PPM Cal Gas

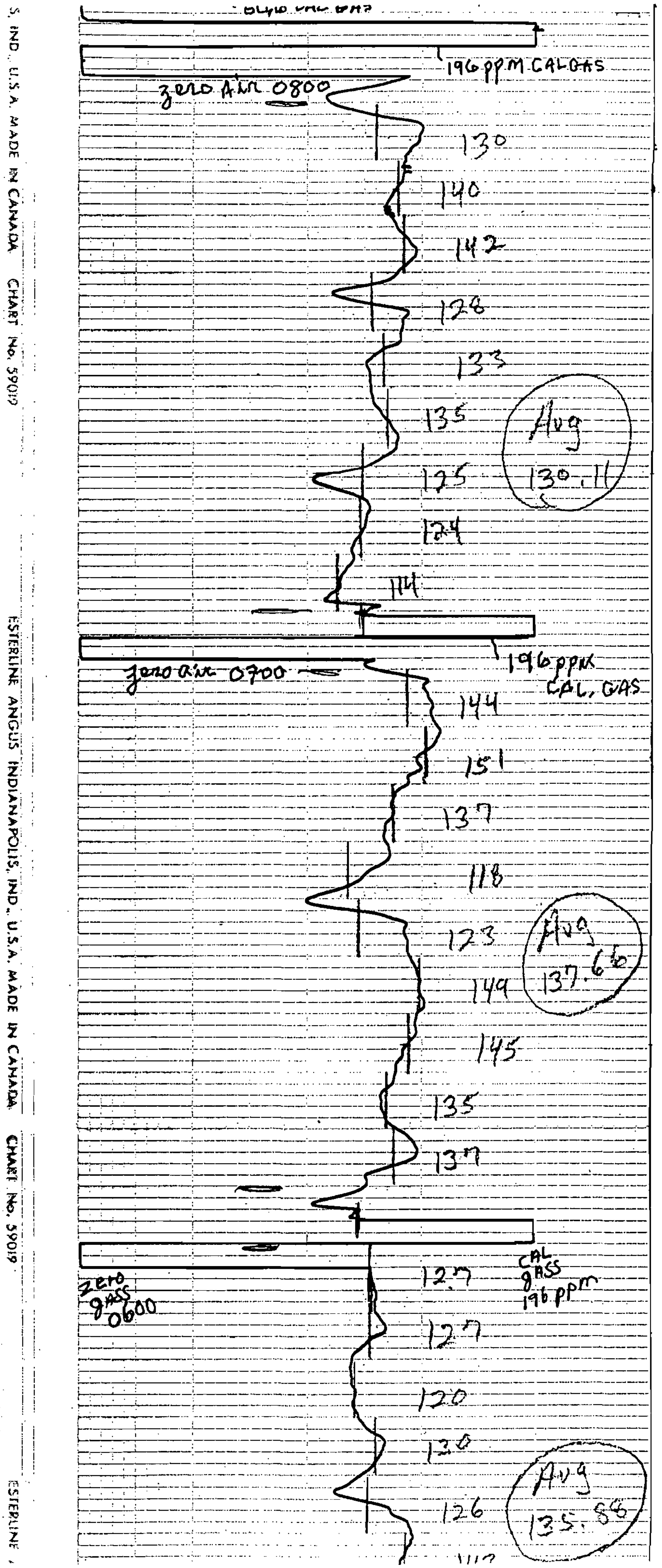
ESTERLINE ANGUS INDIANAPOLIS, IND., U.S.A. MADE IN CANADA CHART No. 5901Y



ESTERLINE ANGUS INDIANAPOLIS, IND., U.S.A. MADE IN CANADA

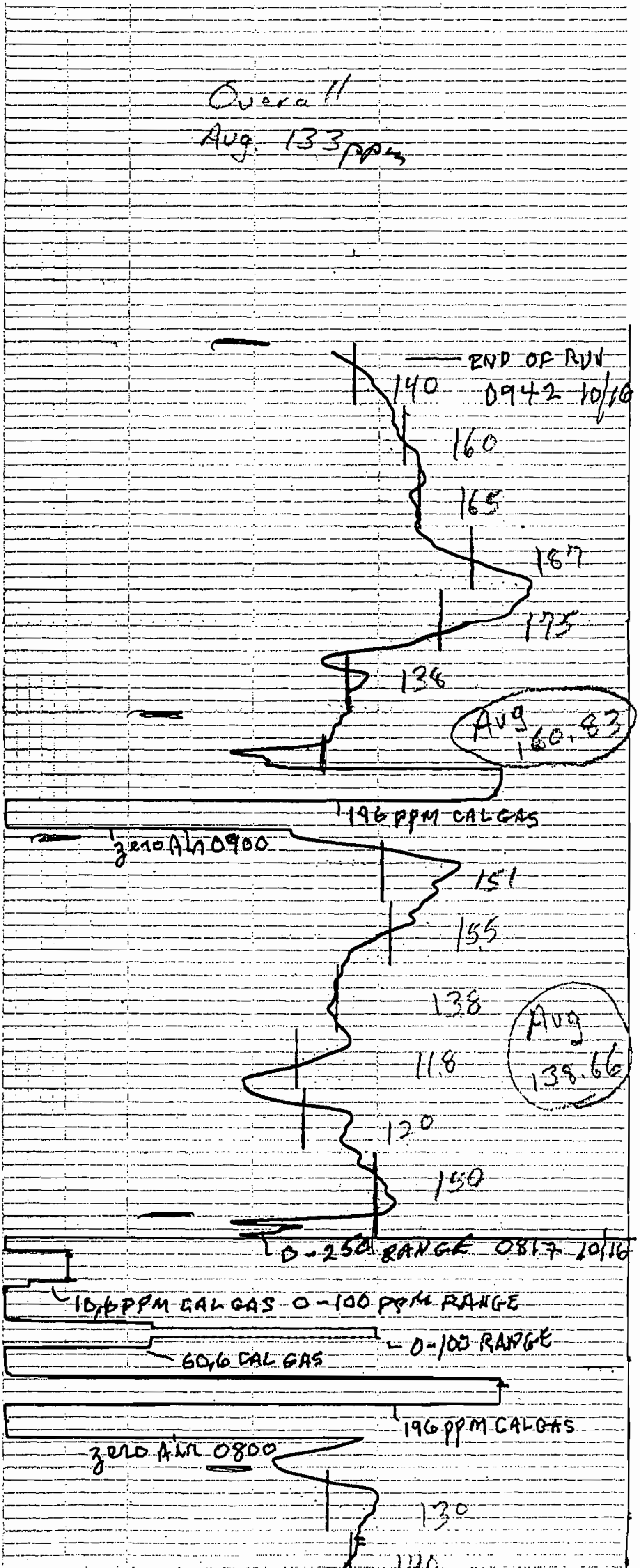

ESTERLINE ANGUS INDIANAPOLIS, IND., U.S.A. MADE IN CANADA CHART No. 59019
114
141
130
128
129
154
130
Avg 135.88
CAL gASS 196ppm
zero gASS 0200
118
115
138
153
155
142
131
118
135
Avg 133.88
ESTERLINE ANGUS INDIANAPOLIS, IND., U.S.A. MADE IN CANADA CHART No. 59019
CAL gASS 196ppm
zero gASS 0100
133
129
149
148
135
130
112
130
Avg 131.88


INDIANAPOLIS, IND., U.S.A. MADE IN CANADA CHART No. 59019
ESTERLINE ANGUS INDIANAPOLIS, IND., U.S.A. MADE IN CANADA CHART No. 59019
151
156
CAL GASS 196 ppm
zero gass 0500
138
135
167
170
158
145
Avg 145.88
140
125
135
CAL GASS 196ppm
Zero gass 0400
145
135
143
Avg 149.55
145
158
174
167
139
142
CAL GASS 196ppm
Zero GASS 0300
152
145

S, IND., U.S.A. MADE IN CANADA CHART No. 59019
ESTERLINE ANGUS INDIANAPOLIS, IND., U.S.A. MADE IN CANADA CHART No. 59019
ESTERLINE
196 ppm CAL GAS
zero Air 0800
130
140
142
128
133
135
Avg 130.11
125
124
114
196 ppm CAL. GAS
zero Air 0700
144
151
137
118
123
Avg 137.66
149
145
135
137
127
CAL gASS 196 ppm
zero gASS 0600
127
120
130
126
Avg 135.88

ESTERLINE ANGUS INDIANAPOLIS, IND., U.S.A. MADE IN CANADA CHART No. 5901P

ESTERLINE ANGUS INDIANAPOLIS, IND. U.S.A. MADE IN C


Overall
Aug. 133 ppm

STACK GAS FLOW AND MOISTURE CALCULATIONS AND DATA SHEETS

KOOGLER & ASSOCIATES

```
GENERAL DATA                                       DATA FILE NAME:   EPA_58
------------                                       --------------

 Company      : FLA. CRUSHED STONE
 Source/Unit  : C/P/L/ STACK
 Date         : OCT. 14-16, 1991       Cp             :     0.840
 Stack dia.   : 223.80 inch    OR  :   Duct Length :      0.00 inch
 Oxygen Corr.:     0.0 percent         Duct Width  :      0.00 inch
                                       Std. Temp.  :        68 dF

FUEL ANALYSIS DATA,
 (for calculating F-Factor)            Process Wt.
---------------------------            --------

Hydrogen,wt% :   0.00         Run 1 :     0.0 tons/hr
Carbon,  wt% :   0.00         Run 2 :     0.0
Sulfur,  wt% :   0.00         Run 3 :     0.0
Nitrogen,wt% :   0.00
Oxygen,  wt% :   0.00
Btu/lb       :      0

F-Factor     :         dscf/MMBtu; enter this value or {F9} for result.
FIELD DATA                                        RUN      RUN      RUN
----------                                         1        2        3

  Meter Temp., Tm (dF) ...............  104.70    90.50    68.00
  Stack Temp., Ts (dF) ...............  308.00   363.00   339.00
  Sq.Rt. dP ..........................    0.80     0.79     0.86
  dH (in. H2O) .......................    0.25     0.25     0.25
  Meter Vol.,Vm (ft3) ................    2.08     2.02     2.10
  Meter Y ............................   1.000    1.000    1.000
  Bar. Press.,Pb (in.Hg.) ............   29.94    29.79    29.87
  Vol. H2O, Vlc (ml) .................     3.9      2.6      2.4
  Static Press.,Ps (in.H2O) ..........   -0.60    -0.88    -1.10
  Test Time (min.) ...................    30.0     30.0     30.0
  Nozzle Dia.,Dn (in.) ...............   0.250    0.250    0.250
  Oxygen, O2 (%) .....................    8.60     9.80     8.10
  Carbon Dioxide, CO2 (%) ............    9.80     8.40     8.80
  Carbon Monoxide, CO (%) ............    0.00     0.00     0.00

  Is this Method 5 or Method 5/8 ?              (5 or 58) :          5

LABORATORY RESULTS                                RUN      RUN      RUN
------------------                                 1        2        3

  GRAVIMETRIC ANALYSIS :
  Front Half Wash (FHW) .............. 0.00000  0.00000  0.00000 grams
  Filterable Particulate (MF) ....... 0.00000  0.00000  0.00000
  Condensible Particulate (BHW) ..... 0.00000  0.00000  0.00000

  SO2 ANALYSIS :
  SO2 Analysis (H2O2 impingers)......    0.00     0.00     0.00 mg H2SO4
  Sample Volume, ml ..................       0        0        0
  Sample Aliquot, ml .................       0        0        0
  Volume of Titer, ml ................    0.00     0.00     0.00
  Volume of Titer Blank, ml ..........    0.00     0.00     0.00
                                         Normality of BaCl .......... 0.0000000
```

```
LABORATORY RESULTS (Continued)
------------------------------

  SULFATE ANALYSIS (FRONT HALF) :
  Front Half Sulfate (FHS) ..........     0.00     0.00     0.00 mg H2SO4
  Sample Volume, ml .................      100      100      100
  Sample Aliquot, ml ................       10       10       10
  Volume of Titer, ml ...............     0.00     0.00     0.00
  Volume of Titer Blank, ml .........     0.00     0.00     0.00
                                    Normality of BaCl .......... 0.0000000

  SULFATE ANALYSIS (BACK HALF) :
  Back Half Sulfate (BHS) ...........     0.00     0.00     0.00 mg H2SO4
  Sample Volume, ml .................      100      100      100
  Sample Aliquot, ml ................       10       10       10
  Volume of Titer, ml ...............     0.00     0.00     0.00
  Volume of Titer IPA Blank, ml .....     0.00     0.00     0.00
                                    Normality of BaCl .......... 0.0000000
```

SOURCE TEST CALCULATIONS .

```
 PLANT : FLA. CRUSHED STONE                        RUN NO.:          1
         C/P/L/ STACK                              DATE    : OCT. 14-16, 1991

 STD.TEMP, Tstd    =    68 DEG. F   | STATIC PRESS.,Ps =    -0.60 in. H2O
 METER TEMP, Tm    = 104.7 DEG. F   | PITOT COFF., Cp  =    0.840
 STACK TEMP, Ts    = 308.0 DEG. F   | STACK I.D.       =   223.80 inch
 AVG.VEL.HEAD,dP =  0.64 in. H2O | DUCT LENGTH      =          inch
 METER ORIFICE,dH=  0.25 in. H2O | DUCT WIDTH       =          inch
 METER VOL., Vm    = 2.080 Cu.Ft.   | STACK AREA, As   =  273.179 Sq.Ft.
 METER COFF., Y    = 1.000          | TEST TIME        =    30.00 min.
 BAR. PRESS., Pb = 29.94 in.Hg    | NOZZLE DIA.      =    0.250 inch
 COND.(Vlc)        =   3.9 ml       | NOZZLE DIA., An  =  3.4E-04 Sq.Ft.

 GAS ANALYSIS      =  8.60   % O2          0.00   % CO
                      9.80   % CO2        81.60   % N2

************************************************************************

Vm(std)  = [ T(std) + 460 / 29.92 ] x Vm x Y x
           (Pb + (dH / 13.6)) / (Tm + 460).....      =     1.947   dscf

Vw(std) =(8.9148 x 10e-5) x (Tstd + 460) x Vlc       =     0.184   scf

Bws = Vw(std) / (Vm(std) + Vw(std))...........       =     0.086 | Lower
                                                                 | Bws
Bws @ Saturated Conditions = Vapor Press. of H2O                 | value
@ Dew Point Temp. / (Ps, in.Hg.)  ............       =     1.000 | used.

%EA =(%O2 - 0.5%CO)/(0.264%N2 - (%O2-0.5%CO)) x 100 =     66.45

Md =(.44 x %CO2)+(.32 x %O2)+[.28 x (%N2 + %CO)]     =     29.91

Ms  = (Md x (1-Bws)) + (18.0 x Bws)............      =     28.89

P(stack) = Pbar + (Ps / 13.6) .................      =     29.90 in. Hg

vs  = 85.49 x CP x (Sq.Rt.dP) x [Sq.Rt.(Ts + 460)
    / (Ms x P(stack))] ......................       =     54.18   ft/sec

Qs  = vs x As x 60 ............................      =   888,007  acf/min

Qs(std) = Qs x (1-Bws)x((Tstd + 460)/(Ts + 460))
          x (P(stack)/29.92) ..................      =   557,461  dscf/min

I  = (Ts+460) x [(0.002669 x Vlc) + (Vm(std) /
     (T(std) + 460) / 29.92] x 100 / [ Time x
     P(stack) x An x vs x 60] .................      =      9.33   %
```

```
                          SOURCE TEST CALCULATIONS


  PLANT : FLA. CRUSHED STONE                      RUN NO.:           2
          C/P/L/ STACK                            DATE    : OCT. 14-16, 1991


  STD.TEMP, Tstd      =     68 DEG. F  | STATIC PRESS.,Ps  =    -0.88 in. H2O
  METER TEMP, Tm      = 90.50 DEG. F   | PITOT COFF., Cp   =    0.840
  STACK TEMP, Ts      = 363.0 DEG. F   | STACK I.D.        =   223.80 inch
  AVG.VEL.HEAD,dP =  0.62 in. H2O      | DUCT LENGTH       =          inch
  METER ORIFICE,dH=  0.25 in. H2O      | DUCT WIDTH        =          inch
  METER VOL., Vm  = 2.020 Cu.Ft.       | STACK AREA, As    =  273.179 Sq.Ft.
  METER COFF., Y  = 1.000              | TEST TIME         =    30.00 min.
  BAR. PRESS., Pb = 29.79 in.Hg        | NOZZLE DIA.       =    0.250 inch
  COND.(Vlc)      =   2.6 ml           | NOZZLE DIA., An   =  3.4E-04 Sq.Ft.

  GAS ANALYSIS     =  9.80  % O2           0.00  % CO
                      8.40  % CO2         81.80  % N2

 ************************************************************  *********

 Vm(std) = [ T(std) + 460 / 29.92 ] x Vm x Y x
           (Pb + (dH / 13.6)) / (Tm + 460).....      =     1.930   dscf

 Vw(std) =(8.9148 x 10e-5) x (Tstd + 460) x Vlc      =     0.122   scf

 Bws = Vw(std) / (Vm(std) + Vw(std))...........      =     0.060 | Lower
                                                                 | Bws
 Bws @ Saturated Conditions = Vapor Press. of H2O                | value
 @ Dew Point Temp. / (Ps, in.Hg.)  ............      =     1.000 | used.

 %EA =(%O2 - 0.5%CO)/(0.264%N2 - (%O2-0.5%CO)) x 100 =    83.08

 Md =(.44 x %CO2)+(.32 x %O2)+[.28 x (%N2 + %CO)]     =    29.74

 Ms = (Md x (1-Bws)) + (18.0 x Bws)............      =    29.04

 P(stack) = Pbar + (Ps / 13.6) .................      =    29.73 in. Hg

 vs = 85.49 x CP x (Sq.Rt.dP) x [Sq.Rt.(Ts + 460)
      / (Ms x P(stack))] ......................      =    55.40   ft/sec

 Qs = vs x As x 60 ............................      =   908,002  acf/min

 Qs(std) = Qs x (1-Bws)x((Tstd + 460)/(Ts + 460))
           x (P(stack)/29.92) ..................      =   544,236  dscf/min

 I = (Ts+460) x [(0.002669 x Vlc) + (Vm(std) /
     (T(std) + 460) / 29.92] x 100 / [ Time x
     P(stack) x An x vs x 60] ..................      =     9.47    %
```

```
                         SOURCE TEST CALCULATIONS

 PLANT : FLA. CRUSHED STONE                         RUN NO.:          3
         C/P/L/ STACK                               DATE    : OCT. 14-16, 1991


 STD.TEMP, Tstd    =     68 DEG. F  | STATIC PRESS.,Ps =    -1.10 in. H2O
 METER TEMP, Tm    = 68.00 DEG. F  | PITOT COFF., Cp   =    0.840
 STACK TEMP, Ts    = 339.0 DEG. F  | STACK I.D.        =   223.80 inch
 AVG.VEL.HEAD,dP =  0.74 in. H2O | DUCT LENGTH       =          inch
 METER ORIFICE,dH=  0.25 in. H2O | DUCT WIDTH        =          inch
 METER VOL., Vm    = 2.100 Cu.Ft.  | STACK AREA, As    =  273.179 Sq.Ft.
 METER COFF., Y    = 1.000          | TEST TIME         =    30.00 min.
 BAR. PRESS., Pb  = 29.87 in.Hg    | NOZZLE DIA.       =    0.250 inch
 COND.(Vlc)        =    2.4 ml      | NOZZLE DIA., An   =  3.4E-04 Sq.Ft.

 GAS ANALYSIS      =   8.10   % O2          0.00   % CO
                       8.80   % CO2        83.10   % N2

************************************************************ ********

Vm(std) = [ T(std) + 460 / 29.92 ] x Vm x Y x
          (Pb + (dH / 13.6)) / (Tm + 460).....       =      2.098    dscf

Vw(std) =(8.9148 x 10e-5) x (Tstd + 460) x Vlc       =      0.113    scf

Bws = Vw(std) / (Vm(std) + Vw(std))..........        =      0.051 | Lower
                                                                  | Bws
Bws @ Saturated Conditions = Vapor Press. of H2O                  | value
@ Dew Point Temp. / (Ps, in.Hg.)  ...........        =      1.000 | used.

%EA =(%O2 - 0.5%CO)/(0.264%N2 - (%O2-0.5%CO)) x 100 =     58.53

Md =(.44 x %CO2)+(.32 x %O2)+[.28 x (%N2 + %CO)]     =     29.73

Ms = (Md x (1-Bws)) + (18.0 x Bws)...........        =     29.13

P(stack) = Pbar + (Ps / 13.6) ................        =     29.79 in. Hg

vs = 85.49 x CP x (Sq.Rt.dP) x [Sq.Rt.(Ts + 460)
     / (Ms x P(stack))] .....................        =     59.26    ft/sec

Qs = vs x As x 60 ...........................        =   971,287   acf/min

Qs(std) = Qs x (1-Bws)x((Tstd + 460)/(Ts + 460))
          x (P(stack)/29.92) .................        =   606,389   dscf/min

I = (Ts+460) x [(0.002669 x Vlc) + (Vm(std) /
    (T(std) + 460) / 29.92] x 100 / [ Time x
    P(stack) x An x vs x 60] .................        =      9.24     %
```

A. FIELD DATA SUMMARY

PLANT : FLA. CRUSHED STONE
C/P/L/ STACK
DATE : OCT. 14-16, 1991

	RUN 1	RUN 2	RUN 3
Vlc = Vol water collected in train, ml	3.9	2.6	2.4
Vm = Sample gas vol, meter cond., dacf	2.080	2.020	2.100
Y = Meter calibration factor	1.0000	1.0000	1.0000
Pbar = Barometric pressure, in. Hg	29.94	29.79	29.87
Pstatic = Stack static pressure, in. H2O	-0.60	-0.88	-1.10
dH = Avg meter pressure diff, in. H2O	0.25	0.25	0.25
Tm = Absolute meter temp., degrees R	564.7	550.5	528.0
Vm(std) = Sample gas vol, Std. cond., dscf	1.947	1.930	2.098
Bws = Water vapor in gas stream, fraction	0.086	0.060	0.051
MF = Moisture factor (1 - Bws)	0.914	0.940	0.949
CO2 = Carbon Dioxide, dry, volume %	9.80	8.40	8.80
O2 = Oxygen, dry, volume %	8.60	9.80	8.10
N2 = Nitrogen, dry volume %	81.60	81.80	83.10
Md = Molecular weight of stack gas, dry	29.91	29.74	29.73
Ms = Molecular weight of stack gas, wet	28.89	29.04	29.13
Cp = Pitot tube coefficient	0.84	0.84	0.84
Sq.Rt. dP = Avg. square root of each dP	0.8000	0.7900	0.8600
Ts = Absolute stack temp., degrees R	768.0	823.0	799.0
A = Area of stack, ft2	273.18	273.18	273.18
Qstd = Volumetric flowrate, dscfm	557,461	544,236	606,389
An = Nozzle area, ft2	3.41E-04	3.41E-04	3.41E-04
0 = Sample time, minutes	30.00	30.00	30.00
%I = Isokinetic variation, percent	9.33	9.47	9.24

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SOURCE SAMPLING FIELD DATA SHEET

Plant FGS.
Sampling Location STACK
Type of Control Baghouse
Type of Samples Moisture
Date 10-14-91 Run No. 1
Time Start 10:44 Time End 11:14
Sample Time 5 min/pt 30 Total min
DB °F, WB °F, VP @ DP "Hg
Bar. Press. 29.94 "Hg, Stack Press. "Hg
Moisture %, FDA , Gas Density Factor
Temp. 45 °F, W/D E , W/S 1-5
Weather Clear Thermocouple Readout
Sample Box No: meter Box No. SO_2 Box
Meter ΔH@ Pitot Corr. Factor
Nozzle Dia. in., Probe Length 4 ft
Probe Heater Setting Nomograph C_f
Stack Dimensions 223.8 in
Stack Area ft^2
Effective Stack Area ft^2
Stack Height ft

PL-06

Stack Dimensions

Umbilical Cord
Thermocouple Probe No.
Pitot Tube No.

Mat'l Processing Rate
Final Gas Meter Reading 19.603 ft^3
Initial Gas Meter Reading 17.520 ft^3
2.083
Condensate Increase in Impingers ml
Moisture in Silica Gel gm
3.9 gms
Silica Gel Container No. Filter No.

Orsat:				
$\%CO_2$	9.8			
$\%O_2$	8.6			
%CO				
$\%N_2$				

Test Conducted By: Steve Bell

Stack Test Observers:

Leak Check Meter Box
Initial 0.00 ~~cfm~~ Rotometer @ 5 In Hg
Final 0.00 ~~cfm~~ @ 5 In Hg

Pitot Tubes
Impact 3 In H_2O for 15 sec. Stable, Leak
Static 3 In H_2O for 15 sec. Stable, Leak

Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft^3)	~~Stack Velocity Head ("H_2O)~~ Rotometer LPM	Meter Orifice Press. Diff. ("H_2O) Calc.	Meter Orifice Press. Diff. ("H_2O) Actual	Stack Gas Temp. (°F)	Sample Box Temp. (°F)	Last Imp. Temp. (°F)	Meter Temp. (°F)	Vacuum on Sample Train ("Hg)
										104.7	
1			17.520	2.0		.25	[illegible]			98	1
2			17.875	2.0			308			101	2
3			18.215	2.0						103	2
4			18.550	2.0						106	2
5			18.895	2.0						108	2
6			19.232	2.0						112	2

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SOURCE SAMPLING FIELD DATA SHEET

Plant FCS
Sampling Location STACK
Type of Control Baghouse
Type of Samples Moisture
Date 10-15-91 Run No. 2 3
Time Start 10:21 Time End 10:51
Sample Time 5 min/pt 30 Total min
DB ___ °F, WB ___ °F, VP @ DP ___ "Hg
Bar. Press. 29.79 "Hg, Stack Press. ___ "Hg
Moisture ___ %, FDA ___, Gas Density Factor ___
Temp. 45 °F, W/D NE, W/S 1-5
Weather OVERCAST. Thermocouple Readout ___
Sample Box No: ___ Meter Box No. SO_2 Box
Meter ΔH@ ___ Pitot Corr. Factor ___
Nozzle Dia. 0.26 in., Probe Length 4 FT ft
Probe Heater Setting ___ Nomograph C_f 4FT
Stack Dimensions 22 3 8 in
Stack Area ___ ft^2
Effective Stack Area ___ ft^2
Stack Height ___ ft

Stack Dimensions

Umbilical Cord ___
Thermocouple Probe No. ___
Pitot Tube No. ___

Mat'l Processing Rate ___
Final Gas Meter Reading 23,773 ft^3
Initial Gas Meter Reading 21.750 ft^3 2,023
Condensate Increase in Impingers ___ ml
Moisture in Silica Gel ___ gm } 2.6 gms.
Silica Gel Container No. ___ Filter No. ___

Orsat:				
$\%CO_2$	8.4			
$\%O_2$	9.8			
%CO				
$\%N_2$				

Test Conducted By: Steve Bell

Stack Test Observers: ___

Leak Check Meter Box
Initial 0.00 ~~cfm~~ Rotometer @ 5 In H_2
Final 0.00 cfm @ 5 In Hg

Pitot Tubes
Impact 3 In H_2O for 15 sec. Stable, Leak
Static 3 In H_2O for 15 sec. Stable, Leak

Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ~~("H_2O)~~ Rotometer Lpm	Meter Orifice Press. Diff. ("H_2O) Calc.	Meter Orifice Press. Diff. ("H_2O) Actual	Stack Gas Temp. (°F)	Sample Box Temp. (°F)	Last Imp. Temp. (°F)	Meter Temp. (°F) 90.6	Vacuum on Sample Train ("Hg)
1			21.750	2.0		.25				87	1
2			22.105	2.0						87	2
3			22.420	2.0						88	2
4			22.755	2.0						91	2
5			23.100	2.0						94	2
6			23.435	2.0						96	2

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SOURCE SAMPLING FIELD DATA SHEET

Plant Fla Crushed Stone
Sampling Location stack
Type of Control Baghouse
Type of Samples Moisture
Date 10-16-91 Run No. 3
Time Start 0744 Time End 0814
Sample Time 5 min/pt 30 Total min.
DB ___ °F, WB ___ °F, VP @ DP ___ "Hg
Bar. Press. 29.87 "Hg, Stack Press. ___ "Hg
Moisture ___ %, FDA ___, Gas Density Factor ___
Temp. ___ °F, W/D ___, W/S ___
Weather ___ Thermocouple Readout ___
Sample Box No: ___ meter Box No. ___
Meter ΔH@ ___ Pitot Corr. Factor ___
Nozzle Dia. 0.26 in., Probe Length ___ ft
Probe Heater Setting ___ Nomograph C_f ___
Stack Dimensions 22.3.8 in
Stack Area ___ ft^2
Effective Stack Area ___ ft^2
Stack Height ___ ft

Stack Dimensions

Umbilical Cord ___
Thermocouple Probe No. ___
Pitot Tube No. ___

Mat'l Processing Rate ___
Final Gas Meter Reading 25.916 ft^3
Initial Gas Meter Reading 23.815 ft^3
Condensate Increase in Impingers ___ ml
Moisture in Silica Gel ___ gm

2.101 ft^3

2.4 gms

Silica Gel Container No. ___ Filter No. ___

Orsat: $\%CO_2$	8.8			
$\%O_2$	8.1			
%CO				
$\%N_2$				

Test Conducted By: R Paul

Stack Test Observers: ___

Leak Check Meter Box
Initial 0.00 cfm @ 3 In H_2
Final 0.00 cfm @ 3 In Hg

Pitot Tubes
Impact 3 In H_2O for 15 sec. Stable, Leak
Static 3 In H_2O for 15 sec. Stable, Leak

Port and Traverse Point No.	Distance From Inside Stack Wall (in.)	Clock Time	Gas Meter Reading (ft^3)	Stack Velocity Head ("H_2O)	Meter Orifice Press. Diff. ("H_2O)		Stack Gas Temp. (°F)	Sample Box Temp. (°F)	Last Imp. Temp. (°F)	Meter Temp. (°F)	Vacuum on Sample Train ("Hg)
					Calc.	Actual				68	
1				23.815	2.0	2.0				64	1
2					2.0	2.0				66	1
3					2.0	2.0				68	1
4					2.0	2.0				69	1
5				25.2	2.0	2.0				70	1
6					2.0	2.0				72	1

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PRELIMINARY DATA SHEET

Plant FCS Stack Big stack

Date 10-14-91

Stack Dimensions 18.65'

Stack Area (ft.^{2}) ______

Pitot Corr. factor 0.84

Sketch of Stack Cross-Section

DB ______°F WB ______°F DP ______°F

V.P. at DP ______"Hg Fract. D.A. ______

Density Factor ______ Stack Pres. ______

Weather Clear

Temp 80 °F Pressure 30.04 "Hg

Wind Dir. S Vel. 5-10

10-14-91

Pitot Traverse

Point Number	Equal Area Radius	Distance From Stack Wall	Distance From End of Port	0942 Port #1		Port #2		Port #3		Port #4	
				H	Velocity	H	Velocity	H	Velocity	H	Velocity
1					0.63						
2					0.63						
3					0.66						
4					0.65						
5					0.58						
6					0.62						
7					0.60						
8					0.67						
9					0.55						
10				0.66	0.66						
11					0.66						
12					0.64						
13					0.64						
14					0.64						
15					0.64						
16											
17				TS	308						
18											
19				PS	-0.60						
20											
21				√x	0.795	BP					
22											
23						TEMP	80°				
24						WIND	5@5				

~~.05~~ . ~~049~~

PRELIMINARY DATA SHEET

Plant FCS CPL　　Stack CPL BIG STACK

Date 10-15-91

TDF RUN

Stack Dimensions 18.65'　　Stack Area $(ft.^2)$ ______

Sketch of Stack Cross-Section

Pitot Corr. factor 0.84

DB ______ °F WB ______ °F DP ______ °F

V.P. at DP ______ "Hg Fract. D.A. ______

Density Factor ______ Stack Pres. ______

Weather Clear

Temp 80 °F Pressure ______ "Hg

Wind Dir. S Vel. 5

1015

Pitot Traverse

Point Number	Equal Area Radius	Distance From Stack Wall	Distance From End of Port	09 Port #1		Port #2		Port #3		Port #4	
				H	Velocity	H	Velocity	H	Velocity	H	Velocity
1					0.65						
2					0.63						
3					0.71						
4					0.61						
5					0.57						
6					0.66						
7					0.65						
8					0.72						
9					0.59						
10					0.59						
11					0.67						
12					0.69						
13					0.55						
14					0.54						
15					0.51						
16					0.56						
17											
18			ST		363°						
19											
20			SP		-0.88						
21											
22				√x	0.786						
23											
24											

-046

PRELIMINARY DATA SHEET

Plant FCS CpL **Stack** CpL Big STAck

Date 10-16-91

Stack Dimensions ______ **Stack Area (ft.^{2})** ______

Pitot Corr. factor .84

Sketch of Stack Cross-Section

DB ______ °F **WB** ______ °F **DP** ______ °F

V.P. at DP ______ "Hg **Fract. D.A.** ______

Density Factor ______ **Stack Pres.** -1.1" H_2O

Weather Clear

Temp 70 °F **Pressure** ______ "Hg

Wind Dir. N **Vel.** 1-5

Final moisture Run

Pitot Traverse 07:50 -1.1" H_2O

Point Number	Equal Area Radius	Distance From Stack Wall	Distance From End of Port	Port #1		Port #2		Port #3		Port #4	
				H	Velocity	H	Velocity	H	Velocity	H	Velocity
1				.77		.79		.79		.77	
2				.78		.76		.75		.76	
3				.76		.73		.77		.75	
4				.72		.59		.65		.72	
5											
6						√x	0.86				
7											
8											
9											
10											
11											
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21											
22											
23											
24											

.053

KBN
KBN ENGINEERING AND APPLIED SCIENCES, INC.
1034 Northwest 57th Street
Gainesville, Florida 32605
FAX: 904/332-4189
Telephone: 904/331-9000

Letter of Transmittal

Date: 11/6/92

Project No.: 22122-0100

To: Bruce Mitchell
Florida DER
2600 Blair Stone Road
Tallahassee, FL 32301
904-488-1344

Re: Fla. Crushed Stone Preliminary Report

The following items are being sent to you: ☐ with this letter ☐ under separate cover

Copies	Description
1	Preliminary Report

These are transmitted:

☐ As requested
☐ For review
☐ For review and comment
☐ For approval
☐ For your information
☐

Remarks: Pls review and comment on.

RECEIVED
NOV 10 1992
Division of Air
Resources Management

Signed: D. A. Buff

Copy to:

KBN6/LOT.1-P
04/06/90

11/6/92

Bruce

Koogler: 904-377-5822

Florida Crushed Stone
on

KBN reviewed test reports
only question on VOC

cement plant: power plant combined

coal only 2.5#/hr
coal & TDF 3.7#/hr
> 50%
5 1/4 TPY increase

B.W.M. project
can get permit w/i next week
mtg before Hernando County Commission next Tuesday
Have other info from both scenarios

NOx, PM, SO_2, opacity
no VOC limit
1,000,000,000 cft/min

(modification is an increase)

< 1 ppm or less in stack gas
23 hr measmt
11#/hr base max
<1#/hr " min
8#/hr TDF max
<1#/hr TDF min

Hernando: mod for appl'n for

Florida Department of Environmental Regulation
Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400
~~Bob Martinez, Governor~~ ~~Dale Twachtmann, Secretary~~ ~~John Shearer, Assistant Secretary~~
Lawton Chiles - Governor
Carol Browner - Secretary

FAX TRANSMITTAL LETTER

DATE: 1-23-91

TO:

NAME: Greg Worley
AGENCY: U.S. EPA, Region IV

TELEPHONE: 404-347-5207

OF PAGES (INCLUDE COVER SHEET): 5

FROM:

NAME: Bruce Mitchell

AGENCY: FDER / DARM / BAR

IF ANY PAGES ARE NOT CLEARLY RECEIVED, PLEASE CALL IMMEDIATELY. PHONE NO. 904-488-1344

SENDER'S NAME: R. Bruce Mitchell

COMMENTS: comments from representatives for Hernando County.

MESSAGE CONFIRMATION

JAN-23-'91 WED 12:20

TERM ID: DIV OF AIR RES MGMT P-9999

TEL NO: 904-922-6979

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488	01-23	12:17	00°02'55	404 347 5207		05	00

OERTEL, HOFFMAN, FERNANDEZ & COLE, P.A.

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(NOT A MEMBER OF THE FLORIDA BAR)

J. P. SUBRAMANI, PH. D., P. E.
ENVIRONMENTAL CONSULTANT
(NOT A MEMBER OF THE FLORIDA BAR)

January 18, 1991

HAND DELIVERY

RECEIVED
JAN 18 1991
DER - BAQM

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

RE: Emission Test Reports at Baseline and TDF Conditions at Florida Crushed Stone Facility; AC27-118674

Dear Mr. Fancy:

Thank you for your December 18, 1990 letter to Commissioner John Richardson and enclosing the Florida Crushed Stone (FCS) test results. On behalf of Hernando County, I have been asked by Mr. Lawrence Jennings, Manager of Planning Department, Hernando County, to provide comments to you.

We have reviewed the information contained in the emission reports which were generated for the baseline operation and tire burning (TDF) conditions. I believe the test data raise more questions than provide answers.

Information submitted by FCS with its original application request revealed that emissions of total particulate, heavy metals (particularly zinc) and polynuclear aromatic compounds would increase when TDF is burned. The attached Table 1 which was compiled from the FCS data show the opposite trend. Secondly, the information on dioxin/furan emissions needs to be further clarified and very closely examined.

Emissions of dioxin and its isomers are reported in toxic equivalent quantities. We question the appropriateness as well as the basis for the toxic equivalence factors (TEF) used in the emissions reports. Attached Table 2 lists the TEFs contained in an EPA Risk Assessment Document versus TEFs used in the FCS report. There are significant differences in TEFs contained in the FCS report which need resolution.

Thirdly, it is noted that the 2,3,7,8-dioxin isomer was found only during the first test run under the baseline conditions at 0.007 nanograms. No dioxin was found in any of the other five test runs. We would like to evaluate the potential dioxin problem further and would appreciate receiving any information available from other test facilities on dioxin emissions. In this regard, we again request that you provide us a copy of the Modesto Energy Company's emissions report which was submitted to DER. We also request a copy of the NO_x test data information as soon as it becomes available.

The citizens and the Board of Hernando County Commissioners are concerned about the potential increases in the emissions of deleterious substances including dioxin/furans, heavy metals, PNAs and other incomplete combustion products (PICs) from the burning of TDFs. We request that you and your staff carefully review the test reports from FCS, and hold public hearings prior to authorizing the burning of TDFs.

Sincerely,

JP Subramani

J. P. Subramani

JPS:gg

Enclosure

cc: Mr. Lawrence Jennings
Ms. Katherine Liles
B. Mitchell
G. Blunn
CHF/BA

TABLE 1

Emissions from Florida Crushed Stone (lbs/hr)

	Baseline Test	**TDF Test**
Particulate	56.80	52.21
SO_2	595.15	551.3
VOC	0.14	0.44
Semi VOC	5.01	0.90
Dioxin/Furan	5.4×10^{-9}	7×10^{-9}
Metal Emissions:		
Al	6.86	8.13
Fe	1.39	1.30
Zn	3.12	1.68

TABLE 2

Dioxin/Furan Toxic Equivalence Factors (TEF)

(From "1989 update to the Interim Procedures for Estimating Risks Associated with Exposures of Chlorinated Dibenzo-p-dioxins and Dibenzofurans", March 1989, EPA/625/3-89/016)

Dioxin Isomer	TEF	TEF in FCS Report
2378 - tetra	1	1
12378 - penta	0.5	0.5
123478 - hexa	0.1	0.04 (different)
123789 - hexa	0.1	0.04 (different)
123678 - hexa	0.1	0.04 (different)
1234678 - hepta	0.01	0.001 (different)
12346789 - octa	0.0001	0 (different)

FURAN ISOMER		
2378 - Tetra	0.1	0.1
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Florida Department of Environmental Regulation

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

~~Bob Martinez, Governor~~ ~~Dale Twachtmann, Secretary~~ ~~John Shearer, Assistant Secretary~~

Lawton Chiles - Governor

Carol Browner - Secretary

FAX TRANSMITTAL LETTER

DATE: 1-23-91

TO:

NAME: John Bunyak

AGENCY: National Park Service - Air

TELEPHONE: 303-969-2822

OF PAGES (INCLUDE COVER SHEET): 5

FROM:

NAME: Bruce Mitchell

AGENCY: FDER/DARM/BAR

IF ANY PAGES ARE NOT CLEARLY RECEIVED, PLEASE CALL IMMEDIATELY. PHONE NO. 904-488-1344

SENDER'S NAME: Bruce Mitchell

COMMENTS: Comments received from representatives of Hernando County.

MESSAGE CONFIRMATION JAN-23-'91 WED 12:41

TERM ID: DIV OF AIR RES MGMT P-9999

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January 18, 1991

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RECEIVED
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Clair H. Fancy, P.E.
Chief, Bureau of Air Regulation
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2600 Blair Stone Road
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RE: Emission Test Reports at Baseline and TDF Conditions at Florida Crushed Stone Facility; AC27-118674

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J P Subramani

J. P. Subramani

JPS:gg

Enclosure

cc: Mr. Lawrence Jennings
Ms. Katherine Liles
B. Mitchell
G. Blunn
C HF/BA

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~~Bob Martinez, Governor~~ ~~Dale Twachtmann, Secretary~~ ~~John Shearer, Assistant Secretary~~

Lawton Chiles- Governor Carol Browner- Secretary

FAX TRANSMITTAL LETTER

DATE: 1-23-91

TO:

NAME: Greg Worley
AGENCY: U.S. EPA, Region IV

TELEPHONE: 404-347-5207

OF PAGES (INCLUDE COVER SHEET): 5

FROM:

NAME: Bruce Mitchell

AGENCY: FDER / DARM / BAR

IF ANY PAGES ARE NOT CLEARLY RECEIVED, PLEASE CALL IMMEDIATELY. PHONE NO. 904-488-1344

SENDER'S NAME: R. Bruce Mitchell

COMMENTS: comments from representatives for Hernando County, FL Crushed Stone Co. - TDF issues vs Baseline results

MESSAGE CONFIRMATION JAN-23-'91 WED 12:20

TERM ID: DIV OF AIR RES MGMT P-9999

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Florida Department of Environmental Regulation

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~~Bob Martinez,~~ Governor ~~Dale Twachtmann, Secretary~~ ~~John Shearer, Assistant Secretary~~
Lawton Chiles - Governor Carol Browner - Secretary

FAX TRANSMITTAL LETTER

DATE: 1-23-91

TO:

NAME: John Bunyak
AGENCY: National Park Service - Air

TELEPHONE: 303-969-2822

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SENDER'S NAME: Bruce Mitchell

COMMENTS: Comments received from representatives of Hernando County, FL Crushed Stone Co - TDF issues vs Baseline results

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Florida Department of Environmental Regulation

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

Bob Martinez, Governor | Dale Twachtmann, Secretary | John Shearer, Assistant Secretary

December 18, 1990

Mrs. Chris Shaver, Chief
Permit Review and Technical Support Branch
National Park Service
Air Quality Division
Post Office Box 25287
Denver, Colorado 80255

Dear Mrs. Shaver:

Re: Emissions Test Reports at Baseline and TDF Conditions
Florida Crushed Stone (PSD-FL-091 amendment test burn)

Enclosed are the above referenced reports regarding recent performance tests conducted at Florida Crushed Stone's existing facility located in Hernando County, Florida. Even though a formal request to continuously fire tire derived fuel at FCS has not yet been received by the Department's Bureau of Air Regulation (BAR), please evaluate and provide comments to the BAR by January 20, 1991.

If there are any questions, please give Bruce Mitchell a call at 904-488-1344 or write to me at the above address.

Sincerely,

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

CHF/BM/plm

Enclosures

c: B. Thomas, SW Dist.
J. Koogler, P.E., K&A
Bruce Mitchell } 12/19/90 RA
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John Glunn }

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Florida Department of Environmental Regulation

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

Bob Martinez, Governor
Dale Twachtmann, Secretary
John Shearer, Assistant Secretary

December 18, 1990

Mr. Bill Thomas, Administrator
Air Programs
Southwest District
4520 Oak Fair Boulevard
Tampa, Florida 33610-7347

Dear Mr. Bill ~~Thomas~~:

Re: Emissions Test Reports at Baseline and TDF Conditions
Florida Crushed Stone (PSD-FL-091 amendment test burn)

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Sincerely,

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

CHF/BM/plm

Enclosures

c: J. Koogler, P.E., K&A

File Copy

Florida Department of Environmental Regulation
Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400
Bob Martinez, Governor
Dale Twachtmann, Secretary
John Shearer, Assistant Secretary

December 18, 1990

Ms. Jewell A. Harper, Chief
Air Enforcement Branch
Air, Pesticides & Toxics Management Division
U.S. EPA, Region IV
345 Courtland Street, N.E.
Atlanta, Georgia 30365

Dear Ms. Harper:

Re: Emissions Test Reports at Baseline and TDF Conditions
Florida Crushed Stone (PSD-FL-091 amendment test burn)

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Sincerely,

CHFancy

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

CHF/BM/plm

Enclosures

c: B. Thomas, SW Dist.
J. Koogler, P.E., K&A
Bruce Mitchell
Reading File
John Glunn
} 12/19/90

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Florida Department of Environmental Regulation
Twin Towers Office Bldg. ● 2600 Blair Stone Road ● Tallahassee, Florida 32399-2400
Bob Martinez, Governor   Dale Twachtmann, Secretary   John Shearer, Assistant Secretary

December 18, 1990

Mr. Tom Richardson, Chairman
Board of Hernando County Commission
20 North Main Street, Room 262
Brooksville, Florida 34601

Dear Mr. Richardson:

Re: Emissions Test Reports at Baseline and TDF Conditions
Florida Crushed Stone (PSD-FL-091 amendment test burn)

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Sincerely,

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

CHF/BM/plm

Enclosures

c: B. Thomas, SW Dist.
J. Koogler, P.E., K&A
Bruce Mitchell
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John Glunn
12-19-90 RA

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ENVIRONMENTAL SERVICES
4014 NW THIRTEENTH STREET
GAINESVILLE, FLORIDA 32609
904/377-5822 ▪ FAX 377-7158

KA 307-90-01

May 13, 1991

Mr. C. H. Fancy
Chief
Bureau of Air Regulations
Florida Department of
Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

RECEIVED
MAY 20 1991
Division of Air
Resources Management

Subject: Florida Crushed Stone Company
Tire Derived Fuel Test
Response to EPA Comments

Dear Mr. Fancy:

Under cover of your letter dated May 8, 1991, you forwarded a copy of a letter to you from Jewell Harper, EPA Region IV, commenting on the emission measurements conducted at the Florida Crushed Stone Company plant in Hernando County in September 1990. Two sets of emission measurements were conducted and reported to your office; one set with the plant operating under normal conditions and the second set with the plant utilizing tire derived fuel to supplement coal normally fired to the cement kiln. In the following paragraphs are responses to the EPA comments.

Documentation of Plant Operating Conditions

1. **Logbooks or stripcharts of the actual feed rates to and production rates of the portland cement kiln, power plant and lime calciner. In the test report, feed and production rates for each process are only stated as an average over the test period and no actual process data is presented. The report also states that TDF was used to provide up to 15 percent of the total heat input to the cement kiln but did not provide any actual feed rates or analysis of the TDF to substantiate the claim.**

In Attachment 1, documentation of plant operating rates, coal feed rates and tire derived fuel feed rates are presented.

2. **Logbooks or strip charts which document the operation of the pollution control devices. The type of air pollution control device should also be specified. Based upon the stack temperature, we believe that the pollution control device is an ESP.**

The air pollution control device that controls emissions from the power plant, lime plant, and cement plant at the Florida Crushed Stone CPL plant is a baghouse. In Attachment 1, the operating parameters of the baghouse are documented.

In addition to the data from the plant operating records documenting the operation of the baghouse, the total particulate matter emission measurements also provide documentation that the baghouse was operating under similar conditions during the two sets of tests. For example, during the baseline test, the particulate matter emission rate was 56.8 pounds per hour and the particulate matter concentration in the stack gas was 0.0104 grains per dry standard cubic foot. During the tire derived fuel test, the particulate matter mass emission rate and concentration were 52.2 pounds per hour and 0.0103 grains per dry standard cubic foot, respectively.

Comments on Test Methods and Test Data

1. **The acetone blank corrections for the Method 5 test results were not performed and the true acetone blank corrections should be obtained. To properly correct the amount of particulate collected in a Method 5 sampling train, the exact volume of acetone used to rinse the front half of the sampling train must be determined as is the volume of the acetone blank. It appears that the analyst evaporated the acetone blanks and samples to dryness without determining their volume. If the volume of acetone for the blank and each sample cannot be determined, small errors in the results (less than ± 5%) are probable.**

The particulate matter samples collected during the baseline test on September 18 and 19, 1990, and the particulate matter samples from the tire derived fuel test conducted on September 20 and 21, 1990, were all processed in our laboratory on September 25, 1990. The acetone used to rinse the sampling train during all tests was from the same batch. As a result, only one acetone blank was run with the six particulate matter samples. The result of this blank analysis was reported only in the baseline test report; however, the same blank was used for both sets of samples. It will be noted on the particulate matter lab data sheets in both test reports that the same blank correction was made (see Attachment 2).

Regarding the volumes of the samples and the acetone blank, it is our practice to adjust the volumes of all samples and the acetone blank to the largest sample volume; whatever this volume may be. The adjustment is made with the acetone that was used for sample train cleanup in the field.

As all samples are adjusted to a constant volume, volume corrections are not necessary when making blank weight corrections on individual samples.

2. **The test procedure and documentation of the CO2 concentrations should be made. With the exception of the three particulate-metal test runs under baseline conditions, no note of the CO2 measurements were made. Considering the nature of the process, CO2 can be generated in portland cement plants and the assumption that CO2 emissions equals 21 minus the O2 concentration is erroneous. In addition, since combustion equipment was utilized, at a minimum an ORSAT analysis of the stack gas per test run should have been performed.**

Carbon dioxide measurements were made using an ORSAT analyzer during each of the three particulate matter/metals test runs for both baseline and tire derived fuel conditions. The carbon dioxide levels measured during the test runs of each set of tests are reported in Table 1 of each report. For the baseline tests, the average carbon dioxide concentration in the stack gas was 9.3 percent and during the tired derived fuel test, the average carbon dioxide concentration was 9.9 percent. The results of the carbon dioxide measurements made during the tire derived fuel test were recorded in the project supervisor's field notebook rather than on the test data sheets.

3. **The CO input data to the computer program which calculates the test run results indicate that CO was as high as 32,000 ppm (3.2%) during the second Modified Method 5 test run with TDF firing which conflicts with the highest reported CO test result during TDF firing of 310 ppm. Other CO input data indicate concentrations of 0 to 14000 ppm when firing TDF. These discrepancies need to be explained.**

The carbon monoxide levels ranged from 160 to 430 ppm by volume during the baseline tests and from 60 and 310 ppm during the tire derived fuel tests as summarized in Table 1 of each of the two test reports. The carbon monoxide concentrations input to the computer programs for calculating emission rates were an error on the part of the data analyst.

The data entry error would introduce an error in the calculation of the stack gas density and a corresponding error in stack gas flow rates and emission rates. Using the particulate matter and multi-metals tests on tire derived fuel as an example, the average stack gas flow rate reported in our report for the three test runs was 0.15 percent high and the reported averaged emission rate for the three test runs was 0.27 percent high as a result of the error in CO concentrations. The reported particulate matter emission rate was 52.21 pounds per hour while the correct emission rate is 52.07 pounds per hour. It is unfortunate that these errors were introduced into the calculations, however, they make no significant difference in the reported results.

Attachment 3 includes copies of the calculations of stack gas flows and particulate matter emission rates for the tire derived fuel test program using both the corrected and the originally reported carbon monoxide and carbon dioxide levels.

4. **We recommend that the dioxan/furan result for the first test run with TDF firing be rejected. The analyst of the sample indicted that the result was in question because of possible sample switching and did not even charge for the analysis of the sample.**

In Table 5 of the tire derived fuel report, a note indicates that the dioxin/furan sample from the first test run was lost in the laboratory. The results of this test run were never included in our report.

5. **We recommend that FCS be required to retest for benzene emissions during TDF firing because the laboratory could not accurately quantify the amount of benzene due to the high amount of benzene in two of three samples.**

When samples for volatile organic compounds are collected in the field, it is difficult to predict the amount of stack gas that must be collected in order to assure that the organic constituents from the gas stream are present in quantifiable amounts; that is, in quantities above the detectable limit but below the upper limit for which the analytical equipment has been calibrated. During both the baseline and the tire derived fuel tests, the samples collected for volatile organic compounds contained benzene and toluene at levels that were near or above the limit for which the analytical method had been calibrated. The linear range of instrumentation for both benzene and toluene was up to 1,000 ng of sample. Quantities of benzene in the two sets of samples ranged up to 2,000 ng (Run 2 with tire derived fuel) and quantities of toluene ranged up to 4,500 ng (Run 2 with tire derived fuel). The other samples contained toluene in quantities ranging from approximately 100 ng to less than 2,000 ng.

EPA commented that Florida Crushed Stone should be required to retest for benzene during the tire derived fuel firing because of the inaccuracy in the laboratory analysis for benzene. Research Triangle Laboratories was contacted regarding the accuracy of the reported benzene quantities when quantities ranged from the upper end of the linear range (1,000 ng) to 2,000 ng. Mr. Wayne Stollings of Research Triangle Laboratories stated that when their analyses indicated samples quantities above the linear range it was the laboratory's policy to report them as such. Mr. Stollings further stated that when the quantity of sample was between 1,000 and 2,000 ng, no sample drop-out was expected and the reported sample mass represented a good estimate of the quantity of sample actually present.

Thus, it is our opinion that the reported emission rates of benzene for both the baseline and tire derived fuel tests represent good estimates of emissions that occurred during those times. Regarding the EPA suggestion to conduct additional emission measurements for benzene while firing tire derived fuel, Florida Crushed Stone has no objection to conducting these tests once tire derived fuel firing is initiated.

If there are any questions or if further information is required to respond to matters addressed in the EPA letter, please do not hesitate to contact me.

Very truly yours,

KOOGLER & ASSOCIATES

John B. Koogler, Ph.D., P.E.

JBK:wa
Enc.

ATTACHMENT 1

SUMMARY OF PLANT AND BAGHOUSE OPERATING CONDITIONS

FLORIDA CRUSHED STONE COMPANY
CEMENT/POWER/LIME PLANT
BROOKSVILLE, FLORIDA

SEPTEMBER 18-24, 1990

KOOGLER & ASSOCIATES

SUMMARY OF PLANT AND BAGHOUSE OPERATING CONDITIONS

FLORIDA CRUSHED STONE COMPANY
CEMENT/POWER/LIME PLANT
BROOKSVILLE, FLORIDA

SEPTEMBER 18-24, 1990

	Cement Plant			Power Plant		Lime Plant	
Date	Kiln Feed (tph)	Clinker Prod (tph)	Coal Feed (tph)	Power output (MW/hr)	Boiler Coal Feed (tph)	Calciner Feed (tph)	Coal to Calciner (tph)
Baseline							
9/18/90	127.25	76.35	8.54	114.08	42.1	34.7	10.8
9/19/90	123.64	74.18	8.15	113.92	43.9	30.4	9.3
9/20/90	123.06	73.84	8.23	92.54	42.2	3.29	0 (3)
AVG	124.65	74.79	8.31	106.85	42.7		
TDF							
9/20/90	122.95	73.77	7.82	92.54	42.2	3.29	0 (3)
9/21/90	125.00(1)	75.00(1)	7.20(1)	109.38	46.6	17.41	6.78
9/24/90	113.81	68.29	7.56	115.92	51.8	1.29	0 (3)
AVG	120.59	72.35	7.69	105.95	46.9		

	Baghouse			
Date	Inlet Temp. (°F)	Fan Speed (%)	Fan Current (Amps)	Pressure Drop ("H_2O)
Baseline				
9/18/90	328.5	34.88	479.33	6.5
9/19/90	327.1	34.73	474.09	6.6
9/20/90	357.2	34.90	470.20	6.3
AVG	337.6	34.83	474.54	6.5
TDF				
9/20/90	337.2	34.95	477.40	6.2
9/21/90	(2)	(2)	(2)	(2)
9/24/90	350.4	33.38	448.90	6.3
AVG	343.8	34.16	463.15	6.3

(1) Data obtained from operator's logbook rather than computer printouts.

(2) Baghouse data not available for this day.

(3) Calciner beds reconditioned.

CEMENT PLANT PRODUCTION DATA

PYROPROCESSING OPERATIONS

DATE: SEPT 21-90

	KILN FEED WITHDRAWAL						Kiln Feed Bin Level			Kiln Feed Control Valve			KITØ2	KIPØ2	Meal Temp	Kiln Inlet Temp	Kiln Inlet Press.	O_2	CO	Nox	Fan Temp	Feedrate	Mill Amps	Fan Amps	Fan Dischar Press.	Precal %	Precal Press.	COOLER			Discharge Temp	Hood Draft		
	C3S Silo 1	1A	1B	C3S Silo 2	2A	2B	PV	SP	OUT	PV	SP	OUT	PREHEATER								COAL							PV	SP	OUT		PV	SP	OUT
7:00		05	—	—	53	-	37	37	28	110	110	34	13.5	800	1320	1670	.58	6.3	169	[illegible]	168	7.5	226	241	14.9			16.5	15	52	447	-.17	-.15	65
8:00		05	—	—	44	-	37	37	21.	110	110	32	12.8	802	1292	1630	.93	4.58	38	044	165	7.5	223	242	15.0			17.8	15	66	353	-.16	-.15	52
9:00		05	—	-	50	-	37	37	23	114	114	36	13.5	806	1320	1685	1.06	5.50	147	-	169	7.5	226	237	14.7			15.7	18	55	352	-.10	-.15	56
10:00		05	—	-	55	-	37	37	30	115	115	36	13.6	781	1304	1685	1.13	6.4	170	-	165	7.7	226	240	14.7			16.8	18	53	392	-.13	-.15	56
11:00		05	-	-	54	-	37	37	29	115	115	34	19.6	784	1308	1704	1.24	5.5	509	-	167	7.6	225	247	15.2			17.3	18	60	350	-.19	-.15	52
12:00		05	-	-	50	-	37	37	26	115	115	34	14.7	788	1317	1944	.76	5.5	202	-	167	7.7	227	242	15.1			16.5	18	59	500	-.14	-.15	86
13:00		05	-	-	51	-	37	37	26	115	115	34	15.9	782	1351	1901	.65	5.1	170	-	167	6.8	218	242	15.0			18.5	18	50	373	-.18	-.15	68
14:00		05	-	-	47	-	37	37	22	118	118	36	17.0	760	1370	1896	.52	5.7	194	-	168	6.8	227	244	15.1			17.5	18	54	373	-.17	-.15	66
15:00												34.8	=	125 tph								7.2												
16:00		05	-	-	45	-	37	37	28.4	100	100	28.6	16.4	725	1320	1864	.042	5.1	157	200	166	7.6	225	245	15.0			17.6	18	56	480	.14	.15	86
17:00		05	-	-	50	-	37	37	24.6	100	100	29.6	16.5	764	1275	1756	0.42	4.9	105	237	168	7.4	222	244	15.0			17.3	17.5	59	489	.13	.15	87
18:00		05	-	-	44	-	37	37	20.0	100	100	29.5	17.6	760	1255	1907	0.52	4.6	250	156	168	7.4	220	244	14.8			16.8	17.7	54	476	.00	.15	80
19:00		05	-	-	50	-	37	37	22.0	95	95	29.0	18.9	736	1232	1669	0.38	5.2	260	203	168	6.8	221	239	14.9			18.4	17.5	65	441	.012	.15	77
20:00												↑										↑												
21:00																																		
22:00																																		
23:00																																		
24:00																																		
1:00																																		
2:00																																		
3:00																																		
4:00																																		
5:00																																		
6:00																																		

Kiln feed flow control valve settings of 29% low and a high of 36% is a average of about 120 tons per hour.

Reading on coal feed rate, tons per hour.

Coal feed rate = 7.20 tph
Kiln feed rate = 125 tph
Clinker production = 75 tph

Kiln Feed / Coal Feed

* Clinker Production = Kil

19SEP90 WEDNESDAY DAILY OPERATIONS REPORT TREND LOG 7

~~H1P01 —— KILN~~ K1Q04
FEED TOTAL

~~S1F01 —— COAL~~ K1F07-S FLOW
TOTAL KILN FUEL OIL

		~~H1P01~~	~~S1F01~~	K1Q04 SMP	K1F07-S
		TPH	TPH	%	GPM
18SEP90	08:00	~~127.50~~	~~8.2813~~	39.500	*
	09:00	127.75	8.3750	43.000	*
	10:00	127.75	8.5938	29.813	*
	11:00	~~127.50~~	~~8.6875~~	30.750	*
1	12:00	126.00	8.6563-	50.375	*
2	13:00	126.75	8.6250	33.500	*
3	14:00	127.50	8.5938	31.500	*
4	15:00	127.75	8.5625	30.000	*
5	16:00	~~127.75~~	~~8.4375~~	30.875	*
6	17:00	127.75	8.3438-	25.813	*
	18:00	127.75	8.4063	21.063	*
	19:00	~~127.75~~	~~8.3125~~	26.000	*
	20:00	127.75	8.3438	24.563	*
	21:00	~~127.75~~	~~8.3750~~	41.750	*
	22:00	126.50	8.3750	52.125	*
	23:00	121.25	8.3750	*	*
19SEP90	00:00	~~119.25~~	~~8.3125~~	*	*
	01:00	114.50	8.3438	35.000	*
	02:00	~~114.50~~	~~8.4063~~	37.625	*
	03:00	114.75	8.4375	21.938	*
	04:00	116.75	8.4375	29.625	*
	05:00	~~119.75~~	~~8.4375~~	33.875	*
	06:00	123.25	8.3125	21.938	*
	07:00	121.25	8.2813	19.375	*

Average Kiln feed = 127.25 tph
average Clinker production = 127.25 *
average Coal feed = 8.54 tph

Kiln feed / Coal feed

* Clinker Production ≈ Kiln

20SEP90 THURSDAY DAILY OPERATIONS REPORT

K1F01 KILN FEED TOTAL

S1F01 COAL TOTAL

		K1F01	S1F01	K1Q[illegible]	K1F0[illegible]
		TPH	TPH	%	SPM
19SEP90	1 08:00	120.75	8.1875	27.938	
	2 09:00	120.75	8.0938	23.938	
	3 10:00	121.25	8.1875	40.000	
	4 11:00	121.50	8.1563	10.338	
	5 12:00	122.25	8.4063	34.625	
	6 13:00	123.50	8.3438	[illegible]	
	7 14:00	124.25	8.3125	34.000	
	8 15:00	125.50	7.8750	30.750	
	9 16:00	125.75	7.8750	23.375	
	10 17:00	125.75	8.0625	27.250	
	11 18:00	125.75	8.1875	[illegible]	
	19:00	125.50	8.2813	[illegible]	
	20:00	125.75	8.3125	17.625	
	21:00	125.75	8.3125	19.000	
	22:00	125.75	8.3438	37.250	
	23:00	126.50	8.3438	19.688	
20SEP90	00:00	127.25	8.2813	26.688	
	01:00	127.75	8.1875	36.188	
	02:00	126.75	8.0938	26.938	
	03:00	124.75	7.7638	30.125	
	04:00	120.75	7.7344	33.000	
	05:00	119.75	8.2813	27.063	
	06:00	119.75	8.7813	32.750	
	1 07:00	122.00	8.2813	41.000	

average Kiln feed = 123.64 tph

average Clinker production = 74.18 tph

average coal feed = 8.15 tph

Kiln feed / Coal feed

Clinker Production = Kiln feed * 0.6

9/20/90

```
21SEP90 FRIDAY              DAILY OPERATIONS REPORT              TREND LOG  7

                    H1F01     KILN        K1Q04
                      FEED TOTAL

                    S1F01      COAL        K1F07-S   FLOW
                               TOTAL        KILN FUEL OIL

                    H1F01      S1F01       K1Q04       K1F07-S
                                              SMF
                    TPH        TPH         %           GPM
20SEP90 2 08:00     123.25     8.2500      35.375               *
        3 09:00     123.75     8.0938      30.625               *
        4 10:00     123.75     8.0625      42.625               *
        5 11:00     ~~123.75~~     ~~8.0625~~      44.375               *
        6 12:00     123.75     8.2813      55.100               *
        7 13:00     122.50     8.4063      30.000               *

        8 14:00     121.75     8.4063 1    33.625               *
          15:00     122.50     8.0000 2    35.250               *
          16:00     123.25     7.8594 3    26.438               *
          17:00     124.50     7.4688 4    23.750               *
          18:00     122.50     7.3750 5    23.000               *
          19:00     119.75     7.7032      40.625               *

          20:00     118.00     8.0000      13.625               *
          21:00     116.25     8.1563      7.1563               *
          22:00     114.75     8.2188      29.813               *
          23:00     115.25     8.3438      34.125               *
21SEP90   00:00     116.75     8.3438      21.688               *
          01:00     117.50     8.2500      23.688               *

          02:00     117.75     8.2188      24.000               *
          03:00     117.75     8.2188      25.750               *
          04:00     115.75     8.2500      50.250               *
          05:00     114.75     8.3438      27.938               *
          06:00     114.00     8.0313      4.8594               *
          07:00     109.75     8.0313      10.594               *
```

average Kiln feed = 123.06 tph
average Clinker production = 73.84 tph
average Coal feed = 8.23 tph

average Kiln feed = 122.95 tph
average Clinker Production = 73.77 tph
average coal feed = 7.82 tph

Baseline average kiln feed = 124.65 tph
Baseline average Clinker Production = 74.79 tph
Baseline average coal feed = 8.31 tph

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9/24/90

Kiln feed / Coal feed

Clinker Production = Kilnfeed * 0.6

```
[illegible] COMPANY            DAILY OPERATIONS REPORT

                      K1F01     KILN        K1Q04
                        FEED  TOTAL

                      S1F01     COAL        K1F07-S    FLOW
                               TOTAL         KILN FUEL OIL

                      K1F01     S1F01       [illegible]  [illegible]

                      TPH       TPH          %          GPM
24SEP90 08:00       132.00     8.0625      38.500
      1 09:00       121.00     8.4688      36.500
      2 10:00       119.75     8.5000      [illegible]
      3 11:00       120.25     8.4375      [illegible]
      4 12:00       121.75     8.2188      [illegible]
      5 13:00       124.25     8.0625      27.063
      6 14:00       125.25     7.9844      2[illegible].563
      7 15:00       131.50     7.4688      [illegible]
      8 16:00       126.00     7.7657      19.[illegible]
      9 17:00       100.00     7.5169      [illegible]
     10 18:00       48.375     3.1250      29.438
        19:00       6.8282     -.0489      [illegible].2188
        20:00       4.6563     -.0489      [illegible]
        21:00       4.2344     -.0489      [illegible]
        22:00       3.8350     -.0489      [illegible]
        23:00       2.7110     -.0489      [illegible].250
25SEP90 00:00       2.9532     -.0489      88.000
        01:00       2.2813     -.0489      [illegible]
        02:00       2.1394     -.0489      [illegible]
        03:00       3.8107     -.0487      [illegible]
        04:00       3.6172     -.0465      89.750
        05:00       3.7579     -.0461
        06:00       4.5[illegible]     -.0461
        [illegible]       1.7032     -.0161
```

average Kiln feed : 113.81 tph
average Clinker Production = 68.29 tph
~~average Coal feed = 7.56 tph~~

TDF Average Kiln feed = 120.59 tph

TDF Average Clinker Production = 72.35 tph

TDF Average Coal feed rate ≈ 7.69 tph

POWER PLANT PRODUCTION DATA

AND

LIME PLANT PRODUCTION DATA

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PRINTED             REPORT FOR                CENTRAL POWER AND LIME INC.               PAGE 65
23:58:05            17-SEP-90                          POWER PLANT
18-SEP-90           MONDAY                             DAILY REPORT
==========================================================================================================
                                       PLANT INTEGRATORS                                :   NET GENERATION
----------------------------------------------------------------------------------------------------------
STM FLOW TO HP TURBINE        129516.0KLB    SERV WATER MAKE-UP FLOW          9464KLB   :   0000    114MW
FW FLOW TO SH ATTEMP 1A        50831.0KLB    TOTAL COAL TO CALCINER         2762.1KLB   :   0100    114MW
FW FLOW TO SH ATTEMP 1B         5910.6KLB    TOTAL AIR TO CALCINER         33298.0KLB   :   0200    114MW
FW FLOW TO RH ATTEMP 1A        15247.0KLB    TOTAL SEC AIR TO CMPT 1A         7027KLB   :   0300    114MW
FW FLOW TO RH ATTEMP 1B         5712.1KLB    TOTAL SEC AIR TO CMPT 1B        43480KLB   :   0400    114MW
FW FLOW TO EAST ECON           265430KLB     TOTAL SEC AIR TO CMPT 1C         6034KLB   :   0500    114MW
FW FLOW TO WEST ECON           961424KLB     TOTAL SEC AIR TO CMPT 1D        52816KLB   :   0600    113MW
BFP A SUCTION FLOW                101KLB     S-U BURNER AIR FLOW              8307KCF   :   0700    116MW
BFP B SUCTION FLOW               4539KLB     TOTAL COAL // STEAM PROD            0KLB   :   0800    115MW
BFP C SUCTION FLOW               4137KLB     LIMESTONE FEED TO CALCINER      38745TONS  :   0900    113MW
PULV 1A COAL FLOW               25392KLB     F B DRYER TOTALIZER             40906TONS  :   1000    115MW
PULV 1B COAL FLOW               29069KLB     D10 HOUR-METER                   1248HRS   :   1100    114MW
PULV 1C COAL FLOW               22299KLB     OIL FLOW TO BOILER              17986GAL   :   1200    115MW
PULV 1D COAL FLOW               30106KLB     OIL FLOW FROM BOILER            14375GAL   :   1300    114MW
TOTAL COAL TO BOILER           106868KLB     NET OIL FLOW                    3611.0GAL  :   1400    115MW
TOTAL AIR TO BOILER               401KLB     TOTAL GENERATION               119.2MWHR   :   1500    115MW
STEAM FLOW TO FGRE               9701KLB     NET GENERATION                   116MWHR   :   1600    115MW
TOTAL COAL //STEAM PROD              KLB     AUXILIARY LOAD                  15.8MWHR   :   1700    116MW
MAKE-UP FLOW TO COND           101092KLB     XFMR 4 (REPURCHASE)            18.01MWHR   :   1800    116MW
DUMP FLOW TO STORAGE TANK      154932KLB     XFMR 5 (POWER PLANT)            0.08MWHR   :   1900    117MW
COND FLOW TO DEAERATOR         648512KLB     CEMENT PLANT                   17.72MWHR   :   2000    115MW
TOTAL DEMIN WATER PRO                KLB                                                :   2100    115MW
                                                                                        :   2200    114MW
                                                                                        :   2300    112MW
                                                                                        :   TOTAL  2747MW
```

= 114.46 MW/hr

Feed Rate for Coal

MW for Power Plant

FAX TRANSMITTAL MEMO

TO: KOOGLER + ASSOC. JOSE

DEPT: ______ FAX #: (904) 377-7?

FROM: FCS PHONE: 377-5822

CO: TOM MOONTAIN FAX #: ______

NO. OF PAGES #1

Post-it™ brand fax transmittal memo 7671

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PRINTED                    REPORT FOR                 CENTRAL POWER AND LIME INC.           PAGE 65
23:58:04                   18-SEP-90                          POWER PLANT
19-SEP-90                  TUESDAY                            DAILY REPORT
==================================================================================================================
                                         PLANT INTEGRATORS                                   :    NET GENERATION
------------------------------------------------------------------------------------------------------------------
STM FLOW TO HP TURBINE        150336.0KLB     SERV WATER MAKE-UP FLOW          9454KLB     :    0000      115MW
FW FLOW TO SH ATTEMP 1A        51555.0KLB     TOTAL COAL TO CALCINER          3299.1KLB =  :    0100      114MW
FW FLOW TO SH ATTEMP 1B         6147.0KLB     TOTAL AIR TO CALCINER         37022.0KLB     :    0200      114MW
FW FLOW TO RH ATTEMP 1A        15688.8KLB     TOTAL SEC AIR TO CMPT 1A         8438KLB     :    0300      113MW
FW FLOW TO RH ATTEMP 1B         5841.1KLB     TOTAL SEC AIR TO CMPT 1B        44684KLB     :    0400      114MW
FW FLOW TO EAST ECON             37089KLB     TOTAL SEC AIR TO CMPT 1C         6967KLB     :    0500      113MW
FW FLOW TO WEST ECON            971136KLB     TOTAL SEC AIR TO CMPT 1D        53810KLB     :    0600      114MW
BFP A SUCTION FLOW                2092KLB     S-U BURNER AIR FLOW              2329KCF     :    0700      114MW
BFP B SUCTION FLOW                6779KLB     TOTAL COAL // STEAM PROD            0KLB     :    0800      115MW
BFP C SUCTION FLOW                4701KLB     LIMESTONE FEED TO CALCINER     395781TONS =  :    0900      116MW
PULV 1A COAL FLOW                25898KLB     F B DRYER TOTALIZER            41714TONS     :    1000      114MW
PULV 1B COAL FLOW                29592KLB     D10 HOUR-METER                   1269HRS     :    1100      114MW
PULV 1C COAL FLOW                22763KLB     OIL FLOW TO BOILER             17986GAL      :    1200      114MW
PULV 1D COAL FLOW                30638KLB     OIL FLOW FROM BOILER           14375GAL      :    1300      115MW
TOTAL COAL TO BOILER            108890KLB =   NET OIL FLOW                   3611.0GAL     :    1400      114MW
TOTAL AIR TO BOILER               7157KLB     TOTAL GENERATION              117.6MWHR      :    1500      115MW
STEAM FLOW TO FGRE                 187KLB     NET GENERATION                  114MWHR      :    1600      115MW
TOTAL COAL //STEAM PROD               KLB     AUXILIARY LOAD                 13.8MWHR      :    1700      114MW
MAKE-UP FLOW TO COND            101898KLB     XFMR 4 (REPURCHASE)           18.25MWHR      :    1800      114MW
DUMP FLOW TO STORAGE TANK       156004KLB     XFMR 5 (POWER PLANT)           0.08MWHR      :    1900      114MW
COND FLOW TO DEAERATOR          665920KLB     CEMENT PLANT                  18.06MWHR      :    2000      114MW
TOTAL DEMIN WATER PRO                 KLB                                                  :    2100      114MW
                                                                                           :    2200      114MW
                                                                                           :    2300      111MW
                                                                                           :    TOTAL    2738MW
```

= 114.08 MW/hr

Feed Rate for Coal
MW for Power Plant

```
PRINTED                    REPORT FOR                   CENTRAL POWER AND LIME INC.                    PAGE 65
23:58:05                   19-SEP-90                           POWER PLANT
20-SEP-90                  WEDNESDAY                           DAILY REPORT
==========================================================================================================
                                     PLANT INTEGRATORS                                       :   NET GENERATION
----------------------------------------------------------------------------------------------------------
STM FLOW TO HP TURBINE         171080.0KLB     SERV WATER MAKE-UP FLOW           9454KLB    :   0000     114MW
FW FLOW TO SH ATTEMP 1A         52323.0KLB     TOTAL COAL TO CALCINER          3745.1KLB -  :   0100     115MW
FW FLOW TO SH ATTEMP 1B          6400.9KLB     TOTAL AIR TO CALCINER          44339.0KLB    :   0200     113MW
FW FLOW TO RH ATTEMP 1A         16094.3KLB     TOTAL SEC AIR TO CMPT 1A          9643KLB    :   0300     115MW
FW FLOW TO RH ATTEMP 1B          5986.1KLB     TOTAL SEC AIR TO CMPT 1B         46006KLB    :   0400     114MW
FW FLOW TO EAST ECON              47730KLB     TOTAL SEC AIR TO CMPT 1C          7763KLB    :   0500     114MW
FW FLOW TO WEST ECON             980752KLB     TOTAL SEC AIR TO CMPT 1D         54750KLB    :   0600     113MW
BFP A SUCTION FLOW                 4082KLB     S-U BURNER AIR FLOW               6278KCF    :   0700     114MW
BFP B SUCTION FLOW                 9019KLB     TOTAL COAL // STEAM PROD             0KLB    :   0800     114MW
BFP C SUCTION FLOW                 5263KLB     LIMESTONE FEED TO CALCINER      40308TONS    :   0900     114MW
PULV 1A COAL FLOW                 26410KLB     F 8 DRYER TOTALIZER             42290TONS    :   1000     114MW
PULV 1B COAL FLOW                 30143KLB     D10 HOUR-METER                    1285HRS    :   1100     115MW
PULV 1C COAL FLOW                 23254KLB     OIL FLOW TO BOILER              17986GAL     :   1200     114MW
PULV 1D COAL FLOW                 31193KLB     OIL FLOW FROM BOILER            14375GAL     :   1300     115MW
TOTAL COAL TO BOILER             110998KLB =   NET OIL FLOW                    3611.0GAL    :   1400     114MW
TOTAL AIR TO BOILER                5017KLB     TOTAL GENERATION               116.9MWHR     :   1500     114MW
STEAM FLOW TO FGRE                  659KLB     NET GENERATION                   114MWHR     :   1600     114MW
TOTAL COAL //STEAM PROD                KLB     AUXILIARY LOAD                  13.8MWHR     :   1700     114MW
MAKE-UP FLOW TO COND             102706KLB     XFMR 4 (REPURCHASE)            18.03MWHR     :   1800     228MW
DUMP FLOW TO STORAGE TANK        157076KLB     XFMR 5 (POWER PLANT)            0.08MWHR     :   1900       2MW
COND FLOW TO DEAERATOR           683264KLB     CEMENT PLANT                   17.60MWHR     :   2000     113MW
TOTAL DEMIN WATER PRO                  KLB                                                  :   2100     113MW
                                                                                            :   2200     114MW
                                                                                            :   2300     110MW
                                                                                            :   TOTAL   2734MW
```

