UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET
ATLANTA, GEORGIA 30308

DEC 22 1980

REF: 4AH-AF

Mr. Steve Smallwood, Chief
Bureau of Air Quality Management
Division of Environmental Programs
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32301

RE: Monsanto Company, Maleic Anhydride
Production Facility, PSD-FL-055

Dear Mr. Smallwood:

Enclosed for your review and comment are the Public Notice and Preliminary PSD Determination for the Monsanto Company's proposed maleic anhydride production facility in Pensacola, Florida. The public notice will appear in a local newspaper, Pensacola News-Journal, in the near future.

Please let my office know if you have comments or questions regarding this determination. You may contact Mr. Kent Williams, Chief, New Source Review, at 404/881-4552 or Mr. Jeffrey Shumaker of TRW Inc. at 919/541-9100. TRW Inc. is under contract to EPA, and TRW personnel are acting as authorized representatives of the Agency in providing aid to the Region IV PSD review program.

Sincerely yours,

KWilliams

for Tommie A. Gibbs, Chief
Air Facilities Branch

TAG:JLS:clu

Enclosure

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PUBLIC NOTICE

A new air pollution source is proposed for modification by the Monsanto Company near the town of Pensacola in Escambia County, Florida. The source is a maleic anhydride production facility and will increase emissions of air pollutants by the following amounts in tons per year:

VOC		CO	
320	Mon. 494 DER 332	364	Mon. 708 DER 515

Allowable increments have not been determined for VOC or CO emissions; therefore, no increment analyses were performed.

The proposed construction has been reviewed by the U.S. Environmental Protection Agency (EPA) under the Federal Prevention of Significant Deterioration (PSD) regulations (40 CFR 52.21), and EPA has made a preliminary determination that the construction can be approved provided certain conditions are met. A summary of the basis for this determination and the application for a permit submitted by Monsanto Company are available for public review in the office of Mr. Joe Flowers, County Controller, Escambia County, Pensacola, Florida.

Any person may submit written comments to EPA regarding the proposed modification. All comments, postmarked not later than 30 days from the date of this notice, will be considered by EPA in making a final determination regarding approval for construction of this source. These comments will be made available for public review at the above location. Furthermore, a public hearing can be requested by any person. Such requests should be submitted within 15 days of the date of this notice. Letters should be addressed to:

Mr. Tommie A. Gibbs, Chief
Air Facilities Branch
U.S. Environmental Protection Agency
345 Courtland Street, NE
Atlanta, Georgia 30308

Preliminary Determination
Monsanto Company
PSD-FL-055

I. Applicant

Monsanto Company
Post Office Box 12830
Pensacola, Florida 32575

II. Location

The proposed modification is located at the north end of Chemstrand Road approximately 3 miles north of 9-Mile Road, north of Pensacola, Florida. The UTM coordinates are: Zone 16, 475.5 kilometers east and 3384.8 kilometers north.

III. Project Description

The applicant proposes to construct a plant to produce maleic anhydride from butane. Benzene will not be used as a raw material as it is for the majority of existing maleic anhydride plants. Benzene has been determined to be a hazardous air pollutant, thus the proposed use of butane as the raw material will completely eliminate benzene emissions. Two existing steam generators are to be modified to incinerate the off-gases from the maleic anhydride process. The production capacity is to be 133 million pounds of maleic anhydride per year.

IV. Source Impact Analysis

The existing plant has the potential to emit greater than 100 tons per year of particulate matter (PM), sulfur dioxide (SO_2), nitrogen oxides (NO_x), volatile organic compounds (VOC), and carbon monoxide (CO); therefore, the existing source is a major stationary source. The proposed modification significantly increases emissions of pollutants regulated under the Clean Air Act as amended August 7, 1977 (Act). Thus, in accordance with Title 40, Code of Federal Regulations, Part 52.21 (40 CFR 52.21) as promulgated August 7, 1980 (45FR52676), the proposed construction is a major modification and is subject to a Prevention of Significant Deterioration (PSD) review.

The PSD review applies to each pollutant for which the modification would result in a significant net emissions increase. Table 1 summarizes emission changes of all pollutants regulated under the Act effected by the proposed modification. As this table shows the proposed net emissions increases of VOC and CO are significant as defined in the PSD regulations (Line E greater than Line F). The emissions of PM, SO_2, and NO_x will have no net increase, and therefore are not subject to PSD review.

The PSD review analyzes the following:

A. Best Available Control Technology (BACT);

B. National Ambient Air Quality Standards (NAAQS) Impacts;

C. PSD Increments Impacts;

D. Class I Area Impacts;

E. Growth Impacts; and

F. Soils, Visibility and Vegetation Impacts.

A. BACT Analysis

Any new or modified facility which increases emissions of VOC or CO must apply BACT. BACT is defined for each pollutant as the maximum degree of reduction achievable determined by a case-by-case review, taking into account energy, environmental, and economic impacts. The applicant has proposed BACT for each applicable case and has presented justification for the choice proposed. The justification is based upon the criteria listed above.

EPA has reviewed the technology and emission limits proposed as BACT; it has concurred in some cases, and required amended values in other cases to achieve a determination which meets the defined objectives.

The maleic anhydride process off-gases will consist of 96 percent H_2O, CO_2, O_2 and N_2 with less than 2 percent each of CO and organics. The organics will be largely butane with small quantities of acetic acid, acrylic acid and maleic anhydride. No benzene is expected in these off-gases. At full operating rate these organics may range up to 7000 pounds per hour and the carbon monoxide range up to 6700 pounds per hour.

Table 1

Summary of Emissions, Tons/Year[a]

Facilities	PM	SO_2	NO_x	VOC	CO
A. New Construction					
Maleic Anhydride Plant	0	0	0	0	0
Product Storage	0	0	0	<1	0
B. Modified (After) Boilers #7 and #8	≤61[b]	≤2.5[b]	≤1358[c]	320[d]	364[d]
C. Modified (Before) Boilers #7 and #8	61[e]	2.5[e]	1358[f]	13[e,g]	70[e,g]
D. Increase from Modified	0	0	0	307	294
E. Increase from New and Modified	0	0	0	308	294
F. Significant Emissions Increase	25	40	40	40	100

[a] Based upon maximum capacity operating 100% of the year.

[b] Applicant proposed no increased emissions; this is ensured through Florida State Operation Permit condition of gas fuel firing only.

[c] Applicant proposed no increased emissions; this is to be ensured through condition 6 of this PSD permit.

[d] Based upon BACT Determination, the applicant proposed higher values which were rejected by EPA (see section IV A. for discussion).

[e] Calculated by EPA based upon AP42 (Table 1.4-1) emission factors for gas combustion.

[f] Based upon test data (1977 and 1979) supplied by applicant.

[g] Applicant proposed higher values (see section IV A.).

The applicant proposes to control emissions of organics and CO by burning the process off-gases in two existing steam generators (Babcock and Wilcox Boilers #7 and #8).

These steam generators are currently permitted to operate with gas fuel only. At full operating rate (500 million Btu/hour each) the actual emissions are estimated to be 3 pounds per hour of VOC and 16 pounds per hour of CO. These estimates were made by EPA based upon AP-42 (Table 1.4-1) emission factors and are somewhat lower than those submitted by the applicant (6 and 30 respectively). The introduction of the process off-gases to these steam generator furnaces will reduce fuel consumption and should not increase emissions from fuel.

The applicant proposes this technology as BACT for the control of organics and CO emissions from the maleic anhydride process. The applicant further proposes BACT for this modification be a maximum of 107 pounds per hour of additional organic emissions and 132 pounds per hour of additional CO emissions. This represents 98.5% and 98.0% control of organics and CO, respectively at the maximum maleic anhydride process off-gas rate. The applicant has proposed the weight rate of emissions should remain constant at lower operating rates down to a minimum control efficiency of 97 percent for each pollutant. The applicant proposes this lower efficiency would occur during operating periods of low steam demand and resulting low furnace temperature.

EPA review concurs that the proposed technology constitutes BACT for this case, and further recognizes that this is a new process with no directly applicable information available to determine control efficiencies. However, EPA concludes by transfer of technology that under worst case conditions (maximum process off-gas rate and high organic inlet concentration) the average combustion efficiency for organics in these steam generators should be above 99 percent, and yield a maximum 70 pounds per hour of new organic emissions. Further, efficiency of CO should be above 99.0 percent and yield less than 67 pounds per hour of new CO emissions. Therefore, BACT for this case is determined to be a maximum of 73 pounds per hour of total organic emissions (including 3 lb/hr emitted before modification) and a maximum of

6
DER

83 pounds per hour of total CO emissions (including 16 lb/hr emitted before modification). Further, at less than maximum process off-gas rate the emission concentrations (ppmv) of VOC and CO should not increase. The control efficiency (by mass) of VOC and CO may decrease at lower inlet concentrations, but the total mass emissions rate will also decrease due to the reduced inlet concentration. Under other operating conditions, a reduced flue gas volume at the maximum VOC/CO concentration also will decrease the mass emissions rate.

The applicant proposed control efficiencies for VOC based upon the proposed National Emission Standard for Hazardous Air Pollutants (NESHAP) published 45FR26660, April 28, 1980 for existing maleic anhydride plants. This standard was derived from option 1 defined in the preamble as:

> "97 percent benzene control, based on the best demonstrated level of control that is now achieved at an existing maleic anhydride plant and that is universally applicable at any existing plant." (Emphasis added)

The selection of this option over a competitive option (99% control) as the standard was based upon a variety of specific environmental, energy and economic considerations involving the affected existing plants. These are discussed at length in the preamble to the proposed standard.

EPA determined higher control efficiencies than those proposed by the applicant are achievable based upon test results at similar incineration facilities[2] and discussions in the literature concerning the important parameters governing combustion efficiency.[2,3,4] In brief, these parameters are:

1. Efficiency increases with increased operating temperatures (with >99.5% efficiency expected above 879°C/1600°F).
2. Efficiency increased with retention time.[2] (with $\geq$ 0.5 seconds specified for $\geq$ 99.5% control).
3. Mixing of the contaminated gases with the fuel prior to combustion, promotes higher efficiency.

The applicant has submitted pilot plant data upon the specific off-gas composition showing the improved destruction of both organics and CO as the retention time increases and as the operating temperature increases to $1500^{O}F$. The applicant expects the operating temperature of the proposed equipment to normally be 2000 to $2400^{O}F$ with a minimum temperature of $1800^{O}F$ at periods of decreased steam demand. Further, the applicant has calculated the minimum retention time to be 0.79 seconds in the boiler combustion box prior to reaching the water tubes. The applicant proposes new boiler windboxes and tri-fuel burners to promote mixing and maximize destruction of the organics and CO of the off-gas. The off-gas will be mixed with the combustion air and injected through the burner.

The applicant also proposes to monitor flow rate, percent combustibles, and O_2 content of the off-gas stream, and the furnace exit gas temperature. Stack VOC emissions also will be monitored to ensure continuous compliance. The boiler will be required to maintain an in stack average VOC concentration equivalent to a 99 percent mass destruction efficiency at worst case operating conditions. This concentration will be determined as a 24-hour average.

Variations in the off-gas composition and boiler operation may cause slight fluctuation in the organic concentration destruction efficiency, making the 99 percent average efficiency unachievable over short averaging periods. For this reason, an additional 1-hour average concentration limit reflective of 98 percent control at worst case conditions will be imposed. The applicant shall run a series of performance tests following start-up to determine the 1-hour and 24-hour concentration limits and to optimize performance considering environmental impacts (including NO_x emissions) and energy recovery.

The maleic anhydride plant processing equipment components (pumps, valves, etc.) also will emit fugitive VOC emissions. For this reason, components in VOC service (butane, etc.) require application of BACT. BACT for fugitive VOC emissions such as this is limited to required work practices and equipment standards. Emissions limits standards can not reasonably be established. In controlling these emissions, the source will establish a leak detection and repair program and meet certain equipment specifications as described in the attached "BACT for Fugitive VOC Emissions."

The National Emission Standards for Hazardous Air Pollutants (NESHAP) proposed as Subpart H of Part 61 of Chapter 1, Title 40 of the Code of Federal Regulations has been proposed as a National Emission Standard for Benzene Emissions from Maleic Anhydride Plants. This was published April 18, 1980 (45FR26660). This proposed maleic anhydride plant would be subject to this rule if promulgated as proposed. The use of butane as a raw material is considered 100 percent control of benzene and therefore ensures compliance with the requirement that a new source shall have no detectable benzene emissions. A condition of this permit shall prohibit the use of benzene as a raw material.

B. Impact Upon National Ambient Air Quality Standards (NAAQS)

Emissions of VOC require review to ensure the ozone NAAQS shall not be violated. The ambient standards for ozone and CO for various averaging times are:

Pollutant	Averaging Time	NAAQS[a]
Ozone	1-hour	235
Carbon Monoxide	8-hour	10,000
	1-hour	40,000

[a] Micrograms per cubic meter; not to be exceeded more than once per year.

The present air quality of Escambia County is monitored by the Florida Department of Environmental Regulation (DER) with continuous readings obtained at a site at Ellyson Field. A summary of the ozone and CO data for 1978 and the first 9 months of 1979 is:

Number of Ozone Observations	1978	1979
Average, ppm	.025	.033
High, ppm	.106	.114
2nd High, ppm	.100	.105
NAAQS, ppm	.120[a]	.120[a]

235 $\mu g/m^3$?

Number of CO Observations	1978
Average, ppm	.45
High, ppm	3.6
2nd High, ppm	3.0
NAAQS, ppm	35[b] 40,000 ug/m^3

[a] Equivalent to 235 micrograms per cubic meter.

[b] Equivalent to 40,00 micrograms per cubic meter.

The applicant proposes that this ambient air data is representative of the maximum concentrations expected in the overall area. He notes that ozone is an "area wide" pollutant and that the monitoring site is surrounded by industrial and mobile sources. The monitoring site is less than 20 kilometers from the proposed modification; EPA concurs that the data is representative of the existing air quality. The data shows the ozone NAAQS was not violated during the representative time.

The applicant has submitted an analysis to show the impact of the proposed modification upon the ozone NAAQS. The analysis considered the proposed VOC emissions increase of 399 tons per year. Also considered was a 1977 emissions inventory[5] which showed total hydrocarbon emissions in Escambia County to be 23996 tons per year. The inventory, developed by the Florida Department of Environmental Regulation also projected that by 1982 the total hydrocarbon emissions will be reduced by 3076 tons per year due to decrease in mobil source emissions. The applicant reasons the 399 tons annual increase from the proposed modification would offset only 13 percent of this projected reduction. As discussed previously, monitoring data does not show NAAQS violations. Further, a net VOC emissions reduction is expected to occur by 1982. On this basis the applicant concluded that the proposed increase does not threaten the NAAQS for ozone.

The reduced VOC emissions allowed by BACT of 153 tons per year will leave 95 percent of the projected emissions inventory reduction intact. EPA concurs that this analysis shows the ozone NAAQS will not be violated due to the proposed modification.

The proposed CO emissions were modeled by the applicant using PTMAX. An expected maximum 1-hour increase of 37 micrograms per cubic meter is below the significance levels of 500 for an 8-hour average or 2,000 for a 1-hour average (43FR26393, June 19, 1978). Therefore, no further analysis of impact upon the NAAQS for CO is required, and it is concluded that the proposed modification does not threaten the NAAQS for CO.

C. Impacts Upon PSD Increments

No PSD increments have been established for VOC or CO.

D. Impacts Upon Class I Areas and Areas of Known Increment Violations

The nearest Class I area is Breton National Wildlife Refuge in Louisiana which is approximately 160 kilometers to the west. The proposed modification is not expected to affect that area. No areas of known increment violation are in the vicinity of this modification.

E. Growth Analysis

No additional employment will result due to this modification, and no growth in the area will result due to product use. Transportation of raw materials and product will result in minimal secondary impacts. The applicant concludes and EPA concurs that growth associated with this modification will not cause significant air quality impacts.

F. Impacts Upon Soils, Visibility, and Vegetation

The applicant concludes this modification will have no impact upon soils, vegetation or visibility because the impact upon NAAQS has been shown to be small and these standards were set with welfare impacts considered. EPA concurs the impact upon soils, vegetation and visibility will not be significant.

V. Conclusions

EPA Region IV proposes a preliminary determination of approval with conditions for construction of the maleic anydride plant and modifications to two existing steam generators proposed by Monsanto Company in its application submitted February 19, 1980. The determination is made on the basis of information contained in the application and in additional information received June 12, 1980, July 21, 1980 and October 1, 1980 (application complete on July 21, 1980). The conditions set forth in the permit are as follows:

1. The new and modified facilities shall be constructed in accordance with the capacities and specifications stated in the application. The production of maleic anhydride is designed to be 133 million pounds annually, while operating 80.5 percent on-stream time (18860 pounds of maleic anhydride per hour).
2. Benzene shall not be used as any part of the maleic anhydride plant feed stream; this shall ensure no detectable benzene emissions in accordance with 40 CFR 51 Subpart H.
3. The total emissions of volatile organic compounds (VOC) from both modified steam generators shall not exceed 73 pounds per hour of total gaseous non-methane organic emissions measured as butane and determined as an average over 24 consecutive 1-hour periods of operation. Further, total VOC emissions from both modified steam generators shall not exceed 143 pounds during any 1-hour period.

   73 # VOC / hr
   24 hr avg

   143 # VOC / hr
   1 hr/24 hrs
4. The total emissions of carbon monoxide (CO) from both modified steam generators shall not exceed a maximum of 83 pounds per hour, averaged over 24 consecutive 1-hour periods. Further, total carbon monoxide (CO) emissions from both modified steam generators shall not exceed 183 pounds during any 1-hour period.
5. The total emissions of nitrogen oxides (NO_X) from both modified steam generators shall not exceed 310 pounds per hour (measured as NO_2).

6. Compliance with the emissions limits (Conditions 3, 4, and 5) shall be determined by performance tests scheduled in accordance with the General Conditions attached. The performance tests shall be in accordance with the provisions of reference methods in Appendix A of 40 CFR 60, except as provided under 40 CFR 60.8(b) as follows:

a. Method 1 for selection of sampling site and sample traverses;

b. Method 3 for gas analysis;

c. Method 7 for concentration of nitrogen oxides;

d. Method 10 for carbon monoxide;

e. The reference method (or alternate reference method) outlined in the document Measurement of Volatile Organic Compounds, EPA-450/2-78-041, (reference number 6) for Volatile Organic Compounds.

7. The performance test to show compliance with the organic emissions limit and the carbon monoxide limit shall be conducted at the maximum maleic anhydride process operating rate, minimum boiler gas temperature, and minimum excess oxygen rate expected during future operations. If operation cannot be achieved with all these extremes simultaneously, additional performance tests shall be run to ensure compliance at all expected actual operating conditions.

The performance test to show compliance with the nitrogen oxides emissions limit shall be conducted at the maximum excess oxygen rate and the maximum exit gas temperature expected during future operations.

The parameters of maleic anhydride process rate, monitored variables and other routinely monitored steam generator process control parameters shall be recorded during compliance testing and made a part of the reported results.

8. The applicant shall develop and implement a plan to monitor and maintain maleic anhydride plant process and modified steam generator process control parameters to optimize destruction efficiency of volatile organic compounds while maintaining NO_x and CO emissions at or below the allowable emissions limits specified in permit conditions 4 and 5. Allowable operating ranges for pertinent process control parameters shall be specified based on analysis of process and performance test data. Performance tests in addition to the compliance tests required in the conditions of this permit may be necessary to define allowable operating ranges. The analysis correlating VOC, NO_x and CO emissions rates to monitored process control parameters shall be documented in the plan. Moreover, process controls shall be alarmed to indicate process operation outside allowable ranges.

   The minimum requirements for the plan are as follows:

   a. The flue gas temperature in each modified steam generator shall be monitored and recorded and shall be maintained at or above 1800°F while any amount of maleic anhydride plant off-gas is being incinerated.

   b. The organic content of flue gas from each modified steam generator will be continuously monitored and recorded in accordance with the alternate reference method outlined in EPA report number EPA-450/2-78-041 (Reference 6). Moreover, the concentration (ppmv organics) at all operating rates shall be maintained at or below the values shown through compliance testing at the maximum operating rate to equal the allowable VOC emissions limits operation in excess of the specified concentrations over the appropriate averaging periods discussed in Specific Condition 3 will constitute non-complying emissions.

c. An allowable operating range for the percent excess oxygen fed to the steam generator furnaces will be established. The allowable range shall be correlated to the flue gas organic content monitored in accordance with condition 8b. Alternatively, the oxygen content of the flue gas can be monitored and recorded and the excess oxygen for combustion can be correlated to this monitored parameter.

d. The flow rate, oxygen content, and combustibles content of the maleic anhydride plant off-gas shall be monitored and recorded.

Any process operation outside the allowable range for each parameter will constitute noncompliance with this specific condition, shall be recorded in accordance with General Condition 4 of this permit and shall be reported quarterly along with excess emissions in accordance with 40 CFR 60.7(c).

Should process modifications, which effect the allowable operating range for any monitored parameter, be made on either the maleic anhydride plant or the steam generators, re-correlation of emissions as described above shall be conducted with 90 days of attaining full operation after such modification and the plan shall be revised as necessary. Such modifications include but are not limited to combustion modifications such as installation of different type burners, combustion air relocation, fuel conversion and tube removal or addition.

9. To control fugitive VOC emissions, the applicant will comply with the requirements and provisions of the attached "BACT for Fugitive VOC Emissions."

10. The source shall comply with the requirements and provisions of the attached General Conditions.

REFERENCES

1. 45FR26660, Benzene Emissions from Maleic Anhydride Plants, National Emissions Standard.

2. EPA 450/3-80-001a, Benzene Emissions from Maleic Anhydride Plants - Background Information Document for Proposed Standard.

3. Lee, K., Jahnes, H.J., Macanley, D.C., "Thermal Oxidation Kinetics of Selected Organic Compounds", Union Carbide Corporation, paper presented at the 71st Annual Meeting of the Air Pollution Control Association, Houston, Texas, June 25-30, 1978.

4. EPA-AP-40, Air Pollution Engineering Manual.

5. Florida DER, Proposed Revision to the State Implementation Plan for Non-attainment Areas, December 1978.

6. EPA-450/2-78-041, Revised September 1979, Measurement of Volatile Organic Compounds.

GENERAL CONDITIONS

1. The permittee shall notify the permitting authority in writing of the beginning of construction of the permitted source within 30 days of such action and the estimated date of start-up of operation.

2. The permittee shall notify the permitting authority in writing of the actual start-up of the permitted source within 30 days of such action and the estimated date of demonstration of compliance as required in the specific conditions.

3. Each emission point for which an emission test method is established in this permit shall be tested in order to determine compliance with the emission limitations contained herein within sixty (60) days of achieving the maximum production rate, but in no event later than 180 days after initial start-up of the permitted source. The permittee shall notify the permitting authority of the scheduled date of compliance testing at least thirty (30) days in advance of such test. Compliance test results shall be submitted to the permitting authority within forty-five (45) days after the complete testing. The permittee shall provide (1) sampling ports adequate for test methods applicable to such facility, (2) safe sampling platforms, (3) safe access to sampling platforms, and (4) utilities for sampling and testing equipment.

4. The permittee shall retain records of all information resulting from monitoring activities and information indicating operating parameters as specified in the specific conditions of this permit for a minimum of two (2) years from the date of recording.

5. If, for any reason, the permittee does not comply with or will not be able to comply with the emission limitations specified in this permit, the permittee shall provide the permitting authority with the following information in writing within five (5) days of such conditions:

   (a) description of noncomplying emission(s),

   (b) cause of noncompliance,

   (c) anticipated time the noncompliance is expected to continue or, if corrected, the duration of the period of noncompliance,

   (d) steps taken by the permittee to reduce and eliminate the noncomplying emission,

   and

   (e) steps taken by the permittee to prevent recurrence of the noncomplying emission.

   Failure to provide the above information when appropriate shall constitute a violation of the terms and conditions of this permit. Submittal of this report does not constitute a waiver of the emission limitations contained within this permit.

6. Any change in the information submitted in the application regarding facility emissions or changes in the quantity or quality of materials processed that will result in new or increased emissions must be reported to the permitting authority. If appropriate, modifications to the permit may then be made by the permitting authority to reflect any necessary changes in the permit conditions. In no case are any new or increased emissions allowed that will cause violation of the emission limitations specified herein.

7. In the event of any change in control or ownership of the source described in the permit, the permittee shall notify the succeeding owner of the existence of this permit by letter and forward a copy of such letter to the permitting authority.

8. The permittee shall allow representatives of the State environmental control agency and/or representatives of the Environmental Protection Agency, upon the the presentation of credentials:

   (a) to enter upon the permittee's premises, or other premises under the control of the permittee, where an air pollutant source is located or in which any records are required to be kept under the terms and conditions of the permit;

   (b) to have access to and copy at reasonable times any records required to be kept under the terms and conditions of this permit, or the Act;

   (c) to inspect at reasonable times any monitoring equipment or monitoring method required in this permit;

   (d) to sample at reasonable times any emission of pollutants;

   and

   (e) to perform at reasonable times an operation and maintenance inspection of the permitted source.

9. All correspondence required to be submitted by this permit to the permitting agency shall be mailed to the:

   Chief, Air Facilities Branch
   Air and Hazardous Materials Division
   U.S. Environmental Protection Agency
   Region IV
   345 Courtland Street
   Atlanta, Georgia 30308

10. The conditions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

The emission of any pollutant more frequently or at a level in excess of that authorized by this permit shall constitute a violation of the terms and conditions of this permit.

(Revised September 24, 1980)

BACT FOR FUGITIVE EMISSIONS OF HYDROCARBONS

As a condition of this permit, the applicant will develop and implement a plan to control fugitive emissions of hydrocarbons from the proposed facility. A detailed written description of the plan must be made available upon request by the Regional Administrator. Moreover, the plan must be fully implemented within 180 days following initial plant startup. As a minimum, the plan will include the following work practice and equipment specifications:

1. A leak detection and repair program will be implemented to reduce emissions from equipment leaks. The following specifications, criteria, and requirements will be built into the monitoring program.
    a) Within 180 days of initial plant startup all components will be monitored for leaks with a VOC detection device. In addition, periodic monitoring of specific components will be performed according to the following frequencies.
        i) monitor with a VOC detection device is at least once every 365 days:
            - open-ended-pipes which have been fitted with closure devices in accordance with Part 4 of this section, and
            - process drains (if a leak is detected, the equipment causing the organic discharge to the stream will be identified and repaired).
        ii) Monitor with a VOC detection device at least once every 90 days:
            - valves in gas service,
            - valves in liquid service,
            - compressors and other components with rotating shafts in gas service,
            - reciprocating compressors and all other components with reciprocating shafts in gas service,
            - safety relief valves in gas service,
            - safety relief valves in liquid service,
            - seal oil degassing vents, and
            - pumps and other components with rotating shafts in liquid service.

iii) Monitor visually at least once every seven days:
   - pumps and other components with rotating shafts in liquid service,
   - reciprocating pumps and other components with reciprocating shafts in liquid service, and
   - valves in liquid service.

b) The instrumentation and procedures used in the monitoring program will conform to or be the equivalent of the test method in Appendix B of the document, <u>Control of Volatile Organic Compound Leaks from Refinery Equipment</u> (EPA-450/2-78-036).

c) A leak will be defined as emission of VOC to the atmosphere as a result of
   i) the dripping of liquid volatile organic compounds, and/or
   ii) the detection of 10,000 ppm by volume measured as butane at the surface of or within one centimeter of the potential source with a portable VOC detection instrument.

d) An attempted repair of the leaking component will be made within 15 calendar days. In all cases the leak will be repaired before start up after the next shutdown. Repair of a component is defined as:
   i) No dripping of liquid volatile organic compounds, and
   ii) No concentrations of volatile organic compounds in excess of 10,000 ppm by volume measured as butane at the surface of or within one centimeter of the leak source with a portable VOC detection instrument.

e) Records will be kept of each leak detected and the subsequent maintenance performed on that leak. One way to comply with this requirement is to keep a survey log as is described in Section 6.3.2 of the document referenced in Part (b) above. Whatever system is used, records will contain sufficient information to identify specific components within the plant. Records will be maintained for a period of at least two years. In addition, when a leak is found an easily identifiable waterproof tag bearing the date the leak was located will be affixed to the components. This tag will remain until the leak is repaired.

f) All components in the service of VOC within the plant, except flanges, will be made readily distinguishable from components not in VOC service. This can be accomplished with an identifiable marking of some kind.

g) Reports on the results of the leak detection and repair program will be submitted to the Regional Administrator within 60 days of each anniversary of initial plant startup. As a minimum this report will include a discussion of the total number and type of leaks repaired and a detailed description of leaks which were not repaired within the 15 day period. The latter will include sufficient detail to enable tracing the identity of each leak to the plant records kept in accordance with the preceding requirement (e). In addition to the annual reports, brief quarterly reports, listing all leaks not repaired during the 15 day limit, will be submitted to the Regional Administrator within 15 days of the end of each 90 day period following initial plant startup. The fourth quarterly report can be incorporated into the annual report.

2. Compressors, pumps and other components with rotating shafts will be equipped with double or tandem mechanical seals.

3. Safety relief valves handling VOC will be fitted with rupture discs in the lines which precede them such that the relief valves are in series with and follow the rupture discs,

   or

   safety relief valves in gas service handling VOC will be vented to a flare, recovery, or some other means of control and safety relief valves in liquid service handling VOC will be equipped with catch basins or some other device which directs liquids discharged during process upsets back to the process, to a control device or to controlled disposal. No more than ten percent by weight of the material discharged from each safety relief valve will be emitted to the atmosphere except loop reactor relief valves. All other relief valves will be vented to a flare.

4. Open-ended-pipes will be equipped with caps, plugs, blind flanges, second valves or other closure devices which will be removed or opened only while the pipe is in use.

5. Cooling water in all non-contact condensers, heat exchangers and other heat transfer equipment in VOC service will be maintained at a pressure which exceeds the pressure of the VOC in the same piece of equipment by ten percent,

   or

   the total organic carbon content of cooling water will be monitored at the inlet to all cooling towers at least once every 90 days. If the net increase in organic content is found to exceed ten ppm by weight, the equipment which is leaking organics to the cooling water will be identified and repaired. Testing will be in accordance with the approved methods for total organic carbon outlined in 40 CFR 136.

6. Sampling ports and procedures will be designed to prevent VOC emissions from purging sample lines and sample vessels. One way to comply with this requirement is to institute closed loop sampling.

7. Wastewater separators will be equipped with sealed covers which totally enclose the compartment liquid contents. These can be solid fixed roofs or floating roofs. Also, any gauging devices will include a projection into the liquid or some other device to eliminate the escape of vapors when the gauge is not in active service.

8. Vacuum systems will be equipped such that non-condensibles from hot wells, condensers, accumulators and other parts of the system are vented to a flare, an incinerator, a fire box, a flue gas system, a recovery system or some other means of control which reduces VOC emissions by at least 90 percent by weight.

9. Pressurized process units handling VOC will be vented to a flare, or some other means of control during depressurization for unit maintenance. Controlled venting will continue until the vessel's internal pressure reaches the pressure drop across the control device or five psig, whichever is less.

10. Any tank truck or rail car loading facility having a throughput greater than 76,000 liters (20,000 gallons) per day of volatile organic compounds averaged over any 30-day period, will be equipped with a vapor

recovery system capable of reducing the aggregate partial pressure of vent gasses to at least 3447 pascals (0.5 psia). Connections on vapor balance systems will be vapor tight.

11. Storage of volatile organic compounds will comply with the provisions of the proposed standards of performance for petroleum liquid storage vessels dated May 18, 1978 (proposed 40 CFR 60 Subpart Ka) with the exception that the capacity size cut-off will be 94,635 liters (25,000 gallons instead of 151,416 liters (40,000 gallons) and the lower limit applicability on true vapor pressure will be 3.45 kilopascals (0.5 psia) instead of 10.35 kilopascals (1.5 psia). Also, any uninsulated tank exterior surfaces exposed to the sun will be painted white. Furthermore, all fixed roof tanks not controlled by a vapor recovery system will be equipped with a conservation vent which will be inspected and maintained yearly to insure proper operation. Finally, all storage tanks with a capacity exceeding 3785 liters (1000 gallons), except pressure vessels and tanks with vapor recovery systems, will be equipped with permanent submerged fill pipes.

EXEMPTIONS

Specifically excluded from the requirements of BACT for Fugitive Emissions of Hydrocarbons are all pieces of equipment handling commercial natural gas.

Any component which has no potential to emit VOC to the atmosphere, is exempt from monitoring requirements. For example, a compressor which is totally enclosed and vented to a flare system or a safety relief valve which discharges to a flare system does not have to be monitored with a VOC detection device.

EQUIVALENT TECHNOLOGY

Any technology shown to the satisfaction of the Regional Administrator to be the equivalent of the work practices and equipment specifications in this section can be substituted, with the Regional Administrator's written permission, for the requirements of Parts 1 - 11.

DEFINITIONS

For the purposes of this section the following terms are defined.

- Volatile Organic Compound (VOC) are compounds of carbon (excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, ammonium carbonate, ethane, and methane) that have a true vapor pressure greater than 3447 pascals (0.5 pounds per square inch at 100^{O}F).

- A Component is any piece of equipment capable of leaking VOC to the atmosphere which includes but is not limited to pumps, compressors, pipeline valves, safety relief valves, seal oil degassing vents, open-ended-pipes and process drains.
- Open-Ended-Pipes are those which are preceded by valves or other closure devices capable of leaking VOC to the atmosphere. Exceptions are safety relief valves and bleeder valves in double block and bleeder valve systems.
- Commercial Natural Gas is a mixture of gaseous hydrocarbons, chiefly methane, used as a fuel and obtained from a company licensed to dispense such gasses.
- Gas Service for components is defined as the VOC being gaseous at the conditions that prevail in the facility during normal operations. Similarly, Liquid Service for components is defined as the VOC being liquid at the conditions which prevail during normal operations.
- A Cover on a waste water separator is considered to be sealed if the concentration within one centimeter of the lip or the surface of the tank does not exceed 10,000 ppm by volume measured as hexane with a VOC detection device. A fixed roof will be measured at the surfaces which join the roof to the walls of the compartment. A floating roof tank will be measured along the plane across the upper edge of the walls of the compartment.
- Fugitive Emissions are emissions of VOC due to equipment leaks, process upsets, sampling procedures, process turnarounds, and storage and transfer of materials. Also included in the definition of Fugitive Emissions are VOC emissions from wastewater separators and vacuum systems.

SUMMARY

MONSANTO AGREES TO 20 OF THE 25 PERMIT CONDITIONS: SPECIFICALLY

1 THROUGH 17

20 THROUGH 22

CHANGES IN CONDITIONS 18, 19, 23, 24 AND 25 ARE REQUESTED

VOC

CO

Boiler Temp & Res.

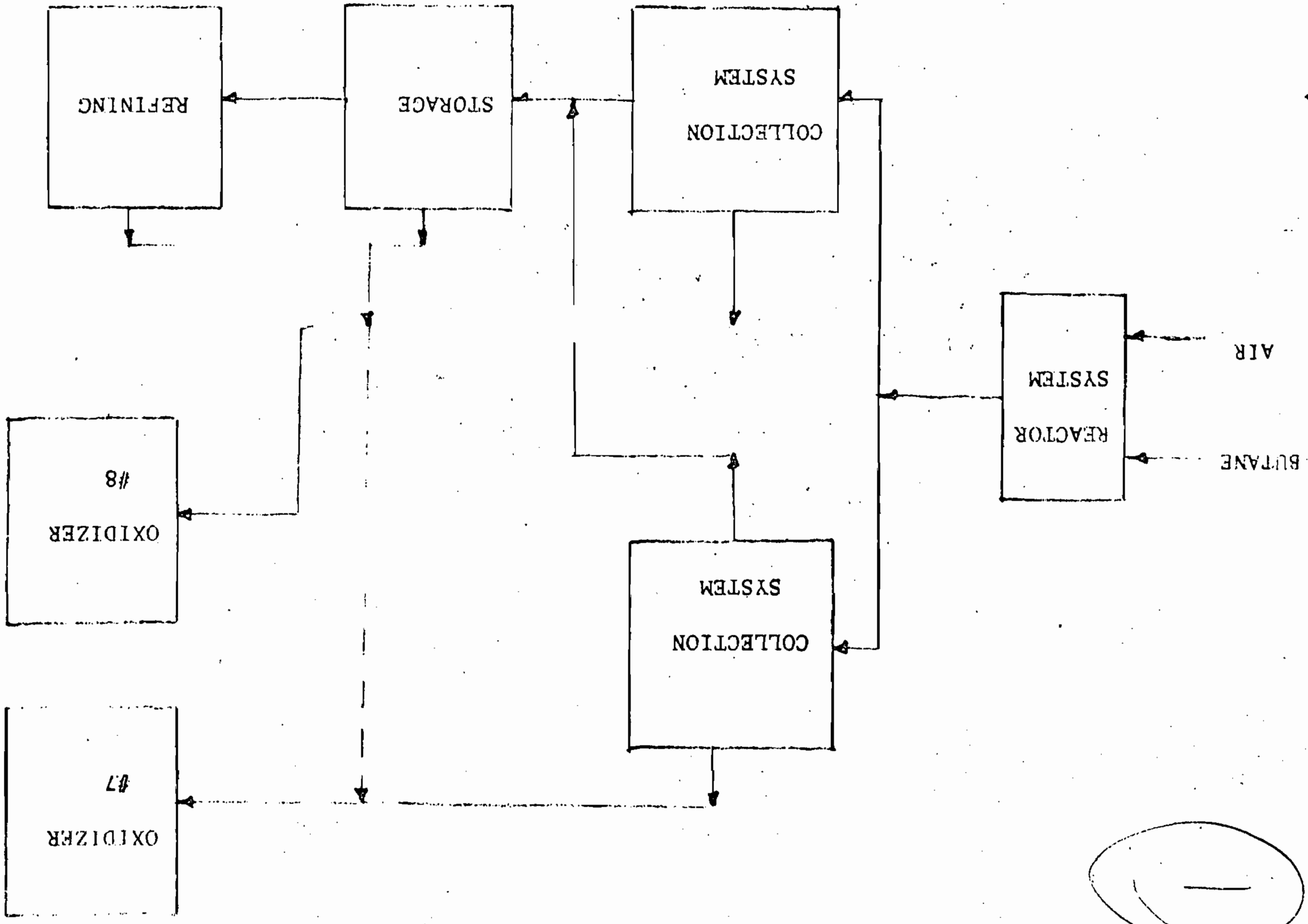
ambient mon.

Reporting

KEY POINTS

1. NEW AND UNIQUE PROCESS
2. LARGE VOLUME LOW CONCENTRATION OFF-GAS
3. UNKNOWNS

BEST AVAILABLE COPY



OFF-GAS

LESS THAN 2% ORGANICS

LESS THAN 2% CO

GREATER THAN 96% H_2O, CO_2, O_2, N_2

THE QUESTION IS

HOW GOOD IS BACT IN THIS CASE?

MONSANTO's CONCERN

WILL WE BE ALLOWED TO OPERATE?

