

United States
Environmental Protection
Agency

Office of Air Quality
Planning and Standards
Research Triangle Park, NC 27711

EPA - 454/R-99-052
September 1999

Air



Review of Industry Test Reports for Refinery MACT II Regulation



Final Report

Review of Industry Test Reports

by

**Susan J. Abbgly, Michael W. Holdren,
Joshua K. Finegold, and Patricia M. Holowecky
Battelle
505 King Avenue
Columbus, Ohio 43201-2693**

September 17, 1999

**Contract 68-D-99-009
Work Assignment No. 1-03**

Project Officer

Kathy Weant

Work Assignment Manager

Rima Dishakjian

**Emissions, Monitoring, and Analysis Division
Office of Air Quality Planning and Standards
U.S. Environmental Protection Agency**

EPA Disclaimer

The information in this document has been funded wholly or in part by the United States Environmental Protection Agency under Contract 68-D-99-009 to Battelle. It has been subject to the Agency's peer and administrative review, and it has been approved for publication as an EPA document. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

Battelle Disclaimer

This report is a work prepared for the United States Government by Battelle. In no event shall either the United States Government or Battelle have any responsibility or liability for any consequences of any use, misuse, inability to use, or reliance upon the information contained herein, nor does either warrant or otherwise represent in any way the accuracy, adequacy, efficacy, or applicability of the contents hereof.

Abstract

In order to set Maximum Achievable Control Technology (MACT) standards, the US EPA is gathering emissions data from industry sources. These test data must be evaluated for appropriate Quality Assurance/Quality Control (QA/QC) procedures. For the Refinery MACT II standard, test reports are being gathered from industry tests, and must be evaluated before data can be used for standard-setting purposes.

This final report describes work conducted by Battelle staff to evaluate 55 test reports gathered from various refinery tests. For this report, Battelle has reviewed and evaluated the 55 test reports and has provided a brief summary report for each refinery test report. Each summary report is organized in tabular format and includes the following headings: pollutant measured, EPA air method that was used, deviations from the EPA method, other methods used, method validation, audit conducted, method QA/QC requirements achieved, and sample data calculations conducted. Each industry test report also received an overall rating based upon the tabular information. Finally, a brief summary on the overall quality of the data is included with each summary report.

This report is submitted in fulfillment of contract No. 68-D-99-009 (Work Assignment No. 1-03) by Battelle under the sponsorship of the U.S. Environmental Protection Agency. It covers the period from March 11, 1999 to September 17, 1999, and all work was completed as of September 17, 1999.

Contents

Abstract	iii
Figures	iv
Tables	iv
Section 1 Introduction	1
Section 2 Results	3
Appendix	
Summary Reports of 55 Industry Test Reports	10

Figure

1. Distribution of 55 Industry Test Reports According to Tier Classifications	9
---	---

Table

1. Industry Test Report Title and Assigned Tier Level	4
---	---

Section 1 Introduction

In order to set Maximum Achievable Control Technology (MACT) standards, the U.S. EPA is gathering emissions data from industry sources. These test data must be evaluated for appropriate Quality Assurance/Quality Control (QA/QC) procedures. For the Refinery MACT II standard, test reports are being gathered from industry tests, and must be evaluated before the data can be used for standard-setting purposes.

For this report, Battelle has reviewed and evaluated 55 industry test reports. A summary report was written for each industry test report. Each summary report is organized in tabular format and includes the following headings:

- Pollutant Measured
- EPA Air Method (Stationary Source) That Was Used
- Deviations from EPA Method
- If Other Method Used, List Summary
- If Not EPA Method, Validation By Method 301?
- Was Audit Conducted?
- Method QA/QC Requirements Met?
- Sample Data Calculations Conducted?

Each industry test report is also given a rating level as follows:

TIER I	EPA Air Method or EPA (other than air), State, or unknown method with Method Validation
TIER II	State Agency method (e.g., California), no Method Validation

TIER III Unknown method, no Method Validation, good QA procedures

TIER IV Unknown method, no QA documentation

Each industry test report receives one of the above ratings based upon the information shown in each summary report as well as from comments in the original test report. For instance, because industry test report No. 22 makes use of only EPA Air Methods, this report received a TIER I rating. However, the report indicates that the data results are suspect. This is discussed in the brief summary on overall quality of the data that is provided for each summary report.

Section 2

Results

Table 1 lists the fifty-five (55) industry test reports that were provided to Battelle. The Tier Level that was assigned to each report is shown in the last column of the table. Most of the reports were classified as Tier Level I reports. Figure 1 shows a graphical distribution of the 55 test reports according to Tier Classification. Appendix A contains Battelle's summary reports of all 55 industry test reports.

Table 1. Industry Test Report Title and Assigned Tier Level

Report No.	Report Description (Title)	Docket No.	Tier Level
1	Western States Petroleum Association report on AB2588 Pooled Source Emission Test Program, July 1990	II-I-4	II
2	Report on Compliance Testing, Indian Refining, Lawrenceville, Illinois, March 8, 1993	IV-D-6	I
3	Particulate Emission Evaluation, BP Oil Refinery, Lima, Ohio, January 19, 1994	IV-D-7	I
4	Ashland Petroleum Company, Canton, Ohio, FCC Stack Test Report, May 4, 1994	IV-D-8	I
5	Plant No. 2 Fluid Catalytic Cracking Unit Emission Test Report, Sun Refining and Marketing, Toledo, Ohio, July 20, 1994	IV-D-9	I
6	Total Petroleum, Incorporated, Alma, Michigan, Emission Sampling on the FCC CO Boiler Exhaust, April 18, 1996	IV-D-10	I
7	Emission Compliance and CEM Relative Accuracy Test Program FCCU Exhaust Stack, Clark Refining and Marketing, Blue Island Illinois, December 29, 1994	IV-D-14, Attachment 1	I
8	Emission Compliance Test Program FCCU Exhaust Stack, Clark Refining and Marketing, Blue Island Illinois, July 3, 1997	IV-D-14, Attachment 2	I
9	Evaluation of Sulfur Dioxide, Nitrogen Oxides, and Carbon Monoxide Emissions, Marathon Petroleum Refinery, Detroit, Michigan, August 6, 1991	IV-D-15, Attachment 1	I
10	Results of Nitrogen Oxide and Carbon Monoxide Emissions Testing Conducted on an Unifiner Charge Heater, Marathon Petroleum Refinery, Detroit, Michigan, July 19, 1994	IV-D-15 Attachment 2	I
11	Results of Compliance Testing on the Alkylation and Unifiner Flares, Marathon Petroleum Refinery, Detroit Michigan, September 16, 1996	IV-D-15, Attachment 3	I
12	Results of Compliance Testing Performed on the Cracking Plant Flare, Marathon Petroleum Refinery, Detroit, Michigan, September 25, 1996	IV-D-15, Attachment 4	I
13	Particulate Emission Compliance Study, FCC Unit-CO Boiler Stack, Mobil Oil Corporation, Joliet, Illinois, August 19, 1996	IV-D-16, Attachment 1	I
14	Particulate Emission Compliance Study, Mobil Oil Corporation, Joliet, Illinois, September 20, 1996	IV-D-16, Attachment 2	I

Table 1. Industry Test Report Title and Assigned Tier Level

Report No.	Report Description (Title)	Docket No.	Tier Level
15	FCC Information Request and Stack Testing Results, Mobil Oil Corporation, Joliet, Illinois, June 18, 1997	IV-D-16, Attachment 3	I
16	No. 1 and No. 2 Cat Cracker Stack Particulate Emission Testing, Shell Oil Company, Wood River, Illinois, April 7/8, 1992	IV-D-17, Attachment 1	I
17	No. 1 and No. 2 Cat Cracker Stack Particulate Emission Testing, Shell Oil Company, Wood River, Illinois, October 27/28, 1992	IV-D-17, Attachment 2	I
18	No. 1 and No. 2 Cat Cracker Stack Particulate Emission Testing, Shell Oil Company, Wood River, Illinois, January 12/13, 1993	IV-D-17, Attachment 3	I
19	No. 1 and No. 2 Cat Cracker Stack Particulate Emission Testing, Shell Oil Company, Wood River, Illinois, February 16/17, 1994	IV-D-17, Attachment 4	I
20	No. 2 Cat Cracker Formal Particulate Emission Testing, Shell Oil Company, Wood River, Illinois, August 8, 1994	IV-D-17, Attachment 5	I
21	Formal Particulate Emission Testing Fluid Catalytic Cracking Unit ESP Exhaust, UNO-VEN Company, Lemont, Illinois, October 28, 1993	IV-D-18, Attachment 1	I
22	Report of Particulate, CO, and SO ₂ Testing on the CO Boiler of the FCCU, UNO-VEN Company, Lemont, Illinois, December 22, 1994	IV-D-18, Attachment 2	Other
23	Fluidized Catalytic Cracking Unit CO Boiler Emissions Testing Results, UNO-VEN Company, Lemont, Illinois, May 24, 1995	IV-D-18, Attachment 3	I
24	112P-2 Particulate Emissions Results Report, UNO-VEN Company, Lemont, Illinois, February 5, 1996	IV-D-18, Attachment 4	I
25	Source Test Report Particulate Matter Emissions Results, Clark Oil and Refining Corporation, Hartford, Illinois, November 19, 1993	IV-D-19, Attachment 1	I
26	Source Test Report Particulate Matter Emissions Results, Clark Oil and Refining Corporation, Hartford, Illinois, March 1994	IV-D-19, Attachment 2	I
27	Total Particulate Matter and Particle Size Distribution FCC Stack, Clark Oil and Refining Corporation, Hartford, Illinois, March 11, 1994	IV-D-19, Attachment 3	I
28	Confirmation of Information Emission Test Report, Clark Oil and Refining Corporation, Hartford, Illinois, April 1994	IV-D-19, Attachment 4	I