= 113.92 MW/hr

Feed Rate for Coal
MW for Power

```
PRINTED                 REPORT FOR                  CENTRAL POWER AND LIME INC.                  PAGE 65
23:58:04                20-SEP-90                              POWER PLANT
21-SEP-90               THURSDAY                               DAILY REPORT
===================================================================================================================
                                        PLANT INTEGRATORS                                        :   NET GENERATION
-------------------------------------------------------------------------------------------------------------------
STM FLOW TO HP TURBINE        188320.0KLB      SERV WATER MAKE-UP FLOW            9464KLB    :   0000      113MW
FW FLOW TO SH ATTEMP 1A        52580.0KLB      TOTAL COAL TO CALCINER            3745.1KLB   :   0100      115MW
FW FLOW TO SH ATTEMP 1B         6481.8KLB      TOTAL AIR TO CALCINER            44786.0KLB   :   0200      114MW
FW FLOW TO RH ATTEMP 1A        16136.3KLB      TOTAL SEC AIR TO CMPT 1A            9691KLB   :   0300      114MW
FW FLOW TO RH ATTEMP 1B         5994.6KLB      TOTAL SEC AIR TO CMPT 1B           46058KLB   :   0400      115MW
FW FLOW TO EAST ECON             56868KLB      TOTAL SEC AIR TO CMPT 1C            7947KLB   :   0500      114MW
FW FLOW TO WEST ECON            988992KLB      TOTAL SEC AIR TO CMPT 1D           54898KLB   :   0600      112MW
BFP A SUCTION FLOW                4520KLB      S-U BURNER AIR FLOW                 5130KCF   :   0700      111MW
BFP B SUCTION FLOW                9477KLB      TOTAL COAL // STEAM PROD               0KLB   :   0800      106MW
BFP C SUCTION FLOW                5837KLB      LIMESTONE FEED TO CALCINER        40387TONS   :   0900       87MW
PULV 1A COAL FLOW                26698KLB      F B DRYER TOTALIZER               42513TONS   :   1000       61MW
PULV 1B COAL FLOW                30735KLB      D10 HOUR-METER                      1290HRS   :   1100       51MW
PULV 1C COAL FLOW                23769KLB      OIL FLOW TO BOILER                 19848GAL   :   1200       69MW
PULV 1D COAL FLOW                31819KLB      OIL FLOW FROM BOILER               15078GAL   :   1300       69MW
TOTAL COAL TO BOILER            113022KLB      NET OIL FLOW                       3770.4GAL  :   1400       76MW
TOTAL AIR TO BOILER               1208KLB      TOTAL GENERATION                  112.2MWHR   :   1500       80MW
STEAM FLOW TO FGRE                1064KLB      NET GENERATION                      109MWHR   :   1600       80MW
TOTAL COAL //STEAM PROD               KLB      AUXILIARY LOAD                     13.9MWHR   :   1700       80MW
MAKE-UP FLOW TO COND            103416KLB      XFMR 4 (REPURCHASE)                5.82MWHR   :   1800       76MW
DUMP FLOW TO STORAGE TANK       158148KLB      XFMR 5 (POWER PLANT)               0.08MWHR   :   1900       77MW
COND FLOW TO DEAERATOR          697824KLB      CEMENT PLANT                       9.45MWHR   :   2000       83MW
TOTAL DEMIN WATER PRO                 KLB                                                    :   2100      103MW
                                                                                             :   2200      108MW
                                                                                             :   2300      105MW
                                                                                             :   TOTAL    2221MW
```

=

= 92.54 MW/hr

~~Head~~ Heat rate for Coal

MW for Power Plant

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PRINTED                    REPORT FOR                        CENTRAL POWER AND LIME INC.                 PAGE 65
23:58:04                   21-SEP-90                                 POWER PLANT
22-SEP-90                  FRIDAY                                    DAILY REPORT
==============================================================================================================================
                                           PLANT INTEGRATORS                                            :     NET GENERATION
------------------------------------------------------------------------------------------------------------------------------
STM FLOW TO HP TURBINE           208216.0KLB         SERV WATER MAKE-UP FLOW               9454KLB     :   0000        109MW
FW FLOW TO SH ATTEMP 1A           53260.0KLB         TOTAL COAL TO CALCINER              4070.7KLB     :   0100        109MW
FW FLOW TO SH ATTEMP 1B            6669.0KLB         TOTAL AIR TO CALCINER              48450.0KLB     :   0200        108MW
FW FLOW TO RH ATTEMP 1A           16407.5KLB         TOTAL SEC AIR TO CMPT 1A             10193KLB     :   0300        106MW
FW FLOW TO RH ATTEMP 1B            6130.8KLB         TOTAL SEC AIR TO CMPT 1B             46557KLB     :   0400        105MW
FW FLOW TO EAST ECON                 67158KLB         TOTAL SEC AIR TO CMPT 1C              8776KLB     :   0500        109MW
FW FLOW TO WEST ECON                998288KLB         TOTAL SEC AIR TO CMPT 1D             55829KLB     :   0600         87MW
BFP A SUCTION FLOW                    7960KLB         S-U BURNER AIR FLOW                   2501KCF     :   0700         70MW
BFP B SUCTION FLOW                    1516KLB         TOTAL COAL // STEAM PROD                 0KLB     :   0800         94MW
BFP C SUCTION FLOW                    4653KLB         LIMESTONE FEED TO CALCINER          40805TONS     :   0900        116MW
PULV 1A COAL FLOW                    27272KLB         F B DRYER TOTALIZER                 42515TONS     :   1000        115MW
PULV 1B COAL FLOW                    31319KLB         D10 HOUR-METER                        1290HRS     :   1100        115MW
PULV 1C COAL FLOW                    24247KLB         OIL FLOW TO BOILER                   27018GAL     :   1200        116MW
PULV 1D COAL FLOW                    32424KLB         OIL FLOW FROM BOILER                 21303GAL     :   1300        117MW
TOTAL COAL TO BOILER                115260KLB         NET OIL FLOW                         5712.5GAL    :   1400        115MW
TOTAL AIR TO BOILER                   8583KLB         TOTAL GENERATION                    118.8MWHR     :   1500        117MW
STEAM FLOW TO FGRE                    1484KLB         NET GENERATION                        115MWHR     :   1600        116MW
TOTAL COAL //STEAM PROD                   KLB         AUXILIARY LOAD                       14.0MWHR     :   1700        114MW
MAKE-UP FLOW TO COND                104248KLB         XFMR 4 (REPURCHASE)                 11.97MWHR     :   1800        114MW
DUMP FLOW TO STORAGE TANK           159216KLB         XFMR 5 (POWER PLANT)                 0.08MWHR     :   1900        114MW
COND FLOW TO DEAERATOR              714576KLB         CEMENT PLANT                        12.13MWHR     :   2000        115MW
TOTAL DEMIN WATER PRO                     KLB                                                           :   2100        117MW
                                                                                                        :   2200        117MW
                                                                                                        :   2300        111MW
                                                                                                        :   TOTAL      2625MW
```

=109.38 MW/hr

Heat Rate for Coal
MW for Power Plant

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PRINTED                 REPORT FOR                    CENTRAL POWER AND LIME INC.                 PAGE 65
23:58:03                23-SEP-90                            POWER PLANT
24-SEP-90               SUNDAY                               DAILY REPORT
=====================================================================================================================
                                     PLANT INTEGRATORS                                           !    NET GENERATION
---------------------------------------------------------------------------------------------------------------------
STM FLOW TO HP TURBINE          250376.0KLB      SERV WATER MAKE-UP FLOW            9454KLB      !    0000       115MW
FW FLOW TO SH ATTEMP 1A          54459.0KLB      TOTAL COAL TO CALCINER           4603.1KLB      !    0100       114MW
FW FLOW TO SH ATTEMP 1B           6906.5KLB      TOTAL AIR TO CALCINER           54819.0KLB      !    0200       115MW
FW FLOW TO RH ATTEMP 1A          16899.0KLB      TOTAL SEC AIR TO CMPT 1A          11278KLB      !    0300       114MW
FW FLOW TO RH ATTEMP 1B           6257.4KLB      TOTAL SEC AIR TO CMPT 1B          47634KLB      !    0400       114MW
FW FLOW TO EAST ECON               89080KLB      TOTAL SEC AIR TO CMPT 1C          10366KLB      !    0500       115MW
FW FLOW TO WEST ECON               18195KLB      TOTAL SEC AIR TO CMPT 1D          57378KLB      !    0600       113MW
BFP A SUCTION FLOW                  2612KLB      S-U BURNER AIR FLOW                8791KCF      !    0700       112MW
BFP B SUCTION FLOW                  6589KLB      TOTAL COAL // STEAM PROD              0KLB      !    0800       113MW
BFP C SUCTION FLOW                  5618KLB      LIMESTONE FEED TO CALCINER        41641TONS     !    0900       115MW
PULV 1A COAL FLOW                  28547KLB      F B DRYER TOTALIZER               43608TONS     !    1000       118MW
PULV 1B COAL FLOW                  32511KLB      D10 HOUR-METER                     1317HRS      !    1100       119MW
PULV 1C COAL FLOW                  25304KLB      OIL FLOW TO BOILER                27016GAL      !    1200       120MW
PULV 1D COAL FLOW                  33655KLB      OIL FLOW FROM BOILER              21303GAL      !    1300       117MW
TOTAL COAL TO BOILER              120016KLB      NET OIL FLOW                      5712.5GAL     !    1400       116MW
TOTAL AIR TO BOILER                 4064KLB      TOTAL GENERATION                  120.7MWHR     !    1500       117MW
STEAM FLOW TO FGRE                  2437KLB      NET GENERATION                      117MWHR     !    1600       117MW
TOTAL COAL //STEAM PROD                 KLB      AUXILIARY LOAD                     14.0MWHR     !    1700       117MW
MAKE-UP FLOW TO COND              105876KLB      XFMR 4 (REPURCHASE)                6.18MWHR     !    1800       118MW
DUMP FLOW TO STORAGE TANK         161360KLB      XFMR 5 (POWER PLANT)               0.08MWHR     !    1900       116MW
COND FLOW TO DEAERATOR            749536KLB      CEMENT PLANT                       9.29MWHR     !    2000       114MW
TOTAL DEMIN WATER PRO                   KLB                                                      !    2100       115MW
                                                                                                 !    2200       118MW
                                                                                                 !    2300       113MW
                                                                                                 !    TOTAL     2771MW
```

Feed rate for Coal
MW for Power Plant

6 115.45 MW

12,600

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PRINTED                   REPORT FOR                    CENTRAL POWER AND LIMF INC.                PAGE 65
23:58:06                  24-SEP-90                               POWER PLANT
25-SEP-90                 MONDAY                                  DAILY REPORT
==================================================================================================================
                                           PLANT INTEGRATORS                                      :   NET GENERATION
------------------------------------------------------------------------------------------------------------------
STM FLOW TO HP TURBINE        271376.0KLB       SERV WATER MAKE-UP FLOW              9454KLB     :   0000      117MW
FW FLOW TO SH ATTEMP 1A        55199.0KLB       TOTAL COAL TO CALCINER             4603.1KLB     :   0100      116MW
FW FLOW TO SH ATTEMP 1B         6906.8KLB       TOTAL AIR TO CALCINER             55073.0KLB     :   0200      117MW
FW FLOW TO RH ATTEMP 1A        17052.0KLB       TOTAL SEC AIR TO CMPT 1A            11278KLB     :   0300      116MW
FW FLOW TO RH ATTEMP 1B         6268.8KLB       TOTAL SEC AIR TO CMPT 1B            47634KLB     :   0400      118MW
FW FLOW TO EAST ECON             99998KLB       TOTAL SEC AIR TO CMPT 1C            10515KLB     :   0500      113MW
FW FLOW TO WEST ECON             28093KLB       TOTAL SEC AIR TO CMPT 1D            57475KLB     :   0600      115MW
BFP A SUCTION FLOW                2924KLB       S-U BURNER AIR FLOW                  8791KCF     :   0700      115MW
BFP B SUCTION FLOW                9040KLB       TOTAL COAL // STEAM PROD                0KLB     :   0800      116MW
BFP C SUCTION FLOW                8073KLB       LIMESTONE FEED TO CALCINER         41672TONS     :   0900      116MW
PULV 1A COAL FLOW                29209KLB       F B DRYER TOTALIZER                43608TONS     :   1000      118MW
PULV 1B COAL FLOW                33130KLB       D10 HOUR-METER                      1317HRS      :   1100      118MW
PULV 1C COAL FLOW                25843KLB       OIL FLOW TO BOILER                  27016GAL     :   1200      119MW
PULV 1D COAL FLOW                34318KLB       OIL FLOW FROM BOILER                21303GAL     :   1300      117MW
TOTAL COAL TO BOILER            122500KLB       NET OIL FLOW                        5712.5GAL    :   1400      115MW
TOTAL AIR TO BOILER               3780KLB       TOTAL GENERATION                  119.5MWHR      :   1500      116MW
STEAM FLOW TO FGRF                2822KLB       NET GENERATION                      117MWHR      :   1600      116MW
TOTAL COAL //STEAM PROD              KLB        AUXILIARY LOAD                     13.9MWHR      :   1700      114MW
MAKE-UP FLOW TO COND            106672KLB       XFMR 4 (REPURCHASE)                9.79MWHR      :   1800      113MW
DUMP FLOW TO STORAGE TANK       162432KLB       XFMR 5 (POWER PLANT)               0.08MWHR      :   1900      115MW
COND FLOW TO DEAERATOR          766880KLB       CEMENT PLANT                       8.96MWHR      :   2000      114MW
TOTAL DEMIN WATER PRO                KLB                                                         :   2100      115MW
                                                                                                 :   2200      116MW
                                                                                                 :   2300      113MW
                                                                                                 :   TOTAL    2782MW
```

1.a

MW 1.b

= 115.92 MW/hr

Feed rate for coal

MW of Power Plant

BAGHOUSE OPERATING DATA

PYROPROCESSING OPERATIONS

DATE: SEPT 21-90

	KILN FEED WITHDRAWAL						Kiln Feed Bin Level			Kiln Feed Control Valve			KIT02	KIP02	Meal Temp	Kiln Inlet Temp	Kiln Inlet Press.	O_2	CO	Nox	Fan Temp	Feedrate	Mill Amps	Fan Amps	Fan Dischar Press.	Precal %	Precal Press.	COOLER			Discharge Temp	Hood Draft		
	C_3S Silo 1	1A	1B	C_3S Silo 2	2A	2B	PV	SP	OUT	PV	SP	OUT	PREHEATER								COAL							PV	SP	OUT		PV	SP	OUT
7:00		05	—	—	53	-	37	37	28	110	110	34	13.5	800	1320	1670	.88	6.3	169	[illegible]	163	7.5	226	241	14.8	.		16.5	18	52	447	-.17	-.15	65
8:00		05	-	-	44	-	37	37	21.	110	110	32	12.8	802	1292	1630	.93	4.88	38	044	168	7.5	223	242	15.0			17.8	18	66	353	-.16	-.15	52
9:00		05	-	-	50	-	37	37	23	114	114	36	13.5	806	1320	1685	1.06	5.50	147	-	169	7.5	226	237	14.7			15.7	18	55	352	-.10	-.15	56
10:00		05	—	-	55	-	37	37	30	115	115	36	13.6	781	1304	1685	1.13	6.4	170	-	169	7.7	226	240	14.7			16.8	18	55	372	-.13	-.15	56
11:00		05	-	-	54	-	37	37	29	115	115	34	14.6	784	1308	1704	1.24	5.5	509	-	167	7.6	225	247	15.2			17.3	18	60	350	-.19	-.15	52
12:00		05	-	-	50	-	37	37	26	115	115	34	14.7	788	1347	1966	.71	5.5	202	-	167	7.1	221	242	15.1			16.5	18	50	500	-.14	-.15	86
13:00		05	-	-	51	-	37	37	26	115	115	34	15.9	782	1351	1901	.65	5.4	170	-	167	6.8	218	242	15.0			18.5	18	50	373	-.18	-.15	68
14:00		05	—	-	47	-	37	37	22	118	118	36	17.0	760	1302	1846	.52	5.2	194	-	168	6.8	231	244	15.1			17.5	18	54	373	-.17	-.15	66
15:00												34.8	=	125 tph								7.2												
16:00		05	—	-	45	-	37	37	28.4	100	100	28.6	16.4	775	1320	1864	.042	5.1	157	200	166	7.6	225	245	15.0			17.6	18	56	480	.14	.15	86
17:00		05	-	-	50	-	37	37	24.6	100	100	29.6	16.5	764	1275	1756	0.42	4.9	105	237	168	7.4	222	244	15.0			17.3	17.5	59	489	.13	.15	87
18:00		05	-	-	44	-	37	37	20.0	100	100	29.5	17.6	760	1255	1507	0.52	4.6	250	216	168	7.4	220	244	14.8			16.8	17.7	54	476	.00	.15	80
19:00		05	-	-	50	-	37	37	22.0	95	95	29.0	18.9	736	1232	1669	0.38	5.2	260	203	168	6.8	221	239	14.9			18.4	17.5	65	441	.012	.15	77
20:00												↑										↑												
21:00																																		
22:00																																		
23:00																																		
24:00																																		
1:00																																		
2:00																																		
3:00																																		
4:00																																		
5:00																																		
6:00																																		

Kiln feed flow control valve settings of 29% low and a high of 36% is a average of about 120 tons per houR.

Reading on coal feed Rate, tons per houR.

Coal feed rate = 7.20 tph
Kiln feed rate = 125 tph
Clinker production = 75 tph

Baghouse Data

9/18/90.

```
19SEP90 WEDNESDAY          RAW MILL LOG 1.1                        TREND LOG  2          DAY END

                  -E1111------BAG------E1104------BAG----E1Q01--------------E1Q03-------SOX
                   HOUSE INLET TMP     HOUSE FAN AMPS      STACK OPACITY        STACK SOX

                  -E1S01------BAG------E1P06------BAG----E1Q02----------NOX--E1Q04-------O2
                   HOUSE FAN SPEED     HOUSE DIFF PRES       STACK NOX           STACK O2

                   E1111     E1S01     E1104     E1P05     E1Q01     E1Q02     E1Q03     E1Q04
                     SMP       SMP       SMP       SMP       MAX       SMP       SMP       SMP
                   DEG F     %         AMPS      "H2O      %         %         %         %
18SEP90 07:14      291.00    34.875    496.00    6.2813    32.000    216.50    204.50    7.8125
        08:14      298.00    34.875    486.00    6.4375    32.125    201.50    226.50    7.9532
        09:14      304.00    34.875    484.00    6.5844    16.063    170.50    214.50    7.9219
        10:14      313.00    34.875    493.00    6.5469    16.375    154.00    204.50    7.5157
        11:14      309.00    34.875    485.00    6.4688    14.844    200.50    200.00    7.5625
        12:14      319.00    34.875    488.00    6.7032    15.094    255.50    193.50    7.3125

        13:14      322.00    34.875    473.00    6.5782    15.125    236.50    224.00    7.7188
        14:14      336.00    34.875    481.00    6.2813    14.719    255.50    194.00    7.8125
        15:14      335.00    34.875    469.00    6.4844    14.281    266.00    186.50    7.4375
        16:14      327.00    34.875    475.00    6.3782    15.125    235.50    171.00    7.6875
        17:14      332.00    34.875    490.00    6.6375    16.375    211.00    174.00    7.4532
        18:14      317.00    35.000    476.00    6.7657    14.594    249.00    196.00    7.4063

        19:14      324.00    34.875    483.00    6.6407    16.125    290.00    217.50    7.2969
        20:14      329.00    34.875    467.00    6.8438    17.063    226.00    194.00    7.4532
        21:14      303.00    34.875    483.00    6.3125    17.188    172.50    165.50    7.9844
        22:14      308.00    34.875    475.00    6.7500    17.188    158.00    203.00    8.2188
        23:14      329.00    34.875    472.00    6.9375    17.563    118.25    194.00    7.4688
19SEP90 00:14      319.00    34.875    488.00    6.8750    17.750    134.00    202.50    7.7344

        01:14      335.00    35.000    469.00    6.6594    16.750    155.50    203.00    7.5000
        02:14      330.00    34.875    477.00    6.7813    17.250    143.50    180.50    7.6094
        03:14      346.00    34.875    464.00    6.9032    17.563    217.00    202.50    7.5938
        04:14      321.00    34.875    478.00    6.6250    16.438    242.50    181.50    7.5000
        05:14      313.00    34.875    469.00    6.5000    18.313    203.00    189.00    7.6250
        06:14      319.00    34.875    472.00    6.7813    19.500    172.75    149.00    7.7188
```

Baghouse Inlet temp. = 328.5 °F

Baghouse Fan Speed = 34.875%

Baghouse Fan Current = 479.33 Amps

Baghouse Pressure drop = 6.5105 " H_2O

BEST AVAILABLE COPY

9/19/90

Baghouse Data

```
20SEP90 THURSDAY          RAW MILL LOG #1                         [illegible]          [illegible]

                 E1I11      BAG-      E1I04      BAG-      E1Q01                 E1Q03      SOX
                 HOUSE INLET TMP      HOUSE FAN AMPS         STACK OPACITY         STACK SOX

                 E1S01      BAG-      E1P05      BAG-      E1Q02          NOX    E1Q04       O2
                 HOUSE FAN SPEED      HOUSE DIFF PRES        STACK NOX             STACK O2

                 E1I11     E1S01      E1I04     E1P05      E1Q01     E1Q02      E1Q03     E1Q04
                   SMP       SMP        SMP       SMP        MAX       SMP        SMP       SMP
                 DEG F     %          AMPS      "H2O       %         %          %         %
19SEP90 07:14    318.00    34.875     483.00    6.7032     32.625    196.00     169.00    7.7813
        08:14    317.00    34.625     471.00    6.6262     20.125    224.00     161.00    7.6407
        09:14    322.00    35.000     480.00    6.5147     21.875    241.50     162.00    7.5938
        10:14    336.00    34.875     471.00    6.6176     21.750    171.00     179.50    7.9532
        11:14    325.00    34.125     468.00    6.5344     23.563    119.50     160.50    7.8125
        12:14    319.00    34.375     465.00    6.4063     24.438    [illegible] 192.50   7.6719

        13:14    342.00    34.500     463.00    6.4688     21.813    -9.781     181.00    7.7344
        14:14    329.00    34.875     478.00    6.7063     32.250    8.063      200.00    7.6907
        15:14    322.00    34.875     475.00    6.9219     19.188    -5.750     198.00    7.7657
        16:14    330.00    35.000     483.00    6.7969     19.750    13.50      184.00    7.6407
        17:14    326.00    34.875     476.00    6.7344     34.125    -9.500     177.50    7.3750
        18:14    330.00    34.875     485.00    6.6875     24.313    -9.781     169.00    7.3594

        19:14    318.00    35.000     471.00    6.3182     15.625    -9.281     190.50    7.2657
        20:14    322.00    35.000     461.00    6.6407     20.313    -11.01     141.00    7.8125
        21:14    314.00    35.000     469.00    [illegible] 20.188   -13.19     136.00    7.4063
        22:14    317.00    34.875     477.00    [illegible] 20.375   -13.50     176.00    7.2657
        23:14    345.00    35.000     494.00    6.2813     17.875    -10.31     160.00    7.4844
20SEP90 00:14    325.00    34.875     465.00    6.7657     18.000    -13.04     [illegible] 7.1407

        01:14    403.00    34.875     473.00    6.5625     17.140    -10.13     [illegible] [illegible]
        02:14    419.00    35.750     466.00    6.9063     13.906    1.781      126.50    7.4532
        03:14    351.00    35.750     491.00    7.0313     16.844    14.63      [illegible] 7.9063
        04:14    419.00    35.750     477.00    [illegible] 17.750   17.88      154.00    7.6563
        05:14    421.00    35.750     462.00    6.5563     13.594    11.31      173.50    [illegible]
        06:14    323.00    35.750     496.00    6.7750     17.750    18.00      [illegible] 7.7657
```

Baghouse Inlet temp = 327.09°F
Baghouse Fan Speed = 34.727%
Baghouse Fan Current = 474.09 Amps
Baghouse Pressure drop = 6.6307" H_2O

Baseline average (total)

Baghouse Inlet temp. = 337.6°F
Baghouse Fan Speed = 34.834 %
Baghouse Fan current = 474.54 Amps
Baghouse Pressure drop = 6.4908" H_2O

Baghouse Inlet Temp. = 357.20°F
Baghouse Fan speed = 34.90 %
Baghouse Fan current = 470.33 Amps
Baghouse Pressure drop = 6.5105" H_2O

Baghouse Data

9/20/90

```
21SEP90 07:08:              [illegible] LOG 1..                           [illegible] LOG 2

              E1I11     BAG-       E1I04     BAG-       E1Q01            O..      E1Q03        SOX
              HOUSE INLET TMP      HOUSE FAN AMPS       STACK OPACITY             STACK SOX

              E1S01     BAG-       E1P05     BAG-       E1Q02            NOX      E1Q04        O2
              HOUSE FAN SPEED      HOUSE DIFF PRESS     STACK NOX                 STACK O2

              E1I11      E1S01      E1I04      E1P05      E1Q01      E1Q02      E1Q03      E1Q04
                SMP        SMP        SMP        SMP        MAX        SMP        SMP        SMP
              DEG F      %          AMPS       "H2O       %          %          %          %
20SEP90 07:14 407.00     34.875     454.00     6.6594     32.250     -14.19     176.00     7.6094
        08:14 409.00     34.875     459.00     6.4844     11.344     -13.66     138.50     7.6250
        09:14 413.00     35.000     448.00     6.4375     9.3438     -13.66     184.00     7.1406
        10:14 403.00     34.875     449.00     6.5625     10.250     -13.00     199.50     7.2813
        11:14 323.00     34.875     462.00     6.0625     10.906     -9.438     196.00     7.7344
        12:14 319.00     34.875     480.00     6.2344     10.281     -3.359     197.50     7.8907

        13:14 323.00     34.875     492.00     6.3594     10.750     4.609      [illegible] 7.3594
        14:14 337.00     35.000     470.00     6.1563     10.844     -5.906     168.50     7.6782
        15:14 334.00     34.375     465.00     6.2969     10.594     -3.008     177.50     7.5157
        16:14 336.00     35.000     473.00     6.1719     10.906     -5.219     158.50     7.4688
        17:14 333.00     35.000     472.00     6.2344     11.125     -6.063     153.50     7.4532
        18:14 346.00     34.875     487.00     6.1719     10.813     -5.219     159.50     7.4844

        19:14 361.00     34.875     465.00     6.1969     10.438     -2.008     179.00     7.5625
        20:14 378.00     34.875     487.00     6.0000     10.969     -1.500     178.00     7.4532
        21:14 375.00     34.875     459.00     6.1094     11.500     0.0235     150.00     7.4844
        22:14 366.00     35.375     474.00     5.8750     11.750     -2.344     166.50     7.6719
        23:14 357.00     35.375     454.00     6.1094     11.156     -3.195     204.50     8.2500
21SEP90 00:14 346.00     35.250     489.00     6.0157     11.313     0.0235     224.00     8.0938

        01:14 345.00     35.000     454.00     5.9219     11.375     -.3164     171.50     8.0938
        02:14 363.00     34.875     482.00     6.4532     11.469     -.4844     223.00     7.9688
        03:14 333.00     34.875     433.00     6.4188     11.219     0.1914     259.50     7.9688
        04:14 321.00     34.875     465.00     6.2969     11.688     0.8672     210.50     8.0000
        05:14 286.00     34.250     481.00     5.4219     12.094     0.6993     217.50     7.9844
        06:14 287.00     34.125     485.00     5.5625     12.781     -.6748     206.00     8.0625
```

Baghouse Inlet temp = 337.20°F
Baghouse Fan Speed = 34.95%
Baghouse Fan Current = 477.40 Amps
Baghouse pressure drop = 6.2063" H_2O

BEST AVAILABLE COPY

9/24/90

Baghouse Data

```
25SEP90 TUESDAY            RAW MILL LOG 1.1                              TREND LOG 4

                   E1111      BAG-     E1104     BAG-     E1Q01                 E1Q03       SOX
                   HOUSE INLET TMP     HOUSE FAN AMPS       STACK OPACITY         STACK SOX

                   EIS01      BAG-     EIP05     BAG-     E1Q02         NOX     E1Q04       O2
                   HOUSE FAN SPEED     HOUSE DIFF PRES      STACK NOX             STACK O2

                   DEG F      %        AMPS      "H2O     %             %       %           %
24SEP90  07:14     317.00     32.625   430.00    5.6250   32.625        194.50  212.50      8.6250
         08:14     324.00     33.375   442.00    6.3719   10.155        156.00  211.00      8.6250
         09:14     310.00     33.375   452.00    5.9719   10.[illegible]  [illegible]  216.50  [illegible]
         10:14     332.00     33.375   452.00    [illegible]  10.0[illegible]  221.00  202.50  [illegible]
         11:14     343.00     33.375   441.00    6.4063   10.594        301.00  [illegible]  [illegible]
         12:14     340.00     33.375   449.00    6.6719   11.375        301.00  224.50      8.5938

         13:14     339.00     33.375   442.00    6.3594   11.281        322.00  233.50      8.5938
         14:14     332.00     33.375   459.00    6.6719   [illegible]   310.00  [illegible]  [illegible]
         15:14     385.00     33.375   452.00    [illegible]  [illegible]  [illegible]  [illegible]  [illegible]
         16:14     360.00     33.375   455.00    [illegible]  [illegible]  [illegible]  [illegible]  [illegible]
         17:14     426.00     33.375   442.00    6.6250   11.563        201.50  233.50      8.5625
         18:14     407.00     33.375   422.00    5.6750   11.188        113.50  237.00      8.5938

         [illegible]
         [illegible]
         [illegible]
         22:14     223.00     33.375   499.00    6.8282   9.0938        107.50  231.00      8.7188
         23:14     220.00     33.375   496.00    6.5469   9.2813        106.75  233.00      8.7500
25SEP90  00:14     206.00     32.250   469.00    6.3203   9.2500        107.75  217.50      8.7188

         [illegible]
         [illegible]
         03:14     178.00     32.250   484.00    6.2969   9.2188        94.000  240.50      8.7500
         04:14     175.00     32.250   481.00    6.1875   9.3750        99.750  234.50      8.7813
         05:14     173.00     31.063   [illegible]  6.1563  9.4750      104.00  [illegible]  8.7500
         [illegible]
```

Baghouse Inlet temp = 350.4 °F

Baghouse Fan Speed = 33.375 %

Baghouse Fan Current = 448.90 Amps

Baghouse pressure drop = 6.3136" H_2O

TDF AND COAL SPECIFICATIONS

HEATING VALUES FOR TDF TEST SEPTEMBER 18-24, 1991

COAL	**12630 btu/lb**
TDF	**14000 btu/lb (Average based on values given by the supplier)**
TDF FEED RATE	**1.134 T/Hr**

METHOD:

Shredded tires were fed into the bottom of the Preheater. The tires were fed into a small bin and then discharged into the Preheater by way of a tipping valve. A five gallon bucket, holding 18.9 lbs. of feed, was used to fill the bin at a rate of 2 buckets/min., or 1.134 T/Hr. The tipping valve was operated manually to try to get a uniform feed rate.

FLORIDA CRUSHED STONE
CEMENT/POWER/LIME
COAL TRAIN ANALYSIS
1990

DATE RECEIVED	C.P.L. AS REC'D B.T.U.	WESTMORE. AS REC'D B.T.U.	ASH CONTENT	AVG. SULFUR	AVG. CHLORINE	HARDGROVE GRIND.	TONS
1-6-90	13456	12855	8.41	0.761	0.09		8737
1-15-90	13082	12819	9.49	0.714	0.08	46	8641
1-24-90	12875	12996	8.26	0.777	0.09		8737
MONTH AVG	13138	12890	8.72	0.751	0.09	46	26115
2-4-90	13108	12876	7.57	0.738	0.09	47	8311
2-13-90	12602	12941	7.91	0.683	0.09		8693
2-19-90	12430	12724	8.87	0.867	0.09		8933
2-26-90	12321	12598	9.05	0.705	0.08	45	7299
MONTH AVG	12615	12785	8.35	0.748	0.09	46	33236
3-7-90	12621	12767	9.42	0.660	0.09		8743
3-16-90	12715	12594	8.68	0.687	0.08	45	8737
3-27-90	12521	12612	9.19	0.749	0.09	45	8693
MONTH AVG	12619	12658	9.10	0.699	0.09	45	26173
4-7-90	12828	12718	8.05	0.820	0.09	45	8742
4-17-90	12770	12819	7.79	0.712	0.08		8722
4-26-90	12781	12756	7.97	0.794	0.08		8743
4-29-90	12646	12758	7.81	0.696	0.09		7287
MONTH AVG	12756	12763	7.91	0.756	0.09	45	33494
5-5-90	12712	12745	8.14	0.741	0.09	45	8645
5-7-90	12767	12663	9.36	0.836	0.08		7307
5-9-90	12652	12831	8.15	0.735	0.08		7314
5-14-90	12929	13072	7.79	0.761	0.09		8837
5-21-90	12601	12833	9.39	0.788	0.08	44	7265
5-23-90	12721	12679	9.17	0.738	0.08	45	8762
5-31-90	12761	12863	7.73	0.739	0.08	45	7149
MONTH AVG	12735	12812	8.53	0.763	0.08	45	55279
6-10-90	12789	12687	8.05	0.817	0.08	45	8555
6-16-90	12874	12562	6.93	0.652	0.09		8692
6-24-90	12685	12518	8.84	0.682	0.08	45	8704
MONTH AVG	12783	12589	7.94	0.717	0.08	45	25951
1/1-6/28	12774	12749	8.42	0.739	0.09	45	200248

DATE RECEIVED	C.P.L. AS REC'D B.T.U.	WESTMORE. AS REC'D B.T.U.	ASH CONTENT	AVG. SULFUR	AVG. CHLORINE	HARDGROVE GRIND.	TONS
7-5-90	12714	12841	7.99	0.734	0.08	45	8682
7-12-90	12789	12739	8.13	0.748	0.09	45	8701
7-20-90	12743	12873	8.23	0.722	0.08	45	8744
7-29-90	12794	12876	10.18	0.738	0.09	44	8659
MONTH AVG	12760	12832	8.63	0.736	0.09	45	34786
8-7-90	12623	12667	8.21	0.720	0.08	45	8659
8-19-90	12678	12649	8.56	0.702	0.08	45	8680
8-28-90	12729	12857	9.01	0.721	0.08	45	8692
MONTH AVG	12677	12724	8.59	0.714	0.08	45	26031
9-8-90	12734	12567	8.49	0.660	0.09	45	8790
9-16-90	12842	12635	8.70	0.686	0.08		8170
9-24-90	12851	12683	8.64	0.692	0.08	45	8692
MONTH AVG	12809	12628	8.61	0.679	0.08	45	25652
10-3-90	12807	12594	9.55	0.664	0.09		8600
10-10-90	12741	12699	10.16	0.783	0.09		8597
10-18-90	*****	12537	9.12	0.691	0.08	44	8731
10-25-90	12625	12513	8.00	0.699	0.08	45	8739
MONTH AVG	9543	12586	9.21	0.709	0.09	45	34667
11-2-90	12910	12820	8.28	0.735	0.08	47	7962
11-10-90	12531	12555	8.42	0.753	0.09	46	8346
11-19-90	12661	12714	8.35	0.742	0.09		8838
11-29-90	12683	12801	8.11	0.721	0.08	46	8353
MONTH AVG	12696	12723	8.29	0.738	0.09	46	33499
12-6-90	12551	12576	9.39	0.691	0.09		8745
12-13-90	12916	12936	8.83	0.727	0.08	46	8745
12-20-90	12731	12696	9.00	0.696	0.09	45	8741
MONTH AVG	12733	12736	9.07	0.705	0.09	46	26231
7/5-12/20	12203	12705	8.73	0.713	0.08	45	180866

** DID NOT RECEIVE SAMPLE ON 10-18-90 TRAIN ** RESULTS ARE FROM WESTMORELAND FOR 10-18-90

YEARLY AVERAGES

DATES COVERED	C.P.L. AS REC'D B.T.U.	WESTMORE. AS REC'D B.T.U.	ASH CONTENT	AVG. SULFUR	AVG. CHLORINE	HARDGROVE GRIND.	TOTAL TONS
1/1-12/20	12489	12727	8.58	0.726	0.08	45	381114

1. Heating value for Coal - Avg for 1990
Generally try for 12,600 BTUs

ATTACHMENT 2

PARTICULATE MATTER LABORATORY DATA SHEETS
(Re: Comment 1 on Test Methods)

KOOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES
4014 NW THIRTEENTH STREET
GAINESVILLE, FLORIDA 32609
904/377-5822 ▪ FAX 377-7158

Baseline

PARTICULATE LAB DATA SHEET

TEST DATE 9/18-24/90

PLANT NAME FL. CRUSHED STONE

SOURCE KILN & CEMENT PLANT

	Run 1 MM-1	Run 2 MM-2	Run 3 MM-3	Blank
Container No.	202	KA-50	KA-42	KA-44
Total Volume (ml)				
Aliquot Evaporated (ml)	ALL	ALL	ALL	ALL
Final Weight (g)	100.4255	103.9048	98.5865	98.4903
Tare Weight (g)	- 100.3995	- 103.8829	- 98.5674	- 98.4892
Gross Weight Gained (g)	0.0260	0.0219	0.0191	0.0011
Average Blank (g)	- 0.0011	- 0.0011	- 0.0011	-
Net Weight (g)	0.0249	0.0208	0.0180	
Aliquot Factor	x	x	x	x
Total Net Weight (mg)				
	MM-1	MM-2	MM-3	BLANK
Container No.	1K	3K	1I	2K
Filter No.	2686	2689	2688	2687
Final Weight (g)	0.4123	0.4185	0.4161	0.4072
Tare Weight (g)	- 0.4016	- 0.4061	- 0.4064	- 0.4070
Gross Weight Gained (g)	0.0107	0.0124	0.0097	0.0002
Average Blank (g)	- 0.0002	- 0.0002	- 0.0002	-
Total Net Weight (mg)	0.0105	0.0122	0.0095	

Blank used for Baseline & TDF Tests

Tare Balance Check

0.0	✓	10.0	✓
1.0	✓	50.0	✓
5.0	✓	100.0	✓

T/H 78-41

By NMJ

Date 9-25-90

Final Balance Check

0.0	✓	10.0	✓
1.0	✓	50.0	✓
5.0	✓	100.0	✓

T/H 78-41

By NMJ

Date 9-25-90

KOOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES
4014 NW THIRTEENTH STREET
GAINESVILLE, FLORIDA 32609
904/377-5822 ▪ FAX 377-7158

TDF

PARTICULATE LAB DATA SHEET

TEST DATE 9/18-24/90

PLANT NAME FL. CRUSHED STONE

SOURCE POWER & CEMENT PLANT

	Run 1	Run 2	Run 3	Blank
	TDF-1	TDF-2	TDF-3	
Container No.	KA-5	KA-3	205	
Total Volume (ml)				
Aliquot Evaporated (ml)	ALL	ALL	ALL	
Final Weight (g)	87.9291	102.1648	98.0049	
Tare Weight (g)	- 87.9129	- 102.1483	- 97.9793	- Blank correction reported on "Baseline" P.M. Lab Data Sheet
Gross Weight Gained (g)	0.0162	0.0165	0.0256	
Average Blank (g)	- 0.0011	- 0.0011	- 0.0011	
Net Weight (g)	0.0151	0.0154	0.0245	
Aliquot Factor	x	x	x	x
Total Net Weight (mg)				
	TDF-1	TDF-2	TDF-3	
Container No.	3I	2I	3E	
Filter No.	2693	2694	2695	
Final Weight (g)	0.4190	0.4106	0.4167	
Tare Weight (g)	- 0.4015	- 0.4069	- 0.4033	-
Gross Weight Gained (g)	0.0175	0.0037	0.0134	
Average Blank (g)	- 0.0002	- 0.0002	- 0.0002	-
Total Net Weight (mg)	0.0173	0.0035	0.0132	

Tare Balance Check

0.0	✓	10.0	✓
1.0	✓	50.0	✓
5.0	✓	100.0	✓

T/H 78-41

By AMJ

Date 9-25-90

Final Balance Check

0.0	✓	10.0	✓
1.0	✓	50.0	✓
5.0	✓	100.0	✓

T/H 78-41

By AMJ

Date 9-25-90

ATTACHMENT 3

COMPARISON OF CALCULATIONS WITH AND WITHOUT CO/CO2 CORRECTIONS
(Re: Comment 3 on Test Methods)

SUMMARY OF SOURCE EMISSION TEST DATA

FL Crushed Stone
Tires - Part. & Multi-metals
Sept. 20-21, 1990

Run No.	Process Weight Rate (Tons/Hr)	Stack Flow Rate (SCFMD)	Stack Gas Temp. (Deg F)	Stack Gas Moisture (%)	Particulate Mater Conc. (gr/dscf)	Particulate Mater Conc. at 3% O2 (gr/dscf)	Particulate Mater Emission Rate (Lbs/Hr)
1	0.0	637017	390.0	7.8	0.0105	0.0177	57.35
2	0.0	623196	401.0	7.3	0.0063	0.0111	33.60
3	0.0	535948	325.0	7.1	0.0142	0.0360	65.27
Avg.	0.0	598720	372.0	7.4	0.0103	0.0216	52.07

Allowable Particulate Matter Emission Rate = 0.00 lbs/Hr
(Chapter 17-2, Florida Administrative Code)

```
GENERAL DATA                                      DATA FILE NAME: fcs9-90c
------------                                      -------------

 Company      : FL Crushed Stone
 Source/Unit  : Tires - Part. & Multi-metals
 Date         : Sept. 20-21, 1990       Cp             :      0.840
 Stack dia.   : 223.80 inch    OR   :   Duct Length :       0.00 inch
 Oxygen Corr.:    3.0 percent           Duct Width   :       0.00 inch
                                        Std. Temp.   :         68 dF

FUEL ANALYSIS DATA,
 (for calculating F-Factor)             Process Wt.
-------------------------               --------
Hydrogen,wt% :   0.00          Run 1 :      0.0 tons/hr
Carbon,  wt% :   0.00          Run 2 :      0.0
Sulfur,  wt% :   0.00          Run 3 :      0.0
Nitrogen,wt% :   0.00
Oxygen,  wt% :   0.00
Btu/lb       :      0

F-Factor     :          dscf/MMBtu; enter this value or {F9} for result.
FIELD DATA                                       RUN      RUN      RUN
----------                                         1        2        3

  Meter Temp., Tm (dF) ..............   91.00    91.50   104.00
  Stack Temp., Ts (dF) ..............  390.00   401.00   325.00
  Sq.Rt. dP .........................  0.9530   0.9350   0.7700
  dH (in. H2O) ......................    1.91     1.84     1.44
  Meter Vol.,Vm (ft3) ...............  49.273   48.050   43.421
  Meter Y ...........................   1.000    1.000    1.000
  Bar. Press.,Pb (in.Hg.) ...........   30.02    30.02    30.03
  Vol. H2O, Vlc (ml) ................    86.0     78.0     66.0
  Static Press.,Ps (in.H2O) .........    0.00     0.00     0.00
  Test Time (min.) ..................    64.0     64.0     64.0
  Nozzle Dia.,Dn (in.) ..............   0.248    0.248    0.248
  Oxygen, O2 (%) ....................   10.30    10.80    13.90
  Carbon Dioxide, CO2 (%) ...........    9.30     9.50    10.90
  Carbon Monoxide, CO (%) ...........    0.03     0.02     0.01

  Is this Method 5 or Method 5/8 ?             (5 or 58) :            5

LABORATORY RESULTS                               RUN      RUN      RUN
------------------                                 1        2        3

  GRAVIMETRIC ANALYSIS :
  Front Half Wash (FHW) ............. 0.01510 0.01540 0.02450 grams
  Filterable Particulate (MF) ....... 0.01730 0.00350 0.01320
  Condensible Particulate (BHW) ..... 0.00000 0.00000 0.00000

  SO2 ANALYSIS :
  SO2 Analysis (H2O2 impingers)......    0.00     0.00     0.00 mg H2SO4
  Sample Volume, ml .................       0        0        0
  Sample Aliquot, ml ................       0        0        0
  Volume of Titer, ml ...............    0.00     0.00     0.00
  Volume of Titer Blank, ml .........    0.00     0.00     0.00
                                   Normality of BaCl .......... 0.0000000
```

```
                      SOURCE TEST CALCULATIONS

 PLANT : FL Crushed Stone                  RUN NO.:          1
         Tires - Part. & Multi-metals      DATE    : Sept. 20-21, 1990


 STD.TEMP, Tstd    =    68 DEG. F  ¦ STATIC PRESS.,Ps =    0.00 in. H2O
 METER TEMP, Tm    =    91 DEG. F  ¦ PITOT COFF., Cp  =   0.840
 STACK TEMP, Ts    = 390.0 DEG. F  ¦ STACK I.D.       =  223.80 inch
 AVG.VEL.HEAD,dP =  0.91 in. H2O ¦ DUCT LENGTH      =         inch
 METER ORIFICE,dH=  1.91 in. H2O ¦ DUCT WIDTH       =         inch
 METER VOL., Vm    =49.273 Cu.Ft.  ¦ STACK AREA, As   = 273.179 Sq.Ft.
 METER COFF., Y    = 1.000         ¦ TEST TIME        =   64.00 min.
 BAR. PRESS., Pb   = 30.02 in.Hg   ¦ NOZZLE DIA.      =   0.248 inch
 COND.(Vlc)        =  86.0 ml      ¦ NOZZLE DIA., An  = 3.4E-04 Sq.Ft.

 GAS ANALYSIS      = 10.30  % O2          0.03  % CO
                      9.30  % CO2        80.37  % N2

************************************************************************

Vm(std) = [ T(std) + 460 / 29.92 ] x Vm x Y x
          (Pb + (dH / 13.6)) / (Tm + 460).....       =    47.596   dscf

Vw(std) =(8.9148 x 10e-5) x (Tstd + 460) x Vlc       =     4.048   scf

Bws = Vw(std) / (Vm(std) + Vw(std))...........       =     0.078 ¦ Lower
                                                                 ¦ Bws
Bws @ Saturated Conditions = Vapor Press. of H2O                 ¦ value
@ Dew Point Temp. / (Ps, in.Hg.) ............        =     1.000 ¦ used.

%EA =(%O2 - 0.5%CO)/(0.264%N2 - (%O2-0.5%CO)) x 100 =    94.07

Md =(.44 x %CO2)+(.32 x %O2)+[.28 x (%N2 + %CO)]     =    29.90

Ms = (Md x (1-Bws)) + (18.0 x Bws)............       =    28.97

P(stack) = Pbar + (Ps / 13.6) .................      =    30.02 in. Hg

vs = 85.49 x CP x (Sq.Rt.dP) x [Sq.Rt.(Ts + 460)
     / (Ms x P(stack))] .....................        =    67.66   ft/sec

Qs = vs x As x 60 ...........................        = 1,109,014  acf/min

Qs(std) = Qs x (1-Bws)x((Tstd + 460)/(Ts + 460))
          x (P(stack)/29.92) .................       =  637,017  dscf/min

I = (Ts+460) x [(0.002669 x Vlc) + (Vm(std) /
    (T(std) + 460) / 29.92] x 100 / [ Time x
    P(stack) x An x vs x 60] ..................      =    95.08   %
```

```
                    SOURCE TEST CALCULATIONS

 PLANT : FL Crushed Stone                    RUN NO.:          2
         Tires - Part. & Multi-metals         DATE    : Sept. 20-21, 1990


 STD.TEMP, Tstd    =     68 DEG. F  | STATIC PRESS.,Ps =     0.00 in. H2O
 METER TEMP, Tm    = 91.50 DEG. F  | PITOT COFF., Cp   =    0.840
 STACK TEMP, Ts    = 401.0 DEG. F  | STACK I.D.        =   223.80 inch
 AVG.VEL.HEAD,dP =  0.87 in. H2O | DUCT LENGTH       =          inch
 METER ORIFICE,dH=  1.84 in. H2O | DUCT WIDTH        =          inch
 METER VOL., Vm   =48.050 Cu.Ft.  | STACK AREA, As    =  273.179 Sq.Ft.
 METER COFF., Y   = 1.000          | TEST TIME         =    64.00 min.
 BAR. PRESS., Pb = 30.02 in.Hg    | NOZZLE DIA.       =    0.248 inch
 COND.(Vlc)       =  78.0 ml       | NOZZLE DIA., An   =  3.4E-04 Sq.Ft.

 GAS ANALYSIS      = 10.80   % O2              0.02   % CO
                      9.50   % CO2            79.68   % N2

************************************************************** *********

Vm(std) = [ T(std) + 460 / 29.92 ] x Vm x Y x
          (Pb + (dH / 13.6)) / (Tm + 460).....      =    46.364   dscf

Vw(std) =(8.9148 x 10e-5) x (Tstd + 460) x Vlc      =     3.671   scf

Bws = Vw(std) / (Vm(std) + Vw(std))...........      =     0.073 | Lower
                                                                | Bws
Bws @ Saturated Conditions = Vapor Press. of H2O                | value
@ Dew Point Temp. / (Ps, in.Hg.) ............       =     1.000 | used.

%EA =(%O2 - 0.5%CO)/(0.264%N2 - (%O2-0.5%CO)) x 100 =    105.30

Md =(.44 x %CO2)+(.32 x %O2)+[.28 x (%N2 + %CO)]     =     29.95

Ms = (Md x (1-Bws)) + (18.0 x Bws)............      =     29.07

P(stack) = Pbar + (Ps / 13.6) .................      =     30.02 in. Hg

vs = 85.49 x CP x (Sq.Rt.dP) x [Sq.Rt.(Ts + 460)
     / (Ms x P(stack))] ......................      =     66.69   ft/sec

Qs = vs x As x 60 ............................      = 1,093,053  acf/min

Qs(std) = Qs x (1-Bws)x((Tstd + 460)/(Ts + 460))
          x (P(stack)/29.92) ..................      =   623,196  dscf/min

I = (Ts+460) x [(0.002669 x Vlc) + (Vm(std) /
    (T(std) + 460) / 29.92] x 100 / [ Time x
    P(stack) x An x vs x 60] ..................      =     94.67   %
```

SOURCE TEST CALCULATIONS

```
PLANT : FL Crushed Stone                     RUN NO.:          3
        Tires - Part. & Multi-metals         DATE    : Sept. 20-21, 1990


STD.TEMP, Tstd     =     68 DEG. F   | STATIC PRESS.,Ps  =     0.00 in. H20
METER TEMP, Tm     =104.00 DEG. F    | PITOT COFF., Cp   =    0.840
STACK TEMP, Ts     = 325.0 DEG. F    | STACK I.D.        =   223.80 inch
AVG.VEL.HEAD,dP =   0.59 in. H20     | DUCT LENGTH       =          inch
METER ORIFICE,dH=   1.44 in. H20     | DUCT WIDTH        =          inch
METER VOL., Vm     =43.421 Cu.Ft.    | STACK AREA, As    =  273.179 Sq.Ft.
METER COFF., Y     = 1.000           | TEST TIME         =    64.00 min.
BAR. PRESS., Pb    = 30.03 in.Hg     | NOZZLE DIA.       =    0.248 inch
COND.(Vlc)         =   66.0 ml       | NOZZLE DIA., An   =  3.4E-04 Sq.Ft.

GAS ANALYSIS       = 13.90  % O2           0.01  % CO
                     10.90  % CO2         75.19  % N2

************************************************************** *********

Vm(std) = [ T(std) + 460 / 29.92 ] x Vm x Y x
          (Pb + (dH / 13.6)) / (Tm + 460).....        =    40.943    dscf

Vw(std) =(8.9148 x 10e-5) x (Tstd + 460) x Vlc        =     3.107    scf

Bws = Vw(std) / (Vm(std) + Vw(std))..........         =     0.071 | Lower
                                                                  | Bws
Bws @ Saturated Conditions = Vapor Press. of H20                  | value
@ Dew Point Temp. / (Ps, in.Hg.) ............         =     1.000 | used.

%EA =(%O2 - 0.5%CO)/(0.264%N2 - (%O2-0.5%CO)) x 100 =    233.40

Md =(.44 x %CO2)+(.32 x %O2)+[.28 x (%N2 + %CO)]       =     30.30

Ms = (Md x (1-Bws)) + (18.0 x Bws)............        =     29.43

P(stack) = Pbar + (Ps / 13.6) .................        =     30.03 in. Hg

vs = 85.49 x CP x (Sq.Rt.dP) x [Sq.Rt.(Ts + 460)
     / (Ms x P(stack))] ......................        =     52.11    ft/sec

Qs = vs x As x 60 ............................        =   854,137   acf/min

Qs(std) = Qs x (1-Bws)x((Tstd + 460)/(Ts + 460))
          x (P(stack)/29.92) ..................        =   535,948   dscf/min

I = (Ts+460) x [(0.002669 x Vlc) + (Vm(std) /
    (T(std) + 460) / 29.92] x 100 / [ Time x
    P(stack) x An x vs x 60] ..................        =     97.21    %
```

TABLE 1
SUMMARY OF SOURCE EMISSION TEST DATA

FL Crushed Stone
Tires - Part. & Multi-metals
Sept. 20-21, 1990

Run No.	Process Weight Rate (Tons/Hr)	Stack Gas Flow Rate (SCFMD)	Stack Gas Temperature (Deg F)	Stack Gas Moisture (%)	Particulate Matter Conc. (gr/dscf)	Particulate Matter Emission Rate (Lbs/Hr)
1	132	635885	390.0	7.8	0.0105	57.25
2	132	622403	401.0	7.3	0.0063	33.55
3	132	540612	325.0	7.1	0.0142	65.83
Average	132*	599633	372.0	7.4	0.0103	52.21

Allowable Particulate Matter Emission Rate = 0.00 lbs/Hr
(Chapter 17-2, Florida Administrative Code)

*Cement plant feed rate: power plant at 110 MW per hour and lime plant calciner at 11 tons per hour.

STACK GAS COMPOSITION

Run	Oxygen (percent)	Carbon Monoxide (ppm, vol)	Carbon Dioxide (percent)
1	10.3	310	9.3
2	10.8	220	9.5
3	13.9	60	10.9
Avg	11.7	197	9.9

SOURCE TEST CALCULATIONS

```
PLANT : FL Crushed Stone                      RUN NO.:          3
        Tires - Part. & Multi-metals          DATE   : Sept. 20-21, 1990


STD.TEMP, Tstd    =     68 DEG. F    | STATIC PRESS.,Ps  =    0.00 in. H2O
METER TEMP, Tm    =104.00 DEG. F     | PITOT COFF., Cp   =   0.840
STACK TEMP, Ts    = 325.0 DEG. F     | STACK I.D.        =  223.80 inch
AVG.VEL.HEAD,dP =   0.59 in. H2O    | DUCT LENGTH       =          inch
METER ORIFICE,dH=   1.44 in. H2O    | DUCT WIDTH        =          inch
METER VOL., Vm    =43.421 Cu.Ft.     | STACK AREA, As    = 273.179 Sq.Ft.
METER COFF., Y    = 1.000            | TEST TIME         =   64.00 min.
BAR. PRESS., Pb   = 30.03 in.Hg      | NOZZLE DIA.       =   0.248 inch
COND.(Vlc)        =   66.0 ml        | NOZZLE DIA., An   = 3.4E-04 Sq.Ft.

GAS ANALYSIS      = 13.90  % O2             0.40  % CO
                     7.50  % CO2           78.20  % N2

************************************************************************

Vm(std) = [ T(std) + 460 / 29.92 ] x Vm x Y x
          (Pb + (dH / 13.6)) / (Tm + 460)......      =   40.943   dscf

Vw(std) =(8.9148 x 10e-5) x (Tstd + 460) x Vlc       =    3.107   scf

Bws = Vw(std) / (Vm(std) + Vw(std))...........       =    0.071 | Lower
                                                                | Bws
Bws @ Saturated Conditions = Vapor Press. of H2O                | value
@ Dew Point Temp. / (Ps, in.Hg.)  ............       =    1.000 | used.

%EA =(%O2 - 0.5%CO)/(0.264%N2 - (%O2-0.5%CO)) x 100 =   197.27

Md  =(.44 x %CO2)+(.32 x %O2)+[.28 x (%N2 + %CO)]    =    29.76

Ms  = (Md x (1-Bws)) + (18.0 x Bws).............     =    28.93

P(stack) = Pbar + (Ps / 13.6) ................       =    30.03 in. Hg

vs  = 85.49 x CP x (Sq.Rt.dP) x [Sq.Rt.(Ts + 460)
     / (Ms x P(stack))] ......................       =    52.56   ft/sec

Qs  = vs x As x 60 ...........................       =  861,570  acf/min

Qs(std) = Qs x (1-Bws)x((Tstd + 460)/(Ts + 460))
          x (P(stack)/29.92) ..................      =  540,612  dscf/min

I = (Ts+460) x [(0.002669 x Vlc) + (Vm(std) /
    (T(std) + 460) / 29.92] x 100 / [ Time x
    P(stack) x An x vs x 60] .................       =    96.37    %
```

```
                         SOURCE TEST CALCULATIONS

 PLANT : FL Crushed Stone                       RUN NO.:          2
         Tires - Part. & Multi-metals           DATE    : Sept. 20-21, 1990


 STD.TEMP, Tstd     =    68 DEG. F    | STATIC PRESS.,Ps  =    0.00 in. H2O
 METER TEMP, Tm     = 91.50 DEG. F    | PITOT COFF., Cp   =   0.840
 STACK TEMP, Ts     = 401.0 DEG. F    | STACK I.D.        =  223.80 inch
 AVG.VEL.HEAD,dP =   0.87 in. H2O     | DUCT LENGTH       =         inch
 METER ORIFICE,dH=   1.84 in. H2O     | DUCT WIDTH        =         inch
 METER VOL., Vm     =48.050 Cu.Ft.    | STACK AREA, As    = 273.179 Sq.Ft.
 METER COFF., Y     = 1.000           | TEST TIME         =   64.00 min.
 BAR. PRESS., Pb = 30.02 in.Hg        | NOZZLE DIA.       =   0.248 inch
 COND.(Vlc)         =   78.0 ml       | NOZZLE DIA., An   = 3.4E-04 Sq.Ft.

 GAS ANALYSIS       = 10.80  % O2              0.40  % CO
                      10.00  % CO2            78.80  % N2

****************************************************************************

Vm(std) = [ T(std) + 460 / 29.92 ] x Vm x Y x
          (Pb + (dH / 13.6)) / (Tm + 460)......       =   46.364   dscf

Vw(std) =(8.9148 x 10e-5) x (Tstd + 460) x Vlc        =    3.671   scf

Bws = Vw(std) / (Vm(std) + Vw(std))...........        =    0.073 | Lower
                                                                 | Bws
Bws @ Saturated Conditions = Vapor Press. of H2O                 | value
@ Dew Point Temp. / (Ps, in.Hg.) .............        =    1.000 | used.

%EA =(%O2 - 0.5%CO)/(0.264%N2 - (%O2-0.5%CO)) x 100 =   103.89

Md =(.44 x %CO2)+(.32 x %O2)+[.28 x (%N2 + %CO)]      =    30.03

Ms = (Md x (1-Bws)) + (18.0 x Bws).............       =    29.15

P(stack) = Pbar + (Ps / 13.6) ................        =    30.02 in. Hg

vs = 85.49 x CP x (Sq.Rt.dP) x [Sq.Rt.(Ts + 460)
     / (Ms x P(stack))] .......................       =    66.60   ft/sec

Qs = vs x As x 60 .............................       = ********* acf/min

Qs(std) = Qs x (1-Bws)x((Tstd + 460)/(Ts + 460))
          x (P(stack)/29.92) .................        =  622,403  dscf/min

I = (Ts+460) x [(0.002669 x Vlc) + (Vm(std) /
    (T(std) + 460) / 29.92] x 100 / [ Time x
    P(stack) x An x vs x 60] ..................       =    94.79   %
```

```
                       SOURCE TEST CALCULATIONS

  PLANT : FL Crushed Stone                        RUN NO.:         1
          Tires - Part. & Multi-metals            DATE    : Sept. 20-21, 1990

  STD.TEMP, Tstd   =     68 DEG. F    ¦ STATIC PRESS.,Ps =    0.00 in. H2O
  METER TEMP, Tm   =     91 DEG. F    ¦ PITOT COFF., Cp  =   0.840
  STACK TEMP, Ts   = 390.0 DEG. F     ¦ STACK I.D.       =  223.80 inch
  AVG.VEL.HEAD,dP  =  0.91 in. H2O    ¦ DUCT LENGTH      =         inch
  METER ORIFICE,dH=  1.91 in. H2O     ¦ DUCT WIDTH       =         inch
  METER VOL., Vm   =49.273 Cu.Ft.     ¦ STACK AREA, As   = 273.179 Sq.Ft.
  METER COFF., Y   = 1.000            ¦ TEST TIME        =   64.00 min.
  BAR. PRESS., Pb  = 30.02 in.Hg      ¦ NOZZLE DIA.      =   0.248 inch
  COND.(Vlc)       =  86.0 ml         ¦ NOZZLE DIA., An  = 3.4E-04 Sq.Ft.

  GAS ANALYSIS     = 10.30  % O2              1.40  % CO
                     10.00  % CO2            78.30  % N2

*************************************************************************

Vm(std) = [ T(std) + 460 / 29.92 ] x Vm x Y x
          (Pb + (dH / 13.6)) / (Tm + 460)......      =   47.596   dscf

Vw(std) =(8.9148 x 10e-5) x (Tstd + 460) x Vlc       =    4.048   scf

Bws = Vw(std) / (Vm(std) + Vw(std))...........       =    0.078 ¦ Lower
                                                                ¦ Bws
Bws @ Saturated Conditions = Vapor Press. of H2O                ¦ value
@ Dew Point Temp. / (Ps, in.Hg.)  ............       =    1.000 ¦ used.

%EA =(%O2 - 0.5%CO)/(0.264%N2 - (%O2-0.5%CO)) x 100 =    86.71

Md =(.44 x %CO2)+(.32 x %O2)+[.28 x (%N2 + %CO)]     =    30.01

Ms = (Md x (1-Bws)) + (18.0 x Bws).............      =    29.07

P(stack) = Pbar + (Ps / 13.6) ................       =    30.02 in. Hg

vs = 85.49 x CP x (Sq.Rt.dP) x [Sq.Rt.(Ts + 460)
     / (Ms x P(stack))] ......................       =    67.54    ft/sec

Qs = vs x As x 60 ............................       = ********* acf/min

Qs(std) = Qs x (1-Bws)x((Tstd + 460)/(Ts + 460))
          x (P(stack)/29.92) .................       =  635,885   dscf/min

I = (Ts+460) x [(0.002669 x Vlc) + (Vm(std) /
    (T(std) + 460) / 29.92] x 100 / [ Time x
    P(stack) x An x vs x 60] .................       =    95.25    %
```

PARTICULATE MATTER AND METALS

```
GENERAL DATA                                    DATA FILE NAME: fcs9-90c
------------                                    --------------
 Company      : FL Crushed Stone
 Source/Unit  : Tires - Part. & Multi-metals
 Date         : Sept. 20-21, 1990      Cp           :      0.840
 Stack dia.   : 223.80 inch     OR  :  Duct Length  :       0.00 inch
 Oxygen Corr.:     3.0 percent         Duct Width   :       0.00 inch
                                       Std. Temp.   :         68 dF

FUEL ANALYSIS DATA,
 (for calculating F-Factor)            Process Wt.
---------------------------            --------
Hydrogen,wt% :   0.00        Run 1 :     0.0 tons/hr
Carbon,   wt% :   0.00        Run 2 :     0.0
Sulfur,   wt% :   0.00        Run 3 :     0.0
Nitrogen,wt% :   0.00
Oxygen,   wt% :   0.00
Btu/lb       :      0

F-Factor     :         dscf/MMBtu; enter this value or {F9} for result.
FIELD DATA                                   RUN     RUN     RUN
----------                                     1       2       3

  Meter Temp., Tm (dF) ..............     91.00   91.50  104.00
  Stack Temp., Ts (dF) ..............    390.00  401.00  325.00
  Sq.Rt. dP .........................    0.9530  0.9350  0.7700
  dH (in. H2O) ......................      1.91    1.84    1.44
  Meter Vol.,Vm (ft3) ...............    49.273  48.050  43.421
  Meter Y ...........................     1.000   1.000   1.000
  Bar. Press.,Pb (in.Hg.) ...........     30.02   30.02   30.03
  Vol. H2O, Vlc (ml) ................      86.0    78.0    66.0
  Static Press.,Ps (in.H2O) .........      0.00    0.00    0.00
  Test Time (min.) ..................      64.0    64.0    64.0
  Nozzle Dia.,Dn (in.) ..............     0.248   0.248   0.248
  Oxygen, O2 (%) ....................     10.30   10.80   13.90
  Carbon Dioxide, CO2 (%) ...........     10.00   10.00    7.50
  Carbon Monoxide, CO (%) ...........      1.40    0.40    0.40

  Is this Method 5 or Method 5/8 ?             (5 or 58) :          5

LABORATORY RESULTS                           RUN     RUN     RUN
------------------                             1       2       3

  GRAVIMETRIC ANALYSIS :
  Front Half Wash (FHW) .............  0.01510 0.01540 0.02450 grams
  Filterable Particulate (MF) .......  0.01730 0.00350 0.01320
  Condensible Particulate (BHW) .....  0.00000 0.00000 0.00000

  SO2 ANALYSIS :
  SO2 Analysis (H2O2 impingers)......      0.00    0.00    0.00 mg H2SO4
  Sample Volume, ml .................         0       0       0
  Sample Aliquot, ml ................         0       0       0
  Volume of Titer, ml ...............      0.00    0.00    0.00
  Volume of Titer Blank, ml .........      0.00    0.00    0.00
                                 Normality of BaCl .......... 0.0000000
```

Florida Department of Environmental Regulation
Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400
Lawton Chiles, Governor
Carol M. Browner, Secretary

FAX TRANSMITTAL LETTER

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TO:

NAME: Dr. John Koogler
AGENCY: Koogler & Associates

TELEPHONE: 904-377-7158

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NAME: Bruce Mitchell

AGENCY: FDER/DARM/BAR

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COMMENTS: FCS wastewater treatment sludge project:

① January 18, 1991 letter (4 pages)

② February 26, 1991 letter (2 pages)

MESSAGE CONFIRMATION

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Sent to Dr. John B. Koogler, Ph.D., P.E	
Street and No. Koogler & Assoc. 4014 N. W. 13th Street	
P.O., State and ZIP Code Gainesville, FL 32609	
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PS Form 3800, June 1985

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PS Form **3811**, Apr. 1989 ★U.S.G.P.O. 1989-238-815 **DOMESTIC RETURN RECEIPT**

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PSD-FL-091
AC27-118674

Florida Department of Environmental Regulation
Twin Towers Office Bldg. ● 2600 Blair Stone Road ● Tallahassee, Florida 32399-2400
Lawton Chiles, Governor
Carol M. Browner, Secretary

March 8, 1991

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Dr. John B. Koogler, P.E.
Koogler & Associates
4014 N.W. 13th Street
Gainesville, Florida 32609

Dear Dr. Koogler:

Re: Florida Crushed Stone Company
Tire Derived Fuel Test

A copy of a letter from Ms. Jewell A. Harper, Chief-Air Enforcement Branch, U.S. EPA-Region IV, is enclosed for your review, which is a critique of the performance test results referenced above. Because of the points raised, please respond to the comments and submit them to the Bureau of Air Regulation.

If there are any questions, please give Bruce Mitchell a call at 904-488-1344 or write to me at the above address.

Sincerely,

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

CHF/BM/plm

Enclosure

c: B. Thomas, SWD 3-8-91
C. Hetrick, HCBCC w/enclosure } 3-11-91 BRm
H. E. Andre, FCS w/enclosure }
Reading File } 3-8-91
Bruce Mitchell }

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IV
345 COURTLAND STREET, N.E.
ATLANTA, GEORGIA 30365

FEB 13 1991

4APT-AE

RECEIVED
FEB 22 1991
DER - BAQM

Mr. C. H. Fancy, P. E., Chief
Bureau of Air Regulation
Division of Air Resources Management
Florida Department of Environmental
  Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Dear Mr. Fancy:

As requested in your December 18, 1990, letter, we have reviewed the test reports submitted by Florida Crushed Stone (FCS) for their facility in Hernando County, Florida. We understand that this facility is jointly owned by FCS and Central Power and Lime, Inc. The purpose of the test reports was to determine the change in emission rate of various pollutants if the facility is permitted to fire tire derived fuel (TDF) in the portland cement kiln. The portland cement kiln emissions are combined with emissions from the power plant and lime calciner to a common stack. Testing was performed on the combined emissions.

We do not recommend that this test report be accepted as evidence of a change in emission rate of any pollutant until additional information is obtained from FCS. The test report is missing process and pollution control device data and some of the test results are in error due to the failure to adhere to proper procedures and quality assurance problems.

The following process and pollution control device data should be obtained for each test run:

1. Logbooks or stripcharts of the actual feed rates to and production rates of the portland cement kiln, power plant and lime calciner. In the test report, feed and production rates for each process are only stated as an average over the test period and no actual process data is presented. The report also states that TDF was used to provide up to 15 percent of the total heat input to the cement kiln but did not provide any actual feed rates or analysis of the TDF to substantiate the claim.

2. Logbooks or stripcharts which document the operation of the pollution control devices. The type of air pollution control device should also be specified. Based upon the stack temperature, we believe that the pollution control device is an ESP.

Without proper documentation of the process and pollution control device data, the comparison of emission rates between TDF firing and baseline operation is without basis. For example, if the ESP was not operating optimally or under the same conditions, the comparison of particulate and metal emission rates would not be accurate.

The following test data and clarifications should be obtained:

1. The acetone blank corrections for the Method 5 test results were not performed and the true acetone blank corrections should be obtained. To properly correct the amount of particulate collected in a Method 5 sampling train, the exact volume of acetone used to rinse the front half of the sampling train must be determined as is the volume of the acetone blank. It appears that the analyst evaporated the acetone blanks and samples to dryness without determining their volume. If the volume of acetone for the blank and each sample cannot be determined, small errors in the results (less than ±5%) are probable.

2. The test procedure and documentation of the CO_2 concentrations should be made. With the exception of the three particulate-metal test runs under baseline conditions, no note of the CO_2 measurements were made. Considering the nature of the process, CO_2 can be generated in portland cement plants and the assumption that CO_2 emissions equals 21 minus the O_2 concentration is erroneous. In addition, since combustion equipment was utilized, at a minimum an ORSAT analysis of the stack gas per test run should have been performed.

3. The CO input data to the computer program which calculates the test run results indicate that CO was as high as 32,000 ppm (3.2%) during the second Modified Method 5 test run with TDF firing which conflicts with the highest reported CO test result during TDF firing of 310 ppm. Other CO input data indicate concentrations of 0 to 14000 ppm when firing TDF. These discrepancies need to be explained.

4. We recommend that the dioxan/furan result for the first test run with TDF firing be rejected. The analyst of the sample indicted that the result was in question because of possible sample switching and did not even charge for the analysis of the sample.

5. We recommend that FCS be required to retest for benzene emissions during TDF firing because the laboratory could not accurately quantify the amount of benzene due to the high amount of benzene in two of three samples.

After this data has been obtained and if desired, we will reevaluate the test reports.

If you have any questions regarding this letter, please contact Mr. Paul Reinermann at 404/347-2904.

Sincerely yours,

Sally L. Shaver, for
Jewell A. Harper, Chief
Air Enforcement Branch
Air, Pesticides and Toxics
Management Division

cc: B. Mitchell
D. Homan, SW Dist.
J. Jennings, HCPD
CHF/BA
C. Shaver, NPS
D. [illegible], [illegible]

Florida Department of Environmental Regulation

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

Lawton Chiles, Governor

Carol M. Browner, Secretary

FAX TRANSMITTAL LETTER

DATE: 2-28-91

TO:

NAME: Chris Shaver / John Bunyak
AGENCY: NPS-Air

TELEPHONE: (303) 969-2822

OF PAGES (INCLUDE COVER SHEET): 4

FROM:

NAME: R. Bruce Mitchell

AGENCY: FDER / DARM / BAR

IF ANY PAGES ARE NOT CLEARLY RECEIVED, PLEASE CALL IMMEDIATELY. PHONE NO. (904) 488-1344

SENDER'S NAME: Same as above.

COMMENTS: U.S. EPA - Region IV's critique on tire derived fuel test results associated with a kiln at Florida Crushed Stone's facility in Hernando County, Florida. If your comments have been finalized, please forward them to me.

Thanks,
R. Bruce Mitchell

```
MESSAGE CONFIRMATION                         FEB-28-'91  THU  11:50

                              TERM ID:  DIV OF AIR RES MGMT    P-9999

                              TEL  NO:  904-922-6979
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NO.	DATE	ST. TIME	TOTAL TIME	ID	DEPT CODE	OK	NG
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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IV
345 COURTLAND STREET, N.E.
ATLANTA, GEORGIA 30365

FEB 13 1991

4APT-AE

RECEIVED
FEB 22 1991
DER - BAQM

Mr. C. H. Fancy, P. E., Chief
Bureau of Air Regulation
Division of Air Resources Management
Florida Department of Environmental
Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Dear Mr. Fancy:

As requested in your December 18, 1990, letter, we have reviewed the test reports submitted by Florida Crushed Stone (FCS) for their facility in Hernando County, Florida. We understand that this facility is jointly owned by FCS and Central Power and Lime, Inc. The purpose of the test reports was to determine the change in emission rate of various pollutants if the facility is permitted to fire tire derived fuel (TDF) in the portland cement kiln. The portland cement kiln emissions are combined with emissions from the power plant and lime calciner to a common stack. Testing was performed on the combined emissions.

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2. Logbooks or stripcharts which document the operation of the pollution control devices. The type of air pollution control device should also be specified. Based upon the stack temperature, we believe that the pollution control device is an ESP.

Without proper documentation of the process and pollution control device data, the comparison of emission rates between TDF firing and baseline operation is without basis. For example, if the ESP was not operating optimally or under the same conditions, the comparison of particulate and metal emission rates would not be accurate.

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After this data has been obtained and if desired, we will reevaluate the test reports.

If you have any questions regarding this letter, please contact Mr. Paul Reinermann at 404/347-2904.

Sincerely yours,

Sally L. Shaver, for
Jewell A. Harper, Chief
Air Enforcement Branch
Air, Pesticides and Toxics
Management Division

cc: B. Mitchell
D. Thomas, SW Dist.
J. Jennings, HCPD
CHF/BA
C. Shaver, NPS
[illegible], KYF

File Copy

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET, N.E.
ATLANTA, GEORGIA 30365

FEB 13 1991

4APT-AE

RECEIVED

FEB 22 1991

DER - BAQM

Mr. C. H. Fancy, P. E., Chief
Bureau of Air Regulation
Division of Air Resources Management
Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

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Sincerely yours,

Sally L. Shaver, for
Jewell A. Harper, Chief
Air Enforcement Branch
Air, Pesticides and Toxics
Management Division

cc: B. Mitchell
D. Thomas, SW Dist.
J. Jennings, HCPD
CHF/BA
C. Shaver / John Bunyak - FAX'd & hard copy sent 2-28-91
J. Koogler, K&A
Dexter Russell - Pacific Env. Services 2-28-91
Durham, N.C.
Tom Dietsch - Calif. Integrated Waste Mgmt. Bd. 2-28-91
Sacramento, Ca

1-23-91
2:41- 2:50

Paul Reinerman -

- no process data
- no control data
- CO measurement
- did not weigh the PM correctly
- did not quantify benzene
- how much TDF did they fire/run

✓ W Syed

Department of Environmental Regulation

Routing and Transmittal Slip

To: (Name, Office, Location)

1. Mr. Dexter Russell
2. Pacific Environmental Services
3. 3708 Mayfair Drive
4. Durham, N.C. 27707

Remarks:

(919) 493-3536

Dear Mr. Russell:

Per your request, I have enclosed a a copy of the emissions and test report of a facility utilizing tires as a supplemental fuel source. The purpose was a trial burn program only.

Since this request is related to a study that you are conducting, I would appreciate it if you would provide me with a copy of any reports derived from this study. If I can be of further assistance, please give me a call.

Sincerely,

From
R Bruce Mitchell

Date
2-20-91

Phone
(904) 488-1344

KOOGLER & ASSOCIATES

BEST AVAILABLE COPY

Department of Environmental F

Routing and Transmi

To: (Name, Office, Location)

1. Mr. Dexter Russell
2. Pacific Environmental Services
3. 3708 Mayfair Drive
4. Durham, N.C. 27707

Remarks: (919) 493-3536

Dear Mr. Russell,

Per your request, I have enclosed a copy of the baseline kiln test. Also, I have enclosed a copy of EPA-Region IV's letter critiquing the test results from firing TDF in the kiln.

If I can be of further assistance, please give me a call. If you have any comments regarding the two tests, please provide them to me.

Sincerely,

From: R Bruce Mitchell

Date: 2-28-91

Phone: (904) 488-1344

DIVISION OF AIR RESOURCES MANAGEMENT

R. BRUCE MITCHELL
ENGINEER
PERMITTING AND STANDARDS SECTION
BUREAU OF AIR REGULATION

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32399-2400

TELEPHONE:
(904) 488-1344
SUNCOM: 278-1344

ASSOCIATES
TAL SERVICES

4014 NW THIRTEENTH STREET
GAINESVILLE, FLORIDA 32609
904/377-5822 ■ FAX 377-7158

Department of Environmental Regulation

Routing and Transmittal Slip

To: (Name, Office, Location)

1. Mr. Tom Dietsch
2. California Integrated Waste Management Bd.
3. 1020 9th Street, Suite 300
4. Sacramento, California 95814

Remarks: 916-323-5280

Dear Mr. Dietsch,

Per your request, I have enclosed a copy of the test report of a source using tire derived fuel. If anyone critiques the report, would you please forward a copy of the report(s) to me.