BACT DETERMINATION FACTORS

1. EPA's BACT AND NSPS
2. SCIENTIFIC AND ENGINEERING DATA
3. OTHER STATES' BACT
4. SOCIAL AND ECONOMIC FACTORS

$$VOC + O_2 \rightarrow CO_2 + H_2O$$

"FOR MOST COMPOUNDS, COMBUSTION INTERMEDIATES DO EXIST AND COMPLETE DESTRUCTION (I.E., TO CO_2 AND H_2O) REQUIRES LONGER TIME AND/OR HIGHER TEMPERATURES".

"FOR EXAMPLE, AT LEAST SIX COMBUSTION INTERMEDIATES CAN BE IDENTIFIED WHEN PROPYLENE WAS COMBUSTED".

	INLET LBS/HR	OUTLET LBS/HR
PROPANE	900	150
PROPYLENE	1800	150
ETHANE	10	375
ETHYLENE	30	190
TOTAL	2740	865

THE CRUCIAL POINT IS HOW CLOSE A 99% LEVEL PUSHES ACTUAL FIELD UNIT EFFICIENCIES TO THOSE OF THE LAB UNIT.

....A 99% LEVEL WOULD FORCE FIELD UNITS TO ALMOST MATCH LAB MIXING.

DOUGLAS COSTLE TO U. S. DISTRICT COURT

DEC. 8, 1980

IN DEVELOPING MOST OF THESE STANDARDS, WE ARE LITERALLY WORKING ON THE FRONTIERS OF SCIENCE.

MOST EARLIER ENGINEERING WORK ON INCINERATORS HAS FOCUSED SYSTEMS MAINTENANCE AND HEATING VALVE, RATHER THAN ON ASSESSING DESTRUCTION EFFICIENCY AND PREDICTING EMISSIONS.

THERE ARE FEW GENERALLY ACCEPTED INDUSTRIAL DESIGN STANDARDS TO SERVE AS A BASIS FOR TECHNICAL REQUIREMENTS. THERE IS LITTLE RECORD OF ACHIEVABLE PERFORMANCE CAPABILITY AND EVEN LESS OF A HISTORY OF <u>ACCEPTABLE</u> PERFORMANCE. CAPABILITY.

ANALYTICAL METHODS USED TO DETERMINE DATA BASE MUST BE EQUIVALENT TO SPECIFIED METHOD FOR COMPLIANCE TESTING.

LABORATORY DATA DO NOT SUPPORT THEORY THAT BUTANE IS EASIER TO DESTRUCT THAN BENZENE.

LONG TERM DAY-TO-DAY

MONTH-TO-MONTH

PERFORMANCE DATA LACKING

AVERAGE vs. SINGLE SAMPLE

- ASSUME STANDARD DEVIATION OF 10 PPH
- TO HAVE NO MORE THAN ONE VIOLATION PER YEAR WITH A LIMIT OF 107 PPH (24 HR. AVG.).
- EMISSIONS MUST AVERAGE 79 PPH.

Large Thermal Oxidizer Data

Unit	O_2 in Process OG Vol. %	Oxidizer Temp F°	Voc In lbs/hr	Voc Out lbs/hr	Destruction %
Monsanto-AN	2.2	1673	2756(G) 400(L)	66.3	99.0 (97.6)
Monsanto-AN	2.2	1681		91.9	98.7
Koppers-Maleic	~13				99.1*
Koppers-Maleic	~13				98.9*
Koppers-Maleic	~13				99.1*
Koppers-Maleic	~13				98.9*
Koppers-Maleic	~13				97.1-98.5*
Koppers-Maleic	~13				95.8-97.9*
Denka-Maleic		1400			93
Denka-Maleic		1400			98.6
Monsanto-Phthalic	17	1607			99.6^{x}

REQUEST 107 PPH VOC FROM PROCESS. THIS REPRESENTS 98.5% TOTAL VOC (NON-METHANE) DESTRUCTION.

OFF-GAS

7000 PPH VOC

6700 PPH CO

7000 LBS BUTANE ⟶ 13,300 LBS CO

TOTAL CO FROM PROCESS 20,000 PPH

CARBON MONOXIDE

CO 1 HOUR STD.	40,000 $\mu g/m^3$
HIGHEST CONCENTRATION RECORD	6,000
IMPACT OF PROJECT	36

REQUEST 132 PPH CO DUE TO PROCESS - REPRESENTING

99.3%. DESTRUCTION OF INITIAL PLUS GENERATED CO.

INCREMENTAL IMPACT

Diff between DER & Monsanto #s.

	MONSANTO REQUESTED	DER PROPOSED	AMBIENT AIR INCREMENTAL IMPACT
VOC	107 PPH	70 PPH	9 $\mu g/m^3$
CO	132 PPH	88 PPH	12 $\mu g/m^3$

BUTANE ONLY

TEMP °F	RESIDENCE TIME sec.	EFFLUENT C4H10 ppm
1300	0.5	408
1525		.15
1550		.90
1600		.1
1700		1.6
1300	0.75	9.5
1525		.15
1550		.1
1600		.1
1700		1.6
1300	1.0	.15
1525		.1
1550		.1
1600		.1
1700		1.2

BENZENE ONLY

TEMP °F	RESIDENCE TIME sec.	EFFLUENT C_6H_6 ppm
1400	0.5	4.5
1500		1.4
1600		1.6
1800		2.6
1400	0.75	2.5
1500		1.5
1600		0.4
1800		0.7
1400	1.0	0.4
1500		0.9
1600		0.5
1800		1.5

BENZENE AND BUTANE

TEMP °F	RESIDENCE TIME sec.	EFFLUENT C_6H_6 ppm	EFFLUENT C_4H_{10} ppm
1400	0.5	1.5	0.9
1500		1.9	1.0
1600		2.4	1.1
1700		3.5	1.6
1400	0.75	2.1	1.0
1500		1.9	1.0
1600		1.9	1.0
1700		3.3	1.6
1400	1.0	2.3	1.3
1500		1.7	1.0
1600		1.9	1.0
1700		2.6	1.2

REQUEST OPERATING CONDITIONS NOT BE SPECIFIED. EMISSION LIMITS AND OPERATING CONDITION LIMITS MAY BE MUTUALLY EXCLUSIVE.

CONDITION 21

REQUEST:

DETERMINE COMPLIANCE WITHIN 60 DAYS OF ACHIEVING MAXIMUM PRODUCTION RATE BUT NO LATER THAN 270 DAYS AFTER INITIAL START-UP.

Allow longer for col/tray mods.

IN THE UNITED STATES DISTRICT COURT

FOR THE DISTRICT OF COLUMBIA

STATE OF ILLINOIS, Plaintiff, v. DOUGLAS M. COSTLE, Defendant.	Civil Action No. 78-1689
ENVIRONMENTAL DEFENSE FUND, INC. et al., Plaintiffs, v. STEFFEN PLEHN, et al., Defendants.	Civil Action No. 78-1715
CITIZENS FOR A BETTER ENVIRONMENT, Plaintiff, v. DOUGLAS M. COSTLE, Defendant.	Civil Action No. 78-1734
NATIONAL SOLID WASTE MANAGEMENT ASSOCIATION, Plaintiff, v. DOUGLAS M. COSTLE, Defendant.	Civil Action No. 78-1899

ADMINISTRATOR'S REPORT ON THE DEVELOPMENT OF SECTION 3004 (PHASE II) REGULATIONS UNDER THE RESOURCE CONSERVATION AND RECOVERY ACT OF 1976

On December 18, 1979, this Court issued an order requiring the United States Environmental Protection Agency ("EPA") to use its best efforts to meet certain target dates for the promulgation of final regulations under the Resource Conservation and Recovery Act of 1976, as amended ("RCRA" or "the Act"). These target dates were identified as follows:

Sections [illegible]02 and 3003	Februar[illegible] 1980
Sections 3001, 3005 and 3006	April, 1980
Section 3004 (Phase I)	April, 1980
Section 3004 (Phase II)	Fall, 1980

The Court's order specified that "if EPA at any time determines that the target dates for promulgation of the Section 3001 through 3006 regulations ... cannot be met despite the Agency's best efforts, EPA should immediately file with the Court in affidavit form over the signature of the Administrator an explanation of why it cannot meet the target dates, identify those target dates which it then believes, in its best judgment, are more realistic and state why such dates are more realistic."

In accordance with the provisions of this Court's December 18, 1979 order, I, Douglas M. Costle, Administrator of EPA, am submitting the following report for the purpose of informing the Court that, while EPA has effectively met the target dates for the first six items on the schedule, and is making good progress on the seventh, we will not be able to promulgate all of the Phase II, Section 3004 standards in the fall of 1980. Before explaining why this last target date cannot in all respects be fully met, I would like to outline what has taken place since our last report to the Court.

A. Accomplishments Since The Agency's Last Report

Our last report to the Court was made in open court at a hearing on December 12, 1979. Since then, EPA has made significant progress in controlling the handling of hazardous waste.

1. On February 26, 1980, we fulfilled our obligations under this Court's schedule by publishing regulations under Sections 3002 and 3003 of the Act. These apply to generators and transporters of hazardous wastes (45 Fed. Reg. 12722). Among other

things, these regulations establish a manifest system for tracking shipments of hazardous waste, require generators to determine whether their waste is hazardous and impose certain labeling, marking and placarding requirements. On February 26, 1980, we also published a notice setting forth the procedures to be used by persons handling hazardous waste in complying with the notification requirements of Section 3010 (45 Fed. Reg. 12746).

2. On May 19, 1980, we again fulfilled our obligations under this Court's order by promulgating regulations under Sections 3001, 3004, 3005 and 3006 of RCRA. These regulations and their preambles occupy almost 500 pages in the Federal Register and are believed to constitute the largest regulatory package ever promulgated by EPA at a single time. Although a full recitation of what these regulations contain would far exceed the limited purposes of this affidavit, some overview can be provided.

a. The basic purpose of the Section 3001 regulations (40 C.F.R. Part 261) is to identify and list wastes which are hazardous. In those regulations, we have identified and defined four characteristics of hazardous waste to be used by generators in determining whether their waste is hazardous. In addition, we have listed 85 hazardous wastes from specific and non-specific sources and 361 commercial chemicals which become hazardous wastes when discarded.

b. The Phase I Section 3004 permitting regulations (40 C.F.R. Part 264) set forth the first phase of the standards which will be used to issue permits to hazardous waste treatment, storage and disposal facilities. This first phase comprises standards which do not require major capital expenditures. They include requirements respecting preparedness for and prevention of hazards, contingency planning, emergency procedures, the manifest system, waste analysis, facility security, inspections, personnel training and recordkeeping and reporting.

c. Complementing these Section 3004 permitting standards, we have promulgated as 40 C.F.R. Part 265 interim status standards applicable to treatment, storage and disposal facilities during "interim status" (the period prior to final Agency disposition of a facility's permit application). These standards include many of the general, non-technical standards embodied in the Phase I permitting standards as well as more technical standards concerning groundwater monitoring, the design and operation of facilities, and facility closure.

d. The Section 3005 permit procedures have been consolidated at 40 C.F.R. Parts 122 and 124 with the procedures for issuing permits under the Clean Air Act, Clean Water Act and other EPA programs. There we have set forth the basic requirements and procedures for the issuance of permits to hazardous waste treatment, storage and disposal facilities, including requirements respecting the content of permit applications, as well as permit issuance, revision, reissuance, termination and review.

e. The Section 3006 state program regulations have likewise been consolidated at 40 C.F.R. Part 123 with the state program regulations for other regulatory programs. These regulations set forth the requirements under which state programs may receive interim and final authorization to run their own hazardous waste programs in lieu of the federal program.

A number of the May 19 regulations, including the hazardous waste lists and many of the interim status standards, were promulgated in interim final form. Several other hazardous waste regulations were also proposed at that time, including a supplemental list of hazardous wastes, financial responsibility requirements, and standards for underground injection wells disposing of hazardous waste.

3. Since the publication of the May 19, 1980, regulations, we have devoted a considerable amount of time to amending, clarifying

and finalizing the regulations. This effort has proceeded on three fronts.

First, we have continued to add to and update our hazardous waste lists. On July 16, 1980 we listed in interim final form eighteen wastes from specific and non-specific industrial processes (45 Fed. Reg. 47832) and proposed for listing seven additional wastes (45 Fed. Reg. 47835). We expect to propose other waste listings by January, 1981.

Second, in response to public comments that the May 19, 1980, regulations needed clarification or led to an inappropriate result in specific situations the Agency has devoted substantial resources to amending and issuing interpretations of the regulations. This effort, which was publicly launched in an August 19, 1980, Federal Register announcement (45 Fed. Reg. 55386), became especially heated as the November 19, 1980 effective date of the regulations approached. During the weeks immediately preceding and following the November 19, 1980 effective date, we either made or proposed the following amendments to the regulations:

(a) October 30, 1980 (45 Fed. Reg. 72024) - Amendment to regulations which clarifies circumstances in which hazardous waste generated in the storage of a product or raw material becomes subject to regulation.

(b) October 30, 1980 (45 Fed. Reg. 72029) - Proposal to narrow the scope of the characteristic of Extraction Procedure (EP) toxicity, making it applicable to a more limited category of chromium-containing wastes. Temporary exclusion from regulation of certain chromium-containing wastes.

(c) October 30, 1980 (45 Fed. Reg. 72039) - Amendment to regulations which extends the period for preparing closure and post-closure plans.

(d) October 30, 1980 (45 Fed. Reg. 72040) - Technical amendment which clarifies the applicability of the analytical procedures used to analyze EP extract contaminants.

(e) November 17, 1980 (45 Fed. Reg. 76074) - Proposal to grant wastewater treatment and elementary neutralization units a permit-by-rule upon compliance with special requirements. Temporary suspension of requirements for such facilities.

(f) November 19, 1980 (45 Fed. Reg. 76618) - Amendment to regulations which excludes from regulation solid waste from the extraction, beneficiation and processing of ores and minerals and cement kiln dust wastes.

(g) November 19, 1980 (45 Fed. Reg. 76620) - Amendment to regulations clarifying the operation of the small quantity generator exemption.

(h) November 19, 1980 (45 Fed. Reg. 76624) - Amendment to regulations which eliminates the distinction between the requirements governing accumulation of hazardous waste prior to on-site treatment, storage or disposal and the requirements governing accumulation of hazardous waste prior to off-site treatment, storage or disposal.

(i) November 19, 1980 (45 Fed. Reg. 76626) - Amendment to regulations which exempts from hazardous waste treatment and storage requirements immediate actions taken to contain or treat spills of hazardous waste.

(j) November 19, 1980 (45 Fed. Reg. 76630) - Amendments to hazardous waste permit regulations which clarify the circumstances under which hazardous waste management facilities may qualify for interim status.

(k) November 25, 1980 (45 Fed. Reg. 78524) - Amendments to regulations which clarify the circumstances in which residues of hazardous waste contained in drums, barrels, tank trucks or other types of containers must be managed as hazardous wastes.

(l) December 4, 1980 (45 Fed. Reg. 80286) - Extension of product storage amendment to pipelines.

(m) December 4, 1980 (45 Fed. Reg. 80286) - Information on obtaining temporary identification numbers in the event of a spill.

These amendments, and their preambles, have run almost 100 pages in the Federal Register. To illustrate their general complexity, a copy of the "container residues" amendment is attached as Appendix A to this affidavit.

In addition to the above, we expect to publish as many as ten more amendments in the next month concerning such topics as the construction ban on new facilities, totally enclosed treatment facilities, in-transit storage, and manifest requirements for railroads.

Third, we have devoted considerable effort to finalizing the proposed and interim final regulations published in May and July of 1980. This effort has required us to carefully review and respond to the hundreds of comments received on these proposed and interim final rules. It has also prompted us, in many cases, to substantially re-examine and rework the original regulation. On November 12, 1980, we finalized 80 hazardous waste listings which were proposed or promulgated in interim final form on May 19 and allowed 2 other listings to become effective in interim final form (45 Fed. Reg. 74884). On November 25, 1980, we finalized the commercial product listings which had been promulgated in interim final form on May 19 (45 Fed. Reg. 78530).

4. Apart from our accomplishments in amending, clarifying and finalizing the May 19, 1980, regulations, we are close to promulgating a major portion of the Phase II regulations scheduled

for Fall, 1980 publication under the Court's order. By the end of the month, or early in January, we expect to issue regulations requiring owners and operators of treatment, storage and disposal facilities to assure that funds are available both to close their facilities and to monitor and maintain those facilities after closure. At the same time, we will be publishing regulations requiring these facilities to obtain third-party liability insurance for damages resulting from both sudden (e.g., explosions) and non-sudden (e.g., soil contamination as a result of facility leakage) events; location standards for facilities; revised standards for closure; and, perhaps most importantly, standards for hazardous waste storage facilities -- including standards for facilities managing containers and for storage tanks. Since we estimate that over 50 percent of all hazardous waste management facilities are storage facilities, these standards will enable us to begin issuing permits to a substantial portion of the hazardous waste management facility universe. Although technically these standards will not become effective until six months after publication, we will begin processing permits for such facilities as soon as the standards are published.

B. Reasons Why the Agency Cannot Meet the Fall, 1980, Target Date for the Remaining Phase II Standards

Notwithstanding these efforts, it now appears that EPA will not be able to finalize the remainder of the Section 3004 (Phase II) regulations -- standards for hazardous waste incinerators and for land disposal facilities -- by the end of this year. A number of factors have contributed to this delay.

5. One of the most significant sources of delay is the large amount of time we have had to spend finalizing the proposed and interim final regulations. As can be seen from the above recitation of accomplishments, the May 19 regulations have been anything but static. A number of provisions in the May 19 regulations were

promulgated in either interim final or proposed form, including the lists of hazardous waste, the definition of "solid waste", many of the Part 265 interim status standards, the financial requirements for owners and operators of hazardous waste management facilities, and the interim status requirements for the disposal of hazardous waste by underground injection.

Putting these interim final and proposed provisions into final form -- a task which, in some cases, has caused the Agency to rethink and substantially revise its original concept -- has been a substantial drain on the time of those critically involved in the Agency's regulatory effort.

6. A second, and related, source of delay is the time which we have had to spend amending the regulations to correct certain unforeseen and unintended results, clarifying the operation of the regulations, and responding to public suggestions on how the regulations could be improved. As is inevitably the case with such a massive and generalized regulatory effort as ours, the regulated community has brought to our attention instances in which our regulations either accomplish an arbitrary or clearly improper result or are unclear. For instance, taken literally, our original regulations required a person spilling a hazardous substance on a factory floor to obtain a treatment facility permit before taking action to mitigate the effects of the spill. Also, the original regulations inadvertently precluded small generators of hazardous waste from taking their waste to resource recovery centers. In an effort to clear up the worst of the "bugs" in the regulations before their November 19, 1980, effective date, we found that we had to divert an ever-increasing amount of resources to developing regulatory amendments and issuing writen interpretations of the regulations. In fact, during the six weeks before November 19, this effort consumed most of the time of the most knowledgeable staff in the Office of Solid Waste, and

the Office of General Counsel, and necessarily diverted them from the task of working on the Phase II regulations.

7. Another factor which has hampered our development of the Phase II standards is the pending litigation over the RCRA regulations in the United States Court of Appeals for the District of Columbia. Since May 19, 1980, almost fifty petitions have been filed by trade associations, individual companies, environmental groups and a state to review the May 19, 1980, regulations (consolidated under the lead cases of *Shell Oil Company v. EPA*, No. 80-1532, and *Natural Resources Defense Council, Inc. v. EPA*, No. 80-1607). [1] The lists of issues submitted by these petitioners run over one-hundred and twenty pages. This litigation has diverted the Agency's resources away from regulation development in a number of respects, not the least of which has been the compilation of the administrative record. This record occupies over 75 linear feet of shelf space and is estimated to contain over 300,000 pages. The certified index of the record alone is almost 300 pages in length. As can be imagined, the task of physically assembling and collating this record was enormous. One person in the Office of Solid Waste worked full time for approximately two and one half months assembling the record, with substantial assistance from personnel in all of the various branches of the Office of Solid Waste. Additionally, over 300 hours of attorney time had to be devoted to ensuring that the record contained all the proper documents.

The RCRA litigation also gave added impetus to our intense effort to clarify and repair the regulations before the November 19, 1980, effective date. Two petitioners indicated by the filing of petitions for an administrative stay of portions of the regulations, and other petitioners indicated informally, that they

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[1] An additional five petitions have been filed to review EPA's July 16, 1980, supplemental hazardous waste list (consolidated under the lead case of *The Ferroalloys Association v. EPA*, No. 80-2255).

might seek a court stay of the regulations unless some of the most serious ambiguities and deficiencies in the regulations were cleaned up by November 19, 1980. For this additional reason, we redoubled our efforts in October and November to make needed changes to the regulations.

The RCRA litigation has also required us to devote substantial attorney time to setting up negotiations, communicating with petitioners' attorneys, and generally wrestling with the manifold mechancial problems posed by such a complex appeal featuring so many litigants.

8. Another factor which has sapped our resources has been the extraordinary amount of effort spent in educating the public and Agency personnel on the RCRA regulations. Beginning in May, 1980, the top managers of the RCRA program have attended a steady stream of hearings, conferences, seminars and meetings designed to acquaint the regulated community, EPA regional personnel, and others with the content of these extraordinarily complex regulations. Gary Dietrich, Associate Deputy Assistant for Solid Waste -- a key figure in coordinating the development of the RCRA regulations -- has had to attend at least ten major conferences on the RCRA regulations, most of them out of town. Sponsored by EPA or by such groups as the American Law Institute, the American Bar Association, the National Solid Waste Management Association, and the <u>Legal Times of Washington</u>, these conferences have occupied an estimated 25 percent of his time. John Lehman, one of three division directors in the Office of Solid Waste, estimates that he has attended five such major conferences and has participated in at least twenty other seminars and meetings for the purpose of educating industrial groups, states, and EPA regional personnel with the contents of the RCRA regulations.

The Office of General Counsel legal staff who work closely with the Office of Solid Waste in developing the RCRA regulations have had similiar experiences. James A. Rogers, Associate General Counsel for the Water and Solid Waste Division, and Lisa K. Friedman, Assistant General Counsel for the RCRA Branch, have between them attended over twelve hearings, conferences, seminars and meetings designed to educate the public, EPA regional personnel and the states.

9. Apart from these seminars, an enormous amount of time has been spent answering the veritable barrage of daily telephone calls from persons requiring advice on the RCRA regulations. These questions are frequently complex and must be answered by program managers and attorneys who have the most comprehensive knowledge of the RCRA regulations. As a result of these telephone calls, signficant amounts of the day are often lost. Gary Dietrich and John Lehman, two of the prime movers in getting out the RCRA regulations, receive an average of twenty five calls a day, which take up between 25 and 50 percent of their time. James Rogers and Lisa Friedman of the Office of General Counsel receive as many as twenty and twenty five calls a day, which take up between 25 and 30 percent of their time.

So great has the volume of telephone calls become, that on October 30, EPA instituted a RCRA "Hot line" for the explicit purpose of answering questions concerning the regulations. Unfortunately, nagging and diverting as these telephone calls are, they cannot simply be ignored. EPA has an obligation to ensure that the public receives sound advice on the operation of the RCRA program, especially during the inception of the program.

10. A great deal of effort has also been spent preparing guidance manuals and documents, both for the Agency's own internal use and for the education of the public and permit writers. To date, a number of these documents have been prepared, including a several hundred page manual on methods for sampling and testing solid waste to determine if it is a hazardous waste and several

draft guidance documents for the Part 265 standards, which total some 500 pages in length. In addition a large amount of time has been spent assembling the guidance documents which are to accompany the Part 264 (Phase II) regulations to be put out this fall.

11. Another factor contributing to the delay has been the substantial amount of time spent reviewing states' applications for interim authorization and cooperative arrangements. In order to obtain interim authorization to conduct their own programs in lieu of the Federal program, states must submit two applications -- a draft application and then a final application. These applications range from between 200 and 2000 pages in length and must be carefully reviewed by the Agency staff. To date, we have received 32 draft applications for interim authorization, 8 final applications for interim authorization, and 16 applications for cooperative arrangements. Review of these applications has required the full time efforts of sixteen Office of Solid Waste personnel and substantial part time efforts of six Office of Water Enforcement and seven Office of General Counsel attorneys. A parallel effort has been responding to the approximately 60,000 notifications we have received under Section 3010 of RCRA and the estimated 25,000 Part A permit applications submitted by hazardous waste treatment, storage and disposal facilities who desire to qualify for interim status. Management of these notifications and applications has required the full time attention of five Office of Solid Waste employees since May.

12. I have just discussed the major factors of a generic nature which have diverted the Agency from the task of drafting the Phase II regulations. Many factors specific to the Phase II regulations themselves have also made it difficult for the Agency to finalize these regulations.

13. First, Section 3004 of RCRA, unlike the Clean Water Act or the Clean Air Act, does not dictate any particular control mechanism (e.g., best practicable technology, best available technology, ambient environmental criteria, design standards) which facilities should be required to use to achieve the Act's objective of protecting human health and the environment. Rather, the selection of appropriate controls is left largely to the Agency's expertise and discretion. Excercising this discretion has necessitated our evaluating a wider range of regulatory options than under statutes where Congress has mandated a single approach. In the area of landfill standards, for example, we have looked at design standards, technology requirements, ambient environmental standards, narrative and numerical standards and combinations of all of these. See, e.g., 45 Fed. Reg. 66816 (October 8, 1980). In deciding what makes the most sense, I have directed my staff to fully explore the advantages, drawbacks and implications of each broad option. This has necessarily required program personnel to spend a substantial amount of time exploring alternatives which do not "pan out" for one reason or another.

14. Second, our choice of standards is complicated by the fact that each control option must each be evaluated in the context of complicated, and often competing, policy objectives. For example, we would ideally like our permitting standards for hazardous waste incinerators and land disposal facilities to achieve the following goals (in addition to protecting human health and the environment):

-- They should be cabable of being easily translated into permit conditions so that permits for an estimated 9-10,000 existing facilities (and an unknown number of new facilities) can be issued expeditiously

-- They should be sufficiently specific to assist states in developing their own hazardous waste management programs and the regulated community in planning to meet applicable regulatory requirements

-- They should inspire public confidence to assure that facilities can obtain suitable sites

-- They should not be so expensive (either in terms of informational or technical requirements) that we discourage the construction of well-operated new facilities, and thereby create a shortfall in hazardous waste treatment, stroage or disposal capacity

The Agency needs to consider all these factors (and others) in developing permitting standards for land disposal facilities and incinerators. Because it is often difficult to develop standards which can fully achieve all these objectives simultaneously, we have had to spend considerable time evaluating and comparing alternative regulatory strategies to determine which provide the best balance of these competing goals.

15. Third, in developing most of these standards, we are literally working on the frontiers of science. We have few, if any, models in other Federal, State or even foreign regulatory programs on which to draw. There are few generally accepted industrial design standards to serve as a basis for technical requirements. There is little record of achievable performance capability and even less of a history of acceptable performance capability. As a result, the Section 3004 technical standards for hazardous waste treatment, storage, and disposal facilities have stretched the Agency's technical resources to the full. Drafting these regulations required analysis both of fields of great technical complexity and fields of great novelty with relatively limited data. It would be needlessly exhausting to discuss the complexity of developing each set of regulations for hazardous waste management facilties.2/

2/ In fact merely categorizing the various types of treatment, storage, and disposal facilities and practices is an exercise comparable in difficulty to the industry categorization process requiring years under the Clean Water Act's effluent guidelines program.

However, I will discuss certain elements of the incinerator and land disposal sections in some detail since they, respectively, illustrate well the problems of extremely complex decision-making and limited data which characterize this field. In each case the Agency's concerns and its approaches have had to differ greatly from all previous work undertaken by professional experts in these fields.

16. The development of the incinerator regulations provides a good example of how an awareness of a significant environmental hazards awaited fundamental research undertaken by EPA specifically to develop these regulations. EPA's own experiments with the Thermal Decomposition Analytical System (TDAS) underlie the recent widespread acceptance of the fact that incineration of hazardous waste can lead to the formation of hazardous combustion by-products (variously called daughter products, products of incomplete combustion, and recombinant products). These by-products may be as hazardous or more hazardous than the principal hazardous constituents of the original waste feed stream. Such by-products have never been expressly regulated by EPA or States and have seldom even been analyzed for, much less monitored, outside of laboratory settings and a few specific industrial test burns of purified waste streams. Regulation of this hitherto-unrecognized problem thus could not even be proposed before recent experiments were concluded. In the regulations we are now drafting, EPA is attempting to resolve significant technical uncertainties as to the predictability of these by-products, develop analytical techniques for their detection, and assess the destruction or removal capabilities of current treatment methods for these chemicals.

17. Even recognized problems required detailed technical research:

(a) Incinerator research, for example, included a characterization of the types of incinerators curently in commercial use, followed by an initial assessment of each listed waste for its appropriateness for incineration in each type of incinerator. This initial assessment is included as Appendix B.

(b) Evaluation of incinerator system designs covered fields ranging from the metallurgy of spray nozzles to the aerodynamics of particle movement in ultra-high-temperature combustion zones. 3/

(c) Most earlier engineering work on incinerators has focused systems maintenance and heating value, rather than on assessing destruction efficiency and predicting emissions. Thus much of

---

3/ As an example of one the simplest of these calculations, Agency engineers investigating waste retention time at various temperatures have concluded that:

Gas residence times are defined by the following formula:

$$\theta = \int_0^V \frac{dV}{q}$$

Where θ = mean residence time, s

V = combustion chamber volume, ft^3

q = gas flow rate, ft^3/s within the differential volume, dv and gas flow rate is given by:

$$q = \left(\frac{0.79}{Y_{N2}}\right)\left(\frac{T = + 460}{528}\right)\left[4.31\ (O_2)_{\text{stoich}}\ 68^{\circ}F\right]\ (1 + EA)$$

where Y_{N_2} = mole fraction N_2 in the gas within the differential volume

T = gas temperature, $^{\circ}F$, within the differential volume

$(O_2)_{\text{stoich}}$ = stoichiometric oxygen requirement, scf/s

EA = excess oxygen fraction, %/100, within the differential volume

As indicated in this equation, residence time is not an independent variable. For an incinerator of fixed volume and relatively constant feed, residence time is influenced by the temperature and excess air rate employed.

Gas flow rate at any point along the length of the combustion chamber is a function of the temperature at that point, the amount of excess air added up to that point, and the extent to which the combustion reactions are completed at that point. Therefore, solution of the above equation requires knowldge of the temperature profile, excess air profile, and waste conversion profile along the combustion chamber. These factors must be expressed as functions of combustion chamber length (i.e., volume) in order for the integration to be performed. Source: Draft Engineering Handbook for Hazardous Waste Incineration: August 1980, pp. 4-27,28

EPA's work has begun with fundamental empirical research and has been followed by complex and time-consuming development of detailed knowledge.

18. We are operating at the technological state-of-the-art in attempting to devise national standards for landfills as well. For example, we have only limited data on how plumes of hazardous waste leachate move through soil and aquifers, a critical link in determining whether (and where) contamination is taking place. Similarly, we have only limited information on the concentrations of constituents in these plumes as they move through the soil and groundwater. One cannot always assume, for example, that the concentration of a given contaminent will be uniform throughout a leachate plume. Waste materials that emerge from land disposal facilities do not automatically diffuse when they enter ground water. Thus the contaminants may remain in a concentrated "slug" as they move downgradient from the facility. It is often difficult to know whether such slugs will be present in a leachate plume and to predict how such slugs will migrate within the plume.

19. Fourth, the regulations must apply to an estimated 25,000 facilities (including some 9-10,000 incinerators and landfills) in a wide variety of climates (from deserts to rain forests) and locations (from facilities which are directly over groundwater to ones that are thousands of feet from groundwater sources, from facilities that are near population sources to ones which are hundreds of miles away). Some of these facilities have been in place for many years; others are new. Some are large off-site facilities handling tens of thousands of tons of wastes each year; others are small on site facilities handling several thousand tons of waste annually. The array of wastes they manage is staggering -- from wastewater to organic chemicals to smelting dusts and slags, from liquids to solids to semi-solids. Crafting

national regulatory standards which assure that each of these 25,000 widely divergent facilities is operated in a way which protects human health and the environment is extraordinarily difficult, particularly given the existing technical state-of-the-art and our desire to develop standards that can be expeditiously translated into permit conditions.

20. Fifth, unlike all other EPA statutes, we must deal with all environmental media in developing hazardous waste facility permitting standards. Our landfill standards, for example, must not only assure protection of groundwater, but also protect surface waters, cut down air emissions, prevent soil contamination, and reduce the possibility of explosions and fires. Sometimes hard tradeoffs must be made between media, further complicating our task. In addition, to the extent possible, as required by Section 1006 of RCRA, we are trying to coordinate our standards with several major pre-existing environmental programs which regulate each of these individual environmental media. For example, we are trying to assure that our groundwater protection strategy for landfills under RCRA is coordinated with our strategy for injection wells under the Safe Drinking Water Act and that standards for RCRA hazardous waste incinerators are consistent with Clean Air Act requirements.

21. Finally, these standards are extremely controversial. As we have indicated in previous reports to the Court, because the standards affect virtually all manufacturing facilities, and complying with them will be expensive (particularly because many of these facilities have not previously been subject to any State or Federal management standards), we have been inundated with comments on them from industry, states and environmental groups. Responding to these comments and developing alternative regulatory approaches to meet their authors' concerns has proven to be extremely difficult and time consuming. For example, in 1978,

the Agency proposed land disposal and incinerator standards that relied heavily on specific design and operating criteria that were based on what our initial surveys indicated to be the best engineering practices of the regulated industry. Comments on these standards asserted two basic themes: 1) The design criteria did not represent uniform industry practice and were too rigid to be applied on a nation-wide basis; in many specific cases they were unnecessary, needlessly expensive, or in fact, likely to produce adverse results, and 2) there was insufficient experience with the history of the design criteria to be assured that they would adequately protect human health and the environment as years went by, as facilities aged, and as new adverse affects might be discovered.

21. Some of these criticisms were ill-founded but required vast efforts to disprove.4/ Others appeared well taken; in responding to them the Agency has undertaken a two-fold effort, each part of which is extraordinarily complex. First, we have looked at our design standards and whenever possible have described the performance goals in terms that permit writers can apply on a case-by-case basis. But then, in order to provide adequate guidance to permit writers it has been necessary to prepare guidance materials which analyze the effects not just of one required set of design and operating criteria, but of many such approaches, any of which might meet the desired performance standard. This has greatly expanded the scope of the technical work required of Agency engineers. Second, we have considered alternative conceptual approaches to regulation. These new approaches were outlined in some detail in a "Concept Paper" published in the Federal Register on October 8, 1980 (45 Fed. Reg. 688676), using land disposal facilities as an example of their applicability.

4/ For example, many comments criticized the validity of the Destruction Efficiencies discovered during EPA's incinerator test burn. A major Agency research effort was launched to validate those results. After much technical work and a world-wide literature review we have confirmed that our initially measured Destruction Efficiencies have, in fact, been attained for a wide range of hazardous organic wastes.

C. Schedule for the Development of the Phase II Incinerator and Landfill Regulations

22. We are working diligently to complete our hazardous waste incinerator regulations and have every expectation of having them signed by the fifteenth of January, 1981.

23. As I have stated above, there are several reasons why the task of preparing standards governing the disposal of wastes in the ground is perhaps the most difficult technical problem the Agency has faced. Our firm objective is to publish these regulations in January as well, and our intensive Agency-wide efforts are directed toward accomplishing that objective. When we have completed reviewing the voluminous comments on the October 8 concept paper and the exact language of the new regulations governing disposal in the ground, I will be able to inform the Court more precisely as to our schedule for issuance of these standards.

24. It is unclear whether the next publication of the regulations noted in paragraph 23 will be as final standards, or will be proposed, because, my lawyers inform me, depending on the substance of those standards, it may be necessary to propose all or part of the regulations to avoid judicial remand for inadequate notice and comment under the Administrative Procedure Act. If the decision is made to propose the regulations it will be virtually impossible for me to predict when those regulations will be issued as final standards, because there will be a new Administrator by then, and probably a new Assistant Administrator for Water and Waste Management. In any event, I will notify the Court in January as to our intentions with respect to these important standards.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on December 8, 1980

Douglas M. Costle

CERTIFICATE OF SERVIC

I hereby certify that the foregoing Affidavit of Douglas M. Costle has been hand-delivered or mailed, first class postage prepaid this 9th day of December, 1980 to each of the following:

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Dean Hansell, Esquire
Georgr W. Wolff, Esquire
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Honorable Bob Eckhardt
Subcommittee on Oversight and
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Lisa K. Friedman
Lisa K. Friedman

Monsanto

MONSANTO TEXTILES COMPANY
P O. Box 12830
Pensacola, Florida 32575
Phone: (904) 968-6311

January 28, 1981

FEB 1981
RECEIVED
BUREAU
AQM

Mr. Tommie A. Gibbs, Chief
Air Facilities Branch
U.S. Environmental Protection Agency
345 Courtland Street, N.E.
Atlanta, Georgia 30308

Dear Mr. Gibbs:

Re: Monsanto Company PSD Permit
Maleic Anhydride Production Facility
PSD FL-055
Legal No. 22111 1-T
January 1, 1981

Some additional significant information which bears on EPA's BACT determination for the reference permit has come to Monsanto's attention. For that reason we are submitting for the record these additional comments and will appreciate your consideration of them in your deliberations.

The attached very recent document is a copy of a transmittal from Douglas Costle, as Administrator of EPA, to the District Court in Washington, D.C. In this document Mr. Costle addresses the problem that EPA has encountered in developing regulations to implement the Resource Conservation and Recovery Act. On pages 15 through 18 of this document, the problems of determining appropriate incinerator destruction efficiencies for establishment of emission limits are discussed. Following are some direct quotations from Mr. Costle.

> "In developing most of these standards, we are literally working on the frontiers of science."
>
> "Most earlier engineering work on incinerators has focused systems maintenance and heating valve, rather than on assessing destruction efficiency and predicting emissions."
>
> "There are few generally accepted industrial design standards to serve as a basis for technical requirements. There is little record of achievable performance capability and even less of a history of acceptable performance capability."

Monsanto believes that these comments strongly support our contention that the data base available for technology transfer used to establish proposed emission limits for the reference permit leaves many questions unanswered and many unknowns which could have a significant adverse impact on achieving the proposed BACT emission limits.

In view of Mr. Costle's further confirmation of the existing problems in establishing emission limits for incinerators, some allowance for these problems should be made in determining BACT so that specific emission limits are actually achievable.

Your review of the attached document and consideration of Monsanto's position will be appreciated.

Sincerely,

J. J. Vick
Environmental Control Superintendent

aw
attachment

cc: Mr. Kent Williams
Mr. Jeff Shumaker
Mr. Bill Thomas
Ms. Mary Clark
Mr. Tom Moody

MAR 26 1981

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

REF: 4AH-AF

Mr. J. J. Vick
Environmental Control Superintendent
Monsanto Company
P. O. Box 12830
Pensacola, Florida 32575

Re: Maleic Anhydride Production Facility
PSD-FL-055

Dear Mr. Vick:

Review of your February 19, 1980 application to construct a facility which will produce maleic anhydride and is to be located near Pensacola, Florida has been completed. The construction is subject to rules for the Prevention of Significant Air Quality Deterioration (PSD) contained in 40 CFR §52.21.