Table 1. Industry Test Report Title and Assigned Tier Level

Report No.	Report Description (Title)	Docket No.	Tier Level
29	Confirmation of Information Emission Test Report FCCU, Clark Oil and Refining Corporation, Hartford, Illinois, December 20, 1994	IV-D-19, Attachment 5	I
30	Source Emission Testing for Particulate Matter Size Distribution, Clark Oil and Refining Corporation, Hartford, Illinois, April 12, 1996	IV-D-19, Attachment 6	I
31	Source Emissions Testing for Particulate Matter, Clark Oil and Refining Corporation, Hartford, Illinois, May 1, 1996	IV-D-19, Attachment 7	I
32	Source Emissions Testing Report FCCU, Clark Oil and Refining Corporation, Hartford, Illinois, June 27, 1996	IV-D-19, Attachment 8	I
33	Source Emissions Testing for Particulate Size Distribution, Clark Oil and Refining Corporation, Hartford, Illinois, August 5, 1996.	IV-D-19, Attachment 9	I
34	Source Emissions Compliance Testing Report for PM, SO ₂ , FCCU, Clark Oil and Refining Corporation, Hartford, Illinois, August 7, 1996	IV-D-19, Attachment 10	I
35	Emission Compliance Test Program FCCU CO Boiler Stack, Marathon Oil Company, Robinson, Illinois, May 12, 1993	IV-D-20, Attachment 1	I
36	Emission Compliance Test Program FCCU CO Boiler Stack, Marathon Oil Company, Robinson, Illinois, August 4/5, 1993	IV-D-20, Attachment 2	I
37	Particulate Emission Characterization Test Program FCCU CO Boiler Stack, Marathon Oil Company, Robinson, Illinois, March 9/10, 1994	IV-D-20, Attachment 3	I
38	Particulate Emission Compliance Test Program FCCU CO Boiler Stack, Marathon Oil Company, Robinson, Illinois, June 27, 1994	IV-D-20, Attachment 4	I
39	Particulate Emission Compliance Test Program FCCU CO Boiler Stack, Marathon Oil Company, Robinson, Illinois, August 9, 1994	IV-D-20, Attachment 5	I
40	Emission Compliance Test Program FCCU CO Boiler Stack, Marathon Oil Company, Robinson, Illinois, March 14, 1995	IV-D-20, Attachment 6	I
41	Superior Refinery FCCU Stack Test Reports, Murphy Oil, USA, Incorporated, Superior, Wisconsin, January 1995	IV-D-21, Attachment 1	I
42	Particulate Emissions Test Program FCCU-ESP Exhaust Stack, Murphy Oil, USA, Incorporated, Superior,	IV-D-21, Attachment 2	I

Table 1. Industry Test Report Title and Assigned Tier Level

Report No.	Report Description (Title)	Docket No.	Tier Level
	Wisconsin, November 20, 1996		
43	Particulate Emission Compliance Test Program FCCU ESP Exhaust Stack, Murphy Oil, USA, Incorporated, Superior, Wisconsin, August 20, 1997	IV-D-31, Attachment 3	I
44	Stack Emissions Test, Coastal Eagle Point Oil Company, Westville, New Jersey, August 15, 1996 and December 11, 1996	IV-D-51	IV
45	Evaluation Test Report: Determination of Emissions from the No. 3 Reformer at Tosco Refining, San Francisco, California, February 26, 1999	IV-D-62	I
46	Emission Test Report, Marathon Ashland Petroleum LLC, Garyville, Louisiana, January 1, 1998 through June 30, 1998	IV-J-5	IV
47	RCRA Trial Burn Report for CO Boiler No. 1 at the Shell Oil Manufacturing Complex, Martinez, California, April 1989 (Revised October 1989)	IV-J-8	I
48	RCRA Trial Burn Report for CO Boiler No. 2 at the Shell Oil Manufacturing Complex, Martinez, California, November 1991	IV-J-12	II
49	Trial Burn Report for CO Boiler No. 3 at the Shell Oil Manufacturing Complex, Martinez, California, December 16, 1993	IV-J-13	II
50	Test Report for Exxon Company, USA, Benecia, California, February 12-20, 1990	IV-J-9	II
51	Determination of Air Toxics Emission Rates - FCCU Volume I and Volume II, Mobil Oil Corporation, Torrance, California, May 16, 30, and 31, 1990	IV-J-10	II
52	Results of Dioxin Testing on the Catalytic Reformer Unit #1 Exhaust, Texaco Refinery, Bakersfield, California, August 8, 1991	IV-J-11	II
53	NOx, SO2, CO, Sulfates and Particulate Compliance Emission Test Program-Heavy Oil Scrubber Exhaust (EPN 121) 70,000 BBL/Day without NaHCO3 Injection, Valero Refining Company, Corpus Christi, Texas, March 15, 1995	IV-J-14	I
54	AB2588 Air Toxics Emissions Test Report FCCU CO Boiler Volume I-Main Report, Texaco Refining and Marketing, Los Angeles Plant, Wilmington, California, May 24, 1996	IV-J-15	II

Table 1. Industry Test Report Title and Assigned Tier Level

Report No.	Report Description (Title)	Docket No.	Tier Level
55	Preliminary results of emission testing at Chevron Refinery, Richmond, California, January, 1997	Awaiting final version for docket entry	IV

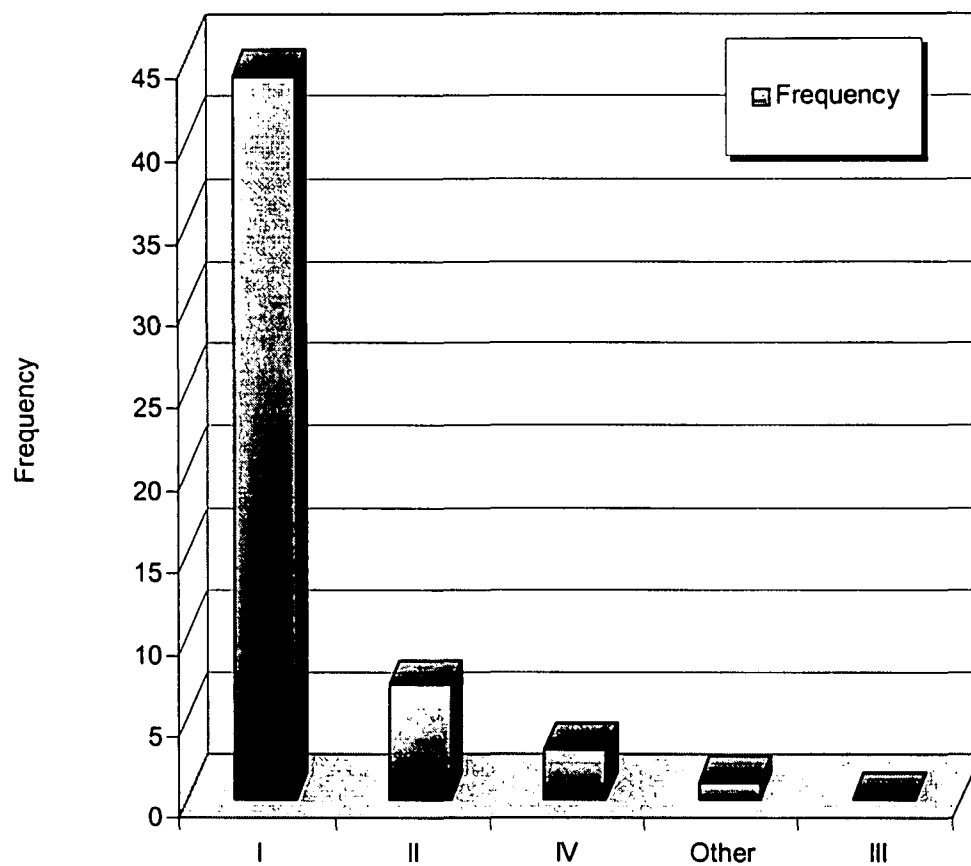


Figure 1. Distribution of 55 Industry Test Reports According To Tier Classifications