If we can be of further service, please give me a call.

Sincerely,

From: Bruce

Date: 2-6-91

Phone: 904-488-1344

Department of Environmental Regu

Routing and Transmitt

DIVISION OF AIR RESOURCES MANAGEMENT

R. BRUCE MITCHELL
ENGINEER
PERMITTING AND STANDARDS SECTION
BUREAU OF AIR REGULATION

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32399-2400

TELEPHONE:
(904) 488-1344
SUNCOM: 278-1344

BEST AVAILABLE COPY

To: (Name, Office, Location)

1. Mr. Tom Dietsch
2. California Integrated Waste Management Board
3. 1020 9th Street, Suite 100
4. Sacramento, California 95814

Remarks: (916) 323-5280

Dear Mr. Dietsch,

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If I can be of further assistance, please give me a call. If you have any comments regarding the two tests, please provide them to me.

Sincerely,

From: R Bruce Mitchell

Date: 2-28-91

Phone: (904) 488-1344

ASSOCIATES
TAL SERVICES
4014 NW THIRTEENTH STREET
GAINESVILLE, FLORIDA 32609
904/377-5822 ■ FAX 377-7158

OERTEL, HOFFMAN, FERNANDEZ & COLE, P. A.
ATTORNEYS AT LAW

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R. L. CALEEN, JR.
C. ANTHONY CLEVELAND
TERRY COLE
ROBERT C. DOWNIE, II
MARTHA J. EDENFIELD
SEGUNDO J. FERNANDEZ
KENNETH F. HOFFMAN
KENNETH G. OERTEL
HAROLD F. X. PURNELL
PATRICIA A. RENOVITCH
SCOTT SHIRLEY
THOMAS G. TOMASELLO
W. DAVID WATKINS

SUITE C
2700 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301

MAILING ADDRESS:
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TALLAHASSEE, FLORIDA 32314-6507

TELEPHONE (904) 877-0099
FACSIMILE (904) 877-0981

JOHN H. MILLICAN
ENVIRONMENTAL CONSULTANT
(NOT A MEMBER OF THE FLORIDA BAR)

J. P. SUBRAMANI, PH. D., P. E.
ENVIRONMENTAL CONSULTANT
(NOT A MEMBER OF THE FLORIDA BAR)

January 18, 1991

HAND DELIVERY

RECEIVED
JAN 18 1991
DER - BAQM

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

RE: Emission Test Reports at Baseline and TDF Conditions at Florida Crushed Stone Facility; AC27-118674

Dear Mr. Fancy:

Thank you for your December 18, 1990 letter to Commissioner John Richardson and enclosing the Florida Crushed Stone (FCS) test results. On behalf of Hernando County, I have been asked by Mr. Lawrence Jennings, Manager of Planning Department, Hernando County, to provide comments to you.

We have reviewed the information contained in the emission reports which were generated for the baseline operation and tire burning (TDF) conditions. I believe the test data raise more questions than provide answers.

Information submitted by FCS with its original application request revealed that emissions of total particulate, heavy metals (particularly zinc) and polynuclear aromatic compounds would increase when TDF is burned. The attached Table 1 which was compiled from the FCS data show the opposite trend. Secondly, the information on dioxin/furan emissions needs to be further clarified and very closely examined.

Emissions of dioxin and its isomers are reported in toxic equivalent quantities. We question the appropriateness as well as the basis for the toxic equivalence factors (TEF) used in the emissions reports. Attached Table 2 lists the TEFs contained in an EPA Risk Assessment Document versus TEFs used in the FCS report. There are significant differences in TEFs contained in the FCS report which need resolution.

Thirdly, it is noted that the 2,3,7,8-dioxin isomer was found only during the first test run under the baseline conditions at 0.007 nanograms. No dioxin was found in any of the other five test runs. We would like to evaluate the potential dioxin problem further and would appreciate receiving any information available from other test facilities on dioxin emissions. In this regard, we again request that you provide us a copy of the Modesto Energy Company's emissions report which was submitted to DER. We also request a copy of the NO_x test data information as soon as it becomes available.

The citizens and the Board of Hernando County Commissioners are concerned about the potential increases in the emissions of deleterious substances including dioxin/furans, heavy metals, PNAs and other incomplete combustion products (PICs) from the burning of TDFs. We request that you and your staff carefully review the test reports from FCS, and hold public hearings prior to authorizing the burning of TDFs.

Sincerely,

JP Subramani

J. P. Subramani

JPS:gg

Enclosure

cc: Mr. Lawrence Jennings
Ms. Katherine Liles
B. Mitchell }
G. Glunn } 1-18-91 PA
C HF/BA

B. Thomas - 1-22-91 [illegible]

Greg Worley-EPA }
John Bunyak-NPS } FAX'd 1-23-91 [illegible]

TABLE 1

Emissions from Florida Crushed Stone (lbs/hr)

	Baseline Test	TDF Test
Particulate	56.80	52.21
SO_2	595.15	551.3
VOC	0.14	0.44
Semi VOC	5.01	0.90
Dioxin/Furan	5.4×10^{-9}	7×10^{-9}
Metal Emissions:		
Al	6.86	8.13
Fe	1.39	1.30
Zn	3.12	1.68

TABLE 2

Dioxin/Furan Toxic Equivalence Factors (TEF)

(From "1989 update to the Interim Procedures for Estimating Risks Associated with Exposures of Chlorinated Dibenzo-p-dioxins and Dibenzofurans", March 1989, EPA/625/3-89/016)

Dioxin Isomer	**TEF**	**TEF in FCS Report**
2378 - tetra	1	1
12378 - penta	0.5	0.5
123478 - hexa	0.1	0.04 (different)
123789 - hexa	0.1	0.04 (different)
123678 - hexa	0.1	0.04 (different)
1234678 - hepta	0.01	0.001 (different)
12346789 - octa	0.0001	0 (different)
FURAN ISOMER		
2378 - Tetra	0.1	0.1
12378 - penta	0.05	0.1 (different)
23478 - penta	0.5	0.1 (different)
123478 - hexa	0.1	0.01 (different)
123789 - hexa	0.1	0.01 (different)
123678 - hexa	0.1	0.01 (different)
234678 - hexa	0.1	0.01 (different)
1234678 - hepta	0.01	0.001 (different)
1234789 - hepta	0.01	0.001 (different)
12346789 - octa	0.001	0 (different)

Florida Department of Environmental Regulation

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

Bob Martinez, Governor　Dale Twachtmann, Secretary　John Shearer, Assistant Secretary

December 18, 1990

Mrs. Chris Shaver, Chief
Permit Review and Technical Support Branch
National Park Service
Air Quality Division
Post Office Box 25287
Denver, Colorado 80255

Dear Mrs. Shaver:

Re: Emissions Test Reports at Baseline and TDF Conditions
Florida Crushed Stone

Enclosed are the above referenced reports regarding recent performance tests conducted at Florida Crushed Stone's existing facility located in Hernando County, Florida. Even though a formal request to continuously fire tire derived fuel at FCS has not yet been received by the Department's Bureau of Air Regulation (BAR), please evaluate and provide comments to the BAR by January 20, 1991.

If there are any questions, please give Bruce Mitchell a call at 904-488-1344 or write to me at the above address.

Sincerely,

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

CHF/BM/plm

Enclosures

c: B. Thomas, SW Dist.
J. Koogler, P.E., K&A
B. Mitchell
File PSD-FL-091 (AC27-118674) amendment
J. Glunn
Reading File

Florida Department of Environmental Regulation
Twin Towers Office Bldg. ● 2600 Blair Stone Road ● Tallahassee, Florida 32399-2400
Bob Martinez, Governor
Dale Twachtmann, Secretary
John Shearer, Assistant Secretary

December 18, 1990

Mr. Tom Richardson, Chairman
Board of Hernando County Commission
20 North Main Street, Room 262
Brooksville, Florida 34601

Dear Mr. Richardson:

Re: Emissions Test Reports at Baseline and TDF Conditions
Florida Crushed Stone

Enclosed are the above referenced reports regarding recent performance tests conducted at Florida Crushed Stone's existing facility located in Hernando County, Florida. Even though a formal request to continuously fire tire derived fuel at FCS has not yet been received by the Department's Bureau of Air Regulation (BAR), please evaluate and provide comments to the BAR by January 20, 1991.

If there are any questions, please give Bruce Mitchell a call at 904-488-1344 or write to me at the above address.

Sincerely,

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

CHF/BM/plm

Enclosures

c: B. Thomas, SW Dist.
J. Koogler, P.E., K&A

Florida Department of Environmental Regulation

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

Bob Martinez, Governor
Dale Twachtmann, Secretary
John Shearer, Assistant Secretary

December 18, 1990

Ms. Jewell A. Harper, Chief
Air Enforcement Branch
Air, Pesticides & Toxics Management Division
U.S. EPA, Region IV
345 Courtland Street, N.E.
Atlanta, Georgia 30365

Dear Ms. Harper:

Re: Emissions Test Reports at Baseline and TDF Conditions
Florida Crushed Stone

Enclosed are the above referenced reports regarding recent performance tests conducted at Florida Crushed Stone's existing facility located in Hernando County, Florida. Even though a formal request to continuously fire tire derived fuel at FCS has not yet been received by the Department's Bureau of Air Regulation (BAR), please evaluate and provide comments to the BAR by January 20, 1991.

If there are any questions, please give Bruce Mitchell a call at 904-488-1344 or write to me at the above address.

Sincerely,

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

CHF/BM/plm

Enclosures

c: B. Thomas, SW Dist.
J. Koogler, P.E., K&A

Florida Department of Environmental Regulation
Twin Towers Office Bldg. ● 2600 Blair Stone Road ● Tallahassee, Florida 32399-2400
Bob Martinez, Governor Dale Twachtmann, Secretary John Shearer, Assistant Secretary

December 18, 1990

Mr. Bill Thomas, Administrator
Air Programs
Southwest District
4520 Oak Fair Boulevard
Tampa, Florida 33610-7347

Dear Mr. ~~Thomas~~ Bill:

Re: Emissions Test Reports at Baseline and TDF Conditions
Florida Crushed Stone

Enclosed are the above referenced reports regarding recent performance tests conducted at Florida Crushed Stone's existing facility located in Hernando County, Florida. Even though a formal request to continuously fire tire derived fuel at FCS has not yet been received by the Department's Bureau of Air Regulation (BAR), please evaluate and provide comments to the BAR by January 20, 1991.

If there are any questions, please give Bruce Mitchell a call at 904-488-1344 or write to me at the above address.

Sincerely,

Clair

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

CHF/BM/plm

Enclosures

c: J. Koogler, P.E., K&A

FCS

FLORIDA CRUSHED STONE COMPANY

CEMENT / POWER / LIME PLANT

November 26, 1990

Mr. Bruce Mitchell
Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Dear Mr. Mitchell:

Enclosed is one copy of each of two reports which describe the results of air pollutant emissions measurements conducted on the CPL Plant on September 18-24, 1990.

Entitled SUMMARY OF PARTICULATE MATTER, VOLATILE ORGANIC COMPOUNDS, SEMI VOLATILE ORGANIC COMPOUNDS, FURANS AND DIOXINS, SULFUR DIOXIDE, NITROGEN OXIDES, METALS AND VISIBLE EMISSION MEASUREMENTS, these reports summerize the results of testing under BASELINE CONDITIONS AND TIRE DERIVED FUEL CONDITIONS.

If you have any questions, please do not hesitate to call.

Sincerely,

Tom Mountain

Tom Mountain
Environmental Manager

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NOV 29 1990
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TM/nc

P.O. BOX 1508 / 10311 CEMENT PLANT ROAD / BROOKSVILLE, FL 34605-1508 / PHONE (904) 799-7881 / FAX (904) 796-6281

KOOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES
4014 NW THIRTEENTH STREET
GAINESVILLE, FLORIDA 32609
904/377-5822 ■ FAX 377-7158

RECEI
NOV 28 1990
DER - BAQM

KA 307-86-04

November 26, 1990

Mr. J. Harry Kerns
Florida Department of
Environmental Regulation
Southwest District Office
4520 Oak Fair Blvd.
Tampa, FL 33610-7347

Subject: Hernando County-AP
Central Power & Lime, Inc.
Cement Kiln and Clinker Cooler
Operating Permit A027-183508

Dear Mr. Kerns:

In response to your letter of November 15, 1990, to Mr. Tom Mountain of Central Power & Lime, Inc., we request additional time to provide information to the Department relative to the air operating permit for the cement kiln and clinker cooler.

As you are aware, Florida Crushed Stone has recently applied to the Department for approval for tests to determine the effect of two cement plant modifications on emissions from the cement plant and approval has been granted by the Department. The first test was to evaluate the effect of supplementing the coal fired to the cement kiln with up to 15 percent tire derived fuel and the second test was to determine the effect of using a wastewater treatment sediment as a raw material additive. If both of these tests demonstrate, as Florida Crushed Stone suspects, that there will be no increase in air pollutant emissions as a result of the modifications, Florida Crushed Stone will request that the construction permit for the cement kiln and clinker cooler be modified to allow the use of both tire derived fuel and the wastewater treatment sediment. Because of these two ongoing matters, Florida Crushed Stone feels that it would be the Department's benefit and the company's benefit to delay the issuance of an air operating permit until the modifications to the construction permit can be made.

Regarding the additional time to provide this information, the report of the emission measurements for the tire derived fuel test has been completed and submitted to Florida Crushed Stone for review. A report describing baseline emission measurements (measurements with the cement plant operating under normal permitted conditions) has also been completed and submitted to Florida Crushed Stone for review. Copies of both of these reports will be submitted to the Department as soon as Florida Crushed Stone has completed its review.

The emission measurements have also been completed for the wastewater sediment test and we are awaiting final laboratory results. The emission tests were completed the end of October and the results of the dioxins and furans analyses are expected from the laboratory about the middle of December 1990. We should have the emission measurements report completed prior to the end of December 1990. By this date, we will have also provided the Department with all other information related to the cement kiln and clinker cooler; including a resolution of the apparent discrepancy in the stack gas flow measurements.

Allowing a reasonable period of time for the Department to review the test reports and other material and to make the necessary modifications to the existing construction permit, I would anticipate that the operating permit for the cement kiln and clinker cooler could be issued by March 31, 1991. I would hereby request that permit AC27-118674 be extended to this date.

If you have any questions regarding these matters, please do not hesitate to contact me.

Very truly yours,

KOOGLER & ASSOCIATES

John B. Koogler, Ph.D., P.E.

JBK:wa

cc: Mr. Clair Fancy, FDER
Mr. Tom Mountain

MEDIA HOT SHEET

Date: 11/28/90

Reporter: Mr. Matt Stahl

At (Newspaper, T.V., Radio, etc.): Spartenburg Herald Journal
Spartenburg, S.C.

From: R. Bruce Mitchell
Division: of Air Resources Management
Bureau/~~Sect.~~: of Air Regulation
Phone: 488-1344

Topic of Call: Compliance status of CMI in Polk Co. and Florida Crushed Stone in Hernando County

Questions asked:
1. Compliance Status of each facility?
2. Materials Processed / Produced?
3.

Deadline:

Summary of Conversation (use remainder of sheet, and back, if necessary):

① I referred him to Mr. Jim Pennington @ DARM/BAR and the SW District office (no name given) for the ~~company~~ companies' status of compliance.

② He said that the proposed facility by CMI for an area outside of Spartenburg (a rural area) was going to incinerate MSW for steam and also to be used as a cogeneration facility. Also, it was going to process/recycle some plastics. I told him that Florida's facilities, CMI and FCS, are not authorized to process MSW; and, that FCS has tested tire derived fuel as a fuel and wastewater sludge from FEA as a clinker supplement, but has not been authorized to continuously use them in their process to date.

DER Employee Interviewed R. Bruce Mitchell

11-28-90
10:45

Jim,

Mr. Matt Stahl, a reporter @ the Spartenburg Herald Journal in Spartenburg, S.C., wants to know the compliance track record of CMI in Polk County and FL Crushed Stone in Hernando County.

Please give him a call @ (803) 487-7146.

Thanks,

OPERATING PERMIT SUBMITTAL ➔

■ TEST FAILED

CHEMICAL LIME ➔ failed to renew

-WN-

CEMENT KILN & KLINKER COOLER
NOx - AUG 20 < 80% EA

NOT AN NSPS STANDARD

MEDIA HOT SHEET

Date: 11/30/90

Reporter: MATT STAHL

At (Newspaper, T.V., Radio, etc.): SPARTANSBURG HERALD JOURNAL
SPARTANSBURG, S.C.
(803) 487-7146

From: JIM PENNINGTON
Division: ARM
Bureau/Sect.: AR/C&E
Phone: 8-1344

Topic of Call: COMPLIANCE HISTORY OF FLORIDA CRUSHED STONE & CMI

Questions asked:
1. WHAT IS THE COMPLIANCE HISTORY,
2.
3.

Deadline: PAST

Summary of Conversation (use remainder of sheet, and back, if necessary):

MR. STAHL WANTED TO KNOW THE HISTORY OF THE TWO COMPANIES IN AIR POLLUTION, AS THEY ARE PLANNING TO BUILD A MUNICIPAL INCINERATOR IN SOUTH CAROLINA.

I TOLD HIM THAT CMI WAS A NEW ENTITY AND WAS APPLYING FOR PERMITS IN DeSOTO COUNTY, ALSO, THAT FLORIDA CRUSHED STONE'S CEMENT KILN IS PRESENTLY (SINCE AUG OUT OF COMPLIANCE FOR NO_x EMISSIONS, BUT THAT THE NOx EMISSIONS IS A STATE STANDARD AND THIS VIOLATION IS NOT REPORTABLE TO THE EPA.

DER Employee Interviewed Jim Pennington

For Routing To Other Than The Addressee

To: ______________ Location ______________
To: ______________ Location ______________
To: ______________ Location: ______________
From: ______________ Date: ______________

State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

Interoffice Memorandum

TO: Clair Fancy

FROM: C.S. Lee

DATE: November 6, 1990

RE: Florida Crushed Stone, C P & L
Tire-derived Fuel Tests and
Wastewater Treatment Sediment
Tests at Cement Kiln

Enclosed please find the copies of the subject tests observation reports for your reference. If you want copies of the complete stack test reports, please let me know (Extension 417).

CSL/js

Encl

Department of Environmental Regulation

Routing and Transmittal Slip

To: (Name, Office, Location)

1.	Clair Fancy
2.	DARM
3.	TT
4.	Bruce

Remarks:

RECEIVED
NOV 13 1990
DER - BAQM

From C. S. Lee	Date 11/7/90 Phone

MEMORANDUM

TO: File

THRU: Bill Thomas

FROM: Scott Sheplak, C.S. Lee, Jason Gorrie

DATE: September 25, 1990

SUBJECT: Florida Crushed Stone, C P & L
Tire-derived Fuel Tests at Cement Kiln

On September 21, 1990, Scott, Lee, & Jason visited Florida Crushed Stone to witness compliance testing of the cement kiln using tire-derived fuel. Koogler & Associates performed the testing. Test team members were Rodney Paul, Mason Joye, and Jose Garcia. Plant contacts were Tom Mountain and Curtis Lauer.

Koogler & Associates performed baseline tests prior to the compliance tests. On September 20, 1990, Koogler conducted two multi-metals tests. On September 21, Koogler conducted one multi-metals test, one VOST, a modified Method 5 for semi-volatiles, a modified Method 5 for furans and dioxans, an SO_2 test and a NOX test. Department personnel split up and witnessed the multi-metals testing on September 21. Lee and Jason audited the testing crew and Scott monitored tire loading. Tire-derived fuel was loaded to the kiln through a chute. Workers loaded one bucket of tires, approximately 19 pounds/bucket, every 30 seconds. Approximately 1.14 tons per hour of tires were fed to the kiln during the test. It was noted that the tire feed rate may need to be adjusted for dirt. Maybe 1 or 2 pounds of dirt was present in a bucket. Coal was fed to the kiln at approximately 7.8 TPH. Tire-derived fuel provided 15% of the total heat input to the cement kiln. Cement production during the test was 115 TPH and clinker 75 TPH. The power plant produced 87.3 MW of electricity. Continuous emission monitors indicated 10% opacity, 10% oxygen, 220 ppm of sulfur dioxide and stack temperature of 380° F. Jason performed a VE during the test. The 6 minute average was approximately 11% opacity.

Department personnel noted a potential buildup of tire residual inside the refractory lined chute which fed the cement kiln. Pictures were taken of the inside of the chute and of the tire loading operation.

SMS/js

MEMORANDUM

TO: File

THRU: Bill Thomas

FROM: Scott Sheplak, C. S. Lee, and Jason Gorrie

DATE: November 2, 1990

RE: Florida Crushed Stone, C P & L
Wastewater Treatment Sediment Tests at Cement Kiln

On October 31, 1990, Scott, Lee and Jason visited Florida Crushed Stone to witness compliance testing of the cement kiln using wastewater treatment sediment from the Jacksonville's Northside Generating Station as a raw feed material to the dry process. Koogler & Associates performed the testing. Test team members were Mason Joye, Rodney Paul, Steve Bell and Andrew Bass. Plant contacts were Tom Mountain, Curtis Lauer, and Andy Hollingshead.

Koogler & Associates conducted a modified Method 5 for PCDDs and PCDFs and PAHs, a VOST for VOC and benzene, and a multi-metals test on October 31, 1990. Koogler & Associates also collected a wastewater sediment sample for analysis using EPA Method 608 (Organochlorine pesticides and PCBs) and EPA Method 610 (PAHs). Department personnel witnessed the sediment feeding and multi-metals sample recovery for Run #1. Florida Crushed Stone agreed to and completed testing for dioxins and furans on November 1, 1990. Florida Crushed Stone plans to submit the test results together with the tire derived fuel results. The laboratory analysis, according to Mason Joye, takes 45 days.

The wastewater treatment sediment was transferred from a rail car into a septic tank and taken to the grinding mill location. The sediment was kept in solution by the addition of pressurized water and pumped via hose into the duct between the grinding mill and grit separator. Approximately 6 gpm (1.62 TPH) of sediment was fed into the dry feed. Curtis Lauer measured the flow rate at 30 minute intervals. Florida Crushed Stone intends to mix dry sediment with dry raw materials prior to the grinding mill. No source modifications would be necessary to accomplish this. The sediment feed comprised roughly 1% of the total raw materials fed to the kiln. The cement production rate was approximately 125 TPH and clinker 80 TPH. Continuous emission monitors indicated 10% opacity 7.5% oxygen, 187 ppm SO_2, and stack temperature of 440° F.

During the multi-metals sample recovery for Run #1, the probe line acid wash and DI water were spilled. Koogler has been informed that the Department can not accept the results for Run #1.

OERTEL, HOFFMAN, FERNANDEZ & COLE, P.A.

ATTORNEYS AT LAW

SUZANNE BROWNLESS
M. CHRISTOPHER BRYANT
R. L. CALEEN, JR.
C. ANTHONY CLEVELAND
TERRY COLE
ROBERT C. DOWNIE, II
MARTHA J. EDENFIELD
SEGUNDO J. FERNANDEZ
KENNETH F. HOFFMAN
KENNETH G. OERTEL
HAROLD F. X. PURNELL
PATRICIA A. RENOVITCH
SCOTT SHIRLEY
THOMAS G. TOMASELLO
W. DAVID WATKINS

SUITE C
2700 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301

MAILING ADDRESS:
POST OFFICE BOX 6507
TALLAHASSEE, FLORIDA 32314-6507

TELEPHONE (904) 877-0099
FACSIMILE (904) 877-0981

JOHN H. MILLICAN
ENVIRONMENTAL CONSULTANT
(NOT A MEMBER OF THE FLORIDA BAR)

J. P. SUBRAMANI, PH. D., P. E.
ENVIRONMENTAL CONSULTANT
(NOT A MEMBER OF THE FLORIDA BAR)

November 1, 1990

HAND DELIVERY

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

RE: (1) Florida Crushed Stone Company; Amendment to AC 27-118674; and

(2) Florida Mining and Materials Company; Amendments to AC 27-169616 and AC 27-173474.

Dear Mr. Fancy:

Our law firm has been retained by Hernando County to evaluate the proposals by the Florida Crushed Stone Company and Florida Mining and Materials to respectively burn industrial sludge, and tires and used oil, in their cement manufacturing operations. We respectfully request that the Department reconsider the permit authorization granted to Florida Crushed Stone Company to burn industrial sludge. We also request the Department not to allow the burning of the tires in the cement kilns owned by the Florida Mining and Materials Company. Our reasons are stated below.

1. Proposal by Florida Crushed Stone Company to burn industrial sludge (AC 27-118674)

Our evaluation of this proposal clearly indicates that the Department approval was granted based on an inadequate and inappropriate review of the EP and TCLP toxicity characterization of the industrial sludge from the Jacksonville Electric Authority (JEA). The EP and TCLP procedures evaluate the solubility characteristics of the metals in the water medium and have no direct relationship to air pollution evaluation factors.The EP and TCLP characterization, while indicative of heavy metals content, is primarily appropriate for evaluating the threat to groundwater and surface water contamination.

Secondly, the Department authorization appears to have been based on the test results of the Gifford-Hill Cement Company in Harleyville, South Carolina. That test report indicates that the metals content of the industrial sludge are much lower than those of the JEA sludge. A comparison of the concentration of certain metals is listed below.

PARAMETER	SOUTH CAROLINA SLUDGE (ppm)	JEA SLUDGE (ppm)
Arsenic	40	6,500
Molybdenum	910	16,000
Nickel	8,200	20,000
Vanadium	26,800	64,000
Selenium	24	330

Additionally, the JEA sludge contains 170,000 ppm iron, 41,000 ppm magnesium, 66,000 ppm sulfates and 5,800 ppm chlorides. No information is available as to the Department's evaluation of air pollution effects due to high contents of these components in the sludge. We also note that the Department has relaxed the requirement of emission testing for dioxins and furons. The chemistry for dioxin formation is not clearly understood and therefore testing for the precursors may not yield reliable information.

2. Proposal by Florida Mining and Materials Company to burn tires and used oil

The company's proposal is to burn as much as 70 percent supplementary fuel consisting of tires and used oil. We believe there will be increases in the emissions of many air pollutants, especially, fine particulate matter, and heavy metals such as arsenic, cadmium, chromium, lead and zinc. We also believe that there will be significant increase in the emissions of sulfur dioxide, acid mist and polynuclear aromatic compounds. We learned that the Department had earlier authorized Florida Crushed Stone to test burn tires in its Brooksville facility. We would appreciate receiving copies of the stack test emissions for the above pollutants. We would also appreciate receiving test reports for the Modesto Energy facility located in Westley, California.

Please feel free to contact me if you have any questions.

Sincerely,

JP Subramani

J. P. Subramani

JPS:gg

cc: Bruce Snow, Esq.
Kathy Liles

Department of Environmental Regulation

Routing and Transmittal Slip

To: (Name, Office, Location)

1. Representative Chuck Smith
2. 610 West Jefferson Street
3. Brooksville, Florida 34601
4.

Remarks:

Dear Sir:

Per your request, I have enclosed the following:

① FL Crushed Stone: Tire Derived Fuel Issue
  a. Technical Evaluation & Preliminary Determination
  b. Final Determination
  c. Attachments are included with the packages

② FL Crushed Stone: JEA wastewater treatment sludge issue
  a. TE & PD
  b. FD
  c. Associated attachments

If there are any questions or if we can be of further service, please give me a call at (904)488-1344.

Sincerely,

C. H. Fancy

From R Bruce Mitchell
for C. H. Fancy, Chief
Bureau of Air Regulation

Date 10-10-90

Phone (904) 488-1344

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Date: 10/10/90

1 From (Your Name) Please Print: Clair Fancy
Your Phone Number (Very Important): (904) 487-3922
Company: DEPT OF ENVIR REG/STATE OF FLA
Department/Floor No.:
Street Address: 2600 BLAIR STONE RD RM 108
City: TALLAHASSEE
State: FL
ZIP Required: 32399

2 To (Recipient's Name) Please Print: Rep. Chuck Smith
Recipient's Phone Number (Very Important): ( )
Company:
Department/Floor No.:
Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip® Codes.): 610 West Jefferson St
City: Brooksville
State: FL
ZIP Required: 34601

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12 ☒ FEDEX PAK *
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3 DELIVER SATURDAY (Extra charge) (Not available to all locations) ☐
4 ☐ DANGEROUS GOODS (Extra charge)
5 ☐
6 ☐ DRY ICE ______ Lbs.
7 ☐ OTHER SPECIAL SERVICE ______
8 ☐
9 ☐ SATURDAY PICK-UP (Extra charge)
10 ☐
11 ☐ DESCRIPTION
12 ☐ HOLIDAY DELIVERY (if offered) (Extra charge)

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FORMAT #041

041

FLORIDA CRUSHED STONE COMPANY

RECEIVED
OCT 1 1990
DER-BAQM

September 28, 1990

Mr. C. H. Fancy, P. E.
BUREAU OF AIR REGULATION
DEPARTMENT OF ENVIRONMENTAL
REGULATION
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Dear Mr. Fancy:

After Mr. Crabill's departure from Florida Crushed Stone Company, somehow Mr. Randy Thompson, our General Manager of Geotech Industries (one of our subsidiaries) started receiving correspondence from your office.

Mr. Don A. Stone is our new Corporate Environmental and Safety Manager and all correspondence regarding permitting and compliance should be addressed to him at our Leesburg office. Thank you for making this correction and we apologize for this confusion in our personnel transition.

Should you have any questions, please do not hesitate to call.

Sincerely,

Linda Fairbanks

Linda Fairbanks
Environmental Department Secretary

lf:60
fderchg.9wp

cc: Don A. Stone

P.O. BOX 490300 / 1616 S. 14th ST. / LEESBURG, FL 34749-0300 / (904) 787-0608 / FAX #904/728-5001

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May 10, 1990

Mr. C. 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: DER File No. 27-118674/PSD-FL-091

Dear Mr. Fancy:

Attached is one copy of the ad published per DER Rule 17-130.150 and FS 403.815 as regards the above referenced DER file number.

The Tampa Tribune had not sent the notarized "proof of publication" at the time of this letter. However, a clerk there promised to send it to your office via Federal Express for arrival by tomorrow, May 11. In the event the newspaper experiences a delay in sending the "proof of publication", please accept this submittal as evidence of notice until the form filled out by the Tampa Tribune staff arrives in its place.

I am available by telephone at (904)-787-0608, should you have any comments. Thank you, I remain

Sincerely,

Randall K. Thompson
Executive Director

Enclosure: Ad copy

cc: Dr. John Koogler
Mr. Joe Piermatteo
File

RKT/sm

1616 S. 14th Street • Post Office Box 490300 • Leesburg, Florida 34749-0300 • Phone (904) 787-0608 • FAX (904) 728-5001
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[redacted]

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5-10-90

1 From (Your Name) Please Print: Randall K. Thompson
Your Phone Number (Very Important): (904) 787-0608
Company: LORIDA CRUSHED STONE CO
Department/Floor No.:
Street Address: 616 S 14TH ST
City: EESBURG
State: FL
ZIP Required: 3 4 7 4 8

2 To (Recipient's Name) Please Print: C. H. Fancy
Recipient's Phone Number (Very Important): (904) 888-134
Company: FL Dept. of Environmental Regulation
Department/Floor No.:
Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip® Codes.): Twin Towrs Office Bld. 2600 Blair Stone
City: Tallahassee
State: FL
ZIP Required: 32399-2400

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Priority Overnight Service
(Delivery by next business morning†)
11 ☐ YOUR PACKAGING
16 ☑ FEDEX LETTER *
12 ☐ FEDEX PAK *
13 ☐ FEDEX BOX
14 ☐ FEDEX TUBE

Standard Overnight Service
(Delivery by next business afternoon†)
51 ☐
56 ☐ FEDEX LETTER *
52 ☐ FEDEX PAK *
53 ☐ FEDEX BOX
54 ☐ FEDEX TUBE

Economy Service
(formerly Standard Air)
(Delivery by second business day†)
30 ☐ ECONOMY SERVICE

Heavyweight Service
(for Extra Large or any package over 150 lbs.)
70 ☐ HEAVYWEIGHT **
80 ☐ DEFERRED HEAVYWEIGHT **

† Delivery commitment may be later in some areas.
*Declared Value Limit $100.
**Call for delivery schedule.

DELIVERY AND SPECIAL HANDLING
1 ☐ HOLD FOR PICK-UP (Fill in Box H)
2 ☒ DELIVER WEEKDAY
3 DELIVER SATURDAY (Extra charge) (Not available to all locations) ☐
4 ☐ DANGEROUS GOODS (Extra charge) (CSS not available for Dangerous Goods Shipments)
5 ☐ CONSTANT SURVEILLANCE SVC. (CSS) (Extra charge) (Release Signature Not Applicable)
6 ☐ DRY ICE ______ Lbs.
7 ☐ OTHER SPECIAL SERVICE ______
8 ☐
9 ☐ SATURDAY PICK-UP (Extra charge)
10 ☐
11 ☐ DESCRIPTION
12 ☐ HOLIDAY DELIVERY (If offered) (Extra charge)

PACKAGES	WEIGHT In Pounds Only	YOUR DECLARED VALUE	OVER SIZE
Total	Total	Total	

DIM SHIPMENT (Heavyweight Services Only)
☐ ______ lbs.

Received At
1 ☐ Regular Stop
2 ☐ On-Call Stop
3 ☐ Drop Box
4 ☐ B.S.C.
5 ☐ Station
FedEx Emp. No.

Emp. No.
Date
☐ Cash Received
☐ Return Shipment
☐ Third Party ☐ Chg. To Del. ☐ Chg. To Hold
Street Address
City
State
Zip
Received By:
X
Date/Time Received
FedEx Employee Number

5 Release Signature:
Date/Time

Federal Express Use
Base Charges
Declared Value Charge
Other 1
Other 2
Total Charges

REVISION DATE 11/89
PART #119501 FXEM 2/90
FORMAT #014
014

Department of Environmental Regulation

Notice of Intent to Issue

The Department of Environmental Regulation hereby gives notice of its intent to issue a permit amendment to FCSC (Florida Crushed Stone Company), Environmental Department, P.O. Box 490300, Leesburg, Florida 34749-0300, to conduct a performance test on the cement kiln while burning tire derived fuel (TDF) with coal at 15% of the total (100%) Btu heat input (i.e., TDF @ 15% and coal @ 85%). The purpose of this amendment is to allow FCSC to obtain the data necessary to determine whether the cement kiln is capable of accommodating TDF under the cement kiln's present physical configuration and what regulations the cement kiln will be subject to if it is to be permitted to burn TDF with coal. The proposed project will occur at the applicant's existing facility located approximately 3.5 miles NW of Brooksville, Hernando County, Florida. The Department is issuing this intent to issue for the reasons stated in the proposed letter amendment to the construction permit No. AC 27-118674 and PSD permit No. PSD-FL-091.

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 fourteen (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.

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The application is available for public inspection during 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 Office
4520 Oak Fair Boulevard
Tampa, Florida 33610-7347

Any person may send written comments on the proposed action to Mr. C. H. Fancy at the Department's Tallahassee address. All comments mailed within 14 days of the publication of this notice will be considered in the Department's final determination.

2642 5/4/90

THE TAMPA TRIBUNE

Published Daily

Tampa, Hillsborough County, Florida

RECEIVED

MAY 11 1990

DER - BAQM

State of Florida } ss.
County of Hillsborough }

Before the undersigned authority personally appeared James L. Gonnering, who on oath says that he is Assistant Comptroller of The Tampa Tribune, a daily newspaper published at Tampa in Hillsborough County, Florida; that the attached copy of advertisement being a .... LEGAL NOTICE ....

in the matter of .... ISSUE A PERMIT AMENDMENT ....

was published in said newspaper in the issues of ....

May 4, 1990

Affiant further says that the said The Tampa Tribune is a newspaper published at Tampa, in said Hillsborough County, Florida, and that the said newspaper has heretofore been continuously published in said Hillsborough County, Florida, each day and has been entered as second class mail matter at the post office in Tampa, in said Hillsborough 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.

....

Sworn to and subscribed before me, this .... 10 .... *day*

of .... May ...., *A.D. 19* 90

Debra Lynne Bouchard

(Seal)

Notary Public, State of Florida
My Commission Expires Jan. 6, 1993
Bonded Thru Troy Fain - Insurance Inc.

State of Florida
Department of Environmental Regulation

Notice of Intent to Issue

The Department of Environmental Regulation hereby gives notice of its intent to issue a permit amendment to FCSC (Florida Crushed Stone Company), Environmental Department, P.O. Box 490300, Leesburg, Florida 34749-0300, to conduct a performance test on the cement kiln while burning tire derived fuel (TDF) with coal at 15% of the total (100%) Btu heat input (i.e., TDF @ 15% and coal @ 85%). The purpose of this amendment is to allow FCSC to obtain the data necessary to determine whether the cement kiln is capable of accommodating TDF under the cement kiln's present physical configuration and what regulations the cement kiln will be subject to if it is to be permitted to burn TDF with coal. The proposed project will occur at the applicant's existing facility located approximately 3.5 miles NW of Brooksville, Hernando County, Florida. The Department is issuing this Intent to Issue for the reasons stated in the proposed letter amendment to the construction permit No. AC 27-118674 and PSD permit No. PSD-FL-091.

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

Department of Environmental Regulation
Southwest District Office
4520 Oak Fair Boulevard
Tampa, Florida 33610-7347

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2642 5/4/90

Best Available Copy

FEDERAL EXPRESS

[redacted]

QUESTIONS? CALL 800-238-5355 TOLL FREE.

AIRBILL
PACKAGE
TRACKING NUMBER

6450968134

64509...

[redacted]

Date
5/10/90

RECIPIENT'S COPY

1 From (Your Name) Please Print
SCOTT WILLIAMS

Your Phone Number (Very Important)
(813) 272-7748

Company
TAMPA TRIBUNE BUSINESS OFFICE

Department/Floor No.

Street Address
[illegible] S. PARKER ST

City
[illegible]

State
FL

ZIP Required
[illegible]

2 To (Recipient's Name) Please Print
C. H. FANCY, P. E.

Recipient's Phone Number (Very Important)
(904 488-1344

Company
STATE OF FLA. DEPT. OF ENVIR. REG.

Department/Floor No.

Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip® Codes.)
TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD

City
TALLAHASSEE

State
FL

ZIP Required
32399-24

YOUR INTERNAL BILLING REFERENCE INFORMATION (First 24 characters will appear on invoice.)
CTI-31-65312.102.0001

H IF HOLD FOR PICK-UP, Print FEDEX Address Here
Street Address
City
State
ZIP Required

3 PAYMENT 1 ☐ Bill Sender 2 ☒ Bill Recipient's FedEx Acct. No. 3 ☐ Bill 3rd Party FedEx Acct. No. 4 ☐ Bill Credit Card
5 ☐ Cash

[redacted]

4 SERVICES
(Check only one box)

Priority Overnight Service
(Delivery by next business morning†)

- 11 ☐ YOUR PACKAGING
- 16 ☑ FEDEX LETTER *
- 12 ☐ FEDEX PAK *
- 13 ☐ FEDEX BOX
- 14 ☐ FEDEX TUBE

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- 54 ☐ FEDEX TUBE

Economy Service
(formerly Standard Air)
(Delivery by second business day†)

- 30 ☐ ECONOMY SERVICE

Heavyweight Service
(for Extra Large or any package over 150 lbs.)

- 70 ☐ HEAVYWEIGHT **
- 80 ☐ DEFERRED HEAVYWEIGHT **

† Delivery commitment may be later in some areas.
*Declared Value Limit $100.
**Call for delivery schedule.

DELIVERY AND SPECIAL HANDLING

- 1 ☐ HOLD FOR PICK-UP (Fill in Box H)
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- 4 ☐ DANGEROUS GOODS (Extra charge) (CSS not available for Dangerous Goods Shipments)
- 5 ☐ CONSTANT SURVEILLANCE SVC. (CSS) (Extra charge) (Release Signature Not Applicable)
- 6 ☐ DRY ICE Lbs.
- 7 ☐ OTHER SPECIAL SERVICE
- 8 ☐
- 9 ☐ SATURDAY PICK-UP (Extra charge)
- 10 ☐
- 11 ☐
- 12 ☐ HOLIDAY DELIVERY (If offered) (Extra charge)

PACKAGES	WEIGHT In Pounds Only	YOUR DECLARED VALUE	OVER SIZE
Total	Total	Total	

DIM SHIPMENT (Heavyweight Services Only)
☐ lbs.

Received At
1 ☐ Regular Stop 3 ☐ Drop Box
4 ☐ B.S.C.
2 ☐ On-Call Stop 5 ☐ Station

FedEx Emp. No.

Emp. No. Date
☐ Cash Received
☐ Return Shipment
☐ Third Party ☐ Chg. To Del. ☐ Chg. To Hold
Street Address
City State Zip
Received By:
X
Date/Time Received FedEx Employee Number

5 Release Signature:
Date/Time

Federal Express Use
Base Charges
Declared Value Charge
Other 1
Other 2
Total Charges

REVISION DATE 11/89
PART #119501 FXEM 1/90
FORMAT #014

014

P 052 482 250

RECEIPT FOR CERTIFIED MAIL

NO INSURANCE COVERAGE PROVIDED
NOT FOR INTERNATIONAL MAIL

(See Reverse)

Sent to Mr. Randy Thompson, FCSC	
Street and No. P. O. Box 490300	
P.O., State and ZIP Code Leesburg, FL 34749-0300	
Postage	$
Certified Fee	
Special Delivery Fee	
Restricted Delivery Fee	
Return Receipt showing to whom and Date Delivered	
Return Receipt showing to whom, Date, and Address of Delivery	
TOTAL Postage and Fees	$
Postmark or Date Mailed: 4-30-90 Permit: AC 27-118674 PSD-FL-091 Amendment	

PS Form 3800, June 1985

● **SENDER:** Complete items 1 and 2 when additional services are desired, and complete items 3 and 4.
Put your address in the "RETURN TO" Space on the reverse side. Failure to do this will prevent this card from being returned to you. The return receipt fee will provide you the name of the person delivered to and the date of delivery. For additional fees the following services are available. Consult postmaster for fees and check box(es) for additional service(s) requested.

1. ☐ Show to whom delivered, date, and addressee's address. *(Extra charge)*
2. ☐ Restricted Delivery *(Extra charge)*

3. Article Addressed to:

Mr. Randy Thompson
Environmental Department
Florida Crushed Stone Company
Post Office Box 490300
Leesburg, Florida 34749-0300

4. Article Number

P 052 482 250

Type of Service:

- ☐ Registered
- ☒ Certified
- ☐ Express Mail
- ☐ Insured
- ☐ COD
- ☐ Return Receipt for Merchandise

Always obtain signature of addressee or agent and DATE DELIVERED.

5. Signature — Address
X

6. Signature — Agent
X

7. Date of Delivery

8. Addressee's Address *(ONLY if requested and fee paid)*

LEESBURG, FL 34748-9998
MAY 4 1990
USPS

PS Form 3811, Mar. 1988 ★ U.S.G.P.O. 1988-212-865 **DOMESTIC RETURN RECEIPT**

File Copy

Florida Department of Environmental Regulation

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

Bob Martinez, Governor　Dale Twachtmann, Secretary　John Shearer, Assistant Secretary

April 30, 1990

CERTIFIED MAIL-RETURN RECEIPT REQUESTED

Mr. Randy Thompson
Environmental Department
Florida Crushed Stone Company
Post Office Box 490300
Leesburg, Florida 34749-0300

Dear Mr. Thompson:

Attached is one copy of the proposed letter amendment to air construction permit No. AC 27-118674 and PSD permit No. PSD-FL-091 for Florida Crushed Stone Company (FCSC) to performance test the cement kiln while burning tire derived fuel (TDF) with coal at 15% of the total (100%) Btu heat input (i.e., TDF @ 15% and coal @ 85%). The purpose of this letter amendment is to allow FCSC to obtain the data necessary to determine whether the cement kiln is capable of accommodating TDF with coal under the cement kiln's present physical configuration and what regulations the cement kiln will be subject to if it is to be permitted to burn TDF with coal.

Please submit any written comments you wish to have considered concerning the Department's proposed action to me.

Sincerely,

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

CHF/BM/plm

Attachments

c: B. Thomas, SW Dist.
J. Koogler, P.E., K&A
C. Shaver, NPS-Air
B. Beals, EPA
Reading File } 4-30-90
Bruce Mitchell }

BEFORE THE STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

In the Matter of
Application for Amendment by:

FCSC
P. O. Box 490300
Leesburg, Florida 34749-0300

DER File No. AC 27-118674
PSD-FL-091

INTENT TO ISSUE

The Department of Environmental Regulation hereby gives notice of its intent to issue an amendment (copy attached) for the proposed project as detailed in the application for an amendment specified above. The Department is issuing this Intent to Issue for the reasons stated in the attached letter amendment.

The applicant, FCSC (Florida Crushed Stone Company), requested on March 14, 1990, to the Department of Environmental Regulation for authorization to performance test the cement kiln while burning tire derived fuel (TDF) with coal at 15% of the total (100%) Btu heat input (i.e., TDF @ 15% and coal @ 85%). The purpose of this amendment is to allow FCSC to obtain the data necessary to determine whether the cement kiln is capable of accommodating TDF under the cement kiln's present physical configuration and what regulations the cement kiln will be subject to if it is to be permitted to burn TDF with coal. The proposed project will occur at the applicant's existing facility located approximately 3.5 miles NW of Brooksville, Hernando County, Florida.

The Department has permitting jurisdiction under Chapter 403, Florida Statutes, and Florida Administrative Code Chapters 17-2 and 17-4. The project is not exempt from permitting procedures. The Department has determined that an amendment is required for the proposed work.

Pursuant to Section 403.815, F.S. and DER 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. 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, at the address specified 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 amendment.

The Department will issue the 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, 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 amendment 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 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 notice. Persons whose substantial interests will be affected by any decision of the Department with regard to the application(s) 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 in 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

Copies furnished to:

B. Thomas, SW Dist.
J. Koogler, P.E., K&A
C. Shaver, NPS-Air
B. Beals, EPA

CERTIFICATE OF SERVICE

The undersigned duly designated deputy clerk hereby certifies that this NOTICE OF INTENT TO ISSUE and all copies were mailed before the close of business on 4-30-90.

FILING AND ACKNOWLEDGEMENT
FILED, on this date, pursuant to §120.52(9), Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.

Kim Tober 4-30-90
Clerk Date

State of Florida
Department of Environmental Regulation
Notice of Intent to Issue

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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 fourteen (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.

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

Department of Environmental Regulation
Southwest District Office
4520 Oak Fair Boulevard
Tampa, Florida 33610-7347

Any person may send written comments on the proposed action to Mr. C. H. Fancy at the Department's Tallahassee address. All comments mailed within 14 days of the publication of this notice will be considered in the Department's final determination.

Florida Department of Environmental Regulation
Twin Towers Office Bldg. ● 2600 Blair Stone Road ● Tallahassee, Florida 32399-2400
Bob Martinez, Governor Dale Twachtmann, Secretary John Shearer, Assistant Secretary

April 30, 1990

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. Randy Thompson
Environmental Department
Florida Crushed Stone Company
Post Office Box 490300
Leesburg, Florida 34749-0300

Dear Mr. Thompson:

Re: Amendment to Construction Permit No. AC 27-118674 and PSD Permit No. PSD-FL-091 to Conduct Performance Test(s) on the Cement Kiln While Burning Tire Derived Fuel (TDF) with Coal.

The Department has reviewed the request that you provided on March 14, 1990. We have also considered the Department's legal authority to allow you to conduct the requested performance test(s). Paragraph 403.061(15), Florida Statutes (F.S.) authorizes the Department to consult with any person proposing to construct, install, or otherwise acquire a pollution control device or system concerning the efficacy of such device or system, or the pollution problem which may be related to the source, device, or system. Paragraph 403.061(16), F.S., authorizes the Department to encourage voluntary cooperation by persons in order to achieve the purposes of the state environmental control act. Paragraph 403.061(18), F.S., authorizes the Department to encourage and conduct studies, investigations, and research relating to the causes and control of pollution. Florida Administrative Code (F.A.C.) Rule 17-2.250(5) authorizes the Department to consider variations in industrial equipment and make allowances for excess emissions that provide practical regulatory controls consistent with the public interest.

In accordance with the provisions of Paragraphs 403.061(15), (16) and (18), F.S., and F.A.C. Rule 17-2.250(5), you are hereby authorized to performance test the cement kiln while burning TDF with coal at 15% of the total (100%) Btu heat input (i.e., TDF @ 15% and coal @ 85%). The purpose of this activity is to obtain the data necessary to determine whether the cement kiln is capable of accommodating TDF with coal under the cement kiln's present physical configuration and what regulations the cement kiln will be subject to if it is to be permitted to burn TDF with coal.

The performance test(s) shall be subject to the following conditions:

1. The permittee shall notify, in writing, the Department's Southwest District and Bureau of Air Regulation (BAR) offices 15 days prior to commencement of the performance test(s). A written report shall be submitted to these offices within 45 days upon completion of the last test run.

2. Prior to or after conducting tests on TDF and coal (Post-tests), performance tests (Pre-tests) shall be conducted while firing 100% coal for all of the identified pollutants and pollutant categories in order to establish background levels, unless performance tests have already been conducted and the results can be provided to the Department. These tests, "Pre-tests" (i.e., coal only), shall be compared to the post-tests (TDF and coal) to determine if:

    a) PSD review is required, which includes a construction permit application package and appropriate processing fee; or,

    b) the current construction and PSD permits can be amended to allow the use of TDF with coal.

3. All post-test results shall be compared to "actual emissions" for PSD review purposes (see Region IV, U.S. EPA's letter dated April 4, 1990).

4. The contents of Dr. John B. Koogler's letter received March 14, 1990, are adopted by reference, with exceptions to part A, of which the following pollutants/pollutant categories will also be tested for:

Pollutant/Pollutant Category	Test Method
o Metals (continued)	
Barium	EPA Method 5
Copper	
Nickel	
Iron	
Vanadium	
o PCDDs and PCDFs	EPA Method 23
o PAHs (polynuclear aromatic hydrocarbons)	Modified Method 5
o Benzene	EPA Method 18

5. An ultimate analysis of the particulate filter(s) shall be required. Also, an ultimate analysis of a representative sample(s) from the baghouse hopper shall be required.

6. This authorized performance test(s) shall not result in the release of objectionable odors pursuant to F.A.C. Rule 17-2.620(2).

7. Performance testing shall immediately cease upon the occurrence of a valid environmental complaint by a citizen or other party, or a nuisance or danger to public health or welfare. Performance testing shall not resume until appropriate measures to correct the problem have been implemented.

8. The performance test(s) shall be conducted under the direct supervision and responsible charge of a professional engineer registered in Florida.

9. This Department action is just to authorize the performance tests on the cement kiln while firing coal and TDF only. The firing of TDF after the last performance test run is completed will be deemed a violation of the current permits, AC 27-118674 and PSD-FL-091, and shall be dealt with as such.

10. Complete documentation of any TDF usage in the cement kiln shall be required (i.e., start-up and testing).

11. The Department shall be notified in writing of the time and date of the last test run completion.

12. From the initial date of using TDF, which shall be documented in writing to the Department, the permittee shall be limited to 45 days to stabilize the cement kiln and to submit notification of performance testing. If additional time is needed, the permittee shall provide the Department with documentation of the progress accomplished to date and shall identify what is left to be done in order to achieve stabilization of the cement kiln for performance testing purposes.

13. Attachments (see Attachment Section) are incorporated.

The Department has relied on the information referenced in the attachments and conversations with representatives of the FCSC, U.S. EPA-Region IV, and Department of Interior's National Park Service in authorizing this permit letter amendment to the construction permit No. AC 27-118674 and PSD permit No. PSD-FL-091.

A copy of this letter and its attachments shall be attached to the construction permit No. AC 27-118674 and PSD permit No. PSD-FL-091.

Sincerely,

Dale Twachtmann
Secretary

DT/plm

Attachments

c: S. Smallwood, DARM
C. Fancy, BAR
B. Thomas, SW Dist.
J. Koogler, P.E., K&A
C. Shaver, NPS-Air
B. Beals, EPA

Attachment Section

1. Final Emissions Test Report of April, 1988, for the Modesto Energy Company's Waste Tire to Energy Facility, Westley, California, received January 18, 1989. Confidential;

2. Federal Register, Volume 52, No. 167, issued August 28, 1987; pages 32597-32600; "Assessment of Zinc and Zinc Oxide as Potentially Toxic Air Pollutants;"

3. "Engineering Study on Burning a Mixture of Coal and Rubber Tire Chips at the United Power Association Elk River Power Station;" Milos Tomaides and Alan Trowbridge; MPCA Reg. #06054;

4. "Measurement of Polynuclear Aromatic Hydrocarbons and Metals from Burning Tire Chips for Supplementary Fuel," by John Drabek and Jay Willenberg, both with the State of Washington Department of Ecology, presented to the 1987 TAPPI Env. Conf., April 26-29, 1987, in Portland, Oregon;

5. "Rubber Tires, A Hazardous Fuel?," by William deBoisblane with the Bay Area AQD, dated March 6, 1985;

6. "Conversion of Scrap Tires to Energy and Its Environmental Issues," by Mark W. Hope with Waste Recovery, Inc., presented to APCA Int. Speciality Conf., October 9-12, 1988;

7. Federal Register, Volume 54, No. 243, issued December 20, 1989; pages 52190-52201; "Standards of Performance for New Stationary Sources; 40 CFR 60, Appendix A - Addition of Methods for Measurement of PCDDs and PCDFs, and Hydrogen Chloride Emissions from Stationary Sources;

8. Dr. John B. Koogler's letter received January 25, 1990;

9. Dr. John B. Koogler's letter received February 6, 1990;

10. Dr. John B. Koogler's letter received March 14, 1990; and,

11. Ms. Jewell A. Harper's letter dated April 4, 1990, and received April 9, 1990.

ATTACHMENT 1

Confidential

ATTACHMENT 2

Use/Production. (S) Abrasion resistance enhancing for thermoplastic resins. Prod. range: Confidential.

Dated: August 17, 1987.

Denise Devoe,

Acting Director, Information Management Division, Office of Toxic Substances.

[FR Doc. 87-19657 Filed 8-27-87; 8:45 am]

BILLING CODE 6560-50-M

Assessment of Zinc and Zinc Oxide as Potentially Toxic Air Pollutants

[AD-FRL-3253-6]

AGENCY: Environmental Protection Agency (EPA).

ACTION: Notice of zinc and zinc oxide assessment (Zn/ZnO) results and solicitation of information.

SUMMARY: This notice announces the results of EPA's assessment of Zn/ZnO as candidates for regulation under the Clean Air Act (CAA). The Agency has concluded that the health date for Zn/ZnO is insufficient to determine their carcinogenic, mutagenic, or teratogenic potential following inhalation exposures. Adverse respiratory effects have been associated with inhalation exposure to Zn/ZnO fumes and dusts. Similarly, exposure to total particulate matter, which may contain Zn/ZnO, has been associated with adverse respiratory effects. Primary national ambient air quality standards (NAAQS) for particles having diameters of less than or equal to 10 microns (PM_{10}) have been established to protect the general public from such adverse respiratory effects. Therefore, no regulation under the CAA directed specifically at controlling emissions of Zn/ZnO is appropriate at this time.

Given the limited opportunity for prior public review of the health and exposure information incorporated in this notice, the Agency is soliciting comment and information pertinent to the determination made today. A further notice will be published only if public comments or additional information suggest a need to revise EPA's conclusion. This finding has no effect on the regulation of Zn/ZnO as particulate matter to attain the NAAQS for particulate matter. In addition, this notice does not preclude any State or local air pollution control agency from specifically regulating emission sources of Zn/ZnO.

DATES: Written comments pertaining to this notice must be received on or before November 27, 1987.

ADDRESSES: Submit comments (duplicate copies are preferred) to: Central Docket Section (A-130), Environmental Protection Agency, Attn: Docket No. A-87-09, 401 M Street SW., Washington, DC 20460.

Availability of related information: Information on the availability of the documents "Summary Review of the Health Effects Associated with Zinc and Zinc Oxide: Health Issue Assessment," EPA 600/8-87/021F, and "Zinc/Zinc Oxide Preliminary Source Assessment," EPA 450/3-87-008, can be obtained from ORD Publications, CERI-FR, U.S. Environmental Protection Agency, 26 West St. Clair Street, Cincinnati, OH 45268 (Telephone: 513-569-7562). The above document and other information on the sources, emissions, and environmental fate of Zn/ZnO are summarized in several reports which are found in Docket No. A-87-09, located in the Central Docket Section of the U.S. Environmental Protection Agency, South Conference Center, Room 4, 401 M Street SW., Washington, DC 20460. The docket may be inspected between 8:00 a.m. and 4:00 p.m. on weekdays, and a reasonable fee may be charged for copying.

FOR FURTHER INFORMATION CONTACT: Robert M. Schell, Pollutant Assessment Branch (MD-12), Strategies and Air Standards Division, U.S. Environmental Protection Agency, Research Triangle Park, NC 27711 (Telephone: 919-541-5519 commercial; 629-5519 FTS).

SUPPLEMENTARY INFORMATION: The EPA initiated an assessment of Zn/ZnO based on the large production volume and the potential for adverse health effects associated with exposure to Zn/ZnO in ambient air. In the course of this assessment, the Agency collected relevant information currently available and today's notice provides a summary of this information on the following topics: production and uses, sources and emissions, health effects, monitored ambient air concentrations, exposure and risk estimates and existing regulations.

Production and Uses

Zinc is used extensively to galvanize iron and steel. The element also readily combines with other metals, imparting the characteristics of workability at low temperatures; corrosion resistance; and finishes for use in die-casting alloys, brass, and other common alloys. Zinc displays a vigorous reducing power, liberating hydrogen from sulfuric and hydrochloric acid. This property is the basis for the use of zinc dust or mossy zinc in many commercial organic chemical processes (EPA, 1987a).

Zinc oxide is principally used to activate the vulcanization of rubber. It also helps protect rubber by its opaqueness to ultraviolet light and its high thermal conductivity. A newer use of zinc oxide utilizes its photoconductive and electrostatic properties in office photocopying applications. One of the oldest uses of zinc oxide is in the treatment of burns, infections, and skin diseases. It is also used to give white paints good concealing power, in the manufacture of opaque and certain types of transparent glass, and in the manufacture of porcelain enamels for sheet iron and vitreous enamels for cast iron (EPA, 1987a).

Sources and Emissions

Zinc is the 24th most abundant element and represents about 0.02% of the earth's crust. Zinc blende or sphalerite (ZnS) is the most important ore, yielding about 90% of the metallic zinc produced (Merck, 1976). Natural sources of zinc (e.g., windblown soil, volcanic emissions) have been estimated to constitute about 13% of the total emissions to the atmosphere (Nriagu, 1979).

Anthropogenic Zn/ZnO are emitted to the ambient air from a variety of sources. Table 1 presents a summary of general source categories which emit Zn/ZnO and their estimated emissions (EPA, 1987b; Vandenberg, 1987). Table 1 also lists the number of facilities and maximum annual facility emissions estimates for each source category, where available. Based on the available information, primary zinc and zinc oxide smelters appear to be the largest individual sources of anthropogenic air emissions of Zn/ZnO.

TABLE 1.—SOURCES AND EMISSIONS OF ATMOSPHERIC ZINC AND ZINC OXIDE [a]

Source category	Number of facilities	Estimated emissions to the atmosphere (Mg/yr)		Highest Annual Emissions per Facility (Mg/yr)	
		Zn	Zn0	Zn	ZnO
Primary Zn/Zn0 Production	5	49.9	198	25.2	139
Iron and Steel Production	319	600	2400	15.8	36.7
Metallurgy [b]	NA [c]	NA	NA	16.2	NA
Miscellaneous [d]	NA	NA	NA	0.1	0.3

[a] EPA, 1987b, Vandenberg, 1987.

[b] Includes secondary zinc/zinc oxide industry, brass and bronze production, plating, etc.

[c] Not available.

[d] Includes pigments/paints, semiconductors, business machines, glass/ceramics, detergents, etc.

Health Effects

The available health effects information summarized in the document "Summary Review of the Health Effects Associated with Zinc and Zinc Oxide: Health Issue Assessment" (EPA, 1987a), are reviewed in this section. General statements made in this notice regarding zinc usually pertain to inorganic zinc compounds. Reference is made to specific zinc compounds when only compound-specific information is available.

Zinc is an essential element necessary for the growth and development of all animals, including humans. The essential nature of zinc is based on its role as an integral part of some metalloenzymes, a cofactor in regulating the activity of zinc dependent enzymes, and as a structural and functional component of biomembranes. In addition, zinc plays an important role in the metabolism of proteins and nucleic acids, is essential for the synthesis of deoxyribonucleic acid and ribonucleic acid, and it may control metabolic processes through the formation and/or regulation of the activity of zinc-dependent enzymes. Recommended dietary allowances have been established, with a greater concern generally associated with zinc deficiencies, rather than with less often seen toxic effects associated with excessive zinc intake.

Inhaled zinc can be absorbed across the alveolocapillary membrane, depending on the particle size, solubility, and functional state of the lungs. Similarly, orally administered zinc can be absorbed across the gut mucosa. Zinc may also be absorbed across the skin.

Numerous studies indicate that the body attempts to control the zinc balance homeostatically according to need by regulating the extent of absorption of dietary zinc and the rate of fecal excretion of stable zinc. Absorbed zinc is distributed to muscle, bone, liver, kidney, hair and some endocrine glands. In humans the highest concentrations of zinc are found in the male reproductive system. Zinc is mainly excreted by the gastrointestinal tract.

Zinc oxide has been shown to cause chromosomal damage in the form of an increased frequency of hyperdiploid cells in the bone marrow of noninbred white rats at concentrations of 0.1 and 0.5 mg/m³. An increase in the frequency of structural aberrations of the chromosomes and hyperdiploid cells was seen when human lymphocytes were exposed *in vitro* to zinc acetate at concentrations of 7.0 to 20.0 μg/ml. An interpretation of this report is difficult because the category of aberrations referred to as hyperdiploid cells is not one generally used by cytogeneticists in discussing this type of study. Additionally, the frequency of structural aberrations at 20 μg/ml was slightly less than the frequency at 7 μg/ml. Zinc oxide was not mutagenic at levels of 100 to 5000 μg/plate in the *Salmonella* reversion assay.

There are no data which suggest that a zinc level over that required for normal growth and development is teratogenic. A greater risk of malformations is expected in regard to zinc deficiency. Zinc also appears to offer a degree of protection against the teratogenic effect of cadmium. There are several animal studies and one human study which suggest that the ingestion of high levels of zinc may have an adverse impact on reproduction. Three premature births and one stillbirth occurred in a small group of women ingesting 40.5 mg zinc/day during the third trimester of pregnancy. However, because of the small sample size and lack of a control group, the results from this study are difficult to interpret. No adverse effects on the outcome of pregnancies were observed in a group of seven women supplemented with 81 mg zinc/day during the third trimester of pregnancy. Also, adverse effects on the outcome of pregnancies were not reported in a group of women supplemented with 8.1 mg zinc/day in addition to dietary zinc intakes of from 9.3 to 11.3 mg/day.

A positive carcinogenic response resulting from zinc administration has been only observed following injection of zinc salts into the testes of fowl and rats. Tumors always developed near the site of injection, with some authors doubting the usefulness of the technique employed if only injection site tumors developed. The injection route of exposure is unlikely to be encountered by man, thus one could conclude that testicular tumors in fowl and rats resulting from the injection of zinc salts into the testes are of limited predictive value.

There is no evidence that the inhalation, ingestion or parenteral administration of zinc induces the formation of tumors. There is, however, a considerable amount of information which indicates that the administration of zinc is indirectly involved in tumor formation as a growth promoter or inhibitor. In some animal studies, zinc deficient diets have been found to promote the development of chemically-induced cancers, whereas zinc-adequate and zinc-supplemented diets provided a protective barier against tumor formation. In other animal studies, zinc-adequate or zinc-supplemented diets facilitated the development of chemically-induced cancers. Also, examinations of cancerous tissues in humans have shown that the zinc level deviates from that found in noncancerous tissue. The EPA's Carcinogen Assessment Group (CAG) has concluded that the overall weight-of-evidence for zinc and its inorganic salts suggests that data are not sufficient to determine its carcinogenic potential for humans. Therefore, based on EPA's Guidelines for Carcinogen Risk Assessment (EPA, 1986a), CAG has classified zinc in Group D (not classifiable as to human carcinogenicity) (EPA, 1987a).

Adverse health effects associated with occupational exposures to airborne zinc oxide fumes and/or dust are primarily manifested by respiratory symptoms. Zinc oxide fumes, as well as fumes of many other heavy metals, have been shown to cause an acute illness called metal fume fever in workers exposed to high concentrations in confined occupational settings. This condition is typically characterized by influenza-like symptoms (e.g., headache, fever, nausea, sensations of chills or warmth, and general aches and pains) that occur within a few hours after exposure and may persist for one to two days.

While data are limited, it has been estimated that metal fume fever generally does not occur at zinc oxide levels below 15 mg/m^3. Some eastern European literature report the occurrence of metal fume fever in workers repeatedly exposed to zinc oxide levels averaging as low as 5 mg/m^3.

The Occupational Safety and Health Administration (OSHA) adopted an 8-hour time weighted average permissible exposure limit of 5 mg zinc oxide/m^3, and the American Conference of Governmental Industrial Hygienists (ACGIH) has established an 8-hour time weighted average threshold limit value (TWA–TLV) of 5 mg/m^3 for zinc oxide fumes and a TWA–TLV of 10 mg/m^3 for zinc and zinc oxide dusts to protect against nuisance effects at high dust concentrations in the work environment (ACGIH, 986).

Monitored Ambient Concentrations

Data contained in the EPA's National Aerometric Data Bank indicate the highest monitored annual average ambient concentraiton of zinc is approximately 2.65 $\mu g/m^3$ (Hunt et al., 1984). Additional information in the literature show annual atmospheric zinc concentrations range from 0.03–27 ng/m^3 in remote locations and from 0.1 to 1.7 $\mu g/m^3$ in urban areas (EPA, 1987a). The highest available ambient air concentration of zinc measured for a 24-hour period was approximately 115 $\mu g/m^3$ located near a point source (Faoro, 1986). Ambient monitoring data specifically for zinc oxide was unavailable.

Exposure Estimates

Estimates of long-term (annual average) human exposure to atmospheric Zn/ZnO emitted from specific or representative facilities for each source category identified in EPA's source assessment for Zn/ZnO (EPA, 1987b) were calculated using the Human Exposure Model (HEM). The HEM estimated concentrations to which populations living within 50 kilometers of specific sources may be exposed. For sources in the primary Zn/ZnO production source category and for several production facilities in the iron and steel source category, site-specific modeling was conducted. Model sources representative of the other facilities within the iron and steel, matallurgy and miscellaneous source categories were used, with maximum reported emission estimates used in the modeling exercise. The results of these modeling analyses indicated a maximum annual zinc concentration of 10.7 $\mu g/m^3$ and a maximum annual zinc oxide concentration of 3.0 $\mu g/m^3$ (Vandenberg, 1987).

In order to assess the potential for adverse noncancer health effects from short-term exposure to Zn/ZnO, a conservative screening modeling analysis was performed using time-adjusted annual emission rates for facilities likely to have emissions resulting in the highest short-term exposures. These facilities included primary Zn/ZnO smelters, a steel producer, two model iron and steel manufacturing furnaces and a facility from the miscellaneous source category (Doll, 1987a, 1987b). Worst case assumptions for source configuration, location, meteorological conditions and terrain effects were applied.

The highest predicted concentrations exceed the 24-hour primary PM_{10} NAAQS for particulate matter by an order of magnitude. While available monitoring data for particulate matter indicate that there are exceedances of this standard in the vicinity of some primary Zn/ZnO smelters, actual total particulate matter measured (containing zinc as well as other particulates) do not confirm ambient concentrations as high as those predicted by the screening technique (Vandenberg, 1987). In addition, fractionation of particulate matter from monitoring sites in close proximity to a source having high predicted concentrations of zinc demonstrate zinc concentrations as high as approximately 10 $\mu g/m^3$, a concentration that is lower than the 24-hour PM_{10} NAAQS for a particulate matter (Pezze and Albert, 1987).

Existing Regulations

Particulate matter, which may or may not contain Zn/ZnO, has been associated with an increased incidence of adverse respiratory effects in both occupationally-exposed people and in the general public. An analysis of the health effects associated with exposure to particulate matter and the concentrations required to elicit these effects is contained in the EPA staff paper (EPA, 1986b) and the criteria document on particulate matter (EPA, 1986c). Primary NAAQS have been established under section 109 of the CAA to protect the general public from adverse respiratory effects for both short-term (24-hours) and long-term (annual) exposure periods. These levels are 150 $\mu g/m^3$ and 50 $\mu g/m^3$, respectively, measured as PM_{10} (i.e., particles having diameters of less than or equal to 10 microns)(EPA, 1987c).

The National Institute for Occupational Safety and Health, OSHA and ACGIH have adopted regulations or have made recommendations for an occupational 8-hour time weighted average level of 5 mg/m^3 for zinc oxide fumes and 10 mg/m^3 for dusts. These levels are designed to protect the average healthy worker that may be repeatedly exposed to zinc or zinc oxide fumes or dusts, day after day, from adverse health effects (ACGIH, 1986).

The Office of Drinking Water has adopted a secondary drinking water standard of 5 mg/liter for organoleptic reasons (EPA, 1985). Zinc and some zinc compounds are currently listed as hazardous substances under section 101(14) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Further, under section 101(14) of CERCLA, Reportable Quatities (RQs) are established for substances specified in the CERCLA as well as substances listed or designated under certain sections of the Clean Water Act, CAA (section 112), the Resource Conservation and Recovery Act and the Toxics Substances Control Act (EPA, 1986d). Section 103(a) of the CERCLA requires that any release to the environment (including the air) in any 24-hour period that is equal to or greater than 1000 pounds of zinc must be reported to the National Response Center (telephone 800–242–8802 or 202–426–2675 for the Washington, DC metropolitan area). The 24-hour period refers to the period within which a reportable quantity of a hazardous substance is released in order for the release to be considered reportable; it does not refer to the time available for a person to report a release. Such reporting must occur immediately.

Conclusions

The Agency concludes that the data available at this time are insufficient to indicate health concerns that require further regulation of Zn/ZnO emissions under the CAA. The target levels identified for protection against adverse respiratory effects associated with exposure to Zn/ZnO were the primary PM_{10} NAAQS for particulate matter. These levels were selected on the basis that the respiratory effects elicited by particulate matter containing or not containing Zn/ZnO are equivalent. Available data on the ambient particle size distribution of zinc indicate that the mass median diameter is 1.13 µm (Milford and Davidson, 1985). Therefore, the PM_{10} levels identified to protect public health are appropriate for protecting against adverse effects associated with exposure to Zn/ZnO.

Protective levels were not identified for metal fume fever. Available information indicates that metal fume fever is an acute occupational hazard confined to the immediate work place. It is associated with exposure to fumes or fine dusts of many heavy metals (e.g., zinc, copper, manganese) which are generated during certain work practices (e.g., welding or cutting metals, galvanizing iron). Metal fume fever is a transitory acute effect and appears to be more a function of the physical form(s) of a metal rather than a specific metal. As noted above, the most appropriate benchmark for this decision on Zn/ZnO was judged to be the PM_{10} NAAQS for particulate matter.

Given the findings presented here, the long-term (annual) Zn/ZnO concentrations measured or estimated to be present in the ambient air are below the health effects levels associated with exposure to Zn/ZnO. In contrast, the concentrations predicted from the short-term modeling exercise indicate a potential cause for concern, since these concentrations exceed the 24-hour primary PM_{10} NAAQS for particulate matter. Criteria air pollution control programs have been established, or will be revised if needed, to control particulate matter emissions in order to attain the NAAQS for particulate matter in all areas. Zinc and zinc oxide, as particulate matter, are controlled under these efforts. Therefore, Federal regulatory activity specifically directed at regulating Zn/ZnO under the CAA is not warranted at this time. The EPA's decision not to separately regulate Zn/ZnO under the CAA has no effect on the regulation of particulate matter, which may include Zn/ZnO.

The EPA invites comments and submission of information pertinent to the determination made today. A further notice will be published if public comments or other additional information suggest a need to reevaluate today's findings and revise EPA's present conclusions.

Date: July 31, 1987.

Don R. Clay,

Acting Assistant Administrator for Air and Radiation.

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[FR Doc. 87–19773 Filed 8–27–87; 8:45 am]

BILLING CODE 6560-50-M

[OPTS–59246A FRL# 3254–1]

Certain Chemicals; Approval of a Test Marketing Exemption

AGENCY: Environmental Protection Agency (EPA).

ACTION: Notice.

SUMMARY: This notice announces EPA's approval of an application for test marketing exemption (TME) under section 5(h)(6) of the Toxic Substances Control Act (TSCA), TME–87–20. The test marketing conditions are described below.

FOR FURTHER INFORMATION CONTACT: Robert Wright, Premanufacture Notice Management Branch, Chemical Control Division (TS–794), Office of Toxic Substances, Environmental Protection Agency, Rm. E–611, 401 M Street SW., Washington, DC 20460, (202–382–7800).

SUPPLEMENTARY INFORMATION: Section 5(h)(1) of TSCA authorizes EPA to exempt persons from premanufacture notification (PMN) requirements and permit them to manufacture or import new chemical substances for test marketing purposes if the Agency finds that the manufacture, processing, distribution in commerce, use and disposal of the substances for test marketing purposes will not present any unreasonable risk of injury to health or the environment. EPA may impose restrictions on test marketing activities and may modify or revoke a test

ATTACHMENT 3

ENGINEERING STUDY ON BURNING A MIXTURE OF COAL AND RUBBER TIRE CHIPS AT THE UNITED POWER ASSOCIATION ELK RIVER POWER STATION

By

Milos Tomaides
and
Alan Trowbridge

RECEIVED
JAN 24 1989
DER - BAQM

MPCA Requisition Number 06054

Prepared For

United Power Association
Elk River, MN [illegible]

and

Minnesota Pollution Control Agency
Division of Solid Waste
1935 West County Road B2
Roseville, MN [illegible]

- SCHRIPTEK/ Tim Brady

DISCLAIMER

This report has been reviewed by the Minnesota Pollution Control Agency and United Power Association and has been approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of the Minnesota Pollution Control Agency and United Power Association, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

TABLE OF CONTENTS

APPENDIXES - See supplement to this report

ENGINEERING STUDY ON BURNING A MIXTURE OF COAL AND RUBBER TIRE CHIPS AT THE UPA ELK RIVER POWER STATION

MPCA Requisition Number 06054

1 INTRODUCTION

MMT Environmental, Inc. (MMT) was authorized by United Power Association to perform a study on the burning of a mixture of sub-bituminous coal and shredded automobile tires. The tests were performed at the Elk River Power Station. The purpose of the study was to collect sufficient amounts of information and test data to allow the following assessments:

(a) Technical feasibility of such a fuel combination with respect to reliable operation of the fuel handling equipment, boiler, and fly ash control equipment.

(b) Economic feasibility of such a fuel combination.

(c) Compliance of the process with existing air quality regulations.

Three (3) complete tests were performed, each of one-day duration. On May 30, 1979, a 100 percent coal test was performed. A 95 percent coal - 5 percent tires test and a 90 percent coal - 10 percent tires test were performed on June 4 and June 7, 1979, respectively. The test results and related conclusions are presented in this report.

2 SUMMARY OF TEST RESULTS

The short-term tests on burning a mixture of coal and rubber tire chips have proven the feasibility of such an approach for the United Power Association, Elk River plant operating conditions. The test results and observations of the plant equipment operation are summarized as follows:

2.1 Fuel Handling

(a) Open-belt type conveyors which were used to convey and mix the coal and rubber worked quite reliably.

(b) The dump type feed-scale worked on the mixture of rubber chips and coal without difficulties.

(c) The mechanical stoker spreader handles the coal/rubber chip mixture adequately.

2.2 Boiler

(a) The short-term tests did not result in any malfunction of boilers because of adding rubber chips to the coal.

(b) A coal/rubber chip mixture of about 5 percent rubber chip content appears to burn at higher temperatures compared to 100 percent coal or 10 percent rubber chips. This most probably results in a higher thermal efficiency of the boiler when about a 5 percent rubber chip/coal mixture is burned.

(c) Soot blowing and pulling of bottom ashes from the boiler were normal during all rubber chip burning tests.

(d) The tests show no increased danger of boiler corrosion for up to 10 percent rubber tire chips coal mixture

(e) The amounts of gaseous and particulate pollutants generated by the boiler did not increase with an increasing rubber chip content up to 10.4 percent.

(f) The amount of fine carbon black aerosol generated by burning rubber tire chips increased with the increasing rubber chip content in the fuel.

(g) It is recommended that a 6 percent rubber chip content in the coal not be exceeded for continuous burning of the coal/rubber tire chip mixture for the boilers tested. The limit must be tested for other boilers on an individual basis.

2.3 Fly Ash Control System

(a) The baghouse operated properly and maintained a very high collection efficiency throughout the tests.

(b) Particulate emissions were well in compliance with existing mass emission and visible emission regulations for all test runs.

(c) The presence of carbon black particles from burning rubber chips increased the rate of baghouse pressure drop rise. As a result, the baghouse may require more frequent cleaning for continuous burning of rubber chips.

(d) When cyclone fly ash collectors are used to control the boiler air emissions, the maximum allowable content of rubber chips will be limited by the 20 percent opacity regulation on visible stack emissions.

3 DESCRIPTION OF TESTED FACILITIES

The combustion tests were performed at the Elk River Power Station of United Power Association. Under evaluation was the performance and reliability of three (3) main groups of technological equipment, namely: the fuel handling system, boilers, and fly ash control system. These systems are described in this section.