We have determined that the construction, as described in the application, meets all applicable requirements of the PSD regulations, subject to the conditions in the Conclusions section to the Final Determination (enclosed). EPA has performed the preliminary determination concerning the proposed construction, and published a request for public comment on January 1, 1981. Your comments were the only comments received. Our response to those comments is attached to the Final Determination. Authority to Construct a Stationary Source is hereby issued for the facility described above, subject to the conditions in the Conclusions section to the Final Determination. This Authority to Construct is based solely on the requirements of 40 CFR §52.21, the Federal regulations governing significant deterioration of air quality. It does not apply to NPDES or other permits issued by this agency or permits issued by other agencies. Information regarding EPA permitting requirements can be provided if you contact Mr. Joe Franzmathes, Director, Office of Program Integration and Operations, at 404/881-3476. Additionally, construction covered by this Authority to Construct must be initiated within 18 months from the date of this letter.

Please be advised that a violation of any condition issued as part of this approval, as well as any construction which proceeds in material variance with information submitted in your application, will be subject to enforcement action.

Authority to Construct will take effect on the date of this letter. The complete analysis which justifies this approval has been fully documented for future reference, if necessary. Any questions concerning this approval may be directed to Dr. Kent Williams, Chief, New Source Review Section, 404/881-4552.

Sincerely yours,

Thomas W. Devine
Director
Air and Hazardous Materials Division

Enclosure

cc: FL DER

PUBLIC NOTICE

On January 1, 1981, the Environmental Protection Agency published a notice of availability of the Preliminary Determination for the proposed modification of Monsanto's maleic anhydride facility near Pensacola. During the 30-day public comment period, no comments were received other than those submitted by the company. As a result of the comments by Monsanto and the Agency's evaluation of them, the allowable emissions of volatile organic compounds (VOC) and carbon monoxide (CO) specified in the Final Determination are 482 tons per year and 648 tons per year respectively.

The Final Determination and Permit are available for inspection at the office of Mr. Joe Flowers, Escambia County Comptroller. Questions regarding the permit conditions may be directed to:

Mr. Tommie A. Gibbs
Air Facilities Branch
Environmental Protection Agency
345 Courtland Street
Atlanta, Georgia 30365

Final Determination
Monsanto Company
PSD-FL-055

I. Applicant

Monsanto Company
Post Office Box 12830
Pensacola, Florida 32575

II. Location

The proposed modification is located at the north end of Chemstrand Road approximately 3 miles north of 9-Mile Road, north of Pensacola, Florida. The UTM coordinates are: Zone 16, 475.5 kilometers east and 3384.8 kilometers north.

III. Project Description

The applicant proposes to construct a plant to produce maleic anhydride from butane. Benzene will not be used as a raw material as it is in the majority of existing maleic anhydride plants. Benzene has been determined to be a hazardous air pollutant, thus the proposed use of butane as the raw material will completely eliminate benzene emissions. Two existing steam generators are to be modified to incinerate the off-gases from the maleic anhydride process. The design capacity is to be 133 million pounds of maleic anhydride per year.

IV. Source Impact Analysis

The existing plant has the potential to emit greater than 100 tons per year of particulate matter (PM), sulfur dioxide (SO_2), nitrogen oxides (NO_x), volatile organic compounds (VOC), and carbon monoxide (CO); therefore, the existing source is a major stationary source. The proposed modification significantly increases emissions of pollutants regulated under the Clean Air Act as amended August 7, 1977 (Act). Thus, in accordance with Title 40, Code of Federal Regulations, Part 52.21 (40 CFR §52.21) as promulgated August 7, 1980 (45 FR 52676), the proposed construction is a major modification and is subject to a Prevention of Significant Deterioration (PSD) review.

The PSD review applies to each pollutant for which the modification would result in a significant net emissions increase. Table 1 summarizes emission changes of all pollutants regulated under the Act affected by the proposed modification. As this table shows, the proposed net emissions increases of VOC and CO are significant as defined in the PSD regulations (Line E greater than Line F). The emissions of PM, SO_2, and NO_x will have no net increase, and therefore are not subject to PSD review.

The PSD review analyzes the following:

A. Best Available Control Technology (BACT);
B. National Ambient Air Quality Standards (NAAQS) Impacts;
C. PSD Increment Impacts;
D. Class I Area Impacts;
E. Growth Impacts, and
F. Soils, Visibility and Vegetation Impacts.

A. BACT Analysis

Any new or modified facility which increases emissions of VOC or CO must apply BACT. BACT is defined for each pollutant as the maximum degree of reduction achievable determined by a case-by-case review, taking into account energy, environmental and economic impacts. The applicant has proposed BACT for each applicable case and has presented justification for the choice proposed. The justification is based upon the criteria listed above.

EPA has reviewed the technology and emission limits proposed as BACT; it has concurred in some cases, and required amended values in other cases to achieve a determination which meets the defined objectives.

The maleic anhydride process off-gases will consist of 96 percent H_2O, CO_2, O_2, and N_2 with less than 2 percent each of CO and organics. The organics will be largely butane with small quantities of acetic acid, acrylic acid and maleic anhydride. No benzene is expected in these off-gases. At full operating rate these organics may range up to 7000 pounds per hour and the carbon monoxide range up to 6700 pounds per hour.

Table 1

Summary of Emissions, Tons/Year[a]

Facilities	PM	SO2	NOx	VOC	CO
A. New Construction					
Maleic Anhydride Plant	0	0	0	0	0
Product Storage	0	0	0	<1	0
B. Modified (After) Boilers #7 and #8	≤61[b]	≤2.5[b]	≤1358[c]	482	648
C. Modified (Before) Boilers #7 and #8	61[d]	2.5[d]	1358[e]	13[d,f]	70[d,f]
D. Increase from Modified	0	0	0	469	578
E. Increase from New and Modified	0	0	0	470	578
F. Significant Emissions Increase	25	40	40	40	100

[a] Based upon maximum capacity operating 100% of the year.

[b] Applicant proposed no increased emissions; this is ensured through Florida State Operation Permit condition of gas fuel firing only.

[c] Applicant proposed no increased emissions; this is to be ensured through Condition 6 of this PSD permit.

[d] Calculated by EPA based upon AP-42 (Table 1.4-1) emission factors for gas combustion.

[e] Based upon test data (1977 and 1979) supplied by applicant.

[f] Applicant proposed higher values (see section IV A.).

The applicant proposes to control emissions of organics and CO by burning the process off-gases in two modified steam generators (Babcock and Wilcox Boilers #7 and #8).

These steam generators are currently permitted to operate with gas fuel only. At full operating rate (500 million Btu/hour each) the actual emissions are estimated to be 3 pounds per hour of VOC and 16 pounds per hour of CO. These estimates were made by EPA based upon AP-42 (Table 1.4-1) emission factors and are somewhat lower than those submitted by the applicant (6 and 30 respectively). The introduction of the process off-gases to these steam generator furnaces will reduce fuel consumption and should not increase emissions from fuel.

The applicant proposes this technology as BACT for the control of organic and CO emissions from the maleic anhydride process. The applicant further proposes BACT for this modification be a maximum of 91 pounds per hour of total gaseous non-methane organic carbon and 148 pounds per hour of CO emissions. This represents 98.5% and 98.0% control of organics and CO, respectively at the maximum maleic anhydride process off-gas rate. The applicant has agreed that when lower operating rates occur the rate (pounds/hour) of emissions will also be lowered (see permit Condition #3, Table II for actual conditional rates).

EPA review concurs that the proposed technology constitutes BACT for this case, and further recognizes that this is a new process with no directly applicable information available to determine control efficiencies.

The applicant proposed control efficiencies for VOC based upon the proposed National Emission Standards for Hazardous Air Pollutants (NESHAPS) published 45 FR 26660, April 28, 1980 for existing maleic anhydride plants. This standard was derived from option 1 defined in the preamble as:

> "97 percent benzene control, based on the best demonstrated level of control that is now achieved at an existing maleic anhydride plant and that is universally applicable at any existing plant." (Emphasis added.)

The selection of the option in this Final Determination over a competitive option (99 percent control specified in the PSD Preliminary Determination) as the standard was based upon a variety of specific environmental, energy and economic considerations involving the affected existing plants. These are discussed at length in the preamble to the proposed standard.

The maleic anhydride plant processing equipment components (pumps, valves, etc.) have the potential to emit fugitive VOC emissions. For this reason, components in VOC service require application of BACT. BACT for fugitive VOC emissions such as this is limited to require work practices and equipment standards. Emissions limits standards cannot reasonably be established. In controlling these emissions, the source will establish a leak detection and repair program.

The National Emission Standards for Hazardous Air Pollutants (NESHAPS) proposed as Subpart H of Part 61 of Chapter 1, Title 40 of the Code of Federal Regulations has been proposed as a National Emission Standard for Benzene Emissions from Maleic Anhydride Plants. This was published April 18, 1980 (45 FR 26660). This proposed maleic anhydride plant would be subject to this rule if promulgated as proposed. The use of butane as a raw material is considered 100 percent control of benzene and therefore ensures compliance with the proposed requirement that a new source shall have no detectable benzene emissions.

B. Impact Upon National Ambient Air Quality Standards (NAAQS)

Emissions of VOC require review to ensure the ozone NAAQS shall not be violated. The ambient standards for ozone and CO for various averaging times are:

Pollutant	Averaging Time	NAAQSa
Ozone	1-hour	235
Carbon Monoxide	8-hour	10,000
	1-hour	40,000

[a]Micrograms per cubic meter; not to be exceeded more than once per year.

The present air quality of Escambia County is monitored by the Florida Department of Environmental Regulation (DER) with continuous readings obtained at a site at Ellyson Field. A summary of the ozone and CO data for 1978 and the first 9 months of 1979 is:

Number of Ozone Observations	1978	1979
Average, ppm	.025	.033
High, ppm	.106	.114
2nd High, ppm	.100	.105
NAAQS, ppm	.120[a]	.120[a]

Number of CO Observations	1978
Average, ppm	0.45
High, ppm	3.6
2nd High, ppm	3.0
NAAQS, ppm	35[b]

[a]Equivalent to 235 micrograms per cubic meter.
[b]Equivalent to 40,000 micrograms per cubic meter.

The applicant proposes that this ambient air data is representative of the maximum concentrations expected in the overall area. He notes that ozone is an "area wide" pollutant and that the monitoring site is surrounded by industrial and mobile sources. The monitoring site is less than 20 kilometers from the proposed modification; EPA concurs that the data is representative of the existing air quality. The data shows the ozone NAAQS was not violated during the representative time.

The applicant has submitted an analysis to show the impact of the proposed modification upon the ozone NAAQS. The analysis considered the proposed VOC emissions increase of 469 tons per year. Also considered was a 1977 emissions inventory [5] which showed total hydrocarbon emissions in Escambia County to be 23996 tons per year. The inventory, developed by the Florida Department of Environmental Regulation also projected that by 1982 the total hydrocarbon emissions will be reduced by 3076 tons per year due to decrease in mobile source emissions. The applicant reasons the 469 tons annual increase from the proposed modification would offset only 15 percent of this projected reduction. As discussed previously, monitoring data does not show NAAQS violations. Further, a net VOC emissions reduction is expected to occur by 1982. On this basis the applicant concluded that the proposed increase does not threaten the NAAQS for ozone.

The reduced VOC emissions allowed by BACT of 469 tons per year will leave 85 percent of the projected emissions inventory reduction intact. EPA concurs that this analysis shows the ozone NAAQS will not be violated due to the proposed modification.

The proposed CO emissions were modeled by the applicant using PTMAX. An expected maximum 1-hour increase of 37 micrograms per cubic meter is below the significance levels of 500 for an 8-hour average or 2,000 for a 1-hour average (43 FR 26393, June 19, 1978). Therefore, no further analysis of impact upon the NAAQS for CO is required, and it is concluded that the proposed modification does not threaten the NAAQS for CO.

C. Impacts Upon PSD Increments

No PSD increments have been established for VOC or CO.

D. Impacts Upon Class I Areas and Areas of Known Increment Violations

The nearest Class I area is Breton National Wildlife Refuge in Louisiana which is approximately 160 kilometers to the west. The proposed modification is not expected to affect that area. No areas of known increment violation are in the vicinity of this modification.

E. Growth Analysis

No additional employment will result due to this modification, and no growth in the area will result due to product use. Transportation of raw materials and product will result in minimal secondary impacts. The applicant concludes and EPA concurs that growth associated with this modification will not cause significant air quality impacts.

F. Impacts Upon Soils, Visibility, and Vegetation

The applicant concludes this modification will have no impact upon soils, vegetation or visibility because the impact upon NAAQS has been shown to be small and these standards were set with welfare impacts considered. EPA concurs the impact upon soils, vegetation and visibility will not be significant.

V. Conclusions

EPA Region IV proposes a final determination of approval with conditions for construction of the maleic anhydride plant and modifications to two existing steam generators proposed by Monsanto Company in its application submitted February 19, 1980. The determination is made on the basis of information contained in the application and in additional information received June 12, 1980, July 21, 1980, and October 1, 1980 (application complete on July 21, 1980). The conditions set forth in the permit are as follows:

1. The new and modified facilities shall be constructed in accordance with the capacities and specifications stated in the application.

2. Benzene shall not be used as any part of the maleic anhydride plant feed stream unless the permit is modified for its use and all applicable regulations met.

3. The allowable emissions for volatile organic compounds (VOC) and carbon monoxide (CO) shall be varied depending on the number of maleic anhydride reactors in operation.

   The total allowable VOC and CO emissions from both modified steam generators for each of the reactor operating modes are limited as follows:

TABLE II

Operating Modes	No. of Reactor in Operation	Emission Limits TGNMO* (lb/hr) (A)	(B)	CO (lb/hr) C	D
I	4	91	118	148	183
II	3	87	113	138	171
III	2 (both boilers in operation)	69	90	115	142
IV	2 (only one boiler in operation)	60	78	100	124

*Total gaseous non-methane organic carbon

(A) = an average of any 24 consecutive one-hour periods for VOC measured as TGNMO
(B) = one hour maximum for VOC measured as TGNMO
(C) = an average of any 24 consecutive one-hour periods for CO
(D) = one hour maximum for CO

Note: Allowable emissions during any 24-hour period during which the operating mode changes shall be determined by prorating the emissions proportionally with the hours of operation in each mode.

4. Permittee shall install, calibrate, maintain, and operate a continuous monitoring system for the measurement of carbon monoxide concentration in the flue gases from each of the two (2) modified steam generators.

   The continuous monitoring system must be able to perform at a minimum of one CO analysis every 15 minutes.

   Permittee shall also monitor and record: (1) process off-gas flow rate, (2) fuel flow rate, (3) combustion air flow rate, (4) furnace temperature, (5) operating time of each reactor and other process parameters or information necessary for a calculation of the total flue gas volumetric flow rate from each steam generator.

   The flue gas temperature in each modified steam generator shall be monitored and recorded and shall be maintained at or above 1800°F while any amount of maleic anhydride plant off-gas is being incinerated. Operation below 1800°F shall be allowed only if specific performance tests have been conducted to demonstrate compliance at or below the specific operating furnace temperature.

5. Permittee shall develop and implement a plan to correlate VOC concentrations to CO concentration of flue gases from each modified steam generator under various operating conditions. VOC/CO correlation can be analytical or empirical equation. VOC concentration will be predicted from monitored CO concentration using the established correlation equation.

   Permittee shall submit to EPA a test report describing in detail the methods, conditions, and validity of the VOC/CO concentration correlation within 15 days after such relations are established.

   Reliability of VOC/CO correlation equations shall be evaluated at least once a year through actual analysis of VOC sampling over the operating range. The test data shall be submitted to EPA for review within 30 days after completion of the test.

   Should process modifications which affect the validity of VOC/CO correlation be made on either the maleic anhydride plant or the steam generators, recorrelation of VOC/CO emission concentrations shall be conducted within 90 days of attaining full operation. After such modification, the plan shall be revised as necessary. Such modifications include, but are not limited to, combustion modifications such as installation of different type burners, combustion air relocation, fuel conversion, and tube removal or addition.

6. Demonstration of Compliance

A. Initial Compliance:

Compliance with the 24-hour average emissions limits (Table II) shall be determined by performance tests scheduled in accordance with the attached General Conditions. The performance tests shall be conducted in accordance with the provisions of reference methods in Appendix A of 40 CFR 60, except as provided under 40 CFR §60.8(b) as follows:

a. Method 1 for selection of sampling site and sample traverses;
b. Method 3 for gas analysis;
c. Method 7 for concentration of nitrogen oxides;
d. Method 10 for carbon monoxide;
e. Method 25 or proposed Method 25a for volatile organic compounds.

The performance test to show compliance with the organic emissions limits and the carbon monoxide limits shall be conducted at the maximum maleic anhydride process operating rate (for each of the operating modes), minimum boiler fuel gas temperature, and minimum excess oxygen rate expected during future operations. If operation cannot be achieved with all these extremes simultaneously, additional performance tests shall be run to ensure compliance at all expected actual operating conditions.

The performance test to show compliance with the nitrogen oxides emissions limit (310 lb/hr) shall be conducted at the maximum excess oxygen rate and the maximum exit gas temperature expected during future operations.

The parameters of maleic anhydride process rate, monitored variables and other routinely monitored steam generator process control parameters shall be recorded during compliance testing and made a part of the reported results.

B. Continuous Compliance

The permittee shall develop and implement a plan to monitor and maintain the maleic anhydride plant and modified steam generator control parameters to optimize destruction efficiency of volatile organic compounds (VOC) while maintaining VOC and CO emissions at or below the allowable emission limits specified in permit condition three (3).

The permittee shall continuously monitor CO concentrations, correlate CO concentration to VOC concentration, calculate and record (1) the flue gas volumetric flow rate, (2) CO emission, lb/hr, and (3) VOC emission, lb/hr, from each of two steam generators; with a time lag of not more than 10 minutes and a frequency of not less than four per hour. Moreover, alarms shall be installed to indicate process operation outside allowable emission limits.

(i) the emissions of carbon monoxide in pounds per hour will be determined from monitored CO concentration and calculated flue gas flow rate;

(ii) the emission of VOC in pounds per hour will be determined from predicted VOC concentration and calculated flue gas flow rate. The VOC concentration will be predicted through VOC/CO correlation equation;

(iii) the predictive VOC emission shall be used to determine compliance unless the permittee adequately demonstrates through other means that the emission levels are in compliance. An evaluation of such demonstration must be made through a submittal to EPA and their concurrence with the alternate methodology.

Compliance determination for VOC or CO for each of the operating modes will be based on the total emission from both modified steam generators, with emission limits specified in permit condition three (3) Table II.

7. The source will establish a program to control fugitive VOC emissions. This program will consist of continuous leak detection and repair program.

8. During start-up, shutdown, and control system malfunction the source must comply with the following:

   a. The emissions will not exceed 1,750 lbs of either VOC (calculated as butane) or CO/reactor hr. for start-ups and malfunctions; 875 lbs of either VOC or CO/reactor hr. for shutdowns.

   b. No more than 1 1/2 hours during an individual reactor start-up or shutdown.

   c. No more than 8 hours for a total production start-up.

   d. No more than 6 hours during a control system malfunction to allow sufficient time to troubleshoot and correct the problem.

9. The source must comply with the requirements and provisions of the attached General Conditions.

GENERAL CONDITIONS

1. The permittee shall notify the permitting authority in writing of the beginning of construction of the permitted source within 30 days of such action and the estimated date of start-up of operation.

2. The permittee shall notify the permitting authority in writing of the actual start-up of the permitted source within 30 days of such action and the estimated date of demonstration of compliance as required in the specific conditions.

3. Each emission point for which an emission test method is established in this permit shall be tested in order to determine compliance with the emission limitations contained herein within sixty (60) days of achieving the maximum production rate, but in no event later than 270 days after initial start-up of the permitted source. The permittee shall notify the permitting authority of the scheduled date of compliance testing at least thirty (30) days in advance of such test. Compliance test results shall be submitted to the permitting authority within forty-five (45) days after the complete testing. The permittee shall provide (1) sampling ports adequate for test methods applicable to such facility, (2) safe sampling platforms, (3) safe access to sampling platforms, and (4) utilities for sampling and testing equipment.

4. The permittee shall retain records of all information resulting from monitoring activities and information indicating operating parameters as specified in the specific conditions of this permit for a minimum of two (2) years from the date of recording.

5. If, for any reason, the permittee does not comply with or will not be able to comply with the emission limitations specified in this permit, the permittee shall provide the permitting authority with the following information in writing of such conditions on a quarterly basis:

   (a) description of noncomplying emission(s);

   (b) cause of noncompliance;

   (c) anticipated time the noncompliance is expected to continue or, if corrected, the duration of the period of noncompliance;

   (d) steps taken by the permittee to reduce and eliminate the noncomplying emission;

   and

   (e) steps taken by the permittee to prevent recurrence of the noncomplying emission.

   Failure to provide the above information when appropriate shall constitute a violation of the terms and conditions of this permit. Submittal of this report does not constitute a waiver of the emission limitations contained within this permit.

6. Any change in the information submitted in the application regarding facility emissions or changes in the quantity or quality of materials processed that will result in new or increased emissions must be reported to the permitting authority. If appropriate, modifications to the permit may then be made by the permitting authority to reflect any necessary changes in the permit conditions. In no case are any new or increased emissions allowed that will cause violation of the emission limitation specified herein.

7. In the event of any change in control or ownership of the source described in the permit, the permittee shall notify the succeeding owner of the existence of this permit by letter and forward a copy of such letter to the permitting authority.

8. The permittee shall allow representatives of the State environmental control agency and/or representatives of the Environmental Protection Agency, upon the presentation of credentials:

   (a) to enter upon the permittee's premises, or other premises under the control of the permittee, where an air pollutant source is located or in which any records are required to be kept iunder the terms and conditions of the permit;

   (b) to have access to and copy at reasonable times and records required to be kept under the terms and conditions of this permit, or the Act;

   (c) to inspect at reasonable times any monitoring equipment or monitoring method required in this permit;

   (d) to sample at reasonable times any emission of pollutants;

   and

   (e) to perform at reasonable times an operation and maintenance inspection of the permitted source.

9. All correspondence required to be submitted by this permit to the permitting agency shall be mailed to the:

   Chief, Air Facilities Branch
   Air and Hazardous Materials Division
   U. S. Environmental Protection Agency
   Region IV
   345 Courtland Street
   Atlanta, Georgia 30365

10. The conditions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

The emission of any pollutant more frequently or at a level in excess of that authorized by this permit shall constitute a violation of the terms and conditions of this permit.

REFERENCES

1. 45 FR 26660, Benzene Emissions from Maleic Anhydride Plants, National Emissions Standard.
2. EPA 450/3-80-001a, Benzene Emissions from Maleic Anhydride Plants - Background Information Documtne for Proposed Standard.
3. Lee, K., Jahnes, H.J., Macanley, D.C., "Thermal Oxidation Kinetics of Selected Organic Compounds" Union Carbide Corporation, paper presented at the 71st Annual Meeting of the Air Pollution Control Association, Houston, Texas, June 25-30, 1978.
4. EPA-AP-40, Air Pollution Engineering Manual.
5. Florida DER, Proposed Revision to the State Implementation Plan for Non-attainment Areas, December 1978.
6. EPA-450/2-78-041, Revised September 1979, Measurement of Volatile Organic Compounds.

Response to Comments

Monsanto Company

PSD-FL-055

One commenter responded to the Preliminary Determination and Public Notice issued January 1, 1981 for Monsanto's application to construct a maleic anhydride plant (PSD-FL-055). EPA Region IV has evaluated the comments made and where appropriate, revised the Preliminary Determination. Responses to individual comments and changes incorporated into the Final Determination are summarized as follows:

Comment 1

The commenter questioned whether or not a statement of design capacity included in condition one in any way restricted actual production.

Response 1

The design capacity of the plant, extracted from the application, should be indicative of actual operation at maximum capacity; however, operation in excess of design capacity is not necessarily precluded under Prevention of Significant Deterioration (PSD) regulations (40 CFR §52.21) or the specific conditions of this determination. For this plant, production in excess of design rates can occur, providing compliance with allowable emissions limits and other conditions of approval is maintained in operating the plant.

Comment 2

The commenter objects to and requests deletion of Condition 2 which precluded use of benzene as a feedstock to the plant consistent with proposed 40 CFR 51 Subpart H.

Response 2

EPA Region IV agrees that exclusion of benzene as a feedstock in this case is premature in the absence of a promulgated standard. However, it is appropriate to acknowledge the proposed standard and condition approval on compliance with applicable requirements of the standard as promulgated.

It is also important to clarify that the proposed modification, as specified in the application, is for construction of a butane process maleic anhydride plant. A change in the feedstock or any other change in the method of operation would require scrutiny for applicability under federal PSD regulations.

Comment 3

The commenter feels that proposed maximum hourly emissions limits for VOC and CO from the maleic anhydride plant are unnecessarily stringent and possibly beyond the capability or destruction efficiency which can reasonably be achieved from the proposed incineration control technology (modified boilers incinerating maleic anhydride air oxidation process off-gass). The commenter further feels that the proposed control system is undemonstrated, in that no like facilities exist at this time and that insufficient data exists to support, through technology transfer, the allowable limits specified in the Preliminary Determination.

Response 3

EPA Region IV agrees that the proposed technology is not well established and is innovative in that the technology has potentially higher control efficiencies and lower operating costs than established incinerator techniques. In respect to VOC, a further review of the available data sources, including additional data submitted with comments, has brought a revision in the determination in that the proposed emissions VOC rate is now 91 pounds per hour of total gaseous non-methane organic emission measured as carbon at maximum capacity measured as a 24-hour average.

The proposed CO emissions limit (83 lb/hr maximum) has been reconsidered in light of the additional data received and reestablished at a less stringent level (148 lb CO/hr). This determination is acceptable in part due to the insignificant ambient air impact resulting from CO emissions (36 ug/m^3 maximum 1 hour concentration). The proposed impact in conjunction with the worse case existing air quality monitored (6000 ug/m^3) is not endangering the ambient standard (40,000 ug/m^3). Furthermore, the minor effect of changing the CO emissions limit (13 ug/m^3) was determined insufficient to require additional opportunity for public comments.

The VOC and CO emissions limits (Condition 3) have been changed in the Final Determination as discussed.

Comment 4

The commenter requested that a NO_x emissions limit and associated compliance testing requirements be deleted because NO_x did not require PSD review.

Response 4

The NO_x emissions limits and testing is necessary to ensure no net increase in NO_x emissions resulting from the boiler modification. Addition of off-gass and new burner designs will significantly change the combustion parameters affecting NO_x formation in the boilers. The threat of increased NO_x emissions is not great enough to justify continuous monitoring; however, compliance testing following start-up will confirm the conclusion drawn in the application based on logical but somewhat subjective analysis, that NO_x emissions will not increase.

Comment 5

The commenter objects to the requirement for an in-stack continuous VOC monitor to ensure compliance. The objection is based on the test being undemonstrated at this time.

Response 5

EPA is in agreement that at present time continuous VOC monitoring has not been demonstrated in continuous commercial use. Continuous monitoring of VOCs will not be required. Continuous monitoring of process parameters and collating these factors with VOC emission is required. If the process parameters indicate VOC emissions are in violation, then a flue gas test will be required.

Comment 6

The commenter objected to the requirement to implement a leak detection and repair program consistent with the general provisions "BACT for Fugitive Emissions of Hydrocarbons." The commenter questioned the cost effectiveness of fugitives controls and requested that if fugitives controls be required that they be consistent with recently proposed regulation for SOCMI fugitives.

Response 6

EPA agrees that in this case, "BACT for Fugitive Emissions of Hydrocarbons" is excessive; however, Monsanto will still have to install a continuous leak detection and repair program. Monsanto will be under SOCMI fugitives regulations when they are promulgated.

Comment 7

The commenter requested a 270 day period following startup during which to optimize the control system and demonstrate compliance.

Response 7

EPA agrees that an extended period for shakedown and compliance testing is reasonable in this instance due to the complexity of the performance testing which must be accomplished. The permit conditions have been revised to allow up to 270 days following start-up for compliance testing.

Comment 8

The commenter requested that reports of excess emissions be required quarterly consistent with NSPS requirements rather than within 5 days.

Response 8

EPA agrees to the quarterly reporting of excess emissions.

Comment 9

The commenter requested specific language be incorporated into the permit conditions to address excess emissions during start-up, shutdown, and malfunction.

Response 9

EPA agrees that specific startup, shutdown, and malfunction provisions should be incorporated into the permit. A condition to this effect has been added to the Final Determination.

Summary

The Final Determination takes into consideration the comments and responses discussed previously. A copy of the comments received have been appended to the Final Determination and will be placed on display in the same location as the Preliminary Determination for public information.

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

NORTHWEST DISTRICT
160 GOVERNMENTAL CENTER
PENSACOLA, FLORIDA 32501-5794

BOB GRAHAM
GOVERNOR

VICTORIA J. TSCHINKEL
SECRETARY

ROBERT V. KRIEGEL
DISTRICT MANAGER

March 2, 1984

DER
MAR 09 1984
BAQM

Mr. R. L. Monty
Superintendent Environmental, Health
and Safety
Monsanto Company
P. O. Box 12830
Pensacola, Florida 32575

Dear Mr. Monty:

Enclosed is Permit Number AO17-77464, dated March 2, 1984, to operate a maleic anhydride plant, issued pursuant to Section 403.087, Florida Statutes.

Should you object to this permit, including any and all of the conditions contained therein, you may file an appropriate petition for administrative hearing. This petition must be filed within 14 days of the receipt of this letter. Further, the petition must conform to the requirements of Section 28-5.201, Florida Administrative Code (see reverse). The petition must be filed with the Office of General Counsel, Department of Environmental Regulation, Twin Towers Office Building, 2600 Blair Stone Road, Tallahassee, Florida 32301.

If no petition is filed within the prescribed time, you will be deemed to have accepted this permit and waived your right to request an administrative hearing on this matter.

Acceptance of the permit constitutes notice and agreement that the Department will periodically review this permit for compliance, including site inspections where applicable, and may initiate enforcement action for violation of the conditions and requirements thereof.

Sincerely,

Thomas W Moody

Thomas W. Moody, P.E.
Special Programs Supervisor

TWM:jpd
Enclosure

DEPARTMENT OF ENVIRONMENTAL REGULATION

ROUTING AND TRANSMITTAL SLIP

ACTION NO.

ACTION DUE DATE

1. TO: (NAME, OFFICE, LOCATION)
~~Bill Thomas~~

INITIAL

DATE

2. ~~Willard Hanks~~

INITIAL

DATE

3. BAQM

INITIAL

DATE

4.

INITIAL

DATE

REMARKS:
Patty | file

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 & REPT
- ☐ INITIAL & FORWARD
- ☐ DISTRIBUTE
- ☐ CONCURRENCE
- ☐ FOR PROCESSING
- ☐ INITIAL & RETURN

FROM: Jack Preece

DATE 3-5-84

PHONE

STATE OF FLORIDA
DEPARTMENT OF
ENVIRONMENTAL REGULATION

MONSANTO COMPANY
MALEIC ANHYDRIDE PLANT
ESCAMBIA COUNTY

OPERATION
PERMIT

NO. A017-77464

DATE OF ISSUANCE

March 2, 1984

Robert V. Kriegel
District Manager

DATE OF EXPIRATION

January 1, 1989

DER FORM PERM 11-40

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

NORTHWEST DISTRICT
160 GOVERNMENTAL CENTER
PENSACOLA, FLORIDA 32501-5794

BOB GRAHAM
GOVERNOR
VICTORIA J. TSCHINKEL
SECRETARY
ROBERT V. KRIEGEL
DISTRICT MANAGER

PERMITTEE:

Monsanto Company

I.D. Number: 10/17/0040/06
Permit/Certification Number: A017-77464
Date of Issue: March 2, 1984

Expiration Date: January 1, 1989
County: Escambia
Latitude/Longitude: 30°35'28"N/87°14'25"W
Section/Township/Range: 30/1N/30W
Project: Maleic Anhydride Plant

This permit is issued under the provisions of Chapter 403, Florida Statutes, and Florida Administrative Code Rules 17-2 and 17-4. The above named applicant, hereinafter called 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:

Operation of a maleic anhydride plant. Designed to produce 18,860 pounds of maleic anhydride per hour (pph) using butane as a raw material. The reaction is carried out in four reactors with waste gases separated in two product recovery units.

Approximately 260,000 pounds per hour of waste gas is emitted from each pair of reactors, this contains less than 3,500 pounds per hour of carbon monoxide (CO) and less than 2,500 pounds per hour of volatile organic compounds (VOC). The balance of the waste gas stream is harmless H_2O, CO_2 and N_2. Emissions of CO and VOC are controlled by incineration in Boilers #7 and #8. The two waste gas headers are cross-connected, but normal flow is from Reactors #1 and #2 to Boiler #7 and from Reactors #3 and #4 to Boiler #8.

During startup, shutdown or malfunction of the maleic anhydride plant, waste gases are vented without control. This is required for safety. Such venting is conditionally allowed.

Located: Intersection of State Roads 292 and 297, north of Pensacola.

PERMITTEE:
Monsanto Company

I.D. Number: 10/17/0040/06
Permit/Certification Number: A017-77464
Date of Issue: March 2, 1984

Expiration Date: January 1, 1989

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 therefor 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.

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.

GENERAL CONDITIONS:

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 noncompliance; 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.

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.

PERMITTEE:
Monsanto Company

I.D. Number: 10/17/0040/06
Permit/Certification Number: A017-77464
Date of Issue: March 2, 1984

Expiration Date: January 1, 1989

GENERAL CONDITIONS:

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 noncompliance 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 Prevention of Significant Deterioration (PSD).

14. The permittee shall comply with the following monitoring and record keeping requirements:

a. Upon request, the permittee shall furnish all records and plans 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.

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.

PERMITTEE:
Monsanto Company

I.D. Number: 10/17/0040/06
Permit/Certification Number: A017-77464
Date of Issue: March 2, 1984

Expiration Date: January 1, 1989

GENERAL CONDITIONS:

c. Records of monitoring information shall include:

- the date, exact place, and time of sampling or measurement;
- the person responsible for performing the sampling or measurement;
- 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:

16. The maximum allowable operating rate is 4.1 million standard cubic feet per hour of waste gas from each pair of reactors fed to each boiler. The minimum allowable boiler operating rate while feeding waste gas is 150,000 pounds of steam per hour per boiler. This source shall not be operated beyond the allowable operating conditions unless the permittee submits a request to the Department outlining conditions desired and a plan to conduct carbon monoxide (CO) emission tests to assure compliance with allowed emissions per Condition 19 below.

17. Permittee shall maintain particulate, SO_2 and visible emissions in compliance with the conditions of Operation Permits A017-63177 and -63178 or subsequent renewal permits issued to operate Boilers #7 and #8.

18. Volatile organic compounds (VOC) emissions are considered to be adequately controlled whenever carbon monoxide (CO) emissions are in compliance with Condition 19 below. Therefore no VOC emission limit is specified.

19. CO emissions shall not exceed 132 pounds per hour total both boilers. Compliance with this standard shall be assured by installing an alarm to the CO continuous monitors which warns of all instances of exceedance of 160 ppm. If 160 ppm is exceeded for more than 120 minutes in any 24 hour period it shall be reported as an excess emission as soon as practical to the Northwest District Office of the Department. In case of fluctuating concentrations each fractional minute shall be counted as a full minute. The cause of these excess CO

PERMITTEE:
Monsanto Company

I.D. Number: 10/17/0040/06
Permit/Certification Number: A017-77464
Date of Issue: March 2, 1984

Expiration Date: January 1, 1989

SPECIFIC CONDITIONS:

emissions shall be investigated and any means taken to reduce, eliminate and prevent recurrence of such cause shall be reported in writing to the Northwest District Office of the Department as soon as practical or at least at the end of each quarter.

20. A log for the carbon monoxide continuous emission monitors shall be kept and shall be available for Department inspections. The log shall contain information concerning routine maintenance inspections, calibrations, adjustments and repairs in accordance with Company policies described and demonstrated to the Department.

21. Visible emissions shall not exceed 20% opacity under normal operation except for up to 2 minutes in any one hour at not more than 40% opacity.

22. During startup, shutdown and malfunction of the maleic anhydride reactors the waste gas stream may be vented without incineration for:

A. Up to 90 minutes during startup or shutdown of an individual reactor, or

B. Up to 120 minutes per reactor during startup or shutdown of more than one reactor simultaneously (not separated by more than 2 hours), or

C. Up to 360 minutes during a malfunction to allow sufficient time to trouble shoot and correct the problem,

provided the vented emissions shall not exceed 1750 pounds of either VOC or CO per reactor hour during startups and malfunctions, or the vented emissions shall not exceed 875 pounds of either VOC or CO per reactor hour during shutdowns.

23. An assessment shall be made of all instances of venting uncontrolled waste gas which shows the time duration of actual venting and the total weight of VOC and of CO vented. The time and weight allowances specified for each instance shall be recorded. A comparison between actual time and weights vented and allowed time and weights (per Condition 22) shall be made to determine instances of non-allowed venting (violation). The details of this assessment shall be maintained as a log available for Department inspections. A copy of these details and analysis shall be submitted to the Northwest District of the Department within 30 days after the end of each calendar quarter.

PERMITTEE: Monsanto Company	I.D. Number: 10/17/0040/06 Permit/Certification Number: A017-77464 Date of Issue: March 2, 1984 Expiration Date: January 1, 1989

SPECIFIC CONDITIONS:

24. A report of instances of excess emissions of CO (as defined in Condition 19) and of all instances of venting which exceed the allowances of Condition 22 shall be submitted to: PSD Coordinator, Bureau of Air Quality Management, Department of Environmental Regulation, 2600 Blair Stone Road, Tallahassee, Florida 32301-8241 with a copy to the Northwest District Office. This report shall be submitted quarterly within 30 days after the end of the quarter.

25. An annual operation report (DER Form 17-1.202(6) attached) shall be submitted by March 1 each year. The attached form shall be reproduced by the permittee and used for future annual submittals.

Expiration Date:

January 1, 1989

Issued this 2d day of March,
1984.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION

ROBERT V. KRIEGEL
District Manager

180 GOVERNMENTAL CENTER
PENSACOLA, FLORIDA 32601

BOB GRAHAM
GOVERNOR

JACOB D. VARN
SECRETARY

ROBERT V. KRIEGEL
DISTRICT MANAGER

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

NORTHWEST DISTRICT

RECEIVED
APR 1 '80
A.M.

COMPLETENESS SUMMARY
AIR POLLUTION SOURCES

AC17-27953

SOURCE NAME: Maleic Anhydride production facility

DATE RECEIVED: February 20,1
DATE REVIEWED: March 17, 198
REVIEWED BY: Thomas W. Moody

APPLICANT NAME: Monsanto Company

APPLICANT ADDRESS: P. O. Box 12830
Pensacola, FL 32575

Your application for a permit to construct/operate this referenced project has been received, and reviewed for completeness. The following checked items are needed to complete your application.

( ) Application fee of $20. Make check payable to the Department of Environmental Regulation.

( ) See comments on application, copy attached.

( ) Letter authorizing applicant to represent owner.

(x) 8½" x 11" diagram of flow process, showing labelled emission points and flow rates (Section V 6 of form 17-1.122(16))

(x) 8½" x 11" location map. (Section V 7)

(x) 8½" x 11" plant layout sketch showing emission points. (Section V 8)

( ) Test results showing compliance with emission limitations of the department.