Appendix A
Summary Reports of 55 Industry Test Reports

Report No.: 1

Report Title: Western States Petroleum Association Report on AB2588 Pooled Source Emission Test Program, July 1990

Docket No.: II-I-4

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
PCDD/PCDF			Method 1613 and Methods 8280/8290	None reported	None reported	None reported	None reported
Formaldehyde			CARB Method 430	None reported	None reported	None reported	None reported
Benzene			CARB Method 410A	None reported	None reported	None reported	None reported
Polycyclic aromatic hydrocarbons (PAHs)			CARB Method 429	None reported	None reported	None reported	None reported
Phenol			Modification of CARB Method 429	None reported	None reported	None reported	None reported
Acetaldehyde			Modification of CARB Method 430	None reported	None reported	None reported	None reported
Hydrogen sulfide			Modification of CARB Methods 15 and 16	None reported	None reported	None reported	None reported

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Hydrogen cyanide			Modification of CARB Method 426	None reported	None reported	None reported	None reported
Toluene	VOST Method		CARB Method 422 and Modifications	None reported	None reported	None reported	None reported
Xylenes	VOST Method		CARB Method 422 and Modifications	None reported	None reported	None reported	None reported
1,1-dichloroethane			CARB Method 422 and Modifications	None reported	None reported	None reported	None reported
Ethylene dichloride			CARB Method 422 and Modifications	None reported	None reported	None reported	None reported
Ethylene dibromide			CARB Method 422 and Modifications	None reported	None reported	None reported	None reported
Dibromoethane			CARB Method 422 and Modifications	None reported	None reported	None reported	None reported
Total petroleum hydrocarbons			CARB Method 422 and Modifications	None reported	None reported	None reported	None reported

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Hydrogen chloride			CARB Method 421	None reported	None reported	None reported	None reported
Ethyl benzene			CARB Method 422 and Modifications	None reported	None reported	None reported	None reported
Ammonia			Modification of CARB Method 421	None reported	None reported	None reported	None reported
Total reduced sulfur compounds			Modification of CARB Methods 15 and 16	None reported	None reported	None reported	None reported
Arsenic		Modification of EPA Multi-Metals train			None reported	None reported	None reported
Beryllium		Modification of EPA Multi-Metals train			None reported	None reported	None reported
Cadmium		Modification of EPA Multi-Metals train			None reported	None reported	None reported

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Copper		Modification of EPA Multi-Metals train			None reported	None reported	None reported
Lead		Modification of EPA Multi-Metals train			None reported	None reported	None reported
Manganese		Modification of EPA Multi-Metals train			None reported	None reported	None reported
Nickel		Modification of EPA Multi-Metals train			None reported	None reported	None reported
Selenium		Modification of EPA Multi-Metals train			None reported	None reported	None reported
Zinc		Modification of EPA Multi-Metals train			None reported	None reported	None reported
Total chromium			CARB Method 425	None reported	None reported	None reported	None reported

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Hexavalent chromium			CARB Method 425	None reported	None reported	None reported	None reported
Mercury			CARB Method 101A	None reported	None reported	None reported	None reported

This report is classified: TIER II

Rating levels are defined as:

- TIER I** EPA Air Method or EPA (other than air), State, or unknown method with Method Validation
TIER II State Agency method (e.g., California), no Method Validation
TIER III Unknown method, no Method Validation, good QA procedures
TIER IV Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

Dioxins in Wastewater

Analytical laboratory performing the analysis was certified by the state of California. Both low resolution (EPA Method 8280) and high resolution (EPA Method 8290 and 1613) laboratory analytical procedures for dioxin/furan quantification were used. The laboratory used was capable of producing detection limits for EPA Method 8280 nearly as low as EPA Method 1613. It was therefore deemed acceptable to use EPA Method 8280 on occasion for cost effectiveness since the purpose of the analytical results was to show process performance rather than to indicate regulatory compliance. There is a statement made in the *results* section which reads, "A review of the laboratory's quality assurance and quality control data indicated that the results are of known quality and considered valid." All samples were taken in duplicate, but only one sample was analyzed. One-liter amber bottles, specially cleaned, were supplied by the contract laboratory. Latex gloves were worn during sampling. All samples were immediately cooled and kept in ice chests containing blue ice for delivery to the laboratory.

Emissions on 19 Refinery Sources

A series of tests were conducted on 19 refinery sources to develop preliminary emission factors to aid in preparation of the 1989 emission estimate report mandated by AB2588, Air Toxics Hot Spots Information and Assessment Act of 1987. These emission factors were established for a limited population of each type of source and were obtained at essentially a single point in time. Therefore the accuracy with which these factors reflect

representative emission factors from all refinery sources is unknown. The field test and laboratory data, calculation summaries, and QA/QC documentation for tests performed on each source were prepared and submitted as a separate series of documents entitled Interim Project Report. According to the test report, all method QA/QC requirements were met. However, all QA/QC results were not reported and therefore could not be verified. Copies of field and laboratory spike data and minimum detectable and minimum quantifiable levels are included in Interim Reports along with chain of custody documentation and equipment calibration data. Emission factors are calculated from triplicate test runs.

Method Descriptions:

CARB Method 422	Determination of Halogenated Organics from Stationary Sources
CARB Method 426	Determination of Cyanide Emissions from Stationary Sources
CARB Method 421	Determination of Hydrochloric Acid Emissions from Stationary Sources
CARB Method 15	Determination of Hydrogen Sulfide, Carbonyl Sulfide and Carbon Disulfide Emissions from Stationary Sources
CARB Method 430	Determination of Formaldehyde in Emissions from Stationary Sources
EPA Multi-Metals Train	Combination of CARB Methods 12, 101A, 104, 424, 425, and 433 for Determination of Specific Metals
CARB Method 425	Determination of Total Chromium and Hexavalent Chromium Emissions from Stationary Sources
CARB Method 101A	Determination of Particulate and Gaseous Mercury Emissions from Sewage Sludge Incinerators
EPA VOST Method	Collection of Volatile Components on a Combined Tenax/Charcoal Adsorption Column
CARB Method 429	Determination of PAHs Using GC/MS Scan Analysis Extended to Include Phenol
CARB Method 410A	Determination of Low Concentrations of Benzene from Stationary Sources
CARB Method 410B	Determination of High Concentrations of Benzene from Stationary Sources
CARB Method 430	Determination of Formaldehyde in Emissions from Stationary Sources
CARB Method 429	Determination of Polycyclic Aromatic Hydrocarbon (PAH) Emissions from Stationary Sources

Report No.: 2

Report Title: Report on Compliance Testing, Indian Refining, Lawrenceville, Illinois, March 8, 1993

Docket No.: IV-D-6

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Particulate	Methods 1 - 5 and 5F			<i>EPA Method(s)</i>	None reported	None reported	Yes
Sulfur dioxide	Method 6			<i>EPA Method(s)</i>	PE Audit conducted (audit number 7194)	See below	Yes
Opacity	Method 9			<i>EPA Method(s)</i>	None reported	None reported	Yes
Carbon monoxide	Method 10			<i>EPA Method(s)</i>	None reported	None reported	Yes

This report is classified: TIER I

Rating levels are defined as:

TIER I EPA Air Method or EPA (other than air), State, or unknown method with Method Validation

TIER II State Agency method (e.g., California), no Method Validation

TIER III Unknown method, no Method Validation, good QA procedures

TIER IV Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

The purpose of this test program was to quantify the emission levels of particulates, sulfur dioxide, carbon monoxide, and opacity for compliance purposes. The testing took place at the FCCU stack of an Illinois refinery.

According to the test report, all method QA/QC requirements were met. However, specific QA/QC results were not reported as such and therefore could not be verified. No deviations from U.S. EPA testing procedures were noted. Documentation for meter box full test calibration, post test calibration check, nozzle calibration data, and type S pilot tube inspection data are included in report. In addition, QC documentation such as field

test data sheets and chain of custody forms are provided in the appendices of the test report and appear complete. An audit sample of sulfur dioxide was analyzed along with the sample analysis (percent difference = 0.9).