3.1 Fuel Handling

The layout of the fuel supply conveyors is shown in Figure 1. The coal is normally transported from either open pile storage on the east side of the plant property or coal car dump bins located in the coal unloading building. The coal is transported by open-type rubber belt conveyors.

For the rubber chip burning test, the rubber chips were transported from the open storage and continuously dropped from the rubber chip conveyor onto the fuel mixture conveyor. The coal was brought to the fuel mixture conveyor from the coal car dump bins by a perpendicularly located conveyor. The mixture of fuels was transported into the steam plant building and continuously fed into coal bins located above each of the four (4) fuel feed-scales.

Each of the two (2) stoker boilers tested has two feed scales. Boiler #I is served by feed-scales #F11 and #F12. Boiler #II is served by feed-scales #F21 and #F22.

The fuel from the feed-scale hopper continues to flow into Model 24 Super Spred mechanical spreaders. There are four (4) spreaders per boiler.

3.2 Boilers

The boilers tested were Units #1 and #2 stoker fired Springfield boilers designed to burn coal, No. 2 fuel oil, No. 6 fuel oil, or natural gas. The primary fuel for these boilers is raw, unwashed coal delivered [illegible] [illegible] from the mine. Each boiler is rated at [illegible] pounds per hour

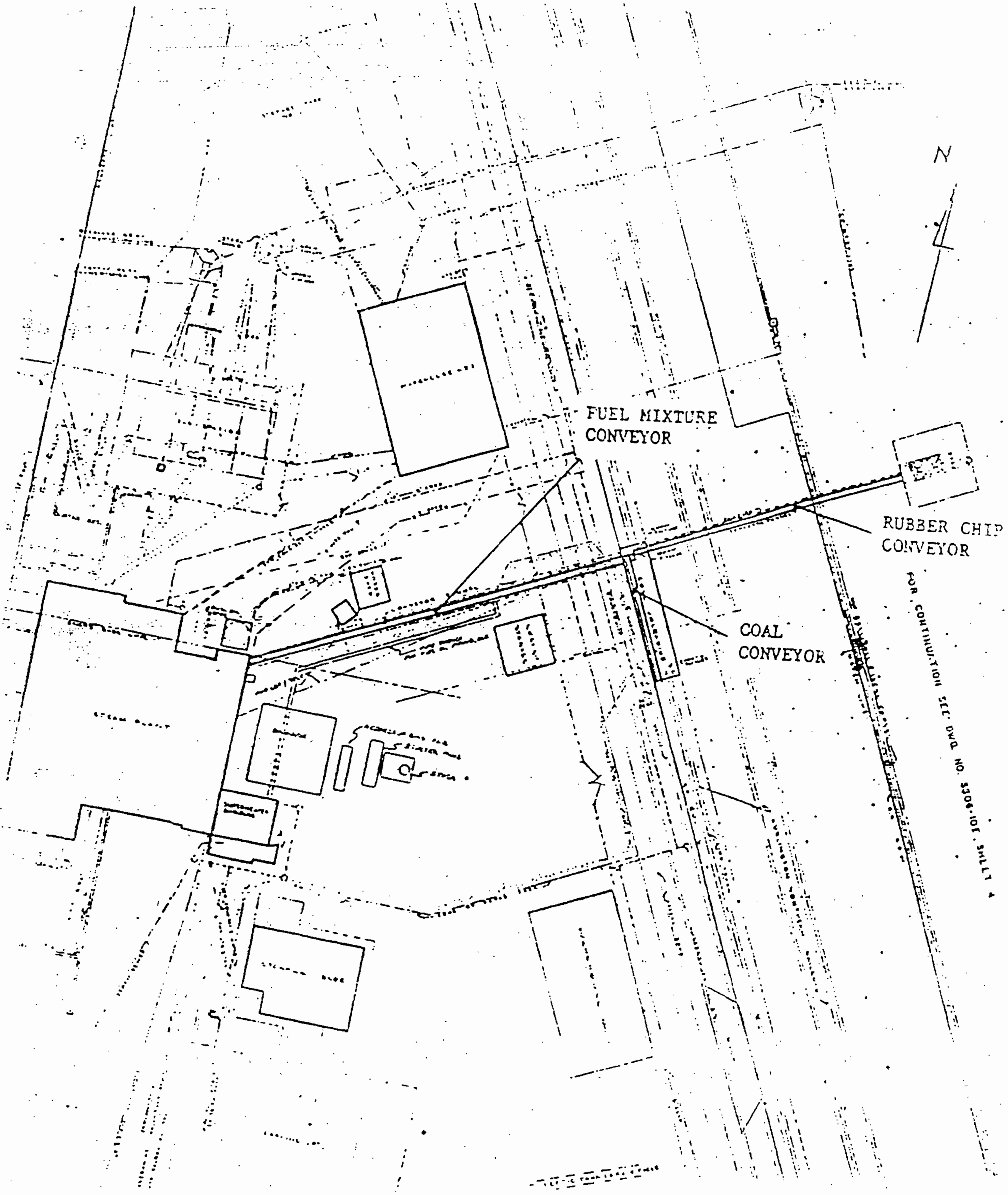

Figure 1. Layout of United Power Association, Elk River, MN Power Plant Facilities

of steam with a gross heat input of 170 x 10^6 Btu per hour. Details on the boiler design are summarized in Table 1.

3.3 Fly Ash Control System

The fly ash is collected from the flue gas in a Research-Cottrell Model #324-12, 264, Series 8 baghouse. The baghouse consists of eight (8) separate modules installed downstream of the boiler as shown in Figure 2.

The flue gas from the individual boilers flows through a duct (Stack #1, Stack #2, Stack #3). Each duct serves one of the three boilers. Boiler #3, which is a pulverized coal unit, was not in operation during the rubber burning tests.

The baghouse is designed for the following parameters:

Maximum throughput, ACFM	280,000
Maximum temperature, °F	360
Bags, glass fiber treated	
Bag diameter, in.	8
Bag length, ft.	22
Maximum baghouse pressure drop, in. w.g.	6
Air to cloth ratio	2.3:1
Maximum inlet dust load, gr/acf	3

Baghouse operation is fully automated. Reverse cleaning of the bags is initiated either automatically at a preselected maximum baghouse pressure drop or manually. The individual baghouse compartments are cleaned in sequence starting with #1 through #8. The total baghouse cleaning cycle is approximately 20 minutes. When all three boilers are running, the cleaning is initiated approximately every 3 hours.

Table 1. Boiler Design Parameters

BOILER, Manufacturer	SPRINGFIELD BOILER Co.
Type	2 DRUM - BENT TUBE
Diameter of Drums	60" ID & 42" ID
Length of Drums	17'-6"
Sq. Ft. Surface	11000
Size and Spacing of Tubes	3¼" OD ON 6¾" 2½" OD ON 5¼"
Kind of Tubes	SEAMLESS
SUPERHEATER, Manufacturer	SPRINGFIELD BOILER Co.
Type	2 STAGE - INTERBANK
Sq. Ft. Surface	4040 SQ.FT.
Size of Tubes	1¾" O.D.
No. and Size of Headers	3-12¾" O.D.
SUPERHEAT CONTROL, Type	SWARTWOUT SPRAY TYPE
ECONOMIZER, Manufacturer	SPRINGFIELD BOILER Co.
Type	CONTINUOUS LOOP
Sq. Ft. of Surface	4440
Size of Tubes	2" O.D.
No. and Size of Headers	2-10¾" O.D.
WATER WALLS, Manufacturer	SPRINGFIELD BOILER Co.
Type	BARE TUBE
Sq. Ft. Surface, Side Walls	[illegible] SQ FT
Rear Wall	680 SQ FT
Roof and Front Wall	1090 SQ FT
[illegible]	
Tube Spacing	SIDES 6 - REAR FRONT & ROOF 6¾
No. and Size of Headers	6-10¾" O.D.

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Table 1. Continued

AIRHEATER, Manufacturer	SPRINGFIELD BOILER Co.
Type	TUBULAR
Sq. Ft. of Surface	3300
Size and Length of Tubes	2½" OD - 22'-0"
Thickness of Tube Sheets	3/4"
SETTING, Manufacturer	SPRINGFIELD BOILER Co
Type	STUDDED TILE
Thickness of Refractory:	Furnace 3½ Boiler 3
Kind of Refractory:	Furnace SP TILE Boiler SL4S TILE
Thickness of Insulation:	Furnace 5 Boiler 5
Kind of Insulation:	Furnace SELECTED Boiler SELECTED
SPREADER STOKER AND TRAVELING GRATE	
Manufacturer	Wm. BROS BOILER & MFG. Co.
Type	MODEL 24 SUPER SPRED
Number of Feeders	4
Effective Grate Area	240 SQ. FT.
Type Grate Drive	HYDRAULIC
H.P. Feeder Drive Motor	(4) ½ H.P. EACH
H.P. Grate Drive Motor	(2) 1 H.P. EACH
OVER-FIRE AIR BLOWERS, Manufacturer	NORTH AMERICAN
Type and Size	SERIES 300 TURBO BLOWER
Capacity, Cfm	1700
Pressure, ins. water	17.35
H.P. Driving Motor	7½ H.P. 3500 RPM

Table 1. Continued

CINDER RETURN BLOWER, Manufacturer	Same As
Type and Size	Overfire Air
Capacity, cfm	[illegible]
Pressure, ins. water	
HP Driving Motor	
FLY ASH COLLECTOR, Manufacturer	BUBAR
Number of Units	As REQUIRED
Type	Low DRAFT LOSS
FORCED DRAFT FAN, Manufacturer	AMERICAN BLOWER CORP.
Type and Size	TYPE HS #400 DIDW.
HP Motor	100
Magnetic Drive, Mfgr.	—
Hydraulic Drive, Mfgr.	A.B Corp TYPE SC #21
INDUCED DRAFT FAN, Manufacturer	AMERICAN BLOWER CORP.
Type and Size	SIROCCO #7 DI 2/3 DW
HP Motor	200
Magnetic Drive, Manufacturer	—
Hydraulic Drive, Manufacturer	A.B. CORP. TYPE SC #27
SOOT BLOWERS, Manufacturer	VULCAN
Material for Heads	CAST IRON
No. High Temp. Elements	FOUR
Material for Elements	[illegible]
No. Medium Temp. Elements	TWO
Material for Elements	VULCROM
[illegible]	[illegible]
Material for Elements	PLAIN STEEL

Table 1. Continued

AIRHEATER, Manufacturer SPRINGFIELD BOILER Co.

Type TUBULAR

Sq. Ft. of Surface 13300

Size and Length of Tubes 2½" OD - 22'-0"

Thickness of Tube Sheets 3/4"

SETTING, Manufacturer SPRINGFIELD BOILER Co.

Type STUDDED TILE

Thickness of Refractory: Furnace 3½ Boiler 3

Kind of Refractory: Furnace SP TILE Boiler SL45 TILE

Thickness of Insulation: Furnace 5 Boiler 5

Kind of Insulation: Furnace SELECTED Boiler SELECTED

SPREADER STOKER AND TRAVELING GRATE

Manufacturer Wm. BROS BOILER & MFG. Co.

Type MODEL 24 SUPER SPRED

Number of Feeders 4.

Effective Grate Area 240 SQ FT.

Type Grate Drive HYDRAULIC

H.P. Feeder Drive Motor (4) ½ H.P. EACH

H.P. Grate Drive Motor (2) 1 H.P. EACH

OVER-FIRE AIR BLOWERS, Manufacturer NORTH AMERICAN

Type and Size SERIES 300 TURBO BLOWER

Capacity, Cfm 1700

Pressure, ins. water 17.35

H.P. Driving Motor 7½ H.P 3500 RPM.

Table 1. Continued

SAFETY VALVES, Manufacturer	FOSTER
Type and Size	TYPE 38 SV - 1-1½", 2", 2½"
WATER COLUMNS AND GAUGE GLASSES	
Manufacturer	JERGUSON
Type	HIGH-LOW ALARM
BLOWOFF VALVES, Manufacturer	HANCOCK
Type and Size	8137 UB - 8137 WB - 1½"
Nozzle Sizes	1½"
No. & Size Feed Water Connections	2 - 3"
Size Saturated Steam Connection	1½"
Size Superheated Steam Connection	56 - 1¾"

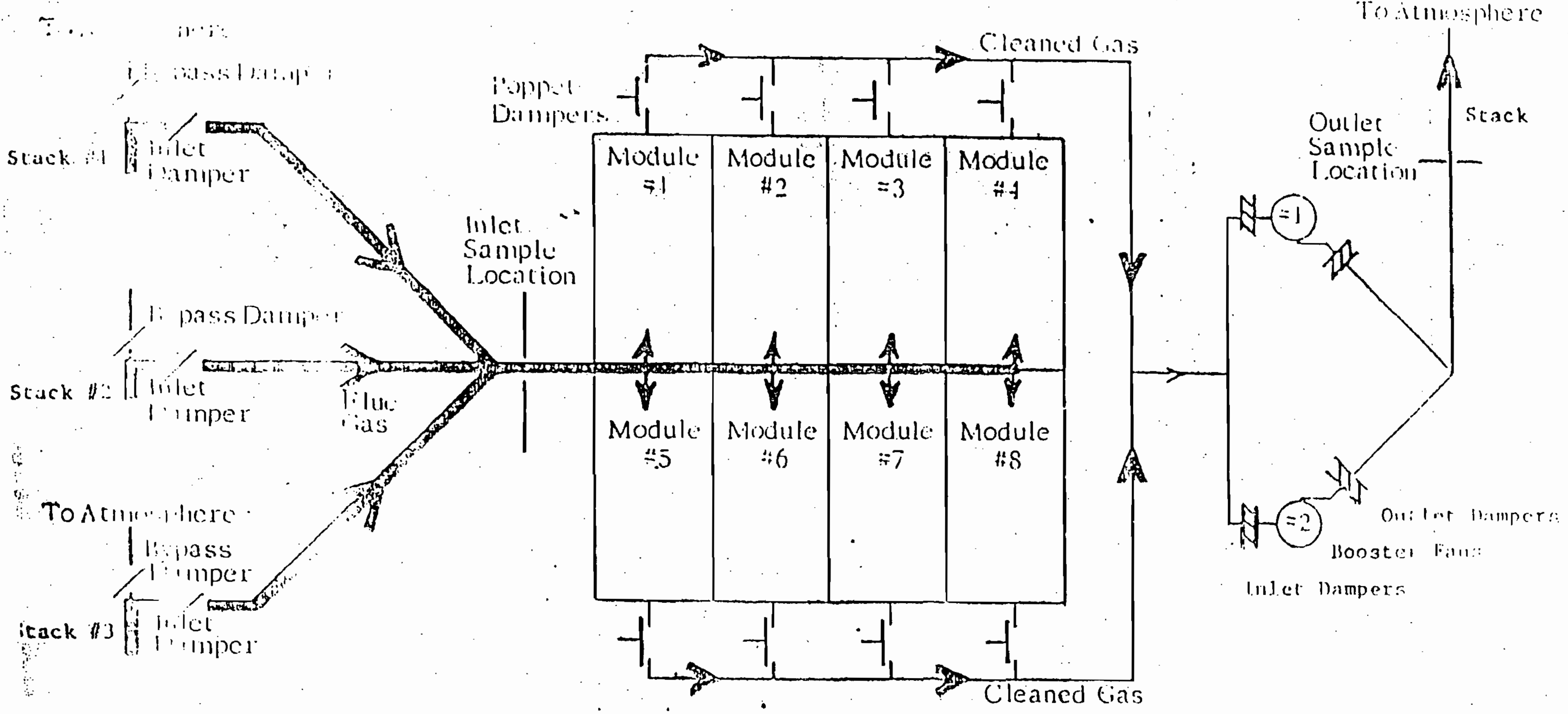

Figure 2. Elk River Baghouse
Flue Gas Schematic Diagram

W. R. [illegible]
July, [illegible]

4 TEST RESULTS

The results of the combustion test have been divided into information regarding: fuels, boiler, boiler effluent, and fly ash control system, as summarized in this section.

4.1 Fuels

The parameters related to fuels determined during the individual test days were: the coal and rubber mixing ratio, fuel feed rates, and fuel properties.

4.1.1 Mixing Ratio

As shown in Appendix A9, the actual content of rubber chips mixed with coal was:

0 percent by weight for Test #I (5/30/79)
6.3 percent by weight for Test #II (6/4/79)
10.4 percent by weight for Test #III (6/7/79)

4.1.2 Fuel Feed Rates

The fuel feed rates are shown on the field test forms in Appendix B11. The results are summarized in Table 2.

4.1.3 Fuel Properties

The results of the analyses of coal samples are presented in Appendix C7. The results of rubber tire chip analyses are presented in Appendix C8. The identification of coal and rubber samples that were analyzed is presented in Appendix C6. The coal burned was Montana Coalstrip 1 1/4 x 0 inches. The rubber was premium non-steel belted tire chips sized up to 2 inches maximum. No tire side walls were included in the chips. The tires used to prepare chips were only polyester type.

No significant deviations among individual samples of coal and rubber ships were detected. Therefore, the average results of the fuel analyses have been calculated and are summarized in Table 3 for coal samples and Table 4 for rubber samples. From these tables, the as-received heating values of the 6.3 percent/93.7 percent coal/rubber chip mixture were 9105 Btu/lb and 9400 Btu/hr, respectively.

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Table 2. Fuel Burning Rate (LB/HR) For 0%, 6.3% and 10.4% Tire Burning Tests

Time	Test I (0%)				Test II (6.3%)				Test III (10.4%)			
	Boiler I		Boiler II		Boiler I		Boiler II		Boiler I		Boiler II	
	F11	F12	F21	F22	F11	F12	F21	F22	F11	F12	F21	F22
0900	----	----	----	----	2600	2800	2000	3800	7600	8800	7200	12600
1000	5800	7800	5600	5200	6800	6200	6200	9400	6400	8200	7800	8400
1100	7200	8800	6400	10200	5400	5400	5400	8000	8400	9800	7800	8800
1200	7400	8400	6400	8600	6800	5400	6400	10000	6000	7000	6600	7000
1300	7800	8200	6000	8200	6400	5600	6200	8800	7000	9000	8000	9000
1400	10000	10200	8000	10000	5400	5800	6800	7400	6200	7800	6000	6200
1500	6800	6600	5200	7400	6000	5800	7400	7800	5200	8400	5400	9600
1600	8200	8800	6000	9800	7600	5600	8200	9000	6200	9200	5600	10200
1700	7400	7800	5600	8600	5600	4400	5800	6800	5400	9000	5400	9400
1800	8000	9200	6200	9600	6600	4800	6400	7200	----	----	----	----
1900	7200	8600	5400	8600	----	----	----	----	----	----	----	----
Total, LB	75800	84400	60800	86200	59200	51800	60800	78200	58400	77200	59800	81200
Total Per Boiler, LB	160200		147000		111000		139000		135600		141000	
Total Per Test, LB	307200				250000				276600			
Rate Per Boiler, LB/HR	16020		14700		11684		14632		15066		15666	
Rate Per Plant, LB/HR	30720				26316				30733			

Table I. Summary of Coal Analyses

Parameter	Test #I	Test #II	Test #III
	Average Values For Each Test Day		
Moisture, %	22.47	22.14	22.78
Ash, %	10.26	9.60	8.83
Volatile Combustible Matter, %	27.50	27.80	28.20
Fixed Carbon, %	39.78	40.47	40.20
Sulfur, %	0.70	0.71	0.44
B.T.U. wet per pound	8650	8810	8780
B.T.U. dry per pound	11154	11314	11429
Total Carbon, %	50.80	51.80	50.75
Hydrogen, %	3.70	3.85	3.70
Oxygen, %	11.10	10.90	11.75

All % contents are by weight.

Average higher heating value of the coal used was 11299 Btu/lb.

Average lower (as-received) heating value was 8747 Btu/lb.

Table 4. Summary of tire chip analyses

Parameter	Average Values For Each Test Day Test #II	 Test #III
Moisture, %	0.71	1.14
Ash, %	3.00	3.68
Volatile Combustible Matter, %	65.49	63.71
Fixed Carbon, %	30.81	31.48
Sulfur, %	1.26	1.46
B.T.U. wet per pound	15880	15880
B.T.U. dry per pound	15988	16062
Total Carbon, %	85.10	85.05
Hydrogen, %	6.75	6.30
Oxygen, %	2.75	2.00

All % contents are by weight.

Average higher heating value was 16025 Btu/lb.

Average lower (as-received) heating value was 15880 Btu/lb.

4.2 Boiler

Information and test results related to the boiler operation are presented in the following paragraphs. They are listed separately to cover: fuel feeding, combustion, bottom ash, and boiler output.

4.2.1 Fuel Feeding

No specific problems were experienced with the fuel feeding and spreading onto the grate. No change in the operation of the feeders was noticed while burning up to 10.3 percent of rubber chips. The only noticeable change was that during the 6.3 percent rubber chip test, the fuel feeders had to be throttled to feed less fuel compared to the first day and third day tests.

The fuel feed rates are summarized in Table 2 separately for each boiler and each feeding scale.

4.2.2 Combustion

As inspected visually, the flames above the grate were longer and hotter during the 6.3 percent rubber test compared to the 100 percent coal test, primarily in Boiler #1. Also, the 6.3 percent rubber test resulted in generation of more black smoke at the end of the flames. The 10.4 percent rubber test resulted in a shorter flame, but large quantities of smoke were generated from the flames filling up the boiler combustion chamber.

Otherwise, the boiler operation was regular without any malfunctions on any of the test days. The soot blow was normal and was performed about once every eight (8) hours on the average.

4.2.3 Bottom Ash

Bottom ashes were pulled approximately every five (5) hours. No significant differences were found among the individual test days. The bottom ash appeared much hotter and with more clinkers on the 10.4 percent rubber test day.

Identification of [illegible] ash samples which were analyzed is described in Appendix C6. The results of the bottom ash analyses are presented in Appendix C9 and Table 5.

Table 5. Summary of Bottom Ash and Fly Ash Analyses for Combustible Matter, Sulfur Trioxide, and Zinc

	Average Content Per Test Day, % weight		
Sample Identification	Combustible Matter	Sulfur Trioxide	Zinc
Test #I			
Bottom Ash	3.77	0.82	0.0009
Fly Ash	26.22	0.38	0.022
Test #II			
Bottom Ash	1.89	1.11	0.0040
Fly Ash	24.32	0.58	0.532
Test #III			
Bottom Ash	2.65	0.91	0.0065
Fly Ash	30.70	0.42	0.784

4.2.4 Boiler Output

The boiler output was very steady on all test days. Each boiler generated about 10 megawatts continuously. The boiler output parameters are presented in Appendix B11.

4.3 Boiler Effluent

The stack test results are presented separately for boiler gaseous effluent and fly ash effluent. The field test data is presented in Appendixes A1 through A8, B1 through B9, and C1 through C5.

4.3.1 Gaseous Effluent

(a) Flow Rate. Test results are summarized in Table 6 for the baghouse inlet and outlet.

(b) Temperature. Dry bulb temperatures are presented in Table 6 for the baghouse inlet and outlet. Also presented are dew-point temperatures as measured at the baghouse inlet only.

(c) Gas Composition and Gas Emission Rates. The results of ORSAT analyses are summarized in Table 6. The emission rates of the main gaseous pollutants are presented in Table 7.

4.3.2 Fly Ash Effluent

(a) Emission Rates. Particulate emission rates are presented in Table 7 for the baghouse inlet and outlet.

(b) Size Distribution. Fly ash samples as identified in Appendix C6 were sieve analyzed for particle size distribution. The results are presented in Appendix C9. The average size distributions of fly ash for individual test days are summarized in Table [illegible]

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Table 6. Summary of Main Parameters of Boiler Gaseous Effluent

Test Description			Parameter				
			Gas Temperature, °F	ORSAT Analysis, $CO_2/O_2/CO$	Flow Rate, ACFM	Flow Rate, DSCFM	Dew Point °F
Test #I (0% Rubber)	In	1-1	302	6.9/12.8/0.1	182450	114220	70
		1-2	313	7.4/12.6/0.0	197320	121710	72
		1-3	318	7.4/12.6/0.0	182170	112120	73
		Ave.	311	7.2/12.7/0.0	187310	116020	72
	Out	1-1	297		178890	112450	--
		1-2	308	7.2/12.8/0.0	185980	116680	--
		1-3	313	7.4/12.6/0.0	180600	112030	--
		Ave.	306	7.3/12.7/0.0	181820	113720	--
Test #II (5% Rubber)	In	2-1	296	7.9/12.1/0.0	160260	102820	74
		2-2	301	8.1/11.7/0.1	173590	109640	75
		2-3	302	7.7/12.5/0.1	175190	109520	75
		Ave.	300	7.9/12.1/0.1	169680	107330	75
	Out	2-1	291		176810	111560	--
		2-2	296	8.0/12.0/0.1	175530	110600	--
		2-3	297	7.8/12.4/0.1	170150	106050	--
		Ave.	295	7.9/12.2/0.1	174160	109400	--
Test #III (10% Rubber)	In	3-1	298	5.4/15.2/0.2	173600	109640	75
		3-2	301	6.4/13.8/0.0	167580	106210	76
		3-3	299	7.6/12.6/0.0	160900	100240	75
		Ave.	299	6.5/13.9/0.1	167360	105360	75
	Out	3-1	293	7.3/12.7/0.0	172110	107890	--
		3-2	296	5.7/14.4/0.0	170250	106370	--
		3-3	294		168810	105790	--
		Ave.	294	6.5/13.6/0.0	170390	106680	--

Table 7. Summary of Emission Rates of Various Pollutants

Test Description			Heat Input	Parameter									
				Particulate Emission Rate		Sulfur Dioxide Emission Rate		Sulfuric Acid(1) Emission Rate		Nitrogen Dioxide Emission Rate		Chloride (as Cl^-) Emission Rate	
			MBTU/HR	LB/HR	LB/MBTU	LB/HR	LB/MBTU	LB/HR	LB/MBTU	LB/HR	LB/MBTU	LB/HR	LB/MBTU
Test #I	In	1-1	292.54	931	3.18	474	1.62	0	0	105*	0.37*	10.5	0.036
(0% Rubber)		1-2	269.01	735	2.73	445	1.65	0	0	213	0.83	13.9	0.050
		1-3	257.77	440	1.71	434	1.68	0	0	202	0.78	0.0	0.000
		Ave.	273.11	702	2.54	451	1.65	0	0	208	0.81	8.1	0.029
	Out	1-1	292.54	2.81	0.010								
		1-2	269.01	4.54	0.017	380	1.41	4.0	0.015	202	0.73		
		1-3	257.77	9.11	0.035								
		Ave.	273.11	5.49	0.021								
Test #II	In	2-1	241.38	799	3.31	87*	0.36*	---	-----	181	0.73	5.4	0.022
(5% Rubber)		2-2	252.67	1137	4.50	451	1.78	1.6	0.006	174	0.72	8.9	0.035
		2-3	226.94	602	2.65	449	1.98	24.9	0.110	204	0.85	23.1*	0.102*
		Ave.	240.33	846	3.49	450	1.88	13.3	0.058	186	0.77	7.2	0.029
	Out	2-1	241.38	4.84	0.020								
		2-2	252.67	3.94	0.016	454	1.80	3.6	0.014	144	0.58		
		2-3	226.94	1.88	0.008								
		Ave.	240.33	3.55	0.015								
Test #III	In	3-1	312.20	666	2.13	454	1.45	24.7	0.079	155	0.55	5.1	0.016
(10% Rubber)		3-2	281.75	389	1.38	229*	0.81*	22.6	0.080	156	0.55	17.5	0.062
		3-3	286.12	635	2.22	434	1.52	----	-----	---	----	0.6	0.002
		Ave.	293.36	563	1.91	444	1.49	23.7	0.080	156	0.55	7.7	0.027
	Out	3-1	312.20	2.14	0.007								
		3-2	281.75	2.40	0.009	430	1.53	3.3	0.012	90	0.30		
		3-3	286.12	3.28	0.011								
		Ave.	293.36	2.61	0.009								

*Starred values not used in calculations of average.

(1) Expressed as sulfuric acid—actually combination of SO_3 and H_2SO_4

Table 8. Average Fly Ash Size Distribution For the Three Test Days

Test	Tire Content By Mass, %	Mass of Particles Larger Than Size Shown, % 2000 μm	425 μm	150 μm	75 μm	0 μm
#I	0	0.2	2.6	44.8	84.9	100
#II	6.3	0.0	1.2	18.0	50.4	100
#III	10.4	0.0	3.4	31.3	64.1	100

Also analyzed, under an optical microscope, were samples of the catch from the stack sampling train. The mass median diameter of fly ash particles collected on the backup filter was about 5 μm for Test Day #I, about 10 μm for Test Day #II, and 17 μm for Test Day #III. Samples from Test Day #II and Test Day #III contained much more carbon black chain aggregates compared to Test Day #I samples. Also, samples from Test Day #I were dark gray compared to samples from Test Day #II and Test Day #III which were black.

(c) Composition. Results of chemical analyses of fly ash samples are presented in Appendix C9. As seen from these results, the only variation was detected on sulfur trioxide and zinc. The average values for individual test days are summarized in Table 5.

(d) Visible Emissions. No visible emissions were observed on the stack during the entire test. The only visible emissions appeared for several seconds during the beginning of the baghouse cleaning cycle. This event is recorded on a chart of the transmissometer readout as shown in Appendix B13.

4.4 Fly Ash Control System

The operating parameters of the fly ash control system for the individual test days are presented in Appendixes B10 and B12. Other pertinent information is described in the following paragraphs.

4.4.1 Mode of Operation

The baghouse was operating throughout the tests with all eight compartments active. The cleaning of the bags was initiated manually when [illegible] These normal operating conditions when the baghouse serves three boilers including the pulverized coal boiler, the cleaning cycle is initiated automatically at about 7.5 in. w.g. baghouse pressure drop. Duration of complete cleaning cycle of the baghouse was approximately 20 minutes.

4.4.2 Gas Flow Rates and Temperatures

Gas flow rates and temperatures at the baghouse inlet were measured using baghouse panel gauges. The results are presented in Appendix B10. More accurate are the flow rates and temperatures actually measured with stack sampling equipment as summarized in Table 8.

4.4.3 Dust Loads

Dust loads at the baghouse inlet and outlet are shown in Table 7.

4.4.4 Pressure Drops

Pressure drops of the baghouse and the individual compartments are presented in Appendix B10.

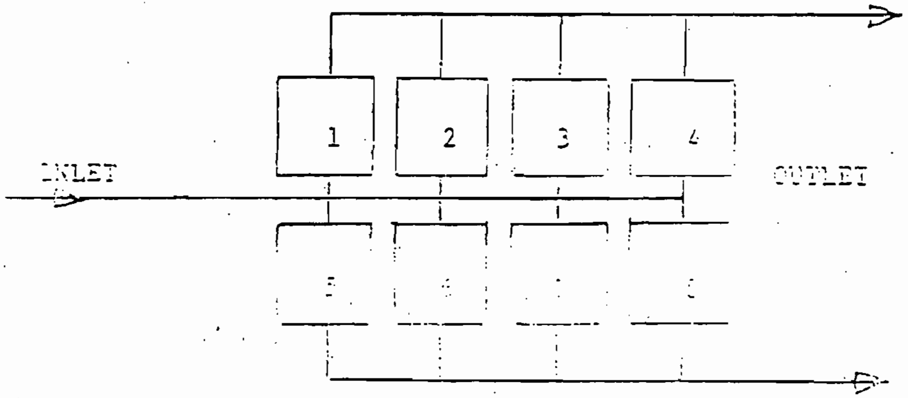
(a) Rate of Increase. To demonstrate the influence of varying quality of the fly ash depending upon the type of fuel burnt, a rate of increase in the baghouse pressure drop and the pressure drop of the individual compartments was calculated. The results are summarized for each test day in Table 9.

(b) Bag Cleaning Effectiveness. The bag cleaning effectiveness was determined from the reduction of the baghouse pressure drop before and after the cleaning cycle expressed in percent of the pressure drop before the baghouse cleaning. This reduction was 29 percent, 18 percent, and 15 percent for [illegible] percent [illegible], [illegible] percent sulfur, and [illegible] percent sulfur, respectively.

Table 9. Rate of Increase of Baghouse Pressure Drop on Individual Test Days

Baghouse Module #	Rate of Increase, in. per hour Test #I	 Test #II	 Test #III
1	0.07	0.15	0.20
2	0.05	0.23	0.27
3	0.08	0.33	0.33
4	0.07	0.30	0.30
5	0.07	0.37	0.20
6	0.08	0.23	0.27
7	0.07	0.30	0.33
8	0.08	0.30	0.33
Total Baghouse	0.07	0.30	0.30

Location of Modules



5 DISCUSSION OF TEST RESULTS

The tests offer the following observations and conclusions:

5.1 Fuel Handling

The rubber chips did not create any significant problems during their handling and transport. The transportation of rubber chips and coal on two separate belt conveyors and their mutual mixing on a third conveyor was quite successful. The mixing ratio was simply controlled by changing the amount of one of the two materials being transported to the mixing conveyor. The same can be accomplished by changing the speed of the conveyors.

The mixture of up to 10.4 percent rubber chips and coal did not result in any difficulties in the operation of the dump type feed-scale. The mixture was also easily handled by ordinary mechanical fuel spreaders and allowed for a normal, evenly spread layer of fuel on the grate.

5.2 Boiler Performance

Both boilers operated normally throughout the tests. Fuel spreading, quality of flames, size of burning region, and bottom ash properties were comparable for all test runs.

The only detectable differences in the boiler performance when comparing the test results of the individual test days were as follows:

(a) Reduced fuel feed rate on the 6.3 percent rubber chip test day

(b) Obviously higher temperature of the burning fuel on the 6.3 percent rubber chip test day

(c) Noticeably more black smoke out in the boiler on the 10.4 percent rubber chip test day

(d) Content of combustible matter in the fly ash and bottom ash was lowest for the 6.3 percent rubber chip test, indicating better combustion during that test

(e) Increasing content of zinc in the fly ash with increasing content of rubber chips.

The above observations suggested that the burning conditions were favorable on the 6.3 percent rubber test day. To assess the possible influence of burning rubber chips on that day, the overall boiler heat utilization factor was calculated for each boiler and each test day. The results are summarized in Table 10.

From this table, the heat utilization factor of the boilers when operating on 100 percent coal is between 0.87 and 0.89 percent. Considering the type of boilers, this factor is much higher than would be anticipated. This means that either the steam flow meters were measuring a higher flow rate than actual or the feed-scale was feeding more than 200 pounds of fuel per dump. The accuracy of the scale is suspect in this case.

Increase of the heat utilization factor in Boiler #I on the second test day should be noted. The heat utilization factor calculated for that test was in excess of 1.0, which is normally not possible. Because of the suspect accuracy of the feed-scale, only a relative difference between heat utilization factors measured on various days should be considered.

The heat utilization factor of Boiler #II was significantly lower on the second test day. This difference may indicate that the feed-scale of Boiler #I was dumping much more than 200 pounds of fuel on that day. This is possible, but notes from the boiler operation show that the fuel spreader had to be throttled on Boiler #I that day to maintain a constant 10 megawatts boiler output. The analyses of other boiler operating parameters do not offer any clues to this apparent discrepancy in the boiler #I heat utilization factor.

By combining the observation of the quality of fuel combustion in Boiler #I on the second test day with the results of fly ash analysis for combustible matter and the heat utilization factor calculations, it is believed that the combustion efficiency on the second test day in Boiler #I was more favorable than on the other test days. One possible explanation is that by better balancing of the amount of top and bottom

Table 10. Heat Utilization Factor for 0%, 6.3%, and 10.4% Tire Burning Test[x1]

Parameter	Test I (0%) BI	Test I (0%) BII	Test I (0%) SUM	Test II (6.3%) BI	Test II (6.3%) BII	Test II (6.3%) SUM	Test III (10.4%) BI	Test III (10.4%) BII	Test III (10.4%) SUM
Fuel Burning[x2] Rate, LB/HR	16020	14700	30720	11684	14632	26316	15066	15665	30733
Combined Lower Heating Value, BTU/LB		8747			9105			9400	
Heat Input, MBTU/HR	140	129	269	106	134	240	142	147	289
Steam Gener. Rate, 1000 LB/HR	105	100	205	105	98	203	102	98	200
Content, BTU/LB	1164	1153	1158	1158	1153	1155	1158	1158	1158
Heat Output, MBTU/HR	122	115	237	122	112	234	118	114	232
Boiler Heat Utilization Factor[x3]	0.87	0.89	0.88	1.15	0.84	0.98	0.83	0.78	0.80

[x1] Calculated for fuel heating values on as-received basis (lower heating value comparing heat input in fuels with heat output in steam.

[x2] Assumed coal scale capacity of 200 lb per each dump. Calculated as a ratio of "Heat Output" and "Heat Input".

[x3] Steam heat content less heat in the boiler make-up water (approx. 860 psig and 340° F).

combustion air in Boiler #1, the higher heating value of rubber chips resulted in a higher combustion temperature and, consequently, more efficient use of combustibles in the fuels. Although an objective explanation would require more testing, the test results suggest that the combustion of rubber chips may, up to a certain content, improve the thermal boiler efficiency.

No differences were observed in the effectiveness of the soot blowing nor was any need for more frequent soot blowing experienced during the tests. However, it must be emphasized that burning tests of longer than one day's duration would be required to be able to generalize this observation.

5.3 Boiler Effluent

The total flow rate of the flue gas remained constant for all test days as seen in Table 6. Also, the effluent temperatures, both wet bulb and dew point, did not change appreciably. A relatively constant dew point temperature indicates that the sulfur oxide emissions, primarily sulfur trioxide, were independent of the amount of rubber chips burned within the range tested. This observation is also supported by the results of sulfur dioxide and sulfuric acid (combined sulfuric acid and sulfur trioxide) emission tests as presented in Table 7. The emissions of nitrogen oxide and chloride were also constant for all practical purposes.

As seen in Table 7, it can be concluded that the quality of gaseous effluent from the boiler does not depend appreciably upon the amount of rubber chips burned within the range tested.

The amount of particulate emissions varied for individual test days. When this variation was compared with the variation for separate test runs for each day, it was found to be about the same. It can be concluded that the mass of particulate emissions did not change appreciably.

On the other hand, the size distribution of the particulate effluent and its quality [illegible] dependent upon the amount of rubber chips burned. The test results indicate that the particulate emissions consisted of fly ash generated by coal burning and carbon black aerosol generated by burning the rubber chips. This observation is supported by the changing color of fly ash samples from gray for 100 percent coal to black for 10.4 percent tire chips. It is further supported by an optical analysis of the fly ash samples from the baghouse and stack sampling train. The optical analysis showed a large quantity of carbon black chain aggregates attached to other fly ash particles whenever rubber was burned. The chains, consisting of about 0.5 µm primary particles, were longer and bigger for 10.4 percent rubber test runs than for 6.3 percent rubber test runs. Finally, the observation is supported by a chemical analysis of the fly ash (shown in Table 5) in which the amount of combustible matter increased with an increasing rubber content. The portion of the fly ash which was generated by coal burning maintained a relatively constant size distribution. This conclusion is supported by the size analysis of fly ash presented in Table 8.

The only other change in chemical composition of the fly ash was the increased content of zinc with the increasing content of rubber chips, as shown in Table 5. The fly ash samples appear to be alkaline, as presented in Appendix C9-3. This does not mean that the carbon black agglomerates are not slightly acidic.

The presence of carbon black particles must be changing the adhesive properties of the fly ash, making the fly ash more difficult to remove from the surface of the heat exchanger and the surface of the filter fabric.

The quality and chemical composition of the bottom ash was constant and independent of the content of rubber chips within the limits tested.

The changed quality of the [illegible] and particulate effluent from the boiler was not significant enough to complicate the performance of the boiler except that the soot blowing may possibly have to be performed more often. The corrosion potential of the effluent did not change enough to result in operational [illegible]

Total sampling time per test run 60 minutes

Port Identification: Ports were labeled A to F with Port A being on the west end.

Point Identification: Points within each port were labeled from 1 to 5 with 1 being farthest from the port.

Baghouse Outlet (Stack)

Stack inside diameter: 96 inches

Distance to flow disturbance

Number of duct diameters before port: 5.8

Number of duct diameters after port: 6 (estimate)

Required number of sampling points: 28

Actual number of sampling points used: 32

Number of ports: 4

Points per port: 8

Sampling time per point: 2 minutes

Total sampling time per test run: 64 minutes

Port Identification: Ports were labeled A to D in a clockwise direction with port A facing the north.

Point Identification: Points within each port were labeled from 1 to 8 with point 1 being farthest from the port.

6.2 Testing Equipment

The boiler and baghouse operation was monitored with standard plant equipment and instruments. The following standard instruments were used to collect all pertinent operation parameters:

Temperatures - thermocouple

Steam pressure - pressure gauge (Bourdon tube)

Pressure drop in bagh. [illegible] - magnehelic gauges

Opacity - EPA approved transmissometer

To measure the amount of fuel (coal or coal/rubber chip mixture), two feed scales per boiler were used. The scales are a product of the Beaumont Birch Company, Philadelphia, Pennsylvania. The scales are set to feed approximately 200 pounds of coal per balance dump. The counter which counts the number of scale dumps was used to monitor the fuel input.

Particulate testing in the boiler before the baghouse and in the stack was performed using two standard EPA type sampling trains.

Manufacturer: Research Appliance Company

Model: RAC Stacksamplr

Probes: Inlet test - 10 foot with stainless steel lines
Outlet test - 5 foot with pyrex lines

Nozzles: Stainless steel

Filter media: Type A/E glass fiber
100mm effective filtration diameter

6.3 Testing and Analytical Procedures

Testing and analytical procedures employed in this study were as follows:

6.3.1 Boiler Operation

The boiler operation parameters were determined and recorded every hour. The following parameters were measured:

Coal consumption

Tire chip consumption

Flue gas temperature

O_2 flue gas content

[illegible]

Steam temperature and pressure

Two (2) coal samples per day

Two (2) tire rubber samples per day

Four (4) bottom ash samples per day

The only procedure which requires special description is how the fuel and bottom ash samples were obtained. The fuel to be analyzed was collected by randomly removing approximately a one-pound sample from each of the four feeding scales. A total of about twenty pounds was removed, put on one pile, mixed, and the pile reduced to about a four-pound sample by the standard quartering technique. This sample was manually screened to separate all rubber. The resulting coal and rubber samples were separately weighed and stored for analysis. By comparing the weights of the rubber and coal samples, the actual rubber content in the fuel was determined.

The bottom ash sample was obtained by removing about fifty pounds of bottom ash while pulling the ashes. This amount was shoveled out of the bottom ash chute to cover the whole width of the boiler. A final sample was obtained by mixing and quartering the original fifty-pound sample down to about five pounds.

A special test was performed on the boiler to observe the quality of the flame in the boiler and also to determine the quality of bottom ash. Both parameters were determined visually.

6.3.2 Baghouse Operation

The boiler operation parameters were determined and recorded every hour. The following parameters were measured:

Particle concentration before and after the baghouse

Particle size from the baghouse hopper

Particle size from the sampling train

[illegible]

Temperature before and after the baghouse

Moisture content before and after the baghouse

Gas composition before and after the baghouse

Plume opacity

Total baghouse pressure drop

Individual compartment pressure drop

Frequency and sequence of baghouse cleaning

On ash sampling test procedures, caution must be exercised in interpreting results from the fly ash sampling tests. United Power Association (UPA) is concerned that a number of the initial fly ash samples were not as representative as they could have been. As the test procedure progressed, somewhat better techniques were developed; however, the fly ash sample still does not provide an accurate representation of the ash collected by the baghouse.

The problem is that fly ash drops out in various portions of the flue gas duct as it leaves the boiler. The first place that the fly ash drops out is in the air preheater section. In this area fairly heavy particles begin to fall out. A portion of these particles are reinjected into the boiler. Previous tests have indicated there can be 50 percent carbon in the air preheater area. As the flue gas enters the bottom of each baghouse module, the heavier particles tend to drop into the bottom of the ash hopper and the relatively fine particles are carried by the flue gas and collect on the filter bags.

The initial samples of fly ash were collected from 6-inch poke holes in the bottom of the fly ash hoppers. Since these poke holes fill up with the heavier particles, the samples were not representative of all the particulate collected in the baghouse.

A more representative fly ash sample was obtained by changing the collection procedure. Initially, the ash collection system cleaned the ash [illegible] through a cleaning cycle and, subsequent to that, a sample of ash was pulled off the bottom of the fly ash hopper. In order to reduce the influence of stratification on the sample of fly ash, the ash removal system was allowed to pull the ash from the hopper for 20 seconds and then the sample was removed from the hopper. This provided a representative sample of the ash as it came out of the ash hoppers.

One problem experienced in this particular sampling procedure was that the upstream hoppers, #1 and #5, tend to have very light loads of fly ash. Therefore, it was very easy not to have a sufficient amount of material for an accurate sample after some ash had been pulled out during the ash removal process. On hoppers #1 and #5, a sample was collected prior to the start of the ash cleaning process and another after the ash cleaning process had been in operation for one cycle.

With respect to the fly ash sampling during the tire test burn, the first sample taken during the 100 percent coal burning operation was not representative because the sample consisted of ash that was in the bottom of the fly ash hopper. The second sample obtained during the 100 percent coal burning operation was taken after cleaning of the baghouse and was somewhat more representative. The samples taken during the 5 percent and 10 percent tire chip test burn were as representative of the fly ash as possible. There is still concern that these do not necessarily reflect the exact proportions of heavy ash which collects in the bottom of the ash hoppers or fine ash which collects on the bags.

6.3.3 Analysis of Ash and Fuel Samples

Three samples of fly ash were analyzed from each test day for: manganese, zinc, boron, potassium, and sodium. The analytical technique used was atomic absorption.

Four samples of bottom ash were analyzed from each test day for the same elements as fly ash.

A duplicate analysis of fly ash and bottom ash leachate was performed on the 10 percent rubber chip test samples. The leachate was analyzed for: arsenic, boron, cadmium, iron, lead, manganese, nickel, and zinc using the atomic absorption technique. Standard EPA techniques for wastewater were used to analyze the leachate for: chlorides, phosphorus, and phenol.

All fly ash and bottom ash samples were also analyzed for acidity. In this test, distilled water was shaken with each sample in a 2:1 ratio and the resulting pH values were measured and recorded.

A standard sieving technique was used to analyze the size of fly ash samples.

6.3.4 Stack Sampling and Analytical Procedures

General

In order to determine the pollutant emission rate from stationary sources, the EPA (Environmental Protection Agency) has established a series of reference methods which specify the manner in which tests must be performed. These reference methods are found in the Code of Federal Regulations under Title 40 - Protection of Environment; Chapter 1 - Environmental Protection Agency; Subchapter C - Air Programs; Part 60 - Standards of Performance for New Stationary Sources; Appendix A - Reference Methods.

Unless otherwise noted, the tests presented in this report were performed according to the EPA Reference Methods. A brief description of the test procedures used follows.

Preliminary Determinations

The number of sampling points and their locations within the duct was determined according to EPA Method 1. The number of points required is based on the distance (duct diameter) of undisturbed flow both up and downstream of the sampling location.

Preliminary measurements to determine the stack pressure, temperature, and range of velocity heads were made by traversing the duct with a pitot tube and thermocouple as per EPA Method 2.

Determination of Particulate, Sulfur Dioxide, and Sulfuric Acid Emissions

The particulate, sulfur dioxide (SO_2), and sulfuric acid (H_2SO_4) emissions were determined per EPA Methods 5 and 8. In the combined procedure, the effluent is isokinetically withdrawn from the source. Particulate matter in the effluent is collected on a glass fiber filter which is maintained at a temperature of 248 ± 25 degrees Fahrenheit. The particulate mass, which includes any material which condenses at the filtration temperature, is determined gravimetrically after removal of uncombined water. The sulfuric acid mist (including sulfur trioxide) and the sulfur dioxide are separated and collected by bubbling the filtered effluent through a series of absorbing solutions. Both sulfur dioxide fractions are then measured by the barium-thorin titration method.

The sampling train (see Figure 3) consists of a heated glass-lined sampling probe with attached thermocouple and S-type pitot tube. The probe attaches to the front sample case which houses an all glass in-line filter holder in a temperature controlled environment. The back sample case houses several moisture condensing impingers and a desiccant column. The first impinger contains an 80 percent isopropanol solution for the collection of sulfuric acid and sulfur trioxide. The second and third impingers each contain a 3 percent hydrogen peroxide solution for the collection of sulfur dioxide. The sample case is connected via an umbilical cord to the control unit which contains the vacuum pump, dry-test meter, calibrated orifice, orifice pressure indicator, velocity pressure indicator, [illegible] operating controls. The [illegible] is [illegible] to a separately [illegible] temperature readout.

A representative particulate sample was acquired by sampling for equal periods of time at the center of a number of equal area regions [illegible]

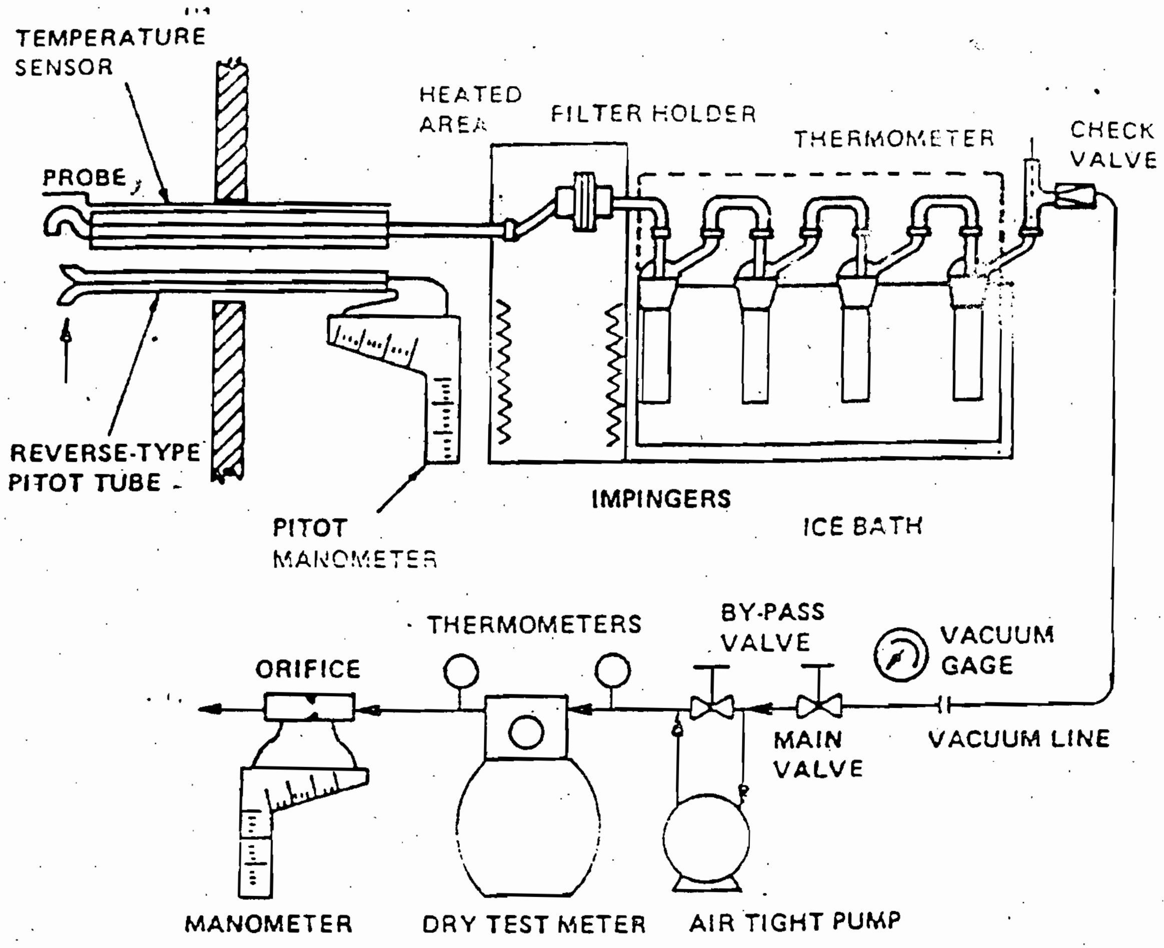


Figure 3. *The EPA Method 5 particulate sampling train.*

were measured and the sampling rate rapidly adjusted to isokinetic conditions with the aid of a nomograph. Sample gas drawn into the nozzle (size determined by preliminary measurements) flowed through the probe to the glass fiber filter where the particulates were collected. The gases then passed through an ice-cooled condenser and desiccant column which quantitatively sorbed all moisture from the gas stream. The gas then passed through the vacuum pump, the dry-test meter, and the calibrated orifice.

Leak checks to detect any dilution air being pulled into the sampling line were performed at the beginning and end of each test run and also when and if any sample line connections (except probe) were broken.

Gas composition was determined per EPA Method 3. Grab samples were collected and analyzed for carbon dioxide, oxygen, and carbon monoxide using a standard ORSAT analyzer.

After completion of each test run, the sampling train was removed to the clean-up area for sample recovery. The filter was removed from the filter holder and placed in Container #1. The probe and all connecting glassware (except cyclone) in front of the filter were rinsed with 80 percent isopropanol and the rinsings were placed in Container #2. The particulate matter collected in the cyclone was transferred to Container #3. The remaining particulate matter in the nozzle, probe, cyclone, and all connecting glassware in front of the filter was quantitatively transferred to Container #4 by means of a distilled water wash followed by an acetone wash. A stiff brush was used in the probe cleaning step to help dislodge deposits. The volume of liquid in the first impinger was measured and transferred to Container #5. This impinger was then rinsed with 80 percent isopropanol and the rinsings added to Container #5. The volume of liquid in each of the remaining impingers (desiccant column excluded) was measured and quantitatively transferred to Container #6. These impingers and their connecting glassware were then rinsed with distilled water and the [illegible] contents transferred to [illegible] container.

Sample analysis was performed at MMI's laboratory. The filter was desiccated to constant weight (Weight A, see Note below). The contents of Container #3 were transferred to a tared beaker and desiccated to constant weight (Weight C). The contents of Container #4 were transferred to a tared beaker, evaporated without heat to near dryness, and desiccated to constant weight (Weight B). The contents of Container #2 were filtered through a tared filter. The filter was dried at 100° C and then desiccated to constant weight (Weight D). The filtered liquid was added to Container #5. The total mass of particulate matter collected during each test run is the summation of Weights A, B, C, and D.

The filter and the material collected in the cyclone were added to Container #5. The sulfur dioxide (Container #6) and the sulfuric acid (Container #5) samples were then each made up to volume and an aliquote titrated using the barium-thorin method.

NOTE: All items were desiccated at 68 ± 10° F for a period of at least 24 hours and then weighed to the nearest 0.1 mg in a balance room where the relative humidity was less than 50 percent. The desiccation/weighing procedure was repeated at intervals of at least six (6) hours until a constant weight (± 0.5 mg) was obtained.

Determination of Nitrogen Oxide Emissions

The concentration of nitrogen oxides (except nitrous oxide) in the effluent stream was determined per EPA Method 7. In this procedure, a grab sample is collected in an evacuated flask containing a dilute sulfuric acid-hydrogen peroxide absorbing solution. The nitrogen oxides are measured colorimetrically using the phenoldisulfonic acid (PDS) procedure.

Determination of Chloride Emissions

The concentration of chloride compounds in the effluent stream was determined by drawing a known volume of gas through a midget impinger containing acetate buffer. The [illegible] by titration.

Determination of Particle Size Distribution

Particle-size distribution of the dust samples collected in the sampling train was determined by optical microscopy.

ATTACHMENT 4

MEASUREMENT OF
POLYNUCLEAR AROMATIC HYDROCARBONS AND METALS FROM BURNING TIRE CHIPS FOR SUPPLEMENTARY FUEL

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ABSTRACT

Air emissions of polynuclear aromatic hydrocarbons (PNAs) and heavy metals air emissions from two wood fired power boilers and a lime kiln were measured. The samples were taken when the sources were burning their normal fuel and when the fuel was supplemented with tire chips. The results indicate increased particulate emissions, primarily due to increased zinc, when tires are burned and little or no change in PNA emissions. Results compare well with air emission measurements from other tire burning sources and wood burning sources. The suitability of the Modified Method 5 PNA technique is also discussed.

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INTRODUCTION

Scrap tires that are not recycled constitute a serious solid waste problem, but also offer energy conservation opportunities through their use as solid fuel. If burned alone tires or tire chips would require specially designed incinerators. However, under some conditions they can be burned as a co-fuel at existing facilities with little modification (1). In Washington at least three pulp mills have burned tire chips as co-fuel.

Complaints from residents in the vicinity of one of these pulp mills generated interest in the Washington Department of Ecology to determine what emissions may be coming from the burning of tires as an auxiliary fuel in a wood fired boiler at the mill. Ecology is also interested in identifying emissions of toxic air contaminants and determining their significance.

A literature search revealed that polynuclear aromatic hydrocarbons (PNAs) and some heavy metals, such as zinc, arsenic and chromium, are potential air emissions from burning of tires. This paper reports results of measurements to determine if burning tire chips as a co-fuel generates significantly more emissions of toxic air contaminant than if tire chips were not burned. The paper also discusses the sampling methodology and problems encountered with sampling particulate and volatile toxic air contaminants.

SAMPLING OBJECTIVES

In sampling for toxic pollutants it must be recognized sensitive methods do not exist for many substances. Also, to sample for too broad a range of compounds would be extremely costly and complex. In most cases, careful selection of a specific set of target pollutants is adequate to determine if significant quantities of most compounds are emitted.

In the case of burning tires a literature search indicated that target pollutants should be polynuclear aromatic hydrocarbons and heavy metals. PNAs have received much attention in studies of air pollution because some of these compounds are highly carcinogenic (2). They are a class of compounds consisting of various arrangements and substitutions of multiple benzene rings and are known to be produced by the incomplete combustion of fossil fuels, wood and other organic materials. Therefore, PNAs are likely to be produced by incomplete combustion of tires.

To look for all of the PNA class of compounds quantitatively would be prohibitive from an analytical and cost standpoint. The more exotic compounds could not be accurately quantified because standards for these substances could not be obtained. Some of these standards, if available cost approximately $3,000/gram.

The sixteen PNAs listed in EPA Method 610, see Table 1, were judged to be the most technically feasible and environmentally significant compounds. It was felt that these compounds would be most environmentally significant. In addition our laboratory has had considerable experience with the analytical procedures.

Another good choice for target compounds are heavy metals. Heavy metals are associated with cancers of the lungs and kidneys, fetus malformation, insomnia, stupor, coma, joint muscle pain, nausea and vomiting. Previous work also indicated they might be present in air emissions from tire burning sources. The particular heavy metals that we decided to analyze for are listed in Table 1.

Table 1 Target Pollutants

Polynuclear Aromatic Hydrocarbons
Listed in EPA Method 610

- Naphthalene
- Acenaphthylene
- Acenaphthene
- Fluorene
- Phenanthrene
- Anthracene
- Fluoranthene
- Pyrene
- Benzo(a)Anthracene
- Chrysene
- Benzo(b)Fluoranthene
- Benzo(k)Fluoranthene
- Benzo(a)Pyrene
- Dibenzo(a,h)Anthracene
- Benzo(ghi)Perylene
- Indeno(1,2,3-cd)Pyrene

Heavy Metals

- Arsenic
- Barium
- Cadmium
- Chromium
- Copper
- Iron
- Lead
- Nickel
- Vanadium
- Zinc

Selecting a sampling procedure is difficult because PNAs can exist as particulate or gases and change phases with different sampling conditions. Traditionally, investigations of airborne PNAs have been confined to particles collected on glass fiber filters (3). For relatively nonvolatile PNAs, such as benzo(a)pyrene, filter collection might be acceptable. However, recent studies have shown that the 3 to 4 ring PNAs are largely in vapor form in ambient air because of their volatility and are therefore not retained by filters (4). Additionally, organic compounds can be present in the gas phase or adsorbed onto particles (e.g. dust, fly ash, water droplets etc.). The fraction retained by filters decreases with increasing temperature and increases with decreasing molecular weight (5). In choosing a sampling procedure it is therefore important to select a method that would collect both gases and solid PNAs.

There are other reasons to analyze for both phases. Certain components may be slowly driven from the captured particles during sampling; whereas, certain gas phase components may adsorb to filter media, hence appearing in the particle sample. In general, compounds less volatile than anthracene will be retained on the filter at around 420 degrees K. There were at least six target PNAs less volatile than anthracene and several more volatile (6).

MODIFIED METHOD 5

The Modified Method 5 was selected to determine the emission rates of:

1. Total particulate
2. PNAs
3. Heavy metals.

This method is a modification of the standard EPA Method 5, see Fig.1. The train was modified by adding a cooler-condenser and an adsorbent cartridge between the filter and the first impinger. Normal Method 5 sampling procedures were followed. Particulate PNAs and metals are extracted from the filter with more volatile PNAs collected on the solid adsorbent.

The solid adsorbent chosen was XAD-2, which is a synthetic adsorbent structurally comprised of a styrene-divinylbenzene copolymer, an organic synthetic plastic. An advantage of the organic polymeric adsorbents is the absence of "active sites", which can lead to irreversible adsorption of certain polar compounds.

Each of the processes tested were controlled by a wet scrubber producing stack gases with 10-30 percent water vapor. In order to sample large volumes of air with a small amount of adsorbent, it is necessary for the adsorbent not to collect the water. Organic polymeric adsorbents such as XAD-2 have this feature. Inorganic adsorbents like silica gel, alumna, Florisil, and molecular sieves are considerably more polar than the organic polymeric adsorbents, leading to the efficient collection of polar materials, such as water.

An inverse relationship exists between the adsorbent temperature and the retention volume. Therefore, large volumes of stack gas may be sampled, using a reasonable quantity of adsorbent, if the trap is cooled to prevent appreciable losses of the most easily eluted components. To accomplish this a water cooled-condenser is necessary downstream of the heated filter and upstream of the XAD-2 trap.

ANALYTICAL PROCEDURE

PNAs were extracted from the filter and XAD-2 using methylene chloride. These extracts were concentrated and analyzed using high performance liquid chromatography (HPLC) with ultraviolet and fluorescent detectors. Selected XAD-2 samples were spot checked using gas chromatography with mass spectrometer (GC/MS) according to EPA Method 625.

Metals were extracted from the filters with nitric acid and hydrogen peroxide and analyzed using atomic absorption. Probe rinses were mixed with nitric acid and hydrogen peroxide and similarly analyzed. Blank values were subtracted from the sample values in calculating emission rates.

QUALITY ASSURANCE

A major deleterious property associated with the use of polymeric sorbents as collection media is the contamination of the product as received from the manufacturer. Users of XAD-2, as received from the manufacturer have experienced resin contamination, qualitatively consistent from lot to lot. The PNA naphthalene has been found in quantities of 470 ug per gram of XAD-2 suggesting that the extractable contaminants are either residuals from the resin manufacturing process (e.g. starting materials or secondary by-products) or artifacts from the degradation of the polymer itself during storage and handling, subsequent to the manufacturing process (7).

A rigorous cleanup prior to use in sampling is required. The most widely accepted clean up procedure was used by the Ecology Environmental Laboratory. The XAD-2 resin, although originally cleaned by Supelco to EPA specifications was cleaned again by soxhleting for eight hours each with chromatography grade methanol, hexane, methylene chloride and diethylether. The resin was then air dried and about 19 grams placed in each resin cartridge and held in place with solvent extracted glass wool. As further quality control a blank XAD-2 cartridge and filter were carried to the sample site. These were analyzed to assess contaminants of the collection media both in the field and in the laboratory. The blank analysis attests to the elimination of media contamination. All PNAs blank values were below the detectable limit. For naphthalene this is equivalent to a contaminant concentration of less than 0.07 ug per gram of XAD-2.

Other problems with solid adsorbents are artifact formation or chemical transformation of some adsorbed materials through the interaction with stack gases like NO_x and SO_x. Nitro PNA derivatives can be formed from reaction of nitric acid, NO_2, and N_2O_5 on sorbed material. Also, sunlight can influence the integrity of sorbed material. This phenomena has been shown to promote insitu degradation of photochemically active species such as PNAs. Precautions must be taken to shield sample filters from sun or room light. To shield the XAD-2 from light the cartridges were wrapped in aluminum foil.

There is some evidence to suggest the structure of XAD-2 will break down into organic components at elevated temperatures. The condenser prevents this by reducing sample gas temperature. In addition, the temperature of the resin was monitored during sampling.

FACILITIES SAMPLED

The MM5 sampling procedure was used to measure emissions where tire chips were burned as a co-fuel in two hog fuel boilers and a lime kiln. Tires were used as an alternate fuel replacing all or part of the oil in the hog fuel boilers. The lime kiln was fired with tire chips as a co-fuel with natural gas. The fraction of heat input received from the tire chips ranged from two to fifteen percent. In each case the sources were asked to operate the facilities normally when tires were burned and as they would if tires were not available. All three sources were located in Washington state at different locations and under different management.

Source A

Source A is a hog fuel boiler built in 1977 that was designed to produce about 90,000 kg/hr (200,000 lb/hr) of steam. The particulate control equipment for this source consisted of a 600 tube multiclone operated with 90 to 100 mm water pressure drop and a venturi scrubber operating with a pressure drop between 300 and 400 mm water.

While waste wood is the primary fuel the boiler is normally operated with between three and eight percent of the heat input coming from auxiliary fuel; oil or tire chips. During the testing about 500 kg/hr of tires were burned representing about seven percent of the heat input. When oil was used as auxiliary fuel about 400 kg/hr were burned representing about five percent of the heat input.

Source B

Source B is a hog fuel boiler that was originally built as an oil boiler in 1952 and later converted to burn hog fuel by Combustion Engineering. Oil or tire chips are still used as auxiliary fuel to increase combustion efficiency. The particulate control equipment consisted of a multiclone followed by a variable throat venturi scrubber with about 300 mm of water pressure drop.

When tire chips were burned they contributed about two percent of the heat input and oil contributed about eleven percent with hog fuel contributing the remaining. When tire chips were burned oil contributed about twelve percent of the heat input.

Source C

Source C is a lime kiln built in about 1980 and equipped with an Air-Pol variable throat venturi scrubber which is normally operated at 700 to 750 mm of water pressure drop.

The kiln normally burns natural gas and recently has been supplementing the gas with tire chips on an experimental basis. During the test about 15 percent of the heat input came from tire chips.

RESULTS

Emissions of PNA and metals were measured while the sources were both burning tire chips as a co-fuel and when the processes were fired without tires chips. Most of the operating parameters were held constant with the exception of the change in the fuel. In each case an increase in particulate emissions was noted as shown in Table 2. Much of the increase in particulate emissions from the hog fuel boilers can be attributed to increased emissions of zinc, as shown in Table 3. Other heavy metals emissions that increased when tires were burned are arsenic which increased from 0.2 gm/hr to 0.5 gm/hr at Source B and an increase of chromium from 3 gm/hr to 13 gm/hr at Source C.

Table 2 Effects of Auxiliary Fuel on Particulate Emissions

Source	Particulate Emissions Rate Not burning tires, gm/hr	 Burning tires, gm/hr
A	21,000	29,000
B	5,000	7,000
C	4,000	7,000

Table 3 Effects of Auxiliary Fuel on Zinc Emissions

	Zinc Emissions Rate	
Source	Not burning tires, gm/hr	Burning tires, gm/hr
A	1,400	22,200
B	210	1,400
C	1	20

The hog fuel boiler at Mill A experienced increases in emissions of anthracene and phenanthrene with the use of tires. On the other hand the emissions of several heavy metals increased with the burning of oil as a supplemtary fuel, as shown in Table 4.

Table 4 Effects of Auxiliary Fuel on Emissions of PNAs and Metals From a Hog Fuel Boiler at Mill A

	Emissions Rate, gm/hr	
Pollutant	Burning oil	Burning tires
Zinc	1440	22,200
Vanadium	90	0.6
Nickel	66	5.4
Lead	58	12
Phenanthrene (PNA)	41	72
Chromium	5.4	3.0
Cadmium	4.2	3
Anthracene (PNA)	1.2	2.4

The higher emissions rates of lead, nickel, vanadium and chromium may come from metals in the oil. As shown in Table 5 these metals are typically in fuel oil ash (8).

Table 5 Typical Oil Ash Analysis

Constituent	Weight %
Iron	23.0
Vanadium	19.6
Nickel	11.9
Chromium	1.4
Lead	0.2
Copper	0.1

Table 7 Comparison of PNA Emission Factors

Pollutant	Mill A ug/kg	Mill B ug/kg	NCASI ug/kg	EPA ug/kg
Anthracene	72	10	64	---
Phenanthrene	3060	450	108	5043
Fluoranthene	3354	371	7	884
Benzo(a)Anthracene	1820	474	25	642
Chrysene	18	14	8	216
Benzo(a)Pyrene	nd	8	7	323
Benzo(ghi)Perylene	nd	48	6	---
Benzo(b)Fluoranthene & Benzo(k)Fluoranthene	18	29	10	413

COMMENTS

The increase in emissions of zinc that was expected from the literature review was verified. Zinc is probably emitted in the form of a very fine particulate that may be generated as zinc in tire chips, is evaporated in the combustion chamber and condensed in the form of zinc oxide as the combustion gases cool. Such a mechanism would result in most of the zinc leaving the boiler in the form of fly ash or fine particulate. This fine particulate can only be collected by high efficiency air pollution control equipment. Hence, it would be reasonable to require a review of the efficiency of air pollution control equipment prior to using tire chips as an auxiliary fuel.

The evidence suggests that all three sources tested are capable of burning tire chips as auxiliary fuel without significantly increasing the emission of polynuclear aromatic hydrocarbons. It is also likely that such emissions would not increase as long as the combustion conditions are properly maintained.

Using the emission factors developed here it is estimated that the emissions from all commercial and industrial wood fired boilers in Washington is about 6.6 tons per year. Emissions from residential wood combustion are estimated to be about one hundred times as much at 690 tons per year.

The increased emissions of zinc measured from each mill during the burning of tires is supported by literature sources. For bench tests of a tire incinerator for Modesto Energy Company, CA (9), emissions of zinc oxide comprised fifty one percent of particulate emissions. W. L. Cox (10) reports one to two percent zinc oxide present in tires which burns to ash. Zinc was found in water run off from the Everett, Washington tire fire (11). Zinc was also found in the smoke plume from the Rhinehart tire fire in Winchester, Virginia, at a concentration of 122 ug/m^3, an order of magnitude times higher than lead, at 11 ug/m^3, or iron, at 14 ug/m^3 (12).

The total of the PNA emissions measured from the burning of wood and auxiliary fuel at Sources A and B are compared in Table 6 with emission estimates derived from emission factors reported in a 1985 inventory of toxic emissions in the State of Washington (13). Considering the uncertainty of applying universal emission factors to a specific source, these emission rates are reasonably close. The PNA emissions are also in the same ranges as reported by the National Council of the Paper Industry for Air and Stream Improvement (14) and the EPA as shown in Table 7.

Table 6 Comparison of Emission Rates for Total PNA

	PNA Emissions	
	Measured gm/hr	Estimate gm/hr
Source A	120	27
Source B	7.2	18

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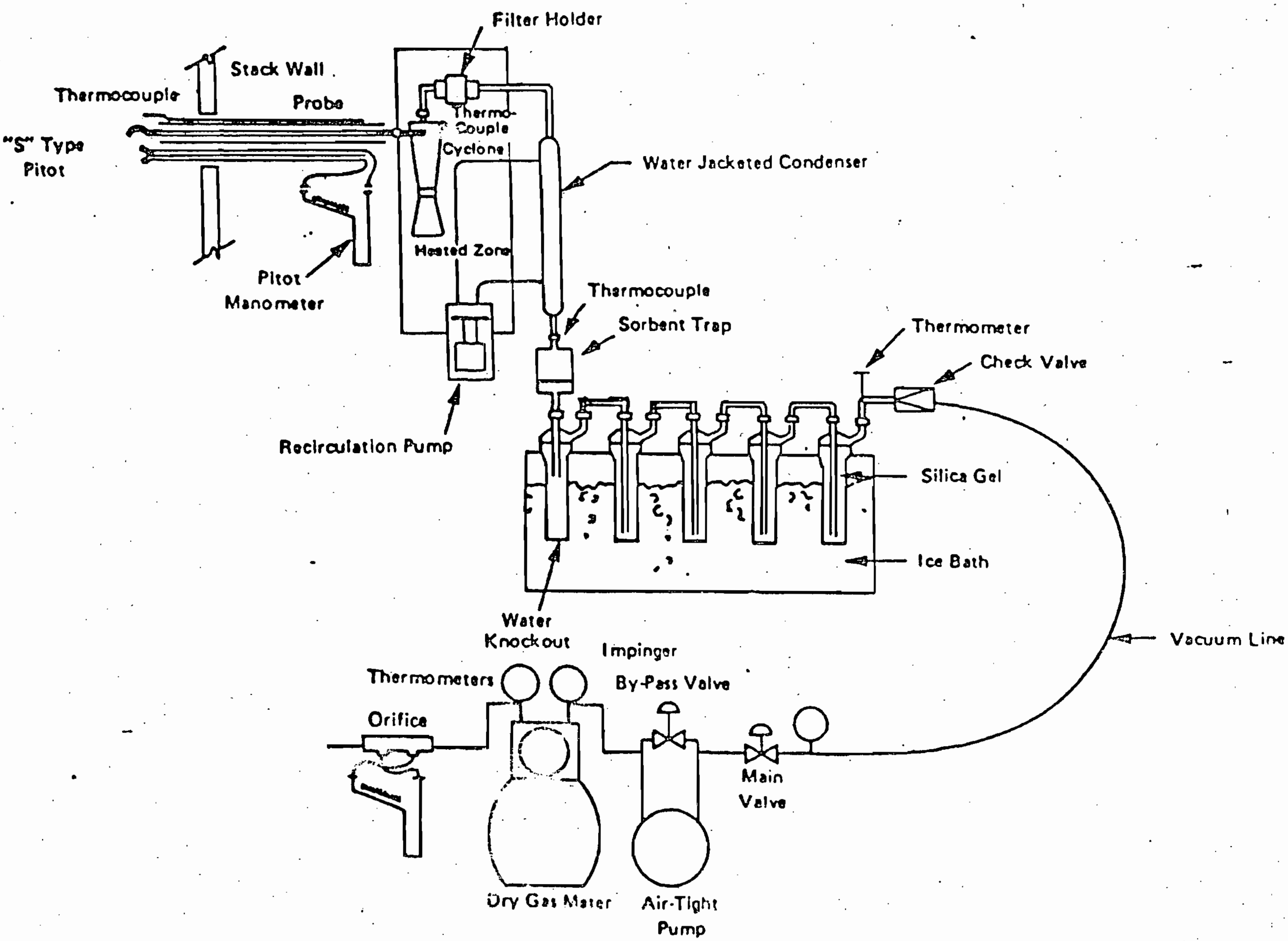


Figure 1: MM5 Train schematic diagram

ATTACHMENT 5

RUBBER TIRES, A HAZARDOUS FUEL?

Over the last few years I have had numerous discussions with eager individuals interested in burning rubber tires as a fuel. I have heard of valleys filled to the brim with rubber tires just waiting to be burned. I personally have contributed my share of Big O's to this ever growing heap over the years. I must admit, that I had preconceived visions of billowing black smoke rising unrelentlessly to the sky. From strictly a heating value viewpoint, rubber tires are an excellent fuel, having a heating value twice that of wood and about 75% of fuel oil, but is it hazardous to burn them?

Just recently the Bay Area AQMD granted Louisiana-Pacific (L-P) a permit which will allow them to burn up to 42 tons/day of rubber tire fuel in their waste wood boiler. Although this may seem like a large quantity, it represent no more than ten percent of the total heat input to this large 550 million Btu/hr boiler and a small fraction of the available supply of tires. Before a permit was issued to L-P they were required to conduct two test burn programs under the supervision of our District and the California Air resources Board. This boiler is controlled by a electrostatic precipitator followed by a wet scrubber for SO2. Both of these devices are considered Best Available Control Technology (BACT) by our District.

The purpose of these test burns was two fold. Firstly, it was L-P's burden to demonstrate that hogged rubber tire fuel could be burned in this unit without significantly increasing already permitted emissions of the so called criteria pollutants. The District was particularly concerned that emissions of NOx not be increased since [illegible] was already operating under a variance for exceeding their permitted level. The effect on emissions of SO2 and particulate matter (PM) was also of concern, considering the sulfur content of rubber tires(~1 to 2 %S) and the dense particulate formation associated with the open burning of rubber tires. Secondly, and perhaps more importantly, there was concern that hazardous air emissions might result. It is well known that rubber tires contain many trace metals including; lead, mercury, nickel, cadmium, zinc and others.