( ) Air diffusion modeling results showing compliance with ambient air standards and PSD increment.

( ) Engineer's report pursuant to Section 17-4.21(1)(c), F.A.C.

(x) Other: (Any section of the application which is incomplete or lacks sufficient information to be evaluated)

(See attached Sheet)

Monsanto Company
Maleic Anhydride production facility
AC17-27953

On form 17-1.122 (16):

Section II c - Show breakdown of estimated costs.
III A and B - Show flow rates, as per section V 1.
III C - Show basis of emission estimates, as per section V 2.
III D - Show derivation of efficiency, as per section V 5.
VI C - Show individual constituents and concentrations of organics.
VI F - The control device selected must be one of those listed as available in Section VI E.

Reasonable assurance must be affirmatively provided that ambient air quality standards at the plant site will not be exceeded. (17-4.07(1) and 17-2.06(4) F. A. C.). Provide more site-specific data, including recent company monitoring results, to show impact on ambient air quality at the plant site. Provide sufficient data and information to enable an evaluation in accordance with EPA Guidelines for Air Quality Maintenance Planning and Analysis, Volume 10 (Revised), EPA-450/4-77-001.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET
ATLANTA, GEORGIA 30308

MAR 20 1980

REF: 4AH-AF

Mr. J. J. Vick
Environmental Control Superintendent
Monsanto Company
P. O. Box 12830
Pensacola, Florida 32575

Re: Maleic Anhydride Facility
Permit Application
(PSD-FL-055); Letter of
February 15, 1980

Dear Mr. Vick:

EPA received on February 19, 1980 your application to construct a Maleic Anhydride production facility north of Pensacola, Florida (PSD-FL-055). Review of this application under the Federal Prevention of Significant Deterioration (PSD) Regulations (40 CFR 52.21) and the partial stay of these regulations published February 5, 1980 (45 FR 7800) has shown it to be incomplete.

To allow review of the application to continue, please submit information on the following items:

1. Calculations leading to the maximum emissions (tons per year and PPH) for organics and carbon monoxide. These should include the source of factual data and the basis of any assumptions.

2. Evidence of enforceable allowable emissions limits for particulates and SO_2, which will assure no increase of allowable emissions of these two pollutants.

Nat gas in boiler [illegible]

3. Estimated potential and allowable emissions of NO_x under current permitted operating conditions and under the proposed operating conditions. This may consist of current test data and a proposed allowable limit. If potential emissions of NO_x exceed 100 tons per year and allowable emissions increases exceed 50 tons per year, 1000 pounds per day, or 100 pounds per hour, analyses of BACT and NAAQS will be required.

Steam plant [illegible]

4. A precise statement of what is proposed as BACT. This should include proposed numerical allowable limits for hydrocarbon and carbon monoxide emissions.

5. A copy of the input and output of the PTMAX runs.

6. Acceptable results of continuous air quality preconstruction monitoring for ozone. These data shall be collected in full accordance with guidelines found in "Ambient Air Monitoring Guidelines for Prevention of Significant Deterioration" OAQPS 1.2-096, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina 27711, May 1978. EPA encourages permit applicants to consult with the reviewing authority (EPA Region IV) regarding implementation of the monitoring requirements.

7. An analysis of the air impact projected for the areas as a result of general commercial, residential, industrial, and other growth associated with the modification.

If you have questions, please feel free to call Mr. Kent Williams of my staff at 404/881-4552 or Mr. Jeffrey L. Shumaker of TRW Inc. at 919/541-9100. TRW is under contract to EPA and its personnel are acting as authorized representatives of the Agency in providing aid to the Region IV PSD review program.

Sincerely,

Tommie A. Gibbs

Tommie A. Gibbs, Chief
Air Facilities Branch

TAG:JWP:jt

RECEIVED
FEB 19 1980
NORTHWEST FLORIDA
DER

AC17-27953

PAID
FEB 20 1980
20.00
KM

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

APPLICATION TO OPERATE/CONSTRUCT AIR POLLUTION SOURCES

SOURCE TYPE: ______________ ☒ New[1] ☐ Existing[1]

APPLICATION TYPE: ☒ Construction ☐ Operation ☐ Modification

COMPANY NAME: Monsanto Company COUNTY: Escambia

Identify the specific emission point source(s) addressed in this application (i.e. Lime Kiln No. 4 with Venturi Scrubber; Peeking Unit No. 2, Gas Fired) Maleic Anhydride Plant

SOURCE LOCATION: Street ______________ City ______________

UTM: East 475.7 North 3384.8

X ——> Latitude ___ ° ___ ' ___ "N Longitude ___ ° ___ ' ___ "W

APPLICANT NAME AND TITLE: J. J. Vick, Environmental Control Superintendent

APPLICANT ADDRESS: P.O. Box 12830, Pensacola, Fl. 32575

SECTION I: STATEMENTS BY APPLICANT AND ENGINEER

A. APPLICANT

I am the undersigned owner or authorized representative* of Monsanto Company

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

*Attach letter of authorization

Signed: ______________

J. J. Vick, Environmental Control Supt.
Name and Title (Please Type)

Date: ______________ Telephone No. 968-7542

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

This is to certify that the engineering features of this pollution control project have been designed/examined by me and found to be in conformity with modern engineering principles applicable to the treatment and disposal of pollutants characterized in the permit application. There is reasonable assurance, in my professional judgment, that the pollution control facilities, when properly maintained and operated, will discharge an effluent that complies with all applicable statutes of the State of Florida and the rules and regulations of the department. It is also agreed that the undersigned will furnish, if authorized by the owner, the applicant a set of instructions for the proper maintenance and operation of the pollution control facilities and, if applicable, pollution sources.

Signed: ______________

J. J. Vick
Name (Please Type)

(Affix Seal)

Monsanto Company
Company Name (Please Type)

P. O. Box 12830 - Pensacola, Fl. 32575
Mailing Address (Please Type)

Florida Registration No. 4636 Date: ______________ Telephone No. 968-7542

---

[1] See Section 17-2.02(15) and (22), Florida Administrative Code, (F.A.C.)

SECTION II: GENERAL PROJECT INFORMATION

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

See Supplement I

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

Start of Construction January 2, 1981 Completion of Construction July 1, 1983

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

Cost for conveying and control facilities for pollution abatement is estimated at $3M.

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

B & W steam generator #7 and #8. Operating permits

E. Is this application associated with or part of a Development of Regional Impact (DRI) pursuant to Chapter 380, Florida Statutes, and Chapter 22F-2, Florida Administrative Code? ___ Yes X No

F. Normal equipment operating time: hrs/day 24 ; days/wk 7 ; wks/yr 52 ; if power plant, hrs/yr ___ ;

if seasonal, describe:

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

1. Is this source in a non-attainment area for a particular pollutant? No
   a. If yes, has "offset" been applied?
   b. If yes, has "Lowest Achievable Emission Rate" been applied?
   c. If yes, list non-attainment pollutants.
2. Does best available control technology (BACT) apply to this source? If yes, see Section VI. Yes
3. Does the State "Prevention of Significant Deteriorioation" (PSD) requirements apply to this source? If yes, see Sections VI and VII. No
4. Do "Standards of Performance for New Stationary Sources" (NSPS) apply to this source? No
5. Do "National Emission Standards for Hazardous Air Pollutants" (NESHAP) apply to this source? No

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

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

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

Description	Contaminants		Utilization Rate - lbs/hr	Relate to Flow Diagram
	Type	% Wt		
Butane	N/A	N/A	N/A	
	SEE SUPPLEMENT I			

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

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

2. Product Weight (lbs/hr):

C. Airborne Contaminants Emitted:

$\frac{113}{2000}$ x 7x24x52 = 493.6TPY org

707.6TPY CO.

why

Name of Contaminant	Emission[1]		Allowed Emission[2] Rate per Ch. 17-2, F.A.C.	Allowable[3] Emission lbs/hr	Potential Emission[4]		Relate to Flow Diagram
	Maximum lbs/hr	Actual T/yr			lbs/hr	T/yr	
Organics	113	399*	N/A	N/A	See Supp. I		7 & 8
CO	162	569*	N/A	N/A	See Supp. I		7 & 8
Maleic Anhydride	4	0.75	N/A	N/A	See Supp. I		3 & 4
* Maximums							

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

Name and Type (Model & Serial No.)	Contaminant	Efficiency	Range of Particles[5] Size Collected (in microns)	Basis for Efficiency (Sec. V, It[5]
B&W Steam Gernerators	Organics	97 to 100%	N/A	Pilot Tests
#7 & #8	CO	97 to 100%		and
				published
				data

[1] See Section V, Item 2.

[2] Reference applicable emission standards and units (e.g., Section 17-2.05(6) Table II, E. (1), F.A.C. – 0.1 pounds per million BTU heat input)

[3] Calculated from operating rate and applicable standard

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

[5] If Applicable

E. Fuels

Type (Be Specific)	Consumption*		Maximum Heat Input (MMBTU/hr)
	avg/hr	max./hr	
	SEE SUPPLEMENT I		

*Units Natural Gas, MMCF/hr; Fuel Oils, barrels/hr; Coal, lbs/hr

Fuel Analysis:

Percent Sulfur: ______ Percent Ash: ______

Density: ______ lbs/gal Typical Percent Nitrogen: ______

Heat Capacity: ______ BTU/lb ______ BTU/gal

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

F. If applicable, indicate the percent of fuel used for space heating. Annual Average ______ Maximum ______

G. Indicate liquid or solid wastes generated and method of disposal.
Small quantities of organics will be disposed of by contract. Equipment wash water and any contaminated storm water will be handled by existing disposal facilities.

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

Stack Height: ______ ft. Stack Diameter: ______ ft.

Gas Flow Rate: See Supplement I ACFM Gas Exit Temperature: ______ °F.

Water Vapor Content: ______ % Velocity: ______ FPS

SECTION IV: INCINERATOR INFORMATION

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

Description of Waste ______

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

Approximate Number of Hours of Operation per day ______ days/week ______

Manufacturer ______

Date Constructed ______ Model No. ______

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

Stack Height: ____________ ft. Stack Diameter ____________ Stack Temp. ____________

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

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

Type of pollution control device: [ ] Cyclone [ ] Wet Scrubber [ ] Afterburner [ ] Other (specify) ____________

Brief description of operating characteristics of control devices: ____________

Ultimate disposal of any effluent other than that emitted from the stack (scrubber water, ash, etc.):

SECTION V: SUPPLEMENTAL REQUIREMENTS

Please provide the following supplements where required for this application.

1. Total process input rate and product weight – show derivation.

2. To a construction application, attach basis of emission estimate (e.g., design calculations, design drawings, pertinent manufacturer's test data, etc.,) and attach proposed methods (e.g., FR Part 60 Methods 1, 2, 3, 4, 5) to show proof of compliance with applicable standards. To an operation application, attach test results or methods used to show proof of compliance. Information provided when applying for an operation permit from a construction permit shall be indicative of the time at which the test was made.

3. Attach basis of potential discharge (e.g., emission factor, that is, AP42 test).

4. With construction permit application, include design details for all air pollution control systems (e.g., for baghouse include cloth to air ratio; for scrubber include cross-section sketch, etc.).

5. With construction permit application, attach derivation of control device(s) efficiency. Include test or design data. Items 2, 3, and 5 should be consistent: actual emissions = potential (1-efficiency).

6. An 8½" x 11" flow diagram which will, without revealing trade secrets, identify the individual operations and/or processes. Indicate where raw materials enter, where solid and liquid waste exit, where gaseous emissions and/or airborne particles are evolved and where finished products are obtained.

7. An 8½" x 11" plot plan showing the location of the establishment, and points of airborne emissions, in relation to the surrounding area, residences and other permanent structures and roadways (Example: Copy of relevant portion of USGS topographic map).

8. An 8½" x 11" plot plan of facility showing the location of manufacturing processes and outlets for airborne emissions. Relate all flows to the flow diagram.

9. An application fee of $20, unless exempted by Section 17-4.05(3), F.A.C. The check should be made payable to the Department of Environmental Regulation.

10. With an application for operation permit, attach a Certificate of Completion of Construction indicating that the source was constructed as shown in the construction permit.

SECTION VI: BEST AVAILABLE CONTROL TECHNOLOGY

A. Are standards of performance for new stationary sources pursuant to 40 C.F.R. Part 60 applicable to the source?
☐ Yes ☒ No

Contaminant	Rate or Concentration

B. Has EPA declared the best available control technology for this class of sources (If yes, attach copy) ☐ Yes ☐ No

Contaminant	Rate or Concentration

C. What emission levels do you propose as best available control technology?

Contaminant	Rate or Concentration
Organics	113#/Hr 399 TPY
Carbon Monoxide	162#/Hr 569 TPY

D. Describe the existing control and treatment technology (if any).

1. Control Device/System:
2. Operating Principles:
3. Efficiency:*
4. Capital Costs:
5. Useful Life:
6. Operating Costs:
7. Energy:
8. Maintenance Cost:
9. Emissions:

Contaminant	Rate or Concentration

*Explain method of determining D 3 above.

10. Stack Parameters

a. Height: ft.
b. Diameter: ft.
c. Flow Rate: ACFM
d. Temperature: °F
e. Velocity: FPS

E. Describe the control and treatment technology available (As many types as applicable, use additional pages if necessary).

1.

a. Control Device: Thermal Oxidizer
b. Operating Principles: Oxidation at 1500 to 1800°F

c. Efficiency*: 97 to 99%
d. Capital Cost: $7.0M̄
e. Useful Life: 15 years
f. Operating Cost: $0.25M̄/Yr gain
g. Energy*: 500 KW
h. Maintenance Cost: $0.25M̄/Yr.
i. Availability of construction materials and process chemicals:

Available

j. Applicability to manufacturing processes: Applicable
k. Ability to construct with control device, install in available space, and operate within proposed levels: Satisfactory

2.

a. Control Device: Catalytic Oxidizer
b. Operating Principles: Catalytic Oxidation

c. Efficiency*: Est. to be 85%
d. Capital Cost: $7.0M̄
e. Useful Life: 15 years
f. Operating Cost: Estimated somewhat inferior to thermal oxidizer
g. Energy**: Lower than thermal oxidizer
h. Maintenance Costs: Estimated higher than thermal oxidizer
i. Availability of construction materials and process chemicals:

Available

j. Applicability to manufacturing processes: Believed applicable but no known experience with this process.
k. Ability to construct with control device, install in available space, and operate within proposed levels: Not known

*Explain method of determining efficiency.

**Energy to be reported in units of electrical power — KWH design rate.

3.

a. Control Device: Hydrocarbon recovery plus catalytic oxidizer
b. Operating Principles: Carbon adsorbtion followed by catalytic oxidation

c. Efficiency*: Estimated at 85%
d. Capital Cost: $7 to $10M̄
e. Life: 15 years
f. Operating Cost: Higher than thermal oxidizer
g. Energy: Higher than thermal oxidizer
h. Maintenance Cost: Higher than thermal oxidizer

*Explain method of determining efficiency above.

i. Availability of construction materials and process chemicals:

Available.

j. Applicability to manufacturing processes: Not demonstrated

k. Ability to construct with control device, install in available space and operate within proposed levels: Not demonstrated

4.

a. Control Device

b. Operating Principles:

c. Efficiency*:

d. Capital Cost:

e. Life:

f. Operating Cost:

g. Energy:

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

F. Describe the control technology selected:

1. Control Device: Fossile fuel fired steam generator
2. Efficiency*: 97-100%
3. Capital Cost: $3.0M
4. Life: 15 Years
5. Operating Cost: $1.0M gain
6. Energy: 375 KW (additional)
7. Maintenance Cost: $120k/Yr.
8. Manufacturer: Babcock & Wilcox
9. Other locations where employed on similar processes:

a. Not known

(1) Company:

(2) Mailing Address:

(3) City:

(4) State:

(5) Environmental Manager:

(6) Telephone No.:

*Explain method of determining efficiency above.

(7) Emissions*:

Contaminant	Rate or Concentration

(8) Process Rate*:

b.

(1) Company:

(2) Mailing Address:

(3) City:

(4) State:

*Applicant must provide this information when available. Should this information not be available, applicant must state the reason(s) why.

(5) Environmental Manager:

(6) Telephone No.:

(7) Emissions*:

Contaminant	Rate or Concentration

(8) Process Rate*:

10. Reason for selection and description of systems:

Selected technology will provide contaminant level reductions equal to or greater than any other applicable technology. No additions to the powerhouse work force will be required and existing capital investment will be utilized not only for steam generation but for pollution control. New capital requirements are minimized. Energy recovery will be better than with any other applicable technology.

*Applicant must provide this information when available. Should this information not be available, applicant must state the reason(s) why.

SECTION VII – PREVENTION OF SIGNIFICANT DETERIORATION

A. Company Monitored Data

1. ________ no sites ________ TSP ________ ( ) SO^2* ________ Wind spd/dir

Period of monitoring ____/____/____ to ____/____/____
month day year month day year

Other data recorded ________________________________

Attach all data or statistical summaries to this application.

2. Instrumentation, Field and Laboratory

a) Was instrumentation EPA referenced or its equivalent? _____ Yes _____ No

b) Was instrumentation calibrated in accordance with Department procedures? _____ Yes _____ No _____ Unknown

B. Meteorological Data Used for Air Quality Modeling

1. _____ Year(s) of data from ____/____/____ to ____/____/____
month day year month day year

2. Surface data obtained from (location) ________________________________

3. Upper air (mixing height) data obtained from (location) ________________________________

4. Stability wind rose (STAR) data obtained from (location) ________________________________

C. Computer Models Used

1. ________________________________ Modified? If yes, attach description.

2. ________________________________ Modified? If yes, attach description.

3. ________________________________ Modified? If yes, attach description.

4. ________________________________ Modified? If yes, attach description.

Attach copies of all final model runs showing input data, receptor locations, and principle output tables.

D. Applicants Maximum Allowable Emission Data

Pollutant	Emission Rate
TSP	________________ grams/sec
SO^2	________________ grams/sec

E. Emission Data Used in Modeling

Attach list of emission sources. Emission data required is source name, description on point source (on NEDS point number), UTM coordinates, stack data, allowable emissions, and normal operating time.

F. Attach all other information supportive to the PSD review.

*Specify bubbler (B) or continuous (C).

G. Discuss the social and economic impact of the selected technology versus other applicable technologies (i.e., jobs, payroll, production, taxes, energy, etc.). Include assessment of the environmental impact of the sources.

H. Attach scientific, engineering, and technical material, reports, publications, journals, and other competent relevant information describing the theory and application of the requested best available control technology.

i. Availability of construction materials and process chemicals:
Available

j. Applicability to manufacturing processes: Not demonstrated

k. Ability to construct with control device, install in available space and operate within proposed levels: Not demonstrated

4.

a. Control Device

b. Operating Principles:

c. Efficiency*:

d. Capital Cost:

e. Life:

f. Operating Cost:

g. Energy:

h. Maintenance Cost:

i. Availability of construction materials and process chemicals:

j. Applicability to manufacturing processes:

k. Ability to construct with control device, install in available space, and operate within proposed levels:

F. Describe the control technology selected:

1. Control Device: Fossile fuel fired steam generator
2. Efficiency*: 97-100%
3. Capital Cost: $3.0 M̄
4. Life: 15 years
5. Operating Cost: $1.0 M̄ /Yr. gain
6. Energy: 375 KW (additional)
7. Maintenance Cost: $120k/Yr.
8. Manufacturer: Babcock & Wilcox
9. Other locations where employed on similar processes:

a. Not Known

(1) Company:

(2) Mailing Address:

(3) City:

(4) State:

(5) Environmental Manager:

(6) Telephone No.:

*Explain method of determining efficiency above.

(7) Emissions*:

Contaminant	Rate or Concentration

(8) Process Rate*:

b.

(1) Company:

(2) Mailing Address:

(3) City:

(4) State:

*Applicant must provide this information when available. Should this information not be available, applicant must state the reason(s) why.

E. Describe the control and treatment technology available (As many types as applicable, use additional pages if necessary).

1.

a. Control Device: Thermal Oxidizer

b. Operating Principles: Oxidation at 1500 to 1800 °F

c. Efficiency*: 97 to 100%	d. Capital Cost: $7.0 $\overline{M}$
e. Useful Life: 15 Years	f. Operating Cost: $0.25 $\overline{M}$ /Yr. gain
g. Energy*: 500 KW	h. Maintenance Cost: $0.25 $\overline{M}$ /Yr.

i. Availability of construction materials and process chemicals:

Available

j. Applicability to manufacturing processes: Applicable

k. Ability to construct with control device, install in available space, and operate within proposed levels: Satisfactory

2.

a. Control Device: Catalytic Oxidizer

b. Operating Principles: Catalytic Oxidation

c. Efficiency*: Est. to be 85%	d. Capital Cost: $7.0 $\overline{M}$
e. Useful Life: 15 years	f. Operating Cost: Estimated somewhat inferior to thermal oxidizer.
g. Energy**: Lower than Thermal oxidizer.	h. Maintenance Costs: Estimated higher than thermal oxidizer.

i. Availability of construction materials and process chemicals:

Available

j. Applicability to manufacturing processes: Believed applicable but no known experience with this process.

k. Ability to construct with control device, install in available space, and operate within proposed levels: Not known

*Explain method of determining efficiency.

**Energy to be reported in units of electrical power – KWH design rate.

3.

a. Control Device: Hydrocarbon recovery plus catalytic oxidizer

b. Operating Principles: Carbon adsorption followed by catalytic oxidation

c. Efficiency*: Est. at 85%	d. Capital Cost: $7 to $10 $\overline{M}$
e. Life: 15 years	f. Operating Cost: Higher than thermal oxidizer
g. Energy: Higher than thermal oxidizer	h. Maintenance Cost: Higher than thermal oxidizer

*Explain method of determining efficiency above.

SUPPLEMENT I

MALEIC ANHYDRIDE
PERMIT

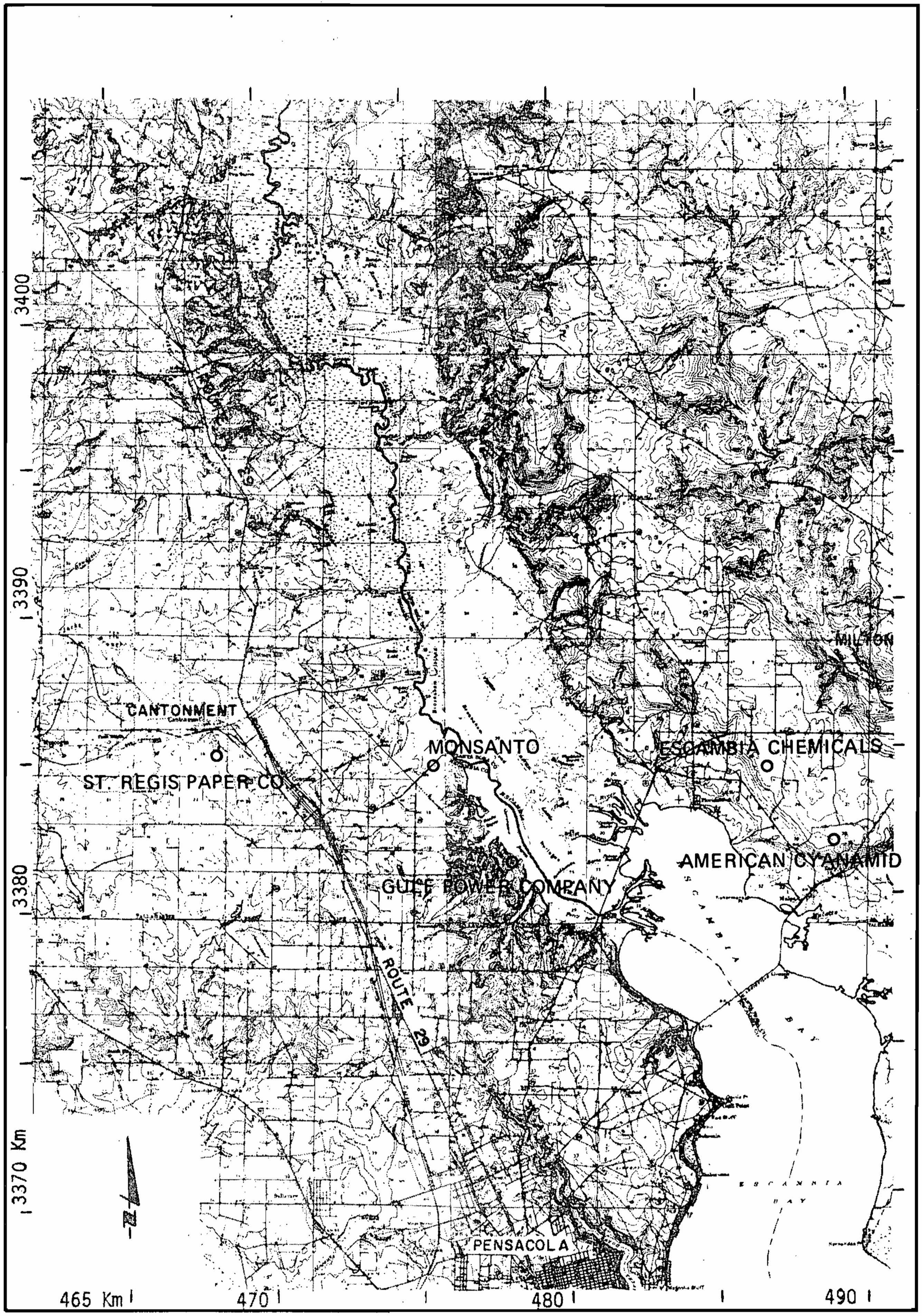
MONSANTO COMPANY

PSD PERMIT APPLICATION
FOR A MALEIC ANHYDRIDE
PRODUCTION FACILITY

SUBMITTED BY: MONSANTO COMPANY

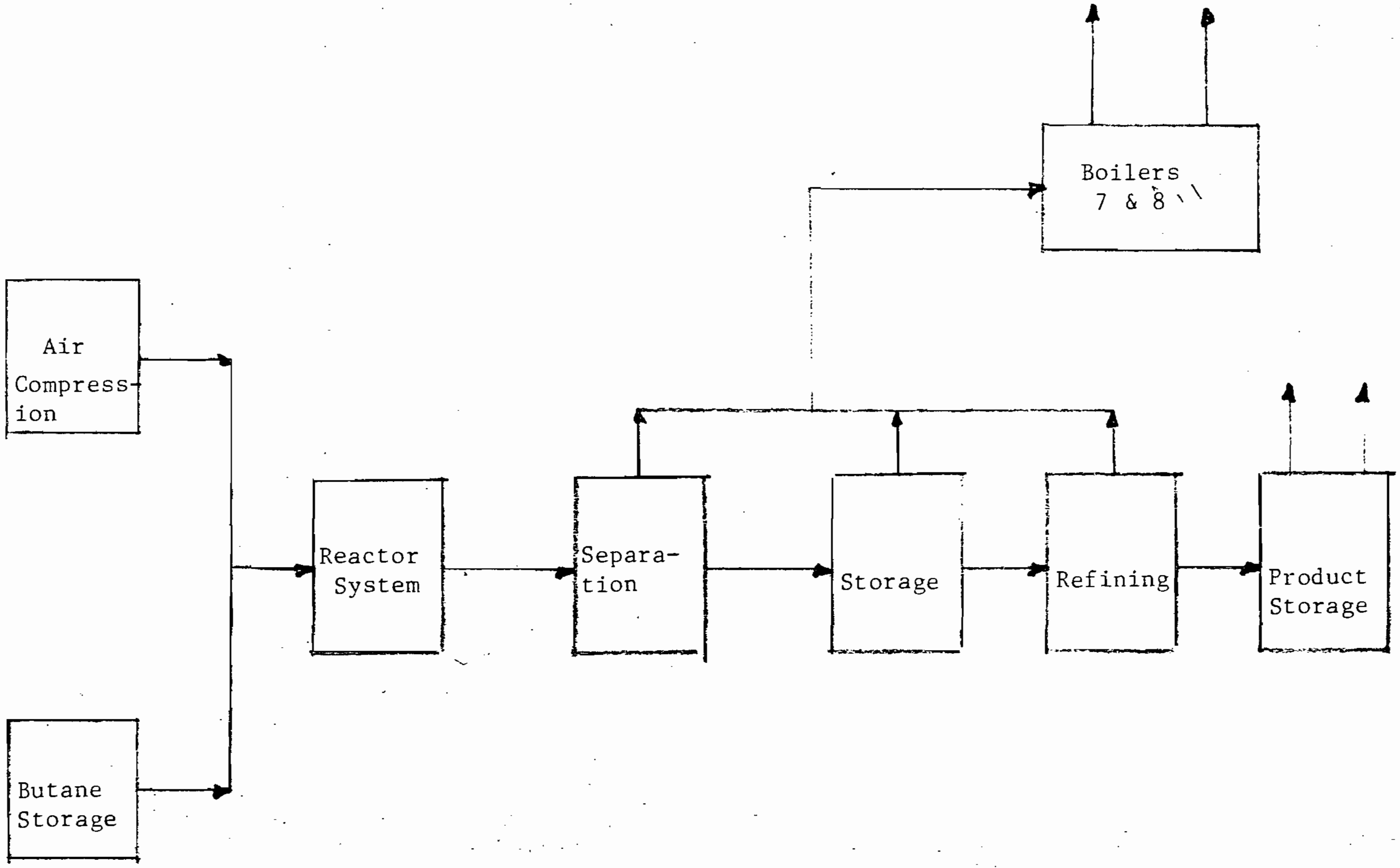
FACILITY ADDRESS:

MONSANTO COMPANY
P. O. Box 12830
Pensacola, Fl. 32575


3400
3390
3380
3370 Km
MILTON
CANTONMENT
MONSANTO
ESCAMBIA CHEMICALS
ST. REGIS PAPER CO.
AMERICAN CYANAMID
GULF POWER COMPANY
ROUTE 29
ESCAMBIA BAY
PENSACOLA
N
465 Km
470
480
490

MALEIC ANHYDRIDE PROCESS
MONSANTO CO.

PENSACOLA, FLORIDA



APPENDIX A

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET
ATLANTA, GEORGIA 30308

MAR 20 1980

REF: 4AH-AF

Mr. J. J. Vick
Environmental Control Superintendent
Monsanto Company
P. O. Box 12830
Pensacola, Florida 32575

Re: Maleic Anhydride Facility
Permit Application
(PSD-FL-055); Letter of
February 15, 1980

Dear Mr. Vick:

EPA received on February 19, 1980 your application to construct a Maleic Anhydride production facility north of Pensacola, Florida (PSD-FL-055). Review of this application under the Federal Prevention of Significant Deterioration (PSD) Regulations (40 CFR 52.21) and the partial stay of these regulations published February 5, 1980 (45 FR 7800) has shown it to be incomplete.

To allow review of the application to continue, please submit information on the following items:

1. Calculations leading to the maximum emissions (tons per year and PPH) for organics and carbon monoxide. These should include the source of factual data and the basis of any assumptions.

2. Evidence of enforceable allowable emissions limits for particulates and SO_2, which will assure no increase of allowable emissions of these two pollutants.

Nat gas as boiler fuel –
Oil to be addressed whe
e.g. (Act. ethane from
Jay oil field ~2 or 3 yea

3. Estimated potential and allowable emissions of NO_x under current permitted operating conditions and under the proposed operating conditions. This may consist of current test data and a proposed allowable limit. If potential emissions of NO_x exceed 100 tons per year and allowable emissions increases exceed 50 tons per year, 1000 pounds per day, or 100 pounds per hour, analyses of BACT and NAAQS will be required.

Water in offgas
steam should
cool combustion
& reduce NOx

4. A precise statement of what is proposed as BACT. This should include proposed numerical allowable limits for hydrocarbon and carbon monoxide emissions.

5. A copy of the input and output of the PTMAX runs.

6. Acceptable results of continuous air quality preconstruction monitoring for ozone. These data shall be collected in full accordance with guidelines found in "Ambient Air Monitoring Guidelines for Prevention of Significant Deterioration" OAQPS 1.2-096, U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina 27711, May 1978. EPA encourages permit applicants to consult with the reviewing authority (EPA Region IV) regarding implementation of the monitoring requirements.

7. An analysis of the air impact projected for the areas as a result of general commercial, residential, industrial, and other growth associated with the modification.

If you have questions, please feel free to call Mr. Kent Williams of my staff at 404/881-4552 or Mr. Jeffrey L. Shumaker of TRW Inc. at 919/541-9100. TRW is under contract to EPA and its personnel are acting as authorized representatives of the Agency in providing aid to the Region IV PSD review program.

Sincerely,

Tommie A. Gibbs

Tommie A. Gibbs, Chief
Air Facilities Branch

TAG:JWP:jt

APPENDIX D

SOURCE LOCATION

Monsanto Company currently operates a facility for the production of Adipic Acid, Hexamethylene Diamine, Nylon Fiber and Nylon resins in Escambia County, Florida. It is proposed to construct a plant to manufacture Maleic Anhydride at this same location. The site consists of 2,000 acres located on the Escambia River approximately twelve (12) miles north of Pensacola, Florida. Coordinates of the proposal source are 475.7km and 3384.8km. The map on page 2 shows the site relative to other industry and the city of Pensacola. The terraine in the area is generally flat with a few small hills. The surrounding area is generally rural with relatively low population density.

PROCESS DESCRIPTION

Compressed air and butane are reacted in the presence of a phosphate enhanced vanadium catalyst to produce maleic anhydride. The reaction is exothermic and the heat generated is recovered as high pressure steam. Most of the butane not converted to maleic anhydride is oxidized to CO and CO_2 with only small quantities of other reaction products produced. Any unreacted butane along with CO, CO_2, other organic and H_2O vapor produced in the process is separated from the crude product maleic anhydride and sent to the vent header. The crude product is then stored and refined by distillation. All emissions from Intermediates storage and refining are also sent to the vent header. With the exception of the finished product storage tanks, all emissions are collected in the vent header and sent to two steam generators for fuel value recovery and destruction of CO and Organics. Page 3 shows the process flow.

GENERAL AND BACT CONSIDERATIONS - Continued

The above data are based on efficiencies ranging from 97% to near 100% with the unoxidized process emissions entering the steam generators in the range of 3000 to 7000 pounds per hour of organics and 4700 to 6700 pounds per hour of Carbon Monoxide.

The two existing steam generators have the capability to burn oil or gas. Gas is the preferred fuel and existing permits limit the fuel to gas only. It is expected that gas supplies will, within one to two years, not be available and appropriate application for authorization to use oil as fuel will be made when necessary. Regardless of the fuel available, and in use at the time, the use of these steam generators to abate air emissions from the maleic anhydride process will not result in an increase in SO_2 or particulate emissions above that due to the fuel alone. The capability to operate the steam generators in a conventional manner if the maleic anhydride facility is not in operation will be maintained.

Due to the composition of the emission, full steam generator capacity cannot be maintained when these units are serving as abatement equipment. The capacity to generate steam from fossile fuels at the existing Power House will be reduced by approximately 10% when the maleic anhydride plant is in full operation. As a result maximum emissions of organics and carbon monoxide due to fuel combustion will be reduced by 10% under these conditions.

The only potential source of emission of organics from the maleic anhydride process not disposed of in the steam generators will be the finished product storage tanks. The product is not a Volatile Organic Compound as defined and potential emissions from these storage tanks are expected to be less than one ton per year. Fugitive emissions will be monitored and controlled through use of vapor detectors.

Emission stack details are given in Appendix F.

APPENDIX B

THERMAL OXIDIZER
PILOT PLANT DATA

Tests were run to determine the effect of temperature and residence time on destruction of butane and carbon monoxide in maleic anhydride reactor effluents (after maleic was removed). Above about a measured 1500°F there was "essentially complete" destruction of organics including butane and carbon monoxide (<1 ppm butane and <10 ppm carbon monoxide) at retention times of 0.5, 0.75, and 1.0 seconds.

The tests were conducted in the maleic anhydride department at JFQ Plant using a pilot thermal oxidizer. Operating conditions similar to those planned for the Pensacola Plant were used. Samples of the gases were taken from the oxidizer operating at various temperatures at retention times of 0.5, 0.75, and 1.0 seconds. The samples were analyzed by GC in the JFQ Plant analytical laboratory. Following are some examples of concentrations of butane and carbon monoxide exiting the thermal oxidizer:

RETENTION TIME (SEC.)	CONCENTRATIONS AT 1300°F (ppm - Volume) ORGANICS/BUTANE	 CARBON MONOXIDE*
0.5	410	17,400
0.75	10	11,300
1.00	0.1	2,700

97.6% reduction

15.5%

RETENTION TIME (SEC.)	CONCENTRATIONS AT 1400°F (ppm) ORGANICS/BUTANE	 CARBON MONOXIDE*
0.5	~1	6,800
0.75	~1	2,400
1.00	~1	980

14.4%

RETENTION TIME (SEC.)	CONCENTRATIONS AT 1500°F (ppm) ORGANICS/BUTANE	 CARBON MONOXIDE*
0.5	0.2	<10
0.75	0.1	<10
1.00	0.1	<10

*For carbon monoxide, about 10 ppm was considered the lower detection limit.

APPENDIX C

RESIDENCE TIME CALCULATIONS
AT MAXIMUM OFF-GAS FLOW RATE PER BOILER

OIL FUEL

Process off-gas	428,000 pph
Fuel and Air	246,000 pph
TOTAL	684,000 pph

Gas density at 2300°F = 0.01468 lbs/Ft^3

Furnace volumn = 10,580 Ft^3

$$\text{Residence Time} = \frac{\overset{\cancel{ft^3}}{(10{,}580)}\overset{\cancel{\#}/\cancel{ft^3}}{(.01468)}\overset{sec/\cancel{hr}}{(3600)}}{\underset{\cancel{\#}/\cancel{hr}}{684{,}000}} = 0.82 \text{ sec.}$$

$P = V/R$

$$\frac{113 \text{ lbs}}{\text{hr}} \quad \frac{\text{hr}}{684{,}000 \text{ lbs}} \quad \frac{10^6}{10^6} =$$

165 PPM organics by weight

$$\frac{162}{684{,}000} \Big| \frac{10^6}{} = 561 \text{ PPM CO by weight}$$

GAS FUEL

Process off-gas	428,000 pph
Fuel & Air	277,000 pph
TOTAL Boiler gas flow	705,000 pph

Gas density at 2300°f = 0.01468 lbs/Ft^3

Furnace volume = 10,580 Ft^3

$$\text{Residence Time} = \frac{(10{,}580)(.01468)(3600)}{705{,}000} = 0.79 \text{ sec.}$$

$$\frac{\cancel{ft^3} \times \frac{\cancel{lbs}}{\cancel{ft^3}} \times \frac{3600 sec}{\cancel{hr}}}{\frac{\cancel{lbs}}{\cancel{hr}}} = sec$$

Hydrocarbon Emissions for masor industrial point sources in the Pensacola Area based on FDER inventory.

	Hydrocarbon emissions
Ashland	123 TPY
Reichold Chemical	720 TPY
American Creosote	161 TPY
Monsanto Company	900 TPY

NOTE: All above sources except Monsanto are located in Downtown Pensacola.

APPENDIX E

APPENDIX G

GENERAL AND BACT CONSIDERATIONS

This is an application for permission to construct a Maleic Anhydride manufacturing facility. This new facility will be located at Monsanto's existing plant site in Escambia County and have a capacity of 133M pounds/year. This is a proprietary process developed by Monsanto and there are no other facilities using an identical process.