Report No.: 3

Report Title: Particulate Emission Evaluation, BP Oil Refinery, Lima, Ohio, January 19, 1994

Docket No.: IV-D-7

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Particulate	Methods 1 - 5			<i>EPA Method(s)</i>	None reported	None reported	None reported

This report is classified: TIER I

Rating levels are defined as:

TIER I	EPA Air Method or EPA (other than air), State, or unknown method with Method Validation
TIER II	State Agency method (e.g., California), no Method Validation
TIER III	Unknown method, no Method Validation, good QA procedures
TIER IV	Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

Testing was performed at the exhaust of the FCCU waste heat boiler ESP exhaust at a refinery located in Ohio. The purpose of the test program was to determine the particulate emission rates from the unit for engineering purposes.

Leak checks of the pilot tube lines and the sample train were all acceptable by EPA regulations, according to the report. Flue gas analysis for carbon dioxide, oxygen, and carbon monoxide was conducted by drawing an integrated air bag sample and analyzing it on a portable gas analyzer. The average of these readings for each run was used in calculating the emission rates. Calibration of the equipment used was conducted within 60 days of the test date, although calibration data is not part of test report and therefore could not be verified.

Report No.: 4

Report Title: Ashland Petroleum Company, Canton, Ohio, FCC Stack Test Report, May 4, 1994

Docket No.: IV-D-8

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Particulate	Methods 1-5			<i>EPA Method(s)</i>	None reported	None reported	Yes
Opacity	Method 9			<i>EPA Method(s)</i>	None reported	None reported	None reported
Sulfur dioxide	Method 6C			<i>EPA Method(s)</i>	None reported	None reported	None reported
Hydrocarbons	Method 25A			<i>EPA Method(s)</i>	None reported	None reported	None reported

This report is classified: TIER I

Rating levels are defined as:

TIER I EPA Air Method or EPA (other than air), State, or unknown method with Method Validation

TIER II State Agency method (e.g., California), no Method Validation

TIER III Unknown method, no Method Validation, good QA procedures

TIER IV Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

This report contains test results on emissions of particulate, sulfur dioxide, hydrocarbons, and opacity. Reported results for particulate emissions were in excess of their permitted levels while sulfur dioxide and hydrocarbon emission rates were below their permitted levels. The high levels of particulate were deemed due to the stack test not being carried out under representative operating conditions according to EPA regulations (i.e. tests carried out during start up period). Particulate emissions were tested following U. S. EPA Methods 1-5 and opacity readings by EPA Method 9. Test methods used for sulfur dioxide and hydrocarbons were not mentioned in the report text but were indicated on spreadsheets in the appendices. No quality control samples were reported.

Test equipment calibration data and standards documentation are provided in the appendices of the test report. According to the test report, all method QA/QC requirements were met. However, specific QA/QC results were not reported as such and therefore could not be verified.

Report No.: 5

Report Title: Plant No. 2 Fluid Catalytic Cracking Unit Emission Test Report, Sun Refining and Marketing, Toledo, Ohio, July 20, 1994

Docket No.: IV-D-9

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Particulate	Methods 1-5			<i>EPA Method(s)</i>	See below	None reported	Yes
Sulfur dioxide	Method 6			<i>EPA Method(s)</i>	EPA audit samples No. 8376 and 8601 were analyzed with the samples	Audit samples within acceptable range	Yes
Opacity	Method 9			<i>EPA Method(s)</i>	See below	None reported	Yes

This report is classified: TIER I

Rating levels are defined as:

- TIER I** EPA Air Method or EPA (other than air), State, or unknown method with Method Validation
TIER II State Agency method (e.g., California), no Method Validation
TIER III Unknown method, no Method Validation, good QA procedures
TIER IV Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

FCC Unit testing was conducted at a Sun Company refinery for particulate and sulfur dioxide emissions to determine the compliance status of the CCU per Ohio EPA Operating Permit. The report also includes results for opacity. According to the test report, quality control procedures were conducted according to the basic principles as set forth in Volumes I, II, and III of the Quality Assurance Handbook prepared by the EPA Quality Assurance staff. Also, external QA audits were conducted, and the results are provided in report. No deviations from standard U. S. EPA methods were reported. No abnormal operating conditions were reported during testing. Documentation for dry gas meter, pitot tube, gravimetric check, magnehelic gauge, and nozzle diameter check calibration data were included in the report.

Quality Control procedures are described in the test report. Two audit samples of sulfur dioxide were analyzed along with the sample analysis ,and results are reported to be within acceptable range. The test report is not specific about audits for the other pollutants measured.

Review of this test report included verification that sample data calculations were performed correctly. Some sample data calculations are wrong (see Appendix 1 of test report).

Report No.: 6

Report Title: Total Petroleum, Incorporated, Alma, Michigan, Emission Sampling on the FCC CO Boiler Exhaust, April 18, 1996

Docket No.: IV-D-10

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Particulate	Methods 1-5			<i>EPA Method(s)</i>	None reported	None reported	None reported
Opacity	Method 9			<i>EPA Method(s)</i>	None reported	None reported	None reported

This report is classified: TIER I

Rating levels are defined as:

TIER I EPA Air Method or EPA (other than air), State, or unknown method with Method Validation
TIER II State Agency method (e.g., California), no Method Validation
TIER III Unknown method, no Method Validation, good QA procedures
TIER IV Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

Emission testing was conducted on the exhaust of a carbon monoxide boiler that services the exhaust of the FCCU. Particulate emissions determination was carried out using U.S. EPA Methods 1-5. Opacity testing was conducted with U.S. EPA Method 9. According to the test report, all method QA/QC requirements were met. However, specific QA/QC results were not reported as such and therefore could not be verified. Equipment calibration forms are provided in the appendix of the test report. A representative from the MDEQ Air Quality Division was present to observe the testing. Formulas for calculations are provided, however no sample data calculations are provided in the report.

Report No.: 7

Report Title: Emission Compliance and CEM Relative Accuracy Test Program FCCU Exhaust Stack, Clark Refining and Marketing, Blue Island Illinois, December 29, 1994

Docket No.: IV-D-14, Attachment 1

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Sulfur dioxide	Method 6C			<i>EPA Method(s)</i>	None reported	None reported	Yes
Carbon monoxide	Method 10			<i>EPA Method(s)</i>	None reported	None reported	Yes
Particulate	Methods 1-5			<i>EPA Method(s)</i>	None reported	None reported	Yes
Opacity	Method 9			<i>EPA Method(s)</i>	None reported	None reported	Yes

This report is classified: TIER I

Rating levels are defined as:

TIER I EPA Air Method or EPA (other than air), State, or unknown method with Method Validation

TIER II State Agency method (e.g., California), no Method Validation

TIER III Unknown method, no Method Validation, good QA procedures

TIER IV Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

Emission compliance testing was performed on the FCCU exhaust stack at an Illinois refinery. Test methods followed those as detailed in 40CFR Part 60, 1996, Appendix A for U.S. EPA Methods 1-5, 6C, 9, and 10.

A representative from Illinois EPA was present to observe the test series. Quality control results are not provided in the test report. Documentation of test equipment calibration and calibration gas certificates of analysis are provided in the appendices of the test report.

Review of this test report included verification that sample data calculations were performed correctly.

Report No.: 8

Report Title: Emission Compliance Test Program FCCU Exhaust Stack, Clark Refining and Marketing, Blue Island Illinois, July 3, 1997

Docket No.: IV-D-14, Attachment 2

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Particulate	Methods 1-5			<i>EPA Method(s)</i>	None reported	None reported	Yes
Opacity	Method 9			<i>EPA Method(s)</i>	None reported	None reported	Yes
Carbon monoxide	Method 10			<i>EPA Method(s)</i>	None reported	None reported	Yes
Sulfur dioxide	Method 6C			<i>EPA Method(s)</i>	Yes using PS-2	Yes ^A	Yes

This report is classified: TIER I

Rating levels are defined as:

- TIER I** EPA Air Method or EPA (other than air), State, or unknown method with Method Validation
TIER II State Agency method (e.g., California), no Method Validation
TIER III Unknown method, no Method Validation, good QA procedures
TIER IV Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

An emission compliance test program was carried out to test for emissions which included particulate, opacity, carbon monoxide and sulfur dioxide. Three emission compliance test runs were conducted for each of two process conditions. A relative accuracy certification test program was conducted during this test period on the SO₂ monitor. ^AThe result of the CEM relative accuracy indicated 14.6% which is within the allowable 20% limit specified in Appendix B - Performance Specification (PS) 2.

EPA methods were followed and sample calculations were conducted for all emissions being tested. QA/QC documentation is not provided in the test report except test equipment calibration data which are provided in the appendix.