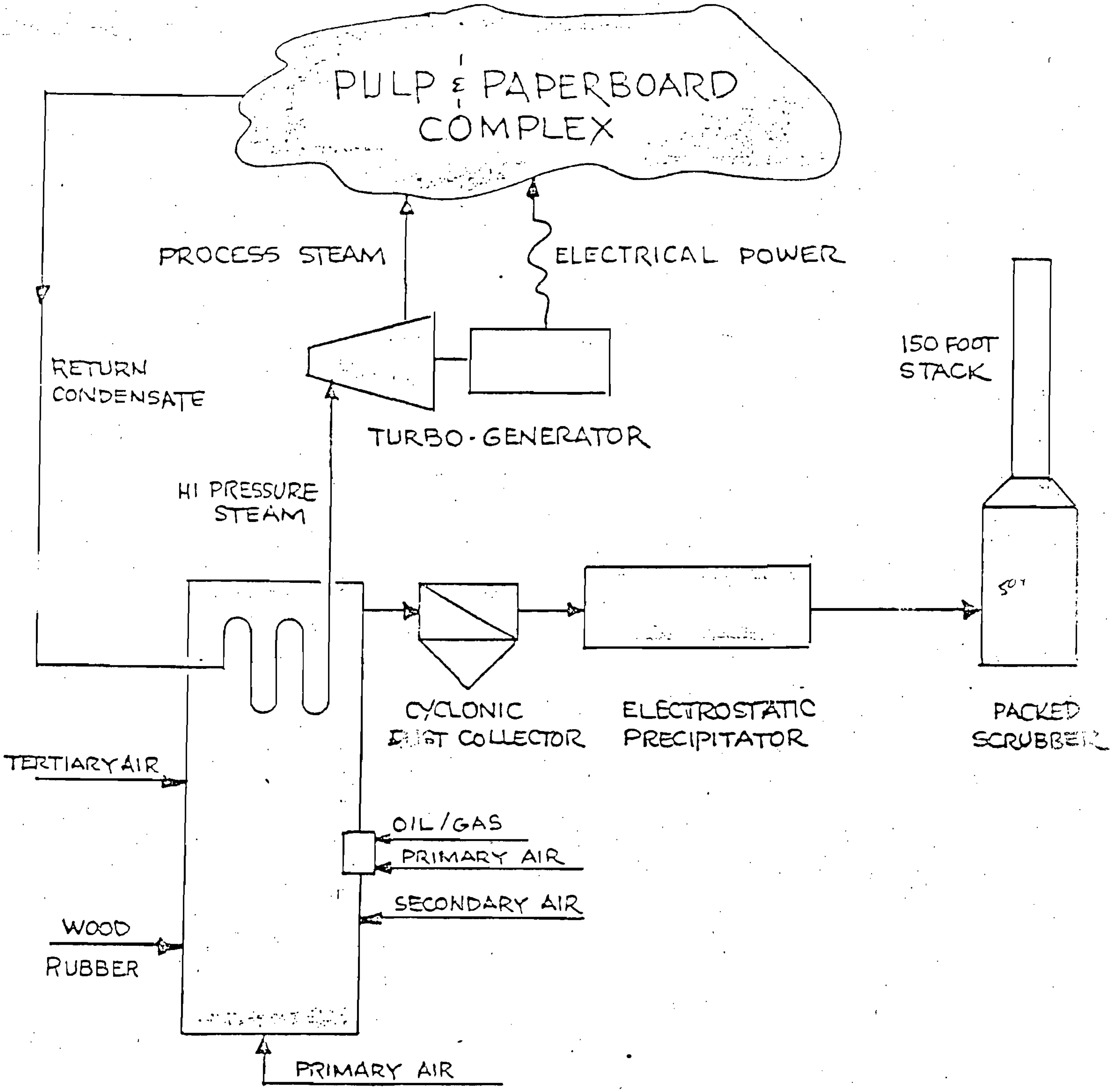
This boiler is equipped with continuous emission monitors for both NOx and SO2 so it was relatively easy to determine what the total emissions of these contaminants were during the test burn periods. However, the waste wood boiler is not base loaded and must handle the large swings in the steam demand of the paper mill resulting in considerable variations in combustion parameters and resulting emission. Therefore, it was difficult to determine conclusively, a significant correlation between percent rubber tires burned and emissions, particularly those of NOx. In spite of this difficulty, it was concluded from the test results, that NOx emissions were probably not increased, while both SO2 and PM showed slight increases. It should be noted that considering both the normal accuracy of the monitors and source test methods used, all changes in emissions noted were in the probable noise level of the data itself.

Composite particulate samples were collected by L-P during stack testing and analyzed for the metals listed above.? Based on the analyses of these samples, the daily emissions of these metals were estimated to be; 8.6 lb of zinc, 0.12 lb of cadmium, 0.05 lb of nickel, 0.006 lb of lead and 0.007 lb of mercury. The zinc emission represents approximately six percent of the total particulate matter emitted and corresponds to a stack concentration of less than one ppm as ZnO. Considering the significant dispersion of these emission which would result before they reach ground level, they would not be expected to constitute a health hazard.

In addition L-P is required by the Regional Water Quality Control Board to conduct periodic tests for toxic compounds in the ash collected from the boiler grate, the sand seperator and electrostatic precipitator in order to determine if the ash can be placed in a landfill. To date, no restrictions have been placed on the land disposal of this ash based on these tests.

In conclusion, I must say that the jury is still out as to whether or not rubber tires can be burned in all combustion devices without creating a hazardous air emission or a hazardous solid waste ash. The L-P boiler is well equipped with air pollution controls for particulate matter, SO2, and HCl. The boiler's solid fuels are supplemented at all times with gas or oil to assure temperatures are maintained high enough to guarantee complete combustion. Although rubber tires are not classified as a hazardous waste under RCRA and their controlled combustion not prohibited under any known regulations, we should proceed with caution in permitting their use as a fuel. Additional testing for metals and other contaminants which may be present in the stack emissions or the ash should be performed on a periodic basis until this question is fully resolved.

By
William deBoisblanc
Manager, New Source Review
Bay Area AQMD
March 6, 1985



WASTE WOOD POWER BOILER

EXHIBIT I

APPENDIX III ASH ANALYSIS WITH 10% RUBBER FUEL

Louisiana Pacific Corporation
test date: March 6, 1984
by Curtis & Tompkins, Ltd.

Results: E P Toxicity, all metals reported as mg/liter in the final extract

Parameter	sample 1	sample 2	sample 3	Allowable
Arsenic	<0.2	<0.2	<0.2	5.0
Barium	<5	<5	<5	100
Beryllium	<0.5	<0.5	<0.5	0.75
Cadmium	<0.1	<0.1	0.34	1.0
Chromium,+6	<0.5	<0.5	<0.5	5.
Lead	0.3	trace<0.1	trace<0.1	5.0
Mercury	<0.1	<0.1	<0.1	0.2
Nickel	<0.1	<0.1	<0.1	20
Selenium	<0.1	<0.1	<0.1	1.0
Silver	<0.1	<0.1	<0.1	5.0
Zinc	9.1	26.1	189.	250

Sample 1 - boiler grate ash
Sample 2 - sand seperator ash
Sample 3 - precipitator ash

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Composite Ash - WFB — Analysis by ULTRACHEM

Results: E P Toxicity, all metals reported as mg/L in the final extract.

Parameter	Sample	Allowable Limit
Arsenic	0.018	5.0
Barium	<2	100
Cadmium	<0.2	1.0
Chromium, Hexavalent	<0.5	5.0
Lead	<0.5	5.0
Mercury	<0.02	0.2
Selenium	<0.2	1.0
Silver	<0.2	5.0

Nutrient Levels

Parameter	as Received	Dry Basis	
Moisture, loss at 105°C, % w/w	39.1	-	
Potassium, K, % w/w	1.17	1.92	2.3
Nitrogen, N, % w/w	<0.04	<0.07	
Phosphorous, P, % w/w	0.013	0.021	0.05

Submitted by,

Michael Lynch

Michael Lynch
Manager, Technical Services

ML/dfh

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LABORATORY CERTIFICATE

[illegible] CONTACT w/ LAB

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Laboratory No.	84h112	Reported	8/15/84
Preliminary No.	8314	Sampled	-------
		Received	7/25/84

For LOUISIANA PACIFIC CORPORATION

Report on 7 samples of Rubber Chips

Mark Shipping Order No. 9-56-688
Sample Nos. as below

	Mark	Nitrogen (N), %	Sulfur (S), %
1)	13th Comp ----------------------	0.19	1.49
2)	20th Comp ----------------------	0.18	1.36
3)	9th July -----------------------	0.20	1.52
4)	July 10th ----------------------	0.19	1.38
5)	July 11th ----------------------	0.18	1.40
6)	July 12th ----------------------	0.54	1.49
7),	July 13th ----------------------	0.19	1.50

Curtis & Tompkins Ltd.

SAMPLES DISCARDED 30 DAYS AFTER RECEIPT UNLESS OTHERWISE REQUESTED

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CAPCOA TECHNICAL SEMINAR

March 7, 1984
ARB 15th & R St. Conference Room
Sacramento, California

Incineration of Hazardous Materials

10:00 am	Introduction	- Jan Bush
10:05 am	Incineration of Misc. Haz. Wastes	- Don Ames, ARB
11:00 am	Burning of Reclaimed or Used Oil	- Bob Barham, ARB
11:30 am	Burning tires	- Bill DeBoisblanc, BAAQMD
12:00 pm	Lunch	
1:00 pm	Infectious Waste Incineration	- Bill Dennison, SCAQMD
1:45 pm	Waste Gas Incineration	- Ken Kitchingman, EPA
2:15 pm	Residential Wood Burning	- Earl Withycombe, MCAB

After each presentation there will be time for questions and discussion of the material presented. The format is intentionally informal and designed to maximize exchange of information and views. An abstract from each presentor is desireable for reference by those unable to attend the Seminar. It will be included in a CAPCOA Newsletter.

ATTACHMENT 6

SUMMARY OF WEST COAST EXPERIENCE WITH EMISSION FROM WOOD-RESIDUE FIRED BOILERS WHILE BURNING TIRE DERIVED FUEL (TDF) AS A SUPPLEMENTAL FUEL

WASTE TIRE UTILIZATION IN SOLID FUEL BOILERS AN ALTERNATIVE FUEL AND IT'S EMISSIONS

Mark W. Hope, Waste Recovery, Inc.

I GENERAL OVERVIEW

Tire derived fuel (TDF) is an alternative fuel that has received acceptance and creditability with the pulp and paper industry over the last 5 years. The most rapidly growing commercial use for scrap tires in the world today is incineration for heat recovery. With a high latent heat content of 15,000 Btu/lb, the burning of tire chips has been found to be profitable in a number of power generation facilities.

A general review of TDF is included here to cover appropriate application, material characteristics, economics and environmental concerns. Costs associated with various fuels in the Pacific Northwest are summarized in Table 1. Specifics with regards to these issues are drawn from a number of companies who have experience with TDF and for more detailed information you are encouraged to contact them directly. It is extremely important to note that emission rates, contaminant routes, handling characteristics and economic return may differ due to the difference among the many combustion and control systems, even if they appear similar.

TABLE 1 WESTERN OREGON FUEL COSTS - 1984

		Gross $/MMBtu	Net Fuel Cost/1000# Steam
*Sawmill Hog Fuel	8.50/ton	0.94	1.45
*TDF - Chopped Tires	50.00/ton	1.67	2.23
Coal - 11,000 Btu/lb	40.00/ton	1.81	2.41
Straw - 12 Mo. Supply	37.50/ton	2.50	3.33
RDF	31.00/ton	2.80	4.00
Logging Residue Chips	24-36.00/grn ton	2.67-4.00	4.11-6.15
Natural Gas Incentive	.42/therm	4.20	5.07
Wood Pellets	68.00/ton	4.00	5.13
No. 6 Heavy Oil	26.00/bbl	4.20	5.25
Natual Gas Industrial	.49/therm	4.90	5.90
Natural Gas Residential	.64/therm	6.40	7.71
Fuel Oil Residential	1.03/gal	7.30	9.12
Dry Cord Wood Residential	80.00/cord	6.00	12.00
Electricity Residential	.42/Kwh	12.30	13.67

*Limited supply
One therm = 100,000 Btu

A. TDF Analysis and Handling Characteristics

TDF is a refined scrap tire. More specifically, it is a scrap tire which has been shredded and processed to a fairly clean rubber chip roughly 1 inch to 2 inches in size. Waste Recovery's TDF is free of bead wire, has 70 percent or more of the belt wire removed and has a conservative Btu value of 15,500/lb.

Wire removal is important to eliminate ash and material conveying problems. TDF with the inherent wire will increase grate cleaning time, ash clinker and create problems with conveying systems due to its tendency to hang up and conflict with magnetic check systems. A quality TDF can be blended and fed into boilers via existing solid fuel systems without modification. To date facilities using TDF are stoker fired and traveling, pinhole or fixed grate boilers. Some caution must be used when replacing coal in a coal only boiler due to grate ash insulation considerations. Rubber has less ash and burns at a higher temperature than coal. To date trials to replace coal have established a 50-50 mix as a good mix in one particular boiler trial. This boiler used a baghouse as primary emission control.

Specially designed material handling and metering systems are imperative to provide a constant, consistent and precise blend rate with the normal solid fuel. An alternative to a metered mix is mixing TDF directly in the pile of solid fuel. Problems with mixing the pile are:

(1) Slugging of the system with TDF which if a large enough concentration reaches the boiler, it can momentarily throw the stack out of compliance and unnecessarily increase steam which wastes fuel.

(2) No guarantee of the mixture rate, percentage of rubber to solid fuel. By mixing rubber directly in the pile one cannot realize a continuous even feed. Thus one may experience a loss of economic benefit due to the lack of a continuous synergistic effect of burning TDF with other fuels.

(3) Environmental constraints limit the quantity of TDF that is ultimately used. Uneven feed rates place further limits on TDF usage due to surging which may create upset conditions.

(4) Cost of handling TDF is actually higher since time must be spent attempting to evenly mix it in the solid fuel pile rather than charging a metering hopper once per shift or less.

The benefits and economic return on a metering unit are as follows:

(1) Even Mixing With Solid Fuel - This is perhaps the most important aspect since the even blending of TDF with other solid fuels increases the efficiency of the boiler. When other solid

fuels have a high moisture content the combustion efficiency and energy recovery drops drastically. If moisture content is high enough one might even create an energy sink. However, it has been proven that by using an even mixture of TDF (15,500 Btu/lb) with hog fuel that has 53 percent or more moisture (8,000 Btu/dry lb) to bring the heat value down onto the grate that TDF not only maintains the combustion of poor quality hog fuel but also contributes significantly to the steam demand without having to rely on oil or natural gas. The metering unit distributes TDF with the main solid fuel such that its heat value is not so isolated to certain feed surges or areas on the grate. If the fuel moisture is not an issue one still realizes an overall efficiency increase due to the competitive cost of a higher Btu value TDF, higher burning temperatures, low moisture and low ash.

(2) Less Employee Time in Handling TDF - A metering unit can be designed to store a shift quantity of TDF. Better yet, it can be fully automated to allow for truck dumping into the unit.

(3) A metering unit allows the boiler operator immediate control of the TDF feed rate as with the other solid fuel system. Such control would allow for more cost effective use of TDF. Specifically, if the fuel system shuts down then TDF can be shut down, and if poor quality fuel creates poor boiler performance than a variable speed control to the TDF metering unit would allow the operator to compensate by increasing the TDF feed rate.

In summary, a TDF metering unit allows better control of fuel feed, reduces employee handling time, saves energy dollars and ensures environmental compliance. One should calculate yearly energy savings based on average boiler efficiency increase (probably somewhere around 3 to 6 percent) when blending TDF with other solid fuels. Be sure to factor in an average moisture value since TDF's best operational benefits are with wet fuels. Based on similar experience elsewhere, the ROI on a TDF metering unit would be 1 year or less.

II TDF ANALYSIS AND ENVIRONMENTAL CONCERNS

An analysis of TDF is presented in Table 2. Specific TDF concerns are the fixed carbon 27.96 percent volatile matter 66.64 percent and ash 4.78 percent. Elements of concern are the sulfur 1.23 percent and zinc 1.52 percent. All other elements are of insignificant quantities when the burning of TDF is a smaller percentage of the solid fuel demand. If burning TDF as a primary fuel then trace elements (less than 0.5 percent) such as chromium, cadmium and lead should be evaluated as a component of the ash. Uses to date verify that these elements would be found in a compounded form and normally pass EP toxicity tests.

Carbon and volatile matter are evaluated for fuel characteristics and would verify TDF as a quality fuel for boilers. TDF is being blended with both coal and wood waste around the

United States. Beneficial advantages have been demonstrated in both applications. No obnoxious odors have been observed during its use in low or high concentrations.

An ash content of 4.78 percent is average as compared to wood species (1.8 percent) and much less than most coal which has an average ash content of 12 percent. Thus one can expect to see very little change, if any, in ash quantities from a wood fired boiler and less ash from coal fired boilers. With a quality TDF, i.e. no wire, ash handling time would remain the same.

TABLE 2 PROXIMATE AND ULTIMATE ANALYSIS AND METAL ANALYSIS OF TIRE-DERIVED FUEL (TDF)*

Proximate Analysis	Percent by Weight As Received	Percent by Weight Dry Basis
Moisture	0.62	-
Ash	4.78	4.81
Volatile Matter	66.64	67.06
Fixed Carbon	27.96	28.13
	100.00	100.00
Ultimate Analysis		
Moisture	0.62	-
Ash	4.78	4.81
Carbon	83.87	84.19
Hydrogen	7.09	7.13
Nitrogen	0.24	0.24
Sulfur	1.23	1.24
Oxygen (by difference)	2.17	2.39
	100.00	100.00
Elemental Analysis		
Zinc	1.52	1.53
Iron	2.52	2.54
Calcium	0.378	0.379
Chlorine	0.149	0.150
Chromium	0.0097	0.0087
Fluoride	0.0010	0.0010
Cadmium	0.0006	0.0006
Lead	0.0065	0.0065
Heat Value	**Btu/lb**	**kJ/kg**
HHV	16,250	37,798
HV_{ave}	15,500	36,053
TDF Combustion	**°F**	**°C**
Tires Ignite	550 - 650	288 - 343
Carbon Begins to Burn	842	450
Carbon Completely Burnt	1202	650

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*Sources: TDF produced from scrap passenger and commercial tires, free of bead wire.

Sulfur content of TDF is within the legal limits of most state's limit for heavy residual fuel oil (1.5 percent). Previous trials and current uses have demonstrated TDF's ability to bring the heat value to the boiler's grate when burning wet hog fuel thus reducing oil demand to sustain steam loading. In this case the actual SOx emissions will actually be reduced as demonstrated in Figure 1. If a boiler uses only wood and/or low sulfur coal, then a slight SOx increase would be observed when burning TDF. Each boiler with its fuel mix must be evaluated to determine any SOx changes as this is a function of its fuel mix, both historic and proposed.

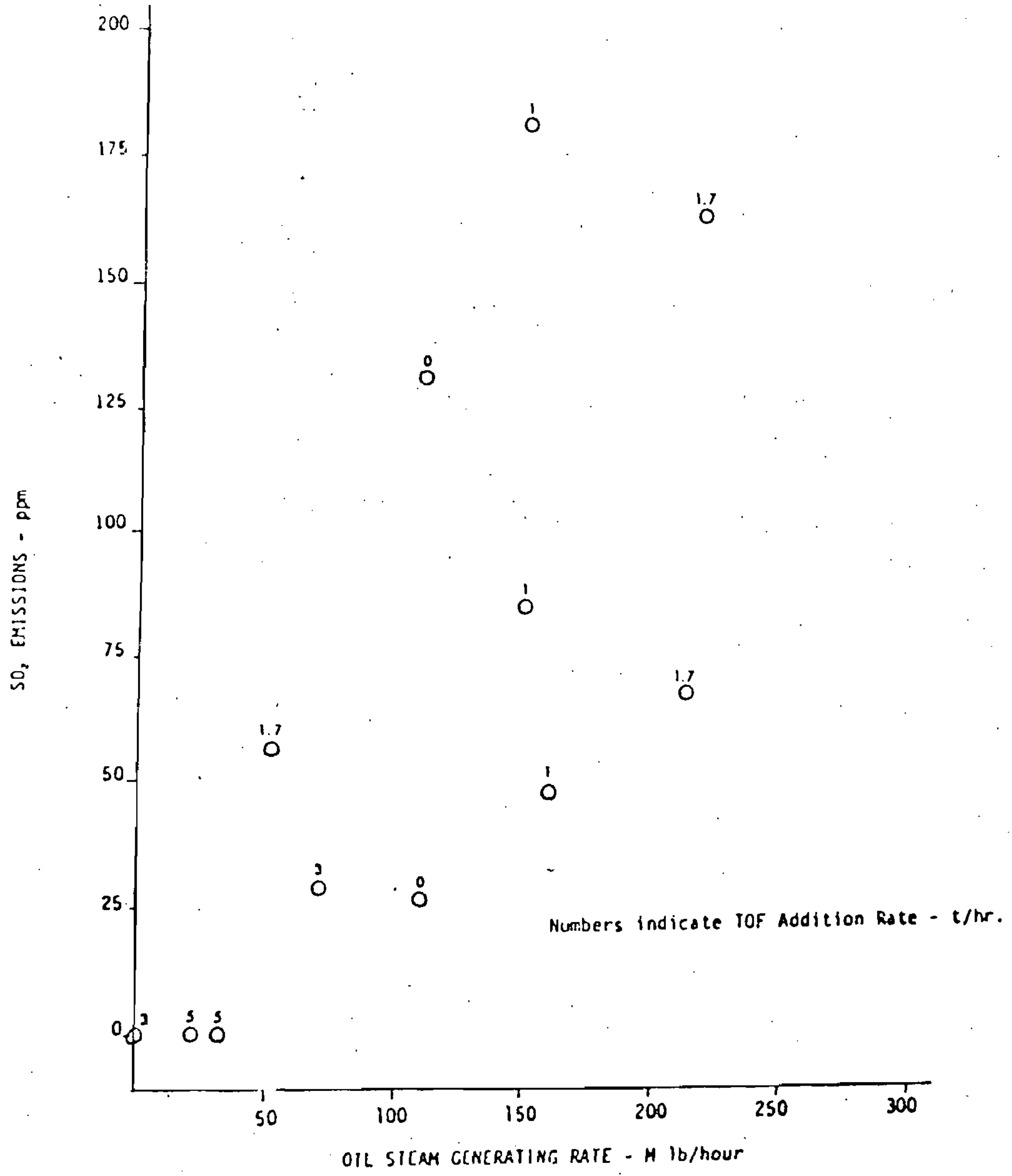

FIGURE 1

SO_2 EMISSIONS DURING TDF ADDITION AS A FUNCTION OF OIL STEAM GENERATING RATE

Zinc is usually the most significant element of concern due to its concentration. Furthermore, zinc is an element that normally is not found in boiler emission and effluent systems. Industry's use of TDF for the past several years have offered operating experience to define the extent of zinc pollution and that it can be dealt with. Whether zinc is an issue to be dealt with is specific to the quantity of TDF used and type of emission control system. Results from the analysis of three ash samples for zinc are presented in Table 3.

TABLE 3 SUMMARY OF BOTTOM ASH AND FLY ASH ANALYSES FOR COMBUSTIBLE MATTER, SULFUR, AND ZINC

Sample Indentification	Average Content Per Test Day, Percent Weight Combustible Matter	Sulfur	Zinc
Test #1			
Bottom Ash	3.77	0.82	0.0009
Fly Ash	26.22	0.38	0.022
Test #2			
Bottom Ash	1.89	1.11	0.0040
Fly Ash	24.32	0.58	0.532
Test #3			
Bottom Ash	2.65	0.91	0.0065
Fly Ash	30.70	0.42	0.784

Test #1 - 0% Rubber
Test #2 - 6.3% Rubber
Test #3 - 10.4% Rubber
Primary Fuel - Coal

When TDF is burned, zinc becomes entrained in the air flow. Particle size distribution of uncontrolled particulate matter emitted from a boiler while firing TDF at rates of 0, 6.3, and 10.4 percent by mass are presented in Table 4. Due to its fine particle size and high carbon content it is more difficult for wet scrubbers than electrostatic or bag houses to control particulate emissions. Some particulate will exit the stack, however, an electrostatic and bag house will allow one to burn TDF in much higher concentrations because they are much more efficient in dealing with TDF particulate. This has been demonstrated by both the power utilities and pulp and paper industry.

TABLE 4 AVERAGE FLY ASH SIZE DISTRIBUTION FOR THE THREE TEST DAYS

Test	Tire Content by Mass Percent	Mass of Particles Larger Than Size Shown, Percent 2000 um	425 um	150 um	75 um	0 um
# 1	0	0.2	2.6	44.8	84.9	100
# 2	6.3	0.0	1.2	18.0	50.4	100
# 3	10.4	0.0	3.4	31.3	64.1	100

Test # 1 - 0% Rubber
Test # 2 - 6.3% Rubber
Test # 3 - 10% Rubber
Primary Fuel - Coal

TDF particulate exiting the stack could affect opacity and grain loading. There is no zinc limit as an air pollutant other than that as a particulate. Since the zinc particulate is small, any great concentration will dramatically affect opacity since the particles will condense with the moisture in the air fairly rapidly causing a blue haze. However, when burning TDF in concentration appropriate with the emission system, this should not be a problem.

Washington State classifies most waste using a fish bioassay LC_{50} and derived toxicity response in addition to the standard RCRA listing criteria. Zinc concentrations in the ash may complicate the aquatic toxicity test since certain forms of aquatic life are sensitive to zinc. Because of the high pH of a dry ash, the zinc would be compounded, insoluable and non-toxic. Landfill testing of dry ash containing 35 percent zinc has shown no significant quantities of zinc leaching to either the groundwater or receiving streams. (Whiteson Landfill, McMinneville, Oregon 1974 to 1979).

Wet fly ash can become a part of the effluent which normally is treated through a wastewater treatment system. Zinc may become an issue here due to aquatic life's sensitivity to it. Two areas of immmediate concern would be the microbial action in the biological treatment system and in the receiving stream. Since solubility of zinc is a function of pH, actual experience has shown the zinc to percipitate and become part of the sludge in a treatment system. Significant quantities of zinc have not been detected in biological treatment system effluent and none has been detected at a discharge point to receiving streams where primary and secondary treatment occurs. Wet ash analysis has been conducted where the fly ash from a multi-clone and blow down from a wet scrubber has entered the wastewater treatment system as a matter of practice. (Western Kraft, Albany, Oregon).

Some dry fly ash is currently being used as a soil amendment to adjust soil pH. If zinc is a component of that ash, then maximum cumulative loading requirements are placed on its application the same as with a municipal sewage sludge. Because the zinc is compounded and fairly insoluable, it would have a low availability to plants. Specifically, zinc will usually remain insoluable as $Zn(OH)2$ and plant uptake will be restricted. Limits in concentration of specific elements in sewage sludge for soil application, concentrations measured in ash from boilers burning TDF as a portion of their fuel and cumulative loading rates when applied on land are presented in Table 5.

The average background levels of zinc in surface water is 10 ug/L. Recommended standard after a mixing zone is 47 ug/L for freshwater, for a 24 hr period; and 58 ug/L for saltwater, for a 24 hr period.

TABLE 5 METAL CONTENTS OF SLUDGES APPROPRIATE FOR AGRICULTURAL LAND APPLICATIONS, CONCENTRATION IN ASH FROM BOILER FIRING TDF AS A FUEL SUPPLEMENT AND MAXIMUM LOADING FOR A SOIL WITH A CATION EXCHANGE CAPACITY OF 5 TO 15 (mg/100g)

Element	Sewage Sludge Conc. (mg/kg)^1	Flyash Conc.	Maximum Loading (kg/ha)^1
Zn	2000 ppm	5000 ppm (10#/ton)	1000
Pb	1000	110 (0.2 #/ton)	500
Cu	800	240 (0.5 #/ton)	250
Ni	100	52 (0.1 #/ton)	100
Cd	25	2	10

1 Guidelines for land applications of wastewater and sludges, Oregon Department of Environmental Quality (May 18, 1981).

Methods for assessment of the impact of the discharge of zinc included:

(1) Evaluate whether or not zinc escapes existing environmental control systems.

(2) Burn TDF in low proportions relative to the primary solid fuel.

(3) Maintain a neutral or higher pH in the scrubber discharge and document the contribution of zinc.

(4) Prepare a zinc balance of the system.

III SUMMARY

Generally most states have been very receptive to industry's interest to test and use TDF. Tires have been a historic disposal problem and alternative beneficial uses are encouraged. It is important that industry work closely with environmental control agencies to test and demonstrate its use within environmental limits. Relative to other industrial process and environmental testing, trials to demonstrate an ongoing ability to use TDF in an industrial boiler as supplemental fuel are fairly simple.

A recommended approach to procede with a TDF trial for its approval as an alternative/supplemental fuel would be:

(1) Contact the state pollution control agency to inform them of your interest to examine TDF as an alternative fuel. Express your interest to conduct a preliminary trial.

ATTACHMENT 7

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 60

Standards of Performance for New Stationary Sources; Appendix A—Addition of Methods for Measurement of Polychlorinated Dibenzo-p-Dioxins, Polychlorinated Dibenzofurans, and Hydrogen Chloride Emissions From Stationary Sources

[AD–FRL–3694–2]

AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed rule and notice of public hearing.

SUMMARY: The purpose of this proposed rule is to add Method 23, "Determination of Polychlorinated Dibenzo-p-Dioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs) from Stationary Sources," and Method 26, "Determination of Hydrogen Chloride Emissions from Stationary Sources" to Appendix A of CFR part 60. These methods are being proposed to determine compliance with subparts Ca and Ea of part 60.

A public hearing will be held, if requested, to provide interested persons an opportunity for oral presentation of data, views, or arguments concerning the proposed rule.

DATES: *Comments.* Comments must be received on or before March 5, 1990.

Public Hearing. If anyone contacts EPA requesting to speak at a public hearing by January 10, 1990, a public hearing will be held February 7, 1990, beginning at 10 a.m. Persons interested in attending the hearing should call the contact mentioned under **ADDRESSES** to verify that a hearing will be held.

Request to Speak at Hearing. Persons wishing to present oral testimony must contact EPA by January 10, 1990.

ADDRESSES: *Comments.* Comments should be submitted (in duplicate if possible) to: Air Docket (LE–131), Attention: Docket Number A–89–11, U.S. Environmental Protection Agency, room M–1500, 1st Floor, Waterside Mall, 401 M Street SW., Washington, DC 20460.

Public Hearing. If anyone contacts EPA requesting a public hearing, it will be held at EPA's Emission Measurement Laboratory Building, Research Triangle Park, North Carolina. Persons interested in attending the hearing or wishing to present oral testimony should notify Gary McAlister, Emission Measurement Branch (MD–19), Technical Support Division, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711, telephone (919) 541–1062.

Docket. Docket No. A–89–11, containing materials relevant to this rulemaking, is available for public inspection and copying between 8 a.m. and 3:30 p.m., Monday through Friday, at EPA's Air Docket, room M–1500, 1st Floor, Waterside Mall, 401 M Street SW., Washington, DC. 20460. A reasonable fee may be charged for copying.

FOR FURTHER INFORMATION CONTACT: Gary McAlister or Roger Shigehara, Emission Measurement Branch (MD–19), Technical Support Division, U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711, telephone number (919) 541–1062.

SUPPLEMENTARY INFORMATION:

I. The Rulemaking

Under subparts Ca and Ea, the EPA is proposing to regulate emissions from municipal waste combustors (MWCs) which will include setting emission limits for polychlorinated dibenzo-p-dioxins (PCDDs, CDDs, or dioxins), polychlorinated dibenzo furans (PCDFs, CDFs, or furans), and hydrochloric acid (HCl). There are presently no methods published in 40 CFR part 60, appendix A, to measure any of these pollutants. This action would propose one method to measure the PCDDs and PCDFs and another method to measure the HCl.

Summary of Reference Methods

Method 23 is used to measure the emission of PCDDs and PCDFs from MWCs. A sample is withdrawn isokinetically from the stack through a probe, a filter, and a trap packed with a solid adsorbent. The PCDDs and PCDFs are collected in the probe, on the filter, and on the solid adsorbent. The PCDDs and PCDFs are extracted from the particulate matter and the adsorbent with a hot organic solvent. The extracted PCDDs and PCDFs are separated by capillary gas chromatography and then each isomer is identified and measured with mass spectrometry (GC/MS). The total PCDDs and PCDFs are the sum of the individual isomers. Toxicity factors are not used in the calculation.

Method 26 is used to measure the emission of HCl from MWCs. A sample is withdrawn at a constant rate from the stack through a probe and impingers filled with a dilute acid. The HCl is collected in the impinger solution. The chloride ion is separated by ion chromatography and measured by a conductivity detector.

Background

In 1983, the American Society of Mechanical Engineers (ASME) recognized that the testing for PCDDs and PCDFs needed to be standardized. In February of 1984, the ASME convened a committee of government representatives, testing consultants, equipment manufacturers, and incinerator operators to write a standard procedure for PCDDs and PCDFs. This eventually distributed as a draft ASME protocol in December of 1984. The procedure that we are proposing was derived from this draft ASME protocol. We are proposing significant changes in the quality assurance requirements and the solvents used to recover the sample. Because more labeled compounds are available, the proposed method will require additional labeled internal standards and surrogate compounds which will provide better representation of the entire range of PCDDs and PCDFs. Under the proposal the filter and solid adsorbent would be extracted in the laboratory with toluene to assure a high PCDD and PCDF recovery efficiency. Additionally the proposed sample recovery solvents used for rinsing the sample train glassware in the field would be acetone followed by methylene chloride with a final quality assurance rinse using toluene. EPA will continue to review the toluene field rinse quality assurance results and continue to evaluate the desirability of replacing methylene chloride with toluene for field rinsing sample glassware.

II. Administrative Requirements

A. Public Hearing

A public hearing will be held, if requested, to discuss the proposed test methods in accordance with section 307(d)(5) of the Clean Air Act. Persons wishing to make oral presentations should contact EPA at the address given in the **ADDRESSES** section of this preamble. Oral presentations will be limited to 15 minutes each. Any member of the public may file a written statement with EPA before, during, or within 30 days after the hearing. Written statements should be addressed to the Air Docket address given in the **ADDRESSES** section of this preamble.

A verbatim transcript of the hearing and written statements will be available for public inspection and copying during normal working hours at EPA's Air Docket in Washington, DC (see **ADDRESSES** section of this preamble).

B. Docket

The docket is an organized and complete file of all the information submitted to or otherwise considered by EPA in the development of this proposed rulemaking. The principal purposes of the docket are: (1) To allow interested parties to identify and locate documents so that they can effectively participate in the rulemaking process and (2) to serve as the record in case of judicial review (except for interagency review materials) [section 307(d)(7)(A)].

C. Office of Management and Budget Review

Executive Order 12291 Review. Under Executive Order 12291, EPA must judge whether a regulation is "major" and, therefore, subject to the requirement of a regulatory impact analysis. The proposal of these test methods is not major because it will not have an annual effect on the economy of $100 million or more; it will not result in a major increase in costs or prices; and there will be no significant adverse effects on competition, employment, investment, productivity, innovation, or on the ability of U.S.-based enterprises to compete with foreign-based enterprises in domestic or export markets. Any burden resulting from the use of these methods is considered in the burden estimate for the regulation requiring the use of these methods.

D. Regulatory Flexibility Act Compliance

Pursuant to the provisions of 5 U.S.C. 605(b), I hereby certify that this attached rule, if promulgated, will not have an economic impact on small entities because no additional costs will be incurred from this action.

This proposal does not contain any information collection requirements subject to OMB review under the Paperwork Reduction Act of 1980, 44 U.S.C. 3501 *et seq.*

List of Subjects in 40 CFR Part 60

Air pollution control, Municipal waste combustors, MWCs, Polychlorinated dibenzo-p-dioxins, Polychlorinated dibenzofurans, Hydrogen chloride.

Dated: November 30, 1989.

William K. Reilly,

Administrator.

The EPA proposes to amend title 40, part 60 of the Code of Federal Regulations as follows:

1. The authority citation for part 60 continues to read as follows:

Authority: 42 U.S.C. 7401, 7411, 7414, 7416, 7601.

2. Appendix A is amended by addin Methods [illegible] and 26 to read as follows.

Appendix A—Reference Methods

* * * * *

Method 23—Determination of Polychlorina Dibenzo-p-Dioxins Polychlorinated Dibenzofurans From Stationary Sources

1. Applicability and Principle

1.1 Applicability. This method is applicable to the determination of polychlorinated dibenzo-p-dioxins (PCDD and polychlorinated dibenzofurans (PCDF from stationary sources.

1.2 Principle. A sample is withdrawn f the gas stream isokinetically and collecte the sample probe, on a glass fiber filter, an on a packed column of adsorbent materia The PCDDs and PCDFs are extracted fro the sample, separated by high resolution g chromatography, and measured by high resolution mass spectrometry.

2. Apparatus

2.1 Sampling. A schematic of the sampli train used in this method is shown in Figure 23–1. The train is identical to that describe in Section 2.1 of Method 5 of this appendix with the following additions:

2.1.1 Nozzle. The nozzle shall be made o nickel, nickel plated stainless steel, quart borosilicate glass.

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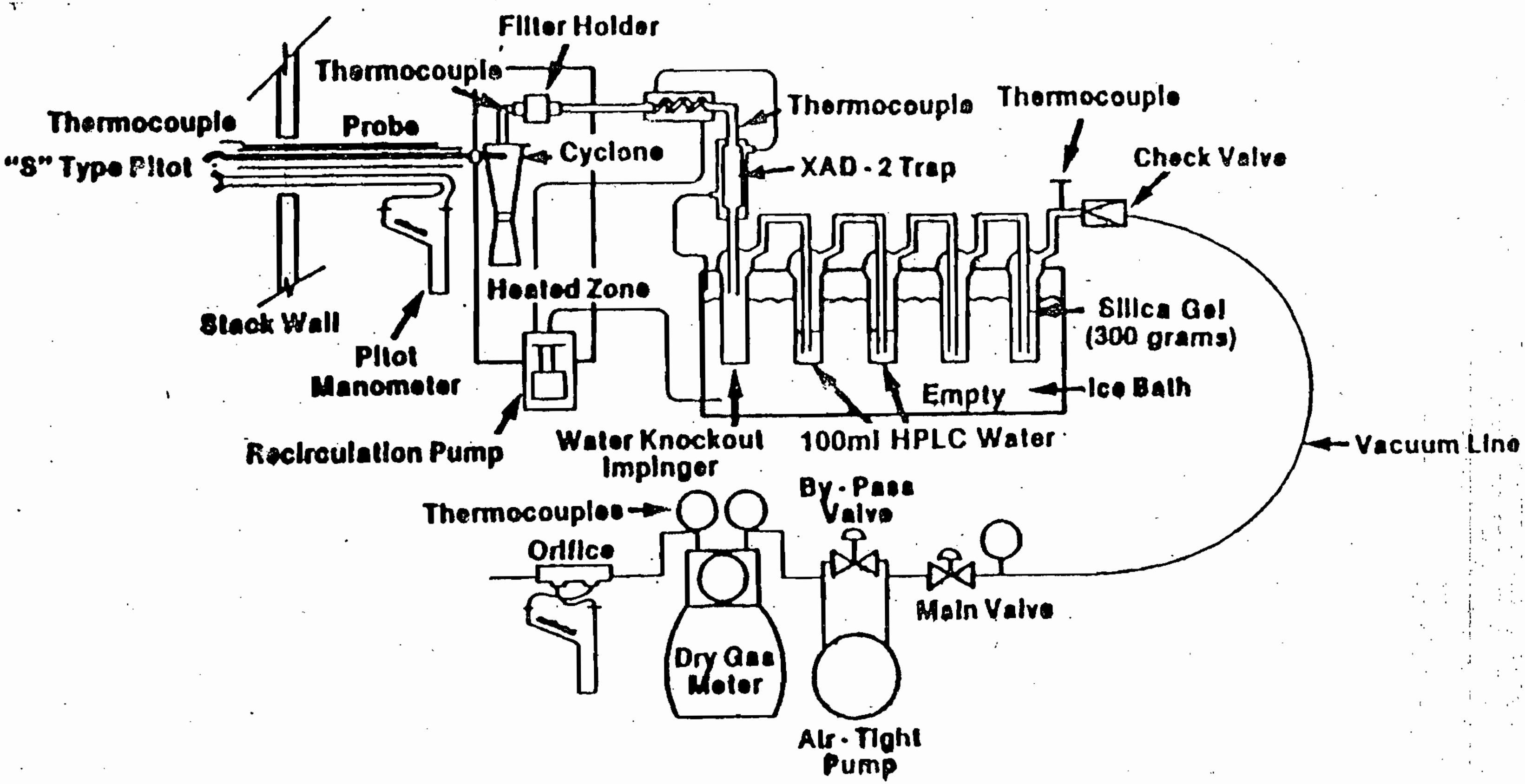

Figure 1. CDD/CDF Sampling Train Configuration

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2.1.2 Sample Transfer Lines. The sample transfer lines, if needed, shall be heat traced, heavy walled TFE (¼ in. OD with ⅛ 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 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.

2.1.3 Condenser. Glass, coil type with compatible fittings. A schematic diagram is shown in Figure 23–2.

2.1.4 Water Bath. Thermostatically controlled to maintain the gas temperature exiting the condenser at <20 °C (68 °F).

2.2 Sample Recovery.

2.2.1 Fitting Caps. Ground glass, Teflon or aluminum foil to cap off the sample exposed sections of the train.

2.2.2 Wash Bottle. Teflon, 500-ml.

2.2.3 Probe Liner and Probe-Nozzle 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 probe liner and nozzle.

2.2.4 Filter Storage Container. Sealed filter holder, wide-mouth amber glass jar with Teflon-lined cap, or aluminum foil.

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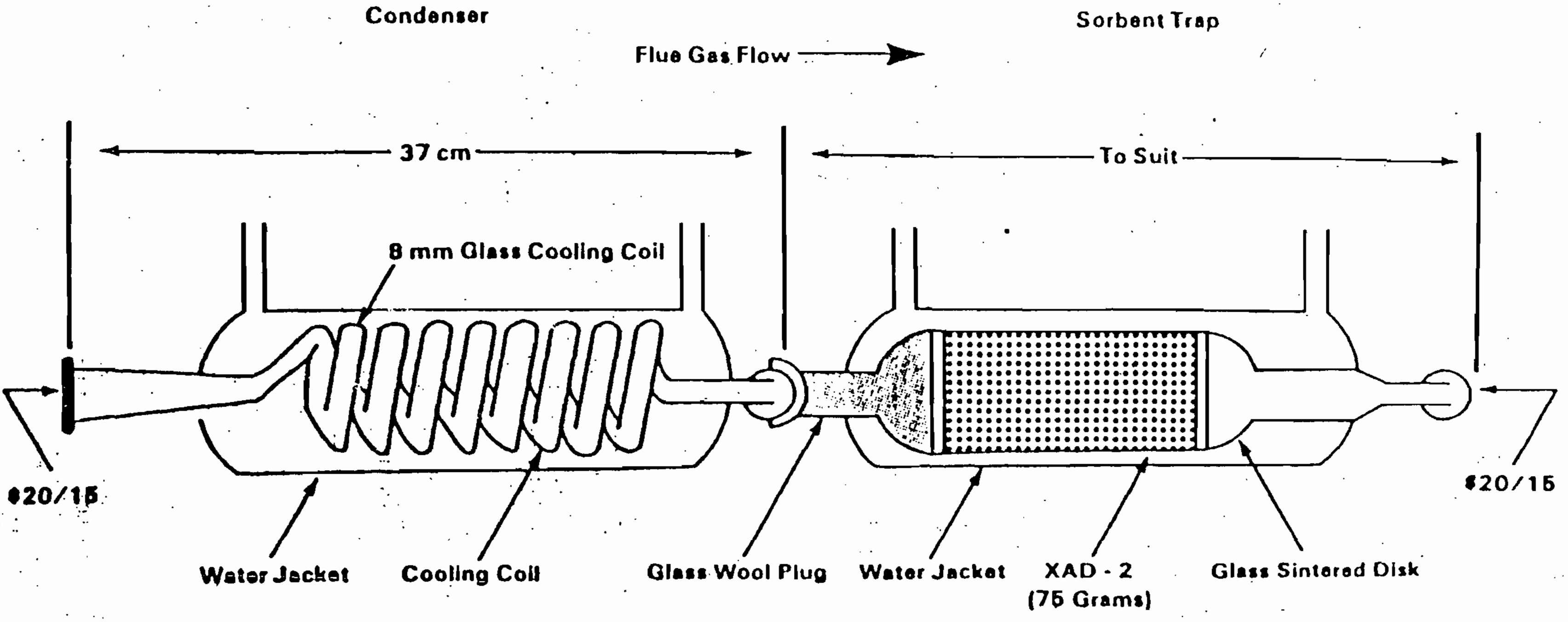

FIGURE 2. CONDENSER AND SORBENT TRAP FOR COLLECTION OF GASEOUS PCDDs AND PCDFs

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2.2.5 Balance. Triple beam.

2.2.6 Aluminum Foil. Heavy duty, hexane-rinsed.

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 43×123 mm extraction thimbles.

2.3.4 Pasteur Pipettes. For preparing liquid chromatographic columns.

2.3.5 Reacti-vials. Amber glass, 2-ml, silanized prior to use.

2.3.6 Rotary Evaporator. Buchi/Brinkman RF-121 or equivalent.

2.3.7 Nitrogen Evaporative Concentrator. N-Evap Analytical Evaporator Model III or equivalent.

2.3.8 Separatory Funnels. Glass, 2-liter.

2.3.9 Gas Chromatograph. Consisting of the following components:

2.3.9.1 Oven. Capable of maintaining the separation column at the proper operating temperature ±1°C and *performing* programmed increases in temperature at rates of at least 3°C/min.

2.3.9.2 Temperature Gauge. To monitor column oven, detector, and exhaust temperatures ±1°C.

2.3.9.3 Flow System. Gas *metering system* to measure sample, fuel, combustion gas, and carrier gas flows.

2.3.9.4 Capillary Columns. A fused silica column, 60 m×25 mm inside diameter (ID), coated with DB-5 and a fused silica column, 30 m×25 mm ID coated with SP-2331.

2.3.10 Mass Spectrometer. Capable of routine operation at a resolution of 1:10000 with a stability of ±5 ppm.

2.3.11 Data System. Compatible with the mass spectrometer and capable of monitoring at least five groups of 25 ions.

2.3.12 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 D2986-71 (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 three hours. Remove the toluene and discard it, but retain the silica gel. Place no more than 50 filters in the thimble onto the bed of silica gel 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 toluene extract, and retain it for analysis. Remove the filters and dry them under a clean N_2 stream. Store the filters tightly wrapped in cleaned aluminum foil.

3.1.1.2 Quality Control Check. Analyze the toluene extract from Section 3.1.1.1 as described in Sections 5.2 and 5.3. If any TCDD or TCDF is present at a concentration above the minimum detectable level, repeat the cleaning procedure and reanalyze the extract until no TCDD or TCDF is detectable.

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-coarse frit is used for extraction of XAD-2. The frit is recessed 10-15 mm above a crenellated 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.
Methylene chloride (fresh).	Extract for 22 hours.

3.1.2.2 Drying.

3.1.2.2.1 Drying Column. Pyrex pipe, 10.2 cm ID by 0.6 m long, with suitable retainers as shown in Figure 23-3.

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 rate of flow should be high enough to gently agitate the particles but not high enough to cause the particles to fracture.

3.1.2.3 Quality Control Check. The adsorbent must be checked for residual methylene chloride as well as TCDDs and TCDFs.

3.1.2.3.1 Methylene Chloride Residue.

3.1.2.3.1.1 Extraction. Weigh a 1.0 g sample of dried resin into a small vial, add 3 ml of toluene, cap the vial, and shake it well.

3.1.2.3.1.2 Analysis. Inject a 5µl sample of the extract into a gas chromatograph operated under the following conditions:

Column: 6 ft × ⅛ in stainless steel containing 10% 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 °C until it reaches 250 °C; return to 30 °C after 1000 seconds.

Compare the results of the analysis to the results from the reference solution. Prepare the reference solution by injecting 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 µg/g of adsorbent. If the adsorbent exceeds this level, drying must be continued until the excess methylene chloride is removed.

3.1.2.3.2 TCDDs and TCDFs. Extract the sample as described in Section 5.1.1. Analyze the extract as described in §§ 5.2 and 5.3. If any of the TCDDs or TCDFs are present at concentrations above the MDL, the adsorbent must be recleaned by repeating the last step of the cleaning procedure. The MDL can be calculated as ½ of the theoretical minimum quantifiable level (TMQL). The TMQL is calculated in § 9.8.

3.1.2.4 Storage. The adsorbent must be used within four 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 Teflon film and elastic bands.

3.1.3 Glass Wool. Cleaned by sequential immersion in three aliquots of hexane, dried in a 110 °C oven, and stored in a hexane-washed glass jar with a Teflon-lined screw cap.

3.1.4 Water. Deionized distilled and stored in a hexane-rinsed glass container with a Teflon-lined screw cap.

3.1.5 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. Reagent grade.

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 Isooctane. 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.

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 PCDDs and PCDFs at the concentrations shown in Table 1 under the heading "Internal Standards" in 10 ml of isooctane.

3.3.21 Surrogate Standard Solution. Prepare a stock standard solution containing the isotopically labelled PCDDs and PCDFs at the concentrations shown in Table 1 under the heading "Surrogate Standards" in 10 ml of isooctane.

3.3.22 Recovery Standard Solution. Prepare a stock standard solution containing the isotopically labelled PCDDs and PCDFs at the concentrations shown in Table 1 under the heading "Recovery Standards" in 10 ml of isooctane.

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 Trap. The traps must be loaded in a clean area to avoid contamination. They should not be loaded in the field. Fill a trap with 20 to 30 g of XAD–2. Follow the XAD–2 with glass wool and tightly cap both ends of the trap.

4.1.1.3 Sample Train. It is suggested that all components be maintained according to the procedure described in APTD–0576.

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 or wrapped in aluminum foil.

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 each of the first two impingers, leave the third impinger empty, and transfer approximately 200 to 300 g of preweighed silica gel from its container to the fourth impinger.

4.1.3.3 Place the 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 TCDDs and TCDFs.

4.1.4 Leak-Check Procedure. Same as Method 5, § 4.1.4.

4.1.5 Sample Train Operation. Same as Method 5, § 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/or filter fibers which adhere to the filter holder gasket, by using a dry inert bristle brush and/or a sharp-edged blade. Seal the container.

4.2.2 Absorbent 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 Cyclone Catch. If the optional cyclone is used, quantitatively recover the particulate into a glass container and cap.

4.2.4 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, the connecting line between the filter and the condenser, and the condenser, if using a separate condenser and absorbent trap, sequentially, three times each, with acetone and methylene chloride. Collect all the rinses in Container No. 2 and mark the level of the liquid on the container.

4.2.5 Container No. 3. Repeat the rinsing described in section 4.2.4 using toluene as the rinse solvent. Collect the rinses in Container No. 3 and mark the level of the liquid on the container.

4.2.6 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 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 fourth impinger to its original container and seal. A funnel may make it easier to pour the silica gel without spilling. A rubber policeman may be used as an aid in removing the silica gel from the impinger.

5. Analysis

5.1 Sample Extraction.

5.1.1 Container No. 1. Place a glass extraction thimble and 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. Suspend the adsorbent module directly over the extraction thimble described in section 5.1.1. The glass frit of the module should be in the up position. The thimble is contained in a clean beaker, which will serve to catch the solvent rinses. Using a Teflon squeeze bottle, flush the XAD–2 into the thimble onto the bed of cleaned silica gel. Thoroughly rinse the glass module with toluene into the beaker containing the thimble. Add the XAD–2 glass wool plug to the thimble, add the contents of container No. 1, and add the concentrate from Section 5.1.2. For low leval samples, add 20 ul of the internal standard solution (section 3.3.20), for high level samples, add 100 ul of the solution. Low level samples are those samples that contain less than 200 pg of any TCDD of TCDF. Cover the XAD–2 in the thimble with the cleaned glass wool plug to prevent the resin from floating into the solvent reservoir of the extractor. If the resin is wet, effective extraction can be accomplished by loosely packing the resin in the thimble. The thimble is placed in the extractor, and the toluene contained in the beaker is added to the solvent reservoir. Additional toluene is added to make the reservoir approximately two—thirds full. Add Teflon boiling chips and assemble the apparatus. Adjust the heat source to cause the extractor to cycle 5–6 times per hour. Extract the resin for 16 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 8 ml. Use nitrogen evaporation to further reduce the sample to about 1 ml. Split the sample in half. Store one half and analyze the other according to the procedures in sections 5.2 and 5.3.

5.1.2 Container No. 1. Transfer the contents directly to the glass thimble of the extractor and extract them simultaneously with the XAD–2 resin.

5.1.3 Container No. 2. 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 as described in section 5.1.1.

5.1.4 Container No. 3. 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 toluene and add these to the concentrated solution and concentrate further to near dryness. Analyze the extract according to the procedures in sections 5.2 and 5.3.

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 16 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 inch from the tip of a 9-ml disposable Pasteur pipette. Insert a filter paper 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. 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 eluates. 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 4 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 N_2. Store extracts in a freezer, shielded from light, prior to analysis.

5.3 Analysis. Analyze the sample using a gas chromatograph coupled to a mass spectrometer (GC/MS) using the instrumental parameters in sections 5.3.1 and 5.3.2. A 1 to 5 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 PCDDs and PCDFs (tetra-through octa-). If tetra-chlorinated dibenzofurans are detected in this analysis, then another aliquot of the sample is analyzed in a separate run, using the SP 2331 column to measure the 2,3,7,8 tetra-chlorodibenzofuran isomer.

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 ballistically 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. 8000–10000 m/e.

5.3.2.2 Ionization Mode. Electron impact, 70 eV.

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 4.

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 5.
2. The retention time for the analytes must be within 3 seconds of the corresponding ^{13}C-labeled internal standard, surrogate or alternate standard.
3. The monitored ions shown in Table 4 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 ^{13}C-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 RRTs found in the continuing calibration.
5. The signal to noise 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 PCDFs, no signal may be found in the corresponding PCDPE 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 PCDDs or PCDFs in its homologous series. For example the $^{13}C_{12}$-1,2,3,4-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 $^{13}C_{12}$-1,2,3,4-TCDD. Recoveries of the hexa- through octa- internal standards are calculated using $^{13}C_{12}$-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 for low level samples or Table 3 for high level samples. 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 6. 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 ratio shall be within the control limits in Table 5.

6.1.2 Daily Performance Check.

6.1.2.1 Calibration Check. Inject one µl of solution number 4 from Table 2 or solution number 3 from Table 3. Calculate the relative response factors (RRF's) for each compound and compare each of them 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 6. In addition the ion-abundance ratios shall be within the allowable control limits shown in Table 6.

6.1.2.2 Column Separation Check. Inject a solution of a mixture of PCDDs and PCDFs 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% of the lower of the two peaks.

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 each test.

7.2 Internal Standard Percent Recoveries. Recoveries of the internal standards must be between 40 to 130% for the tetrathrough hexachlorinated compounds while the range is 25 to 130% for the higher hepta- and octachlorinated homologues. If the internal standards do not meet the recovery requirements, the data will still be acceptable provided that the signal is equal to or greater than ten times the noise level.

7.3 Surrogate Recoveries. The surrogate recoveries are measured relative to the internal standards and are a measure of collection efficiency. All recoveries shall be between 70 and 130%. 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%, 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 samples.

7.4 Toluene Quality Assurance Rinse. Report the results of the toluene quality assurance 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.

8.2 Audit Procedure. 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. If this condition is met, auditing of subsequent compliance analyses for any enforcement agency within seven days is not required.

8.3 Audit Sample Availability. The audit sample 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. The STAC will return the EPA response to the laboratory being audited. Include this EPA response with the results of the compliance samples in appropriate reports to the EPA regional office or the appropriate enforcement agency. Include this information with subsequent analyses for any enforcement agency during the seven-day period.

8. Calculations

Same as Method 5, section 6 with the following additions.

9.1 Nomenclature.

A_{ci} = Integrated ion current of the two ions characteristic of compound i in the calibration standard.

A^*_{ci} = Integrated ion current of the two ions characteristic of the internal standard i in the calibration standard.

A^*_{cs} = Integrated ion current of the two ions characteristic of surrogate compound i in the calibration standard.

A_i = Integrated ion current of the two ions characteristic of compound i in the sample.

A^*_i = Integrated ion current of the two ions characteristic of internal standard i in the sample.

A_{rs} = Integrated ion current of the two ions characteristic of the recovery standard.

A_{s} = Integrated ion current of the two ions characteristic of surrogate compound i in the sample.

C_c = Concentration of the compound of interest in the most dilute calibration solution, pg/μl.

m_{ci} = Mass of compound i in the calibration standard injected into the analyzer, pg.

m^*_{ci} = Mass of labeled compound i in the calibration standard injected into the analyzer, pg.

m^*_i = Mass of internal standard i added to the sample, pg.

m_{rs} = Mass of recovery standard in the calibration standard injected into the analyzer, pg.

m_s = Mass of surrogate compound i in the calibration standard.

RRF_i = Relative response factor.

RRF_{rs} = Recovery standard response factor.

V = Final extract volume, μl.

9.2 Relative Response Factor.

$$RRF = 1/n \sum^{n} A_{ci}\, m^*_{ci} / (A^*_{ci}\, m_{ci}) \qquad \text{Eq. 23-1}$$

9.3 Concentration of the PCDDs and PCDFs.

$$C_i = m^*_i\, A_i / (A^*_i\, RRF_i\, V_{s}) \qquad \text{Eq. 23-2}$$

9.4 Recovery Standard Response Factor.

$$RRF_{rs} = A^*_{ci}\, m_{rs} / (A_{rs}\, m^*_{ci}) \qquad \text{Eq. 23-3}$$

9.5 Recovery of Internal Standards (R^*).

$$R^* = (A^*_i\, m_{rs} / A_{rs}\, RF_{rs}\, m^*_i) \times 100\% \qquad \text{Eq. 23-4}$$

9.6 Surrogate Compound Response Factor.

$$RRF_s = A^*_{ci}\, m_s / (A_{cs}\, m^*_{ci}) \qquad \text{Eq. 23-5}$$

9.7 Recovery of Surrogate Compounds (R_s).

$$R_s = (A_s\, m^*_i / A^*_i\, RRF_s\, m_s) \times 100\% \qquad \text{Eq. 23-6}$$

9.8 Theoretical Minimum Quantifiable Level (TMQL).

$$TMQL = C_c\, V / R^* \qquad \text{Eq. 23-7}$$

9. 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
$^{13}C_{12}$-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:	
$^{37}C_{12}$-2,3,7,8-TCDD	100
$^{13}C_{12}$-1,2,3,4,7,8-HxCDD	100
$^{13}C_{12}$-2,3,4,7,8-PeCDF	100
$^{13}C_{12}$-1,2,3,4,7,8-HxCDF	100
$^{13}C_{12}$-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 (LOW)

Compound	Concentrations (pg/µL)—Solution No.—				
	1	2	3	4	5
Unlabeled analytes:					
2,3,7,8-TCDD	0.5	1	5	50	100
2,3,7,8-TCDF	0.5	1	5	50	100
1,2,3,7,8-PeCDD	2.5	5	25	250	500
1,2,3,7,8-PeCDF	2.5	5	25	250	500
2,3,4,7,8-PeCDF	2.5	5	25	250	500
1,2,3,4,7,8-HxCDD	2.5	5	25	250	500
1,2,3,6,7,8-HxCDD	2.5	5	25	250	500
1,2,3,7,8,9-HxCDD	2.5	5	25	250	500
1,2,3,4,7,8-HxCDF	2.5	5	25	250	500
1,2,3,6,7,8-HxCDF	2.5	5	25	250	500
1,2,3,7,8,9-HxCDF	2.5	5	25	250	500
2,3,4,6,7,8-HxCDD	2.5	5	25	250	500
1,2,3,4,6,7,8-HpCDD	2.5	5	25	250	500
1,2,3,4,6,7,8-HpCDF	2.5	5	25	250	500
1,2,3,4,7,8,9-HpCDF	2.5	5	25	250	500
OCDD	5	10	50	500	1000
OCDF	5	10	50	500	1000
Internal standards:					
$^{13}C_{12}$-2,3,7,8-TCDD	100	100	100	100	100
$^{13}C_{12}$-1,2,3,7,8-PeCDD	100	100	100	100	100
$^{13}C_{12}$-1,2,3,6,7,8-HxCDD	100	100	100	100	100
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDD	100	100	100	100	100
$^{13}C_{12}$-OCDD	200	200	200	200	200
$^{13}C_{12}$-2,3,7,8-TCDF	100	100	100	100	100
$^{13}C_{12}$-1,2,3,7,8-PeCDF	100	100	100	100	100
$^{13}C_{12}$-1,2,3,6,7,8-HxCDF	100	100	100	100	100
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDF	100	100	100	100	100
Surrogate standards:					
$^{37}Cl_4$-2,3,7,8-TCDD	0.5	1	5	50	100
$^{13}C_{12}$-2,3,4,7,8-PeCDF	2.5	5	25	250	500
$^{13}C_{12}$-1,2,3,4,7,8-HxCDD	2.5	5	25	250	500
$^{13}C_{12}$-1,2,3,4,7,8-HxCDF	2.5	5	25	250	500
$^{13}C_{12}$-1,2,3,4,7,8,9-HpCDF	2.5	5	25	250	500
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.—COMPOSITION OF THE INITIAL CALIBRATION SOLUTIONS (HIGH)

Compound	Concentrations (pg/µL)—Solution No.—				
	1	2	3	4	5
Unlabeled analytes:					
2,3,7,8-TCDD	5	50	100	500	1000
2,3,7,8-TCDF	5	50	100	500	1000
1,2,3,7,8-PeCDD	25	250	500	2500	5000
1,2,3,7,8-PeCDF	25	250	500	2500	5000
2,3,4,7,8-PeCDF	25	250	500	2500	5000
1,2,3,4,7,8-HxCDD	25	250	500	2500	5000
1,2,3,6,7,8-HxCDD	25	250	500	2500	5000
1,2,3,7,8,9-HxCDD	25	250	500	2500	5000
1,2,3,4,7,8-HxCDF	25	250	500	2500	5000
1,2,3,6,7,8-HxCDF	25	250	500	2500	5000
1,2,3,7,8,9-HxCDF	25	250	500	2500	5000
2,3,4,6,7,8-HxCDD	25	250	500	2500	5000
1,2,3,4,6,7,8-HpCDD	25	250	500	2500	5000
1,2,3,4,6,7,8-HpCDF	25	250	500	2500	5000
1,2,3,4,7,8,9-HpCDF	25	250	500	2500	5000
OCDD	50	500	1000	5000	10000

TABLE 3.—COMPOSITION OF THE INITIAL CALIBRATION SOLUTIONS (HIGH)—Continued

Compound	Concentrations (pg/µL)—Solution No.—				
	1	2	3	4	5
OCDF	50	500	1000	5000	10000
Internal standards:					
$^{13}C_{12}$-2,3,7,8-TCDD	100	100	100	100	100
$^{13}C_{12}$-1,2,3,7,8-PeCDD	100	100	100	100	100
$^{13}C_{12}$-1,2,3,6,7,8-HxCDD	100	100	100	100	100
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDD	100	100	100	100	100
$^{13}C_{12}$-OCDD	200	200	200	200	200
$^{13}C_{12}$-2,3,7,8-TCDF	100	100	100	100	100
$^{13}C_{12}$-1,2,3,7,8-PeCDF	100	100	100	100	100
$^{13}C_{12}$-1,2,3,6,7,8-HxCDF	100	100	100	100	100
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDF	100	100	100	100	100
Surrogate standards:					
$^{37}Cl_4$-2,3,7,8-TCDD	5	50	100	500	1000
$^{13}C_{12}$-2,3,4,7,8-PeCDF	25	250	500	2500	5000
$^{13}C_{12}$-1,2,3,4,7,8-HxCDD	25	250	500	2500	5000
$^{13}C_{12}$-1,2,3,4,7,8-HxCDF	25	250	500	2500	5000
$^{13}C_{12}$-1,2,3,4,7,8,9-HpCDF	25	250	500	2500	5000
Alternate standard:					
$^{13}C_{12}$-1,2,3,7,8,9-HxCDF	5	50	100	500	1000
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 4.—ELEMENTAL COMPOSITIONS AND EXACT MASSES OF THE IONS MONITORED BY HIGH RESOLUTION MASS SPECTROMETRY FOR PCDDS AND PCDFS

Descriptor No.	Accurate mass	Ion type	Elemental composition	Analyte
1	303.9016	M	$C_{12}H_4{}^{35}Cl_4O$	TCDF
	305.8987	M+2	$C_{12}H_4{}^{35}Cl_3{}^{37}ClO$	TCDF
	315.9419	M	$^{13}C_{12}H_4{}^{35}Cl_4O$	TCDF (S)
	317.9389	M+2	$^{13}C_{12}H_4{}^{35}Cl_3{}^{37}ClO$	TCDF (S)
	319.8965	M	$C_{12}H_4{}^{35}Cl_4O_2$	TCDD
	321.8936	M+2	$C_{12}H_4{}^{35}Cl_3{}^{37}ClO_2$	TCDD
	327.8847	M	$C_{12}H_4{}^{37}Cl_4O_2$	TCDD (S)
	331.9368	M	$^{13}C_{12}H_4{}^{35}Cl_4O_2$	TCDD (S)
	333.9339	M+2	$^{13}C_{12}H_4{}^{35}Cl_3{}^{37}ClO_2$	TCDD (S)
	375.8364	M+2	$C_{12}H_4{}^{35}Cl_5{}^{37}ClO$	HxCDPE
	354.9792	LOCK	C_9F_{13}	PFK
2	339.8597	M+2	$C_{12}H_3{}^{35}Cl_4{}^{37}ClO$	PECDF
	341.8567	M+4	$C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O$	PeCDF
	351.9000	M+2	$^{13}C_{12}H_3{}^{35}Cl_4{}^{37}ClO$	PeCDF (S)
	353.8970	M+4	$^{13}C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O$	PeCDF (S)
	355.8546	M+2	$C_{12}H_3{}^{35}Cl_4{}^{37}ClO_2$	PeCDD
	357.8516	M+4	$C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O_2$	PeCDD
	367.8949	M+2	$^{13}C_{12}H_3{}^{35}Cl_4{}^{37}ClO_2$	PeCDD (S)
	369.8919	M+4	$^{13}C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O_2$	PeCDD (S)
	409.7974	M+2	$C_{12}H_3{}^{35}Cl_6{}^{37}ClO$	HpCPDE
	354.9792	LOCK	C_9F_{13}	PFK
3	373.8208	M+2	$C_{12}H_2{}^{35}Cl_5{}^{37}ClO$	HxCDF
	375.8178	M+4	$C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O$	HxCDF
	383.8639	M	$^{13}C_{12}H_2{}^{35}Cl_6O$	HxCDF (S)
	385.8610	M+2	$^{13}C_{12}H_2{}^{35}Cl_5{}^{37}ClO$	HxCDF (S)
	389.8157	M+2	$C_{12}H_2{}^{35}Cl_5{}^{37}ClO_2$	HxCDD
	391.8127	M+4	$C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O_2$	HxCDD
	401.8559	M+2	$^{13}C_{12}H_2{}^{35}Cl_5{}^{37}ClO_2$	HxCDD (S)
	403.8529	M+4	$^{13}C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O$	HxCDD (S)
	445.7555	M+4	$C_{12}H_2{}^{35}Cl_6{}^{37}Cl_2O$	OCDPE
	430.9729	LOCK	C_9F_{17}	PFK
4	407.7818	M+2	$C_{12}H{}^{35}Cl_6{}^{37}ClO$	HpCDF
	409.7789	M+4	$C_{12}H{}^{35}Cl_5{}^{37}Cl_2O$	HpCDF
	417.8253	M	$^{13}C_{12}H{}^{35}Cl_7O$	HpCDF (S)
	419.8220	M+2	$^{13}C_{12}H{}^{35}Cl_6{}^{37}ClO$	HpCDF (S)
	423.7766	M+2	$C_{12}H{}^{35}Cl_6{}^{37}ClO_2$	HpCDD
	425.7737	M+4	$C_{12}H{}^{35}Cl_5{}^{37}Cl_2O_2$	HpCDD
	435.8169	M+2	$^{13}C_{12}H{}^{35}Cl_6{}^{37}ClO_2$	HpCDD (S)
	437.8140	M+4	$^{13}C_{12}H{}^{35}Cl_5{}^{37}Cl_2O_2$	HpCDD (S)
	479.7165	M+4	$C_{12}H{}^{35}Cl_7{}^{37}Cl_2O$	NCPDE
	430.9729	LOCK	C_9F_{17}	PFK
5	441.7428	M+2	$C_{12}{}^{35}Cl_7{}^{37}ClO$	OCDF
	443.7399	M+4	$C_{12}{}^{35}Cl_6{}^{37}Cl_2O$	OCDF
	457.7377	M+2	$C_{12}{}^{35}Cl_7{}^{37}ClO_2$	OCDD
	459.7348	M+4	$C_{12}{}^{35}Cl_6{}^{37}Cl_2O_2$	OCDD
	469.7779	M+2	$^{13}C_{12}{}^{35}Cl_7{}^{37}ClO_2$	OCDD (S)
	471.7750	M+4	$^{13}C_{12}{}^{35}Cl_6{}^{37}Cl_2O_2$	OCDD (S)

TABLE 4.—ELEMENTAL COMPOSITIONS AND EXACT MASSES OF THE IONS MONITORED BY HIGH RESOLUTION MASS SPECTROMETRY FOR PCDDS AND PCDFS—Continued

Descriptor No.	Accurate mass	Ion type	Elemental composition	Analyte
	513.6775	M+4	$C_{12}{}^{35}Cl_8{}^{37}Cl_2O$	DCDPE
	442.9728	LOCK	$C_{10}F_{17}$	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

TABLE 5.—ACCEPTABLE RANGES FOR ION-ABUNDANCE RATIOS OF PCDDS AND PCDFS

Number 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[1]	M/M+2	0.51	0.43	0.59
7[2]	M/M+4	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

[1] Used only for ^{13}C-HxCDF.
[2] Used only for ^{13}C-HpCDF.

TABLE 6.—MINIMUM REQUIREMENTS FOR INITIAL AND DAILY CALIBRATION RESPONSE FACTORS

Compound	Relative Response Factors	
	Initial calibration RSD	Daily calibration percentage 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
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
1,2,3,4,6,7,8-HpCDD	25	25
1,2,3,4,6,7,8-HpCDF	25	25
OCDD	25	25
OCDF	30	30
Internal standards:		
$^{13}C_{12}$-2,3,7,8-TCDD	25	25
$^{13}C_{12}$-1,2,3,7,-PeCDD	25	25
$^{13}C_{12}$-1,2,3,6,7,8-HxCDD	25	25
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDD	30	30
$^{13}C_{12}$-OCDD	30	30
$^{13}C_{12}$-2,3,7,8-TCDF	30	30
$^{13}C_{12}$-1,2,3,7,8-PeCDF	30	30
$^{13}C_{12}$-1,2,3,6,7,8-HxCDF	30	30
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDF	30	30
Surrogate standards:		
$^{37}Cl_4$-2,3,7,8-TCDD	25	25
$^{13}C_{12}$-2,3,4,7,8-PeCDF	25	25
$^{13}C_{12}$-1,2,3,4,7,8-HxCDD	25	25
$^{13}C_{12}$-1,2,3,4,7,8-HxCDF	25	25
$^{13}C_{12}$-1,2,3,4,7,8,9-HpCDF	25	25
Alternate Standard:		
$^{13}C_{12}$-1,2,3,7,8,9-HxCDF	25	25

* * * * *

Method 26—Determination of Hydrogen Chloride Emissions From Stationary Sources

1. Applicability, Principle, Interferences, Precision, Bias, and Stability

1.1 Applicability. This method is applicable for determining hydrogen chloride (HCl) emissions from stationary sources.

1.2 Principle. An integrated sample is extracted from the stack and passed through dilute sulfuric acid. In the dilute acid, the HCl gas is dissolved and forms chloride (Cl^-) ions. The Cl^- is analyzed by ion chromatography (IC).

1.3 Interferences. Volatile materials which produce chloride ions upon dissolution during sampling are obvious interferences. Another likely interferent is diatomic chlorine (Cl_2) gas which reacts to form HCl and hypochlorous acid (HOCl) upon dissolving in water. However, Cl_2 gas exhibits a low solubility in water and the use of acidic, rather than neutral or basic collection solutions, greatly reduces the chance of dissolving any chlorine present. This method does not experience a significant bias when sampling a 400 ppm HCl gas stream containing 50 ppm Cl_2. Sampling a 220 ppm HCl gas stream containing 180 ppm Cl_2 results in a positive bias of 3.4 percent in the HCl measurement.

1.4 Precision and Bias. The within-laboratory relative standard deviations are 6.2 and 3.2 percent at HCl concentrations of 3.9 and 15.3 ppm, respectively. The method does not exhibit a bias to Cl_2 when sampling at concentrations less than 50 ppm.

1.5 Stability. The collected samples can be stored for up to 4 weeks before analysis.

1.6 Detection Limit. The analytical detection limit of the method is 0.1 μg/ml.

2. Apparatus

2.1 Sampling. The sampling train is shown in Figure 26–1, and component parts are discussed below.

2.1.1 Probe. Borosilicate glass, approximately ⅜-in. (9-mm) I.D. with a heating system to prevent moisture condensation. A ⅜-in. I.D. Teflon elbow should be attached to the inlet of the probe and a 1-in. (25-mm) length of ⅜-in. I.D. Teflon tubing should be attached to the open end of the elbow to permit the opening of the probe to be turned away from the gas stream. This reduces the amount of particulate entering the train. This probe configuration should be used when the concentration of particulate matter in the emissions is high. When high concentrations are not present, the Teflon elbow is not necessary, and the probe inlet may be perpendicular to the gas stream. A glass wool plug should *not* be used to remove particulate matter since a negative bias in the data could result. Instead, a Teflon filter (see § 2.1.5) should be installed at the inlet (for

ATTACHMENT 8

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KA 307-90-01

January 24, 1990

Mr. C. H. Fancy
Bureau Chief
Division of Air Resources Management
Florida Department of
  Environmental Regulation
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Subject: Florida Crushed Stone Company
CPL Cement Plant
Brooksville, Florida
Permit AC27-118674
Request for Trial Burn to Test
  Tire-Derived Fuel in the Cement Kiln

Dear Mr. Fancy:

At the request of the Florida Crushed Stone Company and in accordance with conversations that I have had with Mr. Bill Thomas and Mr. Bruce Mitchell of your staff, I would like to request that Permit AC27-118674, issued to the Florida Crushed Stone Company for the construction and initial operation of a dry process Portland cement kiln, be amended to allow a one-time test for burning tire-derived fuel along with coal in the cement kiln. The cement kiln is designed and operated at a feed rate of approximately 123 tons per hour. Heat is provided to the kiln, under conditions of the subject permit, by coal fired at a rate of 10 tons per hour. The resulting heat input to the kiln is 240 million BTU per hour. During the requested one-time test, Florida Crushed Stone will use tire-derived fuel to provide up to 10 percent of the heat input to the kiln, or approximately 24 million BTU per hour.

The cement plant operated by Florida Crushed Stone is a modern, dry process Portland cement plant. The hot gases discharged from the cement kiln pass through a pre-heater where heat is recovered and transferred to the kiln feed. The kiln gases then pass through a baghouse before being discharged to the atmosphere. The baghouse also controls particulate matter emissions from the power/lime plant and a limestone dryer. The stack through which the kiln gases are discharged is equipped with continuous emission monitors for opacity, nitrogen oxides and sulfur dioxide. These monitors can be used to provide a continuous record of stack gas opacity and sulfur dioxide and nitrogen oxides concentrations during the trial period. The dust collected in the baghouse will be disposed of by incorporating it into the kiln feed as is the current practice. As a result, the baghouse dust ends up in the clinker and eventually in the finished product.

A 30-day trial period is requested. During this time, Florida Crushed Stone will evaluate methods of feeding the tire-derived fuel to the cement kiln and will experiment with the quantities of tire-derived fuel that can be used. It is anticipated that the maximum amount of heat that can be provided by tire-derived fuel will be in the range of 24 million BTU per hour; or 10 percent of the heat input to the kiln. During the test period, Florida Crushed Stone will also evaluate the effect of tire-derived fuel on the quality of clinker produced in the cement plant.

During the trial period, Florida Crushed Stone will maintain records of the time periods when tire-derived fuel is fired to the cement kiln. Records will also be maintained documenting the amount of tire-derived fuel fed to the kiln, the procedures for firing the tire-derived fuel, clinker production rates and total heat input to the kiln. Continuous monitoring records from the in-stack opacity, sulfur dioxide and nitrogen oxide monitors will also be available for all periods of time during the test to document the effect of tire-derived fuel on stack emissions.

Consistent with your requirements for other tire-derived fuel tests, Florida Crushed Stone is also proposing emission measurement tests for several criteria and non-criteria pollutants during the trial. As tire-derived fuel will be used to provide only a small fraction (10 percent) of the total heat input to the cement kiln, it is proposed that the emission measurements be conducted on a one-time basis at or near this maximum tire-derived fuel heat input rate.

The emission measurements proposed for the trial burn (at a 10 percent tire-derived fuel heat input rate) will include the following:

Test	Test Method
Particulate Matter	EPA Method 5
Metals	EPA Method 5 filter and probe rinse
Aluminum	
Arsenic	
Cadmium	
Chromium (Total)	
Lead	
Zinc	
Nitrogen Oxides	EPA Method 7

Sulfur Dioxide	EPA Method 6 (in back-half of Method 5 train)
Carbon Monoxide	EPA Method (10)
Volatile Organic Compounds	VOST
Semi-Volatile Organic Compounds	Modified Method 5
Furans and Dioxins	Modified Method 5
CO_2/O_2	EPA Method 3
Stack Gas Flow/Moisture/Temp.	EPA Methods 2 and 4 in conjunction with EPA Method 5

Three replicate test runs will be conducted for each of the measurements listed above. The measurements that are proposed are consistent with those suggested by Mr. Thomas and Mr. Mitchell of you staff. The metals which we propose to test for are metals of potential environmental concern that were measured in significant quantity during a test performed by the Radian Corporation (April 1988) at a waste tire to energy facility in California.

I appreciate your consideration of this request and will provide any additional information that you may require to complete your evaluation of this matter.

Very truly yours,

KOOGLER & ASSOCIATES

John B. Koogler, Ph.D., P.E.