Historically, Maleic Anhydride has been produced from Benzene. The proposed process eliminates all environmental problems associated with benzene. Emissions from the process will be greater than 96% H_2O, CO_2, O_2, and N with less than 2% each of CO and Organics. The Organics will be largely butane with small quantities of acetic acid, acrylic acid and maleic anhydride. The proposed BACT for abatement of these emissions is thermal oxidation in two existing Bobcock and Wilcox steam generators. A portion of the combustion air will be replaced with the process emissions.

Two documents published by the Environmental Protection Agency address emissions from and BACT for Maleic Anhydride facilities. These are "Source Assessment: Maleic Anhydride Manufacture" prepared in December, 1978 by Monsanto Research Corporation for the Environmental Protection Agency under contract No. 68-02-1874, and an undated but recent document "National Emission Standards for Hazardous Air Pollutants: Benzene emissions from Maleic Anhydride Plants".

Both of these documents deal primarily with the benzene based process and consequently the data is not directly translatable to the butane based process but does provide a basis for establishing BACT.

Based on information in these documents, hydrocarbon and carbon monoxide destruction efficiencies of 97 to 98% can be achieved using thermal oxidation. The latter publication indicates that the Environmental Protection Agency intends to propose 97% destruction as BACT for the benzene process. Since no commercial data is available for efficiency when butane is the raw material, this same value is proposed as the minimum efficiency for the butane process. Appendix A which is the Florida Department of Environmental Regulation form for BACT determination shows other potentially available control technology.

Afterburner

Pilot plant testing of thermal oxidation of emissions from the butane based process has been carried out by Monsanto. Data from these tests indicate that on a pilot plant scale, even higher efficiencies can be achieved. Extrapolation of pilot plant data to commercial size equipment is subject to some question but based on these results an "expected" level of emissions has been projected but not guaranteed. It is planned to operate the two steam generators at a temperature in the range of 2000 to 2400°F which is higher than the temperature indicated in the Environmental Protection Agency documents and higher than that in the pilot plant. The higher temperature along with a residence time of approximately 0.8 seconds should provide a fully adequate margin of safety. Pilot plant test data are shown in Appendix B and residence time calculations in Appendix C.

Maximum emissions based on published data and expected emissions based on pilot plant data are as follows:

	MAXIMUM TONS/YEAR	PPH	EXPECTED TONS/YEAR	PPH
Organics	399	113	99	28
Carbon Monoxide	569	162	221	63

PSD REVIEW

DISPERSION MODELING

Emissions of carbon monoxide and hydrocarbons from the two boiler stacks were subjected to dispersion calculations using the Environmental Protection Agency's PTMAX program. One hour ground level impacts of these emissions were determined to be as follows:

	MAXIMUM CONCENTRATION IMPACT	EXPECTED CONCENTRATION IMPACT
Hydrocarbons	25 $\mu g/M^3$	6 $\mu g/M^3$
Carbon Monoxide	36 $\mu g/M^3$	9 $\mu g/M^3$

COMPARISON TO AMBIENT AIR STANDARD

An ambient air hydrocarbon concentration of 160 $\mu g/M^3$ (3 hour max.) is specified as a guide in devising implementation plans to achieve oxidant standards. The one hour maximum impact of the proposed emissions determined by PTMAX of 25 $\mu g/M^3$ is less than 16 percent of the specified 3 hour guide.

The carbon monoxide one hour ambient standard maximum is 40,000 $\mu g/M^3$. The calculated impact of 36 $\mu g/M^3$ is an insignificant quantity compared to the standard.

HYDROCARBON EMISSION IN ESCAMBIA COUNTY

In December, 1978, the Florida Department of Environmental Regulation published a "Proposed Revision to the State Implementation Plan for Non-attainment Areas" which included current and projected hydrocarbon emission inventories for several counties in Florida. At that time, the ambient air standard for ozone was 0.08 0.12 ppm and Escambia County was among the areas in Florida classified as nonattainment for ozone. The current emission inventory and "roll-back" method for determining acceptable emission levels as well as the projected 1982 and 1987 emission inventories were accepted by the Environmental Protection Agency in its conditional approval of Florida's rules for nonattainment areas. A copy of the Escambia Inventory and projections as well as emissions from major point sources in the area are attached as Appendix D.

Since that time the ambient standard has been changed to 0.12 ppm and Escambia County is no longer classified by Florida as nonattainment and the Environmental Protection Agency has formally proposed to change the Classification to "unclassifiable".

The projections include some reduced emissions from existing point sources which may not take place so the follwoing summary assumes no reductions from existing point sources.

PSD REVIEW - Continued

TON/YEAR

	1977	1982		1987	
Mobile Sources	16,583	13,507	13507	10,579	10579 6414
Point Sources	6,813	6,813	6402	6,813 ×	16993
TOTAL	23,396	20,320	19909	17,392	

The maximum emissions from the proposed Maleic Anhydride facility are 399 tons/year or an increase of 1.7% above the 1977 inventory level. From 1977 to 1983 the projection is that total HC emissions in Escambia County will be reduced by 3,076 tons/year. Since this new facility would not be on-stream until early 1983 its emissions would be additive to the 1982 expected emissions and the net impact would be a somewhat lesser reduction from 1977 to 1983 of 2,677 tons/day. Put another way, emissions from the Maleic Anhydride facility would not interfere with achieving 87% of the expected reduction in hydrocarbon emissions forecast by the Department of Environmental Regulation and the steady trend to lower total hydrocarbon emissions would remain.

EXISTING AMBIENT AIR QUALITY AND IMPACE OF PROPOSED PROJECT

The Department of Environmental Regulation operates a continuous ambient air monitor at Ellyson Field in Escambia County. Ozone, carbon monoxide and hydrocarbon concentrations are determined. Attached as Appendix E are summaries of the monitoring results for 1978 and the first 9 months of 1979.

Escambia County is not listed by Florida as a nonattainment area for any pollutant. The Environmental Protection Agency has proposed to classify the county as "unclassifiable" for ozone based on data available several months ago. Additional data now available could lead to "Attainment" status since no violations of the 0.12 ppm ozone standard have been observed during 1978 or the first 9 months of 1979.

STD-1 hr - 35 ppm

Carbon monoxide levels have been consistently low averaging about 0.45 ppm for 1 hour readings with a maximum of less than 5.0 ppm. The incremental increase from this proposed project of 0.03 ppm is considered insignificant and in no way impairs achievement of the ambient standard.

Based on Ozone being an "area wide" as opposed to a "point source" pollutant and the fact that the monitor operated by the Department of Environmental Regulation is strategically located between major industrial and business sources and is surrounded by major traffic arteries, the monitoring data for ozone from this site should be representative of the maximum concentrations expected in the overall area.

STD-1 hr - 0.08 ppm

In 1978 the hourly ozone analysis for the 7,017 observations averaged 0.025 ppm with a high of 0.106 and a second high of 0.100. In 1979 the average through the first 9 months was .033; the high was 0.114 with a second high of 0.105.

Based on the linear relationship between hydrocarbon emissions and ambient ozone concentration and no reduction from the 1977 hydrocarbon inventory, the increase of 1.7% in hydrocarbon emissions from the proposed project would cause an increase of .002 ppm in the maximum ambient ozone concentration and an increase of .002 ppm in the second high concentration.

Based on Escambia County Non-attainment status No longer valid. Can't understand why they ~~to this~~ say 87% reduction ~~[illegible]~~ in this paragraph, and then in the next section ~~they~~ state Escambia is attainment

[illegible]

PSD REVIEW - Continued

The maximum ambient ozone concentrations resulting from this "worst-case" analysis would be as follows:

.12 EPA
1hr STD. - 0.08 PPM DER

	WITH PROPOSED PROJECT	WITHOUT PROJECT
Maximum 1 hour (ppm)	.116	.114
Second high 1 hour (ppm)	.107	.105

Once the projected 1982 emissions inventory figures are achieved the impact will be as follows:

	WITH PROPOSED PROJECT	WITHOUT PROJECT
Maximum 1 hour (ppm)	.103	.100
Second high 1 hour (ppm)	.096	.093

On either of the above bases, the incremental increase in ozone due to this project is quite small and no violation of ambient standards would be expected. With the expected reduction in emissions by 1982, ozone levels after project start-up would be lower than current levels.

Typical meteorlogical data for the vicinity of the proposed source are given in Appendix G.

SOILS, VEGATATION & VISIBILITY

No impact on soil, vegetation or visibility is expected.

APPENDIX G

TWO-WAY DISTRIBUTIONS OF WIND SPEED, WIND DIRECTION
AT WHITING FIELD - SEPTEMBER, OCTOBER, NOVEMBER

	WIND SPEED (Knots)						TOTAL	AVG WS	STABILITY CLASS					
	0-3	4-6	7-10	11-16	17-21	>21			A	B	C	D	E	F
N	4.1	5.3	5.0	1.9	0.4	0.1	16.7	7.2	0.1	0.9	1.7	5.0	3.0	6.4
NNE	2.7	3.5	2.9	0.8	0.1	*	10.0	6.5	*	0.8	1.4	2.7	1.4	3.7
NE	2.6	3.1	2.4	0.8	0.1	*	9.0	6.4	0.1	0.6	1.0	2.5	1.3	3.5
ENE	1.9	2.8	2.8	1.0	0.2	*	8.8	7.3	*	0.7	1.3	3.1	1.2	2.2
E	3.0	4.1	3.8	1.5	0.1	*	12.5	7.0	*	1.1	2.2	4.5	1.5	2.9
ESE	1.0	1.1	1.1	0.5	0.1	*	3.8	7.2	*	0.5	0.5	1.6	0.3	0.7
SE	0.8	0.9	0.7	0.4	*	*	2.9	7.0	*	0.3	0.3	1.2	0.3	0.7
SSE	0.7	0.9	0.9	0.4	*	*	2.9	7.3	0.1	0.3	0.4	1.1	0.3	0.6
S	1.4	2.2	1.7	0.5	0.1	*	5.8	6.8	0.1	0.3	0.8	2.0	0.8	1.7
SSW	0.7	1.1	0.9	0.3	0.1	*	3.2	7.2	*	0.1	0.3	1.3	0.4	1.0
SW	0.6	0.7	0.4	0.1	*	*	1.9	6.3	*	0.1	0.2	0.5	0.2	0.9
WSW	1.0	1.1	0.5	0.2	*	0.0	2.7	5.6	*	0.2	0.2	0.7	0.3	1.3
W	1.4	1.3	0.7	0.1	*	*	3.6	5.5	0.1	0.3	0.3	0.7	0.4	1.8
WNW	0.9	1.0	0.8	0.4	0.1	*	3.4	7.4	*	0.3	0.4	1.1	0.4	1.1
NW	0.9	1.1	1.1	0.8	0.2	0.1	4.3	8.9	*	0.3	0.4	1.8	0.5	1.2
NNW	1.9	2.3	2.5	1.3	0.4	0.1	8.5	8.0	0.1	0.6	0.8	3.1	1.4	2.7
TOTAL	25.7	32.6	28.2	11.0	2.0	0.5		6.3						
A	0.6	0.2	0.0	0.0	0.0	0.0	0.8							
B	2.8	3.6	1.0	0.0	0.0	0.0	7.4							
C	1.3	3.9	6.7	0.5	*	0.0	12.4							
D	1.7	5.8	12.7	10.5	2.0	0.5	33.2							
E	0.0	5.9	7.9	0.0	0.0	0.0	13.8							
F	19.3	13.2	0.0	0.0	0.0	0.0	32.5							

APPENDIX G

TWO-WAY DISTRIBUTIONS OF WIND SPEED, WIND DIRECTION AT WHITING FIELD - JUNE, JULY, AUGUST

	WIND SPEED (Knots)						TOTAL	AVG WS	STABILITY CLASS					
	0-3	4-6	7-10	11-16	17-21	>21			A	B	C	D	E	F
N	3.3	3.2	2.0	0.4	*	*	9.0	5.7	0.5	1.4	1.3	1.6	1.0	3.3
NNE	2.4	2.2	1.3	0.3	*	*	6.2	5.5	0.3	0.8	1.1	1.1	0.6	2.3
NE	1.9	2.0	1.1	0.2	*	*	5.2	5.6	0.2	0.6	0.8	1.1	0.7	1.8
ENE	1.8	1.8	1.3	0.3	*	0.0	5.2	5.9	0.2	0.6	0.9	1.4	0.5	1.5
E	3.7	3.5	1.9	0.5	*	0.0	9.6	5.6	0.3	1.2	1.5	2.3	1.1	3.2
ESE	1.6	1.7	0.7	0.1	*	*	4.2	5.3	0.2	0.5	0.7	0.9	0.5	1.4
SE	1.1	1.0	0.5	0.1	*	*	2.7	5.5	0.1	0.3	0.4	0.7	0.2	0.9
SSE	1.2	1.3	1.0	0.2	*	*	3.8	6.3	0.2	0.4	0.6	1.3	0.3	1.1
S	2.6	3.3	2.8	0.8	*	*	9.6	6.7	0.2	0.7	1.8	2.9	1.1	2.7
SSW	2.0	2.8	2.3	0.9	*	0.0	8.0	6.9	0.1	0.5	1.2	2.5	1.2	2.4
SW	2.0	2.4	1.4	0.5	*	0.0	6.4	6.1	0.1	0.4	0.7	1.6	1.0	2.7
WSW	2.7	2.8	1.5	0.4	*	0.0	7.4	5.6	0.1	0.6	1.1	1.5	1.0	3.1
W	3.7	3.3	1.5	0.2	*	*	8.8	5.1	0.3	0.8	1.4	1.6	0.9	3.9
WNW	1.7	1.6	0.9	0.2	*	0.0	4.5	5.6	0.2	0.6	0.9	0.9	0.4	1.5
NW	1.2	1.4	0.9	0.2	*	*	3.7	6.0	0.2	0.6	0.8	0.7	0.4	1.0
NNW	1.7	2.0	1.5	0.4	*	*	5.7	6.3	0.5	1.2	1.1	1.0	0.4	1.4
TOTAL	34.7	36.3	22.7	5.9	0.3	0.1		5.0						
A	1.8	1.6	0.0	0.0	0.0	0.0	3.4							
B	4.3	4.5	2.5	0.0	0.0	0.0	11.3							
C	2.7	5.8	7.2	0.8	*	0.0	16.5							
D	1.3	6.2	10.1	5.1	0.3	0.1	23.1							
E	0.0	8.4	2.9	0.0	0.0	0.0	11.3							
F	24.6	9.7	0.0	0.0	0.0	0.0	34.3							

APPENDIX G

TWO-WAY DISTRIBUTIONS OF WIND SPEED, WIND DIRECTION

AT WHITING FIELD - DECEMBER, JANUARY, FEBRUARY

	WIND SPEED (Knots)						TOTAL	AVG WS	STABILITY CLASS					
	0-3	4-6	7-10	11-16	17-21	>21			A	B	C	D	E	F
N	2.1	3.5	4.7	3.6	1.1	0.2	15.2	9.5	*	0.3	0.9	8.6	2.2	3.2
NNE	1.6	2.5	2.6	1.4	0.2	*	8.3	7.9	*	0.2	0.7	4.1	1.1	2.0
NE	1.3	1.9	1.5	0.7	0.1	*	5.5	7.1	*	0.2	0.5	2.7	0.7	1.5
ENE	1.0	1.7	1.2	0.5	*	*	4.5	6.9	*	0.2	0.4	2.2	0.6	1.1
E	2.1	3.1	2.9	1.3	0.1	*	9.6	7.3	*	0.3	0.8	5.5	1.1	1.7
ESE	1.4	2.0	2.0	0.7	0.1	*	6.3	7.3	*	0.2	0.5	3.9	0.6	0.9
SE	1.0	1.5	1.4	0.6	0.1	0.1	4.7	7.8	*	0.2	0.4	3.1	0.4	0.6
SSE	0.7	1.0	1.4	1.0	0.1	*	4.3	8.6	*	0.2	0.3	3.0	0.3	0.5
S	1.3	1.9	2.3	1.6	0.3	*	7.4	8.5	*	0.3	0.5	4.7	0.7	1.1
SSW	0.8	1.1	1.2	1.0	0.2	*	4.4	8.6	*	0.1	0.3	2.8	0.4	0.7
SW	0.6	0.9	0.8	0.4	0.1	*	2.8	7.6	*	0.1	0.2	1.3	0.4	0.8
WSW	0.7	1.2	1.1	0.5	0.1	0.0	3.6	7.4	*	0.1	0.2	1.5	0.7	1.3
W	1.1	1.5	1.2	0.4	0.1	*	4.3	7.2	*	0.2	0.3	1.5	0.7	1.6
WNW	0.6	0.9	1.0	0.6	0.3	*	3.5	8.9	*	0.1	0.4	1.7	0.5	0.9
NW	0.6	0.9	1.6	1.6	0.6	0.2	5.5	10.9	*	0.1	0.4	3.4	0.8	0.9
NNW	1.0	1.7	3.0	2.9	1.1	0.4	10.1	10.9	*	0.3	0.7	6.3	1.3	1.6
TOTAL	18.0	27.3	30.1	18.9	4.6	1.2		7.8						
A	0.3	0.0	0.0	0.0	0.0	0.0	0.3							
B	1.7	1.1	0.3	0.0	0.0	0.0	3.1							
C	1.0	2.4	3.9	0.2	0.0	0.0	7.5							
D	3.9	9.1	18.9	18.7	4.6	1.2	56.4							
E	0.0	5.4	7.0	0.0	0.0	0.0	12.4							
F	11.0	9.3	0.0	0.0	0.0	0.0	20.3							

APPENDIX G

TWO-WAY DISTRIBUTIONS OF WIND SPEED, WIND DIRECTION
AT WHITING FIELD - MARCH, APRIL, MAY

	WIND SPEED (Knots)							AVG	STABILITY CLASS					
	0-3	4-6	7-10	11-16	17-21	>21	TOTAL	WS	A	B	C	D	E	F
N	1.9	3.3	3.4	1.7	0.3	0.1	10.7	8.0	0.2	0.8	1.3	3.6	1.8	3.1
NNE	1.1	1.7	1.7	0.7	0.1	0.0	5.4	7.3	0.1	0.5	0.9	1.8	0.8	1.2
NE	0.9	1.2	0.9	0.3	*	0.0	3.3	6.6	0.1	0.4	0.5	1.0	0.4	0.8
ENE	0.9	1.2	1.0	0.3	*	*	3.4	6.6	0.1	0.3	0.5	1.2	0.4	0.8
E	1.9	2.8	2.1	0.7	*	*	7.6	6.6	0.1	0.6	1.0	3.0	0.9	1.8
ESE	1.3	1.8	1.3	0.6	0.1	*	5.0	7.0	0.1	0.4	0.7	2.3	0.6	1.0
SE	1.0	1.5	1.3	0.8	0.1	0.1	4.8	7.9	0.1	0.3	0.4	2.7	0.4	0.9
SSE	1.0	1.8	2.5	1.6	0.2	0.1	7.1	8.8	0.1	0.4	0.8	4.2	0.6	1.0
S	1.9	3.9	5.5	3.2	0.3	0.1	14.9	8.7	0.2	0.7	2.1	7.9	1.6	2.4
SSW	1.1	2.0	2.9	2.0	0.3	0.1	8.4	9.0	0.1	0.3	0.9	4.4	1.1	1.6
SW	1.0	1.4	1.2	0.7	0.2	*	4.6	7.9	0.1	0.1	0.3	1.9	0.7	1.5
WSW	1.3	1.8	1.3	0.6	0.1	*	5.1	7.0	0.1	0.2	0.5	1.8	0.8	1.8
W	1.4	1.8	1.1	0.3	0.1	*	4.6	6.2	0.2	0.3	0.5	1.1	0.6	2.0
WNW	0.8	1.0	1.0	0.5	0.1	*	3.4	7.7	0.1	0.3	0.5	1.2	0.5	0.9
NW	0.7	1.1	1.5	1.1	0.2	0.1	4.6	9.2	0.1	0.4	0.6	2.2	0.5	0.8
NNW	1.1	1.7	2.3	1.6	0.5	0.1	7.2	9.2	0.2	0.5	1.0	3.1	1.0	1.4
TOTAL	19.2	29.9	31.0	16.7	2.6	0.6		7.2						
A	0.9	0.8	0.0	0.0	0.0	0.0	1.7							
B	1.8	2.9	1.8	0.0	0.0	0.0	6.5							
C	1.1	2.5	7.2	1.6	*	*	12.5							
D	2.6	7.2	15.4	15.1	2.5	0.6	43.4							
E	0.0	6.2	6.6	0.0	0.0	0.0	12.8							
F	12.8	10.4	0.0	0.0	0.0	0.0	23.2							

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Escambia County

SUMMARY FORMAT FOR VOC

SOURCE		BASE YEAR EMISSIONS 1977	1982 (1987) PROJECTED ALLOWABLE E 1982	 1987
PETROLEUM REFINERIES	REFINERY FUGITIVE LEAKS			
	MISCELLANEOUS SOURCES a) Process Drains and Waste b) Vacuum Producing Systems c) Process Unit Turnaround			
	OTHER			
STORAGE, TRANSPORTATION & MARKETING OF PETROLEUM PRODUCTS	OIL & GAS PRODUCTION FIELDS			
	NATURAL GAS AND NATURAL GASOLINE PROCESSING PLANTS			
	GASOLINE & CRUDE OIL STORAGE¹	1180	684	646
	SHIP AND BARGE TRANSFER OF GASOLINE & CRUDE OIL	0	0	0
	BULK GASOLINE TERMINALS ²	10	10	9
	GASOLINE BULK PLANTS³	0	0	0
	SERVICE STATION LOADING (stage I)	550	542	512
	SERVICE STATION UNLOADING (stage II)	560	552	521
	OTHER	522	515	486
INDUSTRIAL PROCESSES	ORGANIC CHEMICAL MANUFACTURE			
	PAINT MANUFACTURE			
	VEGETABLE OIL PROCESSING			
	PHARMACEUTICAL MANUFACTURE			
	PLASTIC PRODUCTS MANUFACTURE	123	146	170
	RUBBER PRODUCTS MANUFACTURE			
	TEXTILE POLYMERS MANUFACTURE	900	900	900
	OTHERS	881	881	881
INDUSTRIAL SURFACE COATING	LARGE APPLIANCES			
	MAGNET WIRE			
	AUTOMOBILES			
	CANS			
	METAL COILS			
	PAPER			
	FABRIC			
	METAL FURNITURE			
	WOOD FURNITURE	5	1	1
	FLAT WOOD PRODUCTS			
	OTHER METAL PRODUCTS			
	OTHERS			
NON-INDUSTRIAL SURFACE COATINGS	ARCHITECTURAL COATINGS	500	493	493
	AUTO REFINISHING	55	55	55
	OTHERS			
OTHER SOLVENT USE	DEGREASING	645	681	751
	DRY CLEANING	205	222	240
	GRAPHIC ARTS	150	162	169
	ADHESIVES			
	CUTBACK ASPHALT	108	108	108
	OTHER SOLVENT USE			
OTHER MISCELLANEOUS SOURCES	FUEL COMBUSTION	293	316	330
	SOLID WASTE DISPOSAL	33	33	33
	FOREST, AGRICULTURAL, AND OTHER OPEN BURNING	93	101	109
TOTAL VOC EMISSIONS FROM STATIONARY SOURCES		6813)	6402	6414
MOBILE SOURCES	HIGHWAY VEHICLES a) Light Duty Automobiles b) Light Duty Trucks c) Heavy Duty Gasoline Trucks d) Heavy Duty Diesel Trucks e) Motorcycles	14141	10636	7284
	OFF HIGHWAY VEHICLES	679	968	1122
	RAIL	64	60	56
	AIRCRAFT	891	924	947
	VESSELS	808	919	1170
TOTAL VOC EMISSIONS FROM MOBILE SOURCES		16583	13507	10579
TOTAL VOLATILE ORGANIC EMISSIONS		23396	19909	16993

[1] Includes all storage facilities except those at service stations and bulk plants

[2] Emissions from loading tank trucks and rail cars.

[3] Emissions from storage and transfer operations

Figure VI-6

1979 AMBIENT AIR DATA
ESCAMBIA COUNTY FLORIDA

1979	OZONE		MONOXIDE		METHANE		TOTAL HYDRO-CARBONS	
	Mo. Avg.	Mo. Max.	Mo. Avg.	Mo. Max.	Mo. Avg.	Mo. Max.	Mo. Avg.	Mo. Max.
Jan.	.023	.050	.7	3.1	1.6	1.9	2.5	4.2
Feb.	.025	.054	.6	2.0	1.6	2.0	1.9	3.0
Mar.	.037	.080	.5	2.5	1.7	2.1	1.8	4.7
Apr.	.040	.095	.4	2.6	1.6	2.0	1.8	2.7
May	.041	.104	.5	2.0	1.5	1.9	1.8	2.6
June	.038	.114	.7	2.6	1.6	2.2	1.8	3.2
July	.027	.104	.7	2.4	1.6	2.1	2.5	3.9
Aug.	.033	.101	.5	2.3	1.7	2.2	1.8	2.5
Sept.	.029	.080	.6	2.0	1.6	2.1	1.7	2.4
	.033		.6		1.6		2.0	

APPENDIX F

EMISSION STACKS

Stack No.	Height from ground, ft.	Diameter inch	Temperature °F (MAX)	CFM
7	100	139.5	350	196,000
8	100	139.5	350	196,000
3	40	4	150	33
4	40	4	150	33

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```
AGENCY:     STATE                               SAROAD-KEY:  103540004F01          PERIOD:    78/01/01 TO 78/12/31
------                                          ----------                         ------
STATE:      FLORIDA              PROJECT: POPULATION-ORIENTED SURV.                METHOD:    INSTRUMENTAL
-----                            -------                                           ------
SITE:       004 ELLYSON NAVAL AIR STATION (PENSACOLA) ESCAMBIA CO                  ANALYSIS: CHEMILUMINESCENCE
----                                                                               --------
PARAMETER: OZONE                     SAMPLING INTERVAL:     01 HOURS               UNITS:    PARTS PER MILLION (VOL/VOL)
KEY-1:  1035400004F01178      KEY-2:  010100      KEY-3:  44201110?3                UNITS CODE:   07          DECIMAL CODE:  3

                                                   PERCENTILES
   SITE       NUM         MIN                                                                                       MAX
   NUM        OBS         OBS       10      30      50      70      90      95      96      97      98      99      OBS
   ---        ---         ---       --      --      --      --      --      --      --      --      --      --      ---
   004       7,117        .00?     .005    .014    .023    .032    .050    .059    .061    .064    .068    .072    .106

                       HIGH READINGS         PERCENT     ARITH       STD        GEO         GEO
                       (2)       (3)         ACTUAL      MEAN        DEV        MEAN        DEV
                       ----      ----        ------      ----        ---        ----        ---
                       .100      .100        81.2        .025        .016       .016        2.641

MINIMUM DETECTABLE VALUE   0.005     NUMBER OF TIMES HALF OF THE MINIMUM DETECTABLE WAS SUBSTITUTED:          993
-----------------------------------------------------------------------------------------------------------------

AGENCY:     STATE                               SAROAD-KEY:  103540004F01          PERIOD:    78/01/01 TO 78/12/31
------                                          ----------                         ------
STATE:      FLORIDA              PROJECT: POPULATION-ORIENTED SURV.                METHOD:    INSTRUMENTAL
-----                            -------                                           ------
SITE:       004 ELLYSON NAVAL AIR STATION (PENSACOLA) ESCAMBIA CO                  ANALYSIS: VISUAL AVERAGE
----                                                                               --------
PARAMETER: WIND SPEED                SAMPLING INTERVAL:     01 HOURS               UNITS:    MILES PER HOUR
---------                            -----------------                             -----
KEY-1:  1035400004F01178      KEY-2:  010100      KEY-3:  61101?0121                UNITS CODE:   1?          DECIMAL CODE:  1
-----                         -----               -----                             ----------                  ------------

                                                   PERCENTILES
   SITE       NUM         MIN                                                                                       MAX
   NUM        OBS         OBS       10      30      50      70      90      95      96      97      98      99      OBS
   ---        ---         ---       --      --      --      --      --      --      --      --      --      --      ---
   004       8,366        .0       .0      1.0     3.0     5.0     7.5     9.0     9.5    10.0    11.0    12.5     20.5

                       HIGH READINGS         PERCENT     ARITH       STD        GEO         GEO
                       (2)       (3)         ACTUAL      MEAN        DEV        MEAN        DEV
                       ----      ----        ------      ----        ---        ----        ---
                       16.?      16.0        95.5        3.45        3.0?       1.36        6.48
```

1,779

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```
AGENCY:     STATE                              SAROAD-KEY:  103540004F01        PERIOD:  78/01/31  TO  78/12/09
---------                                      ----------
STATE:      FLORIDA                  PROJECT: POPULATION-ORIENTED SURV.         METHOD:  INSTRUMENTAL
------
SITE:       004 ELLYSON NAVAL AIR STATION (PENSACOLA) ESCAMBIA CO               ANALYSIS: FLAME IONIZATION
----                                                                            --------
PARAMETER: TOTAL HYDRO-CARBONS                 SAMPLING INTERVAL:    01 HOURS   UNITS:    PARTS PER MILLION (VOL/VOL)
                                               -----------------                -----
KEY-1:  [illegible]        KEY-2:  [illegible]     KEY-3:  [illegible]          UNITS-CODE:  07      DECIMAL CODE:  1
-----                      -----                   -----                        ----------           ------------

                                                     PERCENTILES
                                                     -----------
 SITE      NUM        MIN                                                                                      MAX
 NUM       OBS        OBS      10      30      50      70      90      95      96      97      98      99     OBS
 ---       ---        ---      --      --      --      --      --      --      --      --      --      --     ---
 004      4,924       1.0     1.6     1.8     2.0     2.4     2.8     2.9     3.1     3.3     3.5     3.6     4.6

                     HIGH READINGS        PERCENT     ARITH       STD        GEO        GEO
                     (2)        (3)       ACTUAL      MEAN        DEV        MEAN       DEV
                     ---        ---       ------      ----        ---        ----       ---
                     4.5        4.5       65.5        2.13        .51        2.07       1.26

MINIMUM DETECTABLE VALUE    0.2     NUMBER OF TIMES HALF OF THE MINIMUM DETECTABLE WAS SUBSTITUTED:            0
----------------------------------------------------------------------------------------------------------------

AGENCY:     STATE                              SAROAD-KEY:  103540004F01        PERIOD:  78/01/01  TO  78/12/09
---------
STATE:      FLORIDA                  PROJECT: POPULATION-ORIENTED SURV.         METHOD:  INSTRUMENTAL
------                               -------                                    ------
SITE:       004 ELLYSON NAVAL AIR STATION (PENSACOLA) ESCAMBIA CO               ANALYSIS: FLAME IONIZATION
----
PARAMETER: METHANE                             SAMPLING INTERVAL:    01 HOURS   UNITS:    PARTS PER MILLION (VOL/VOL)
---------                                      -----------------                -----
KEY-1:  [illegible]        KEY-2:  [illegible]     KEY-3:  [illegible]          UNITS-CODE:  07      DECIMAL CODE:  1
------                     -----                   -----                        ----------           ------------

                                                     PERCENTILES
                                                     -----------
 SITE      NUM        MIN                                                                                      MAX
 NUM       OBS        OBS      10      30      50      70      90      95      96      97      98      99     OBS
 ---       ---        ---      --      --      --      --      --      --      --      --      --      --     ---
 004      4,959        .1      .9     1.2     1.4     1.5     1.7     1.8     1.8     1.9     1.9     2.0     7.6

                     HIGH READINGS        PERCENT     ARITH       STD        GEO        GEO
                     (2)        (3)       ACTUAL      MEAN        DEV        MEAN       DEV
                     ---        ---       ------      ----        ---        ----       ---
                     2.6        2.6       60.2        1.32        .36        1.22       1.69

MINIMUM DETECTABLE VALUE    0.2     NUMBER OF TIMES HALF OF THE MINIMUM DETECTABLE WAS SUBSTITUTED:            0
```

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AGENCY:      STATE                               SAROAD-KEY:  103540004F01         PERIOD:    78/01/01 TO 78/12/09
STATE:       FLORIDA              PROJECT: POPULATION-ORIENTED SURV.               METHOD:    INSTRUMENTAL
SITE:        004 ELLYSON NAVAL AIR STATION (PENSACOLA) ESCAMBIA CO                 ANALYSIS: GAS CHROMATOGRAPHIC
PARAMETER: CARBON MONOXIDE                      SAMPLING INTERVAL:     01 HOURS    UNITS:     PARTS PER MILLION (VOL/VOL)
KEY-1:  103540004F01176      KEY-2:  010100      KEY-3:  4210121071                 UNITS-CODE:   07      DECIMAL CODE:  1

                                                             PERCENTILES
  SITE       NUM          MIN                                                                                      MAX
  NUM        OBS          OBS      10      30      50      70      90      95      96      97      98      99      OBS

  004       5,363          .0      .2      .2      .2      .5     1.0     1.1     1.3     1.5     1.8     2.0      4.5

                   HIGH READINGS          PERCENT      ARITH       STD        GEO        GEO
                    (2)       (3)         ACTUAL       MEAN        DEV        MEAN       DEV

                    3.5       3.0          64.4         .45        .39         .36       1.81

MINIMUM DETECTABLE VALUE        0.5      NUMBER OF TIMES HALF OF THE MINIMUM DETECTABLE WAS SUBSTITUTED:          3,593

AGENCY:      STATE                               SAROAD-KEY:  103540004F01         PERIOD:    78/01/01 TO 78/12/31
STATE:       FLORIDA              PROJECT: POPULATION-ORIENTED SURV.               METHOD:    INSTRUMENTAL
SITE:        004 ELLYSON NAVAL AIR STATION (PENSACOLA) ESCAMBIA CO                 ANALYSIS: FLAME PHOTOMETRIC
PARAMETER: SULFUR DIOXIDE                       SAMPLING INTERVAL:     01 HOURS    UNITS:     PARTS PER MILLION (VOL/VOL)
KEY-1:  103540004F01176      KEY-2:  010100      KEY-3:  4240116072                 UNITS-CODE:   07      DECIMAL CODE:  2

                                                             PERCENTILES
  SITE       NUM          MIN                                                                                      MAX
  NUM        OBS          OBS      10      30      50      70      90      95      96      97      98      99      OBS

  004       7,098         .00     .00     .00     .00     .01     .01     .02     .03     .03     .05     .09      .41

                   HIGH READINGS          PERCENT      ARITH       STD        GEO        GEO
                    (2)       (3)         ACTUAL       MEAN        DEV        MEAN       DEV