Report No.: 9

Report Title: Evaluation of Sulfur Dioxide, Nitrogen Oxides, and Carbon Monoxide Emissions, Marathon Petroleum Refinery, Detroit, Michigan, August 6, 1991

Docket No.: IV-D-15, Attachment 1

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Exhaust gas composition	Method 3			<i>EPA Method(s)</i>	None reported	None reported	None reported
Sulfur dioxide	Method 6C			<i>EPA Method(s)</i>	None reported	None reported	None reported
Nitrogen oxide	Method 7E			<i>EPA Method(s)</i>	None reported	None reported	None reported
Carbon monoxide	Method 10			<i>EPA Method(s)</i>	None reported	None reported	None reported

This report is classified: TIER I

Rating levels are defined as:

TIER I EPA Air Method or EPA (other than air), State, or unknown method with Method Validation

TIER II State Agency method (e.g., California), no Method Validation

TIER III Unknown method, no Method Validation, good QA procedures

TIER IV Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

The purpose of this test was to quantify emissions from the Sulfur Recovery Unit (SRU) Incinerator. The test report did not provide any data verification information or quality control results of emissions testing data, or the subsequent interpretation of that data. The text of the report states the field data sheets are provided in Appendix B. No Appendix B is present. Very little information is reported besides method used and results.

Review of this test report was to include verification that sample data calculations were performed correctly. No sample data calculations are provided in the test report.

Report No.: 10

Report Title: Results of Nitrogen Oxide and Carbon Monoxide Emissions Testing Conducted on an Unifiner Charge Heater, Marathon Petroleum Refinery, Detroit, Michigan, July 19, 1994

Docket No.: IV-D-15, Attachment 2

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Nitrogen oxide	Method 7E	U.S. EPA NO _x and CO instrument calibration procedure		<i>EPA Method(s)</i>	None reported	None reported	None reported
Carbon monoxide	Method 10	U.S. EPA NO _x and CO instrument calibration procedure		<i>EPA Method(s)</i>	None reported	None reported	None reported

This report is classified: TIER I

Rating levels are defined as:

- TIER I** EPA Air Method or EPA (other than air), State, or unknown method with Method Validation
TIER II State Agency method (e.g., California), no Method Validation
TIER III Unknown method, no Method Validation, good QA procedures
TIER IV Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

Emission testing was conducted on a Unifier Charge Heater at a Marathon refinery. Nitrogen oxide and carbon monoxide emissions were tested following EPA Method 7E and Method 10 respectively. Exhaust gas sampling was also conducted to comply with EPA Methods 1-4. According to section 3.3 of the test report, Quality Assurance/Quality Control guidelines for source sampling were followed during the emission testing. However, no QA/QC documentation is provided and therefore cannot be verified.

A representative of the Wayne County Air Pollution Control Division (WCAPCD) was on site to observe test procedures.

Modifications were made to the U.S. EPA reference NO_x and CO instrument calibration procedure. Two point calibrations using the zero-gas and 137 ppmv gas was performed to enable NO_x measurements of concentrations within the range of 0-200 ppmv, and the zero-gas and 448 ppmv gas to enable CO measurements of concentrations within the range of 0-2000 ppmv.

According to the test report, system bias checks and other quality checks were within the allowable deviation, however raw data is not provided. And although cited in the text, no appendices are attached.

Report No.: 11

Report Title: Results of Compliance Testing on the Alkylation and Unifiner Flares, Marathon Petroleum Refinery, Detroit Michigan, September 16, 1996

Docket No.: IV-D-15, Attachment 3

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Opacity	Method 22			<i>EPA Method(s)</i>	None reported	None reported	None reported
Refinery Gas Compounds (VOCs by GC)	Method 18		UOP Method 539-87	<i>EPA Method(s)</i>	None reported	None reported	None reported

This report is classified: TIER I

Rating levels are defined as:

TIER I EPA Air Method or EPA (other than air), State, or unknown method with Method Validation
TIER II State Agency method (e.g., California), no Method Validation
TIER III Unknown method, no Method Validation, good QA procedures
TIER IV Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

Compliance testing was performed under normal operating conditions on the Alkylation and Unifiner flares to demonstrate compliance with 40CFR 63.11b.

According to the test report, U.S. EPA QA/QC guidelines for source sampling were followed during the tests. No raw data is provided to allow for verification of this. A mention of a QA/QC check of both field and laboratory data showed that one of the gas samples had "a large amount of ambient air within the sample". This sample was removed from the calculations for the Net Heating Value.

Review of this test report was to include verification that sample data calculations were performed correctly. However, no sample data calculations were provided in the test report. None of the appendices cited in the text of the report are provided. Therefore, no calibration data or field data sheets are available for review.

Report No.: 12

Report Title: Results of Compliance Testing Performed on the Cracking Plant Flare, Marathon Petroleum Refinery, Detroit, Michigan, September 25, 1996

Docket No.: IV-D-15, Attachment 4

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Refinery Gas Compounds (VOCs by GC)	Method 18	Molecular weight of the gas was determined from gas composition analysis performed on collected gas samples- not Method 3	UOP Method 539-87	<i>EPA Method(s)</i>	None reported	None reported	None reported
Opacity	Method 22			<i>EPA Method(s)</i>	None reported	None reported	None reported

This report is classified: TIER I

Rating levels are defined as:

TIER I EPA Air Method or EPA (other than air), State, or unknown method with Method Validation

TIER II State Agency method (e.g., California), no Method Validation

TIER III Unknown method, no Method Validation, good QA procedures

TIER IV Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

Compliance testing was performed on a Marathon Cracking Plant flare. EPA Methods 1-4, 18, and UOP Method 539-87 were carried out on the flare gas. Opacity was determined by EPA Method 22. Section 2.4 of the test report states that Quality Assurance/Quality Control guidelines were followed during the test, however no QA/QC documentation is provided and therefore could not be verified. No supporting documentation is provided for any aspect of testing and all appendices that are cited throughout the text are missing.

Report No.: 13

Report Title: Particulate Emission Compliance Study, FCC Unit-CO Boiler Stack, Mobil Oil Corporation, Joliet, Illinois, August 19, 1996

Docket No.: IV-D-16, Attachment 1

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Particulate	Methods 1- 5			<i>EPA Method(s)</i>	None reported	None reported	Yes

This report is classified: TIER I

Rating levels are defined as:

TIER I EPA Air Method or EPA (other than air), State, or unknown method with Method Validation

TIER II State Agency method (e.g., California), no Method Validation

TIER III Unknown method, no Method Validation, good QA procedures

TIER IV Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

A particulate emission compliance test program was performed on the FCC Unit- CO Boiler Stack at a Mobil Oil refinery in Illinois. The purpose of the test program was to determine particulate emission rates during normal operating conditions. A representative from the Illinois EPA observed the tests.

According to the test report, the sampling team enforced a QA Program in order to minimize factors that may cause errors. This included the daily preparation of reagents and standardization of reagents carried out daily during on-site analysis. According to the test report, all method QA/QC requirements were met. However, specific QA/QC results were not reported as such and therefore could not be verified. The test meters (dry and wet) were calibrated according to methods in the Quality Assurance Handbook.

QA/QC documentation is not provided in the test report except test equipment calibration data which are provided in the appendix. Review of this report included verification that sample data calculations were performed correctly.

Report No.: 14

Report Title: Particulate Emission Compliance Study, Mobil Oil Corporation, Joliet, Illinois, September 20, 1996

Docket No.: IV-D-16, Attachment 2

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Particulate	Methods 1-5			<i>EPA Method(s)</i>	None reported	None reported	None reported

This report is classified: TIER I

Rating levels are defined as:

- TIER I** EPA Air Method or EPA (other than air), State, or unknown method with Method Validation
TIER II State Agency method (e.g., California), no Method Validation
TIER III Unknown method, no Method Validation, good QA procedures
TIER IV Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

Particulate emission testing was conducted on a FCC Unit-CO Boiler Stack of Mobil Oil Corp. EPA Methods 1-5 were performed. According to the test report, all testing, sampling, analytical, and calibration procedures used for this test program were performed as described in 40 CFR Part 60. No deviations from U.S. EPA testing procedures were noted. Test equipment calibration data are provided in the appendix of the report. Quality control procedures for all aspects of field sampling, sample preservation and holding time, reagent quality, analytical method, and instrument cleaning, calibration, and safety were followed according to the test report, and all method QA/QC requirements were met. However, specific QA/QC results were not reported as such and therefore could not be verified.