JBK:wa

cc: Mr. Randy Thompson, FCS, Leesburg
Mr. Bill Thomas, FDER-Tallahassee
✓ Mr. Bruce Mitchell, FDER-Tallahassee

ATTACHMENT 9

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KA 307-90-01

February 2, 1990

Mr. C. H. Fancy
Bureau Chief
Florida Department of
Environmental Regulation
Northwest District
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Subject: Florida Crushed Stone Company
CPL Plant
Brooksville, Florida
Permit AC27-118674
Amendment to Permit AC27-118674 to Allow the Use of Tire-Derived Fuel in the Cement Kiln

Dear Mr. Fancy:

The purpose of this letter is to modify the request made in my letter to you dated January 24, 1990. In that letter, I requested that the subject permit be amended to allow a one-time test to investigate the feasibility of burning tire-derived fuel as a supplemental fuel in the dry process Portland cement kiln operated by the Florida Crushed Company near Brooksville in Hernando County, Florida. After further investigation into the use of tire-derived fuel, Florida Crushed Stone feels that the project is feasible and would like to pursue a permanent amendment to the subject permit to allow the use of this fuel as a supplement to coal, which is normally fired to the kiln. I discussed this matter with Mr. Bruce Mitchell of you staff and it was suggested that an amendment to the subject permit would be possible if the new permit conditions were framed in such a way that the Department would have the necessary assurances that the cement kiln will continue to operate in compliance with all existing permit conditions and that the emission rate of any trace organic or inorganic compounds currently unregulated by DER and/or federal regulations will not result in an unacceptable environmental risk. Based on my conversation with Mr. Mitchell, I understand that a bleach plant, presumably associated with a paper mill, recently received an air construction permit that was contingent upon the results of emission measurements and a risk assessment; both of which would be performed after the facility was constructed and in operation.

Based upon my conversation with Mr. Mitchell, I would like to request that the subject permit be amended to allow the use tire-derived fuel in conjunction with coal to provide the necessary heat for the Florida Crushed Stone cement kiln. The tire-derived fuel will be used to provide up to 15 percent of the total heat input to the cement kiln or up to 36 million BTU per hour. The suggested permit conditions related to this amendment include:

A. Within three months following completion of construction, start-up and the achievement of normal and reliable operations, emission measurements shall be conducted on the cement kiln while fired with tire-derived fuel at a firing rate within 10 percent of the maximum permitted rate of 36 million BTU per hour and while the cement kiln is operating, within 10 percent of the permitted kiln feed rate and total heat input rate. The emission measurements will include:

Test	Test Method
Particulate Matter	EPA Method 5
Visible Emissions	EPA Method 9
Metals Aluminum Arsenic Cadmium Chromium (Total) Lead Zinc	EPA Method 5 filter and probe rinse
Nitrogen Oxides	EPA Method 7
Sulfur Dioxide	EPA Method 6 (in back-half of Method 5 train)
Carbon Monoxide	EPA Method (10)
Volatile Organic Compounds	VOST
Semi-Volatile Organic Compounds	Modified Method 5

Furans and Dioxins	Modified Method 5
CO_2/O_2	EPA Method 3
Stack Gas Flow/Moisture/Temp.	EPA Methods 2 and 4 in conjunction with EPA Method 5

Three replicate test runs will be conducted for each of the measurements listed above. As stated in my letter of January 24, 1990 to you, the measurements proposed herein are consistent with those suggested by Mr. Bill Thomas and Mr. Bruce Mitchell of your staff. The metals proposed in the emission measurements program are those of potential environmental concern that were measured in significant quantity during a test performed by the Radian Corporation in April 1988 at a tire-to-energy facility in California.

B. Within one month following receipt of the results of the emission measurements described in Paragraph A, an air toxics screening test shall be conducted using criteria agreed to by the Department and the permittee. In general, the screening test will include the use of an air quality model (the ISC-ST or equivalent), representative of meteorological data and the emission rates of the various unregulated substances measured during the emission test described in paragraph A. The ground-level concentrations of the various substances will be calculated for receptors at the Florida Crushed Stone property line and these concentrations will be compared with ambient guideline concentrations agreed to by the Department and the permittee.

C. The results of the screening tests will be used to determine whether:

1. The measured emission levels are acceptable, or
2. Additional control measures are required to achieve the screening test criteria, or
3. A detailed risk assessment is necessary to ensure that the achievable emissions are acceptable.

D. For any compound or substance addressed in this permit that fails to meet the criteria established in Paragraph B, the permittee shall submit within six months following receipt of the screening test a plan and schedule which addresses the factors identified in Paragraph C. The plan may include recommendations to install control measurements and/or process modifications if needed and available and practical, or may include recommendations to develop a risk assessment to demonstrate that the practically achievable emissions are acceptable.

E. Upon receipt of the results of the emission measurements described in Paragraph A, a determination shall be made regarding the compliance of the cement plant with established permit limits for particulate matter, nitrogen oxides, sulfur dioxide, and opacity. If compliance cannot be demonstrated, the permittee shall not use tire-derived fuel except for test purposes until the plant has been modified to assure compliance with all existing permit conditions.

An air operating permit will not be issued for the cement plant until a satisfactory screening test as described in Paragraph B is submitted to the Department and compliance with existing permit conditions and emission limits as described in Paragraph E is demonstrated or until the plan described in Paragraph D is approved by the Department and implemented by the permittee.

The proposed use of tire-derived fuel as a replacement for up to 15 percent (based on heating value) of the coal fired to the cement kiln is not expected to increase particulate matter, sulfur dioxide, nitrogen oxides emissions, or on the opacity of emissions. These pollutants are those addressed by emission limiting standards in the current permit for the cement plant. The baghouse that controls emissions from the plant will effectively control particulate matter emissions to the levels currently being achieved. The sulfur content of the tires is lower than the sulfur content of the coal currently being fired to the kiln; hence, there should be a reduction in sulfur dioxide emissions. It is anticipated that the tire-derived fuel may also reduce nitrogen oxides. Nitrogen oxides are primarily a result of the fixation of atmospheric nitrogen and the use of tire-derived fuel will probably result in a more even distribution of the heat release and hence, a reduction in NOx emissions. The baghouse associated with the cement plant is also expected to adequately control the emissions of metals and the semi-volatile organic compounds (by adsorption or condensation).

Based upon the expected operation of the cement plant while firing tire-derived fuel as a supplement to coal; taking into consideration the characteristics of the tire-derived fuel, the amount of tire-derived fuel that will be used, and the normal operating characteristics of the plant; and considering the effectiveness of the air pollution control system associated with the cement plant, it is our opinion that there will be no perceptible differences in emissions from the plant or in operations of the plant. As pointed out to you in my letter of January 24, 1990, the cement plant is equipped with continuous emission monitors for opacity, sulfur dioxide and nitrogen oxides that can be used to monitor the overall performance of the plant and to provide a continuous record of plant emissions while tire-derived fuel is used as a supplemental heat source. Additionally, the test program described herein will define emission rates of trace organic and inorganic compounds and the screening test that is proposed will assess the risk associated with these emissions. All of these factors, coupled with the assurances guaranteed by the proposed permit conditions should allow the Department to grant the requested amendments to the subject permit.

Again, I appreciate you consideration of this request and will provide any additional information that you may require to complete your evaluation of this matter.

Very truly yours,

KOOGLER & ASSOCIATES

John B. Koogler, Ph.D., P.E.

JBK:wa

cc: Mr. Bill Thomas, FDER-Tallahassee
Mr. Bruce Mitchell, FDER-Tallahassee
Mr. Randy Thompson, FCS, Leesburg
Mr. Charles Bush, FCS, Leesburg

ATTACHMENT 10

KOOGLER & ASSOCIATES
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KA 307-90-01

March 13, 1990

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Mr. C. H. Fancy
Bureau Chief
Florida Department of
Environmental Regulation
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Subject: Florida Crushed Stone Company
CPL Plant
Brooksville, Florida
Permit AC27-118674
Request to Burn Tire-Derived Fuel in the Cement Kiln

Dear Mr. Fancy:

As a follow-up to previous correspondence to your office, to a meeting with Mr. Bill Thomas and Mr. Bruce Mitchell of your staff and to several recent telephone conversations that I have had with Mr. Mitchell, I would like to request, on behalf of the Florida Crushed Stone Company, a modification or amendment that will allow the use of tire-derived fuel as a supplement to coal in the cement kiln permitted by Permit AC27-118674. The tire-derived fuel will be used to provide up to 15 percent of the total heat input to the cement kiln, or up to 36 million BTU per hour.

The cement plant operated by the Florida Crushed Stone Company is a modern dry-process Portland cement plant. The plant is designed for a kiln feed rate of approximately 123 tons per hour and for a clinker production rate of 75 tons per hour. Under conditions of the present permit, heat is provided to the kiln by coal, fired at the rate of 10 tons per hour; resulting in a heat input to the kiln of approximately 240 million BTU per hour. The tire-derived fuel will replace up to 15 percent of this total heat input.

The hot gases exhausted from the cement kiln passed through a pre-heater where heat is recovered and transferred to the kiln feed material. The kiln gases then pass through a baghouse before being discharged to the atmosphere. The baghouse also controls particulate matter emissions from the power/lime plant and from a limestone dryer. The dust collected in the baghouse will be disposed of by incorporating it in with the kiln feed, as is the current practice. As a result, the baghouse dust ends up in the clinker and eventually, in the finished product.

The requested change should not be considered a modification, as modification is defined in Rule 17-2.100(118) as:

> Any physical change in, change in the method of operation of, or addition to a stationary source or facility which increases the actual emissions of any air pollutant, regulated under this Chapter, including any not previously emitted, from any source or facility...

The Florida Crushed Stone Company has committed that there will be no increase in the emission rate of any air pollutant as a result of using tire-derived fuel as a supplement to the coal. The requested change will require an amendment to the existing permit however, as tire-derived fuel is not included as an allowable fuel in the subject permit.

To demonstrate that there will be no increase in the emission rate of any permitted air pollutant or any air pollutant not previously emitted from the cement kiln, the Florida Crushed Stone Company will conduct one set of emission measurements with the cement plant operating under presently permitted conditions to establish a baseline. A second set of emission measurements will then be conducted with tire-derived fuel being used at the maximum anticipated firing rate to demonstrate that there is no increase in air pollutant emission rates above the baseline.

Suggested permit conditions related to this requested amendment include:

A. The permittee shall conduct emission measurements on the cement kiln while fired with coal and operating under presently permitted operating conditions to establish a baseline emission rate for all regulated and unregulated air pollutants. Within three months following the achievement of normal and reliable operations while firing tire-derived fuel, emission measurements shall be conducted on the cement kiln while fired with tire-derived fuel at a rate within 10 percent of the maximum permitted rate of 36 million BTU per hour, and while the cement kiln is operating within 10 percent of the permitted kiln feed rate and total heat input rate. The emission measurements will include:

Test	Test Method
Particulate Matter	EPA Method 5
Visible Emissions	EPA Method 9
Metals Aluminum Arsenic Cadmium Chromium (Total) Lead Zinc	EPA Method 5 filter and probe rinse
Nitrogen Oxides	EPA Method 7
Sulfur Dioxide	EPA Method 6 (in back-half of Method 5 train)
Carbon Monoxide	EPA Method (10)
Volatile Organic Compounds	VOST
Semi-Volatile Organic Compounds	Modified Method 5
Furans and Dioxins	Modified Method 5
CO_2/O_2	EPA Method 3
Stack Gas Flow/Moisture/Temp.	EPA Methods 2 and 4 in conjunction with EPA Method 5

Three replicate test runs will be conducted for each of the measurements listed above. (Note: The metals proposed in the emission measurements program are those of potential environmental concern that were measured in significant quantity during a test performed by the Radian Corporation in April 1988 at a tire-to-energy facility in California.)

B. Upon receipt of the results of the emission measurements described in Paragraph A, a determination shall be made regarding the compliance of the cement plant with established permit limits for particulate matter, nitrogen oxides, sulfur dioxide, and opacity and significant unregulated air pollutants. If compliance cannot be demonstrated, the permittee shall not use tire-derived fuel except for approved test purposes until the plant has been modified to assure compliance with all existing permit conditions.

C. If there should be an increase in the emission rate of one or more substances, the permittee shall submit within six months following receipt of the emission tests a plan and schedule to install control measurements and/or process modifications if needed and available and practical to reduce the emission rate increases to zero. Or, the plan may suggest an alternative permitting strategy.

An air operating permit will not be issued for the cement plant until compliance with existing permit conditions and emission limits as described in Paragraph B is demonstrated or until the plan described in Paragraph C is approved by the Department and implemented by the permittee.

The proposed use of tire-derived fuel as a replacement for up to 15 percent (based on heating value) of the coal fired to the cement kiln will not increase particulate matter, sulfur dioxide, nitrogen oxides emissions, or the opacity of emissions. These pollutants are those addressed by emission limiting standards in the current permit for the cement plant. The baghouse that controls emissions from the plant will effectively control particulate matter emissions to the levels currently being achieved. The sulfur content of the tires is lower than the sulfur content of the coal currently being fired to the kiln; hence, there should be a reduction in sulfur dioxide emissions. It is anticipated that the tire-derived fuel may also reduce nitrogen oxides. Nitrogen oxides are primarily a result of the fixation of atmospheric nitrogen and the use of tire-derived fuel will probably result in a more even distribution of the heat release and hence, a reduction in NOx emissions. The baghouse associated with the cement plant is also expected to adequately control the emissions of metals and the semi-volatile organic compounds (by adsorption or condensation).

Based upon the expected operation of the cement plant while firing tire-derived fuel as a supplement to coal; taking into consideration the characteristics of the tire-derived fuel, the amount of tire-derived fuel that will be used, and the normal operating characteristics of the plant; and considering the effectiveness of the air pollution control system associated with the cement plant, Florida Crushed Stone will commit that there will be no increase in emissions from the plant or changes in the operations of the plant.

As pointed out to you in my previous correspondence, the cement plant is equipped with continuous emission monitors for opacity, sulfur dioxide and nitrogen oxides that can be used to monitor the overall performance of the plant and to provide a continuous record of plant emissions while tire-derived fuel is used as a supplemental heat source. Additionally, the test program described herein will define emission rates of trace organic and inorganic compounds, both under present and proposed operating conditions. All of these factors, coupled with the assurances guaranteed by the proposed permit conditions should allow the Department to grant the requested amendments to the subject permit.

Again, I appreciate your consideration of this request and will provide any additional information that you may require to complete your evaluation of this matter.

Very truly yours,

KOOGLER & ASSOCIATES

John B. Koogler, Ph.D., P.E.

JBK:wa

cc: Mr. Bill Thomas, FDER-Tallahassee
Mr. Bruce Mitchell, FDER-Tallahassee
Mr. Randy Thompson, FCS, Leesburg
Mr. Charles Bush, FCS, Leesburg
Mr. Thomas Mountain, FCS, Brooksville

ATTACHMENT 11

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IV
345 COURTLAND STREET, N.E.
ATLANTA, GEORGIA 30365

APR 4 1990
4APT-AEB

RECEIVED
APR 09 1990
DER-BAQM

Mr. C. 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: Florida Crushed Stone (PSD-FL-091)

Dear Mr. Fancy:

This is to acknowledge receipt of your letter dated March 15, 1990, transmitting a request by Florida Crushed Stone to amend their prevention of significant deterioration (PSD) permit to allow the burning of tire derived fuel (TDF) in their cement kiln. The current permit for the source limits the fuel of the kiln to coal only. As discussed between Mr. Bruce Mitchell of your staff and Mr. Gregg Worley of my staff on March 30, 1990, we have the following comments.

Under the scenario presented by the source, the switch to the use of TDF in the kiln would not constitute a major modification for the purposes of PSD provided that the increase in pollutants due to the fuel switch did not exceed significant emissions increase levels. It is important to note that the change in emissions must be evaluated from "old actual" to "new allowable" emissions. The old actual emissions must be based on the previous two years of operating data unless some other period is deemed to be more representative of normal operating conditions. The new allowable emissions will be those emissions which are reflected in the amended permit. Also, it was noted that the list of pollutants to be tested did not include benzene. Since benzene is a pollutant regulated under the Clean Air Act for which a significant emissions rate has not been established, any increase of emissions of benzene would subject the source to PSD.

Thank you for the opportunity to review and comment on this package. If you have any further questions or comments, please do not hesitate to contact Mr. Gregg Worley of my staff at 404/347-2864.

Sincerely yours,

Jewell A. Harper, Chief
Air Enforcement Branch
Air, Pesticides and Toxics
Management Division

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IV
345 COURTLAND STREET, N.E.
ATLANTA, GEORGIA 30365

APR 4 1990

4APT-AEB

RECEIVED
APR 09 1990
DER - BAQM

Mr. C. 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

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Sincerely yours,

Jewell A. Harper

Jewell A. Harper, Chief
Air Enforcement Branch
Air, Pesticides and Toxics
Management Division

File Copy
AC27-118674

Florida Department of Environmental Regulation
Twin Towers Office Bldg. ● 2600 Blair Stone Road ● Tallahassee, Florida 32399-2400
Bob Martinez, Governor
Dale Twachtmann, Secretary
John Shearer, Assistant Secretary

March 15, 1990

Mr. Bill Thomas
Administrator, Air Programs
Southwest District
4520 Oak Fair Blvd.
Tampa, Florida 33610-7347

Dear Mr. Thomas:

Re: Request to Burn Tire Derived Fuel
Florida Crushed Stone - Cement Kiln

The enclosed information is being forwarded to you for completeness review.

Florida Crushed Stone has requested to burn tire derived fuel up to a maximum of 15% of the total heat input in their existing cement kiln, which was permitted under construction permit No. AC 27-118674 and PSD permit No. PSD-FL-091. Even though the claim is that there will be no actual pollutant emission increase, which will have to be verified, the source is not permitted to burn TDF as a fuel in accordance with the referenced permits.

Due to the potential controversy with this operational change, the Department will require public notice of the company's intent to burn TDF in their existing cement kiln prior to amending the above referenced construction permits.

If you have any questions, please call Bruce Mitchell at (904) 488-1344 or write to me at the above address. All comments, written or oral, should be received by April 6, 1990. If it is convenient to FAX a response to us, the FAX number to use is (904) 487-4938.

Sincerely,

James K. Pennington
for C. H. Fancy, P.E.
Chief
Bureau of Air Regulation

CHF/plm

Attachments

c: B. Mitchell, BAR
PSD-FL-091, also
Reading File

Recycled Paper

File Copy
AC27-118674

DEPARTMENT OF ENVIRONMENTAL REGULATION
STATE OF FLORIDA

Florida Department of Environmental Regulation

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

Bob Martinez, Governor
Dale Twachtmann, Secretary
John Shearer, Assistant Secretary

March 15, 1990

Mrs. Chris Shaver
Chief, Permit Review and Technical
  Support Branch
National Park Service
Air Quality Division
P. O. Box 25287
Denver, Colorado 80255

Dear Mrs. Shaver:

Re: Request to Burn Tire Derived Fuel
    Florida Crushed Stone - Cement Kiln

The enclosed information is being forwarded to you for completeness review.

Florida Crushed Stone has requested to burn tire derived fuel up to a maximum of 15% of the total heat input in their existing cement kiln, which was permitted under construction permit No. AC 27-118674 and PSD permit No. PSD-FL-091. Even though the claim is that there will be no actual pollutant emission increase, which will have to be verified, the source is not permitted to burn TDF as a fuel in accordance with the referenced permits.

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Sincerely,

James K. Pennington
for C. H. Fancy, P.E.
Chief
Bureau of Air Regulation

CHF/plm

Attachments

c: B. Mitchell, BAR
PSD-FL-091, also
Reading File

File Copy
AC27-118674

Florida Department of Environmental Regulation

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

Bob Martinez, Governor | Dale Twachtmann, Secretary | John Shearer, Assistant Secretary

March 15, 1990

Mr. Wayne Aronson, Chief
Air Programs
U.S. EPA, Region IV
345 Courtland Street, N.E.
Atlanta, Georgia 30365

Dear Mr. Aronson:

Re: Request to Burn Tire Derived Fuel
Florida Crushed Stone - Cement Kiln

The enclosed information is being forwarded to you for completeness review.

Florida Crushed Stone has requested to burn tire derived fuel up to a maximum of 15% of the total heat input in their existing cement kiln, which was permitted under construction permit No. AC 27-118674 and PSD permit No. PSD-FL-091. Even though the claim is that there will be no actual pollutant emission increase, which will have to be verified, the source is not permitted to burn TDF as a fuel in accordance with the referenced permits.

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Sincerely,

for James K. Pennington

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

CHF/plm

Attachments

c: B. Mitchell, BAR

PSD-FL-091, also
Readg File

KOOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES
4014 NW THIRTEENTH STREET
GAINESVILLE, FLORIDA 32609
904/377-5822 ■ FAX 377-7158

KA 307-90-01

March 13, 1990

RECEIVED
MAR 14 1990
DER - BAQM

Mr. C. H. Fancy
Bureau Chief
Florida Department of
Environmental Regulation
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Subject: Florida Crushed Stone Company
CPL Plant
Brooksville, Florida
Permit AC27-118674
Request to Burn Tire-Derived Fuel
in the Cement Kiln

Dear Mr. Fancy:

As a follow-up to previous correspondence to your office, to a meeting with Mr. Bill Thomas and Mr. Bruce Mitchell of your staff and to several recent telephone conversations that I have had with Mr. Mitchell, I would like to request, on behalf of the Florida Crushed Stone Company, a modification or amendment that will allow the use of tire-derived fuel as a supplement to coal in the cement kiln permitted by Permit AC27-118674. The tire-derived fuel will be used to provide up to 15 percent of the total heat input to the cement kiln, or up to 36 million BTU per hour.

The cement plant operated by the Florida Crushed Stone Company is a modern dry-process Portland cement plant. The plant is designed for a kiln feed rate of approximately 123 tons per hour and for a clinker production rate of 75 tons per hour. Under conditions of the present permit, heat is provided to the kiln by coal, fired at the rate of 10 tons per hour; resulting in a heat input to the kiln of approximately 240 million BTU per hour. The tire-derived fuel will replace up to 15 percent of this total heat input.

FEDERAL EXPRESS

USE THIS AIRBILL FOR DOMESTIC SHIPMENTS WITHIN THE CONTINENTAL U.S.A., ALASKA AND HAWAII.
USE THE INTERNATIONAL AIR WAYBILL FOR SHIPMENTS TO PUERTO RICO.
QUESTIONS? CALL 800-238-5355 TOLL FREE.

AIRBILL
PACKAGE
TRACKING NUMBER **5353652721**

5353652721

RECIPIENT'S COPY

Date 3/13/90

1 From (Your Name) Please Print: John Koogler
Your Phone Number (Very Important): 904-377-5822
Company: OGLER & ASSOC
Department/Floor No.:
Street Address: 14 NW 13TH ST
City: INSVILLE
State: FL
ZIP Required: 32609

2 To (Recipient's Name) Please Print: Bruce Mitchell
Recipient's Phone Number (Very Important): ( )
Company: FDER
Department/Floor No.:
Exact Street Address *(We Cannot Deliver to P.O. Boxes or P.O. ® Zip Codes.)*: 2600 BLAIR STONE RD
City: Tallahassee
State: FL
ZIP Required: 32399

3 *YOUR BILLING REFERENCE INFORMATION (First 24 characters will appear on invoice.)*: 307-90-01

H *IF HOLD FOR PICK-UP, Print FEDEX Address Here*
Street Address:
City:
State:
ZIP Required:

PAYMENT 1 ☒ Bill Sender 2 ☐ Bill Recipient's FedEx Acct. No. 3 ☐ Bill 3rd Party FedEx Acct. No. 4 ☐ Bill Credit Card
5 ☐ Cash

4 *SERVICES* (Check only one box)

Priority Overnight Service (Delivery by next business morning†)	*Standard Overnight Service* (Delivery by next business afternoon†)
11 ☐ *YOUR PACKAGING*	51 ☐
16 ☐ *FEDEX LETTER* *	56 ☒ *FEDEX LETTER* *
12 ☐ *FEDEX PAK* *	52 ☐ *FEDEX PAK* *
13 ☐ *FEDEX BOX*	53 ☐ *FEDEX BOX*
14 ☐ *FEDEX TUBE*	54 ☐ *FEDEX TUBE*
Economy Service (formerly Standard Air) (Delivery by second business day†)	*Heavyweight Service* (for Extra Large or any package over 150 lbs.)
	70 ☐ *HEAVYWEIGHT* **
30 ☐ *ECONOMY SERVICE*	80 ☐ *DEFERRED HEAVYWEIGHT* **

† Delivery commitment may be later in some areas.
*Declared Value Limit $100.
**Call for delivery schedule.

DELIVERY AND SPECIAL HANDLING

1 ☐ *HOLD FOR PICK-UP* (Fill in Box H)
2 ☑ *DELIVER WEEKDAY*
3 *DELIVER SATURDAY* (Extra charge) ☐
4 ☐ *DANGEROUS GOODS* (Extra charge)
5 ☐ *CONSTANT SURVEILLANCE SVC. (CSS)* (Extra charge) (Release Signature Not Applicable)
6 ☐ *DRY ICE* ______ Lbs.
7 ☐ *OTHER SPECIAL SERVICE* ______
8 ☐
9 ☐ *SATURDAY PICK-UP* (Extra charge)
10 ☐
11 ☐ DESCRIPTION
12 ☐ *HOLIDAY DELIVERY* (If offered) (Extra charge)

PACKAGES	*WEIGHT In Pounds Only*	*YOUR DECLARED VALUE*	*OVER SIZE*
Total	Total	Total	

DIM SHIPMENT (Heavyweight Services Only)
☐ ______ lbs.

Received At
1 ☐ Regular Stop
2 ☐ On-Call Stop
3 ☑ Drop Box
4 ☐ B.S.C.
5 ☐ Station

FedEx Emp. No.

Emp. No. | Date
☐ Cash Received
☐ Return Shipment
☐ Third Party ☐ Chg. To Del. ☐ Chg. To Hold
Street Address
City | State | Zip
Received By
X
Date/Time Received | FedEx Employee Number

5 Release Signature:
Date/Time

Federal Express Use
Base Charges
Declared Value Charge
Other 1
Other 2
Total Charges

REVISION DATE 8/89
PART #119501 FXEM 9/89
FORMAT #014

014

The hot gases exhausted from the cement kiln passed through a pre-heater where heat is recovered and transferred to the kiln feed material. The kiln gases then pass through a baghouse before being discharged to the atmosphere. The baghouse also controls particulate matter emissions from the power/lime plant and from a limestone dryer. The dust collected in the baghouse will be disposed of by incorporating it in with the kiln feed, as is the current practice. As a result, the baghouse dust ends up in the clinker and eventually, in the finished product.

The requested change should not be considered a modification, as modification is defined in Rule 17-2.100(118) as:

> Any physical change in, change in the method of operation of, or addition to a stationary source or facility which increases the actual emissions of any air pollutant, regulated under this Chapter, including any not previously emitted, from any source or facility...

The Florida Crushed Stone Company has committed that there will be no increase in the emission rate of any air pollutant as a result of using tire-derived fuel as a supplement to the coal. The requested change will require an amendment to the existing permit however, as tire-derived fuel is not included as an allowable fuel in the subject permit.

To demonstrate that there will be no increase in the emission rate of any permitted air pollutant or any air pollutant not previously emitted from the cement kiln, the Florida Crushed Stone Company will conduct one set of emission measurements with the cement plant operating under presently permitted conditions to establish a baseline. A second set of emission measurements will then be conducted with tire-derived fuel being used at the maximum anticipated firing rate to demonstrate that there is no increase in air pollutant emission rates above the baseline.

Suggested permit conditions related to this requested amendment include:

A. The permittee shall conduct emission measurements on the cement kiln while fired with coal and operating under presently permitted operating conditions to establish a baseline emission rate for all regulated and unregulated air pollutants. Within three months following the achievement of normal and reliable operations while firing tire-derived fuel, emission measurements shall be conducted on the cement kiln while fired with tire-derived fuel at a rate within 10 percent of the maximum permitted rate of 36 million BTU per hour, and while the cement kiln is operating within 10 percent of the permitted kiln feed rate and total heat input rate. The emission measurements will include:

Test	Test Method
Particulate Matter	EPA Method 5
Visible Emissions	EPA Method 9
Metals Aluminum Arsenic Cadmium Chromium (Total) Lead Zinc	EPA Method 5 filter and probe rinse
Nitrogen Oxides	EPA Method 7
Sulfur Dioxide	EPA Method 6 (in back-half of Method 5 train)
Carbon Monoxide	EPA Method (10)
Volatile Organic Compounds	VOST
Semi-Volatile Organic Compounds	Modified Method 5
Furans and Dioxins	Modified Method 5
CO_2/O_2	EPA Method 3
Stack Gas Flow/Moisture/Temp.	EPA Methods 2 and 4 in conjunction with EPA Method 5

Three replicate test runs will be conducted for each of the measurements listed above. (Note: The metals proposed in the emission measurements program are those of potential environmental concern that were measured in significant quantity during a test performed by the Radian Corporation in April 1988 at a tire-to-energy facility in California.)

B. Upon receipt of the results of the emission measurements described in Paragraph A, a determination shall be made regarding the compliance of the cement plant with established permit limits for particulate matter, nitrogen oxides, sulfur dioxide, and opacity and significant unregulated air pollutants. If compliance cannot be demonstrated, the permittee shall not use tire-derived fuel except for approved test purposes until the plant has been modified to assure compliance with all existing permit conditions.

C. If there should be an increase in the emission rate of one or more substances, the permittee shall submit within six months following receipt of the emission tests a plan and schedule to install control measurements and/or process modifications if needed and available and practical to reduce the emission rate increases to zero. Or, the plan may suggest an alternative permitting strategy.

An air operating permit will not be issued for the cement plant until compliance with existing permit conditions and emission limits as described in Paragraph B is demonstrated or until the plan described in Paragraph C is approved by the Department and implemented by the permittee.

The proposed use of tire-derived fuel as a replacement for up to 15 percent (based on heating value) of the coal fired to the cement kiln will not increase particulate matter, sulfur dioxide, nitrogen oxides emissions, or the opacity of emissions. These pollutants are those addressed by emission limiting standards in the current permit for the cement plant. The baghouse that controls emissions from the plant will effectively control particulate matter emissions to the levels currently being achieved. The sulfur content of the tires is lower than the sulfur content of the coal currently being fired to the kiln; hence, there should be a reduction in sulfur dioxide emissions. It is anticipated that the tire-derived fuel may also reduce nitrogen oxides. Nitrogen oxides are primarily a result of the fixation of atmospheric nitrogen and the use of tire-derived fuel will probably result in a more even distribution of the heat release and hence, a reduction in NOx emissions. The baghouse associated with the cement plant is also expected to adequately control the emissions of metals and the semi-volatile organic compounds (by adsorption or condensation).

Based upon the expected operation of the cement plant while firing tire-derived fuel as a supplement to coal; taking into consideration the characteristics of the tire-derived fuel, the amount of tire-derived fuel that will be used, and the normal operating characteristics of the plant; and considering the effectiveness of the air pollution control system associated with the cement plant, Florida Crushed Stone will commit that there will be no increase in emissions from the plant or changes in the operations of the plant.

As pointed out to you in my previous correspondence, the cement plant is equipped with continuous emission monitors for opacity, sulfur dioxide and nitrogen oxides that can be used to monitor the overall performance of the plant and to provide a continuous record of plant emissions while tire-derived fuel is used as a supplemental heat source. Additionally, the test program described herein will define emission rates of trace organic and inorganic compounds, both under present and proposed operating conditions. All of these factors, coupled with the assurances guaranteed by the proposed permit conditions should allow the Department to grant the requested amendments to the subject permit.

Again, I appreciate your consideration of this request and will provide any additional information that you may require to complete your evaluation of this matter.

Very truly yours,

KOOGLER & ASSOCIATES

John B. Koogler, Ph.D., P.E.

JBK:wa

cc: Mr. Bill Thomas, FDER-Tallahassee
Mr. Bruce Mitchell, FDER-Tallahassee
Mr. Randy Thompson, FCS, Leesburg
Mr. Charles Bush, FCS, Leesburg
Mr. Thomas Mountain, FCS, Brooksville
B. Thomas
N. Aronson, EPA
C. Shaver, NPS
CHF/JKP/BT

KOOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES
4014 NW THIRTEENTH STREET
GAINESVILLE, FLORIDA 32609
904/377-5822 ▪ FAX 377-7158

RECEIVED
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KA 307-90-01

February 2, 1990

2-7

~~CAF~~
~~JKP~~ } FYI

PA

Mr. C. H. Fancy
Bureau Chief
Florida Department of
Environmental Regulation
Northwest District
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Subject: Florida Crushed Stone Company
CPL Plant
Brooksville, Florida
Permit AC27-118674
Amendment to Permit AC27-118674 to Allow the Use of Tire-Derived Fuel in the Cement Kiln

Dear Mr. Fancy:

The purpose of this letter is to modify the request made in my letter to you dated January 24, 1990. In that letter, I requested that the subject permit be amended to allow a one-time test to investigate the feasibility of burning tire-derived fuel as a supplemental fuel in the dry process Portland cement kiln operated by the Florida Crushed Company near Brooksville in Hernando County, Florida. After further investigation into the use of tire-derived fuel, Florida Crushed Stone feels that the project is feasible and would like to pursue a permanent amendment to the subject permit to allow the use of this fuel as a supplement to coal, which is normally fired to the kiln. I discussed this matter with Mr. Bruce Mitchell of you staff and it was suggested that an amendment to the subject permit would be possible if the new permit conditions were framed in such a way that the Department would have the necessary assurances that the cement kiln will continue to operate in compliance with all existing permit conditions and that the emission rate of any trace organic or inorganic compounds currently unregulated by DER and/or federal regulations will not result in an unacceptable environmental risk. Based

GAINESVILLE
FEB-2'89
FLA.
P.B.METER
1302590
U.S. POSTAGE
0.45

KOOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES

4014 NW THIRTEENTH STREET
GAINESVILLE, FLORIDA 32609
904/377-5822 • FAX 377-7158

TO:

Mr. C.H. Fancy
Bureau Chief
Florida Department of
Environmental Regulation
2600 Blair Stone Road
Tallahassee, Fl 32399-2400

FIRST CLASS MAIL

on my conversation with Mr. Mitchell, I understand that a bleach plant, presumably associated with a paper mill, recently received an air construction permit that was contingent upon the results of emission measurements and a risk assessment; both of which would be performed after the facility was constructed and in operation.

Based upon my conversation with Mr. Mitchell, I would like to request that the subject permit be amended to allow the use tire-derived fuel in conjunction with coal to provide the necessary heat for the Florida Crushed Stone cement kiln. The tire-derived fuel will be used to provide up to 15 percent of the total heat input to the cement kiln or up to 36 million BTU per hour. The suggested permit conditions related to this amendment include:

A. Within three months following completion of construction, start-up and the achievement of normal and reliable operations, emission measurements shall be conducted on the cement kiln while fired with tire-derived fuel at a firing rate within 10 percent of the maximum permitted rate of 36 million BTU per hour and while the cement kiln is operating, within 10 percent of the permitted kiln feed rate and total heat input rate. The emission measurements will include:

Test	Test Method
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Carbon Monoxide	EPA Method (10)
Volatile Organic Compounds	VOST
Semi-Volatile Organic Compounds	Modified Method 5

Furans and Dioxins	Modified Method 5
CO_2/O_2	EPA Method 3
Stack Gas Flow/Moisture/Temp.	EPA Methods 2 and 4 in conjunction with EPA Method 5

Three replicate test runs will be conducted for each of the measurements listed above. As stated in my letter of January 24, 1990 to you, the measurements proposed herein are consistent with those suggested by Mr. Bill Thomas and Mr. Bruce Mitchell of your staff. The metals proposed in the emission measurements program are those of potential environmental concern that were measured in significant quantity during a test performed by the Radian Corporation in April 1988 at a tire-to-energy facility in California.

B. Within one month following receipt of the results of the emission measurements described in Paragraph A, an air toxics screening test shall be conducted using criteria agreed to by the Department and the permittee. In general, the screening test will include the use of an air quality model (the ISC-ST or equivalent), representative of meteorological data and the emission rates of the various unregulated substances measured during the emission test described in paragraph A. The ground-level concentrations of the various substances will be calculated for receptors at the Florida Crushed Stone property line and these concentrations will be compared with ambient guideline concentrations agreed to by the Department and the permittee.

C. The results of the screening tests will be used to determine whether:

1. The measured emission levels are acceptable, or
2. Additional control measures are required to achieve the screening test criteria, or
3. A detailed risk assessment is necessary to ensure that the achievable emissions are acceptable.

D. For any compound or substance addressed in this permit that fails to meet the criteria established in Paragraph B, the permittee shall submit within six months following receipt of the screening test a plan and schedule which addresses the factors identified in Paragraph C. The plan may include recommendations to install control measurements and/or process modifications if needed and available and practical, or may include recommendations to develop a risk assessment to demonstrate that the practically achievable emissions are acceptable.

E. Upon receipt of the results of the emission measurements described in Paragraph A, a determination shall be made regarding the compliance of the cement plant with established permit limits for particulate matter, nitrogen oxides, sulfur dioxide, and opacity. If compliance cannot be demonstrated, the permittee shall not use tire-derived fuel except for test purposes until the plant has been modified to assure compliance with all existing permit conditions.

An air operating permit will not be issued for the cement plant until a satisfactory screening test as described in Paragraph B is submitted to the Department and compliance with existing permit conditions and emission limits as described in Paragraph E is demonstrated or until the plan described in Paragraph D is approved by the Department and implemented by the permittee.

The proposed use of tire-derived fuel as a replacement for up to 15 percent (based on heating value) of the coal fired to the cement kiln is not expected to increase particulate matter, sulfur dioxide, nitrogen oxides emissions, or on the opacity of emissions. These pollutants are those addressed by emission limiting standards in the current permit for the cement plant. The baghouse that controls emissions from the plant will effectively control particulate matter emissions to the levels currently being achieved. The sulfur content of the tires is lower than the sulfur content of the coal currently being fired to the kiln; hence, there should be a reduction in sulfur dioxide emissions. It is anticipated that the tire-derived fuel may also reduce nitrogen oxides. Nitrogen oxides are primarily a result of the fixation of atmospheric nitrogen and the use of tire-derived fuel will probably result in a more even distribution of the heat release and hence, a reduction in NOx emissions. The baghouse associated with the cement plant is also expected to adequately control the emissions of metals and the semi-volatile organic compounds (by adsorption or condensation).

Based upon the expected operation of the cement plant while firing tire-derived fuel as a supplement to coal; taking into consideration the characteristics of the tire-derived fuel, the amount of tire-derived fuel that will be used, and the normal operating characteristics of the plant; and considering the effectiveness of the air pollution control system associated with the cement plant, it is our opinion that there will be no perceptible differences in emissions from the plant or in operations of the plant. As pointed out to you in my letter of January 24, 1990, the cement plant is equipped with continuous emission monitors for opacity, sulfur dioxide and nitrogen oxides that can be used to monitor the overall performance of the plant and to provide a continuous record of plant emissions while tire-derived fuel is used as a supplemental heat source. Additionally, the test program described herein will define emission rates of trace organic and inorganic compounds and the screening test that is proposed will assess the risk associated with these emissions. All of these factors, coupled with the assurances guaranteed by the proposed permit conditions should allow the Department to grant the requested amendments to the subject permit.

Again, I appreciate you consideration of this request and will provide any additional information that you may require to complete your evaluation of this matter.

Very truly yours,

KOOGLER & ASSOCIATES

John B. Koogler, Ph.D., P.E.

JBK:wa

cc: Mr. Bill Thomas, FDER-Tallahassee
Mr. Bruce Mitchell, FDER-Tallahassee
Mr. Randy Thompson, FCS, Leesburg
Mr. Charles Bush, FCS, Leesburg
B. Thomas, SW Dist
CHF/BT

MEDIA HOT SHEET

Date: 2/1/90

Reporter: SALLY HICKS

At (Newspaper, T.V., Radio, etc.): ST. PETERSBURG TIMES
1(800) 333-7505 X 6115

From: JIM PENNINGTON
Division: ARM
Bureau/Sect.: BAR/PaSS
Phone: 488-1344

Topic of Call: FLORIDA CRUSHED STONE'S APPLICATION TO BURN TIRE-DERIVED FUEL

Questions asked:
1. WHAT DOES THE APPLICATION ASK FOR?
2. WHAT ARE FLORIDA CRUSHED STONE'S FUTURN PLANS FOR TIR
3. WHAT IS THE CONSULTANT'S PHONE NO?

Deadline: CALLED AT 3:30P.M. WITH A 4:00 P.M. DEADLINE.

Summary of Conversation (use remainder of sheet, and back, if necessary):

ANSWERS:
1. A 30 DAY TRIAL BURN FOR TIRE-DERIVED FUEL UP TO 10% OF THE CEMENT KILN'S HEATING VALUE.
2. UNKNOWN; THE APPLICATION IS FOR A ONE TIME TRIAL BURN.
3. (904) 377-5822

I INFORMED MS. HICKS THAT THE LETTER WAS UNDER REVIEW BY BRUCE MITCHELL AND THAT SHE SHOULD CALL HIM ON 2/2/90 FOR MORE INFORMATION.

DER Employee Interviewed Jim Pennington

KOOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES
4014 NW THIRTEENTH STREET
GAINESVILLE, FLORIDA 32609
904/377-5822 ▪ FAX 377-7158

RECEIVED
JAN 25 1990
DER - BAQM

KA 307-90-01

January 24, 1990

Mr. C. H. Fancy
Bureau Chief
Division of Air Resources Management
Florida Department of
Environmental Regulation
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Subject: Florida Crushed Stone Company
CPL Cement Plant
Brooksville, Florida
Permit AC27-118674
Request for Trial Burn to Test
Tire-Derived Fuel in the Cement Kiln

Dear Mr. Fancy:

At the request of the Florida Crushed Stone Company and in accordance with conversations that I have had with Mr. Bill Thomas and Mr. Bruce Mitchell of your staff, I would like to request that Permit AC27-118674, issued to the Florida Crushed Stone Company for the construction and initial operation of a dry process Portland cement kiln, be amended to allow a one-time test for burning tire-derived fuel along with coal in the cement kiln. The cement kiln is designed and operated at a feed rate of approximately 123 tons per hour. Heat is provided to the kiln, under conditions of the subject permit, by coal fired at a rate of 10 tons per hour. The resulting heat input to the kiln is 240 million BTU per hour. During the requested one-time test, Florida Crushed Stone will use tire-derived fuel to provide up to 10 percent of the heat input to the kiln, or approximately 24 million BTU per hour.

The cement plant operated by Florida Crushed Stone is a modern, dry process Portland cement plant. The hot gases discharged from the cement kiln pass through a pre-heater where heat is recovered and transferred to the kiln feed. The kiln gases then pass through a baghouse before being discharged to the atmosphere. The baghouse also controls particulate

KOOGLER & ASSOCIATES
ENVIRONMENTAL SERVICES
4014 NW THIRTEENTH STREET
GAINESVILLE, FLORIDA 32609

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Mr. C.H. Fancy
Assistant Director
Flroida Department of
  Environmental Regulation
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

matter emissions from the power/lime plant and a limestone dryer. The stack through which the kiln gases are discharged is equipped with continuous emission monitors for opacity, nitrogen oxides and sulfur dioxide. These monitors can be used to provide a continuous record of stack gas opacity and sulfur dioxide and nitrogen oxides concentrations during the trial period. The dust collected in the baghouse will be disposed of by incorporating it into the kiln feed as is the current practice. As a result, the baghouse dust ends up in the clinker and eventually in the finished product.

A 30-day trial period is requested. During this time, Florida Crushed Stone will evaluate methods of feeding the tire-derived fuel to the cement kiln and will experiment with the quantities of tire-derived fuel that can be used. It is anticipated that the maximum amount of heat that can be provided by tire-derived fuel will be in the range of 24 million BTU per hour; or 10 percent of the heat input to the kiln. During the test period, Florida Crushed Stone will also evaluate the effect of tire-derived fuel on the quality of clinker produced in the cement plant.

During the trial period, Florida Crushed Stone will maintain records of the time periods when tire-derived fuel is fired to the cement kiln. Records will also be maintained documenting the amount of tire-derived fuel fed to the kiln, the procedures for firing the tire-derived fuel, clinker production rates and total heat input to the kiln. Continuous monitoring records from the in-stack opacity, sulfur dioxide and nitrogen oxide monitors will also be available for all periods of time during the test to document the effect of tire-derived fuel on stack emissions.

Consistent with your requirements for other tire-derived fuel tests, Florida Crushed Stone is also proposing emission measurement tests for several criteria and non-criteria pollutants during the trial. As tire-derived fuel will be used to provide only a small fraction (10 percent) of the total heat input to the cement kiln, it is proposed that the emission measurements be conducted on a one-time basis at or near this maximum tire-derived fuel heat input rate.

The emission measurements proposed for the trial burn (at a 10 percent tire-derived fuel heat input rate) will include the following:

Test	Test Method
Particulate Matter	EPA Method 5
Metals Aluminum Arsenic Cadmium Chromium (Total) Lead Zinc	EPA Method 5 filter and probe rinse
Nitrogen Oxides	EPA Method 7

Sulfur Dioxide	EPA Method 6 (in back-half of Method 5 train)
Carbon Monoxide	EPA Method (10)
Volatile Organic Compounds	VOST
Semi-Volatile Organic Compounds	Modified Method 5
Furans and Dioxins	Modified Method 5
CO_2/O_2	EPA Method 3
Stack Gas Flow/Moisture/Temp.	EPA Methods 2 and 4 in conjunction with EPA Method 5

Three replicate test runs will be conducted for each of the measurements listed above. The measurements that are proposed are consistent with those suggested by Mr. Thomas and Mr. Mitchell of you staff. The metals which we propose to test for are metals of potential environmental concern that were measured in significant quantity during a test performed by the Radian Corporation (April 1988) at a waste tire to energy facility in California.

I appreciate your consideration of this request and will provide any additional information that you may require to complete your evaluation of this matter.

Very truly yours,

KOOGLER & ASSOCIATES

John B. Koogler, Ph.D., P.E.

JBK:wa

cc: Mr. Randy Thompson, FCS, Leesburg
Mr. Bill Thomas, FDER-Tallahassee
Mr. Bruce Mitchell, FDER-Tallahassee
B. Thomas, SW Dist.

~~Jim~~ PKP
~~Patty~~ - Please return to me for file 1/26

I think this should be handled like Bill proposed to do CCA. Need an intent letter with 14 day public notice. System being as modern as it is, and only 10% fuel replacent makes it certainly a possible candidate technically.

Clai

PERMIT IS BEING ASKED FOR EXTENSION AND MAY HAVE EXPIRED.

BEST AVAILABLE CONTROL TECHNOLOGY (BACT) DETERMINATION
Florida Crushed Stone Company
Hernando County
(Amended April 6, 1982)

(This amended BACT determination supersedes the determination dated January 12, 1983. The applicant added one additional baghouse to Table 1 and reduced the expected amount of pollutants to be discharged in the kiln exhaust gases.)

The applicant plans to construct a Portland cement production facility two miles northwest of Brooksville, Florida. The manufacturing processes will use the latest innovations in dry cement technology and recirculation of hot exhaust gas streams to conserve energy. Baghouses will be used to limit the amount of particulate matter discharged into the atmosphere. The facility is designed to produce 600,000 tons of Portland cement per year. The operating schedule will be between 7620 and 8760 hours per year.

The maximum heat input to the cement kiln is 248 million Btu per hour and the design production rate is 75 tons of clinker per hour. The cement kiln when fired at maximum heat input will consume 10.3 tons of coal per hour and 9.25 tons per hour at the average firing rate. The coal used will have a sulfur content of 0.75 percent and a heating value of approximately 12,000 Btu per pound. The hot exhaust gases from the cement kiln are cooled in the kiln feed preheater and a rotary dryer before discharging through a baghouse into the atmosphere. Clinker from the kiln is reduced in temperature in a clinker cooler. The heated air discharge from the clinker cooler is used as pre-heated combustion air for the kiln and the power plant boiler.

The power plant boiler is designed to produce steam in excess of the cement plant requirements. The excess steam will be used to produce up to 125 megawatts of electrical power. The power plant will be reviewed by the Electrical Power Plant Siting Section as set forth in Chapter 17-17 of the Florida Administrative Code. This information is included in this determination because one large baghouse will control particulate emissions from gas streams ducted from both the power plant and portions of the cement plant.

The movement of raw materials, recycled materials, and product will be through enclosed transfer systems. All gas streams from the various transfer systems will vent through a baghouse into the ambient air. Table 1 lists the various point sources.

TABLE 1

BAGHOUSE INVENTORY

AC-27 Permit	SOURCE	LB.PM/HR	TPY	IDENT.**
61021	Kiln Feed	0.8	2.9	H-15***
61019	Cement Kiln*			
51019	Raw Materials Bin	0.8	3.0	D-18
61012	Pre Mix Bins	0.6	2.3	D-12
61013	Fly Ash Bin	0.6	2.4	D-23
61017	Raw Meal Transfer	0.3	1.0	F-14
61020	Blending Silo	3.3	12.7	G-12
61030	Clinker Silo	0.6	2.4	L-06
61032	Clinker Silo	0.6	2.4	L-08
61027	Cooler Discharge	0.8	2.9	L-16
61033	Silo Discharges	1.8	6.9	M-08
61037	Finish Mill	6.4	24.5	N-13
61038	Cement Silo Discharge	0.6	2.4	Q-17
61040	Cement Silo	0.6	2.4	Q-15A
61042	Cement Silo	0.6	2.4	Q-15C
61041	Cement Silo	0.6	2.4	Q-15B
61026	Coal Handling	0.8	2.9	S-04
	Particulate Totals	19.8	75.9	

* The cement kiln exhaust gases discharge into the ambient air through the power plant baghouse.

Pollutant	Amended	Previous	Amended
Particulates	49.5 lb/hr	50 lb/hr	189 TPY
SO_2	80 lb/hr	100 lb/hr	305 TPY
NO_x	416 lb/hr	422 lb/hr	1585 TPY

** Plant equipment number
*** Baghouse source added

A Portland cement plant is one of the major facilities listed in Table 500-1 of 17-2.500, FAC, Prevention of Significant Deterioration (PSD). A BACT determination is required for each pollutant exceeding the significant emission rates in Table 500-2, which in this case are particulates, sulfur dioxide and nitrogen oxides. This facility is also subject to New Source Performance Standards (NSPS), 40 CFR 60.60, Subpart F.

BACT Determination Requested by the applicant:

Pollutant	Emission Limit
Particulates (kiln)	0.3 lbs/ton of dry kiln feed
Particultes (cooler)	0.1 lbs/ton of dry kiln feed
Sulfur dioxide (kiln)	Coal containing 0.75% sulfur
Nitrogen Oxides (kiln)	1.7 lbs/million Btu heat input
Nitrogen Oxides (rotary dryer)	0.2 lbs/million Btu heat input

Fabric filter baghouses will be used to limit particulate emissions from all other sources. Particulate matter discharged to the atmosphere will be in the range between 0.012 and 0.015 grains per actual cubic feet. (Table 1)

Date of Receipt of a BACT Application:

October 1, 1982

Date of Publication in the Florida Administrative Weekly:

October 15, 1982

Review Group Members:

Comments were obtained from the New Source Review Engineering Section, the Air Modeling Section, and the DER Southwest District Office.

BACT Determined by DER:

Source	Pollutant Emission Limit
Kiln	0.30 pound particulate matter per ton of feed (dry basis).
Kiln	Visible emissions not to exceed 10 percent opacity.
Kiln	0.60 pound SO_2 per ton of feed (dry basis). Fossil fuels must be the only fuels fired.
Kiln	2.9 pounds NO_x per ton of feed (dry basis).
Clinker Cooler	0.10 pound particulate matter per ton of kiln feed (dry basis).
Clinker Cooler	Visible emissions not to exceed 10 percent opacity.
Dryer	Visible emissions not to exceed 10 percent opacity.
Raw Mill	Visible emissions not to exceed 10 percent opacity.

BACT for the sources (except the cement kiln) as listed in Table 1 is that visible emissions must not exceed 5 percent opacity.

Compliance with the particulate emission limitations will be in accordance with the EPA Reference Methods in Appendix A, 40 CFR 60, as set forth in Subsection 60.64 of the NSPS for Portland Cement Plants, 40 CFR 60.60.

Compliance with opacity standards will be determined by conducting observations in accordance with DER Method 9 (17-2.700(6)(a)9. FAC).

Compliance with the SO_2 and NO_x emission limitations will be in accordance with 40 CFR 60, Appendix A; Method 6 and 7.

The performance test for the cement kiln must be conducted with the dryer feed shut off. The performance test for the clinker cooler must be conducted with the feed to the raw mill shut off. Since the kiln and clinker cooler have one common control device, their emission rates may be combined. The power plant boiler must be down during these performance tests.

BACT Determination Rationale

The NSPS visible emission limitation for the clinker cooler, dryer and raw mill exhaust gases are not to exceed 10 percent opacity, and the cement kiln exhaust gases must not exceed 20 percent opacity. Exhaust gases from all four sources pass through a common baghouse and only one VE limitation would be practical. The visible emission BACT for these four sources and the baghouse was determined to be the 10 percent.

BACT for particulate emissions was determined to be equivalent to NSPS for Portland Cement Plants, 40 CFR 60.60, Subpart F.

BACT for SO_2 emissions from the cement kiln was determined to be equal to 25 percent of the rate calculated from the emission factor in AP-42, Table 1.1-2. The 75 percent reduction in SO_2 emissions is due to the alkaline nature and affinity for SO_2 of the material being processed.

BACT for the sources listed in Table 1, other than the cement kiln, is that the exhaust gases must not exhibit greater than 5 percent opacity. The department feels the 5 percent opacity determined as BACT, which is more stringent than the NSPS standard of 10 percent, is attainable with a baghouse.

BACT for NO_x emissions from the cement kiln was determined to be equal to 360 pounds per hour. This rate was obtained from the EPA-BACT clearinghouse report.

This BACT determination was based upon the firing of coal. The firing of non-fossil fuels is not allowed.

Details of the Analysis May be Obtained by Contacting:

Edward Palagyi, BACT Coordinator
Department of Environmental Regulation
Bureau of Air Quality Management
2600 Blair Stone Road
Tallahassee, Florida 32301

Recommended By:

C. H. Fancy, Deputy Chief, BAQM

Date: 11/10/83

Approved:

Victoria J. Tschinkel, Secretary

Date: 10/11/83

Bob Graulich

DCN No. 88-243-047-10
Radian No. 243-047-20

MODESTO ENERGY COMPANY
WASTE TIRE TO ENERGY FACILITY
WESTLEY, CALIFORNIA

FINAL

EMISSION TEST REPORT

Prepared for:

Oxford Energy Company
114 State Street
Boston, Massachusetts 02109

Prepared by:

Radian Corporation
Post Office Box 13000
Research Triangle Park, North Carolina 27709

April 25, 1988

JES/016

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

LIST OF TABLES

LIST OF TABLES (Continued)

LIST OF FIGURES

1.0 EXECUTIVE SUMMARY

1.1 INTRODUCTION

This test report presents the combined results from emission tests performed on January 9-14 and March 2-4, 1988 at the Modesto Energy Company's tire to energy facility in Westley, California. Emission tests were performed by Radian Corporation under contract to Oxford Energy Company. Emission tests were performed for the primary purpose of evaluating the plant's compliance status with respect to the permit conditions. A secondary purpose of the test program was to develop additional data to be used specifically by Oxford Energy in evaluating process conditions. All compliance emission sampling was performed on controlled flue gases at the stack outlet. Additional testing was performed at the inlet to the fabric filter control device. Table 1-1 contains the sampling and analysis matrix describing the test programs.

As seen from the table, these emission test programs were designed to measure the following emissions:

- particulate matter, (PM);
- chlorinated dibenzo-p-dioxins (CDD);
- chlorinated dibenzofurans (CDF);
- polycyclic aromatic hydrocarbons (PAH);
- polychlorinated biphenols (PCB);
- ammonia (NH_3);
- hydrochloric acid (HCl);
- sulfur dioxides (SO_2);
- sulfur trioxides (SO_3);
- nitrogen oxides (NO_x);
- carbon monoxide (CO);

TABLE 1-1. SAMPLING MATRIX FOR MODESTO

Parameter	Sampling Method	Analytical Method	Inlet No. Runs	Outlet No. Runs
Particulate	CARB Method 5	Gravimetric	3	3
Particle Size	Anderson Impactor	Gravimetric	3	-
SO_x	CARB Method 8	$Ba(ClO_4)_2$ Titration/IC	3	3
NH_3	Modified Method 6	Selective Ion Electrode	2	33
SO_3	CCS	Ion Chromatograph	3	-
Dioxin/Furan	MM5 (Semi-Vost)	HRCG/HRMS	-	3
PAH	MM5 (Semi-Vost)	HRCG/LRMS	-	3
PCB	MM5 (Semi-Vost)	LRGC/MS	-	2
HCl	MOD CARB 421	Ion Chromatograph	3	2
Metal	Method 5	ICAP	3	-
THC	CARB Method 100	FID	-	X
NO_x	CARB Method 100	Chemilumenescent	-	X
SO_2	CARB Method 100	Pulsed Fluorescent	-	X
CO	CARB Method 100	GFC - NDIR	-	X
CO_2	CARB Method 100	NDIR	-	X
O_2	CARB Method 100	Thermal Oxidation	-	X

- total hydrocarbons (THC);
- particle size distribution (PSD); and
- metals.

Sampling was performed as specified by California Air Resource Board (CARB) methods with four exceptions; CDD/CDF/PAH, NH_3, PSD and metals. In the absence of specific CARB methods for these parameters, Radian used the best available sampling approaches. Radian sampled for CDD/CDF/PAH in a combined train, using the protocol for the Modified Method 5 (MM5) train developed at the 1984 Environmental Standards Workshop sponsored by the American Society of Mechanical Engineers and the U.S. Environmental Protection Agency (ASME/EPA). The sampling train is a modification of EPA Method 5, which includes the addition of a cooled sorbent module after the filter for the collection of volatile and semivolatile constituents. Analysis was performed for CDD/CDF using high resolution gas chromatography/high resolution mass spectrometry (HRGC/HRMS) according to the procedures outlined in the ASME/EPA protocol and the pre-proposal draft of EPA Method 8290. PAH analyses were performed using high resolution gas chromatography/low resolution mass spectrometry (HRGC/LRMS) according to the procedures outlined in EPA Method 8270.

Radian sampled for NH_3 using a sampling train identical to the CARB Method 5 train except that the train had midget impingers and the impinger solutions consisted of 0.1 N sulfuric acid instead of water. The sampling approach selected was based on a working draft protocol currently being used by U.S. EPA for collection of NH_3. Analyses for NH_3 samples was performed using an ammonia specific ion electrode according to the electrode manufacturer's instructions and consistent with National Institute of Occupational Safety and Health (NIOSH) Method S347. Each of the sampling and analysis procedures shown in Table 1-1 are discussed in detail in Sections 4.0 of this document.

Particle size distribution results were obtained using an Anderson impactor with eight stages and a preseparator. The filters were weighed and the results tabulated. Emissions of trace metals were measured by analyzing the front filter of the inlet particulate train. The particulate matter was obtained by isokinetically traversing the inlet location. The representative sample was then analyzed by Inductively Coupled Argon Plasma (ICAP) for the metal species.

1.2 EMISSION RESULTS

Emission testing was performed while operating the process at maximum operating load. This corresponded to a gross output rate of approximately 14 megawatts. The process is assumed to have 188 MMBtu/hr heat input for both test periods. Table 1-2 contains a summary of emission results measured during both test programs. For further information or listing of the individual runs see Section 3.0.

1.2.1 Chlorinated dibenzo-p-dioxins and Chlorinated dibenzofurans (CDD/CDF)

Dioxin and furan emission values reflect totals of mono through octa chlorinated classes. Emission rates for both dioxins and furans are expressed in terms of 2,3,7,8-TCDD toxicity equivalents. This format for presenting results was selected to allow direct comparison between the differing chlorinated classes in order to allow summing the measured results to give emission levels allowable under the permit conditions. As seen in the table, the average of the three runs was 5.15×10^{-10} g/sec for dioxins and 1.69×10^{-9} g/sec for furans. The total CDD and CDF expressed as 2,3,7,8-TCDD toxic equivalents for the three day average is 2.21×10^{-9} g/sec. This combined dioxin and furan emission rate is less than one one-hundredth of the permit level.

1.2.2 Polycyclic Aromatic Hydrocarbons (PAH)

PAH emission rates ranged from approximately 1.9×10^{-5} to 9.1×10^{-5} g/sec and averaged 6.2×10^{-5} g/sec for the three test runs. Although 17 individual PAH species were analyzed for, benzo(b)fluoranthene was the

TABLE 1-2. SUMMARY OF MEASURED EMISSIONS AT THE CONTROL DEVICE OUTLET

Parameter	Emissions	Factor	Units	lb/day
CDD	0.515 ng/sec	9.85E-03	ug/MMBtu	9.81E-08
CDF	1.69 ng/sec	3.23E-02	ug/MMBtu	3.22E-07
PAH	61.6 ug/sec	1.18	mg/MMBtu	1.17E-02
PCB[a]	3 ug/sec	5.74E-02	mg/MMBtu	5.71E-04
THC[b]	0.239 ppmv @ 12% CO_2	64.8	mg/MMBtu	0.646
NH_3	63.9 ppmv @ 12% CO_2	0.037	lb/lb NH_3 injected	181.8
NO_x	49.54 ppmv @ 12% CO_2	38.6	g/MMBtu	384.3
SO_3 (CCS)	4.5 ppmv @ 12% CO_2	5.56	g/MMBtu	55.4
SO_2 (M8)	4.2 ppmv @ 12% CO_2	4.56	g/MMBtu	45.4
SO_2 (CEM)	3.76 ppmv @ 12% CO_2	4.08	g/MMBtu	40.6
HCl	< 3.5 ppmv @ 12% CO_2	<2.24	g/MMBtu	<22.3
CO	52.59 ppmv @ 12% CO_2	24.9	g/MMBtu	247.8
PM - Front 1/2	0.00190 grains/dscf	2.75	g/MMBtu	25.5
- Back 1/2	0.000418 grains/dscf	0.605	g/MMBtu	5.7
- Total	0.0023 grains/dscf	3.36	g/MMBtu	31.2
Total Metals[c]	48.4 mg/sec	0.92	g/MMBtu	9.2
Particle Sizing	grains/dscf 0.423	50% cut point 0.086 um	Percent Less Than 2 um 79.9%	

[a] Data obtained from Engineering-Science.

[b] Expressed as parts per million methane.

[c] Estimated based on inlet concentrations and particulate reduction; see Section 3.0 for speciation of metals.

only species found in the three samples. Therefore, the values seen in the table are the benzo(b)fluoranthene emission rates measured during the test program.

1.2.3 Polychlorinated Biphenols (PCB)

PCB samples were collected and analyzed by Engineering Science on February 23 and 24th. There were no PCB aroclors detected and the results reported are the detection limits of the method. Seven aroclors were analyzed for, including aroclors 1016, 1221, 1232, 1242, 1248, 1254, and 1260.

1.2.4 Particulate Matter (PM)

The particulate matter samples were collected isokinetically from the outlet stack. Particulate concentrations ranged from 0.0017 gr/dscf to 0.0033 gr/dscf with an average of 0.0023 gr/dscf, which is equivalent to 30.7 lbs per day of emissions. This is approximately one fourth of the permitted level of 113 lbs per day. The particulate back half results were corrected for the ammonium sulfate artifact which occurs in this stack.

1.2.5 Ammonia (NH_3)

Controlled stack gas concentrations of NH_3 for the three compliance test runs ranged from 50.6 to 77.2 ppmv @ 12% CO_2 and averaged 64.5 ppmv @ 12% CO_2. The average of the three runs exceeded the permitted level of 50 ppmv @ 12% CO_2 by approximately 15 ppmv. The average ammonia injection rate during the sampling periods was approximately 160 lbs/hr.

In addition to the compliance test which was performed on March 4, 1988, 28 additional ammonia samples were taken during the second series of tests from the exhaust stack. The results of all 31 samples were an average of 63.9 ppmv NH_3 at 12 percent CO_2. Twenty-two of these samples exceeded the 50 ppmv limit and nine were below the limit. During the January testing, inlet and outlet sampling was conducted for NH_3 with outlet results averaging 152 ppmv at 12 percent CO_2. The ammonia injection during the January testing was much higher (>200 lbs/hr) than during the March testing.

1.2.6 Particle Size Distribution (PSD)

The mean diameter of the particles was measured at the inlet location. The mass mean diameter for all the runs was 0.86 microns with 79.9 percent of all particles measuring less than 2.00 microns. The samples were collected isokinetically at the inlet in order to obtain engineering information for the control devices.

1.2.7 Metals

The metal samples were collected at the inlet because it would have taken approximately 50 hours of continuous sampling at the outlet to obtain sufficient quantities of metals to be detected in the laboratory analysis. The inlet sample was analyzed for a range of target metals. For purposes of this summary, the mass of each of these individual metals were added together and presented as a total uncontrolled metals emission value. The sum of the metals was multiplied by the outlet particulate matter emission results to give the total controlled metal emissions estimate of 48.4 mg/sec. Section 3.0 contains emission numbers for the individual metals.

1.2.8 Carbon Monoxide (CO)

Table 1-2 contains an overall average of CO emissions measured during each of the three testing days. Daily average emission rates ranged from approximately 230 lbs/day to 260 lbs/day with a three day average rate of 247.8 lbs/day. This three day average emission rate is approximately 100 lbs/day under the permitted level.

1.2.9 Nitrogen Dioxide (NO_2)

Daily average NO_2 emission rates ranged from approximately 340 lbs/day to 426 lbs/day with a three-day average rate of 384.3 lbs/day. Modesto Energy will utilize the offsets previously approved by Stanislaus County Air Resources Board, which permits operation up to 500 lbs/day of NO_x.

1.2.10 Sulfur Dioxide (SO_2)

Sulfur dioxide emissions collected with CARB Method 8 were collected during two testing periods. During the first test series, SO_2 emission rates ranged from 38.0 to 110 pounds SO_2 per day, and averaged 74 pounds SO_2/day.

Controlled SO_2 emission rates as measured during the second test series ranged from 12.7 to 43.5 lbs SO_2 per day. The average SO_2 emission rate for these three test runs was 28.9 lbs/day which is approximately 220 lbs/day less than allowed under the permit conditions.

The average for all test runs during both test series was 45.4 lbs/day. Daily average SO_2 emission rates as derived from continuous emission monitor data range from approximately 20 to 77 lbs/day. The average SO_2 emission rate for the three-day sampling period was approximately 41 lbs/day, which is approximately 209 lbs/day less than allowed under the permit conditions. Note that these values derived from CEM data are consistent with values derived from the manual method for determination of SO_2 (CARB Method 8).

1.2.11 Total Hydrocarbons (THC)

Total hydrocarbon values are available for two of the three test runs. Excessive drift was observed during run 3 and, therefore, values are not reported. Average THC concentrations for the two valid test runs were 0.13 and 0.35 ppmv (expressed as methane and corrected to 12% CO_2), for an overall average of 0.24 ppmv @ 12% CO_2. The overall average for the two runs was 0.646 lbs/day. Permit conditions for THC emissions are 148.4 lbs/day.

1.3 TEST REPORT ORGANIZATION

This document is organized as follows: Section 2.0 contains a brief description of the tire incineration process and the air pollution control systems; Section 3.0 contains a summary and discussion of the test results; Section 4.0 describes the sampling and analytical procedures along with the sampling locations; and Section 6.0 describes the quality assurance and quality control data. There are no appendices to this report. If the background data is required or further details of these results are desired, the reader is referred to the original test reports dated February 8, 1988 and March 18, 1988.

2.0 DESCRIPTION OF PROCESS AND AIR POLLUTION CONTROL SYSTEM

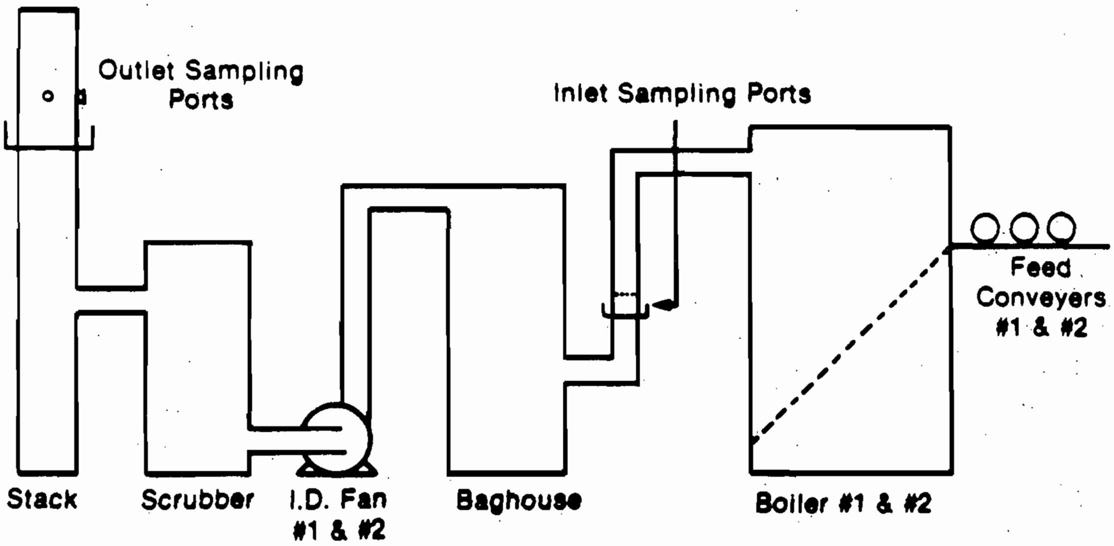
2.1 PROCESS DESCRIPTION

The Modesto Energy Company operates two mass burn waterwall boilers at the tire to energy facility in Westley, California. Figure 2-1 presents a process diagram of the two identical boiler systems. Discarded whole tires are fed by means of a conveyor belt/roller assembly to each boiler at a rate of approximately 6,423 pounds per hour (3.97 tons/hr). The tire feed rate to the boiler is varied as a means of controlling and optimizing the energy input rate. Each boiler is equipped with several auxiliary gas-fired burners, which are used for achieving and maintaining proper temperatures during periods of start-up and during periods when the feeding of tires is interrupted. Tires are fed to the boiler and burned on a reciprocating stoker grate. Heat generated during the combustion process is used to convert boiler water to steam. The steam is delivered to a 14 megawatt turbine generator where the electricity produced is delivered into the Pacific Gas and Electric Company grid.

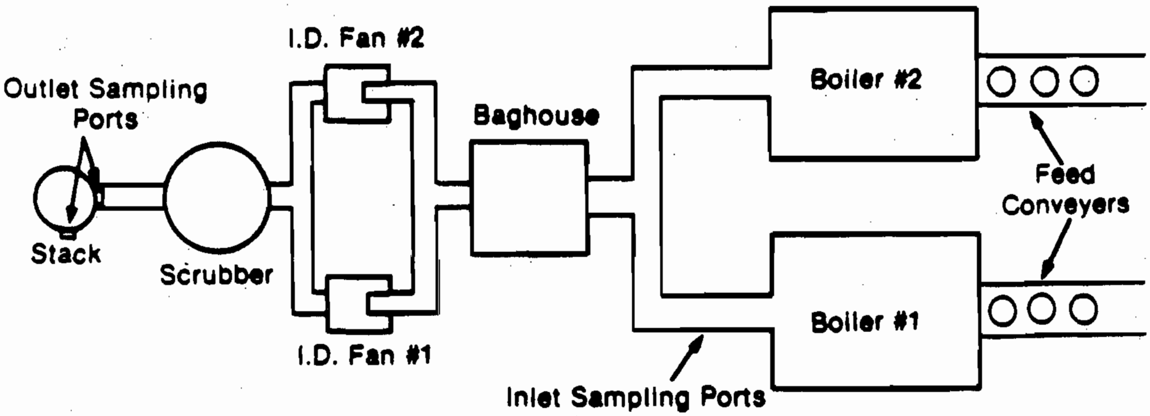
Furnace slag and grate siftings are discharged into a water quenched residue system. Ash from the air pollution control equipment is collected separately and conveyed to the ash removal system to be collected in bags.

2.2 AIR POLLUTION CONTROL SYSTEM

The air pollution control system at the Modesto Energy Company consists of a thermal ammonia injection system (thermal de-NO_x) for removal of nitrogen oxides, a fabric filtration system (or baghouse) for collection of particulate matter, and a lime slurry scrubbing system for removal of sulfur gases.



Side View



Top View

Figure 2-1. Schematic diagram of the Modesto Energy Company Plant.

During the combustion process, hot offgases leave the combustion zone and are routed through a superheater section where the hot offgases are used to further heat the steam produced by the boiler. The offgases are then directed through an economizer section where heat from the offgases is used to preheat the water being supplied to the boiler. In this economizer section, ammonia is injected and mixed with the hot flue gases for the purpose of reducing nitrogen oxides. After leaving the economizer, the flue gases from both boilers enter a common duct and are routed to a fabric filtration system for particulate control. After leaving the fabric filtration system, flue gases are routed to a lime slurry scrubbing system for removal of SO_2 and then exhausted through a 120 foot stack.

3.0 SUMMARY AND DISCUSSION OF RESULTS

The results of the emission test program conducted at the Modesto Energy Company tire to energy facility from January 1-4 and March 2-4, 1988 are summarized in this section. Formats for presenting results were selected specifically to allow direct comparison between measured emission levels and emission levels specified by the plant's permit conditions. The supporting data for the results presented in this section are included in the appendices of the previous Modesto test reports.

3.1 PARTICULATE LOADING

Particulate matter emission data and results are presented in Tables 3-1 and 3-2 for three runs at the inlet and outlet locations, respectively. Particulates were collected in both front-half (FH) and back-half (BH) portions of the Method 5 train at each location. The front-half, back-half, and total particulate results are presented. The back-half results have been corrected for ammonium sulfate [$(NH_4)_2SO_4$] which goes through the filter in the gaseous phase, then condenses in the impinger train.

A comparison of inlet and outlet mass loadings indicates good particulate removal across the baghouse and wet scrubber. Minimum particulate removal efficiencies were estimated across this control equipment. These values range from 99.2 percent (Run 2) to 99.6 percent (Run 1), with an average of 99.4 percent; however, since the wet scrubber introduces particulate to the emissions, these are conservative.

3.2 CDD/CDF/PAH EMISSION RESULTS

Dioxins, furans and polycyclic aromatic hydrocarbons were all collected with a single sampling train at the stack outlet location. Each of the three samples were collected over an 8-hour period using a Modified Method 5 train (MM5) as described in Section 4.0. The samples were recovered in the field and shipped by air freight to the analytical laboratory in Research

TABLE 3-1. SUMMARY OF PARTICULATE DATA

Parameter	Run 1		Run 2		Run 3	
	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet
Front-Half						
Amt. of PART. (mg)	6419.8	7.8	3479.1	21.6	6111.2	21.4
Back-Half						
Amt. of PART. (mg)	757.5	12.9	30.9	0[b]	304.5	2.6
Total						
Amt. of PART. (mg)	7177.3	20.7	3510.0	21.6	6415.7	24.0
Gas Volume (dscm)	3.963	5.380	2.078	2.827	3.813	5.404
Flowrate (dscmm)	1067	1840	1031	1896	1017	1772
CO_2[a] (% by volume)	9.8	8.7	9.2	9.8	8.1	7.6

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[a] By Orsat analysis.

[b] All particulate found in the back-half was determined to be ammonium sulfate.

TABLE 3-2. SUMMARY OF PARTICULATE RESULTS

		Measured Concentrations				Emission Rate	
Parameter	Test Run Number	mg/dscm	mg/dscm at 12% CO_2	gr/dscf	gr/dscf at 12% CO_2	lb/hr	lb/day
Front-Half							
Inlet Particulates	01	1620	1984	0.708	0.867	228.7	5488
Inlet Particulates	02	1674	2184	0.732	0.954	228.4	5481
Inlet Particulates	03	1603	2374	0.700	1.038	215.6	5175
Outlet Particulates	01	1.45	2.00	0.0006	0.0009	0.353	8
Outlet Particulates	02	7.64	9.36	0.0033	0.0041	1.92	46
Outlet Particulates	03	3.96	6.25	0.0017	0.0027	0.928	22
Back-Half							
Inlet Particulates	01	191	234	0.0835	0.102	27.0	648
Inlet Particulates	02	14.9	19.39	0.0865	0.1126	28.0	671
Inlet Particulates	03	79.9	118	0.035	0.0517	10.7	257
Outlet Particulates	01	2.39	3.30	0.001	0.00144	0.59	14.2
Outlet Particulates	02	0.0	0.0	0.0	0.0	0.0	0.0
Outlet Particulates	03	0.481	0.760	0.00021	0.000332	0.11	2.6
Total							
Inlet Particulates	01	1811	2218	0.791	.969	256	6136
Inlet Particulates	02	1689	2203	0.738	.963	256	6152
Inlet Particulates	03	1683	2493	0.725	1.09	226	5432
Inlet Particulates	Average	1728	2305	0.755	1.01	246	5907
Outlet Particulates	01	3.8	5.3	0.0017	0.0023	0.94	22.6
Outlet Particulates	02	7.6	9.4	0.0033	0.0041	1.92	46
Outlet Particulates	03	4.4	7.0	0.0019	0.0031	1.04	24.9
Outlet Particulates	Average	5.3	7.2	0.0023	0.0032	1.30	31.2

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[a] All inlet mass emission rates are for Boiler #1 only and as such, represent approximately 55 percent of the total.

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Triangle Park, North Carolina, for extraction, clean-up and analysis. For each test run, the various sampling train components (i.e., filter, probe rinse, XAD-2, impinger contents and rinses) were combined so that analytical results represent a total train catch.

Table 3-3 presents an overall summary of the CDD/CDF/PAH emission rates and conditions measured during the test program.

3.2.1 CDD/RESULTS

Dioxins are members of a family of organic compounds known chemically as dibenzo-p-dioxins and referred to in this document as CDDs. The common aspect of all dioxin compounds is that they have a three ring nucleus containing two benzene rings interconnected through a pair of oxygen atoms. Theoretically, one to eight chlorine atoms can occur on the dioxin structure such that 75 different chlorinated dioxin isomers are possible. Each isomer has its own physical and chemical properties and differs from others in the number and relative position of chlorine atoms. As discussed in this document, total CDD is the sum of all 75 possible CDD isomers. The analyses performed on each of the MM5 samples was for the purpose of quantifying: (1) total CDDs, (2) CDDs in each of the eight chlorination classes (i.e., mono through octa), and (3) 7 specific CDD isomers (indicating the exact positions where chlorines are located within the dioxin molecule). Specific CDD isomers include: 2,3,7,8-TCDD; 1,2,3,7,8-PCDD; 1,2,3,4,7,8-HxCDD; 1,2,3,6,7,8-HxCDD; 1,2,3,7,8,9-HxCDD; 1,2,3,4,6,7,8-HpCDD; and OCDD.