                    .37       .34          81.0         .01        .02         .00       3.74
```

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Read for Monsanto

Dave Beck
Les Evan –

(919) 541-5374
5454

DATE: JUN 11 1980

SUBJECT: Thermal Incinerator Performance for NSPS

FROM: David C. Mascone
Chemical Manufacturing Section, CPB

TO: Jack R. Farmer, Chief
Chemicals and Petroleum Branch

Over the past few months, CMS has investigated incinerator efficiency, cost and fuel use. The purpose of this study has been to pick an efficiency that represents the highest control level achievable by all new incinerators, considering available technology, cost and energy use.

Conclusions

Based on our study, we conclude that 98 percent VOC reduction, or 20 ppmv by compound exit concentration, whichever is less stringent, is the highest control level achievable by all new incinerators, considering available technology, cost and energy use. This level is expressed in both percent reduction and ppmv to account for the leveling off of exit concentrations as inlet concentrations drop. This level is based on incinerator operation at a maximum of 1600°F and .75 second residence time. The costs and energy use of achieving this level are based on recuperative heat recovery capable of lowering the flue gas temperature to 510°F.

From our study, we also conclude that mixing is a critical factor in efficiency, a factor of equal or greater importance than other factors such as temperature. After surveying available means of improving mixing, we conclude that incinerator adjustment after start-up is the most feasible and efficient. The control levels in the previous paragraph are based on such an adjustment.

From our study, we also conclude that, with proper use of recuperative heat recovery (RHR), no significant energy penalties occur with changes in combustion temperature. The reason is that, based on the technical limits of heat recovery and present fuel costs, the optimum incinerator exit gas temperature is slightly above 500°F, regardless of combustion temperature. Since incinerator fuel use depends on exit gas and not combustion temperature, RHR can essentially eliminate the fuel penalty of increasing combustion temperature.

Discussion

This section discusses our data and findings on incinerator efficiency, cost and fuel use, and presents the logic behind the choice of the above control level. This section has three parts, one on efficiency, one on cost and fuel use, and one on control levels. Tables cited in this section are at the end of the memo.

In using the conclusions and data from this discussion, the reader should be aware of several qualifications. First, this discussion picks a control level applicable to all new incinerators, even the worst cases. In reality, there will be a distribution of cases from worst to best. Thus, in many situations, incinerators will achieve greater than 98 percent, or less than 20 ppmv, control at less than 1600°F and .75 seconds residence time.

Second, this discussion lists specific incinerator conditions (temperature, residence time, heat recovery) for analysis purposes only, i.e. to calculate cost, fuel and emission impacts. This memo does not recommend that these conditions be specified in regulations. As just noted, this set of conditions represents only oneof many with which to achieve 98 percent reduction or 20 ppmv. Thus, the control levels in the above conclusions, not the incinerator conditions, should be the basis for regulations.

Third, this discussion focuses on thermal incineration since this control method has the widest applicability to control of ducted VOC emissions. This memo does not conclude that incineration is applicable to all situations or that, when applicable, incineration is the only feasible control method.

Fourth, this discussion covers incinerators operating with relatively constant inlets and flows and with waste gas flows greater than 500 scfm. This in general includes incinerators on solvent drying operations, polymer production plants, and air oxidation units. For incinerators with varying inlet conditions or small flows, such as those on organic liquid storage tanks, the fuel and capital cost calculations in this memo may not hold. Since these calculations are a critical basis for the above conclusions on efficiency, these efficiency conclusions are not applicable to such incinerators.

Finally, this discussion covers new incinerators applied for control of VOC for oxidant reduction purposes. Existing incinerators may not be physically capable of achieving the temperature, residence time and heat recovery conditions listed in this memo. Thus, these incinerators may not be able to reach 98 percent or 20 ppmv. On the other hand, incinerators for control of toxic or hazardous VOC need not be limited to 98 percent or 20 ppmv. As discussed below, higher efficiency incinerators are possible for all compounds with some development and design cost.

Efficiency - The available data on incinerator efficiency is described in Table 1 and summarized in Tables 2-4. The data include results from lab scale incinerator tests conducted by Union Carbide and from field tests run by EPA, Los Angeles County and chemical companies.

These data were analyzed to determine the impact of incinerator variables on efficiency. Six variables were studied, namely temperature, residence time, mixing, inlet concentration, flow regime, and type of compound, in three analyses. These analyses are described below. Mixing and flow regime are defined in Appendix A.

The first analysis was designed to remove the influence of mixing. This was desired since mixing cannot be measured and thus its impact on efficiency cannot be readily separated when studying the effect of other variables. The Union Carbide lab work was chosen for this analysis since its small size and careful design best assured consistent and proper mixing.

The results of the Union Caribde work are shown in Table 2. These results show moderate increases in efficiency with temperature, residence time and type of compound. These results also show the impact of flow regime on efficiency. This subject is discussed further in Appendix A on mixing and flow regime. Finally, the results show that a given temperature does not correspond to a given efficiency. Rather, increasing temperature increases efficiency by narrowing the range over which efficiencies fall and increasing the average of the range.

The next analysis focused on mixing. To accomplish this, cases were picked where all variables except mixing were held constant or accounted for in other ways. It was then assumed any changes in efficiency would be due to changes in mixing.

The case most directly showing the effect of mixing on efficiency is presented in Table 3. The Petro-tex data show the efficiency changes due to two modifications of the incinerator after start-up. These modifications increased efficiency from 70 percent to over 99 percent, with no change in temperature. The modifications include repositioning baffles and burners, and rerouting inlet combustion air.

A case indirectly showing the effect of mixing is presented in Table 5. These data compare the efficiency of the Rohm and Haas (R&H) incinerator in combusting four specific compounds with that of the Union Carbide lab unit. The lab unit clearly outperforms the R&H unit. The data from both units are based on the same temperature, residence time and inlet stream conditions. The more complete mixing of the lab unit is judged the cause of the differing efficiencies.

Another case indirectly showing the effect of mixing is presented in Table 6. These data are a partial list of L.A. County tests where efficiency dropped or remained the same with increasing temperature. In total this result occurred in 21 of the 50 L.A. County tests in which the same incinerator was tested at different temperatures. As above, all factors except mixing remained the same or can be accounted for in other ways. Thus, changes in the completeness of mixing are judged to be the cause of the results.

The final analysis was designed to study the effect of all variables at once. The L.A. data were chosen for this analysis since the L.A. units operated over a wide range of each of the variables of interest. In addition, the L.A. results represented the largest body of available efficiency data and thus were the most amenable to statistical analysis. The results of the analysis of the L.A. data are shown in Table 4. These results show a weak relation between efficiency and inlet concentration and no relation between efficiency and temperature.

The temperature vs. efficiency results are surprising. Kinetic theory and the lab scale results show large increases in efficiency over the 300°F range in Table 4, but in fact no such increase occurred in the L.A. data. Detailed analysis of this data points to poor mixing as the cause of these results. This analysis is described in Appendix A to this memo.

The conclusion from these three analysis is that mixing is the most important variable in incinerator efficiency. This is based on the large changes in efficiency in the R&H and Petro-tex results and the ability of mixing to mask the impact of temperature in the L.A. data. This is not to conclude that temperature, residence time and other variables have no influence on efficiency. These variables do have an important, though smaller, influence.

Cost and Fuel Use - The data used to study incinerator cost and energy use are contained in the Hydroscience report on thermal incineration. Selected parts of these data are shown in Table 7 and 8. These data were used to analyze the relations between capital cost, energy use and heat recovery. In addition, the costs of efforts to improve mixing were also analyzed. These analyzes are discussed below.

The first analysis studied the cost trade-offs between heat recovery and energy use. The results of this analysis are shown in Table 7. This table lists the incremental capital costs and energy savings with increasing recuperative heat recovery (RHR). The 70 percent RHR case, which corresponds to a flue gas temperature slightly above 500°F, represents the maximum feasible level of recovery. Beyond 70 percent RHR, problems arise with precombustion in the heat exchanger and with condensation of water in the flue gas and possible corrosion.

The results on Table 7 indicate that the maximum feasible RHR should be used. Up to this maximum, except for the 1000 scfm case, the capital cost of each increment of RHR is more than offset by the incremental energy savings. The basis for these savings is the increasing cost of energy. In older designs, based on cheaper fuel, cost savings from heat recovery were not large enough to justify maximum RHR. However, with escalating fuel costs, extra capital equipment has become cheaper than energy.

The results on table 7 also indicate that, with the proper use of heat recovery, negligible energy penalties occur with increasing combustion temperature. The reason is that the energy use of an incinerator depends on exit gas temperature, not combustion temperature. And as noted above, the optimum exit gas temperature is slightly above 500°F, regardless of combustion temperature. Higher exit gas temperatures are not warranted since additional heat recovery produces a net savings. Lower exit gas temperatures are prevented by technical limits. Thus, with optimum RHR, increasing combustion temperatures will lead to negligible increases in energy use.

The second analysis concerned the capital cost differences between incinerators designed at 1400°F and 1600°F. The results of this analysis are shown in Table 8. These results show moderate increases in capital costs and small to moderate increases in annualized costs between the 1400°F and 1600°F incinerators. The major factors in the increase are the larger recuperative heat exchanger and larger combustion chamber needed for the 1600°F degree unit.

The final analysis concerned the cost and feasibility of various methods to improve mixing. Four methods were studied: pilot plants, lab work, engineering design and adjustment after start-up.

Pilot plant work is judged too expensive. The costs involved in constructing and operating the pilot plant unit, providing a waste gas stream, and collecting and analyzing the data could well exceed the capital cost of the full scale unit. A quarter to a half million dollars could be required for such work for small incinerators, and up to a million dollars for larger units. Pilot plant work appears more appropriate as an EPA or vendor research project.

Two of the alternatives, lab work and engineering design, appear affordable but are not feasible. Lab work provides good data on kinetics, but no useable data on mixing. Engineering equations are useful in many situations, but few such equations exist for mixing. The number of trays in a distillation column can be reasonably calculated; the number of baffles in an incinerator cannot be.

The final alternative, adjusting the incinerator after start-up, does appear both affordable and feasible. Such an adjustment would involve repositioning baffles, adjusting ducts and performing similar tasks while measuring efficiency, temperature and similar variables. Such a procedure applies to incinerators the same adjustment that process equipment receives after start-up and would involve the same, moderate time, expertise, and costs. Finally, the success of such a procedure has been demonstrated by Petro-tex.

Control Level - Based on the above findings, a series of conclusions were made which lead to the choice of 98 percent reduction, or 20 ppmv, (98/20) as the highest control level achievable for all new incinerators, considering available technology, cost and energy use. These conclusions are discussed below.

First, incinerator combustion temperature has little impact on cost and energy effectiveness ratios. This conclusion is based on the small changes with temperature that occur in the three items, namely annualized cost, energy use and VOC control efficiency, that make up these ratios. As discussed above, these three items all increase less than 15 percent with temperature over a 1300°F to 1600°F range. Simple math shows that such small changes in the numerators and denominators of the cost and energy effectiveness ratios lead to almost negligible changes in the ratios. Calculations with the actual numbers confirm this. Based on a 5 percent increase in VOC control, a 12 percent increase in annualized costs and essentially no change in energy use (see Table 2 and 8 and previous discussion), a 1400°F to 1600°F change in temperature increases cost per pound VOC controlled only 5 to 10 percent and actually decreases energy uses per pound VOC controlled.

Second, the highest control limit should be based on incinerator operation at 1600°F. This conclusion is based directly on the first, i.e. that over the range of interest temperature does not adversely affect cost or energy effectiveness. Given this, higher temperatures, with higher control efficiencies, are preferred.

This conclusion on operating temperature is also based on the practical limits on metal recuperative heat exchangers. Based on the logic in the preceding paragraph, there is no upper limit to the combustion temperature which should be used. However, above 1600°F, ceramic recuperative heat exchangers are required. Since these exchangers are more complex and costly, and less typical, than metal designs, the decision was made not to rely on them in considering the achievable control levels. Thus, 1600°F was chosen for the incinerator operating temperature. This conclusion was further supported by the high control levels found achievable at this temperature, as discussed below.

Third, and finally, 98 percent VOC reduction, or 20 ppmv by compound, whichever is less stringent, represents the highest achievable control level for all new incinerators, considering available technology, cost and energy use. This is based on incinerator operation at 1600°F, as discussed in the preceding paragraph, and on adjustment of the incinerator after start-up, as discussed in the section on cost. The dual statement of the conclusion, i.e. as percent reduction or ppmv, accounts for the observed fall-off of efficiency at lower inlet concentrations. The 98/20 numbers themselves were picked by analyzing three different control levels, 99 percent or 10 ppmv, 98 percent or 20 ppmv, and 95 percent or 30 ppmv.

The 99/10 level is judged too stringent. Two of the six non-L.A. tests and 65 percent of the L.A. tests fail this criteria. Consideration was given to the fact that many of the units tested were below 1600 and did not have good mixing. However, due to the large percent that failed, it is judged that even with higher temperatures and moderate adjustment, a large number of units would still not meet the 99/10 level.

The 98/20 ppm level is judged attainable. All of the non-L.A. and the majority of the L.A. units meet this criteria. There is concern over the large number of L.A. tests that failed, i.e. 43 percent. However, two factors outweigh this concern.

First, all the non-L.A. units meet the criteria. This is significant since, though the L.A. units represent many tests, they represent the same basic design. They all are small units designed over a decade ago to meet a rule for 90 percent reduction. They are for similar applications for the same geographic region designed in many cases by the same vendor. Thus, though many failed, they likely did so due to common factors and do not represent a wide spread inability to meet 98 percent reduction or 20 ppmv.

Second, the difference between 65 percent failing 99/10 and 43 percent failing 98/20 is larger than a direct comparison of the percentages would reveal. At 98/20, not only did fewer units fail, but those that did miss the criteria did so by a smaller margin and would require less adjustment. Dropping the criteria from 99/10 to 98/20 drops the failure rate by 20 percent, but is judged to drop the overall time and cost for adjustment by over 50 percent.

The difference between the two levels is even greater when the adjustment effort for the worst case is considered. The crucial point is how close a 99/10 level pushes actual field unit efficiencies to those of the lab unit. Lab unit results for complete backmixing range throughout the 99 range at 1600°F, meaning a 99/10 level would force field units to almost match lab unit mixing. Appendix A describes the reasons the complete backmix results were used. Backing off to 98/20 increases the margin, especially for the worst cases. Given that exponential increases may occur in costs to improve mixing as field units approach lab unit efficiencies, a drop from 99/10 to 98/20 may decrease costs to improve mixing in the worst cases by an order of magnitude.

The 95/30 level was judged too lenient. The only data indicating such a low efficiency was from L.A. All other data showed 98/20. The non-L.A. data and lab data meet 98/20 and the Petro-tex experience showed that moderate adjustment can increase efficiency above 98. In addition, in the previous discussion on efficiency, the L.A. units were judged to have poor mixing. The mixing deficiencies were large enough to mask the effect of increasing temperature. Thus, it is judged that 98/20 could be reached with moderate adjustment and that a 95/30 level would represent a criteria not based on the best available units, considering cost, energy, and environmental impact.

Table 1

Description - Available Incinerator Test Data

Below are described the available incinerator test data. Four sets of such data are present. These sets are lab scale incinerator data from tests by Union Carbide and field unit data from tests conducted by EPA, chemical companies and L.A. County.

Union Carbide Test Data[1] - These data show the combustion efficiencies achieved on 15 organic compounds in a lab scale incinerator operating between 800 and 1500°F and .1 to 2 second residence time. The incinerator consisted of a 130 centimeter thin bore tube in a bench size tube furnace. Outlet analyzes were done by direct routing of the incinerator outlet to a FID and GC. All inlet gases were set at 1000 ppmv.

EPA Test Data[2,3,4] - These data show the combustion efficiencies for full scale incinerators on air oxidation vents at three chemical plants. These three plants are the Uniton Caribde, Taft, Louisiana, and Rohm & Haas, Deer Park, Texas, acrylic acid units and the Denka, Houston, Texas unit. The data for Union Carbide include test results based on two different incinerator temperatures and the data from Rohm & Haas, results from three temperatures. In all tests integrated bags were used for sampling and a GC/FID was used for organic analysis.

Chemical Company Test Data[5,6,7,8] - These data are from tests performed by chemical companies on incinerators at three air oxidation units. The companies and units are, Monsanto at their acrylonitrile unit at Alvin, Texas, Petro-tex at their oxidative butadiene unit at Houston, Texas, and Koppers at their maleic anhydride unit at Bridgeville, Pennsylvania. The Monsanto incinerator burns both liquid and gaseous wastes from the acrylonitrile unit and the Koppers incinerator is actually a boiler adapted to burn gaseous wastes. In all tests, analysis was performed by GC/FID. The sampling was performed as follows:

Monsanto - Cold water scrubbing - AN, AcN, HCN; metal sample bombs - remaining compounds
Petro-tex- Integrated bag - inlet; glass syringe - outlet
Koppers - Glass sample bombs and charcoal tubes

L.A. County Test Data[9] - These data are from over 200 tests by L.A. County on various waste gas incinerators, most of which are on coating operations. Data from 147 tests were used, with the remaining tests being discarded since back-up data were missing, the incinerators were catalytic units or similar reasons. In the L.A. data, only flow, temperature, and inlet and outlet VOC concentration are reported; data on compounds and residence time are not present. Evacuated 40 liter gas cylinders were used for sampling and oxidation to CO_2 and NDIR were used for analysis.

Table 2

Results - Union Carbide Tests*

Destruction Efficiency Under Stated Conditions

Flow Regime**	Temperature (F)	Residence Time/Compound .75 seconds				.5 & 1.5 seconds
		Ethyl Acrylate	Ethanol	Ethylene	Vinyl Chloride	Ethylene
Two-Stage Backmixing	1300	99.9	94.6	92.6	78.6	87.2/97.6
	1400	99.9	99.6	99.3	99.0	98.6/99.8
	1500	99.9	99.9	99.9	99.9	99.9/99.9
	1600	99.9	99.9	99.9	99.9	99.9/99.9
Complete Backmixing	1300	98.9	86.8	84.4	69.9	78.2/91.5
	1400	99.7	96.8	95.6	93.1	93.7/97.8
	1500	99.9	99.0	98.7	98.4	98.0/99.0
	1600	99.9	99.7	99.6	99.6	99.4/99.8
Plug Flow	1300	99.9	99.9	99.5	90.2	97.3/99.9
	1400	99.9	99.9	99.9	99.9	99.9/99.9
	1500	99.9	99.9	99.9	99.9	99.9/99.9
	1600	99.9	99.9	99.9	99.9	99.9/99.9

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*The results of the Untion Carbide work are presented as a series of equations. These equations relate destruction efficiency to temperature, residence time and flow regime for each of 15 compounds. The efficiencies in this table were calculated from these equations.

** Three flow regimes are presented, two-stage backmixing, complete backmixing and plug flow. Two stage backmixing is considered a reasonable approximation of actual field units, with complete backmixing and plug flow representing the extremes. The subject of flow regime is further discussed in Appendix A.

Table 3 BEST AVAILABLE COPY

Results - EPA and Company Incinerator Tests

any	Residence Time/Inlet Flow (SCFM)	Temperature (F°)	Number of Test Runs	Inlet VOC (ppmv)***	Outlet VOC (ppmv)	% VOC† Control
n ide	2 to 3 sec/ 20,600	1160	6*	11900	243	96.1
		1475	3*	11900	10	99.9
&	1 sec/ Tank Farm Vent, (TFV)-12,500 Oxidizer Vent, (OXV)-40,000	1425	3*	TFV 2580 OXV 11600	1330	82.6
		1510	4*	TFV 2600 OXV 12800	150	98.3
		1545	1*	TFV 2410 OXV 12200	25	99.7
ka	.6 sec/33,000	1400	3*	950	13	98.5
santo	(Unit size) - 18' Dia. X 36' (Outlet Flow) 75,000	Confidential	Unit 1-6**	Conf.	25	>99
			Unit 2-8**	Conf.	47	>99
pers††	.6 sec/30,000	1800	Inlet-4** Outlet-6*	850	Set 1 7 Set 2 11	99.0 97.2
ro-tex†††	.6 sec/14,400	1400	N/A Set 1	10300	1000	70.3
			Set 2	10650	215	94.1
			Set 3	10300	10	99.6

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pling conducted with integrated bags.
mpling conducted with grab sample bombs or syringes.
C does not include methane of ethane. This definition of VOC is different from that
ed in earlier memos on EPA tests, and thus results reported here may differ from results
the earlier memo.
C % destruction is by weight percent.
e data in Set 1 and 2 for Koppers were taken during different time periods.
let and outlet VOC for Petro-tex reported as ppmv methane. The data in set one were
ken prior to adjustment of the incinerator; the data in sets two and three, after
justment. The specific alterations made by Petro-tex are described in references 6 and 7.

Table 4

Results - L.A. Incinerator Tests

Destruction Efficiency*
Under Stated Conditions

Destruction Efficiency vs. Temperature

Temperature Range (°F)	Number of Tests	1st Quartile **	Median	3rd Quartile
1300 - 1380	32	93.0	96.4	98.0
1385 - 1420	40	94.0	96.0	98.6
1425 - 1475	49	91.5	95.0	97.4
1480 and greater	26	91.5	96.5	98.6

Destruction Efficiency vs. Inlet Concentration

Inlet Concentration (VOC as ppmv carbon)	Number of Tests	1st Quartile	Median	3rd Quartile
0 - 399	16	85.1	90.8	96.0
400 - 799	21	91.0	93.3	97.2
800 - 1199	14	90.0	92.5	94.7
1200 - 1599	16	86.0	92.9	97.9
1600 - 1999	9	93.0	94.5	96.0
2000 - 2399	11	91.0	95.5	97.3
2400 - 3199	12	95.9	98.4	99.3
3200 - 3999	9	97.0	97.8	99.0
4000 - 4999	13	95.5	98.4	99.2
5000 - 5999	8	94.9	97.5	98.1
6000 - 6999	8	96.0	97.5	98.4
7000 or more	10	98.2	98.7	99.5

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*Destruction efficiency as weight percent carbon.

** Medians and quartiles are used rather than averages and standard deviations due to the manner in which the data were distributed.

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Table 5
Result Comparison -
Lab Incinerator vs. Rohm & Haas Incinerator*

	Rohm & Haas Incinerator		Lab Incinerator	
Compound	Inlet (lbs/hr)	Outlet (lbs/hr)	Inlet (grams/sec)	Outlet (grams/sec)
ropane	900	150	9.0	.08
ropylene	1800**	150**	18.0	.70
thane	10	375	.1	.50
thylene	30	190	.3	.43
	2740	865	27.4	1.71
VOC Destruction	68.4%		93.8	

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*Table shows the destruction efficiency on the four listed compounds for the ohm & Haas (R&H) field and Union Carbide (UC) lab incinerators. The R&H results re measured; the UC results are calculated. Both sets of results are based on 425°F combustion temperature and 1 second residence time. In addition, the C results are based on complete backmixing and a four step combustion sequence onsisting of propane to propylene to ethane to ethylene to CO_2 and H_2O. These ast two items are worst case assumptions.

*Are not actual values. Actual values are confidential. Calculations with actual values give similar results.

Table 6
Results - Selected L.A. Incinerator Tests*

Test No.	Temperature (°F)	Inlet** Concentration	Outlet** Concentration	% VOC Destruction
1158	1300	2300	60	97.4
	1400	1600	83	94.9
1214	1400	1200	23	98.2
	1510	1200	89	92.7
1215	1400	1500	94	93.9
	1500	1500	170	89.1
1329	1300	3100	27	99.2
	1325	3700	70	98.1
	1375	3800	120	96.9
	1400	2700	7	99.7
1746	1320	7430	83	98.9
	1410	6247	88	98.6
	1500	7370	104	98.6
1842	1140	1260	83	93.5
	1285	1090	60	94.5
	1425	1420	109	93.0
2130	1300	801	34	93.9
	1375	777	66	89.4
	1495	890	63	90.7
2235	1400	11065	97	99.1
	1450	10731	254	97.6
2359	1400	871	90	85.1
	1450	871	131	72.3
2624A	1200	4110	60	98.1
	1450	3090	65	98.4
2624B	1200	1405	23	98.4
	1420	1164	18	98.8

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*Partial listing of tests where incinerator temperature was increased with no change or a decrease in VOC destruction.
**VOC as ppmv carbon; destruction efficiency as weight percent carbon.

Table 7

Cost Comparison - Incremental Capital Cost and Fuel Savings with Heat Recovery*

Incinerators not Requiring Supplemental Air**

cuperative at Recovery (%)	Inlet Flow (SCFM)	1000		2000	
		Incr. Capital	Incr. Fuel	Incr. Capital	Incr. Fuel
30		$15,600	$11,500	$18,600	$23,000
50		$6,600	$7,500	$9,900	$15,000
70		$10,800	$7,500	$13,500	$15,000

		3000		10000	
		Incr. Capital	Incr. Fuel	Incr. Capital	Incr. Fuel
30		$22,500	$34,500	$36,000	$115,000
50		$12,000	$22,500	$29,000	$75,000
70		$18,000	$22,500	$59,000	$75,000

Incinerators Requiring Supplemental Air

[illegible] at Recovery (%)	Inlet Flow (SCFM)	700		5000	
		Incr. Capital	Incr. Fuel	Incr. Capital	Incr. Fuel
30		$13,000	$27,000	$27,000	$178,000
50		$5,000	$10,000	$12,000	$84,000
70		$2,000	$9,000	$13,000	$77,000

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* Dollar figures are the incremental annualized capital costs and incremental annual fuel cost savings for increasing the heat recovery from the previous level to the listed level. For example, the figures on the 50% line are the costs and savings of going from 30% to 50% heat recovery, and on the 30% line, of going from no heat recovery to 30% recovery. Costs are based on an incinerator operating at 1600°F and .75 seconds residence time. 70% recuperative heat recovery corresponds to an exit gas temperature of approximately 550°F.

** Costs based on Reference 10.

Table 8

Cost Comparison - Incremental Costs of Combustion Temperature Increase

Flow (scfm)	Capital Cost - 1400°F**	Incr. Capital to 1600°F	Percent Increase	Annualized Cost - 1400°F***	Incr. Annual to 1600°F	Percent Increase
Incinerators Requiring Supplemental Air*						
700	328	38	11%	137	11	8%
5000	593	97	17%	288	28	10%
25000	1754	438	24%	965	127	13%
50000	2970	856	28%	1741	248	14%
Incinerators not Requiring Supplemental Air						
1000	328	36	11%	139	10	7%
10000	705	135	19%	363	40	10%
25000	1310	330	25%	728	96	13%

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*All money figures in thousands of dollars

**The capital cost column shows the total installed capital for an incinerator operating at 1400°F, .75 seconds residence time, recuperative recovery with an exit gas temperature of 510°F, and the listed flow. The next column shows the extra capital for a similar incinerator operating at 1600°F. The fourth column shows the percent increase in capital cost from 1400°F to 1600°F.

***The annualized cost column shows the total annual cost (depreciation, interest, taxes, utilities and maintenance) for 1400°F, .75 seconds, 510°F exit temperature and the listed flow. The next column shows the incremental annualized cost for a similar incinerator at 1600°F. The seventh column shows the percent increase in annualized cost from 1400°F to 1600°F.

Appendix A

Mixing is a key concept in incinerator efficiency. Thus, a discussion of incinerator efficiency will likely rely heavily on this concept. However, mixing is also a complex concept. Thus, discussions of efficiency can become burdened with technical explanations of mixing. To handle this difficulty, this memo only cites mixing in the main discussion and leaves detailed explanation of this concept to this appendix.

This appendix discusses mixing in three parts. The first describes the actual physical events involved in mixing and contrasts proper and improper mixing. The second discusses a related item, flow regime, and explains the importance of this idea in interpreting the lab scale data. The third analyzes the lack of a relationship between temperature and efficiency in the L.A. data and concludes that poor mixing was the cause.

Mixing

Mixing can be understood in terms of the two items required for combustion of organic compounds, high temperature and sufficient oxygen. In incineration, these are provided by combustion gases and supplemental air. The combustion gases from burning supplemental fuel provide the heat to achieve high temperatures. Supplemental air, when needed, provides oxygen to combust the supplemental fuel and VOC's.

Mixing concerns these two streams, i.e. combustion gases and supplemental air. Mixing involves the speed and completeness with which these two streams are dispersed into the waste gas. In proper mixing, these two streams are broken apart and intermingled with the waste gas on a molecular level. In addition, this process occurs within only a small fraction of the incinerator residence time.

In contrast, in improper mixing, packets of waste gas pass through the incinerator intact. The turbulence in the incinerator fails to break the waste gas into sufficiently small units for intermingling on a molecular level to occur. Poor mixing also results if this intermingling occurs too late. If the waste gas is mixed just prior to exiting the incinerator, then the actual residence time (R.T.) is much shorter than the nominal R.T., and complete combustion may not occur. Finally poor mixing results if only one of the two required streams, i.e. combustion gas or supplemental air, is properly dispersed. For example, the waste gas may be properly intermingled with combustion gases, but the supplemental air flow may be stratified. The result would be incomplete combustion.

Flow Regime

Flow regime involves the large scale gas currents in an incinerator. In a diagram of the gas flows in an incinerator, flow regime corresponds to broad arrows representing the macroscopic currents.

Certain flow regimes have been labelled. In plug flow, inlet gases remain within fixed vertical "slices" that travel directly from inlet to outlet with no backflow. In complete backmixing, the opposite occurs. Inlet gases are rapidly spread throughout the incinerator and significant backflow occurs. Other flow regimes are composites of these. In two stage backmixing, the incinerator operates like two units in series, with each undergoing complete backmixing. Clearly, actual flow patterns rarely correspond to these idealized types, but these types can serve as approximations.

Flow regime is related to both mixing and efficiency. Specifically, the flow regimes most favorable to high efficiency are the least favorable to mixing, and vice versa. Based on engineering kinetics, plug flow achieves the highest efficiencies at a given temperature. However, to achieve good mixing and still maintain plug flow, the gases in each vertical "slice" must completely mix with each other while remaining separate from the adjoining "slices." Such a phenomena is difficult to create. As the gases mix vertically they also tend to mix horizontally, resulting in a flow pattern closer to complete backmixing. Thus, providing good mixing inherently creates flow patterns less advantageous to high efficiencies.

Flow regime is important in interpreting the Union Carbide (UC) lab unit results. These results are significant since the UC unit was designed for optimum mixing and thus the UC results represent the upper limit of incinerator efficiency. This upper limit is used in evaluating the costs involved in adjusting and designing an incinerator to reach a given efficiency. The closer this given efficiency is to the upper limit, the higher the costs will be.

An understanding of flow regime is required to choose which part of the UC results represents the upper limit. As seen in Table 2, the UC results vary by flow regime. Based on the above discussion, the results under complete backmixing were chosen as the upper limit for the discussion in this memo. Though some incinerators may achieve good mixing and plug flow, the worst cases will likely require flow patterns similar to complete backmixing to achieve complete mixing. Thus, since this memo is considering efficiencies applicable to all incinerators, a conservative assumption of complete backmixing was required when considering the upper limit of efficiency.

L.A. Data

The L.A. data surprisingly showed no relation between temperature and efficiency. Various factors were analyzed to determine the cause for this result.

In a search for the cause, sampling error and the incinerator variables of residence time, inlet concentration and type of compound were ruled out. For sampling error to be the cause, the sampling would have had to consistently underestimate efficiency in high temperature tests and overestimate it in low temperature tests. With over 150 tests, this is essentially impossible. For the three incinerator variables to have been the cause, these variables would need to mask the effect of temperature. However, based on the Union Carbide work and kinetic theory, these variables only scatter the efficiencies around an average determined by temperature. In the UC cases, the effect of temperature is still seen in the increasing average efficiency.

The remaining variable is mixing. A plausible explanation of the results is possible if this variable is considered. The reason lies in two factors which allow mixing to mask the relation of temperature and efficiency. First, the completeness of mixing can drop with temperature. Thus, improper mixing can offset the effect of increasing temperature. In contrast, the other variables remain the same as temperature changes and thus offsetting cannot occur. Second, increases in temperature only increase the efficiency of the well-mixed portion of the waste gas. Since this portion contains only part of the uncombusted VOC, and likely the smaller part, the impact of increasing temperature is greatly diluted. In contrast, the other variables cannot "isolate" parts of the waste gas from the affect of temperature.

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10. Control Device Evaluation - Thermal Oxidation, Jim Blackburn, IT Enviroscience, Knoxville, Tennessee, December 1979.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

DATE: JUL 22 1980

SUBJECT: Thermal Incinerator Performance for NSPS, Addendum

FROM: David C. Mascone
Chemical Manufacturing Section

TO: Jack R. Farmer, Chief
Chemicals and Petroleum Branch

After reviewing the recent memo on incinerator performance, (Thermal Incinerator Performance for NSPS, June 11, 1980, DCM to Jack Farmer), you indicated several areas where further discussion was desired. These areas were as follows:

- continuous compliance of thermal incinerators
- the impact of compound on efficiency
- the impact of inlet concentration on cost effectivesness and efficiency

These three areas are discussed below preceeded by a summary of the conclusions.

Conclusions

In the absence of a demonstrated continuous VOC monitor for thermal incinerators, CPB is investigating alternate methods. After study of the cost and effectiveness of several such methods, the following should be considered: continuous temperature and flow monitoring and bi-annual compliance testing and inspection/maintenance. For example, in monitoring temperature and flow, a company could be required to run the incinerator between ±50°F of the temperature, and between +20 percent and -50 percent of the flow, measured during the performance test.

Detailed analysis shows that type of compound does affect incinerator efficiency. However, due to the complexity of the relationship, no attempts were made in the June 11 memo to draw fine-tuned efficiency conclusions relating different efficiencies to different compounds at different temperatures. Rather, a more conversative approach was taken in which the efficiency conclusions were based on the most difficult compounds to combust. These conclusions, based on such a worst case analysis, would then apply regardless of compound.

Detailed analysis also shows that inlet concentration affects incinerator efficiency. However, unlike type of compound, statistical study of the relationship between inlet concentration and efficiency was possible. Based on this study, the conclusions in the June 11 incinerator memo are expressed in both ppmv and percent reduction. This dual format accounts for the effect of inlet concentration.

Inlet concentration also affects cost effectiveness. One effect is that as inlet concentration drops the energy content of the waste gas drops, increasing supplemental fuel use. However, this is not the major effect. By far the largest effect of inlet concentration on cost effectiveness is to change the amount of VOC controlled. Over a typical range of inlet concentrations (i.e. 10,000 to 500 ppm) and for an incinerator with 70 percent recuperative heat recovery, increasing fuel use can increase cost effectiveness 5 to 50 percent while decreasing VOC can increase cost effectiveness 5 to 2000 percent.

Discussion

Monitoring - One CPB goal is continuous monitoring of air pollution control equipment. At present, we are limited in achieving this goal for incinerators by the lack of a demonstrated continuous VOC monitor. Given this limitation, CPB is studying alternate monitoring methods, such as measuring firebox temperature, to indicate incinerator performance.

To develop alternate monitoring methods, two goals were considered. First, these alternate methods should detect all or most cases of poor incinerator performance. Second, the methods should have reasonable costs and impose reasonable recordkeeping requirements.

To meet these goals, the variables that affected incinerator performance were analyzed. These variables are temperature, mixing, type of compound, inlet concentration, residence time, and flow regime. Of these variables, the last three were judged of little concern when considering continuous monitoring. These three variables are essentially set after incinerator construction and adjustment and/or have only small impact on incinerator performance. The three remaining variables were then analyzed in more detail to define their impact on performance and the ability to monitor them.

Temperature was analyzed first. This analysis was based on data in the previous incinerator memo. Even with good mixing, the Union Carbide lab data and kinetic theory show that lower temperatures cause significant decreases in efficiency. In addition, the L.A. data indicate that increasing temperature can also adversely affect efficiency, apparently by changing mixing. In terms of cost, temperature monitors are inexpensive, costing less than $5000 installed with strip charts, and are easily and cheaply operated. Given the large effect of temperature on efficiency and the low cost of temperature monitors, this variable is clearly an effective parameter to monitor.