Report No.: 15

Report Title: FCC Information Request and Stack Testing Results, Mobil Oil Corporation, Joliet, Illinois, June 18, 1997

Docket No.: IV-D-16, Attachment 3

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Particulate	Method 5			<i>EPA Method(s)</i>	None reported	None reported	None reported
Carbon monoxide	Method 10			<i>EPA Method(s)</i>	None reported	None reported	None reported
Opacity	Method 9			<i>EPA Method(s)</i>	None reported	None reported	None reported

This report is classified: TIER I

Rating levels are defined as:

TIER I EPA Air Method or EPA (other than air), State, or unknown method with Method Validation

TIER II State Agency method (e.g., California), no Method Validation

TIER III Unknown method, no Method Validation, good QA procedures

TIER IV Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

A particulate and gaseous emission test program was conducted on the FCC-CO Boiler stack at a refinery in Illinois. The purpose of the test program was to determine particulate and gaseous emissions during normal operating conditions. Stack testing was conducted using Methods 5, 9, and 10 for particulates, opacity, and carbon monoxide respectively. U.S. EPA representatives from Region V observed portions of the testing.

According to the test report, all testing, sampling, analytical, and calibration procedures used for the program were performed as described in 40CFR 60. No audits were reported. The sampling team enforced a QA Program that included the daily preparation of reagents, and standardization of reagents carried out daily during on-site analysis. According to the test report, all method QA/QC requirements were met. However, specific QA/QC

results were not reported as such and therefore could not be verified. The test meters (dry and wet) were calibrated according to methods in the Quality Assurance Handbook.

Review of this test report was to include verification that sample data calculations were performed correctly. No sample data calculations are provided in the test report. A *summary of results calculations* are provided but appear to be equations only.

Report No.: 16

Report Title: No. 1 and No. 2 Cat Cracker Stack Particulate Emission Testing, Shell Oil Company, Wood River, Illinois, April 7/8, 1992

Docket No.: IV-D-17, Attachment 1

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Particulate	Methods 1-5			<i>EPA Method(s)</i>	None reported	None reported	Yes

This report is classified: TIER I

Rating levels are defined as:

TIER I	EPA Air Method or EPA (other than air), State, or unknown method with Method Validation
TIER II	State Agency method (e.g., California), no Method Validation
TIER III	Unknown method, no Method Validation, good QA procedures
TIER IV	Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

Particulate emission testing was conducted on two cat cracker precipitate stacks belonging to Shell Oil Co. The purpose of this test was to determine the degree of compliance with applicable Illinois EPA emission codes. EPA Methods 1-5 were followed and sample calculations were conducted. The test report states that emission testing was conducted following procedural requirements as detailed in Title 40, Code of Federal Regulations (40 CFR). According to the test report, all method QA/QC requirements were met. However, specific QA/QC results were not reported as such and therefore could not be verified. Documentation of all field test data including equipment calibrations, chain of custody, and several supporting calculations are provided in the appendices.

Report No.: 17

Report Title: No. 1 and No. 2 Cat Cracker Stack Particulate Emission Testing, Shell Oil Company, Wood River, Illinois, October 27/28, 1992

Docket No.: IV-D-17, Attachment 2

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Particulate	Methods 1-5			<i>EPA Method(s)</i>	None reported	None reported	Yes
Sulfur oxide	Method 6			<i>EPA Method(s)</i>	None reported	None reported	Yes
Sulfuric acid mist	Method 8			<i>EPA Method(s)</i>	None reported	None reported	Yes
Hydrogen sulfides	Method 15			<i>EPA Method(s)</i>	None reported	None reported	Yes

This report is classified: TIER I

Rating levels are defined as:

- TIER I** EPA Air Method or EPA (other than air), State, or unknown method with Method Validation
TIER II State Agency method (e.g., California), no Method Validation
TIER III Unknown method, no Method Validation, good QA procedures
TIER IV Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

Particulate emission testing was conducted on two cat cracker precipitate stacks belonging to Shell Oil Co. The purpose of this test was to determine the degree of compliance with applicable Illinois EPA emission codes. EPA Methods 1-5 were followed and sample calculations were conducted.

In a second attached test report, results of sulfur oxide, sulfuric acid mist, and hydrogen sulfide emission testing on two cat cracker precipitator stacks are presented.

Both test reports state that emission testing was conducted following procedural requirements as detailed in Title 40, Code of Federal Regulations (40 CFR). However, there was no description of quality assurance or quality control procedures in the test report. Documentation of all field test data including equipment calibrations, chain of custody, and several supporting calculations are provided in the appendices.

Report No.: 18

Report Title: No. 1 and No. 2 Cat Cracker Stack Particulate Emission Testing, Shell Oil Company, Wood River, Illinois, January 12/13, 1993

Docket No.: IV-D-17, Attachment 3

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Particulate	Methods 1-5			<i>EPA Method(s)</i>	None reported	None reported	Yes

This report is classified: TIER I

Rating levels are defined as:

TIER I EPA Air Method or EPA (other than air), State, or unknown method with Method Validation

TIER II State Agency method (e.g., California), no Method Validation

TIER III Unknown method, no Method Validation, good QA procedures

TIER IV Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

Particulate emission testing was conducted on two cat cracker precipitate stacks belonging to Shell Oil Co. The purpose of this test was to determine the degree of compliance with applicable Illinois EPA emission codes. EPA Methods 1-5 were followed and sample calculations were conducted. The test report states that emission testing was conducted following procedural requirements as detailed in Title 40, Code of Federal Regulations (40CFR). However, there was no specific mention of quality assurance or quality control procedures in the test report. Documentation of all field test data including equipment calibrations, chain of custody, and several supporting calculations are provided in the appendices.

Report No.: 19

Report Title: No. 1 and No. 2 Cat Cracker Stack Particulate Emission Testing, Shell Oil Company, Wood River, Illinois, February 16/17, 1994

Docket No.: IV-D-17, Attachment 4

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Particulate	Methods 1-5			<i>EPA Method(s)</i>	None reported	None reported	Yes

This report is classified: TIER I

Rating levels are defined as:

TIER I EPA Air Method or EPA (other than air), State, or unknown method with Method Validation
TIER II State Agency method (e.g., California), no Method Validation
TIER III Unknown method, no Method Validation, good QA procedures
TIER IV Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

A series of emission tests was conducted on two cat cracker precipitator stacks following procedural requirements as detailed in 40CFR. Field test data and calculation summaries are included in Appendix A. According to the test report, all method QA/QC requirements were met. However, specific QA/QC results were not reported as such and therefore could not be verified. The report does contain documentation for the calibration of the instruments, as well as sample chain of custody forms.

Review of this report included verification that sample data calculations were performed correctly.

Report No.: 20

Report Title: No. 2 Cat Cracker Formal Particulate Emission Testing, Shell Oil Company, Wood River, Illinois, August 8, 1994

Docket No.: IV-D-17, Attachment 5

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Particulate	Methods 1-5			<i>EPA Method(s)</i>	None reported	None reported	Yes

This report is classified: TIER I

Rating levels are defined as:

- TIER I** EPA Air Method or EPA (other than air), State, or unknown method with Method Validation
TIER II State Agency method (e.g., California), no Method Validation
TIER III Unknown method, no Method Validation, good QA procedures
TIER IV Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

Particulate emission testing was conducted on a cat cracker precipitator stack at Shell Oil Co. The purpose of this test was to determine the degree of compliance with applicable Illinois EPA emission codes. EPA Methods 1-5 were followed and sample calculations were conducted. The test report states that emission testing was conducted following procedural requirements as detailed in Title 40, Code of Federal Regulations (40 CFR). However, there was no description provided of quality assurance or quality control procedures in the test report. Documentation of all field test data including equipment calibrations, chain of custody, and several supporting calculations are provided in the appendices.

There are several values and text purposefully obliterated by ink, that may present a problem (e.g., Sections 1.1, 4.3, Table 1).

Report No.: 21

Report Title: Formal Particulate Emission Testing Fluid Catalytic Cracking Unit ESP Exhaust, UNO-VEN Company, Lemont, Illinois, October 28, 1993

Docket No.: IV-D-18, Attachment 1

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Particulate	Method 1-5 and 5F			<i>EPA Method(s)</i>	None reported	None reported	Yes

This report is classified: TIER I

Rating levels are defined as:

TIER I	EPA Air Method or EPA (other than air), State, or unknown method with Method Validation
TIER II	State Agency method (e.g., California), no Method Validation
TIER III	Unknown method, no Method Validation, good QA procedures
TIER IV	Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

A series of formal particulate emission tests were conducted on the outlet of the electrostatic precipitator associated with the FCCU. According to the test report, emission test methods followed those detailed in 40CFR 60. The purpose of this test series was to determine the concentration and emission rate of total particulate exhausting from the ESP outlet for compliance with permitted levels specified by Illinois EPA.

There was no description provided of quality assurance, quality control, or audit procedures in the test report. Documentation of all field test data including equipment calibrations, chain of custody, and several supporting calculations are provided in the appendices.

Review of this report included verification that sample data calculations were performed correctly.