A considerable amount of toxicological data exists for the CDD isomer 2,3,7,8-TCDD. This CDD isomer is the most toxic of all the CDDs and, therefore, is most commonly used and understood as being synonymous with "dioxin."

For the purpose of presenting data on a common and understandable basis, CDDs are reported as 2,3,7,8-TCDD toxic equivalents. This approach was developed by and is currently used by the U.S. EPA for the purpose of deriving and reporting single emission values for all CDDs that relate

TABLE 3-3. SUMMARY OF CONTROLLED CDD/CDF/PAH EMISSION RATES, PROCESS OPERATIONS AND SAMPLING PARAMETERS FOR THE MODESTO ENERGY COMPANY TEST PROGRAM

	Run 1 03/02/88	Run 2 03/03/88	Run 3 03/04/88
Sampling Parameters			
Volume gas sampled (dscf)	396.8	397.5	417.4
Flue gas flow rate (dscfm)	69,828	69,678	71,411
Flue gas temperature (^{o}F)	182.9	182.8	186.1
Percent Moisture by volume	12.1	11.3	11.9
Percent isokinetic	92.5	93.9	95.1
CO_2 (percent by volume, dry)	7.5	6.0	6.4
O_2 (percent by volume, dry)	12.0	13.0	13.1
Process Operations			
Tire feed rate (lbs/hr)	12,846	12,846	12,846
Ammonia injection rate (lbs/hr)	154.9	159.9	161.7
Steam flow (10^3 lbs/hr)	122.7	115.1	123.1
Gross power output (megawatts)	14.0	13.2	14.1
Dioxin and Furan Emission Results[a]			
2,3,7,8-TCDD (ng/sec)	[<0.088][b]	[<0.009]	[<0.029]
Total CDD (ng/sec)	0.259	1.134	0.153
Total CDF (ng/sec)	2.604	1.981	0.490
Total CDD + CDF (ng/sec)	2.863	3.155	0.643
PAH Emission Results			
Total PAH (ug/sec)	74.866	90.077	19.217
BaP (ug/sec)	[<1.838]	[<1.910]	[<1.868]

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[a] CDD and CDF emission rates are expressed as 2,3,7,8-TCDD toxic equivalents.

[b] Values in brackets are minimum detection limits (MDL) of non-detectable species. Therefore emission rates for these species are reported as less than the MDL.

directly to the toxicity of 2,3,7,8-TCDD. Toxic equivalency factors are assigned to each CDD isomer or class and are multiplied by the emission rate of each isomer to yield the 2,3,7,8-TCDD toxic equivalents.

Table 3-4 presents controlled CDD emission rates expressed as 2,3,7,8-TCDD equivalents for each of the measured CDD isomers and chlorinated classes. The CDD emission rates for the three test runs ranged from 0.153 to 1.134 ng/sec and averaged 0.515 ng/sec. Analysis of both a field blank and a lab blank confirm that no contamination of the samples occurred during the sampling and analysis procedures.

3.2.2 CDF Results

Furans are a group of organic compounds chemically known as dibenzofurans and referred to in this document as CDFs. They have similar structure to the dibenzo-p-dioxins (CDDs) except that the two benzene rings in the nucleus are interconnected with a five member ring containing only one oxygen atom. Theoretically, the chlorinated furan group can contain up to 135 different structural isomers, each with varying physical and chemical properties. As discussed in this document, total CDF is the sum of all 135 possible isomers. The CDF analyses performed on each of the MM5 samples was for the purpose of quantifying: (1) total CDFs, (2) CDFs in each of the eight chlorination classes (i.e., mono through octa), and (3) 10 specific CDF isomers (indicating the exact positions where chlorines are located within the furan molecules). Specific CDF isomers targeted for quantification include: 2,3,7,8-TCDF; 1,2,3,7,8-PCDF; 2,3,4,7,8-PCDF; 1,2,3,4,7,8-HxCDF; 1,2,3,6,7,8-HxCDF; 2,3,4,6,7,8-HxCDF; 1,2,3,7,8,9-HxCDF; 1,2,3,4,6,7,8-HpCDF, 1,2,3,4,7,8,9-HpCDF; and OCDF.

While much less toxicological data are available for CDF isomers as compared to CDDs, sufficient data are available to form a basis for the belief that 2,3,7,8-TCDF may be similar but less potent than 2,3,7,8-TCDD in its toxicological properties.

TABLE 3-4. CONTROLLED CDD/CDF EMISSION RATES MEASURED AT THE MODESTO ENERGY COMPANY TIRE TO ENERGY FACILITY, EXPRESSED AS 2,3,7,8-TCDD TOXIC EQUIVALENTS

Isomer	Emission Rates (ng/sec) Run 1 03/02/88	Run 2 03/03/88	Run 3 03/04/88	Average Runs 1-3
<u>Dioxins</u>				
Mono-CDD	0.000	0.000	0.000	0.000
Di-CDD	0.000	0.000	0.000	0.000
Tri-CDD	0.000	0.000	0.000	0.000
2,3,7,8-TCDD	0.000	0.000	0.000	0.000
Other TCDD	0.157	0.493	0.077	0.242
1,2,3,7,8-PCDD	0.000	0.000	0.000	0.000
Other PCDD	0.076	0.138	0.053	0.089
1,2,3,4,7,8-HxCDD	0.000	0.092	0.000	0.031
1,2,3,6,7,8-HxCDD	0.000	0.201	0.020	0.074
1,2,3,7,8,9-HxCDD	0.000	0.152	0.000	0.051
Other HxCDD	0.018	0.058	0.003	0.026
1,2,3,4,6,7,8-HpCDD	0.008	0.000	0.000	0.003
Other HpCDD	0.000	0.001	0.000	0.000
Octa-CDD	0.000	0.000	0.000	0.000
TOTAL CDDs	0.259	1.134	0.153	0.515
<u>Furans</u>				
Mono-CDF	0.000	0.000	0.000	0.000
Di-CDF	0.000	0.000	0.000	0.000
Tri-CDF	0.000	0.000	0.000	0.000

TABLE 3-4. (Continued)

Isomer	Emission Rates (ng/sec) Run 1 03/02/88	 Run 2 03/03/88	 Run 3 03/04/88	 Average Runs 1-3
Furans (Continued)				
2,3,7,8-TCDF	0.026	0.057	0.011	0.031
Other TCDF	0.068	0.059	0.027	0.051
1,2,3,7,8-PCDF	0.393	0.220	0.079	0.231
2,3,4,7,8-PCDF	1.522	0.794	0.263	0.860
Other PCDF	0.153	0.107	0.024	0.094
1,2,3,4,7,8-HxCDF	0.210	0.240	0.038	0.163
1,2,3,6,7,8-HxCDF	0.000	0.089	0.015	0.035
2,3,4,6,7,8-HxCDF	0.154	0.216	0.025	0.132
1,2,3,7,8,9-HxCDF	0.066	0.145	0.015	0.075
Other HxCDF	0.000	0.001	0.000	0.000
1,2,3,4,6,7,8-HpCDF	0.012	0.042	0.003	0.019
1,2,3,4,7,8,9-HpCDF	0.000	0.011	0.000	0.004
Other HpCDF	0.000	0.000	0.000	0.000
Octa-CDF	0.000	0.000	0.000	0.000
TOTAL CDFs	2.604	1.981	0.490	1.692
TOTAL CDD + CDF	2.863	3.115	0.643	2.207

Therefore, for the reasons described in the previous subsection, all CDF data are expressed as 2,3,7,8-TCDD equivalents.

Table 3-4 includes controlled CDF emission rates expressed as 2,3,7,8-TCDD equivalents for each of the measured CDF isomers and chlorination classes. The CDF emission rates for the three test runs ranged from 0.49 to 2.60 ng/sec and averaged 1.69 ng/sec. Analysis of both field and lab blanks confirmed that no contamination of the samples occurred during the sampling and analysis procedures.

3.2.3 PAH Results

The term polycyclic aromatic hydrocarbon refers to a class of organic compounds that have two or more fused aromatic rings. (Two aromatic rings that share a pair of carbon atoms are said to be fused.)

The analysis was performed on the three stack gas samples to quantify 17 target PAH species. Table 3-5 contains the results from each of the three samples. With one exception, none of the target PAHs were found at levels above the analytical detection limit. The exception was benzo(b)fluoranthene which was identified in each of the three samples. The emission rate for this PAH ranged from 19 to 90 ug/sec and averaged 61 ug/sec for the three test runs. Bracketed values shown in Table 3-5 represent the minimum detection limit in ug/sec for each of the target species. No PAH species were found in either the field blank or lab blank.

3.3 NH_3 EMISSION RESULTS

Table 3-6 contains a summary of ammonia emissions measured during the two Modesto tire test programs. Tests labeled A and B were performed during January, tests 1 through 24 were performed in late February and tests C1 through C8 were performed in March. Tests C1, C2, and C3 were the actual compliance tests, which were performed at an ammonia injection rate of approximately 160 lbs/hr.

TABLE 3-5. CONTROLLED PAH EMISSION RATES MEASURED AT THE MODESTO ENERGY COMPANY TIRE TO ENERGY FACILITY

	Emission Rates[a] (ug/sec)		
Species	Run 1 03/02/88	Run 2 03/03/88	Run 3 03/04/88
Acenaphthylene	[0.902]	[0.920]	[0.917]
Acenaphthene	[1.344]	[1.371]	[1.365]
Fluorene	[1.249]	[1.274]	[1.269]
Phenanthrene	[0.859]	[0.850]	[0.832]
Anthracene	[0.952]	[0.942]	[0.922]
Fluoranthene	[0.773]	[0.765]	[0.749]
Pyrene	[0.977]	[0.489]	[1.047]
Benzo(a)anthracene	[0.975]	[0.488]	[1.045]
Chrysene	[0.899]	[0.450]	[0.963]
Benzo(b)fluoranthene	74.866	90.077	19.217
Benzo(k)fluoranthene	[1.039]	[1.080]	[1.055]
Benzo(e)pyrene	[b]	[b]	[b]
Benzo(a)pyrene	[1.838]	[1.910]	[1.868]
Perylene	[b]	[b]	[b]
Indeno(1,2,3-cd)pyrene	[3.586]	[3.422]	[3.346]
Dibenzo(a,h)anthracene	[4.545]	[4.724]	[4.618]
Benzo(g,h,i)perylene	[3.036]	[3.155]	[3.084]
TOTAL PAH	74.866	90.077	19.217

[a] Values in brackets are minimum detection limits (MDL) of non-detectable species.

[b] Minimum detection limits not reported in the analytical data package.

TABLE 3-6. MODESTO TIRE TO ENERGY AMMONIA CONCENTRATIONS

Test	Date	Time	ppmv	ppmv @ 12% CO_2	Ammonia Inj. Rate (lb/hr)
Inlet A	01/09/88	(1636-2043)	1340	1641	>200
Outlet B	01/09/88	(2004-2213)	113	158	>200
Inlet A	01/11/88	(1235-1440)	915	1121	>200
Outlet B	01/11/88	(1312-1534)	92.9	147	>200
Outlet 1	02/23/88	(1830-1845)	56.9	93.6	130
Outlet 2	02/23/88	(1915-1930)	37.5	64.3	130
Outlet 3	02/23/88	(1950-2005)	48.4	83.0	130
Outlet 4	02/24/88	(1555-1625)	21.5	35.8	133
Outlet 5	02/24/88	(1640-1710)	39.4	65.7	133
Outlet 6	02/24/88	(1725-1755)	56.6	93.0	133
Outlet 7	02/25/88	(1025-1055)	59.6	91.7	99
Outlet 8	02/25/88	(1110-1140)	76.7	109.6	99
Outlet 9	02/25/88	(1200-1230)	49.6	69.2	99
Outlet 10	02/26/88	(1515-1615)	25.5	37.4	116.5
Outlet 11	02/26/88	(1627-1736)	24.9	36.5	116.5
Outlet 12	02/26/88	(1743-1843)	29.5	43.2	116.5
Outlet 13	02/27/88	(0844-0906)	15.9	21.4	118.5
Outlet 14	02/27/88	(0918-1118)	50.1	70.7	104.5
Outlet 15	02/27/88	(1131-1331)	38.8	56.1	104.5
Outlet 16	02/27/88	(1342-1542)	46.4	70.5	104.5
Outlet 17	02/27/88	(1550-1646, 1653-1757)	39.6	56.6	104.5
Outlet 18	02/27/88	(1808-2008)	47.0	69.6	116
Outlet 19	02/27/88	(2030-2153, 2203-2240)	50.6	77.8	116
Outlet 20	02/27/88	(2300-0200)	INVALID TEST - PLANT OUTAGE		
Outlet 21	02/28/88	(0912-1112)	17.4	26.7	128
Outlet 22	02/28/88	(1121-1321)	19.0	29.2	128
Outlet 23	02/28/88	(1330-1530)	5.4	8.4	128
Outlet 24	02/28/88	(1537-1737)	24.7	38.0	128
Outlet C1	03/04/88	(1954-2014)	33.3	50.6	162.8
Outlet C2	03/04/88	(2019-2039)	50.23	77.2	162.8
Outlet C3	03/04/88	(2043-2103)	43.3	65.8	162.8
Outlet C4	03/05/88	(1228-1248)	49.3	80.6	121.0
Outlet C5	03/05/88	(1357-1417)	43.3	67.5	82.0
Outlet C6	03/05/88	(1700-1720)	80.5	136.5	0.0
Outlet C7	03/05/88	(2022-2042)	55.4	86.6	160.8
Outlet C8	03/05/88	(2058-2118)	46.0	69.3	160.8

Inlet concentrations of NH_3 sampled in January averaged 1381 ppmv at 12 percent CO_2. For all three testing periods, outlet concentrations of ammonia ranged from 8.4 to 158 ppmv at 12 percent CO_2 and averaged 63.9 ppmv at 12 percent CO_2. During the three compliance runs (tests C1-C3), ammonia concentrations averaged 64.5 ppmv at 12 percent CO_2.

3.4 SO_x EMISSION RESULTS

SO_x emissions at the Modesto Tire to Energy facility were determined using two sampling techniques. SO_2 concentrations were determined using the CARB Method 8 protocol. SO_3 concentrations were determined using the Goksoyr-Ross controlled condensate (CCS) technique. Method 8 was determined to be a poor sampling technique for SO_3 due to the presence of free ammonia in the flue gas. Ammonia causes the formation of particulate sulfates in the flue gas and causes sulfites to form in the probe and in the SO_3 impinger of the Method 8 train. All Method 8 train SO_3 concentrations were invalidated due to these interferences and therefore, do not appear in this report.

Results of the CCS SO_3 sampling and analysis for the inlet location were used to estimate the emissions at the outlet location. Outlet concentrations of SO_3 were estimated using the following three assumptions:

1. Boiler #2 SO_3 emissions are essentially identical to Boiler #1 emissions;
2. There is no significant formation of SO_3 in the emission control devices; and
3. There is no significant removal of SO_3 across the control devices.

Based on these assumptions, the outlet SO_3 concentration is the same as the inlet measured concentrations. Table 3-7 lists the CCS train SO_3 results. The average SO_3 concentration was 4.2 ppmv at 12 percent CO_2.

Table 3-8 lists the Method 8 SO_2 test results for both the inlet and outlet locations. SO_2 concentrations averaged 520 ppmv and 4.5 ppmv at 12 percent CO_2 for the inlet and outlet testing, respectively, during normal operating conditions.

TABLE 3-7. SUMMARY OF METHOD 8 SO_2 RESULTS

Date	Time	Location	ppmv	ppmv @ 12% CO_2	lb/day	Process Condition
01/09/88	(1935-2150)	Inlet	253	310	2182	Normal
01/10/88	(1420-1655)	Inlet	642	856	5688	No NH_3 injection
01/10/88	(2040-0018)	Inlet	302	394	2544	Normal
01/09/88	(2017-2225)	Outlet	7.05	10.4	110	Normal
01/10/88	(1415-1630)	Outlet	2.40	2.91	38	No NH_3 injection
01/10/88	(2055-2231)	Outlet	2.63	3.95	38	Normal
03/03/88	(1337-2215)	Outlet	1.78	2.77	30.4	Normal
03/04/88	(1223-1622)	Outlet	2.57	3.95	43.5	Normal
03/04/88	(1804-2010)	Outlet	0.76	1.18	12.7	Normal

TABLE 3-8. SUMMARY OF CONTROLLED CONDENSATE SO_3 RESULTS[a]

Date	Time	ppmv	ppmv @ 12% CO_2	lb/day	Process Condition
01/12/88	(1300-1320)	0.683	1.08	14.3	Normal
01/12/88	(1446-1545)	4.08	6.45	85.6	Normal
01/12/88	(1617-1632)	3.16	4.99	66.3	Normal

[a] Note that the SO_3 values are based on concentrations of SO_3 measured at the inlet location. The control efficiency of SO_3 is assumed to be zero and outlet concentrations are therefore assumed to be identical to inlet concentrations.

3.5 HCl RESULTS

HCl testing was conducted during two periods in order to collect data on the chloride content of the tires that is volatilized and present in the uncontrolled flue gases. The results of these tests are presented in Table 3-9. During the January testing, the sampling was conducted at the inlet to the baghouse (boiler outlet) and at the stack outlet. The normal CARB-421 HCl gaseous sampling method was used during these tests. As can be seen in Table 3-9, the results indicate very little HCl gas present. After evaluating the results and examining the process, one conclusion was the possibility of ammonia reacting with chloride to form a salt. Literature suggests that this reaction only takes place at temperatures <400°F and increases at lower temperatures. It was therefore possible that the sampling train, which was being controlled at 250°F was causing the reaction to take place prior to the filter. The salt would be caught on the filter portion of the sampling train and not included in the analysis for HCl gas.

During the March test, two modifications to the previous testing were performed. First, the plant turned off the ammonia injection so that there was no ammonia present to react with the HCl. Since there is NH_3 retained in the scrubber water, no testing was conducted at the outlet location. The second modification was to increase the temperature of the probe and filter holder to be equal or greater than the stack temperature. During the testing, it was maintained at 500°F. The results indicated in Table 3-9 are the HCl gaseous results, which, according to the method, does not include analysis of the filter. For this test, the filter was also analyzed and shown to have approximately 18 ppmv as HCl caught on the filter. The gaseous HCl and the chloride salt content were added together to give a total chloride value of 40 ppmv.

3.6 CONTINUOUS EMISSIONS MONITORING RESULTS (SO_2, NO_2, CO AND THC)

A summary of the SO_2, NO_2, CO, and THC emission concentrations measured during the three day test program in March are presented in Table 3-10.

TABLE 3-9. SUMMARY OF CARB-421 HCl RESULTS

Date	Time	Location	ppmV	ppmV @12%CO2	lb/day	Process Condition
01/09/88	11:05-15:30	Inlet	< 0.832	< 1.02	< 4.2	Normal
01/09/88	11:24-15:23	Outlet	3.94	5.50	36	Normal
01/11/88	12:35-14:40	Inlet	< 0.665	< 0.982	< 3.3	Normal
01/11/88	13:13-15:35	Outlet	< 0.946	< 1.49	< 8.6	Normal
03/05/88	16:10-17:10	Inlet	21.7	32.1	108	No NH3 injection

TABLE 3-10. SUMMARY OF CEM EMISSION MEASUREMENTS, PROCESS OPERATIONS AND SAMPLING PARAMETERS FOR THE MODESTO ENERGY COMPANY TEST PROGRAM

Start/Stop Time	03/02/88 (1157-2122)	03/03/88 (1151-1947)	03/04/88 (1229-2111)	Average
Sampling Parameters				
Flue gas flow rate (dscfm)	69,828	69,678	71,411	70,306
CO_2 (percent by volume, dry)[a]	7.5	7.6	7.7	7.5
O_2 (percent by volume, dry)[a]	12.1	11.3	11.3	11.6
Process Operations				
Tire feed rate (lbs/hr)	12,846	12,846	12,846	12,846
Ammonia injection rate (lbs/hr)	154.9	159.9	161.7	158.8
Steam flow (10^3 lbs/hr)	122.7	115.1	123.1	120.3
Gross power output (megawatts)	14.0	13.2	14.1	13.8
CEM Emission Results				
SO_2 ppmv[b]	4.7	1.3	2.2	2.7
SO_2 ppmv @ 12% CO_2	7.6	2.0	3.5	4.5
NO_2 ppmv	28.2	31.2	34.6	31.3
NO_2 ppmv @ 12% CO_2	45.2	49.1	54.0	49.5
CO ppmv	34.5	35.6	30.7	33.6
CO ppmv @ 12% CO_2	55.2	56.0	47.9	52.6
THC ppmv[c]	0.08	0.22	d	0.15[e]
THC ppmv[c] @ 12% CO_2	0.13	0.35	d	0.24[e]

[a] Based on CEM results.
[b] ppmv = parts per million by volume, dry basis
[c] ppmv = parts per million by volume, dry expressed as methane.
[d] These data are not presented due to excessive drift.
[e] Average includes two days instead of three.
[f] This data obtained by ORSAT.

Oxygen and CO concentrations are also listed for purposes of combustion analysis and normalizing pollutant concentrations. Due to non-linear behavior in the CO_2 analyzer on 3/02/88, the Orsat value for CO_2 collected during the MM5 run is used for normalizing the CEM results for that day. The non-linearity problem was corrected by calibrating at a lower range on subsequent days. The average SO_2 concentration was 2.7 ppmv. NO_x averaged 31.3 ppmv. CO average concentration was 33.6 ppmv. THC values averaged 0.05 ppmv. The average THC concentration reflects only two days of data due to excessive drift in the Beckman 402 analyzer on 3/04/88. A power outage the previous evening caused the flame ionization detector (FID) flame to trip out in the THC analyzer as a safety precaution. The flame was re-lit shortly before calibration on 3/04/88 and there was insufficient time for the instrument to warm up prior to testing. For this reason, a linear drift assumption is invalid and THC for 3/04/88 must be discarded. Additional hydrocarbon data recorded during other testing periods agree with the data from 3/02/88 and 3/03/88 and this data is considered representative.

Figures 3-1 and 3-2 show graphs of continuous monitoring data for each of the stack gas constituents measured on Wednesday, 03/02/88. Figures 3-3 and 3-4 and Figures 3-5 and 3-6 show similar graphs for Thursday, 03/03/88 and Friday, 03/04/88, respectively.

3.7 PARTICLE SIZE DISTRIBUTION (PSD)

Particle size distribution at the inlet to the baghouse was determined using an Anderson impactor with eight stages and a pre-separator. The results are presented in Table 3-11 and graphically depicted in Figure 3-7. The results are presented as 50 percent cut point and the fraction < 2 um. The 50 percent cut point represents the point where half of the weight of the particles are smaller than the stated size and half are larger. The fraction < 2 um gives the percentage by weight of the sample which is smaller than 2 um in diameter. 2 um represents the respirable particulate matter and is a common size used in reporting emissions. However, it is only used here to give the reader an idea of the relative size distribution.

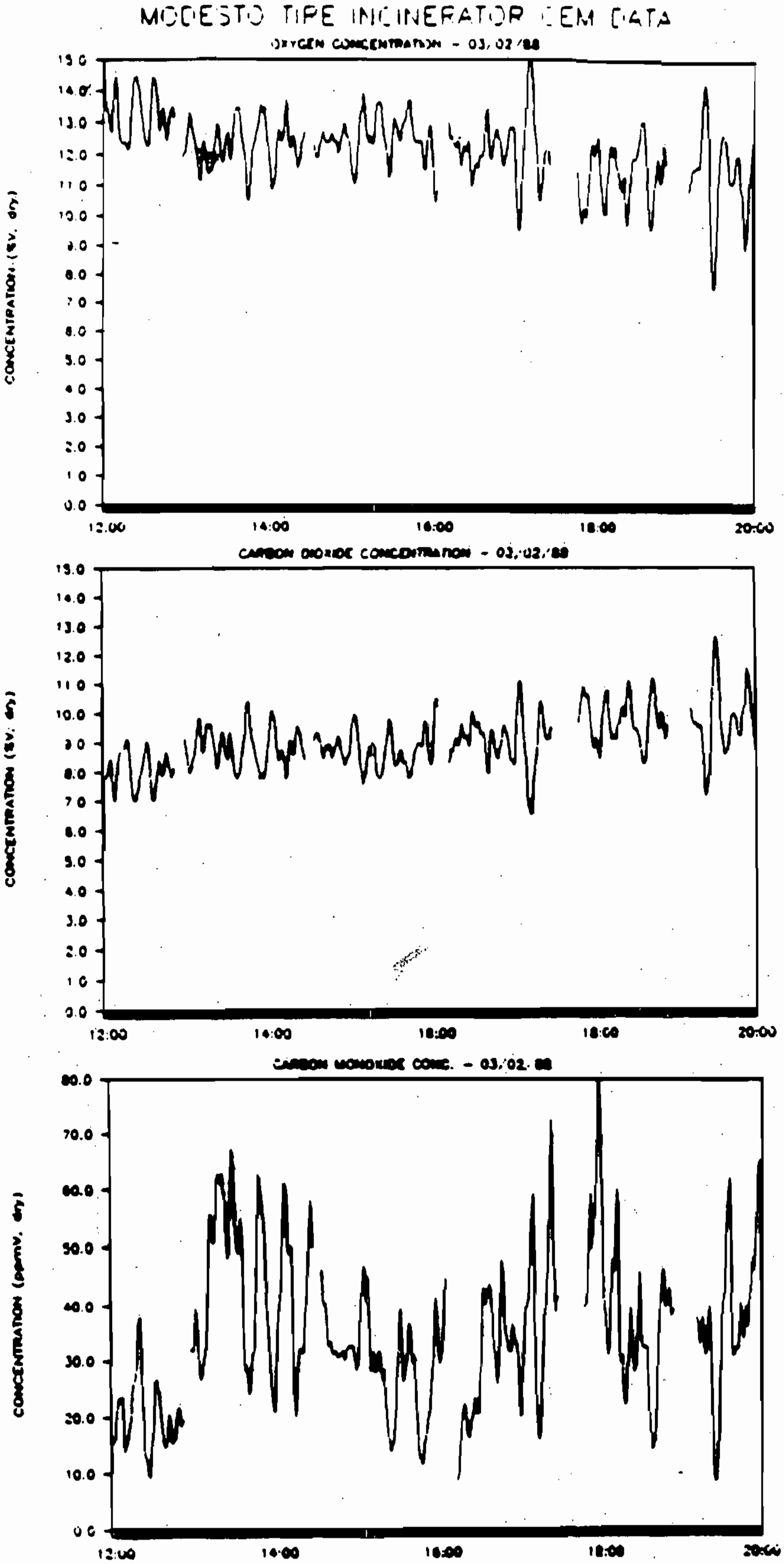


Figure 3-1. O_2, CO_2 and CO CEM data for 03/02/88.

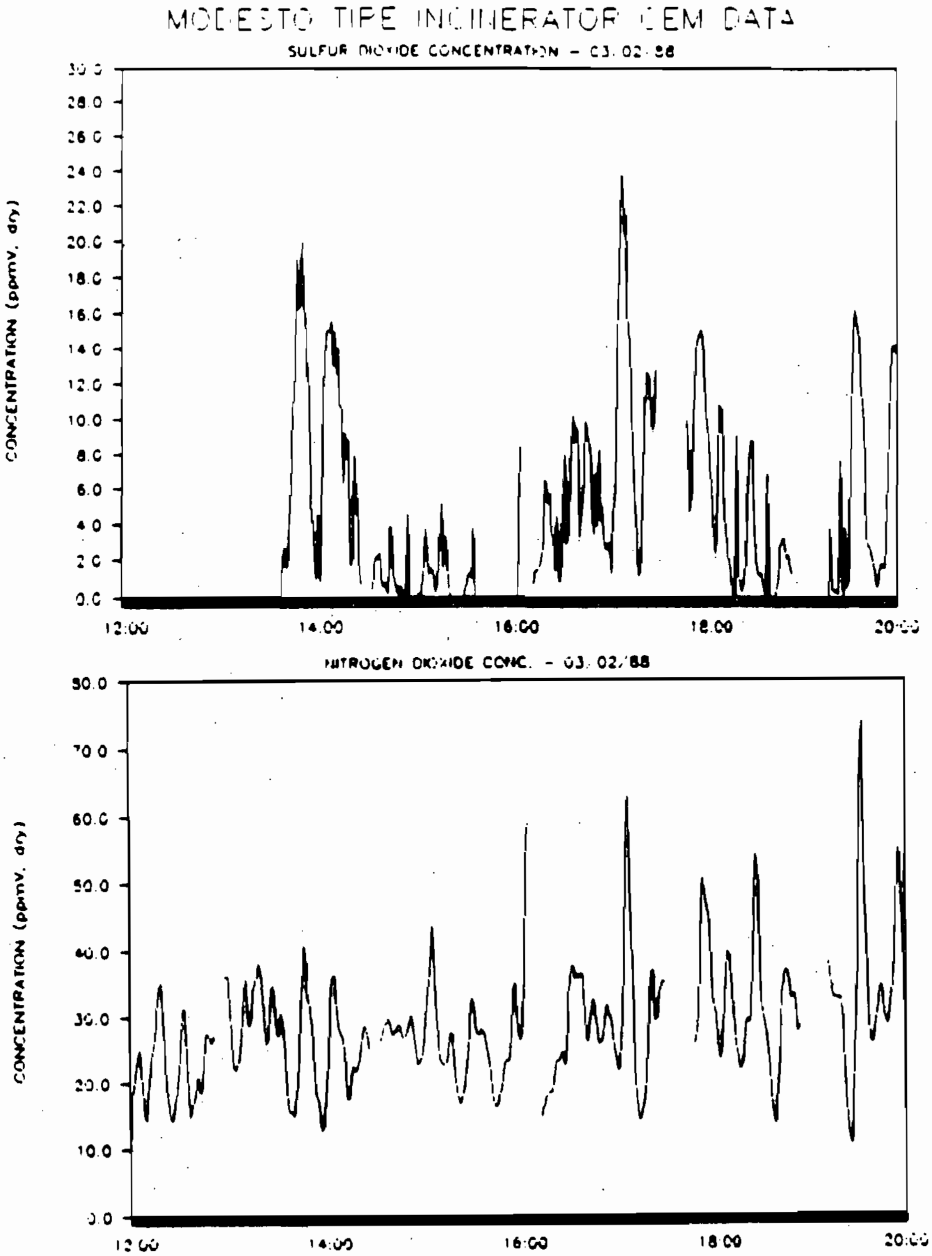


Figure 3-2. SO_2 and NO_2 CEM data for 03/02/88.

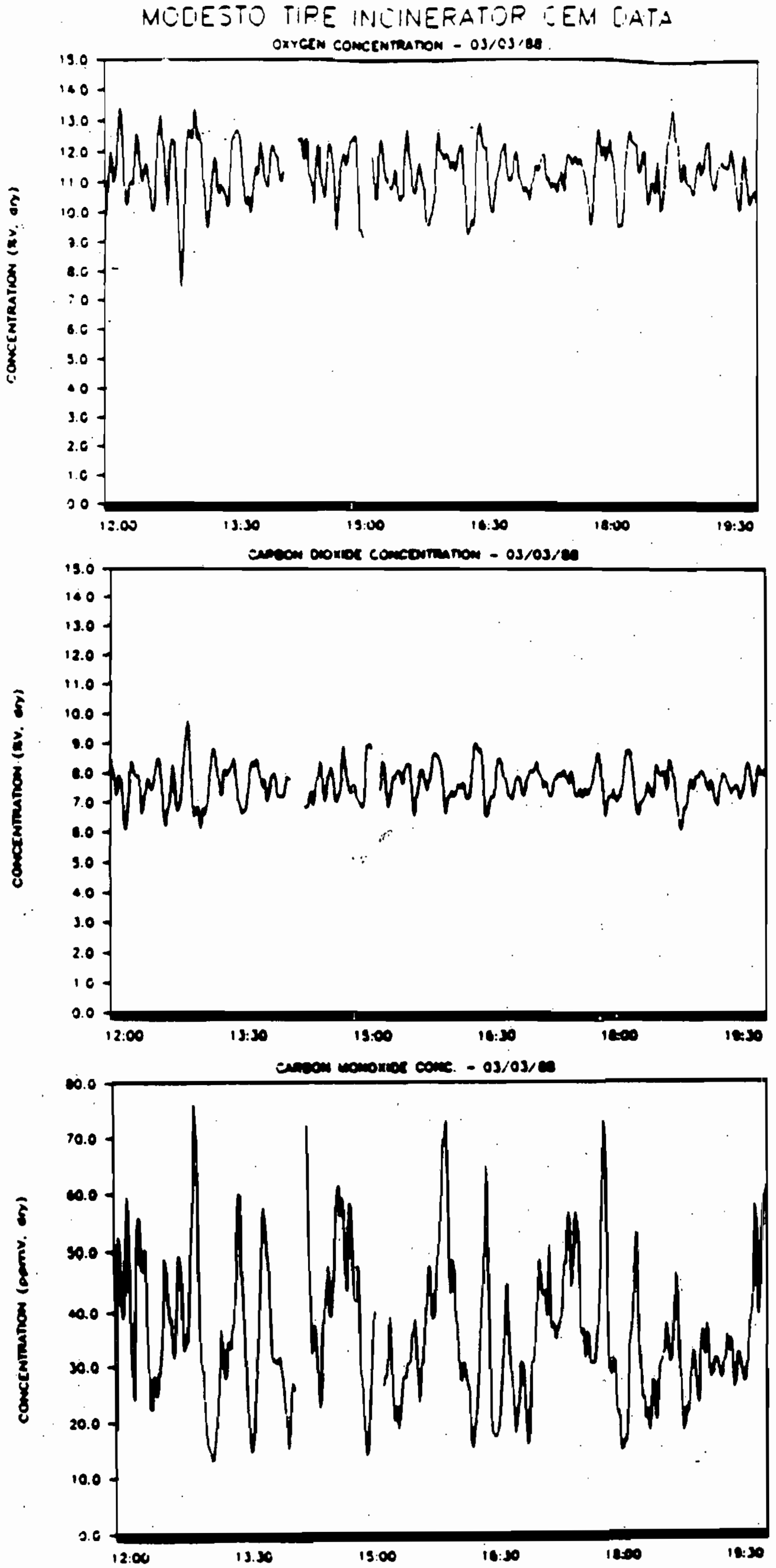


Figure 3-3. O_2, CO_2 and CO CEM data for 03/03/88.

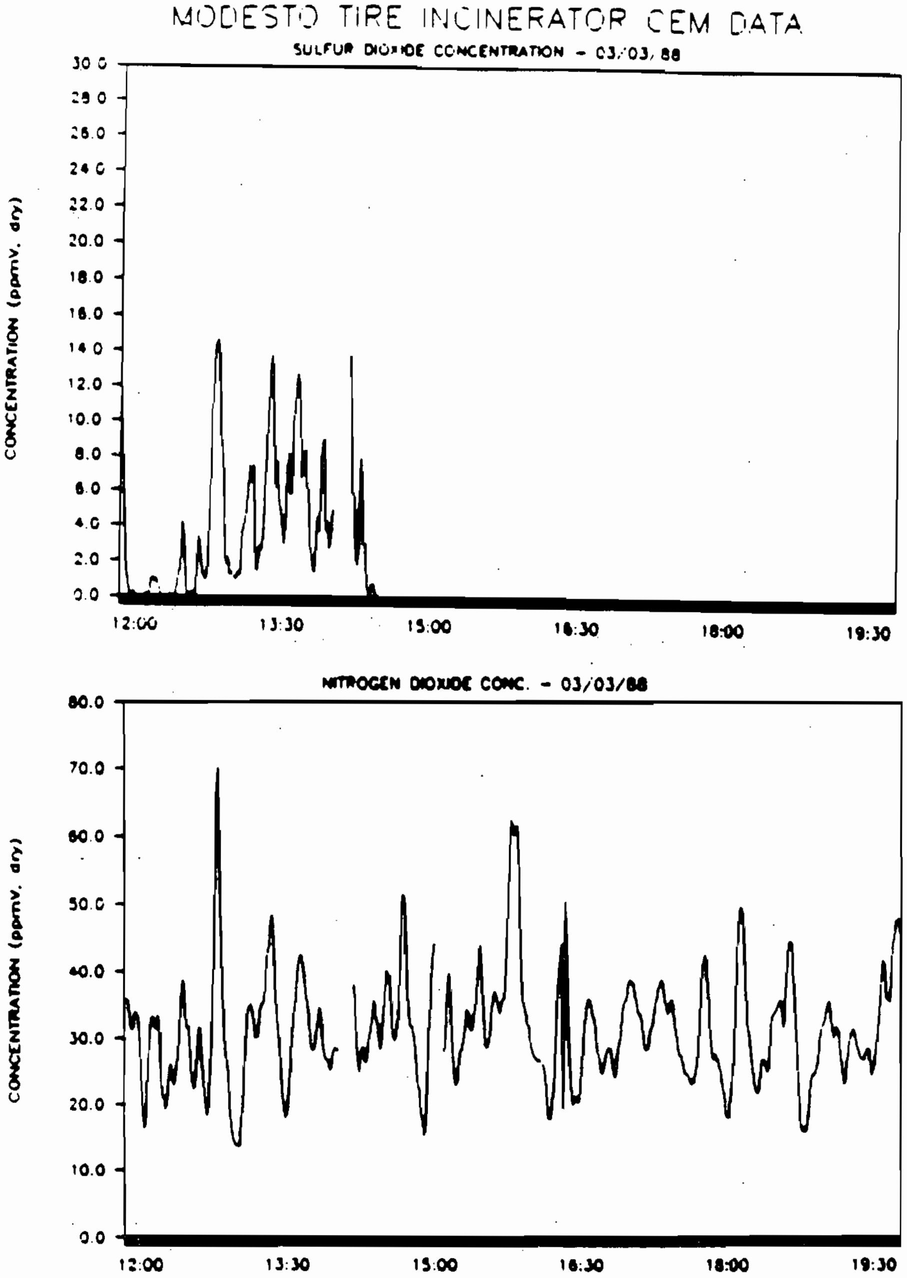


Figure 3-4. SO_2 and NO_2 CEM data for 03/03/88.

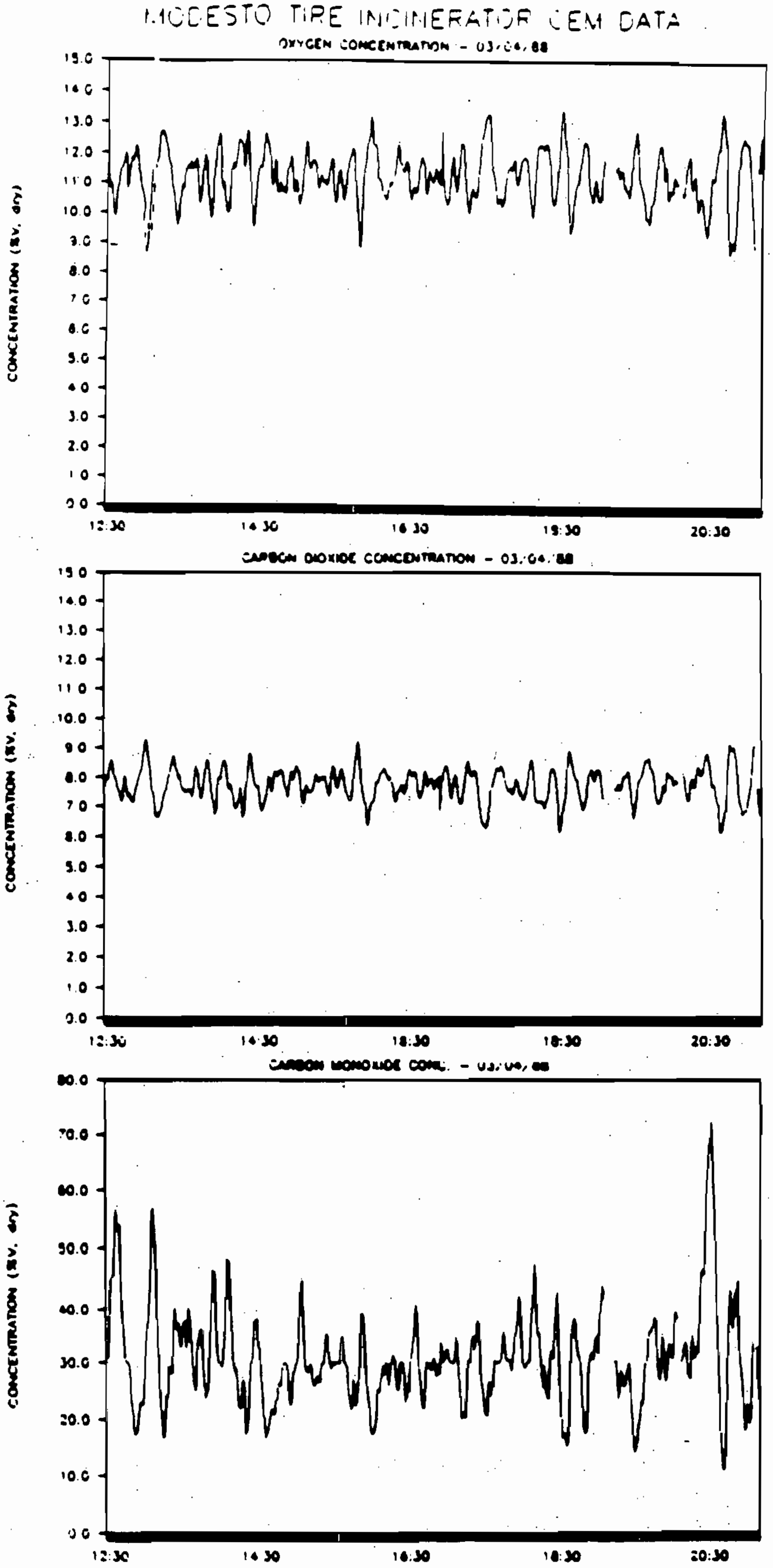


Figure 3-5. O_2, CO_2 and CO CEM data for 03/04/88.

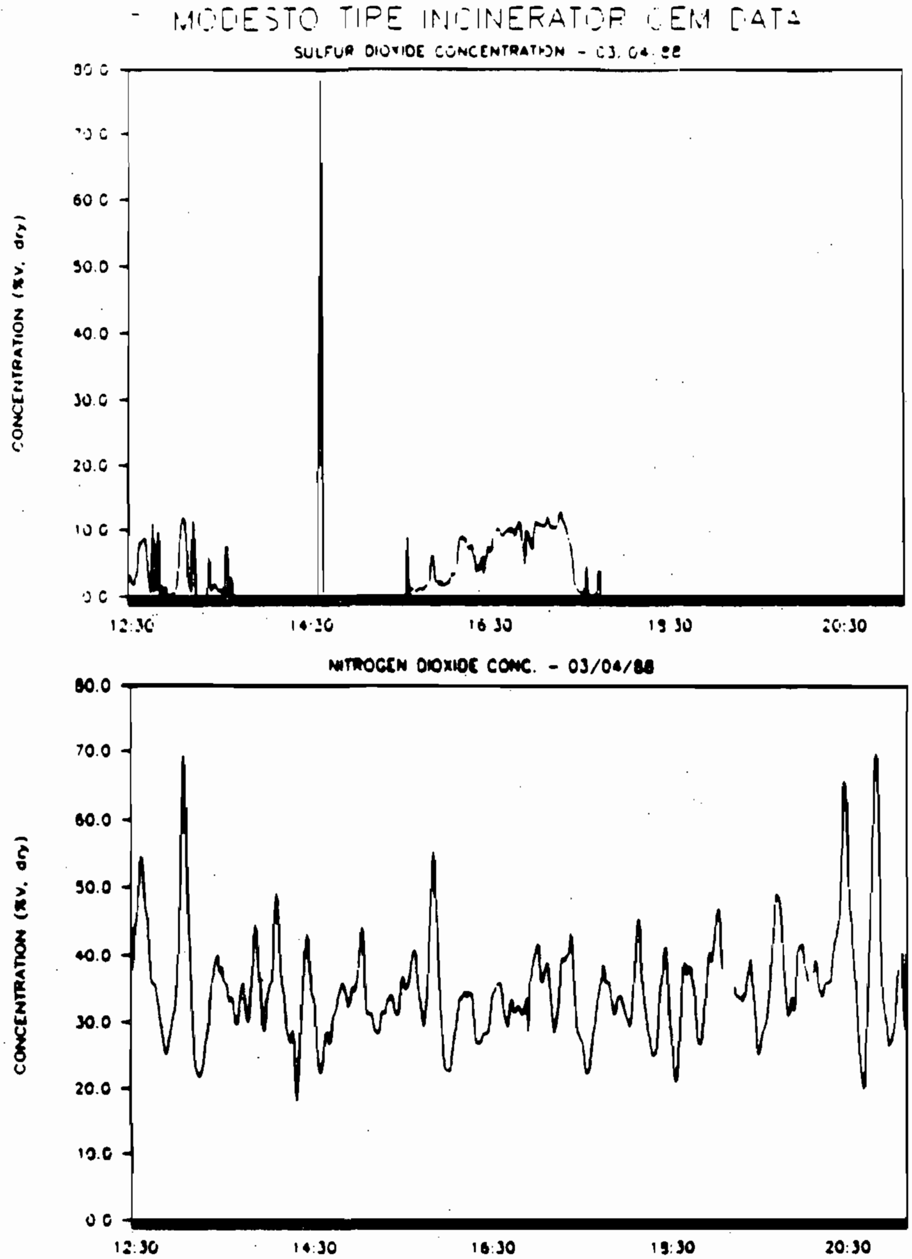


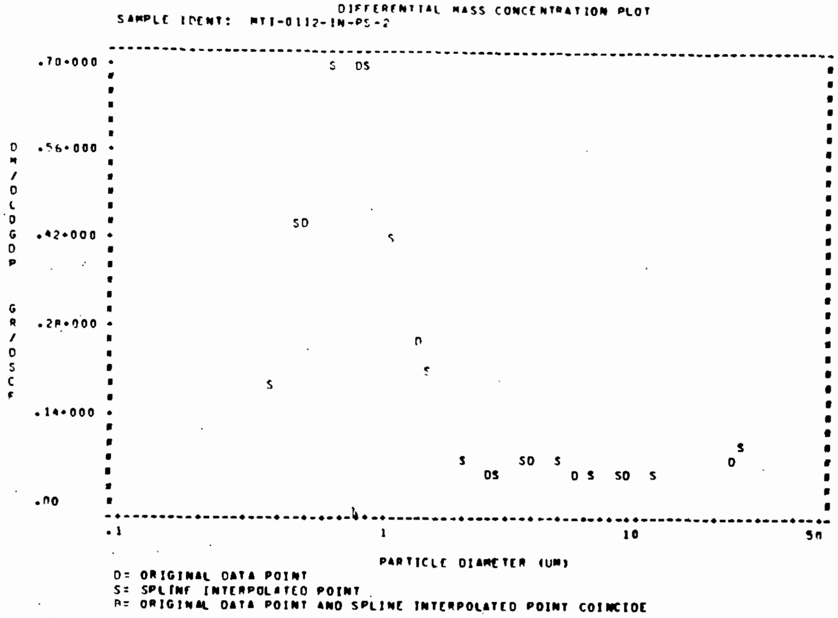
Figure 3-6. SO_2 and NO_2 CEM data for 03/04/88.

TABLE 3-11. PARTICLE SIZE DISTRIBUTION RESULTS

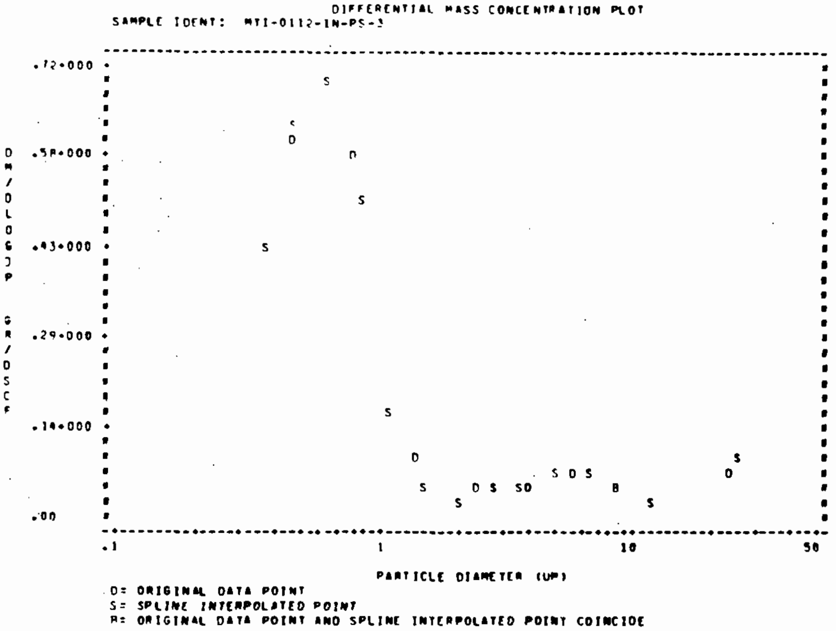
Run No.[*]	Mass Concentration gr/dscf	% Isokinetic	50% Cut Points	Fraction < 2.0 um	Duration of Test
2	0.433	91.9	0.92 um	78.6%	2 min
3	0.447	97.5	0.78 um	78.4%	2 min
4	0.389	93.0	0.87 um	82.8%	2 min
Average	0.423	94.1	0.86 um	79.9%	

[*] Run 1 was a trial run to ensure enough particulate was collected on each stage.

RUN #2



RUN #3



RUN #4

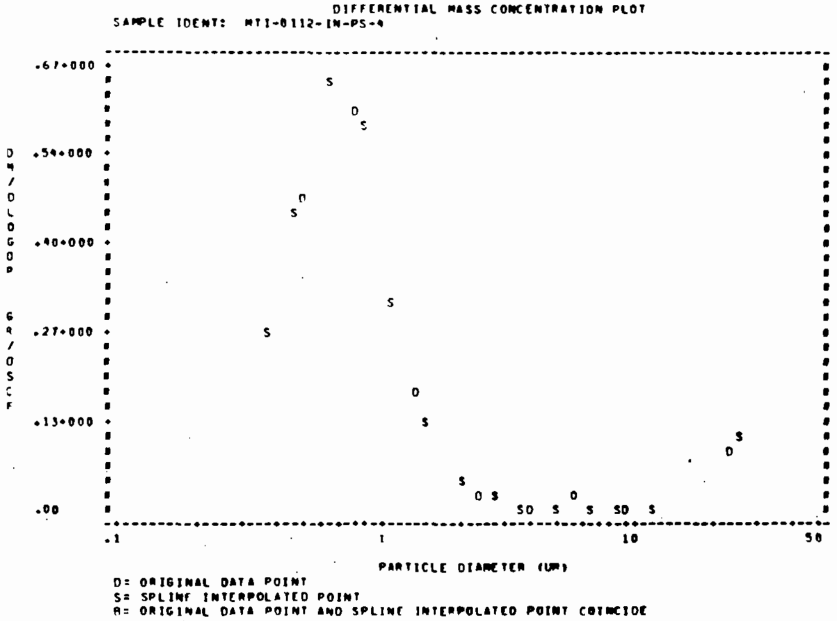


Figure 3-7. Particle size distribution of the boiler exhaust gases.

3.8 TRACE METALS

The front-half particulate catch taken during inlet particulate sampling was analyzed for trace metals. Metals results are presented in Table 3-12, and estimates of the mass emission rates of these metals are presented in Table 3-13. The FH inlet particulates contained very high levels of zinc and iron. Both of these metals are also major components of tires.

Estimates of the metals mass emission rates were calculated by assuming: 1) that the majority of metals present in the inlet and outlet flue gas are collected in the front half particulate, and 2) that significant metal condensation did not occur in the control equipment. Based on these assumptions, the minimum metals removal efficiency would be the same as the minimum front half particulate removal efficiency. The minimum front half removal efficiency for metals would therefore be 99.4 percent. It should be noted that particulate is added to the emissions from the scrubber solution and while this amount is not quanitified, it is included in the particulate and therefore, metals emission estimates.

TABLE 3-12. METALS CONCENTRATIONS IN INLET FRONT HALF PARTICULATE CATCH

Run	Concentration in ug/g												
	Al	As	Ca	Cd	Cr	Cu	Mg	Na	Pb	Fe	K	Zn	Hg
01	12,400	112	6,200	72	52	640	1,200	5,400	1,040	30,000	12,000	320,000	1.4
02	11,400	102	5,000	70	42	560	840	4,800	1,060	24,000	9,800	300,000	1.4
03	9,000	100	3,000	68	50	600	960	4,800	960	22,000	10,000	300,000	<1.0

TABLE 3-13. ESTIMATED METALS EMISSIONS FOR THE OUTLET BASED ON FRONT HALF FRACTION PARTICULATE LOADING AND METALS ANALYSES OF THE INLET FRONT HALF PARTICULATE FRACTION

Metal Species	Emission Rate (ug/sec) Run 1	Run 2	Run 3	Average
Al	554	2,762	1,078	1,464
As	5	24.7	11.5	13.7
Ca	277	1,211	340	609
Cd	3.22	17	7.97	9.38
Cr	2.32	10.2	5.51	6.00
Cu	28.6	136	69.1	77.8
Hg	0.063	0.34	< 0.12	< 0.17
Mg	53.6	203	109	122
Na	241	1,163	562	655
Pb	46.5	257	111	138
Fe	1,340	5,814	2,578	3,244
K	536	2,374	1,113	1,341
Zn	14,293	72,672	35,153	40,706

4.0 SAMPLING LOCATIONS, PROCEDURES AND ANALYSES

This section describes specific sampling locations and procedures that were used during the January and March 1988 test program at the Modesto tire to energy facility. The following subsections describe the sampling locations and sampling procedures in detail.

4.1 SAMPLING LOCATIONS

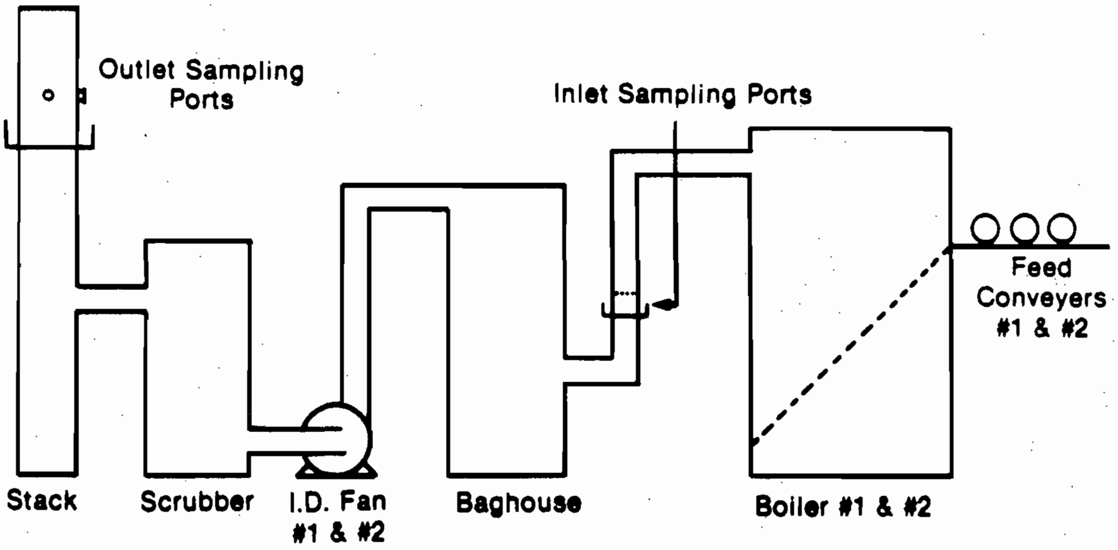
4.1.1 Stack

Figure 4-1 identifies the outlet stack sampling location used during the Modesto test program. The outlet stack is a 4.3 foot diameter common exhaust stack serving both of the facility's boilers. The emissions and flue gas parameters measured at the outlet stack location represents the combined exhaust stream after the gases have been treated by the air pollution control system. The sampling location for the outlet stack is approximately 110 feet above ground level and approximately 10 feet below the stack exit height. A schematic of the outlet stack location is shown in Figure 4-2.

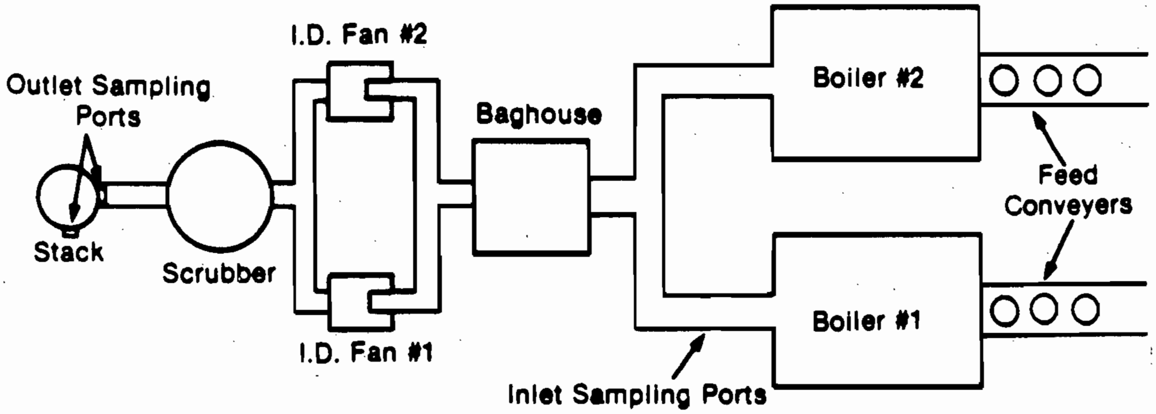
For the manual sampling methods, the controlled flue gas was sampled through two 4 inch access ports located at right angles to each other. CEMs were sampled through a similar port on the opposite side of the stack. The sampling point layout, as specified in CARB Method 1, specifies a total of 12 traverse points (six on each axis). The traverse point layout and sample port orientation is shown in Figure 4-3.

4.1.2 Boiler Outlet

The point at which the samples were taken was located prior to the point where the flue gas from boiler number 1 merged with the flue gas from boiler number 2. Therefore, the mass flow rates determined from the



Side View



Top View

Figure 4-1. Schematic diagram of the Modesto Energy Company plant showing sampling locations.

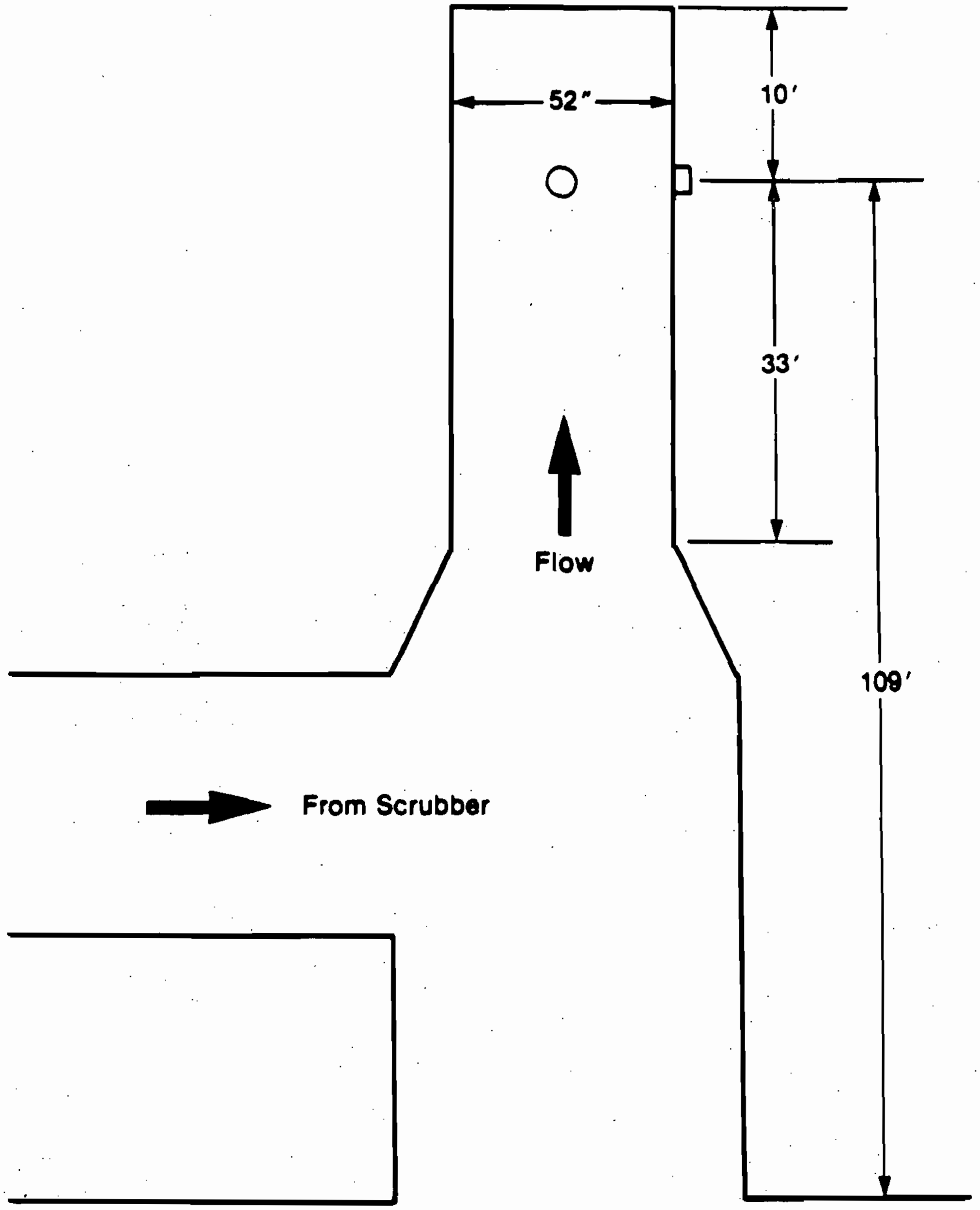
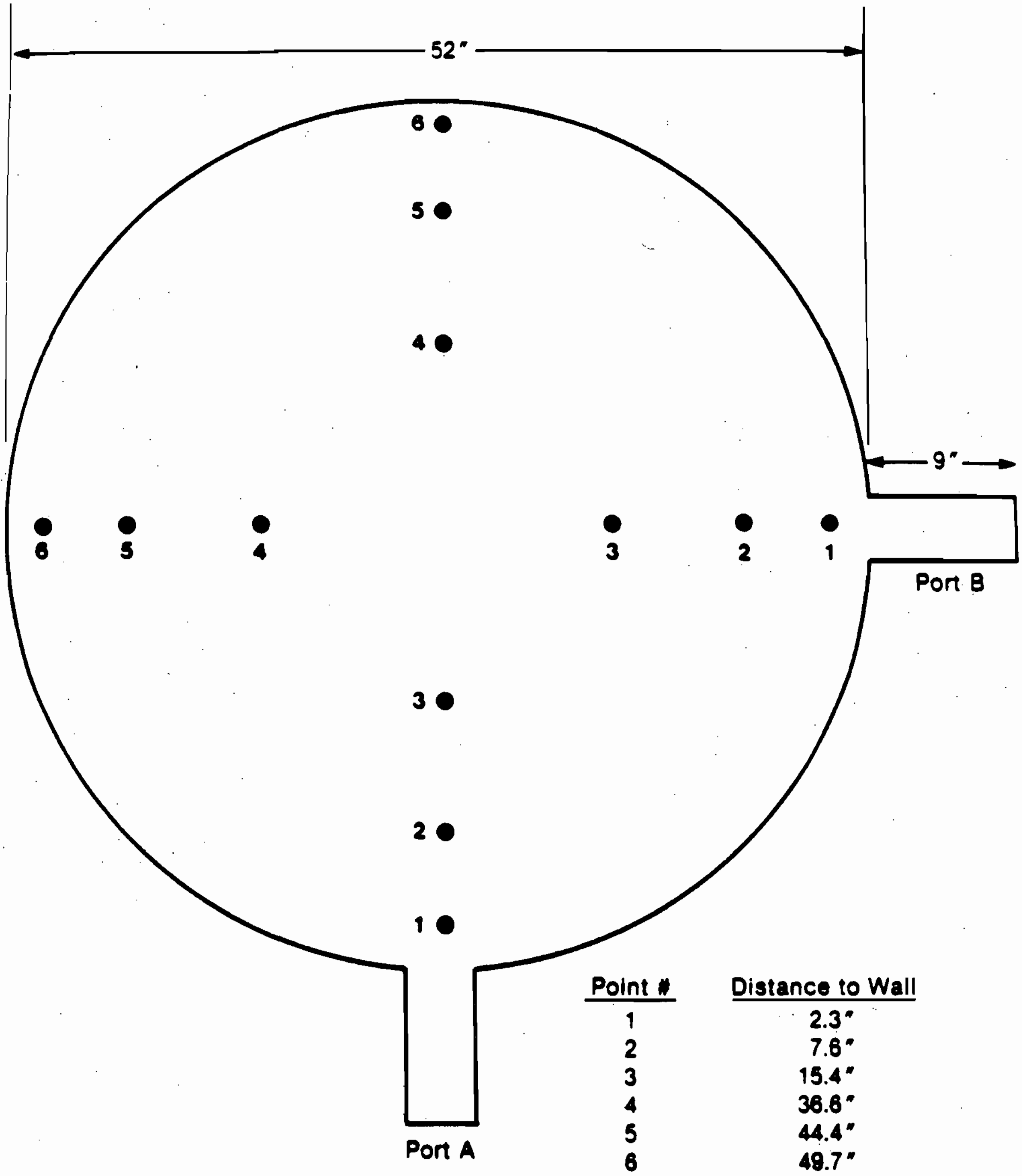


Figure 4-2. Outlet stack location at the Modesto Energy Company tire to energy facility.



Point #	Distance to Wall
1	2.3"
2	7.6"
3	15.4"
4	36.6"
5	44.4"
6	49.7"

Figure 4-3. Traverse point layout for the outlet stack sampling location.

boiler outlet location do not represent a total entering the baghouse. During testing the emissions from boiler number 1 comprised approximately 55 percent of the total emissions entering the control device. The results from this location which were expressed as flue gas concentrations should be representative of the total flue gas entering the baghouse.

The boiler outlet testing was performed in a vertical, 48 inch by 60 inch, rectangular duct. The sampling location was approximately 60 feet from ground level. Samples were collected through four 4-inch ports which are shown in Figure 4-4. The sampling point layout was determined as specified in California Air Resources Board (CARB) Method 1. The method specified that 12 sample points were required which are illustrated in Figure 4-5.

4.2 SAMPLING PROCEDURES

Manual gas sampling methods were used to collect flue gas samples for particulate grain loading, CDD/CDF, PAH, NH_3, SO_x, HCl, PSD, and metals. Manual methods were also used to measure gas velocity/volumetric flow and moisture content. Continuous sampling methods were used for determining stack gas SO_2, NO_x, CO, CO_2, O_2, and THC.

All testing was conducted in accordance with applicable CARB regulations as outlined in Volume 1 of the Stationary Source Test Methods (March 18, 1987). For those methods not covered in the CARB regulation, the best available technology was employed.

4.2.1 Manual Methods

4.2.1.1 CDD/CDF/PAH. Three test runs were performed at the outlet stack location for the determination of CDD/CDF/PAH. Each of the three test runs involved sampling for approximately eight hours to ensure a sufficient sample size to achieve the desired minimum detection limits.

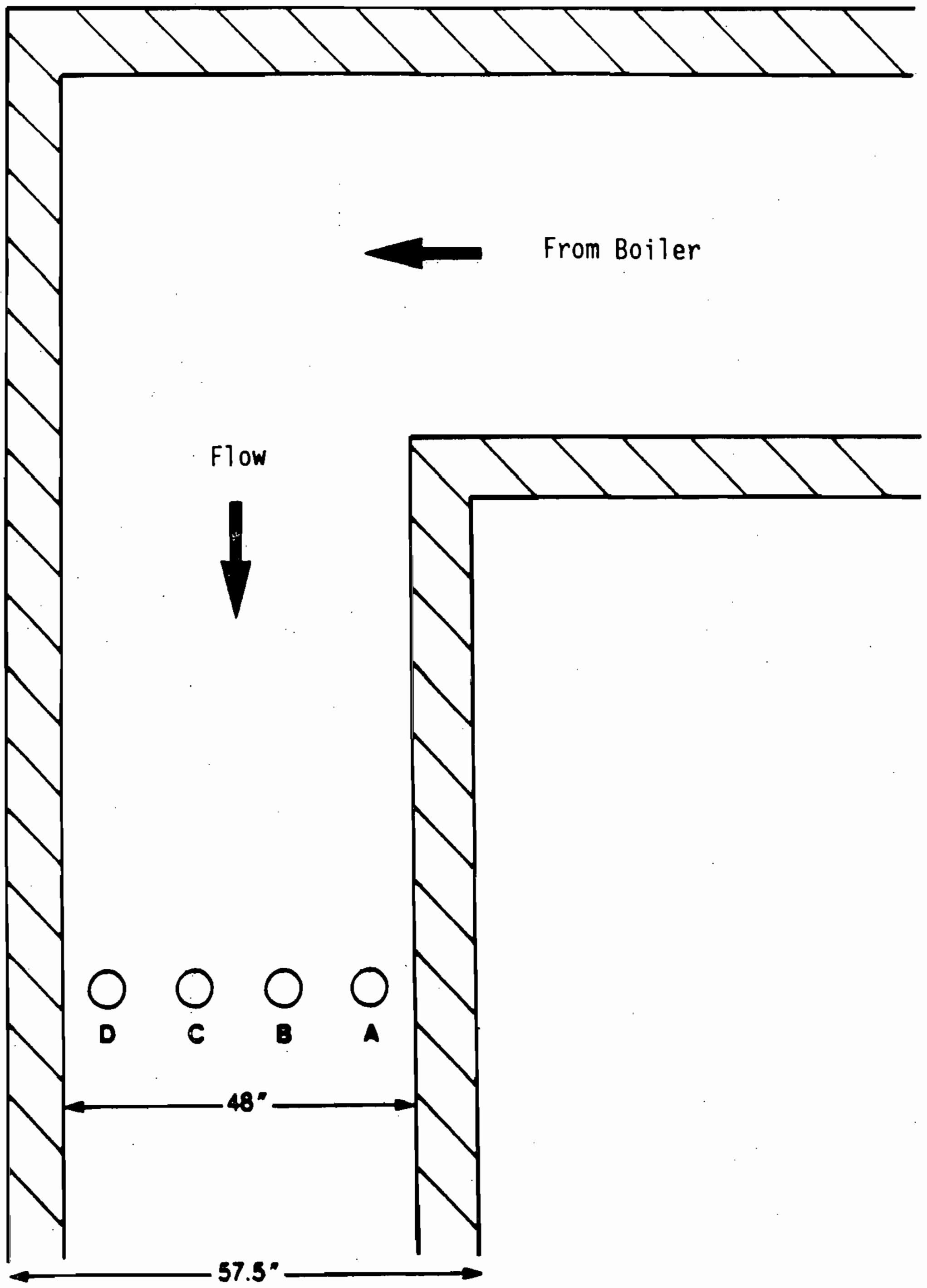


Figure 4-4. Schematic diagram of the boiler outlet sampling locations.

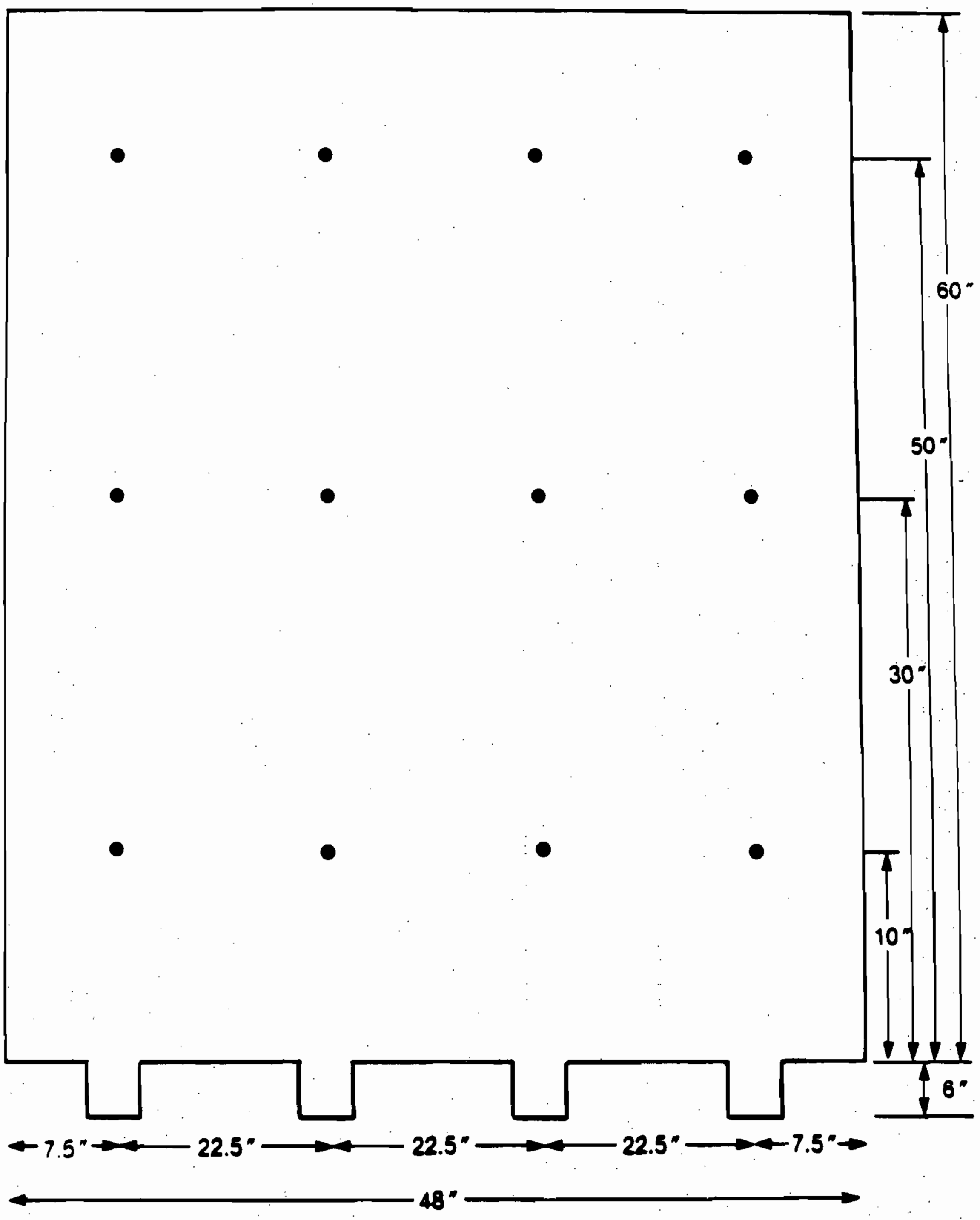


Figure 4-5. Traverse point layout for the boiler outlet sampling location.

The CARB regulation does not specify a method for collecting samples for determination of CDD/CDF/PAH. Therefore, gas sampling for these parameters was conducted according to the latest draft of the Environmental Standards Workshop (sponsored by EPA and ASME) chlorinated organic compound sampling protocol with several modifications.

The sampling method is a modified version of EPA Method 5 that includes a solid sorbent module for trapping vapor phase organics. Radian has modified the protocol to include:

- the use of a horizontal condenser; and
- the use of methylene chloride to replace hexane for final recovery of dioxins, furans, and PAH.

These deviations have been approved by EPA and have been used extensively in past programs conducted for the U.S. EPA. A schematic diagram of a typical MM5 sampling train is shown in Figure 4-6.

4.2.1.2 Ammonia (NH_3). The CARB regulation does not specify a method for the determination of ammonia from stationary sources; therefore, the best available technology was used. The method is based on a method currently being used by EPA's Emission Measurement Branch. The sampling train which was used is the same configuration as used for the CARB Method 5, except that midget impingers are used. A schematic of the sampling train used for NH_3 is shown in Figure 4-7. The following are changes to the CARB Method 5 approach that were made to enhance the collection of NH_3.

1. The samples were not collected isokinetically since the ammonia was in the gas phase and non-isokinetic sampling would not bias the sample. Therefore, a buttonhook nozzle was not required and the sample was collected at a constant rate.
2. The samples were collected from a single point in the sample stream.
3. An in-stack, glass wool plug was used to remove particulate from the flue gas sample instead of a glass fiber filter.
4. To enhance the collection of ammonia, 0.1 N sulfuric acid was used as the sampling reagent in the impingers.