As an example, a specific requirement could be that an incinerator cannot be operated for more than three hours at an average firebox temperature above 50°F over, or under 50°F below, the average temperature recorded during performance testing. If an operating range greater than 100°F is desired, a company could perform performance tests at more than one temperature. The three hour time period would correspond to the period required for integrated bag sampling in a typical performance test. This would make the averaging period for temperature monitoring similar to that of the performance test. Finally, the company could be required to install, operate, and calibrate the monitor according to manufacturer's specifications. These specifications generally cover proper placement of the monitor.

The next variable studied was mixing. The most likely item to affect mixing, given a constant temperature and an already constructed incinerator, would be flow. No direct field data is available on the effect of flow on mixing efficiency. However, based on engineering judgement, increasing flow may lead to "shortcircuiting," where the increased kinetic energy of higher flow streams causes waste gas to jet through the incinerator unmixed. Decreased flow may lead to the opposite, where lower flow rates result in insufficient kinetic energy for complete mixing. As with temperature, flow monitors are inexpensive and easily operated. Given the potential impact of flow on efficiency, and the low cost of flow monitors, flow rate is also an effective parameter to monitor.

As an example, a specific requirement could be that an incinerator cannot be operated for more than three hours at an average flow less than 50 percent or greater than 120 percent of the average waste gas flow recorded during a performance test. The permissible range would be intentionally broad due to the lack of field data on the impact of flow on mixing and efficiency. The upper restriction would be tighter than the lower since increase flow not only may adversely affect mixing but decreases residence time. Any adverse effects of decreased flow may be offset by the increased residence time. The above discussion for temperature on widening the operating range, the three hour time limit, and installation, operation and calibration of the monitor would hold for this flow monitoring example.

The final variable analyzed was type of compound. For most incinerator applications, the compounds in the waste gas are set by the process to which the incinerator is attached. Thus, type of compound is of no concern. However, certain applications may have differing compounds in the waste gas. A coating operation may have at one time a solvent with an MEK base, and then switch to a solvent with a toluene base. MEK is oxidized easier than toluene, and thus an incinerator which achieves compliance on an MEK stream may be inadequate for the toluene stream.

The judgement on this item is that no general monitoring requirement on type of compound can be specified. Most cases will have the waste gas compounds set by the process. In those that do not, considerable difficulty is envisioned in defining, in a general way, when the waste gas compounds have changed enough to require additional compliance tests. For example, differentiating between solvent formulations would be difficult. The same generic name of solvent may show greater variations in composition than two different name specialized solvents. However, though a general requirement on type of compound cannot be set, specific requirements may be desired for certain standards.

Temperature and flow monitoring do not measure incinerator performance directly. Thus, concern exists over the long term stability of incinerator performance, even with temperature, flow and type of compound held constant. Data on this issue is shown in Table 1. The top part of the table shows data from L.A. County where the same incinerator was tested in different years. The bottom part lists possible incinerator malfunctions that could affect performance, without changing temperature and flow.

Based on Table 1, incinerators, if properly designed and adjusted, are judged to have fairly stable performance over time. The L.A. units showed only small changes in efficiency over time. The efficiencies of these units changed less than two percentage points over several years, except one case. In addition, the listed malfunctions are judged to occur infrequently. This is based on several factors. First, these malfunctions involve non-moving parts subject to little wear. Also, the typical waste gases are not highly corrosive and the typical incinerator fuels, natural gas and fuel oil, have low sulfur and ash content. Finally, even though incinerators undergo wide temperature swings, incinerator components are designed to withstand these changes, given proper cooling and heating of the unit.

The above conclusion should not be overstated. Though fairly stable, all four L.A. data sets show some drop in performance over time. And though improbable, incinerator malfunctions are not impossible. Thus, the conclusion from the data is not that no additional requirements are needed over temperature and flow monitoring. Rather, the conclusion is that the costs and recordkeeping of additional monitoring requirements must be carefully balanced against emissions potentially prevented by them.

After this balance was studied, two additional requirements were considered. These are bi-annual performance testing and bi-annual inspection and maintenance (I & M) for incinerators. The performance testing would follow the method specified in the standard. The I & M would involve visual inspection for items such as corrosion and firebox deterioration, calibration and testing of control instrumentation, and so on. Such I & M could most likely be performed at the same time as a process turnaround.

These two additional monitoring methods would effectively detect drops in incinerator performance not detected by temperature and flow monitoring. Performance testing is the most direct means of detecting poor efficiency. The I & M will catch drops in performance by spotting equipment failures or impending failures that could lead to poor performance. The I & M has the added advantage that impending failures which could lead to incinerator shutdown would also be spotted. The two year period for compliance testing and I & M is based on the rate at which incinerator performance is likely to deteriorate. The two year period for I & M also corresponds to the typical time between process turnarounds. Thus, with a bi-annual I & M the incinerator I & M could be performed at the same time as process equipment I & M, and it would not be necessary to shut down the process just to check the incinerator. Finally, the timing of the performance test and the I & M are not linked. They can be done together in any order or apart.

Type of Compound - One factor which affects incinerator efficiency is type of compound. The June 11 memo on incinerator efficiency excludes this factor from its conclusions, but discusses only briefly the reasons for this exclusion. This section discusses the impact of this factor on efficiency and explains in more detail the reasons for its exclusion.

In terms of the impact of compound on efficiency, the available incinerator data does show a moderate impact. The Union Carbide lab data demonstrates this most clearly. In cases where different compounds were incinerated at the same temperature, residence time, and flow regime, variations in efficiency of up to 5 percent points occurred for temperatures above 1400°F. At lower temperatures, the efficiency variations increased up to 20 and 30 percentage points.

However, as a practical matter, including compound as a factor in an efficiency conclusion would be difficult. First, a precise quantitative relation between compound and efficiency could not be determined. As with mixing, no single value could be assigned to an individual compound to represent ease of combustion. Thus, analysis of the relation between efficiency and compound was limited. Second, even if a relationship could be devised, it would be complex and difficult to apply. The relationship would likely involve kinetic rate constants, autoignition temperatures, factors for molecular configuration and structural groups and similar variables.

To avoid these difficulties, an alternative approach was taken. No initial attempts were made at drawing a fine-tuned efficiency conclusion showing differing efficiencies at differing temperatures for different compounds. Rather, a conservative approach of choosing a simple set of incinerator conditions and efficiencies based on the most difficult compounds to combust was pursued. This approach proved successful.

Several factors aided in the success of this approach. First, the available test data covered a wide range of compounds. The compounds on which test data were available included C_1 to C_5 alkanes and olefins, aromatics such as benzene, toluene, and xylene, oxygenated compounds such as MEK and isopropanol, nitrogen containing species such as acrylonitrile and ethylamines and chlorinated compounds such as vinyl chloride. With such a range of compounds and the consideration of kinetics, it was concluded that worst case compounds had been taken into account. The second factor was the discovery that increasing combustion temperature resulted in only negligible energy penalties and moderate cost increases. Thus, choosing a higher temperature to cover the worst cases did not make incinerators unaffordable or too energy intensive.

Inlet Concentration - A second factor which affects efficiency is inlet concentraton. Unlike type of compound, an allowance for this factor was included in the efficiency conclusions. Specifically, these conclusions included not only an efficiency of 98 percent but a minimum exit concentration of 20 ppmv by compound. Thus, as inlet concentration drops, the minimum ppmv lowers the efficiency required. For example, with a 500 ppmv inlet concentration for a waste gas containing oxygen, the 20 ppmv minimum translates to a 96 percent efficiency; with a 250 ppmv inlet, a 92 percent efficiency. This section explains in more detail the reasons for this allowance for inlet concentration.

The test results from L.A. County form the major basis for this allowance. These results show a strong trend where lower inlet concentration results in lower efficiency. For example, for inlet concentrations less than 1600 ppmv as carbon, the median L.A. efficiency was approximately 92 percent. For inlet concentrations between 1600 and 2400, the median L.A. efficiency was approximately 94 percent. For inlet concentrations above 2400, the median efficiency was approximately 97 percent.

Kinetic considerations also support the allowance for inlet concentration. The most likely kinetic model where inlet concentration does not affect efficiency is a first order model. However, available literature indicates that combustion follows complex reaction mechanisms.[1,2] In cases, these mechanisms can be fit to a first order model. However, as a general rule, these mechanisms, which involve chain reactions, free radicals and multiple pathways, cannot be reduced to first order models.

The June 11, 1980, incinerator memo concluded that the L.A. incinerators did not all achieve proper mixing. This improper mixing may have caused or influenced the relation between efficiency and inlet concentration in the L.A. data. If this is the case, then an allowance for inlet concentration may permit lower efficiencies than are actually achievable in incinerators with proper mixing. However, the possible effect of poor mixing on the relation of efficiency and inlet concentration remains just that, possible; no conclusive statement can be made. Given this, a more conservative approach was taken and lower efficiencies for lower inlet concentrations were allowed.

Inlet concentration also impacts cost effectiveness, i.e. costs per unit weight VOC controlled. The precise impact depends on molecular weight, the size of the incinerator and the ratio of waste gas energy content to VOC. Figure 1 show these impacts.

A surprising conclusion in the analysis of inlet concentration vs. cost effectiveness is the role of supplemental fuel. The increasing cost for supplemental fuel as inlet ppm drops is not a major factor in cost effectiveness. Incinerator size and the amount of VOC being destroyed are much more important factors. An illustrative example is a 5000 SCFM incinerator burning benzene in nitrogen. The extra fuel required when dropping the inlet contration from 5000 to 500 ppmv increases the cost effectiveness only 20 percent. The fact that only one-tenth the benzene is being destroyed for about the same cost increases the cost effectiveness 1000 percent. And decreasing the stream size to 1000 SCFM increases the cost effectiveness about 300 percent. Clearly, increasing fuel costs at lower ppmv is only a minor factor.

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[1] Rolke, R.W., et. al. Afterburner System Study, U.S. Environmental Protection Agency, Report S-14121, Shell Development Company, 1971.

[2] Barnes, R.H., et. al Chemical Aspects of Afterburner Systems, IERL Report U.S. Environmental Protection Agency, EPA-600/7-79-096. Batelle Columbus Laboratories, April 1979.

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Table 1

Long Term Incinerator Performance

Part A - L.A. Test Data*

any	Test No.	Date	Inlet (ppmv	Outlet carbon)	% VOC Destruction	Flow(SCFM)/ Temp. (°F)
& Night facturing	1754	10-30-73	443	33	92.5	3270/1300
	2442	7- 7-76	1030	91	91.4	2020/1300
	2443	8-10-78	716	94	87.3	2050/ -
teel, Inc.	2236	5-12-75	6020	52	99.0	1210/1260
	2402	2-17-76	5860	71	98.9	4150/1375
onal Can	1430	6-10-70	4900	31	99.4	2520/1500
	1746	3-21-74	7370	104	98.6	1990/1500
onal Can	1451	6-10-70	3500	22	99.4	4620/1460
	1746	3-21-74	6247	82	98.0	4660/1420
			7370	79	98.0	4650/1525

Part B - Possible Incinerator Malfunctions**

unction	Cause	Possible Effect on VOC Control
rebrick Deterioration	Improper heating & cooling of incinerator during start-up & shutdown; firebox temperature too high	Deteriorated wall allows local heat loss resulting in cool spots in firebox, and thus potentially lower destruction efficiency in those spots
sulation Loss from cinerator Exterior	General weathering & corrosion from rain, cold, incinerator start-up & shutdown & so on	Same as previous; insulation loss leads to local heat loss & cool sp in the incinerator
rrosion of ducts, ffles & other posed metal	Ash, acids, salts, etc. in fuel or waste gas	Severe corrosion of metal parts affects the gas flow patterns through and around them, potential affecting mixing & thus efficiency
ugging of Burners	Ash & carbon build-up	A plugged or partially plugged bur affects the flow patterns & temperature profiles in the firebo potentially lowering destruction efficiency
eaking of Recuperative at Exchanger Seals	General corrosion; temperature warping from hot spots in the exchanger, improper heating & cooling during start-up & shutdown	Inlet waste gas leaks into the out flue gas without passing through the firebox.

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listed data are from incinerators which were tested in more than one year.

listed malfunctions include only those which would likely not affect temperature at a gle point firebox temperature monitor or inlet/outlet flow.

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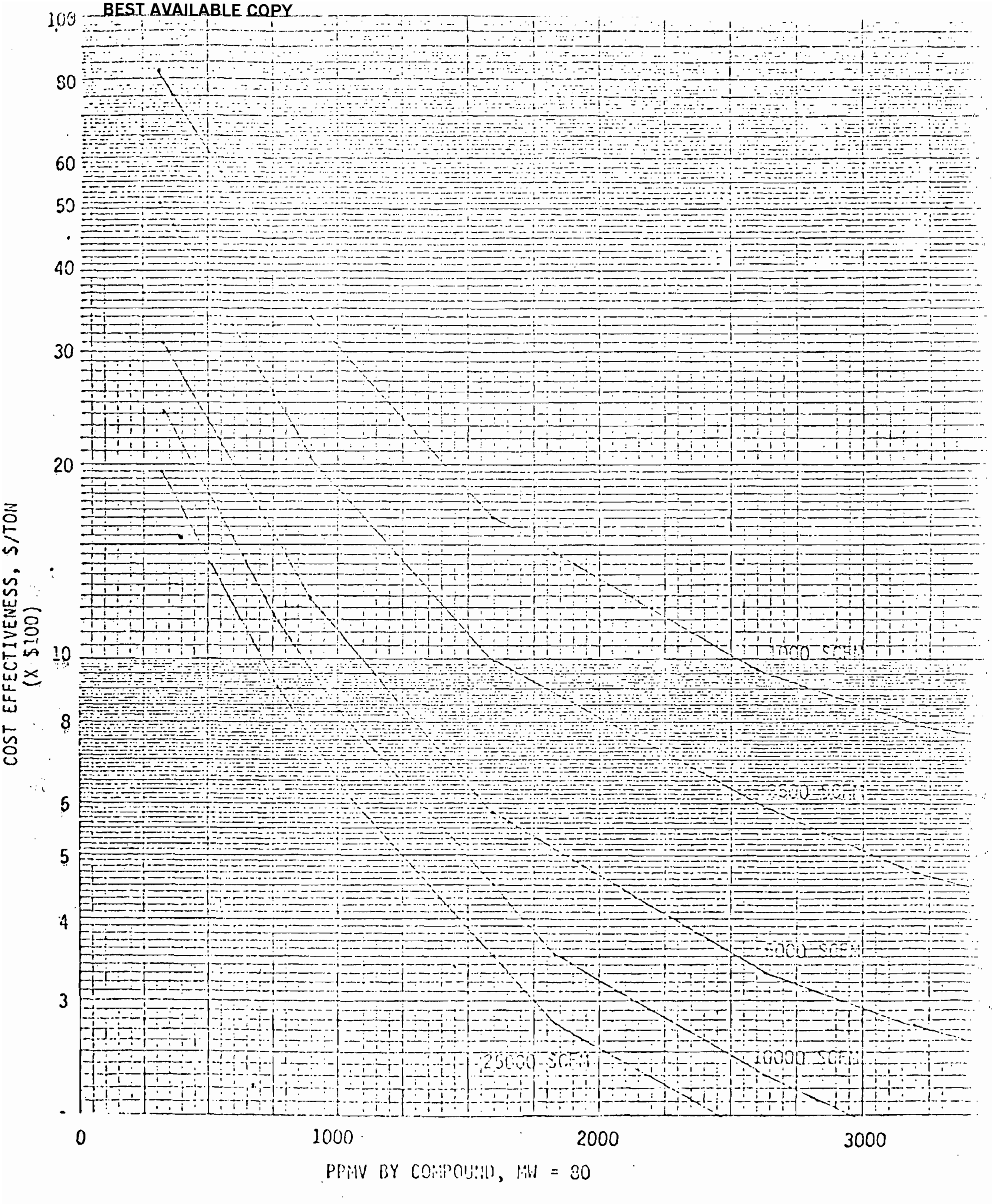

Figure 1 - Cost Effectiveness for Thermal Incinerators by Inlet Concentration and Waste Gas Flow

Figure 1 - Notes and Explanation

Figure 1 shows the cost effectiveness of thermal incinerators by inlet concentration and waste gas flow. The cost effectiveness is in hundred dollars per 2000 pound ton; inlet concentration is ppmv by compound; and the flow rate is in SCFM. The costs in the figure assume a waste gas deficient in air, and a compound with a molecular weight of 80 and a heat of combustion of 15,000 BTU/lb VOC. The thermal incinerator operates at 1600°F and .75 seconds and achieves 70 percent recuperative heat recovery.

The figure can be used to approximate cost effectiveness for situations other than that described in the above paragraph. For compounds with different molecular weights, the x-axis scale should be increased by 80 over the molecular weight of the compound. For example, for a compound with molecular weight of 40, the x-axis scale would read 2000, 4000, and 6000. For cases where the waste gas contains sufficient oxygen for combustion, the cost effectiveness should be decreased by the following percentages:

1000 SCFM	7%
2500 SCFM	14%
5000 SCFM	21%
10000 SCFM	26%
25000 SCFM	30%

This adjustment accounts for the smaller size and lower fuel requirements of these cases. Finally, for cases where the combustion value of the stream per pound of VOC is higher, the below listed decreases approximate the costs. These adjustments assume 30,000 BTU/lb VOC.

for ppmv <500	No adjustment	
for ppmv between 500 & 3000	1000 SCFM	5%
	2500 SCFM	10%
	5000 SCFM	15%
	10000 SCFM	20%
	25000 SCFM	25%
for ppmv >3000	No adjustment	

This adjustment accounts for the lower fuel use at higher BTU/lb levels.

Monsanto

MONSANTO CHEMICAL INTERMEDIATES CO.
800 N. Lindbergh Boulevard
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Phone: (314) 694-1000

January 20, 1981

Mr. Tommie A. Gibbs, Chief
Air Facilities Branch
U.S. Environmental Protection Agency
345 Courtland Street, N.E.
Atlanta, Georgia 30308

Dear Mr. Gibbs:

Re: Monsanto Company PSD Permit
Maleic Anhydride Production Facility
PSD FL-055
Legal No. 22111 1-T
January 1, 1981

The attached comments are submitted in connection with the above-referenced permit in accordance with the provisions of the Public Notice recently issued concerning said permit. We would like to thank representatives of EPA and its contractor TRW for meeting with Monsanto representatives about this permit on January 15, 1981, in EPA's Atlanta office. We believe the discussion we had helped clarify many of our concerns and assisted in the preparation of our comments.

The comments will initially summarize Monsanto's major concerns with proposed permit conditions, then set forth specific recommended changes to the conditions and finally cover certain background matters discussed at the January 14 meeting.

These comments are being made with Joe Vick's involvement and concurrence and comprise all of Monsanto's comments.

Sincerely,

ED Malone

E. D. Malone
Project Director,
Maleic Anhydride

ap
attachment

cc: Mr. Kent Williams - EPA
Mr. Jeffery Shumaker - TRW

Monsanto Company Comments
PSD FL-055
Legal No. 22111 1-T
January 1, 1981

Submitted on January 20, 1981

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IV. Exhibit A

I. SUMMARY OF MAJOR CONCERNS

Monsanto has four major concerns with the proposed permit conditions, which arise in large part because the maleic anhydride plant proposed by Monsanto is unique and there is no other plant of this type, scale and processs currently in operation. Consequently, EPA's attempt to utilize technology transfer and pilot plant data to predict emission abatement efficiency is not appropriate.

The first major concern is that volatile organic compounds (VOC) and carbon monoxide (CO) emission limitations set forth in Conditions 3 and 4 exceed best available control technology (BACT) in this case. Unless they are increased, Monsanto is faced with construction of a facility costing tens of millions of dollars, which we could be prohibited from operating because of an inability to consistently meet these excessively strict limits.

Second, the requirements in Condition 8 regarding continuous compliance monitoring and operating condition parameters, such as minimum steaming rate and minimum furnace temperature are inappropriate. Permit compliance should instead be based upon manual sampling of the boiler flue gas.

Third, Condition 9 imposes fugitive VOC emission controls which are unsupported and inappropriate in this case, and should be deleted. New VOC fugitive emission data is presented in these comments which adds substantive support for this requested deletion.

Forth, the permit is silent on allowable emissions during startup, shutdown and malfunction conditions, and it should be modified to specifically allow excess emissions during these periods.

II. COMMENTS ON PERMIT CONDITIONS

Monsanto's specific comments on the proposed permit conditions are as follows:

II.1. Condition 1 - This condition sets forth the annual design production of the facility, its operating on-stream time and per hour production rate. Based upon EPA statements to Monsanto during our January 14, 1981 meeting, it is Monsanto's understanding that the inclusion of those items in the permit refers only to the design of the facility and do not in any way limit actual production to those figures.

II. COMMENTS ON PERMIT CONDITIONS (Continued)

II.2. Condition 2 - This condition bans the use of benzene feedstock, and EPA has no authority to ban its use under this permit. While Monsanto does not now intend to use benzene, and the permit application does not request it, future developments -- including price and availability of feedstock and catalysts, safety considerations, and production requirements -- may make benzene a desirable alternative or supplementary feedstock in some circumstances. Accordingly, this condition should be deleted.

II.3. Conditions 3 and 4 - These conditions constitute determination of BACT for emissions of VOC and CO. Monsanto believes that the proposed VOC and CO emission limits are far in excess of BACT and Monsanto's expected capabilities in this case, and are unsupported by any laboratory or pilot plant data or data from existing thermal oxidizers. The VOC and CO limits should be increased as detailed in Section II.3.E. of these comments.

II.3.A. Inapplicability of Laboratory and Pilot Plant Data - The preamble of the proposed permit conditions based the 99% destruction requirements for VOC and CO, in part, upon extrapolation from laboratory and pilot plant data to the proposed full scale maleic anhydride plant. This extrapolation of data is not valid for the establishment of 99% VOC and CO destruction efficiencies as BACT for this full scale facility because, (1) waste gas mixing will be different from the complete mixing achieved in the pilot plant, (2) the data does not take into account the 2000 to 1 scale-up in size from pilot plant to full scale, (3) the pilot plant and full scale plant designs differ in all cases.

II. COMMENTS ON PERMIT CONDITIONS (Continued)

II.3 Conditions 3 and 4 (Continued)

II.3.A. Inapplicability of Laboratory and Pilot Plant Data (Continued)

Pilot plant mixing of waste gas with air and the hot combustion gases is designed to be complete. Monsanto's pilot plant at our St. Louis maleic facility was a 6" x 6" cross section of insulated duct with a natural gas burner on one end. The duct was long enough that we could withdraw gas samples for analysis at three points corresponding to 0.5, 0.75, and 100 seconds of residence time. Waste gas streams from benzene reactors, butane reactors and combination of both were tested. The duct was operated at temperatures from 1100°F to 1800°F.

At temperatures over 1400°F, benzene and butane were both more than 99% destructed. A residence time of 0.5 seconds was adequate once the temperature given above was reached. Mixing was not a problem due to the small size of the test unit.

Complete mixing is not achievable in a full commercial scale facility. The scale-up in size from the test unit to the boiler furnaces is dramatic. Cross sectional area of the boiler furnace is 2000 times greater than the test unit. Waste gas flow rate is 500 times greater than tested in St. Louis; that is, over 500,000 lb/hr, and it is both poor fuel and poor combustion air. Intimate mixing of the waste gas with air and the hot combustion gases from the flame will be much more difficult and uncertain in the boiler furnace, and this can have a significant impact on waste gas destruction efficiencies. This is because, as reported by David C. Mascone of EPA in his June 11 and July 22, 1980, correspondence to Jack R. Former, "mixing is a critical factor in efficiency, a factor of equal or greater importance than other factors such as temperature".

II.3 Conditions 3 and 4 (Continued)

II.3.A. Inapplicability of Laboratory and Pilot Plant Data (Continued)

Without complete radial mixing bypassing becomes a distinct possibility. Less than 1% effective bypassing without destruction would in effect bring the efficiency level to the presently proposed limits in the preliminary determination.

The size and shape of the pilot plant promotes "plug flow", which is the most kinetically efficient type of flow regime in a reactor. The attainment of "plug flow" in a large square space such as a boiler is impossible.

Our concern regarding the 99% destruction efficiency is the same concern that Mascone reported in his letter to Farmer dated June 11, 1980, and we quote, "The crucial point is how close a 99 level pushes actual field unit efficiencies to those of a lab unit ... a 99 level would force field units to almost match lab unit results".

The main conclusion of this Mascone letter is that 98% VOC reduction is the highest control level achievable by all new commercial incinerators controlling ducted VOC emissions.

Analysis of Union Carbide laboratory work (Reference 3, page 13 of the proposed permit) further supports the position that the laboratory results presented are not valid bases for predicting the efficiencies that can be achieved in an industrial thermal oxidation unit. The laboratory incinerator consisted of a tube 0.09 cm in diameter and 130 cm long, totally enclosed in an oven to supply the necessary heat. If this same design were to be used for incineration of the maleic anhydride off-gas, two pipes, each 2 ft. in diameter and 3000 ft. long totally enclosed in an infinite heat source would be required. If such a device were feasible (and it is not) and could be constructed, a high destruction efficiency could probably be achieved. The destruction efficiency achieved in such a long, narrow configuration with uniform heating of all the wall surface and perfect premixing of air with the VOC cannot be extrapolated to a commercial oxidizer where mixing, temperature variation, fuel combustion and energy conservation are important factors.

II.3.B. Existing VOC Destruction Data Is Incomplete

On page 4 of this proposed permit, EPA relies on References 2 and 3 in establishing the proposed VOC limit, which represents 99% destruction efficiency. This data does not support 99% destruction efficiencies primarily because it is based upon disappearance of a specific organic compound and not on all VOC components present in waste gas. Oxidiation of a hydrocarbon does not proceed in one step directly to carbon dioxide and water. There are a large number of different organic compounds and/or free radicals that form as the oxidation reactions proceed. Anaylsis of this mixture of compounds and radicals will show the disappearance of the initial compound if a specific determination for that compound is made, but analysis for total VOC may show much of the organic still present.

The destruction efficiencies for benzene emissions from maleic anhydride plants reported in Reference 2 apply only to the disappearance of benzene not to the disappearance of total VOC. Obviously, a report of 99% removal of benzene does not necessarily represent a 99% removal of all VOC.

II. COMMENTS ON PERMIT CONDITIONS (Continued)

II.3. Conditions 3 and 4 (Continued)

II.3.B. Existing VOC Destruction Data is Incomplete (Continued)

The destruction efficiencies reported in Reference 3 also apply only to the disappearance of specific compounds, not total VOC. In fact, the authors of Reference 3 clearly indicate this fact in the following direct quotation from page 7 of their publication entitled "Predictive Model of the Time-Temperature Requirements for Thermal Destruction of Dilute Organic Vapors":

> "However, data presented in this paper were based on the test compound measurements only, since the main objective of this paper is to present a predictive destruction kinetic rate model based on the compound structure. For most compounds, combustion intermediates do exist ... For example, at least six combustion intermediates can be identified when propylene was combusted."

Any extrapolation of the data in Reference 3 to establish emission limits for total VOC must take into consideration the fact stated above. It is important to note that six intermediate combustion products were identified when burning propylene, a smaller molecule than butane.

Further proof of the presence of intermediate combustion products is given in the Mascone's June 11, 1980, letter to Farmer in Table 5 where the following results from an industrial incinerator are reported:

	Inlet Lbs/Hr.	Outlet Lbs/Hr.
Propane	900	150
Propylene	1800	150
Ethane	10	375
Ethylene	30	190
Total	2740	865

II.3.B. Existing VOC Destruction Data Is Incomplete (Continued)

While propane and propylene are being destroyed, ethane and ethylene are being generated.

It should also be noted that the authors of Reference 3 state that the main objective of their work was "to present a predictive destruction kinetic rate model..." and in regard to use of their work to design a real thermal oxidizer "although the work reported here is a significant step forward, it is only the first step". In view of this objective, their work cannot form the basis for VOC emission limits.

II.3.C. Existing VOC Commercial Incinerator Data Is Not Transferable

There are inadequate data from existing thermal oxidizers to support the proposed 99% VOC destruction limit. VOC destruction efficiency data from existing thermal oxidizers was generated using various analytical methods which either did not measure all compounds of the VOC or are unknown.

When technology transfer is used as a basis for establishing emission limits, special care must be taken to ensure that the analytical method used to determine emission rates for existing technology is the same as or equivalent to the method required to determine compliance with those limits. The capability of analytical methods has been significantly improved over the recent past and much of the existing data base of emission rates has been developed utilizing various analytical methods. This fact casts serious doubt on the validity of using existing data as a basis for setting new source emission limits. Unless the analytical method used to establish the

II. COMMENTS ON PERMIT CONDITIONS (Continued)

II.3. Conditions 3 and 4 (Continued)

II.3.C. Existing VOC Commercial Incinerator Data Is Not Transferable (Continued)

base is equivalent to the required method for a new source, the existing data should not be used. If such data is used, the unknown influence of this variable must be considered in establishing emission limits.

Following is a discussion of data set forth in attached Exhibit A relating to several large existing off-gas incinerators in the same size range as the Pensacola unit (250,000 pounds of process off-gas per hour). The purpose is to show the variability among incinerators in operation, analytical methods and results, and to show that technology transfer must be used with caution.

Data are presented on two tests of one of Monsanto's acrylonitrile (AN) off-gas incinerators. AN off-gas is low in oxygen, and large quantities of combustion air must be added. In order to obtain high levels of VOC destruction, the unit is operated at a relatively high temperature. The AN incinerator burns both liquid and gaseous VOC. Since the liquid VOC burn much like No. 2 fuel oil, very high levels of destruction can be attained for the liquid VOC. The 99.0% destruction shown is an average of the liquid and gaseous VOC. If 100% destruction of the liquid VOC is assumed, destruction of the gaseous VOC would be 97.6%. VOC destruction on this incinerator is shown in the Mascone to Farmer letter of June 11, 1980, as greater than 99% for the average liquid and gaseous VOC destruction. However, C_2 hydro-carbons were not included in calculating the VOCs in the stack gas, which will make a difference in the percent destruction reported.

II.3.C. Existing VOC Commercial Incinerator Data Is Not Transferable (Continued)

The Koppers incinerator referenced in Exhibit A is a water wall boiler and most closely resembles the units proposed for the Monsanto installation. Unfortunately, we were not able to obtain specific temperature data taken during the tests. Verbal communications with a Koppers' representative indicates that the temperature was in the range of 1600°F, rather than 2000°F mentioned in Reference 2., page 13 of the proposed permit. Finally, the percent destruction is based on the disappearance of benzene, not total VOCs.

The first test (93% destruction) on the Denka incinerator in Houston, Texas, was reported in Chemical Engineering Progress in 1977. The second test was reported by Mid-West Research Institute in 1978. The result (98.6% destruction) is the average of 3 test runs. No explanation is given for the improvement in destruction efficiency.

The Monsanto phthalic anhydride process at Texas City, Texas, produces an off-gas high in oxygen (17%). No additional air is required for combustion, and only small purge air streams are added to the system. As a result, there is no mixing problem with air and off-gas. At the high end of the operating temperature range (1600°F), high levels of destruction are attained. However, the stack gas was analyzed only for water soluble organics, such as phthalic anhydride, maleic anhydride, and benzoic acid. If any low molecular weight hydrocarbons are present, they would not be measured.

II. COMMENTS ON PERMIT CONDITIONS (Continued)

II.3. Conditions 3 and 4 (Continued)

II.3.C. Existing VOC Commercial Incinerator Data Is Not Transferable (Continued)

Another weakness in the transferability of data from existing incinerators is that the thermal oxidizer data used to support the proposed VOC emission limit represents a very limited number of short term tests. There is no data reported that any existing thermal oxidizers can achieve the proposed destruction level on a continuous, long-term basis.

In order to meet a given emission limit for a one hour or 24 hour sample time, on a long term consistent basis, the plant would have to average considerably below the limit over the course of a year. Of course, no statistical data is available on the VOC emitted from the boiler-incinerators proposed for Pensacola. Therefore, a number of assumptions have been made as shown below (24 hour averaging time, one violation per year, standard deviation of 10 pph) to demonstrate this point.

Given:

A) 107 pounds per hour averaged over 24 hours;

B) one violation per year is equivalent to 2.78 standards deviations; and

C) Assume standard deviation of 10 pounds per hour.

Conclusion:

Plant would have to operate at a mean of 79 pounds per hour, or about 98.9% destruction.

II. COMMENTS ON PERMIT CONDITIONS (Continued)

II.3. Conditions 3 and 4 (Continued)

II.3.C. Existing VOC Commercial Incinerator Data Is Not Transferable (Continued)

In this specific case, every pound of butane fed to the boilers will theoretically produce 1.9 pounds of CO. At maximum off-gas rates 7000 pounds/hour of butane and 6700 pounds/hour of CO will be present in the off-gas. The 7000 pounds of butane will produce 13,300 pounds of CO. This means that a total of 20,000 pounds an hour of CO due to the off-gas must be subjected to oxidation to CO_2. Since CO is produced by destruction of the organics, the level of destruction of CO cannot be as great as that for the organics. The proposed permit fails to take this fact into account. The oxidation of CO produced by organics in the off-gas is much more difficult than oxidation of CO produced by the primary fuel. The primary fuel creates the flame and thus all the fuel is subjected to the high flame temperature under conditions of high degree of mixing of fuel with combustion air. This degree of mixing cannot be achieved with the large volume low concentration off-gas and obviously CO formed from organics in the off-gas does not have the benefit of the residence time afforded that entering with the off-gas.

The CO emission rate requested by Monsanto (132 pph due to process) represents 98% oxidation of the CO initially present in the off-gas but requires 99.3% oxidation of the total CO present in and generated by the off-gas. This is an extremely high level of oxidation. The CO emission rate proposed in the proposed permit represents 99.7% oxidation - a level Monsanto cannot meet.

Under these assumptions, an annual mean emission of 79 pounds per hour would be required to meet a 24 hour limit of 107 pounds per hour.

II.3.C. Existing VOC Commercial Incinerator Data Is Not Transferable (Continued)

In the meeting of January 14, 1981, the question of a 7 day average was discussed briefly. This question has been reviewed by Monsanto. We have determined that the effect of different sampling or averaging times cannot be evaluated unless data on the mean and variability of emissions is available.

In summary, there are a wide range of operating conditions and destruction efficiencies among existing large off-gas incinerators. There are not data on these existing incinerators to support that a 99% destruction of VOC an be attained on a continuous basis.

II.3.D. Inadequate Data to Support CO Emission Limit

There is no data or basis presented in the proposed CO limit, and, based upon the discussion below, we request the CO limit be changed as set forth in Section II.3.E.

The off-gas stream to be oxidized contains both organics and carbon monoxide. As the oxidiation of the organic component proceeds step-wise as discussed earlier, nearly all of the organic carbon will be eventually oxidized to CO. Any requirement to meet a given CO emission rate must consider this fact and also the fact that CO is more difficult to oxidize than are VOC.

The ambient air impact of the CO emission rate requested by Monsanto is extraordinarily small. The following data substantiates this fact.

Ambient Air Standard	40,000 ug/m^3
Maximum Concentration on Record	6,000 "
Impact of Requested Emission	36 "

In view of the above it is requested that the initial emission rate of 132 pph due to process by Monsanto be used as the final permit limit.

II. COMMENTS ON PERMIT CONDITIONS (Continued)

II.3. Conditions 3 and 4 (Continued)

II.3.E. Monsanto Proposed BACT for VOC and CO Emissions

Monsanto has discussed with EPA various destruction efficiency levels. The levels proposed below are the maximum levels which Monsanto might be able to achieve under the best possible conditions. There is a great deal of uncertainty on Monsanto's part in meeting these levels 100% of the time.

Because there is a degree of uncertainty in Monsanto's ability to meet the maximum levels thought to be achievable, if operations of the plant demonstrate that the facility consistently operates at emission reduction levels greater or less than the below proposals, such limits should be incorporated into the permit.

Accordingly, Conditions 3 and 4 should be changed at minimum to read as follows:

> The total emissions of volatile organic compounds (VOC) from the process through both modified steam generators shall not exceed 107 pounds per hour of total gaseous non-methane organic emissions measured as butane and determined as an average over 24 consecutive 1-hour periods of operation. Further, total VOC emissions from both modified steam generators shall not exceed 143 pounds during any 1-hour period.
>
> The total emissions of carbon monoxide (CO) from the process through both modified steam generators shall not exceed a maximum of 132 pounds per hour, averaged over 24 consecutive 1-hour periods. Further, total carbon monoxide (CO) emissions from both modified steam generators shall not exceed 183 pounds during any 1-hour period".

As max during testing
Op. Perm. should specify
reductions for reduced
production &
Figs based on meeting
100% of time —
∴ Extended limits for
startup etc beyond 14-2.05
not justified — Anyway
this is for test not full
production so storage +
reduced thruput should be
employed during testing phase.

II.4. Conditions 5 and 7 - These conditions set forth an emission limit and performance test for nitrogen oxides. These requirements are inappropriate and should be deleted in this case because NO_x emissions are not subject to PDS permit review. Also, the steam generators to be used to abate the emission from the process will continue primarily as steam generators with the process off-gas providing supplemental fuel. A continuing review of the past 3 years of the need for emission limits for NO_x from existing steam generators within the State of Florida by a task force appointed by the Florida Environmental Regulation Commission has shown that such regulation is not warranted. NO_x emission are not affected by this project and the cost associated with the inclusion of NO_x limits would create a situation such that the two boilers to be used in the maleic anhydride project would be the only existing source fossil fuel fired boilers in the State of Florida with NO_x emission limits.

II.5. Condition 8 - This condition sets forth a continuous monitoring requirement and requires establishment of process operating ranges, both of which will serve as bases for determining compliance with CO and VOC emission limits.

II.5.A. Continuous Monitoring - With regard to the continuous monitoring requirement, it is an inappropriate and invalid compliance determination method in this case. No valid continuous analyzer for non-methane VOC emissions exists.

The proposed permit in Conditions 6.c. and 8.b. specifies either the reference method or the alternate reference method outlined in the document Measurement of Volatile Organic Compounds, EPA-450/2-78-041 (Reference 6, page 13 of the proposed permit) to determine compliance with VOC emission limits. Neither method has been demonstrated as a reliable procedure to continuously monitor VOC and, therefore, should not be used as a compliance method. The reference method calls for an automated analyzer with a gas chromatograph to separate VOC from methane. The VOC is then oxidized to CO_2, the CO_2 is reduced to methane, and the methane is measured by a flame ionization detector (FID).

II. COMMENTS ON PERMIT CONDITIONS (Continued)

II.5. Condition 8 (Continued)