Report No.: 22

Report Title: Report of Particulate, CO, and SO₂ Testing on the CO Boiler of the FCCU, UNO-VEN Company, Lemont, Illinois, December 22, 1994

Docket No.: IV-D-18, Attachment 2

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Particulate	Methods 1-5			<i>EPA Method(s)</i>	None reported	None reported	Yes
Sulfur dioxide	Method 6			<i>EPA Method(s)</i>	None reported	None reported	Yes
Carbon monoxide	Method 10			<i>EPA Method(s)</i>	None reported	None reported	None reported

This report is classified: TIER I /data suspect

Rating levels are defined as:

- TIER I** EPA Air Method or EPA (other than air), State, or unknown method with Method Validation
TIER II State Agency method (e.g., California), no Method Validation
TIER III Unknown method, no Method Validation, good QA procedures
TIER IV Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

This report contains results from particulate, sulfur dioxide, and carbon monoxide testing on a FCCU unit. EPA Methods 1-5, 6, and 10 were followed respectively. Although equipment calibration data and sample calculations are provided, it is stated that the results are inaccurate due to problems with the stack test and are an inaccurate reflection of emissions from the stack. This complete data package should be considered suspect.

Report No.: 23

Report Title: Fluidized Catalytic Cracking Unit CO Boiler Emissions Testing Results, UNO-VEN Company, Lemont, Illinois, May 24, 1995

Docket No.: IV-D-18, Attachment 3

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Particulate	Methods 1-5			<i>EPA Method(s)</i>	None reported	See below	None reported
Sulfur dioxide	Method 6			<i>EPA Method(s)</i>	Yes	See below*	None reported
Carbon monoxide	Method 10			<i>EPA Method(s)</i>	None reported	None reported	None reported
Opacity	Method 9			<i>EPA Method(s)</i>	None reported	None reported	None reported

This report is classified: TIER I

Rating levels are defined as:

TIER I EPA Air Method or EPA (other than air), State, or unknown method with Method Validation
TIER II State Agency method (e.g., California), no Method Validation
TIER III Unknown method, no Method Validation, good QA procedures
TIER IV Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

This test report was the result of an information request from U.S. EPA Region 5 to conduct particulate, sulfur dioxide, and carbon monoxide emission testing for a fluid catalytic cracking unit (FCCU) at an Illinois refinery.

All calibration gases used were certified EPA Protocol #1. Calibration gas certifications are provided in appendix C. All equipment used for the tests were calibrated according to procedures detailed in the EPA Quality Assurance Handbook for Air Pollution Measurement Systems – Volume III – Stationary Source Specific Methods. Copies of chain of custody forms, laboratory QC data, and field data sheets are provided in the appendices.

The program included the collection of field and reagent blanks and an audit sample for SO₂ analysis. The results of the blanks and audit sample are presented on page 4-2 of the report. It is not stated specifically whether these QC samples meet acceptance criteria*.

Review of this test report was to include verification that sample data calculations were performed correctly. No sample data calculations are provided in the test report. *Emission calculation summaries* are provided but appear to be equations only.

Report No.: 24

Report Title: 112P-2 Particulate Emissions Results Report, UNO-VEN Company, Lemont, Illinois, February 5, 1996

Docket No.: IV-D-18, Attachment 4

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Particulate	Methods 1-5			<i>EPA Method(s)</i>	None reported	See below	None reported
Opacity	Method 9			<i>EPA Method(s)</i>	None reported	None reported	None reported

This report is classified: TIER I

Rating levels are defined as:

TIER I EPA Air Method or EPA (other than air), State, or unknown method with Method Validation
TIER II State Agency method (e.g., California), no Method Validation
TIER III Unknown method, no Method Validation, good QA procedures
TIER IV Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

Particulate measurements and opacity readings were conducted on the CO Boiler exhaust of a FCC unit. The purpose of the testing was to quantify the emission rates of particulate matter and determine opacity from the exhaust to determine compliance with applicable limitations set forth in the facility's construction permit. Particulate measurements followed EPA Methods 1-5, while opacity readings were collected by EPA Method 9. A representative from the Illinois Environmental Protection Agency was present during the testing. Sample equations are provided in Appendix A, however no sample data calculations are provided.

Per the test report, equipment used for the stack test program was calibrated in accordance with the appropriate sampling method and the procedures listed in the EPA Quality Assurance Handbook for Air Pollution Measurement Systems - Volume III - Stationary Source Specific Methods. According to the test report, pre and post calibrations were within allowable errors. All equipment calibration data is provided in Appendix E.

A field audit was performed of the dry gas meter with a result of 3.5%. Sample chain of custody procedures were followed and chain of custody forms are provided in the appendix of the report. Results of filter and train blanks are provided in section 5.3 of the text.

Report No.: 25

Report Title: Source Test Report Particulate Matter Emissions Results, Clark Oil and Refining Corporation, Hartford, Illinois, November 19, 1993

Docket No.: IV-D-19, Attachment 1

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Particulate	Methods 1-5			<i>EPA Method(s)</i>	None reported	None reported	Yes

This report is classified: TIER I

Rating levels are defined as:

- TIER I** EPA Air Method or EPA (other than air), State, or unknown method with Method Validation
TIER II State Agency method (e.g., California), no Method Validation
TIER III Unknown method, no Method Validation, good QA procedures
TIER IV Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

The purpose of this test was to conduct compliance emission testing for particulate matter (PM) from the fluid catalytic cracking unit (FCCU) stack of a facility in Illinois. The PM testing of the source was performed in accordance with U.S. EPA methods 1-5.

According to the test report, all method QA/QC requirements were met. However, specific QA/QC results were not reported as such and therefore could not be verified. A detailed outline of all methods used is contained within the report. Calibration data and chain of custody data are also contained within the report. Review of this test report included verification that sample data calculations were performed correctly. Sample data calculations are provided in appendix B.

Report No.: 26

Report Title: Source Test Report Particulate Matter Emissions Results, Clark Oil and Refining Corporation, Hartford, Illinois, March 1994

Docket No.: IV-D-19, Attachment 2

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Particulate	Methods 1-5			<i>EPA Method(s)</i>	None reported	None reported	Yes

This report is classified: TIER I

Rating levels are defined as:

TIER I EPA Air Method or EPA (other than air), State, or unknown method with Method Validation
TIER II State Agency method (e.g., California), no Method Validation
TIER III Unknown method, no Method Validation, good QA procedures
TIER IV Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

Particulate emissions were measured from a FCCU stack owned by Clark Oil and Refining Corporation. The Particulate Matter testing of the source was performed in accordance with U.S. EPA methods. Three 1-hour test runs were performed at or near maximum load on the source.

Representatives from the Illinois EPA were present during the test program. Sample calculations were conducted and are provided with complete field test data in the appendices of the test report. Documentation for quality assurance/quality control procedures that were conducted during the test are also provided in the appendices of the report (e.g., chain of custody, equipment calibration worksheets) and appear complete.

Final leak checks and other field QC checks were reported to be within the guidelines outlined in U.S. EPA Method 5.

Report No.: 27

Report Title: Total Particulate Matter and Particle Size Distribution FCC Stack, Clark Oil Refining Corporation, Hartford, Illinois, March 11, 1994

Docket No.: IV-D-19, Attachment 3

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Particulate	Methods 1-5			<i>EPA Method(s)</i>	None reported	None reported	Yes

This report is classified: TIER I

Rating levels are defined as:

TIER I	EPA Air Method or EPA (other than air), State, or unknown method with Method Validation
TIER II	State Agency method (e.g., California), no Method Validation
TIER III	Unknown method, no Method Validation, good QA procedures
TIER IV	Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

The purpose of this test was to conduct compliance air emissions testing on the FCC unit and included three 1-hour test runs. The air emissions testing included total particulate matter testing and particle size distribution analysis. It is stated that all emissions testing was conducted following the procedures outlined in 40 CFR 60, Appendix A. Review of this report included verification that sample data calculations were performed correctly. The following QA/QC documentation is provided in the appendices of the test report: field data sheets, laboratory data, equipment calibration records, and sample calculations. No audit procedures were reported.

Particle size distribution analysis was conducted from the particulate collected on the Method 5 filter. The analysis was conducted using the Elzone[®] analysis technique (Micromeritics Instrument Corporation). The Elzone analyzer counts and sizes the pulses that occur when particles in an electrolytic solution pass through an orifice tube (negative electrode).