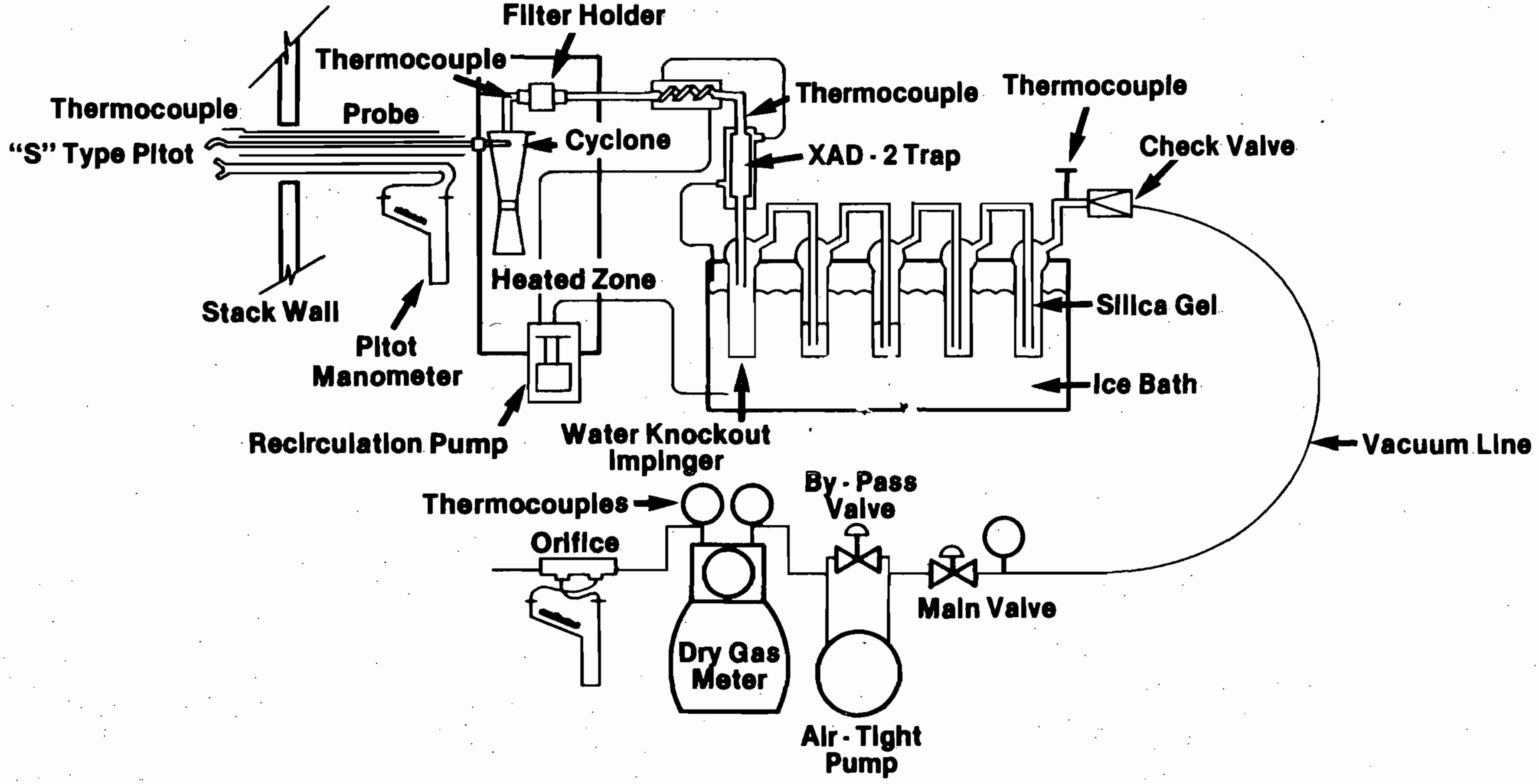


Figure 4-6. Schematic diagram of MM5 sampling train for collection of CDD/CDF/PAH.

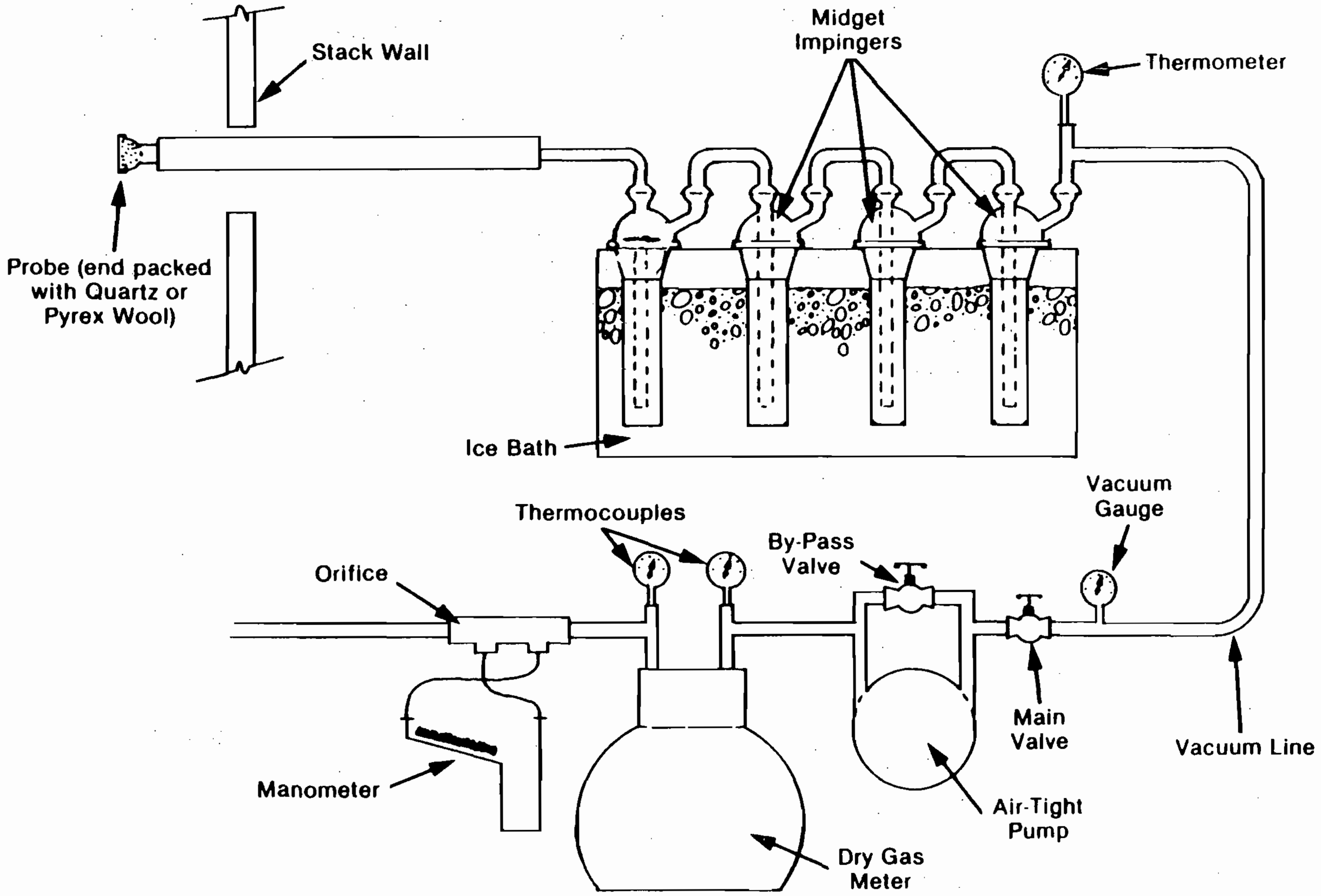


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Figure 4-7. Schematic diagram of the sampling train used for collection of NH_3.

The front half of this train was not recovered. The impinger solutions were recovered along with water rinses to yield the total sample. The ammonia was analyzed on-site using an ion specific electrode as discussed in Section 5.2.

4.2.1.3 Particulate Sampling.

4.2.1.3.1 Particulate/metals inlet location -- Particulate and metals were simultaneously collected in one sampling train. The method used is based on CARB Method 5 with the following exceptions:

1. 0.1 N HNO_3 replaced water in the first two impingers.
2. All glassware used 0.1 N HNO_3 as a final rinse to remove any metal contamination.

Figure 4-8 is a schematic of CARB Method 5.

4.2.1.3.2 Particulate/metals outlet -- The CARB Method 5 was used with no exceptions at the outlet location.

4.2.1.4 SO_x Sampling.

4.2.1.4.1 Sulfur oxides (SO_x) outlet -- Sulfur oxides at the outlet stack were measured using two separate methods. The manual approach using CARB Method 8 is described in this subsection. The second approach which utilizes continuous emission monitors (CEM) and determines sulfur dioxide (SO_2) concentrations is discussed in Section 4.2.2.1. This manual method distinguishes between SO_2 and SO_3. Three test runs were performed at the outlet stack location with the CARB Method 8 train, with each sample being collected for a total of 120 minutes.

The sampling train used for CARB Method 8 is identical to the train used for CARB Method 5 (Figure 4-8). The following modifications were made to enhance the capture of sulfur trioxide (SO_3) and sulfur dioxide (SO_2).

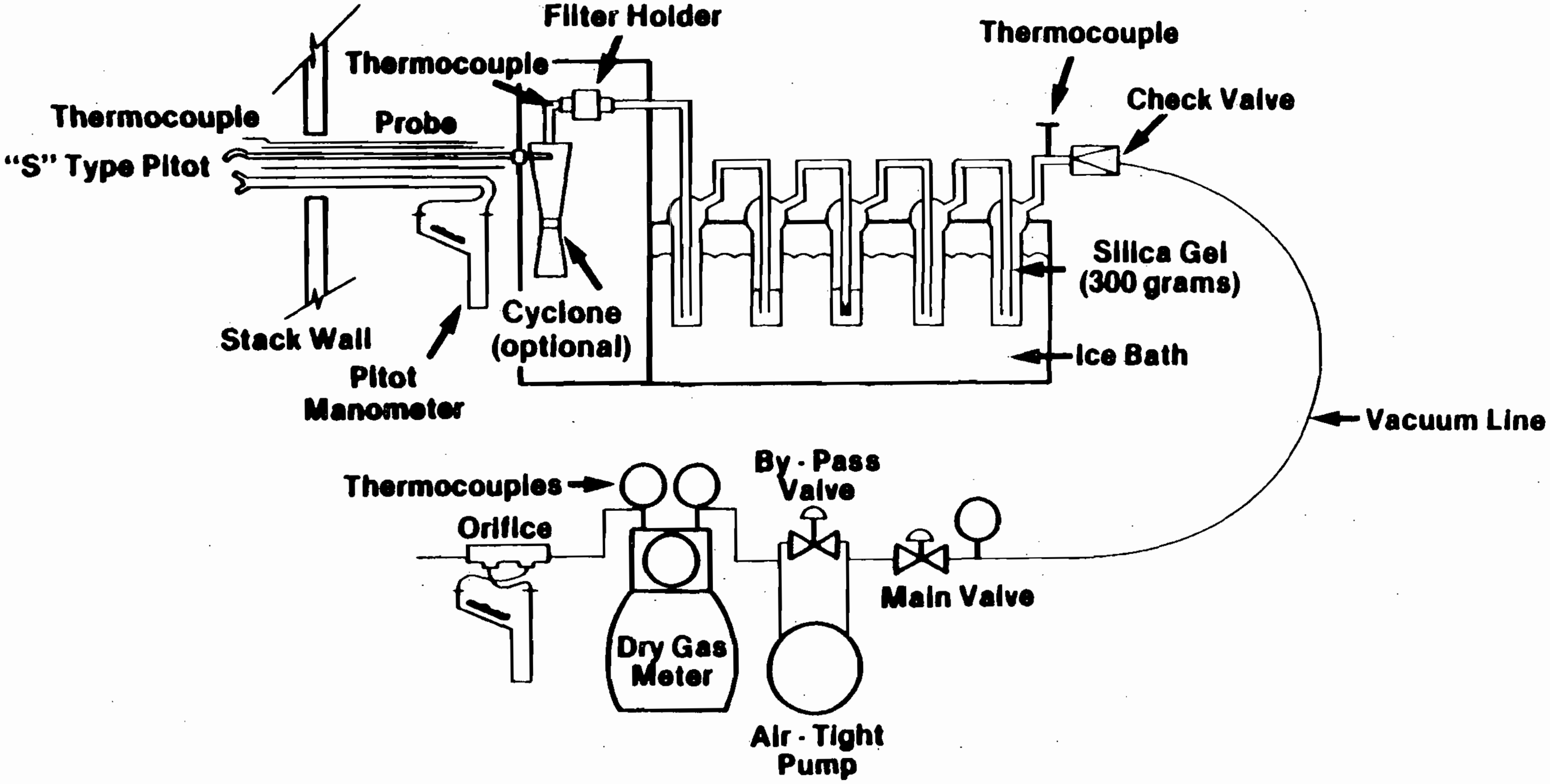

Figure 4-8. Schematic diagram of the CARB Method 8 sampling train with optional water knock-out impinger.

1. A glass wool plug was placed in the outlet of the first impinger to prevent acid mist carryover.

2. The second and third impingers contained 100 ml of 6 percent hydrogen peroxide (H_2O_2) (instead of 3 percent) to absorb sulfur dioxide (SO_2). This increase in H_2O_2 concentration was made to ensure adequate oxidation capacity in the impinger solutions, since stack gas NH_3 depletes some of the H_2O_2 in the train impingers.

The impingers were weighed before and after sampling to determine the moisture content of the flue gas. Each sample was recovered in two separate fractions. The first fraction included the probe rinse, filter, and the first impinger and its rinses (along with the glass wool plug). The second fraction included the second and third impingers and their rinses. Each of these fractions were analyzed separately on-site using a barium- thorin titration method to determine SO_3 (first impinger) and SO_2 (second and third impingers). The sample recovery and the analytical approach is discussed in Section 5.4.

4.2.1.4.2 <u>Sulfur oxides (SO_x) inlet</u> -- Sulfur oxides at the boiler outlet location were measured using two separate manual methods. The first approach used CARB Method 8 described in the above subsection. Three two hour test runs were performed using CARB Method 8.

Sulfur oxides at the boiler outlet were also determined by using the controlled condensate sampling technique (CCS) used for separate and quantitative collection of SO_2 and SO_3/H_2SO_4 in the flue gas. The sampling train (Figure 4-9) consisted of the following basic components:

- a high temperature (600^oF) quartz lined probe;
- a high temperature (600^oF) quartz filter holder for particulate removal;
- a temperature controlled (140^oF) condenser for collection of SO_3/H_2SO_4;
- an impinger train for SO_2 and moisture removal; and
- a pump and dry gas meter for controlling and monitoring sample flow.

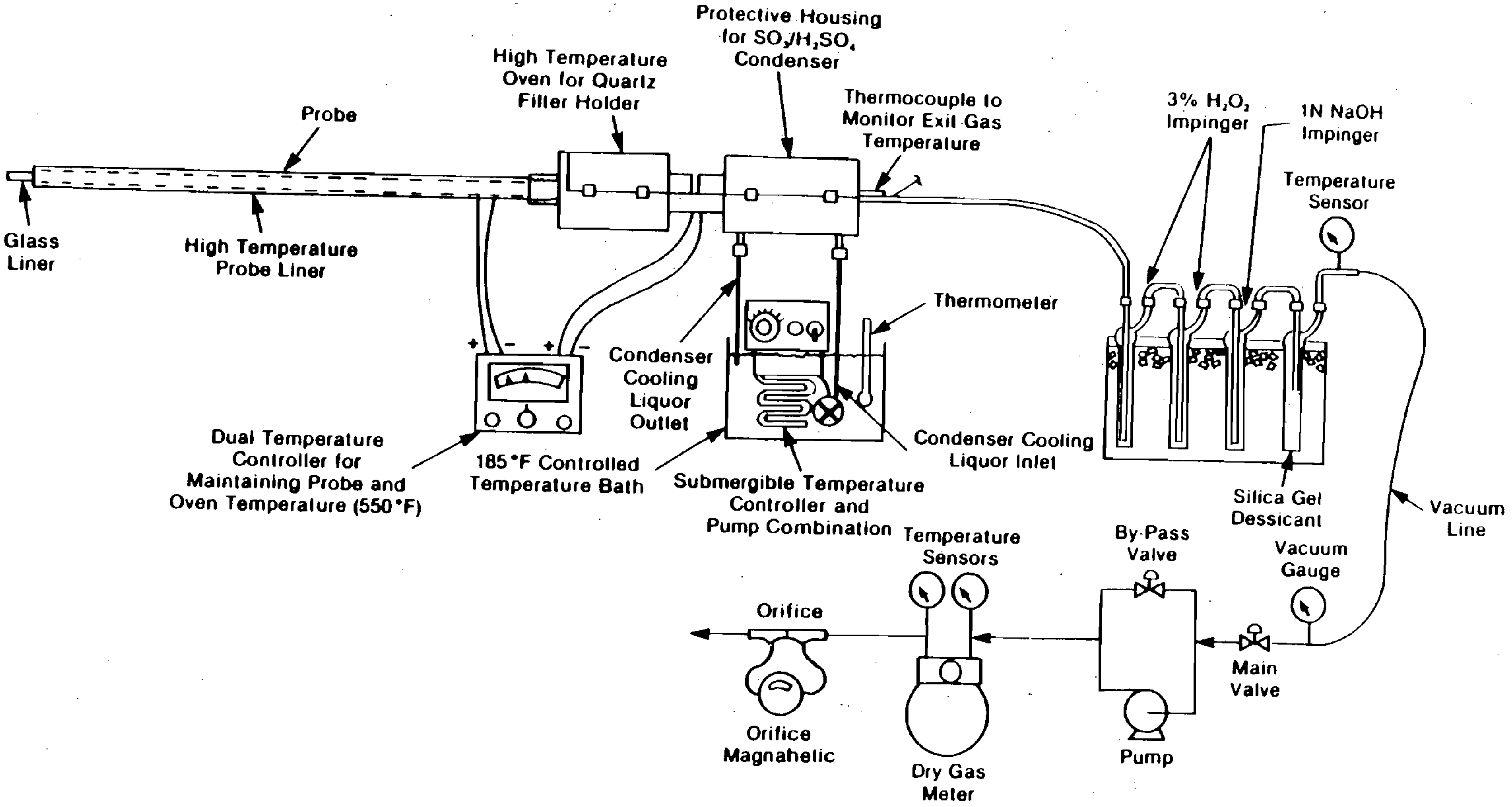

Figure 4-9. Schematic diagram of the Goksoyr-Ross controlled condensate sampling system.

This system was designed based on previous studies sponsored by the EPA. Sample recovery and analysis procedures are discussed in Section 5.4.

4.2.1.5 Hydrochloric Acid (HCl). Hydrochloric Acid sampling was conducted at the boiler outlet and the outlet stack locations. Each sample was collected for a total of 120 minutes. The process was operating with ammonia injection at the economizer inlet during all HCl determination runs. The HCl train used in the March test was modified to give a heated probe and filter temperature which was at least as high as the flue gas temperature (~500^{O}F). Temperatures higher than those required by the method were used to avoid condensing or reaction of the HCl prior to passing through the filter. The high temperature train was only used at the inlet to the baghouse to determine the chloride content of the tires.

The HCl sampling at the outlet was conducted according to CARB Method 421. The sampling technique and sampling train used for CARB Method 421 are identical to those used for CARB Method 5 (Figure 4-8). The only difference between the two methods was that the first and second impingers each contained a 100 ml buffer solution of 3 mM sodium bicarbonate ($NaHCO_3$) and 2.4 mM sodium carbonate (Na_2CO_3) instead of distilled, deionized water. This solution was also used during recovery to rinse the impingers.

The front half of the outlet sampling train was not recovered for HCl analysis. The impingers were weighed before and after sampling to determine the moisture content of the flue gas. The impingers were recovered in two fractions. The first fraction consisted of the first impinger contents and its rinses. The second fraction consisted of the contents of the second and third impingers and the rinses of the connecting glassware. Each sample was analyzed separately by ion chromatography as specified in the method and the analysis is described in Section 6.4.

4.2.1.6 Flue Gas Volumetric Flow Rate. The volumetric stack gas flow rate for both stack outlet and inlet locations was determined using procedures described in CARB Method 2. Based on this method, the volumetric flow rate was determined by measuring the cross-sectional area of the stack and average velocity of the flue gas through this cross-sectional area.

Pressure and temperature profiles were obtained by an S-type pitot tube and type K thermocouple at each of the traverse points. An inclined oil manometer was used to measure pressure differential across the S-type pitot tube. Static gas pressure was measured by an S-type pitot tube with the faces aligned at right angles to the gas stream flow. One side of the pitot was disconnected after proper placement and static pressure was determined using an oil-filled manometer.

4.2.1.7 Flue Gas Molecular Weight Determination. The molecular weight of the flue gas was determined during each run using the CO_2, and O_2 values from the integrated bag sample and Orsat analysis described in CARB Method 3.

4.2.1.8 Flue Gas Moisture Content. The moisture content of the flue gases were determined using procedures described in CARB Method 4. Based on this method, a known volume of particulate-free gas was pulled through a chilled impinger train. The quantity of condensed water was gravimetrically determined and then related to the volume of gas sampled.

The moisture content of the flue gas was determined simultaneously during the operation of the MM5, M5, HCl, and SO_x trains. The impingers used with these trains were weighed before and after sampling. The mass increase in moisture is related to the volume of gas sampled to calculate the moisture content of the flue gas.

4.2.1.9 Particle Size Distribution (PSD). The size distribution of particulate matter in the flue gas was determined at the boiler outlet location using an Anderson Mark III cascade impactor. The Anderson Mark III is an in-stack impactor which classifies particles according to aerodynamic size, as opposed to physical diameter. Particles were classified as equivalent aerodynamic diameters of spherical particles with a mass density of 1 gm/cc.

All PSD samples were isokinetically withdrawn in order to obtain a representative sample of air stream particles.

4.2.2 Continuous Emission Monitoring

During each of the outlet location test runs performed in March, stack gas concentrations of SO_2, NO_x, CO, CO_2, O_2, and THC were determined using continuous emission monitors (CEM). The CEM system was operated according to the procedures outlined in CARB Method 100.

The stack gas sample was continuously withdrawn from a single point in the exhaust gas stream and transferred to the CEM trailer through heat-traced Teflon lines. The sampled flue gas was conditioned (temperature lowered and particulate removed) and subsequently split using a manifold to provide sample gas to each of the analyzers.

All of the CEM instruments were linked to a data acquisition system. The acquisition system scanned the detector responses from each instrument at a rate of 2,000 times per minute and calculated one-minute averages which were printed and recorded on computer disk. The signals from the instruments were also recorded on strip charts as a back up. At the end of the test, the data was edited for blowbacks and corrected for drift using a computer program which calculated the incremental drift for each one-minute observation.

The following subsections provide a brief description of the CEM instrumentation that was used.

4.2.2.1 <u>Continuous Monitoring for SO_2</u>. Stack gas SO_2 concentrations were monitored using a TECO 40 SO_2 analyzer which uses pulsed ultraviolet (UV) radiation and a photomultiplier tube (PMT) detector. This particular analyzer and principle of detection was specifically selected since the detector does not experience the degree of interference by NH_3 as compared to instruments using a continuous UV spectrophotometric technique.

4.2.2.2 Continuous Monitoring for NO_x. Stack gas NO_x concentrations were monitored using a Thermo Electron Model 10AR. The principle of operation of this instrument is a chemiluminescent reaction in which ozone (O_3) reacts with nitric oxide (NO) to form oxygen (O_2) and nitrogen dioxide (NO_2). During this reaction, a photon is emitted which is detected by a photomultiplier tube. The instrument is capable of analyzing total oxides of nitrogen (NO + NO_2) by thermally converting NO_2 to NO in a separate reaction chamber prior to the photomultiplier tube. All NO_x measured is reported as NO_2, based on California State protocol.

4.2.2.3 Continuous Monitoring for CO_2. Stack gas CO_2 concentrations were monitored using a Beckman 865 Non-dispersive Infrared (NDIR) analyzer. This instrument operates by emitting specific wavelengths of infrared radiation through a sample cell which is selectively absorbed by CO_2 molecules in the sample stream.

The intensity of radiation which reaches the end of the sample cell is compared to the intensity of radiation through a reference cell. A reference cell is used to determine background absorbance which was subtracted from the sample absorbance. Absorbance at specific wavelengths for CO_2 is directly proportional to the CO_2 concentration in the gas.

4.2.2.4 Continuous Monitoring for CO. Stack gas CO concentrations were monitored using the TECO 48 Gas Filter Correlation Non-dispersive Infrared (GFC-NDIR) analyzer. The GFC-NDIR analyzer differs from most NDIR analyzers in that it is both more sensitive and more selective. The GCF-NDIR uses a single cell with no reference cell. This allows for multiple beam passes through the cell, improving sensitivity and accuracy.

The reference potential is provided for in the chopper blade itself. The blade consists of two equally sized compartments or gas filters. One side is filled with nitrogen and the other is filled with a high concentration of CO. The nitrogen allows the incident beam to pass freely into the sample cell where radiation is absorbed by CO molecules. When the blade rotates and the beam passes through the CO filter, all wavelengths specifically absorbed by CO are blocked and do not enter the sample cell. The gas filter, therefore, reduces interference problems associated with NDIR by selectively differentiating between wavelengths which are absorbed by CO and those which are not.

4.2.2.5 <u>Continuous Monitoring for O_2</u>. Stack gas O_2 concentrations were monitored using a Thermox WDG III which measures oxygen content using an electrochemical cell. Porous platinum electrodes are attached to the inside and outside of the cell which provide the instrument voltage response. Zirconium oxide, contained in the cell, conducts electrons when hot due to the mobility of oxygen ions in its crystal structure. A difference in oxygen concentration between the sample side of the cell and the reference (outside) side of the cell produces a voltage. This response voltage is proportional to the logarithm of the oxygen concentration ratio. A linearizer circuit board is used to make the response linear with concentration. Reference gas is ambient air at 20.9 percent oxygen by volume.

4.2.2.6 <u>Continuous Monitoring for THC</u>. Continuous monitoring for THC was performed at the stack outlet. The THC concentrations were monitored using a Beckman 402 flame ionization detector (FID). The sample gas is passed through a flame produced by combining H_2 and air. The flame ionizes any hydrocarbons which are burned into H ions and C ions. These ions pass by two charged plates in the exhaust gas. The amount of current conducted between these plates is directly proportional to the amount of ionization occurring in the flame. A propane calibration gas is used for a reference.

4.3 ANALYTICAL METHODS

4.3.1 CDD/CDF/PAH

Upon completion of each test run, the MM5 trains were leak checked, disassembled, and transported from the outlet stack to the on-site MM5 recovery trailer. Openings on each of the disassembled sampling train components were capped with methylene chloride rinsed aluminum foil prior to transporting. As soon after the completion of a test as possible, MM5 sample trains were recovered. Liquid fractions were recovered into precleaned amber bottles in order to protect the samples from photodegradation.

At Triangle Laboratories, Inc., the sample components were extracted, combined, and concentrated according to the scheme shown in Figure 4-10. Isotopically labeled internal standards and surrogate compounds were added to the samples before beginning the extraction process.

The samples were analyzed for CDD and CDF by high resolution gas chromatography, followed by a high resolution mass spectrometry (HRGC/HRMS) according to a modified EPA/ASME approach. The PAH samples were analyzed using high resolution gas chromatography/low resolution mass spectrometry, using a modification of EPA Method 8270. Tables 4-1 and 4-2 show the target analytes for the CDD/CDF and PAH analyses, respectively.

4.3.2 Ammonia (NH_3) Specific Ion Probe

Ammonia samples were analyzed in the field during the March testing. The samples collected in the ammonia train were analyzed using an ion specific electrode as described in NIOSH Method S347. An Orion Research ammonia electrode (Model 95-10) was used to determine the ammonia concentration of the samples. The Orion ammonia electrode is a gas-detecting electrode, sensing the level of dissolved ammonia in aqueous solutions. The ammonia concentration of the impinger solutions was determined using the

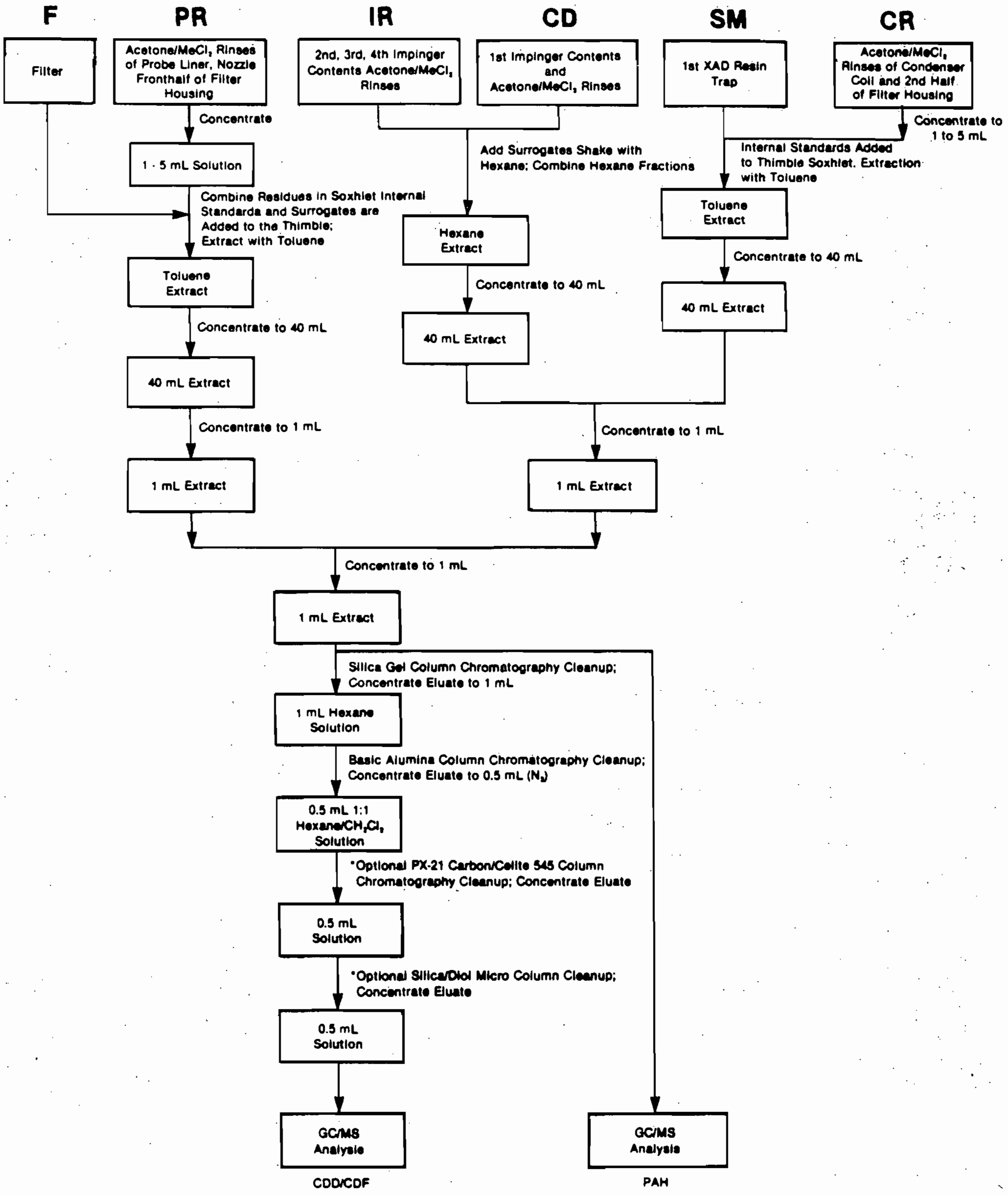

Figure 4-10. Analytical scheme for CDD/CDF/PAH analysis.

TABLE 4-1. TARGET CDD/CDF SPECIES

CDD

Monochlorodibenzo-p-dioxin (MCDD)
Total Dichlorinated dibenzo-p-dioxins (DCDD)
Total Trichlorinated dibenzo-p-dioxins (TrCDD)
2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD)
Total Tetrachlorinated dibenzo-p-dioxins (TCDD)
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (1,2,3,7,8-PeCDD)
Total Pentachlorinated dibenzo-p-dioxins (PeCDD)
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (1,2,3,4,7,8-HxCDD)
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (1,2,3,6,7,8-HxCDD)
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (1,2,3,7,8,9-HxCDD)
Total Hexachlorinated dibenzo-p-dioxins (HxCDD)
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (1,2,3,4,6,7,8-HpCDD)
Total Heptachlorinated dibenzo-p-dioxins (HpCDD)
Total Octachlorinted dibenzo-p-dioxins (OCDD)

CDF

Monochlorodibenzofuran (MCDF)
Total Dichlorinated dibenzofurans (DCDF)
Total Trichlorinated dibenzofurans (TrCDF)
2,3,7,8-Tetrachlorodibenzofuran (2,3,7,8-TCDF)
Total Tetrachlorinated dibenzofurans (TCDF)
1,2,3,7,8-Pentachlorodibenzofuran (1,2,3,7,8-PeCDF)
2,3,4,7,8-Pentachlorodibenzofuran (2,3,4,7,8-PeCDF)
Total Pentachlorinated dibenzofurans (PeCDF)
1,2,3,4,7,8-Hexachlorodibenzofuran (1,2,3,4,7,8-HxCDF)
1,2,3,7,8,9-Hexachlorodibenzofuran (1,2,3,7,8,9-HxCDF)
1,2,3,6,7,8-Hexachlorodibenzofuran (1,2,3,6,7,8-HxCDF)
2,3,4,6,7,8-Hexachlorodibenzofuran (2,3,4,6,7,8-HxCDF)
Total Hexachlorinated dibenzofurans (HxCDF)
1,2,3,4,6,7,8-Heptachlorodibenzofuran (1,2,3,4,6,7,8-HpCDF)
1,2,3,4,7,8,9-Heptachlorodibenzofuran (1,2,3,4,7,8,9-HpCDF)
Total Heptachlorinated dibenzofurans (HpCDF)
Total Octachlorinted dibenzofurans (OCDF)

TABLE 4-2. TARGET PAH SPECIES

Acenaphthylene
Acenaphthene
Fluorene
Phenanthrene
Anthracene
Fluoranthene
Pyrene
Benzo(a)anthracene
Chrysene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(e)pyrene
Benzo(a)pyrene
Perylene
Indeno(1,2,3-cd)pyrene
Dibenzo(a,h)anthracene
Benzo(g,h,i)perylene

method of known addition. Initially, the electrode was placed in a known volume of sample. Then a known volume of standard solution was added to the sample and the change in potential was recorded. The ammonia concentration was calculated using the potential change value along with instrument and electrode specific factors provided by the instrument manufacturer. Calibrations were performed before and after each individual measurement. The method of known addition is preferable to using calibration curves alone because it incorporates calibration procedures into each analysis.

4.3.3 Sulfur Dioxide (SO_2) and Sulfur Trioxide (SO_3) (March 1988 Testing)

The sulfur oxide samples collected using the CARB Method 8 train collected during the January testing were analyzed by titration in the on-site wet chemistry laboratory. In this sampling train, the SO_3 was collected in the 80 percent isopropanol solution as sulfate and SO_2 was oxidized to sulfate in the 6 percent hydrogen peroxide solution. Each of these components were then analyzed for sulfates using the barium-thorin titration method. In this method, barium ions react preferentially to form an insoluable barium sulfate precipitate. When the barium has reacted with all sulfate ions, excess barium then reacts with the thorin indicator to form a metal salt of the indicator, resulting in a color change.

4.3.4 Sulfur Dioxide (SO_2) and Sulfur Trioxide (SO_3) (January 1988 Testing)

The sulfur dioxide (SO_2) and sulfur trioxide (SO_3) samples were collected using the CARB Method 8 and the Goksoyr-Ross controlled condensate trains. For the CARB Method 8 train SO_3 was collected in the 80 percent isopropanol solution as sulfate and SO_2 was oxidized to sulfate in the hydrogen peroxide solutions. For the controlled condensate train the SO_3/sulfuric acid mist was condensed out in the initial condenser (as sulfate) and again the SO_2 was oxidized to sulfate in the hydrogen peroxide solutions. Each of these solutions were analyzed for sulfate by ion chromatography. The SO_2 and SO_3 concentrations were then calculated from the sulfate concentration of the sample by multiplying by the ratio of the molecular weights.

4.3.5 Hydrochloric Acid

The hydrochloric acid concentration of the flue gas was determined according to CARB Method 421. The gaseous chloride in the flue gas was collected in the sodium bicarbonate, sodium carbonate impinger solutions. These solutions were then analyzed for chloride by ion chromatography with conductivity detection. The type of columns and detectors required are specified in the method. The chloride peak was identified by characteristic retention time, and quantified by reference to external standards.

4.3.6 Particulate

Particulate grain loading was determined using CARB Method 5. After gravimetric analysis the particulate was analyzed for metals at the inlet location.

4.3.7 Metals

The particulate metals composition was determined by two methods: ICAP and AA. Aluminum (Al), Arsenic (As), calcium (Ca), cadmium (Cd), chromium (Cr), copper (Cu), magnesium (Mg), sodium (Na), lead (Pb), iron (Fe), potassium (K), and zinc (Zn) were determined by the inductively coupled argon plasma (ICAP) technique. The aliquot of particulate was dissolved in hydrofluoric acid then parr bombed at 150°C. The volume of the sample was then adjusted to 100 ml and analyzed by ICAP.

The mercury content of the particulate sample was determined by cold-vapor atomic absorption (AA) technique. The mercury in the sample is reduced to the elemental state and aerated from solution in a closed system. The mercury vapor passes through a cell positioned in the light path of an AA spectrophotometer and the absorbance is measured as a function of mercury concentration.

4.3.8 Particle Size Distribution (PSD)

Particle size distribution was determined at the boiler outlet with an Anderson Mark III Cascade Impactor. This impactor separates particles into ten sizes. Each of eight stage filters and the final filter are preweighed on a five place analytical balance and particle size distribution is determined gravimetrically. A cyclone pre-cutter was used to remove particles greater than 10 microns prior to impaction. These catches were weighed in a pretared container.

5.0 DATA QUALITY

Data quality, as used in this report, refers to the reliability of test results generated for the Modesto tire to energy facility. Data quality incorporates aspects of both precision and accuracy based on the sampling techniques, analytical methods, and analytical standards used. Ultimately, in Section 5.3, data quality will be expressed as the uncertainty in the calculated results based on the uncertainties in the primary measurements. This section gives insight into quality assurance/quality control tests that provide the basis for the data accuracy determinations and that ensure reliable sampling and analysis.

5.1 DATA QUALITY MEASUREMENTS

The following subsections describe the QA/QC measures that were performed on the individual sampling and analytical methods to define the accuracy or precision of the data.

5.1.1 Dioxin/Furan, PAH, PCB

To ensure accurate, representative, and precise data for the semi-volatile organic sampling train, the following procedures were followed.

Sampling

- The glassware was cleaned following the EPA protocol.
- The clean glassware was baked in the oven and then capped/sealed to prevent contamination.
- The XAD-2 was precleaned by extraction. The extract was screened by GC/FID for the presence of any hydrocarbons.
- The sealed train and XAD-2 were not used for any other purpose prior to the testing.

TABLE 5-1. SUMMARY OF SAMPLING ISOKINETICS AND LEAK CHECKS

Date	Sampling Train	Location	Percent Isokinetics	Final Leak Rate (cu.ft./min)
01/09/88	HCl	Inlet	91.7	<0.02 @ 10" Hg
01/11/88	HCl	Inlet	92.6	0.006 @ 8" Hg
01/09/88	HCl	Outlet	98.7	0.00 @ 6" Hg
01/11/88	HCl	Outlet	99.3	0.008 @ 10" Hg
01/09/88	Particulate	Inlet	93.0	0.010 @ 15" Hg
1/9-10/88	Particulate	Inlet	94.6	0.010 @ 10" Hg
01/10/88	Particulate	Inlet	93.9	0.005 @ 12" Hg
01/09/88	Particulate	Outlet	99.4	0.014 @ 8" Hg
01/10/88	Particulate	Outlet	100.3	0.013 @ 3" Hg
01/10/88	Particulate	Outlet	100.3	0.010 @ 6" Hg
01/09/88	NH3	Inlet	NA	<0.02 @ 10" Hg
01/11/88	NH3	Inlet	NA	<0.02 @ 10" Hg
01/09/88	NH3	Outlet	NA	<0.02 @ 10" Hg
01/11/88	NH3	Outlet	NA	0.012 @ 10" Hg
01/09/88	SOx(M8)	Inlet	90.8	0.015 @ 7" Hg
01/10/88	SOx(M8)	Inlet	93.0	<0.02 @ 10" Hg
01/10/88	SOx(M8)	Inlet	91.9	0.005 @ 8" Hg
01/09/88	SOx(M8)	Outlet	96.0	<0.02 @ 10" Hg
01/10/88	SOx(M8)	Outlet	98.7	0.007 @ 4" Hg
01/10/88	SOx(M8)	Outlet	100.1	0.01 @ 5" Hg
01/12/88	SOx(CCS)	Inlet	NA	<0.02 @ 10" Hg
01/12/88	SOx(CCS)	Inlet	NA	<0.02 @ 10" Hg
01/12/88	SOx(CCS)	Inlet	NA	<0.02 @ 10" Hg
01/12/88	SOx(CCS)	Inlet	NA	<0.02 @ 10" Hg
01/12/88	PSD	Inlet	91.3	0.008 @ 8 "Hg
01/12/88	PSD	Inlet	97.5	0.005 @ 8 "Hg
01/12/88	PSD	Inlet	93	0.000 @ 8 "Hg
03/02/88	CDD/CDF/PAH	Outlet	92.5	0.00 @ 20" Hg
03/03/88	CDD/CDF/PAH	Outlet	93.9	0.00 @ 28" Hg
03/04/88	CDD/CDF/PAH	Outlet	95.1	0.10 @ 10" Hg
03/04/88	NH3	Outlet	NA	0.00 @ 10" Hg
03/04/88	NH3	Outlet	NA	0.00 @ 10" Hg
03/04/88	NH3	Outlet	NA	0.00 @ 10" Hg
03/03/88	SOx	Outlet	98.5	0.02 @ 15" Hg
03/04/88	SOx	Outlet	97.1	0.00 @ 15" Hg
03/04/88	SOx	Outlet	97.0	0.00 @ 15" Hg
03/05/88	HCl	Inlet	NA	<0.02 @ 5" Hg

NA = Not applicable.

- The assembled trains were leak checked prior to and after the sampling. The results are presented in Table 5-1.
- The sampling train was recovered in a clean environment.
- A field blank train was assembled and recovered.

Analytical

- Dueterated compounds were injected into the sample in order to determine recovery efficiency. Table 5-2 lists the results of the surrogate and internal standard recoveries.
- Internal standards are placed in the sample as a means of calibrating each injection. (See Table 5-2.)
- The samples were extracted and subjected to two cleaning columns prior to analysis.
- The dioxin/furan samples were injected into the high resolution Mass Spectrometer twice; once on the dioxin separation column and once on the furan confirmation column.
- All of the internal quality checks for ion strength and injected compound recovery percentages were acceptable.
- The field blank and the method blanks were analyzed with results indicating no contamination was present.
- The calibration curves all fell into the expected ranges.

5.1.2 Particulate Matter (PM)

The following were conducted for the particulate sampling and analysis to ensure accurate, representative and contamination free samples.

- Each set of glassware was precleaned.
- Leak checks of the assembled train were conducted prior to and after sampling (see Table 5-1).
- Blanks of each solvent, including water were taken and analyzed. The results indicated no contamination.
- Isokinetic sampling rates were maintained throughout the sampling period (see Table 5-1).

TABLE 5-2. LABELED STANDARD RECOVERY RESULTS FOR THE MODESTO ENERGY COMPANY CDD/CDF ANALYSIS

Labeled Standard	Recovery (%)				
	Run 1	Run 2	Run 3	Field Blank	Lab Blank
Internal Standard					
(13)C12-TCDF 2,3,7,8	133.8	56.0	81.4	77.5	98.5
2378-(13)C12 TCDD	67.2	69.5	91.5	87.3	102.2
(13)C12-PCDF 1,2,3,7,8	79.2	76.9	102.1	77.1	121.4
(13)C12-PCDD 1,2,3,7,8	96.1	72.3	91.3	59.4	113.0
(13)C12-HxCDF 1,2,3,4,7,8	102.7	77.5	81.6	104.5	96.9
(13)C12-HpCDF 1,2,3,4,6,7,8	104.9	72.1	84.1	92.7	109.2
(13)C12-HpCDF 1,2,3,4,6,7,8	71.2	60.5	71.0	69.0	82.2
(13)C12-HpCDD	77.9	61.4	73.3	62.5	99.9
(13)C12-OCDD	49.1	50.4	52.8	36.1	86.7
Surrogates					
(37)C1-TCDD 2,3,7,8	107.7	95.4	87.7	72.2	100.6
(13)C12-HxCDF 1,2,3,7,8,9	96.0	92.6	101.8	68.5	87.1

- Filter specifications and weighing techniques of the method were adhered to. Radian maintains a separate humidity and temperature controlled room in order to control the weighing environment.
- Meter calibrations were performed prior to and after each test series according to EPA specifications.
- The percent moisture collected in the train was compared with other runs to ensure no sample dilution occurred.
- Each operator of the sampling train has at least three years experience in the sampling and analytical field.

5.1.3 Continuous Emissions Monitoring Data Quality

Continuous emissions monitoring for SO_2, NO_x, O_2, CO, CO_2, and THC were performed using the various instruments discussed in Section 4.0. Quality control procedures for all instruments are essentially the same, except that some additional QA/QC was performed for the SO_2 analyzer.

All Radian CEM instruments were calibrated prior to arrival on-site on a multipoint basis to assure the accuracy and linearity of response of each instrument. Two calibrations were performed daily on all instruments; one prior to sampling and one after sampling. The post test calibration was made without adjustments to check for drift. Any drift in the instruments was assumed to be linear and the data from each instrument was corrected in a linear fashion. Calibrations were performed by blowing excess sample up to the stack and back down through the sample lines and conditioning system. This method of calibration accounts for any sample bias due to the sampling system. A history of calibrations and drift checks is included in Table 5-3.

The primary control check for precision of the continuous monitors were the daily analysis of control standards. The control standards, which are certified (±2% accuracy), were introduced upstream of the sampling system like the calibration gases. The acceptance criterion for the daily control standard determination is agreement within ±10 percent of the certified concentration for each instrument. Table 5-4 shows the QC checks performed during each of the three compliance CEM tests.

TABLE 5-3. SUMMARY OF CEM CALIBRATION DATA

Parameter	Units	Zero Concentration	Span Concentration	Zero Response		Span Response		Percent Drift
				Initial	Final	Initial	Final	
03/02/88				(digital counts)		(digital counts)		(% of span)
Oxygen	%V	0.198	20	127	127	217.04	216.874	-0.2
Carbon Dioxide	%V	0	18	127	127	230.56	230.12	-0.4
Carbon Monoxide	ppmV	0	447.5	127	127	241.142	237.649	-3.1
Nitrogen Dioxide	ppmV	0	190.2	127	127	211.733	209.155	-3.0
Sulfur Dioxide	ppmV	0	81.9	127	127	(b)	142.007	(b)
Hydrocarbons	ppmV(a)	0	8.9	127	127	(b)	255	(b)
03/03/88								
Oxygen	%V	0.198	20	127	(c)	216.883	(c)	(c)
Carbon Dioxide	%V	0	8.02	127	(c)	171.746	(c)	(c)
Carbon Monoxide	ppmV	0	81	127	(c)	148.25	(c)	(c)
Nitrogen Dioxide	ppmV	0	190.2	127	(c)	212.213	(c)	(c)
Sulfur Dioxide	ppmV	0	81.9	127	(c)	141.549	(c)	(c)
Hydrocarbons	ppmV(a)	0	8.9	127	(c)	224.622	(c)	(c)
03/04/88								
Oxygen	%V	0.198	20	127	128.09	217.094	216.335	-0.8
Carbon Dioxide	%V	0	8.02	127	127	171.807	171.725	-0.2
Carbon Monoxide	ppmV	0	81	127	127	148.694	148.249	-2.1
Nitrogen Dioxide	ppmV	0	190.2	127	127	212.381	211.768	-0.7
Sulfur Dioxide	ppmV	0	81.9	127	127	141.643	142.329	4.7
Hydrocarbons	ppmV(a)	0	8.9	127	127	214.831	233.063	20.8

a. Expressed as ppmV Propane.
b. Offline for initial computer calibration, calibrated by millivolt output; low apperent drift.
c. Unable to perform valid final calibration due to Power outage. Assume no drift.

TABLE 5-4. COMPARISON OF METHOD 8 AND CEM SO_2 VALUES FOR MARCH 1988 TEST

Date	Sulfur Dioxide Emission Rate[a]	
	Method 8	CEM
Run 1	30.4 lbs/day	46.5 lbs/day
03/03/88	1.78 ppmv, dry	2.72 ppmv, dry
Run 2	43.5 lbs/day	53.0 lbs/day
03/04/88	2.57 ppmv, dry	3.12 ppmv, dry
Run 3	12.7 lbs/day	0 lbs/day
03/04/88	0.76 ppmv, dry	0 ppmv, dry

[a] CEM data are representative of only those periods in which the Method 8 trains were operated. Values (ppmv) are as measured, not normalized to 12 percent CO_2.

5.1.4 Ammonia Measurement Data Quality

During the course of the two tests at Modesto, a total of 36 ammonia tests were performed and analyzed. The sampling technique requires a heated probe to prevent condensation prior to the impingers. The technique also requires leak checks to ensure an undiluted sample. Probe heat temperatures are available on the sample sheets included in the appendices of the two previous reports. Leak rates appear in Table 5-1.

The ammonia analyses were performed by several methods as a check for the relative accuracy of the result. The specific ion electrode used to analyze the January samples and samples 1-19 of the March tests showed some degree of erratic response. To compensate for this behavior, several analysis techniques were used.

The January samples were first analyzed using the procedure of calibrating, analyzing, and then recalibrating. An average of these calibrations was used to calculate the result. Secondly, the method of known additions was used. If the two values agreed, the analysis was accepted. Otherwise, the analysis was repeated.

An additional quality control method was used to assess samples 1-19 taken during the March testing. After the concentration of the sample was determined, a standard of the same approximate concentration was prepared and analyzed with the specific ion electrode (SIE) using the most recent calibration curve. If the measured concentration matched the standard concentration and the two sample analyses agreed, the analysis was accepted.

A new specific ion electrode probe was purchased for the subsequent analyses of samples 21-24 and for the compliance tests C1-C3, and later samples C4-C8. This probe gave a more stable response. The analysis technique used with this probe was to calibrate, analyze, and recalibrate. Corrections in the analysis were made if the second calibration differed significantly from the initial calibration.

5.1.5 HCl Data Quality

HCl train leak checks and isokinetics are included in Table 5-1. Laboratory analytical quality control procedures include analysis of a method blank and the use of spiked samples to determine chloride recovery.

Two separate trains were used for the HCl analysis. After the results of the first test were reviewed, it was suspected that the lower temperatures (250^{o}F) which were used in the sampling probe and filter housing might allow conversion of HCl to ammonium chloride. This salt would then be collected on the filter and hence not reported as HCl. During the second series of tests, the probe and filter assembly was heated to ~ 500^{o}F or slightly higher than the stack temperature so that a more representative value for HCl could be obtained. The subsequent analysis of the train indicated that there was still some chloride in the particulate phase but that 55 percent of the chlorine passed through the filter and was trapped in the impinger solution. The impingers were analyzed serially so that the collection efficiency of this modified method could be determined.

5.1.6 SO_x Sampling Data Quality

Isokinetics and leak checks for the Method 8 sampling run are listed in Table 5-1. All of the Method 8 test runs met the isokinetic sampling criteria of 100% ± 10 percent and had final leak check rates less than 0.02 cfm. Method 8 samples from the January test were analyzed by ion chromatography. Method 8 samples taken in March were analyzed on-site using the reference method by titration with a standardized solution of barium perchlorate. The $Ba[ClO_4]_2$ solution concentration was accurate to within 1.0 percent. Reagent and method blanks were analyzed for both analysis methods. The two types of analyses yielded similar results and are considered acceptable.

Table 5-5 shows a comparison of Method 8 SO_2 results and continuous monitoring SO_2 results and continuous monitoring SO_2 results. The continuous monitoring data represents an average during the same time period

TABLE 5-5. SUMMARY OF CEM QUALITY CONTROL CHECKS

DATE	PARAMETER	UNITS	QC GAS CONCENTRATION	OBSERVED CONCENTRATION	PERCENT DIFFERENCE
03/02/88	OXYGEN	%V	10.1	10.2	0.99
	OXYGEN	%V	7.9	7.8	-1.27
	CARBON DIOXIDE	ppmV	8.0	10.1	(b)
	CARBON DIOXIDE	ppmV	10.1	11.9	(b)
	CARBON MONOXIDE	ppmV	213.0	209.2	-1.78
	SULFUR DIOXIDE	ppmV	40.5	43.5	7.41
	HYDROCARBONS	ppmV (a)	8.9	8.9	0.00
03/03/88	OXYGEN	%V	10.1	10.1	0.00
	CARBON DIOXIDE	%V	8.0	7.5	-6.48
	CARBON MONOXIDE	ppmV	39.8	38.9	-2.26
	CARBON MONOXIDE	ppmV	219.0	220.1	0.50
	SULFUR DIOXIDE	ppmV	40.5	35.1	-13.33
	HYDROCARBONS	ppmV	4.3	4.7	9.30
03/04/88	OXYGEN	%V	10.1	10.2	0.99
	CARBON DIOXIDE	%V	8.0	8.0	-0.25
	CARBON MONOXIDE	ppmV	219.0	218.0	-0.46
	CARBON MONOXIDE	ppmV	39.8	38.1	-4.27
	SULFUR DIOXIDE	ppmV	40.5	41.3	1.98
	HYDROCARBONS	ppmV	4.3	4.6	6.98

[a] ppmV as propane.

[b] Non-linearity observed at midrange on CO2 analyzer, corrected by calibrating at a lower range.

as the Method 8 trains. Method 8 and CEM values generally agree to within 1.0 ppmv. This level of agreement indicates that both analyses are accurate within the specifications of the methods.

5.1.7 Controlled Condensate Data Quality

The main quality indicators for the controlled condensation train are the temperature readings in various components of the train. The front filter was maintained at > 500°F which allows the particulate to be removed before condensation or reaction occurs. The condensing coil is maintained at 140°F through the use of cooling water which is pumped from a constant temperature bath. These temperatures were monitored by calibrated thermocouples at five-minute intervals throughout the test period. Leak checks were performed prior to and after the test was concluded and were within the 4 percent limit. The samples were analyzed by Ion Chromatography by comparing their responses to a calibration curve. Reagent blanks were analyzed to ensure no contamination occurred.

5.1.8 Metals Data Quality

The raw sample for the metals analyses was obtained from the inlet particulate matter sampling train. The data quality results for the inlet particulate train applies to the metals collection also. The sample was greater than 0.5 grams which is the minimum amount required for the metals analysis. Calibration curves were prepared on the ICAP and the Atomic Absorption analyzers to give response factors used for the sample. The samples were analyzed twice to ensure the integrity of the analysis. Most of the reported numbers are well above the detection limits for the individual species. In order to provide an estimate of outlet metal emissions, the metals distribution was assumed to be the same as at the inlet. A ratio of outlet particulate to inlet particulate was used to determine an approximation; however, outlet metals concentrations were so low that accurate sampling at that location was not practical.

5.1.9 Particle Sizing Data Quality

Particle sizing by impaction is a trial and error type of measurement. Experienced personnel such as those used during this sampling are extremely valuable. Only one trial was used to set the correct parameters for the test runs. Each test run lasted only two minutes but were still within the ± 10 percent isokinetic requirements and had sufficient samples to obtain valid weights without overloading. It is rare that particle sizing samples are this good as the results are not known until long after the tests are conducted. The reported weights coupled with the known leak checks and isokinetics make this data of the highest quality.

5.2 SAMPLING AND ANALYSIS PROBLEM AREAS

5.2.1 Problems with the Ammonia Analysis

While there is no indication that the ammonia numbers are inaccurate, there were some problems which were encountered in the analysis. These problems were overcome in the field by the use of multiple analytical techniques and redundancy. The original specific ion electrode had lost some of its ability to respond, dampening the results. The best resolution that could be obtained during the analysis was approximately 5 percent of the reading, which translates to an estimated accuracy of approximately 12.5 percent. In order to improve the analytical accuracy, the samples were analyzed using the average of two calibration curves prepared before and after the samples were run. After the samples were analyzed for the calibration curve, a known amount of standard was added and the resultant mV increase was calculated to obtain the original sample. For half of the samples a standard was made to duplicate the resultant number. This known sample was then analyzed to see if it gave the same result. When the threefold analysis for the samples agreed to within 10 percent, the number was accepted. During the second portion of the test a new specific ion electrode was purchased and used for the final runs.

5.2.2 Method 8 Problem Areas

Sampling for SO_3 and SO_2 using CARB Method 8 is subject to interference in the presence of ammonia. Ammonia combines with SO_2 in the probe and first impinger to form ammonium sulfite. This effect creates an artificially high SO_3 value in the first impinger and deflates the SO_2 concentration taken from impingers 2 and 3. Typically, the Method 8 SO_2 concentrations compared favorably with the CEM values and are considered acceptable. The SO_3 concentration, however, was affected by particulate sulfates as well as sulfites formed in the probe and impinger. Therefore, all Method 8 SO_3 results should be considered invalid. Controlled condensation train results should be used for SO_3 concentrations.

5.2.3 CEM Problem Areas

During the course of the compliance testing, three tests were performed for outlet emission levels of NO_x, CO, SO_2, and THC. Oxygen and carbon dioxide were also monitored during these tests.

Two values were invalidated for the CEM measurements. Total hydrocarbon data for 3/04/88 was discarded because of a power outage to the CEM trailer the previous evening. The FID flame had to be re-lit prior to calibration. This caused a non-linear drift in the instrument response. Normally, the flame should be allowed several hours to warm up prior to calibration. Carbon dioxide data was also invalidated for 3/02/88 due to a non-linearity observed at the midrange of the instrument. The problem was corrected by calibrating at a lower range so that the stack gas concentrations were within the linear band of instrument operation.

Additionally, there may have been a problem with interference on the NO_x monitor. The TECO 10 AR NO_x monitor used is susceptible to interference from free NH_3. Ammonia is converted to NO in the NO_2 to NO converter unit with about 90 percent efficiency. Although stack concentrations of NH_3 were about 50-60 ppmv at 12 percent CO_2, we feel that the gas conditioning system knocked out most of the ammonia. We estimate that the concentration of ammonia that reached the instruments may have been as high as 2-6 ppmv. This estimate is based on Engineering Sciences NH_3 tests which were sampled from a remote location. Therefore, the actual NO_x concentration may be 2-6 ppmv lower than the reported concentration.

5.3 DATA ACCURACY LIMITS

The accuracy of the sampling methods, analytical methods, recoveries and flows have been combined for each sampling method. Table 5-6 reports the method accuracy and the flow accuracy which were combined statistically to produce the overall data accuracy limits.

TABLE 5-6. ACCURACY LIMITS FOR POLLUTANT MEASUREMENTS

Parameter	Method Accuracy (+/- percent)	Flow Accuracy (+/- percent)	Overall Accuracy (+/- percent)
Particulate	5	10	11
Dioxin/Furans	50	10	51
PAH	50	10	51
PCBs	50	10	51
NH3	10	10	14
HCl	10	10	14
CEMs			
SO2	5	10	11
NOx	5	10	11
CO	5	10	11
THC	5	10	11
SO2(M8)	10	10	14
SO2(CCS)	10	10	14
Particle Sizing	10	10	14
Metals	10	10	14

To Bruce

Date 8/16 Time 1:11

WHILE YOU WERE OUT

M Bob Ellery

of

Phone 707 - 575 - 3939
Area Code Number Extension

☒	TELEPHONED	☒	PLEASE CALL
☐	CALLED TO SEE YOU	☐	WILL CALL AGAIN
☐	WANTS TO SEE YOU	☐	URGENT
	☐	RETURNED YOUR CALL	

Message also, Christ, Larken - spoke w her first

8-16-91

Spoke w B. Ellery - OK to release the report.

Ann
Operator

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301-8241

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

June 17, 1986

CERTIFIED MAIL-RETURN RECEIPT REQUESTED

Mr. R. Fred Crabill
Environmental Manager
Florida Crushed Stone Company
Post Office Box 317
Leesburg, Florida 32748

Dear Mr. Crabill:

Attached is one copy of the Technical Evaluation and Preliminary Determination, and proposed permits to renew and modify construction permits issued for the cement/power plant at your facility in Brooksville, Hernando County, Florida.

Please submit, in writing, any comments which you wish to have considered concerning the department's proposed action to Mr. Bill Thomas of the Bureau of Air Quality Management.

Sincerely,

C. H. Fancy, P.E.
Deputy Chief
Bureau of Air Quality
Management

CHF/pa

Attachments

cc: John B. Koogler, P.E.
Jim Estler

State of Florida
Department of Environmental Regulation
Notice of Intent

The Department gives notice of its intent to renew and modify air pollution source construction permits for Florida Crushed Stone Company's cement/power plant in Hernando County, Florida. The modifications will result in an overall net emissions decrease of approximately 12.8 tons per year of particulate matter. A revised determination of best available control technology (BACT) was not required.

Persons whose substantial interests are affected by the Department's proposed permitting decision may petition for an administrative determination (hearing) in accordance with Section 120.57, Florida Statutes. The petition must conform to the requirements of Chapters 17-103 and 28-5, Florida Administrative Code, and must be filed (received) in the Department's Office of General Counsel, 2600 Blair Stone Road, Twin Towers Office Building, Tallahassee, Florida 32301, within fourteen (14) days of publication of this notice. Failure to file a petition within this time period constitutes a waiver of any right such person has to request an administrative determination (hearing) under Section 120.57, Florida Statutes.

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 proposed agency action. Therefore, persons who may not wish to file a petition may wish to intervene in the proceeding. A petition for intervention must be filed pursuant to Rule 28-5.207, Florida Administrative Code, at least five (5) days before the final hearing and be filed with the hearing officer if one has been assigned at the Division of Administrative Hearings, Department of Administration, 2009, Apalachee Parkway, Tallahassee, Florida 32301. If no hearing officer has been assigned, the petition is to be filed with the Department's Office of General Counsel, 2600 Blair Stone Road, Tallahassee, Florida 32301. Failure to petition to intervene within the allowed time frame constitutes a waiver of any right such person has to request a hearing under Section 120.57, Florida Statutes.

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:

Dept. of Environmental Regulation
Bureau of Air Quality Management
2600 Blair Stone Road
Tallahassee, Florida 32301

Dept. of Environmental Regulation
Southwest District
7601 Highway 301 North
Tampa, Florida 33610

Any person may send written comments on the proposed action to Mr. Bill Thomas at the department's Tallahassee address. All comments mailed within 30 days of the publication of this notice will be considered in the department's final determination.

Technical Evaluation
and
Preliminary Determination

Florida Crushed Stone Company
Hernando County
Brooksville, Florida

State Permit Numbers:

AC 27-118672
AC 27-118673
AC 27-118674
AC 27-118675
AC 27-118676
AC 27-118677
AC 27-118678
AC 27-118680
AC 27-118681
AC 27-118683
AC 27-118684
AC 27-118685
AC 27-118686
AC 27-118687
AC 27-118688
AC 27-118689
AC 27-118690

Florida Department of Environmental Regulation
Bureau of Air Quality Management
Central Air Permitting

June 13, 1986

I. Applicant and Source Location

A. Applicant

Florida Crushed Stone Company
Post Office Box 300
Leesburg, Florida 32749

B. Location

The proposed construction is located in Hernando County, approximately 3.5 miles Northwest of Brooksville, Florida. The plant will be located on 6,400 acres of property owned by Florida Crushed Stone. The UTM coordinates of the plant are 360.0, 360.1 km East and 3162.1-3162.5 km North.

II. Project and Process Descriptions

On November 10, 1983, the Florida Crushed Stone Company was issued air pollution source construction permits. There are 17 construction permits that are part of the construction of a cement/power plant complex in Hernando County, Florida.

On March 10, 1986, the Department received a package which included applications to renew each of the 17 construction permits with a number of minor amendments, primarily to reflect "as built" changes. Since applications were submitted after expiration of the original permits the affected permits will be reissued with amendments incorporated.

After reviewing each application, the department has assigned a new number for each application and the request for modifications is granted. The following shall be added or changed.

Permit No. Old	New	Modification
AC 27-61012	AC 27-118672	Change name from pre-mix (and limestone) bins to filter dust bins and extend construction permit until 6/30/87. Air flow increased from 6000 to 6800 acfm increasing particulate emissions from 2.3 to 2.7 TPY.
AC 27-61013	AC 27-118673	Flyash Bin - Extend construction permit until 6/30/87 and reduce air flow from 6000 to 4200 acfm. Particulate emissions will decrease from 2.4 to 1.6 TPY.
AC 27-61016	AC 27-118674	Cement Plant - Extend construction permit until 6/30/87. No other changes.

AC 27-61017	AC 27-118675	Raw Meal Tansfer - Extend construction permit until 6/30/87 and reduce air flow from 2000 to 1200 acfm. Particulate emissions will decrease from 1.0 to 0.6 TPY.
AC 27-61019	AC 27-118676	Change name from Raw Materials Bin Discharge to Lime Rock Bin and extend construction permit until 6/30/87. Air flow increased from 6000 to 10,500 acfm increasing particulate matter emissions from 3.0 to 4.1 TPY.
AC 27-61020	AC 27-118677	Blending Silo - Extend construction permit until 6/30/87 and reduce airflow from 26,000 to 17,000 acfm. Particulate emissions will decrease from 12.7 to 8.3 TPY.
AC 27-61021	AC 27-118678	Change name from Kiln Feed to Kiln Feed Surge bin and extend construction permit until 6/30/87. No other changes.
AC 27-61026	AC 27-118680	Change name from Raw Coal Handling to Clinker Handling and extend construction permit until 6/30/87. Particulate emissions will decrease from 2.9 to 1.3 TPY.
AC 27-61041	AC 27-118681	Change name and Cement Silo to Contaminated Flyash and Filter Dust Bin; change size of baghouse from 5000 ACFM to 11,000 ACFM and extend construction permit until 6/30/87. Particulate emissions will increase from 2.4 to 5.4 TPY.
AC 27-61042	AC 27-118683	Revise Permit AC 27-61042 to allow use of baghouse Q-15C to control emissions from an iron ore storage bin rather than from a cement silo and to extend Permit AC 27-61042 until 6/30/87. Reduce air flow from 5000 to 3200 acfm and reduce particulate emissions from 2.4 to 1.8 TPY.
AC 27-61027	AC 27-118684	Cooler Discharge - Extend construction permit until 6/30/87 and reduce air flow from 6000 to 3000 acfm. Particulate emissions will decrease from 2.9 to 1.5 TPY.

AC 27-61030	AC 27-118685	Add the venting of finish mill silo L-07 to this system and extend the construction permit unitl 6/30/87. Air flow reduced from 5000 to 2600 acfm decreasing particulate emissions from 2.4 to 1.3 TPY.
AC 27-61032	AC 27-118686	Change name from Clinker Silo to Gypsum and Limestone Bins and extend construction permit unitl 6/30/87. No other changes.
AC 27-61033	AC 27-118687	Silo Discharges - Extend the construction permit until 6/30/87 and reduce air flow from 14,000 to 9000 acfm. Particulate emissions will decrease from 6.9 to 4.4 TPY.
AC 27-61037	AC 27-118688	Finish Mill - Extend construction permit until 6/30/87 and reduce air flow from 50,000 to 40,000 acfm. Particulate emissions will decrease from 24.5 to 19.6.
AC 27-61038	AC 27-118689	Cement Silo - Extend construction permit until 6/30/87 and reduce air flow from 5000 to 3200 acfm. Particulate emissions will decrease from 2.4 to 1.6 TPY.
AC 27-61040	AC 27-118690	Add second cement silo vent to baghouse; increase size of baghouse from 5000 acfm to 7400 acfm and extend construction permit until 6/30/87. Particulate emissions will increase from 2.4 to 3.6 TPY.

The overall net effect of these changes is a reduction of 12.8 TPY of particulate matter; therefore, no further review is required.

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301-8241

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

PERMITTEE:
Florida Crushed Stone Co.
P. O. Box 300
Leesburg, Florida 32749

Permit Number: AC 27-118674
Expiration Date: June 30, 1987
County: Hernando
Latitude/Longitude: 28° 35' 00" N
82° 25' 53" W
Project: Cement Kiln, Clinker Cooler, Dryer and Raw Mill

This permit is issued under the provisions of Chapter 403, Florida Statutes, and Florida Administrative Code Rule(s) 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 drawing(s), plans, and other documents attached hereto or on file with the department and made a part hereof and specifically described as follows:

Cement Plant - Extend construction permit until 6/30/87. No other changes.

Construction shall be in accordance with the attached permit application and additional information except as otherwise noted on pages 5 - 7, Specific Conditions.

GENERAL CONDITIONS:

1. The terms, conditions, requirements, limitations, and restrictions set forth herein are "Permit Conditions" and as such are binding upon the permittee and enforceable pursuant to the authority of Sections 403.161, 403.727, or 403.859 through 403.861, Florida Statutes. The permittee is hereby placed on notice that the department will review this permit periodically and may initiate enforcement action for any violation of the "Permit Conditions" by the permittee, its agents, employees, servants or representatives.

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. Nor 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 does not constitute 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, plant or aquatic life or property and penalties therefore caused by the construction or operation of this permitted source, 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.

GENERAL CONDITIONS:

6. The permittee shall at all times 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 credentials or other documents as may be required by law, access to the premises, at reasonable times, where the permitted activity is located or conducted for the purpose of:

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

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

  c. Sampling or monitoring 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 notify and provide the department with the following information:

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

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

GENERAL CONDITIONS:

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 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 arising under the Florida Statutes or department rules, except where such use is proscribed by Sections 403.73 and 403.111, Florida Statutes.

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 17-4.12 and 17-30.30, 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 is required to be kept at the work site of the permitted activity during the entire period of construction or operation.

13. This permit also constitutes:

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

14. The permittee shall comply with the following monitoring and record keeping requirements:

a. Upon request, the permittee shall furnish all records and plans required under department rules. The retention period for all records will be extended automatically, unless otherwise stipulated by the department, during the course of any unresolved enforcement action.

GENERAL CONDITIONS:

b. The permittee shall retain 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), copies of all reports required by this permit, and records of all data used to complete the application for this permit. The time period of retention shall be 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 date(s) 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 submitted or corrected promptly.

SPECIFIC CONDITIONS:

1. Except as required pursuant to DER's BACT determination the proposed cement plant construction shall be carried out in accordance with the statements in the application and additional information supplied by the permittee.

SPECIFIC CONDITIONS:

2. The emission rates from the kiln and cooler shall not exceed the emission limits and maximum allowable emissions listed below:

Pollutant	Emission Limits lb/ton of kiln of feed	Maximum Allowable Emissions lb/hr	Maximum Allowable Emissions tons/yr
PM (cooler)	0.1	12.4	54
PM (kiln)	0.3	37.1	162
SO_2	0.6	50 ~~74.3~~	~~325~~ 219
NOx	2.9	359.0	1572

3. The hours of operation of the cement plant shall not exceed 8,760 hours per year.

4. Visible emissions from the kiln, cooler, dryer or raw mill shall not be greater than 10 percent opacity demonstrated in accordance with DER Method 9 (Rule 17-2.700(b)(a)9., FAC).

5. Compliance with the particulate emission limits in specific condition No. 2 shall be demonstrated in accordance with the EPA Reference Method 5 in Appendix A, 40 CFR 60, as set forth in subsection 60.64 of the NSPS for Portland Cement Plants, 40 CFR 60.60.

6. Compliance with the SO_2 and NO_x emission limits in specific conditions No. 2 shall be demonstrated in accordance with EPA Methods 6 and 7, respectively, in 40 CFR 60, Appendix A.

7. The maximum coal consumption in the kiln shall not exceed 10.3 tons per hour.

8. Instruments shall be installed, calibrated, and maintained to continuously measure the amounts of coal used in the kiln, material fed to the kiln, and clinker produced. The records of fuel usage with the fuel analysis, daily kiln feed and clinker produced shall be reported quarterly to the DER Southwest District office.

9. In accordance with Rule 17-2.700(4), FAC, the stack sampling configuration of the proposed kiln shall comply with the maximum of 2D downstream and 0.5 upstream distances to any fan, bend, constriction, or other flow disturbance.

10. Reasonable precautions to prevent fugitive particulate emissions at the site, such as the application of dust suppressants on roads and the construction site, landscaping and planting of vegetation, shall be taken by the permittee.

PERMITTEE:
Florida Crushed Stone Co.

Permit Number: AC 27-118674
Expiration Date: June 30, 1987

SPECIFIC CONDITIONS:

11. Prior to 90 days before the expiration of this permit, a complete application for an operating permit shall be submitted to the DER Southwest District office. Full operation of the source many then be conducted in compliance with the terms of this permit until its expiration or until receipt of an operating permit.

12. Prior to submitting an application for an operating permit, the permittee shall request that the allowable particulate emission rates from the following Chemical Lime Company sources be reduced to the following values:

Sources	Permit No.	Particulate Emission Limit (lb/hr)
Kiln	AO 27-55581	18.0
Hydrator	AO 27-25269	14.0
Dryer	AO 27-50400	16.0
Bagging	AO 27-17352	6.0

Issued this_____day of ______,
19____.

STATE OF FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION

Victoria J. Tschinkel, Secretary

_____pages attached.

Final

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301-8241

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

PERMITTEE:
Florida Crushed Stone Co.
P. O. Box 300
Leesburg, Florida 32749

Permit Number: AC 27-118674
Expiration Date: June 30, 1987
County: Hernando
Latitude/Longitude: 28° 35' 00" N
82° 25' 53" W
Project: Cement Kiln, Clinker Cooler, Dryer and Raw Mill

This permit is issued under the provisions of Chapter 403, Florida Statutes, and Florida Administrative Code Rule(s) 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 drawing(s), plans, and other documents attached hereto or on file with the department and made a part hereof and specifically described as follows:

Cement Plant - Extend construction permit until 6/30/87. No other changes.

Construction shall be in accordance with the attached permit application and additional information except as otherwise noted on pages 5 - 7, Specific Conditions.

GENERAL CONDITIONS:

1. The terms, conditions, requirements, limitations, and restrictions set forth herein are "Permit Conditions" and as such are binding upon the permittee and enforceable pursuant to the authority of Sections 403.161, 403.727, or 403.859 through 403.861, Florida Statutes. The permittee is hereby placed on notice that the department will review this permit periodically and may initiate enforcement action for any violation of the "Permit Conditions" by the permittee, its agents, employees, servants or representatives.

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. Nor 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 does not constitute 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, plant or aquatic life or property and penalties therefore caused by the construction or operation of this permitted source, 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.

GENERAL CONDITIONS:

6. The permittee shall at all times 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 credentials or other documents as may be required by law, access to the premises, at reasonable times, where the permitted activity is located or conducted for the purpose of:

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

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

c. Sampling or monitoring 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 notify and provide the department with the following information:

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

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

GENERAL CONDITIONS:

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 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 arising under the Florida Statutes or department rules, except where such use is proscribed by Sections 403.73 and 403.111, Florida Statutes.

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 17-4.12 and 17-30.30, 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 is required to be kept at the work site of the permitted activity during the entire period of construction or operation.

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.

14. The permittee shall comply with the following monitoring and record keeping requirements:

a. Upon request, the permittee shall furnish all records and plans required under department rules. The retention period for all records will be extended automatically, unless otherwise stipulated by the department, during the course of any unresolved enforcement action.

GENERAL CONDITIONS:

b. The permittee shall retain 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), copies of all reports required by this permit, and records of all data used to complete the application for this permit. The time period of retention shall be 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 date(s) 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 submitted or corrected promptly.

SPECIFIC CONDITIONS:

1. Except as required pursuant to DER's BACT determination the proposed cement plant construction shall be carried out in accordance with the statements in the application and additional information supplied by the permittee.

SPECIFIC CONDITIONS:

2. The emission rates from the kiln and cooler shall not exceed the emission limits and maximum allowable emissions listed below:

Pollutant	Emission Limits lb/ton of kiln of feed	Maximum Allowable Emissions lb/hr	 tons/yr
PM (cooler)	0.1	12.4	54
PM (kiln)	0.3	37.1	162
SO_2	0.6	50.0	219
NOx	2.9	359.0	1572

3. This source shall be allowed to operate continuously, 8,760 hours per year.

4. Visible emissions from the kiln, cooler, dryer or raw mill shall not be greater than 10 percent opacity demonstrated in accordance with DER Method 9 (Rule 17-2.700(b)(a)9., FAC).

5. Compliance with the particulate emission limits in Specific Condition No. 2 shall be demonstrated in accordance with the EPA Reference Method 5 in Appendix A, 40 CFR 60, as set forth in subsection 60.64 of the NSPS for Portland Cement Plants, 40 CFR 60.60.

6. Compliance with the SO_2 and NO_x emission limits in Specific Condition No. 2 shall be demonstrated in accordance with EPA Methods 6 and 7, respectively, in 40 CFR 60, Appendix A.

7. The maximum coal consumption in the kiln shall not exceed 10.3 tons per hour.

8. Instruments shall be installed, calibrated, and maintained to continuously measure the amounts of coal used in the kiln, material fed to the kiln, and clinker produced. The records of fuel usage with the fuel analysis, daily kiln feed and clinker produced shall be reported quarterly to the DER Southwest District office.

9. In accordance with Rule 17-2.700(4), FAC, the stack sampling configuration of the proposed kiln shall comply with the maximum of 2D downstream and 0.5 upstream distances to any fan, bend, constriction, or other flow disturbance.

10. Reasonable precautions to prevent fugitive particulate emissions at the site, such as the application of dust suppressants on roads and the construction site, landscaping and planting of vegetation, shall be taken by the permittee.

SPECIFIC CONDITIONS:

11. Prior to 90 days before the expiration of this permit, a complete application for an operating permit shall be submitted to the DER Southwest District office. Full operation of the source many then be conducted in compliance with the terms of this permit until its expiration or until receipt of an operating permit.

12. Prior to submitting an application for an operating permit, the permittee shall request that the allowable particulate emission rates from the following Chemical Lime Company sources be reduced to the following values:

Sources	Permit No.	Particulate Emission Limit (lb/hr)
Kiln	AO 27-55581	18.0
Hydrator	AO 27-25269	14.0
Dryer	AO 27-50400	16.0
Bagging	AO 27-17352	6.0

FILING AND ACKNOWLEDGEMENT

FILED, on this date, pursuant to S120.52 (9), Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.

Patricia Lee for Peggy Brown — Clerk
8/27/86 — Date

Issued this 26 day of August 1986.

STATE OF FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION

Victoria J. Tschinkel, Secretary

______pages attached.