II.5.A. Continuous Monitoring (Continued)

The system is complex, excessively costly and presents problems with maintenance and on-stream time when used for monitoring in the field. A copy of testimony on this subject presented by Mr. Williams Fearheller of Monsanto Research Corporation at the NAPTAC meeting on the proposed NESHAPS standard for benezene-based maleic plants was submitted to Mr. Shumaker of TRW at the January 14, 1981 meeting.

The alternate method calls for direct measurement of total VOCs in the stack gas with an FID. The alternate method is much simplier and possibly more reliable than the reference method but has not been proven in continuous commercial use.

II.5.B. Operating Conditions - The requirement to establish operating parameters is inappropriate in this case to determine compliance with VOC and CO limits.

Rather than rely on the unproven technology, we request that operators be allowed to establish control device operating conditions as indicators in maintaining compliance. Under this approach, indicator monitoring would be based on proven, reliable methods for measuring temperature, oxygen and air flow and not on a continuous monitoring system which is yet to be proven in actual field service.

Development of the necessary correlations to determine acceptable operating ranges for the appropriate parameters within which compliance with emission limits has been demonstrated may be appropriate but Monsanto objects to use of the parameters to indicate non-compliance. It is requested that, since, in our opinion, no appropriate and reliable continuous monitor for VOC is available compliance or non-compliance be determined by laboratory analysis of a stack gas sample to be taken as soon as any of the parameters are found to be outside the acceptable range.

Edge of window —
within 10% of range
maintain ~~data~~
Failure to trigger = noncomp.

II.5. Condition 8 (Continued)

II.5.B. Operating Conditions (Continued)

In view of data from Monsanto's pilot plant incinerator which indicates that furnace temperatures above 1600°F may give higher VOC emissions, it is requested that a minimum furnace temperature not be included as a permit condition. Operation below the proposed minimum of 1800°F may be required to control emissions at an acceptable level. Monsanto's application indicated minimum steaming rate of 175,000 pph and a predicted minimum furnace temperature of 1800°F. It is requested that these minimums not be imposed as a permit condition. The acceptable minimum steaming rate will be determined as part of the correlation referred to above.

II.5.C. Proposed Revision - In the January 14th meeting, Monsanto agreed, at TRW's request, to submit a revised version of Condition 8. It is requested that Condition 8 be rewritten as follows:

"The applicant shall develop and implement a plan to monitor and maintain maleic anhydride off-gas and modified steam generator control parameters to control destruction efficiency of volatile organic compounds while maintaining emissions at or below the allowable emission limits specified in Conditions 3 and 4. Allowable operating ranges for pertinent parameters shall be determined based on analysis of performance test data. Performance tests in addition to compliance tests required in the conditions of this permit may be necessary to define allowable operating ranges. The analysis correlating VOC and CO emission rates to monitored control parameters affecting the emission control devices shall be documented in the plan. Moreover, controls shall be alarmed to indicate operation outside allowable ranges. The minimum requirements for the plan are as follows:

II.5. Condition 8 (Continued)

II.5.C. Proposed Revision (Continued)

a. If operation outside this designated range occurs, a flue gas sample shall be collected and analyzed to determine compliance. Concentrations (ppmv) above those shown previously to correlate with levels above the permitted emission rates will constitute non-compliance.

b. An operating range for the percent excess oxygen fed to the steam generator furnaces will be established. The range shall be correlated to the flue gas organic content monitored in accordance with condition 8.a. Alternatively, the oxygen content of the flue gas will be monitored and recorded and the excess oxygen for combustion will be correlated to this monitored parameter."

II.6. Condition 9 - Condition 9 impose fugitive emission controls which are referred to as "BACT." Federal PSD regulations define BACT as emission limits (work practices) based on the maximum degree of reduction taking into account,on a case by case basis,energy, environmental,and economic impacts and other costs. The BACT fugitive control plan proposed by EPA does not meet this definition. There is no reference to any assessment made of expected fugitive emissions with and without the imposition of the controls on this maleic anhydride facility. The proposed permit contains no data to support the need for fugitive emission controls of any kind, and, accordingly, this condition should be deleted.

The engineering design firm employed by Monsanto to design the facility has estimated 560 pounds per year of fugitive VOC emission from the plant and a capital cost estimated to be about $1.8M to comply with the applicable parts of the fugitive emission plan included in Condition 9. This is an unreasonable cost for the benefit obtained.

II.6. Condition 9 (Continued)

If, however, the condition is retained, it should be modified. The proposed fugitive control plan contains some conditions which are unreasonable and other conditions which cannot be met in a maleic anhydride facility. The monitoring requirements in Paragraph 1 of the proposed control plan will create a significant cost in terms of manpower and monitoring equipment, and are unneeded in our maleic anhydride facility. The record keeping and reporting requirements would impose an unreasonable burden with no substantial benefit.

The cost of meeting Paragraph 2 requires installation of double mechanical seals on certain equipment. The cost of this requirement is significant, without any significant benefit in VOC emission reduction.

Paragraph 3 sets forth requirements for installation of rupture discs. Installation of rupture discs ahead of relief valves is a very dangerous practice. The hazard to personnel and equipment created by such a requirement is unacceptable. The alternative included in Paragraph 3 has already been determined by EPA to be infeasible for some parts of maleic anhydride facilities.

Paragraphs 5, 6, 7, 8 relate to loss of organics into cooling water, during sampling, from wastewater separators, and from vacuum systems. They are not applicable to this facility due to its design and raw materials and should be deleted. Paragraph 9 cannot be met for some process vessels since it is not feasible to flare the process materials contained in them, and this paragraph should be deleted.

As indicated in the January 14th meeting, EPA on January 5, 1981, issued proposed VOC fugitive emission control new source performance standards which, when promulgated, will apply specifically to maleic anhydride plants built after that date. Any fugitive control plan included in the permit must also be met and Monsanto under these circumstances would have to meet two different VOC fugitive emission control requirements. This obviously would create an unreasonable burden on Monsanto. Since start-up of this facility

II. COMMENTS ON PERMIT CONDITIONS (Continued)

II.6. Condition 9 (Continued)

will not occur until sometime in 1983, it is highly probable that EPA will have issued final NSPS specifically for facilities of the type to be constructed by Monsanto.

?

In view of the above, Monsanto feels that it is inappropriate to include fugitive emission controls in the PSD permit. Based on the definition in the permit, butane is the only VOC associated with the maleic anhydride facility. Monsanto is considering installation of continuous vapor monitors at all relief valves, pump seals and compressor seals in butane service. Since these are the sources most apt to emit fugitive VOCs, Monsanto feels that this installation of continuous monitors provides an even greater degree of control than that of the control plan in the proposed permit.

ok

II.7. General Condition 3 - This condition requires performance testing within 180 days of initial startup. Because of the complexity of the maleic anhydride process and the application of new technology, it is anticipated that startup of this facility may take several months prior to capacity operation being achieved. The performance tests in Conditions 6 and 7 are extensive and will require considerable time to complete. For these reasons, Monsanto requests 270 days from initial startup within which to demonstrate compliance.

Upsets?

II.8. General Condition 5 - This condition requires reporting of noncomplying emissions within five (5) days of noncompliance conditions. Monsanto requested this be changed to quarterly reporting consistent with the 40 CFR Part 60 new source performance standards reporting requirements.

II.9. General Condition - Start-up, Shut-down, and Malfunction - At the end of the General Conditions is a provision prohibiting emissions of pollutants more frequently or at levels in excess of those authorized by permit. Monsanto requests that this condition be modified to allow for (1) excess emissions during start-up and shut-downs and (2) excess emissions during a control system malfunction. Proposed permit language is as follows:

II. COMMENTS ON PERMIT CONDITIONS (Continued)

II.9. General Condition - Start-up, Shut-down, and Malfunction (Continued)

Compliance with emission limits shall not apply:

A. For up to 1½ hours during an individual reactor start-up or shut-down.

B. For up to 8 hours during a total production start-up.

C. For up to 6 hours during a control system malfunction to allow sufficient time to troubleshoot and correct the problem.

?
Thought Boiler was control device
Explain

An allowance to by-pass the control device during total department start-ups and a variance from the numerical standard during individual reactor start-ups are mandatory in order to insure safe, smooth operations. Variable flow rates and compositions during start-ups can cause safety and control device operating problems. Many false starts are likely as the butane feed is cut back to stay within the numerical emission limit or because the off-gas stream is too rich to allow for safe operation.

B.S.

We also feel it is mandatory that operators be given up to six (6) hours to troubleshoot a control-system malfunction. It is prudent to direct initial efforts toward correction of the problem rather than department shutdown. Because of the proposed permit requirement to operate a continuous monitor, a control system malfunction may not be a malfunction at all. It could be an error in the monitoring equipment which could result in false indications of a violation and force unwarranted production curtailments with their attendant safety and operational problems.

Detailed comments on excess emissions during start-ups and shut-downs and excess emissions during a control system malfunction are as follows:

II.9.A. Excess Emissions During Start-Ups - The first point deals with an allowance to by-pass the control equipment for up to eight (8) hours during department start-ups and a variance from the numerical standard for one and one-half (1½) hours

II.9. General Conditions - Start-up, Shut-down and Malfunction (Continued)

II.9.A. Excess Emissions During Start-Ups (Continued)

for individual reactor start-ups. The ability to start-up the process and the oxidizer independently will help insure a safe and smooth start-up.

There is a potential hazard in the operation of a maleic anhydride plant equipped with a thermal incinerator. A mixture of air and butane vapor close to the lower explosive limit is fed into the process, and there is always a source of ignition at the end. The process is made safe by ensuring that the off-gas entering the incinerator is below the lower explosive limit.

Under normal operating conditions, keeping the off-gas below the lower explosive limit is not a problem. Most of the butane is converted to maleic anhydride in the reactors, and the maleic anhydride is removed in the scrubbers. The unreacted butane, a small amount of other organics, and carbon monoxide are the only flammables remaining in the off-gas. The off-gas entering the incinerator system is below the lower explosive limit.

During a normal reactor start-up, the reactor will be heated to operating temperature and air flow will be started through the reactor. As soon as the air flow is established, butane feed is started. During a proper start-up, the reaction of butane to maleic anhydride starts immediately, and the concentration of the flammables in the scrubber off-gas does not rise above that of normal operation. However, there is a risk that the reaction will not start immediately. There is also a risk that either the air or butane flow control instrument will not control accurately, and that too high a ratio of butane to air will be fed to the reactor. If both of these events occur, an explosive mixture could be fed to the incinerator, and a flashback and explosion in the off-gas ducting, and the scrubber could occur.

II.9. General Conditions - Start-up, Shut-down and Malfunction (Continued)

II.9.A. Excess Emissions During Start-Ups (Continued)

Since total department start-ups are expected to occur, only three to four times per year, an eight (8) hour allowance will have no material impact on ambient VOC concentration.

II.9.B. Excess Emissions During a Shut-down - A variance from the numerical standard for one and one-half hours for an individual reactor shutdown is requested to allow for the safe controlled shutdown of reactors. Although the butane feed to a reactor could be stopped immediately, the butane in the system would have to be purged, which generally takes 15 to 20 minutes. Furthermore, in a plant with multiple reactors, the reactors would have to be shutdown sequentially to avoid damaging the equipment. Based on operating experience with the existing maleic anhydride unit, individual reactor shutdowns are expected to occur 25-30 times per year. The purge of residual butane from a reactor shutdown will have minimal if any affect on the atmospheric VOC concentration.

II.9.C. Control System Malfunctions - Control system malfunctions are anticipated to be of short duration and may even be the result of a faulty emissions monitoring system and not a control device problem at all. Therefore, some period of trouble-shooting time is necessary to prevent immediate production curtailments.

Based on Monsanto's experience with other oxidizers in phthalic anhydride and acrylonitrile, malfunctions are estimated to occur 6-8 times per year per boiler train, will be minor in nature, and require only about one hour to find and correct. Total boiler trips which are infrequent could take up to six hours to find and correct. Therefore, we request that operators be

II.9, General Conditions - Start-up, Shut-down and Malfunction (Continued)

II.9.C. Control System Malfunctions (Continued)

given a minimum of six hours to troubleshoot a control system malfunction. This allowance is particularly critical to our plant because about 50% of the plant's total steam supply will be generated from the boilers and the exothermic reaction which produces maleic anhydride. A production curtailment at maleic anhydride could easily force production curtailments of other plant products. In addition to the very real safety concerns and operational problems which inevitably occur with every unplanned shutdown, these products may be operating at capacity, as we expect maleic anhydride to be, and lost production could not be regained.

III. ADDITIONAL BACKGROUND INFORMATION

III.1. Evaluation of Proposed Permit References 2, 3 and 4

A. Summary:

An indepth evaluation of the three references detailed in the proposed permit was conducted to determine the justification of the VOC emission limitation equivalent to 99% destrution. Based upon this evaluation, it is Monsanto's opinion that none of the documents referred to in the permit or in Ref. 2, that we have been able to obtain to date, show any cases where large off-gas incinerator systems are attaining 99% destruction of VOC. The 99% requirement in the proposed permit is based on extrapolation of laboratory or pilot plant results (where the effect of scale up is uncertain) or on extrapolation of data from large units operating at lower temperatures and efficiencies. In our opinion the data in these references are totally inadequate to justify a permit requirement equivalent to 99% destruction of VOC or CO.

B. Comments on Permit References:

The permit contains 3 references that apply to VOC emissions as listed below:

Ref. 2. EPA 430/3-80-0019, Benzene Emissions from Maleic Anhydride Plants - BID for proposed Standard.

Ref. 3. Lee, K., et al "Thermal Oxidation Kinetics of Selected Organic Compounds", Union Carbide Corp., paper presented at the 71st Annual Meeting of the APCA, Houston, Texas, June 25-30, 1978.

Ref. 4. EPA-AP-40, Air Pollution Engineering Manual

A detailed evaluation of each reference listed above is as follows:

Ref. 2. (BID for Proposed Standard - Benzene Emissions from Maleic Anhydride Plants)

This reference (#2) contains the following statement in Sec. 2.2.2, Thermal Incineration: "Based on engineering experience with similar applications for the control of VOCs, it is expected that a thermal incinerator

III.1. Evaluation of Proposed Permit References 2, 3 and 4 (Continued)

III.1.B. (Continued)

Ref. 2. (Continued)

can be designed and operated at a sustained benzene removal efficiency of 99%.

This conclusion is based on a number of additional references discussed below. The sub-reference numbers refer to those listed on pages 2-15 through 2-17 of the BID.

Ref. 2/Sub-Ref. 5.

MSA Research Corp. Hydrogen Systems Study, Vol. L., Stationary Sources, Effects and Control. U.S. EPA. RTP, N.C. Pub. No. APTID 1499. October 1972. This document has not been obtained.

Ref. 2/Sub-Ref. 7.

Lawson, J. F. Emission Control Options for the Synthetic Organic Chemicals Manufacturing Industry Maleic Anhydride - Product Report. Hydroscience, Inc. (Prepared for office of Air Quality Planning and Standards, U.S. Environmental Protection Agency. Research Triangle Park, N.C.) EPA Contract Number 68-02-2577. March, 1978.

On pages V-3 and Sub. Ref. 7, the statement is made that "sustained benzene and VOC removal efficiencies greater 99% are attainable". The references quoted to support this statement are the Air Pollution Engineering Manuals, AP-40; 1967 and 1973 Editions. These engineering manuals contain only a small amount of data on destruction efficiencies.

There is a graph (Fig. 111 - Direct-Flame Afterburner Efficiency as a Function of Temperature) in these manuals which shows an efficiency of 99% at 1500°F, and a table (Table 52 - Typical Analysis of Emissions Entering and Leaving Large Direct-Fired Afterburners) which shows an efficiency of

III.1. Evaluation of Proposed Permit References 2, 3 and 4 (Continued)

III.1.B. (Continued)

Ref. 2/Sub-Ref. 7. (Continued)

96% at 1500°F. No additional data at 1500°F or higher temperature are shown, and the data at 1500°F are obviously in disagreement. Neither the graph or the table are referenced, so there is no way to check on their validity.

Ref. 2/Sub-Ref. 25

Rolke, R. W. et al. Afterburn Systems Study, Shell Development Co. Office of Air Programs, U.S. Environmental Protection Agency. EPA-R2-72-062. August 1972.

In Section 12.3.1 Hydrocarbon Destruction, experimental work on the destruction of Toluene is reported. Toluene vapor was mixed with air already preheated to the desired combustion temperature. Mixing was designed to be nearly instantaneous and plug flow was maintained in the reactor. Reactor size is not given. VOC's were measured directly on a flame ionization detector, which does not measure partially oxidized organics 100%. The results are shown in Figures 12-4 and 12-5. Figure 12-4 shows 99.9% destruction at 1410°F and .21 seconds. However, Figure 12-5 shows an asymptote at 6 ppm, equivalent to about 99% destruction. The statement is made "The asymptote shown for concentrations >10 ppm may be real, but more likely is a sampling and analysis problem." This discrepancy leaves the results in doubt.

Ref. 2/Sub-Ref. 26

Industrial Gas Cleaning Institute Study of Heat Recovery Systems for Afterburners. (Prepared for Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency.) EPA Contract Number 68-02-1473. August 1977. This report was not available to Monsanto. Comments will be forwarded when a copy is received.

III.1. Evaluation of Proposed Permit References 2, 3 and 4 (Continued)

III.1.B (Continued)

Ref. 2/Sub-Ref. 27

Memo from Seeman, W. R., Hydroscience, Inc., to White, R. E., Hydroscience, Inc. May 4, 1978. This communication was not available to Monsanto.

Ref. 2/Sub-Ref. 29

Letter from Lawrence, A. W., Kopper Co., Inc., to Goodwin, D. R., Office of Air Quality Planning and Standards, U. S. Environmental Protection Agency. February 28, 1978. See discussion below under Ref. 2/Sub-Ref. 30.

Ref. 2/Sub-Ref. 30

Letter from Lawrence, A. W., Kopper Co., Inc., to Goodwin, D. R., Office of Air Quality Planning and Standards, U. S. Environmental Protection Agency. January 17, 1979. Sub-Ref. 29 and 30 letters are not available to Monsanto. However, conversations with Koppers personnel confirmed that tests on their boiler-incinerator gave benzene destruction of 98.9 and 99.1% in the fall of 1977 and 95.8 to 98.5% in June 1978. It must be noted that these numbers represent benzene destruction, not total non-methane VOC destruction. Koppers' experience would definitely not support a requirement for continuous 99% destruction of non-methane VOC.

Ref. 2/Sub-Ref. 31

U. S. Department of Health, Education, and Welfare, Air Pollution Engineering Manual. 1967. See comments under Ref. 2/Sub-Ref. 7.

Ref. 2/Sub-Ref. 32

Pruessner, R. D., and Broz, L. D. Hydrocarbon Emission Reduction Systems. Chemical Engineering Progress. 73(8): 69-73. August 1977. This reference reports a test on Denka's incinerator which gave a benzene destruction of 93%.

III.1. Evaluation of Proposed Permit References 2, 3 and 4 (Continued)

III.1.B (Continued)

Ref. 2/Sub-Ref. 33

Midwest Research Institute Stationary Source Testing of a Maleic Anhydride Plant at the DENKA Chemical Corporation, Houston, Texas. EPA Contract Number 68-02-2814. This reference reports tests performed on the thermal incinerator at DENKA's maleic anhydride plant. Under the best operating conditions, a mean benzene destruction efficiency of 98.6% was attained. No data are quoted on total VOC destruction.

Ref. 2/Sub-Ref. 35

Ann Arbor Science Publishers, Inc. Pollution Engineering Practice Handbook, Cheremunoff, P. N., and Young, R. A. (ed.). 1975 p. 262-264. This reference is quoted in the BID to support 90% destruction of CO at 1128 °F. However, there are no data on CO destruction on P. 262-264 or any other page of the handbook that could be found. In addition, in the BID the following statement is made "at the higher temperatures --- of 870 °C (1600 °F), more than 99% of the CO is expected to be oxidized." This statement is not supported by any reference.

Ref. 3. ("Thermal Oxidation Kinetics of Selected Organic Compounds," - Union Carbide Corporation) - The authors of Reference 3 state that the main objective of the reference was "to present a predictive destruction kinetic rate model.." and in regard to use of their work to design a real thermal oxidizer "although the work reported here is a significant step forward, it is only the first step."

III.1. Evaluation of Proposed Permit References 2, 3 and 4 (Continued)

III.1.B (Continued)

Ref. 3. ("Thermal Oxidation Kinetics of Selected Organic Compounds," - Union Carbide Corporation) - (Continued)

It appears obvious that the authors did not intend their work to form the basis for emission limits.

Further analysis of Reference 3 strengthens the position that the laboratory results presented are not valid bases for predicting the efficiencies that can be achieved in an industrial thermal oxidation unit. The laboratory incinerator consisted of a tube 0.09 cm in diameter and 130 cm long totally enclosed in an oven to supply the necessary heat. If this same design were to be used for incineration of the maleic anhydride off-gas, two pipes, each 2 ft. in diameter and 3000 ft. long totally enclosed in an infinite heat source would be required. If such a device were feasible and could be constructed, high destruction efficiency could probably be achieved. The destruction efficiency achieved in such a long, narrow configuration with uniform heating of all the wall surfaces and perfect premixing of air with the VOC cannot be extrapolated to a commercial oxidizer where mixing, temperature variation, fuel combustion and energy conservation are important factors.

The destruction efficiencies reported in Reference 3 also apply only to the disappearance of specific compounds, not total VOC. In fact, the authors of Reference 3 clearly indicate this fact in the following direct quotation from the reference:

III.1. Evaluation of Proposed Permit References 2, 3 and 4 (Continued)

III.1.B (Continued)

Ref. 3. ("Thermal Oxidation Kinetics of Selected Organic Compounds, " - Union Carbide Corporation) - (Continued)

> "However, data presented in this paper were based on the test compound measurements only, since the main objective of this paper is to present a predictive destruction kinetic rate model based on the compound structure. For most compounds, combustion intermediates do exist---. For example, at least six combustion intermediates can be identified when propylene was combusted."

An extrapolation of the data in Reference 3 to establish emission limits for total VOC must take into consideration the fact stated above. It is also important to note that six intermediates combustion products were identified when burning propylene, a smaller molecule than butane.

Ref. 4. (EPA-AP-4P, Air Pollution Engineering Manual)- Reference 4, the Air Pollution Engineering Manual, contains only a small amount of data of destruction efficiencies. There is a graph (Fig. 111, Direct flame afterburner efficiency as a function of temperature) which shows an efficiency of 99% at 1500°F, and a table (Table 52 - Typical Analysis of Emissions Entering and Leaving Large Direct-Fired Afterburners) which shows an efficiency of 96% at 1500°F. No additional data at 1500°F or higher tempperature are shown, and the data at 1500°F are obviously in disagreement. Neither the graph or the table are referenced, so there is no way to check on their validity.

III. ADDITIONAL BACKGROUND INFORMATION (Continued)

III.2 Minimum Incinerator Operating Temperature

Pilot plant data shows decreased VOC destruction efficiency at temperatures above 1600°F.

From discussions with EPA's contractor, TRW, and from statements in the proposed permit there appears to be a presumption that temperatures above 1600°F will provide extraordinarily high organic destruction efficiency. Data from the Monsanto pilot plant refute this and actually indicate a loss in efficiency at these higher temperatures. The following data collected when oxidizing benzene, butane and mixture of the two clearly indicate this phenomenon:

BENZENE ONLY

Temp. ^oF	Residence Time Sec.	Effuent C_6H_6 ppm
1400	0.5	4.5
1500		1.4
1600		1.6
1800		2.6
1400	0.75	2.5
1500		1.5
1600		0.4
1800		0.7
1400	1.0	0.4
1500		0.9
1600		0.5
1800		1.5

BUTANE ONLY

Temp ^oF	Residence Time Sec.	Effluent C_4H_{10} ppm
1300	0.5	408
1525		.15
1550		.90
1600		.1
1700		1.6
1300	0.75	9.5
1525		.15
1550		.1
1600		.1
1700		1.6
1300	1.0	.15
1525		.1
1550		.1
1660		.1
1700		1.2

BENZENE AND BUTANE

Temp °F	Residence Time Sec.	Effluent C_6H_6 ppm	Effluent C_4H_{10} ppm
1400	0.5	1.5	0.9
1500		1.9	1.0
1600		2.4	1.1
1700		3.5	1.6
1400	0.75	2.1	1.0
1500		1.9	1.0
1600		1.9	1.0
1700		3.3	1.6
1400	1.0	2.3	1.3
1500		1.7	1.0
1600		1.9	1.0
1700		2.6	1.2

III. ADDITIONAL BACKGROUND INFORMATION (Continued)

III.2 Minimum Incinerator Operating Temperature (Continued)

In view of data from Monsanto's pilot plant incinerator which indicates that furnace temperatures above 1600°F may give higher VOC emissions, it is requested that a minimum furnace temperature not be included as a permit condition. Operation below the proposed minimum of 1800°F may be required to control emissions at an acceptable level. Monsanto's application indicated minimum steaming rate of 175,000 pph and a predicted minimum furnace temperature of 1800°F. It is requested that these minimums not be imposed as a permit condition. The acceptable minimum steaming rate will be determined as part of the correlation referred to in Section II.5.B.

III.3. Monsanto Thermal Oxidizers/Boilers

A. Babcock & Wilcox Study

Monsanto contracted Babcock & Wilcox to do a feasibility study regarding use of two B&W boilers (our #7 and #8 boilers) at the Pensacola site to oxidize the waste gas stream. These boilers are each rated at 350,000 Lb/Hr of 650 PSIG, 750°F steam. Overall dimensions are 45'L x 20'W x 40'H. The furnaces are 22'L x 20'W x 24'H. Furnace volume is 10,560 ft^3.

The study confirmed that the boilers could achieve a minimum of 1600°F furnace exist gas temperature and a one second residence time.

B. Boilers, Burners, and Controls

This type of boiler was originally designed to burn natural gas, oil and waste fuels such as carbon monoxide, blast furnace gas or waste liquids. A copy of a page from B&W's book STEAM is attached showing a cut-away view of the boiler. There are four burners on the boiler in the picture. Monsanto's boilers actually have 6 burners, two rows of 3 each. These burners will be replaced with waste gas burners. It has not been definitely decided how many new waste gas burners will be installed.

B&W's assumption, and Monsanto concurrs, is that all combustion stops when the furnace gases enter the first row of generating tubes. B&W selected their Tri-fuel burner as the best for this application. It is capable of intro- [illegible]

[illegible]

[illegible]

III.3. Monsanto Thermal Oxidizers/Boilers (Continued)

B. Boiler, Burners, and Controls (Continued)

ducing large volume, low heat content waste gas streams into the flames from combustion of gas, oil or pulverized coal. Ambient air is mixed with natural gas and burns around the circumference of the central pipe thru which the waste gas will flow.

Attached are two general views of this burner from B&W's operating instruction book. One view is from outside the furnace and the other view is from the furnace end.

It was suggested that Monsanto consider mixing fuel with the waste gas stream to enhance its combustability. Each waste gas nozzle will be about 30" in diameter and occupies 80% of the burner diameter. Uniform mixing of natural gas with the waste gas flowing in each nozzle would be very difficult. If we were successful, and increased the heat content of the mixture so it was self sustaining, the results would be very dangerous. The waste gas contains oxygen and the fire could propagate back into the waste gas header with drastic results.

Also, any increase in hydrocarbon concentration in the waste gas stream would necessitate even better mixing and higher conversion of the combustiles to reach emission limits.

We did consider mixing the ambient air with the waste gas to enhance mixing but B&W and other burner manufacturers expressed concern for the natural gas flame stability at oxygen concentrations below 16%. Our boiler flue gas pressure drop limitations will not permit adding enough ambient air to the waste gas to raise its oxygen content to 16%. It would also be a very thermally inefficient boiler. Additional inerts (nitrogen from ambient air) would also quench the furnace temperature.

Pre-heating the waste gas stream was suggested. We would have to use a tubular type air heater to try to keep the waste gas and flue gas separated. The waste gas is at the higher

III.3: Monsanto Thermal Oxidizers/Boilers (Continued)

B. Boiler, Burners, and Controls (Continued)

pressure so any leakage would immediately appear in the stack flue gas. A rather small leak flow bypassing the furnace would put us in violation of our permit. We also have a potential for waste gas deposits to plug the air heater.

The present boiler controls modulate the fuel and air to the burners in response to changes in steam pressure thereby producing more or less steam as required by the entire Monsanto Pensacola plant. Air flow is corrected by a stack gas oxygen analyzer. Future boiler control will be made more difficult because the waste gas steam is a source of both fuel and combustion air. Compensation for the waste gas flows fuel value and oxygen content must be made by the control system to ensure proper boiler operation.

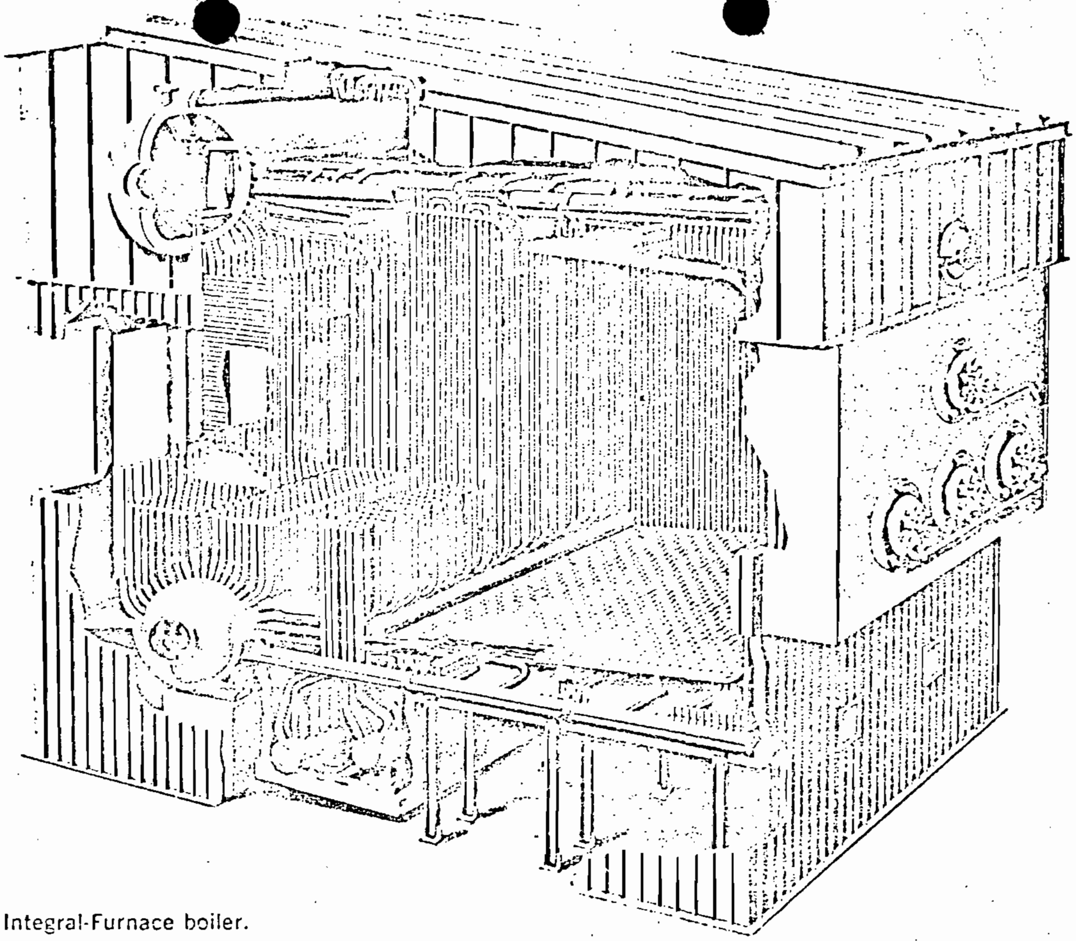

Fig. 7 Type PFI Integral-Furnace boiler.

General description

Standard bent-tube, bottom-supported, two-drum unit arranged with gastight membrane furnace and bare-tube boiler for pressurized or induced draft operation, with completely water-cooled furnace and drum cyclones. Maximum shop subassembly facilitates field erection. The unit is designed in 3 heights, and in several widths for each height. Superheated units are equipped with an inverted-loop, fully drainable superheater. Gas flow is horizontal throughout the unit with multiple passes in the boiler bank. The unit is designed with integral gas and air ducts.

Range in Size, Steam Output
  80,000 to 700,000 lb/hr in spaced increments.

Operating Pressure
  Up to approximately 975 psi.

Steam Temperature
  Saturation temperature to approximately 900F.

Fuel
  Oil and gas, in combination or singly.
  Waste fuels such as CO gas, turbine exhaust gas, blast-furnace gas or liquid fuels.

Operational Control
  Manual to complete-automatic combustion and feedwater regulation.

Furnace
  Membrane-wall construction; pressure or suction type.

Dimensions Outside Setting, Approximate
  Smallest, 11 ft wide × 30 ft high × 27 ft front to rear.
  Largest, 37 ft wide × 41 ft high × 35 ft front to rear.

Indicated field of application

1. In the production of steam for heating, power, or process, within the output and specifications noted above with oil, gas, or waste-fuel firing.
2. For either outdoor or housed locations; bottom supports for minimum space requirements; reinforced concrete or steel foundations.
3. Where economic conditions require high efficiency, sustained operation, and a minimum of attention and maintenance.

General comments. The PFI Integral-Furnace boiler is used for applications covering the aforementioned steam conditions and waste-gas firing. The completely water-cooled furnace provides a gastight unit suitable for pressurized or induced draft operation. The unit is specifically designed to operate at high ratings for maximum steam output with a minimum of available space. Superheaters are completely drainable and arranged with wide tube spacing to provide a relatively constant steam temperature over a wide load range. Air heaters or economizers are normally provided and are justified by fuel saving.

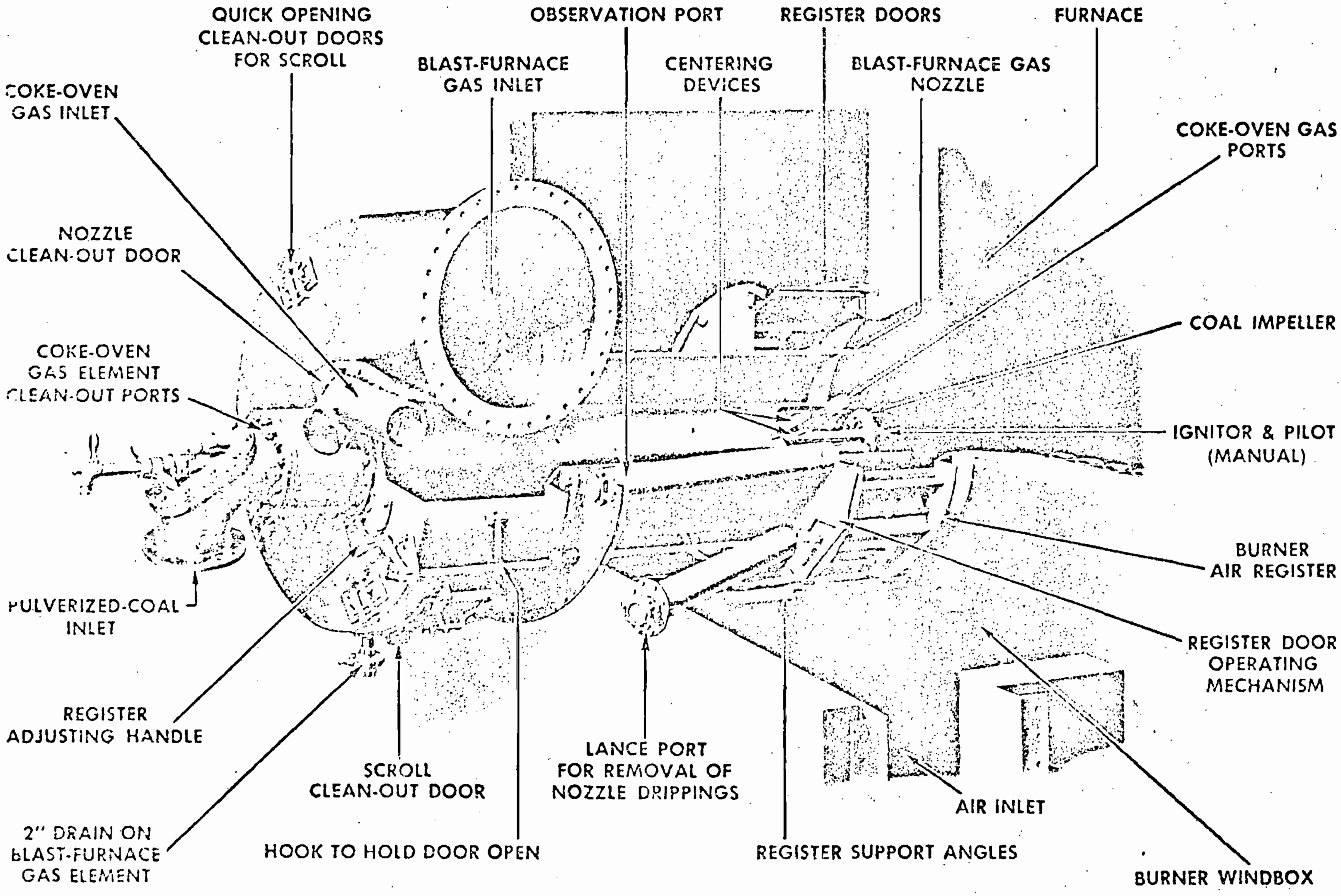

FIG. 1

B&W TRI-FUEL - CIRCULAR TYPE - BURNER FOR BLAST-FURNACE GAS, COKE-OVEN GAS, AND PULVERIZED COAL

BEST AVAILABLE COPY

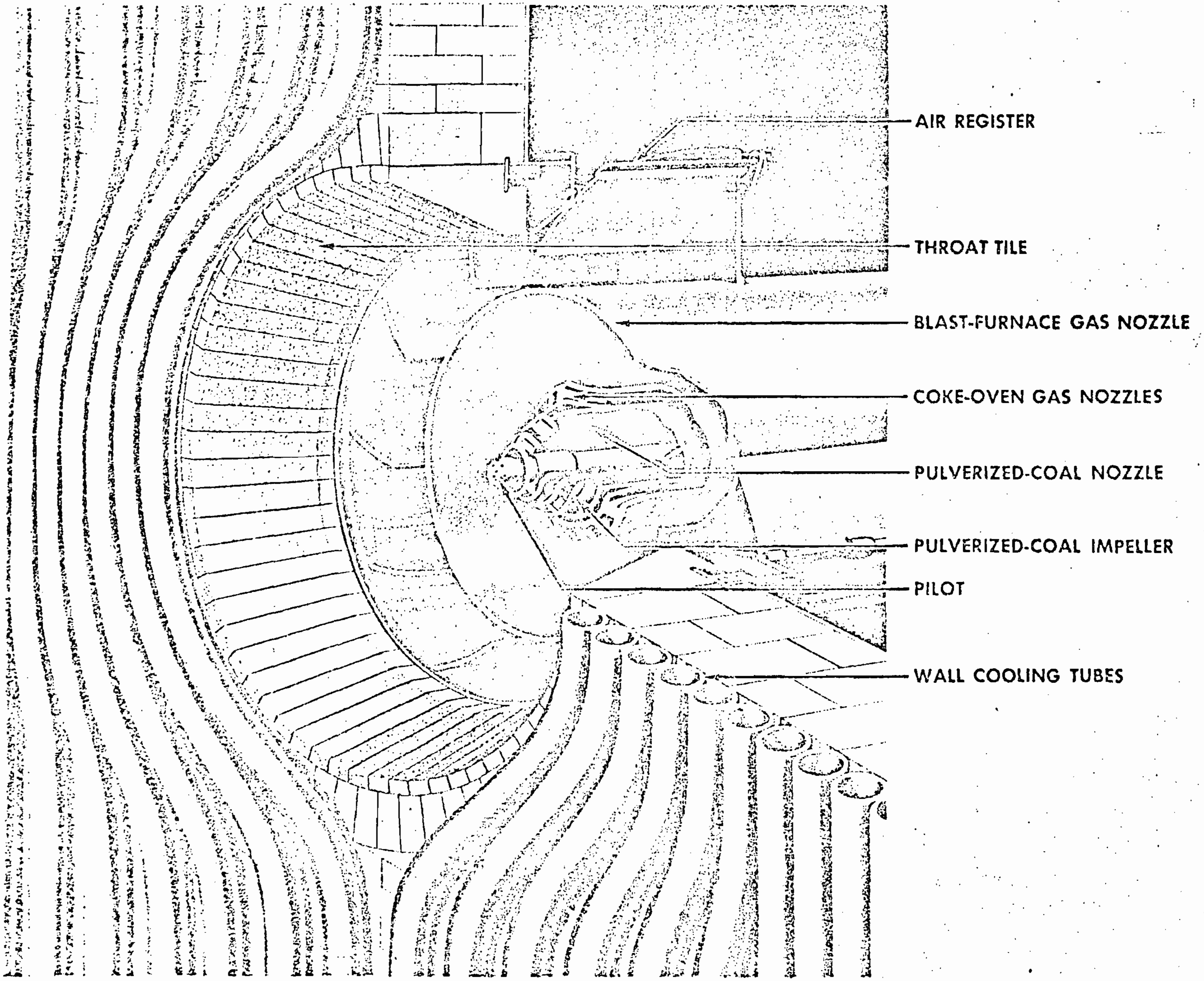

FIG. 2

B&W TRI-FUEL - CIRCULAR TYPE - BURNER

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: Jim Pennington

Ed m 11/14

THROUGH: Ed Middleswart
Jack Preece

FROM: R. J. Prusa RJP

DATE: November 14, 1990

SUBJECT: Monsanto Maleic Anhydride Quarterly EER Review

Based on your memorandum dated November 5, 1990, the quarterly EER's for Monsanto's Maleic Anhydride plant, permit No. A017-77464, were reviewed. There were no violations found during the review. This permitted source is in compliance with the quarterly reporting requirements and limits.

Further, the current report format is acceptable to the District.

RJP:rpl

For Routing To Other Than The Addressee

To: Rick Vail Location:

To: Location:

To: Location:

From: Date:

State of Florida

DEPARTMENT OF ENVIRONMENTAL REGULATION

Interoffice Memorandum

TO: Ed Middleswart

FROM: Jim Pennington

SUBJ: Monsanto Maleic Anhydride Facilities

DATE: November 5, 1990

EPA has reviewed the maleic anhydride facilities most recent quarterly report. The EPA found the report difficult to interpret and has requested that we review the quarterly report for violators. If these reports have been reviewed, a decision about the compliance status should be made. If not, your review is requested.

Please let me know the compliance status of this source before November 16, 1990. If you have any questions on the above, please call Rick Vail or me at SC 278-1344.

JP/ht

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET
ATLANTA, GEORGIA 30365

OCT 16 1990

RECEIV
OCT 19 1990
DER - BAQ

4APT-AE

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

Dear Mr. Fancy:

In the August 13, 1990, letter from Monsanto Chemical Company in Pensacola, Florida (enclosed), they requested alternative monitoring requirements to those at §60.613(c)(1) for their two Maleic Anhydride facilities which are subject to 40 C.F.R. Part 60, Subpart III. In addition, they requested a reduced reporting frequency requirement to the requirement specified in the PSD permit for the Maleic Anhydride facilities (PSD-FL-055).

In our letter to Monsanto Chemical Company (enclosed), we informed them that their proposed alternative monitoring requirements were not considered to be alternatives but instead reflected the required monitoring requirements contained in §60.613(c)(1).

We denied their request for a reduced reporting frequency requirement from the requirement specified in PSD-FL-055 because the monitoring data is used for direct compliance with the VOC and CO emission limitations in the permit. We informed them that submission of the quarterly report required by PSD-FL-055 will satisfy the reporting requirements of 40 C.F.R. Part 60, Subpart III for the Maleic Anhydride facility.

In addition, we reviewed the most recent quarterly report for the Maleic Anhydride facilities and found the report difficult to interpret. We recommend that your agency review the report and determine if any violations have occurred.

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

Sincerely,

Sally S. Turner, for

Jewell A. Harper, Chief
Air Enforcement Branch
Air, Pesticides and Toxics
  Management Division

Enclosures

Monsanto

MONSANTO CHEMICAL COMPANY
P. O. Box 12830
Pensacola, Florida 32575-2830
Phone: (904) 968-7000

AIR, PESTICIDES &
TOXICS MANAGEMENT DIVISION
RECEIVED
AUG 16 1990
EPA-REGION IV
ATLANTA, GA.

VIA CERTIFIED MAIL

August 13, 1990

Director, Air and Waste Management Division
U.S. Environmental Protection Agency, Region IV
345 Courtland Street, Northeast
Atlanta, Georgia 30365

As noted in my letter of July 27, 1990, the Maleic Anhydride facility has elected to comply with the requirements of 40 CFR 60.612(a). Two 515 million Btu boilers are used to comply with the requirements of this paragraph. The boiler performance tests which were scheduled for August 27, 1990, have been canceled pursuant to 40 CFR 60.614(b)(5) that states when a boiler or process heater with a design capacity of 44MW(150 million Btu/hour) or greater is used to seek to comply with 60.612(a), the requirement for an initial performance test is waived, in accordance with 60.8(b).

This letter is also submitted to fulfill the reporting requirement in 40 CFR 60.615(b) for the Maleic facility at the Pensacola plant. The maleic anhydride vent streams are introduced into Boilers 7 and 8 in the flame zone of the boilers as shown in enclosed Monsanto drawing No. C-4137.

In addition, Monsanto seeks approval to substitute the vent stream flow measurements presently required by our PSD permit for the measurements specified in 60.613(c)(1). The Maleic PSD permit requires the measurement of the vent stream flow between the absorber columns and the boilers and at the vent stack when flow is diverted from the boilers. The locations of the flow measurements (FM) are shown in the flow diagram on page 3.

Monsanto also seeks approval to substitute the quarterly excess emission report required by the Maleic facility's PSD permit for the semiannual reports specified in 60.615(j). The quarterly report shows: (1) the instances of excess venting, (2) the instances of excess CO emissions, (3) periods when the vent stream is diverted, (4) the amount of the vent stream flow when it is diverted, and (5) the amount of CO and VOC emissions when the vent stream is diverted. I have attached a copy of the 2nd Quarter 1990 report for your consideration.

Sincerely,

R. T. Cannon

R. T. Cannon
General Engineer
Environmental Control

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

OCT 16 1990

4APT-AE

Mr. R. T. Cannon
Monsanto Chemical Company
P.O. Box 12830
Pensacola, Florida 32575-2830

Dear Mr. Cannon:

As requested in your August 13, 1990, letter, we have reviewed your request for alternative monitoring requirements to those at 40 C.F.R. §60.613(c)(1) for your two Maleic Anhydride facilities subject to 40 C.F.R. Part 60, Subpart III. In addition, your request for a reduced reporting frequency requirement to the requirement specified in the PSD permit for the Maleic Anhydride facilities (PSD-FL-055) has been reviewed.

We have determined that your proposed alternative monitoring requirements for the Maleic Anhydride facilities are acceptable. Please note that your proposed alternative monitoring requirements are not considered alternatives to the requirements in 40 C.F.R. §60.613(c)(1), but instead, reflect the requirements of 40 C.F.R. §60.613(c)(1).

Your request for a reduced reporting frequency requirement from the requirement specified in PSD-FL-055 is not approved because the monitoring data is used for direct compliance with the VOC and CO emission limitations in the permit. Submission of the quarterly report required by PSD-FL-055 will satisfy the reporting requirements of 40 C.F.R. Part 60, Subpart III for the Maleic Anhydride facility.

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

Sincerely,

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

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