Report No.: 28

Report Title: Confirmation of Information Emission Test Report, Clark Oil and Refining Corporation, Hartford, Illinois, April 1994

Docket No.: IV-D-19, Attachment 4

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Particulate	Methods 1-5			<i>EPA Method(s)</i>	None reported	None reported	Yes

This report is classified: TIER I

Rating levels are defined as:

TIER I EPA Air Method or EPA (other than air), State, or unknown method with Method Validation
TIER II State Agency method (e.g., California), no Method Validation
TIER III Unknown method, no Method Validation, good QA procedures
TIER IV Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

Particulate emissions were measured from a FCCU stack owned by Clark Oil and Refining Corporation. The Particulate Matter testing of the source was performed in accordance with U.S. EPA methods. Three 1-hour test runs were performed at or near maximum load on the source.

A representative from the Illinois EPA was present during the test program. Sample calculations were conducted and are provided with complete field test data in the appendices of the test report. Documentation for quality assurance/quality control procedures that were conducted during the test are also provided in the appendices of the report (e.g., chain of custody, equipment calibration worksheets) and appear complete.

Final leak checks and other field QC checks were reported to be within the guidelines outlined in U.S. EPA Method 5.

Report No.: 29

Report Title: Confirmation of Information Emission Test Report FCCU, Clark Oil and Refining Corporation, Hartford, Illinois, December 20, 1994

Docket No.: IV-D-19, Attachment 5

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Particulate	Methods 1-5			<i>EPA Method(s)</i>	None reported	None reported	Yes
Sulfur dioxide	Method 6C			<i>EPA Method(s)</i>	None reported	None reported	Yes
Carbon monoxide	Method 10			<i>EPA Method(s)</i>	None reported	None reported	Yes
Oxygen	Method 3			<i>EPA Method(s)</i>	None reported	None reported	Yes
Carbon dioxide	Method 3A			<i>EPA Method(s)</i>	None reported	None reported	Yes

This report is classified: TIER I

Rating levels are defined as:

TIER I EPA Air Method or EPA (other than air), State, or unknown method with Method Validation

TIER II State Agency method (e.g., California), no Method Validation

TIER III Unknown method, no Method Validation, good QA procedures

TIER IV Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

The purpose of this test program was to conduct emission testing programs for oxygen, carbon dioxide, sulfur dioxide, carbon monoxide, and particulate matter from the FCCU stack of a facility in Illinois. Three 1-hour test runs were performed at or near maximum load on the source. It is stated in the test report that all methods were performed in accordance with U.S. Environmental Protection Agency (U.S. EPA) methodology.

Stack gas emissions of carbon dioxide, oxygen, sulfur dioxide, and carbon monoxide from the source were measured with continuous emission monitors. Sample calculations were conducted and are provided with complete field test data in the appendices of the test report. Review of this report included verification that sample data calculations were performed correctly. Documentation for quality assurance/quality control procedures

that were conducted during the test are also provided in the appendices of the report (e.g., chain of custody, equipment calibration worksheets) and appear complete.

Final leak checks and other field QC checks were reported to be within the guidelines outlined in U.S. EPA Method 5.

Report No.: 30

Report Title: Source Emission Testing for Particulate Matter Size Distribution, Clark Oil and Refining Corporation, Hartford, Illinois, April 12, 1996

Docket No.: IV-D-19, Attachment 6

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Particulate	Methods 1-5			<i>EPA Method(s)</i>	None reported	None reported	Yes

This report is classified: TIER I

Rating levels are defined as:

- TIER I** EPA Air Method or EPA (other than air), State, or unknown method with Method Validation
TIER II State Agency method (e.g., California), no Method Validation
TIER III Unknown method, no Method Validation, good QA procedures
TIER IV Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

Particulate emissions were measured from a FCCU stack owned by Clark Oil and Refining Corporation. The particulate matter testing of the source was performed in accordance with U.S. EPA methods. Two 1-hour test runs were performed at or near maximum production load on the source.

Sample calculations were conducted and are provided with complete field test data in the appendices of the test report. Documentation for quality assurance/quality control procedures that were conducted during the test are also provided in the appendices of the report (e.g., chain of custody, equipment calibration worksheets) and appear complete.

Final leak checks and other field QC checks were reported to be within the guidelines outlined in U.S. EPA Method 5.

Report No.: 31

Report Title: Source Emissions Testing for Particulate Matter, Clark Oil and Refining Corporation, Hartford, Illinois, May 1, 1996

Docket No.: IV-D-19, Attachment 7

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Particulate	Methods 1- 5			<i>EPA Method(s)</i>	None reported	None reported	Yes

This report is classified: TIER I

Rating levels are defined as:

TIER I EPA Air Method or EPA (other than air), State, or unknown method with Method Validation

TIER II State Agency method (e.g., California), no Method Validation

TIER III Unknown method, no Method Validation, good QA procedures

TIER IV Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

The purpose of this test program was to conduct in-house emission tests for total particulate matter (PM) from the FCCU stack at a facility in Illinois. All tests were performed in accordance with U.S. EPA methodology. Three 1-hour test runs were performed at or near maximum production load.

Sample calculations were conducted and are provided with complete field test data in the appendices of the test report. Review of this report included verification that sample data calculations were performed correctly. Documentation for quality assurance/quality control procedures that were conducted during the test are also provided in the appendices of the report (e.g., chain of custody, equipment calibration worksheets) and appear complete.

Final leak checks and other field QC checks were reported to be within the guidelines outlined in U.S. EPA Method 5.

Report No.: 32

Report Title: Source Emissions Testing Report FCCU, Clark Oil and Refining Corporation, Hartford, Illinois, June 27, 1996

Docket No.: IV-D-19, Attachment 8

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Particulate	Methods 1-5			<i>EPA Method(s)</i>	None reported	None reported	Yes
Sulfur dioxide	Method 6 C			<i>EPA Method(s)</i>	None reported	None reported	Yes
Carbon monoxide	Method 10			<i>EPA Method(s)</i>	None reported	None reported	Yes
Carbon dioxide	Method 3A			<i>EPA Method(s)</i>	None reported	None reported	Yes
Oxygen	Method 3			<i>EPA Method(s)</i>	None reported	None reported	None reported

This report is classified: TIER I

Rating levels are defined as:

TIER I EPA Air Method or EPA (other than air), State, or unknown method with Method Validation

TIER II State Agency method (e.g., California), no Method Validation

TIER III Unknown method, no Method Validation, good QA procedures

TIER IV Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

Emission testing was conducted on a FCCU stack at a Clark Oil Facility. Emissions were determined for oxygen, carbon dioxide, particulate, sulfur dioxide and carbon monoxide. EPA Methods 3, 3A, 5, 6C and 10 were performed respectively. Calculations were conducted and provided in the

report for each pollutant tested. There was no reference as to whether quality assurance/quality control requirements were met. Chain of custody procedures were used to document sample handling. Test equipment data are provided in the appendix of the report.

Ancillary data collected includes particle size distribution by Polarized Light Microscopy (PLM).

Report No.: 33

Report Title: Source Emissions Testing for Particulate Size Distribution, Clark Oil and Refining Corporation, Hartford, Illinois, August 5, 1996.

Docket No.: IV-D-19, Attachment 9

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Particulate	Methods 1-5			<i>EPA Method(s)</i>	None reported	None reported	None Reported

This report is classified: TIER I

Rating levels are defined as:

TIER I EPA Air Method or EPA (other than air), State, or unknown method with Method Validation
TIER II State Agency method (e.g., California), no Method Validation
TIER III Unknown method, no Method Validation, good QA procedures
TIER IV Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

Emission tests for particulate matter (PM) size distribution from the FCCU stack at a Clark Oil facility located in Illinois were conducted using U.S. EPA Method 5 sample train to collect total particulate matter on glass fiber filters. Three 30-minute test runs were performed at or near maximum production load. Field test data, laboratory data, and chain of custody forms are provided in the appendices of the test report. Filter samples were sent to the RJ Lee Group, Inc., for particle size distribution. Particle size distributions were determined using computer-controlled scanning electron microscopy techniques.

Review of this report was to include verification that sample data calculations were performed correctly. However, no sample data calculations were provided in the test report. Copies of the field data sheets are included, along with charts of data results (see appendix B). No audits were conducted during emission testing. According to the test report, all method QA/QC requirements were met. However, specific QA/QC results were not reported as such and therefore could not be verified.

Report No.: 34

Report Title: Source Emissions Compliance Testing Report for PM, SO₂, FCCU, Clark Oil and Refining Corporation, Hartford, Illinois, August 7, 1996

Docket No.: IV-D-19, Attachment 10

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Particulate	Methods 1-5			<i>EPA Method(s)</i>	None reported	None reported	Yes
Carbon dioxide	Method 3A			<i>EPA Method(s)</i>	None reported	None reported	Yes
Sulfur dioxide	Method 6C			<i>EPA Method(s)</i>	None reported	None reported	Yes

This report is classified: TIER I

Rating levels are defined as:

- TIER I** EPA Air Method or EPA (other than air), State, or unknown method with Method Validation
TIER II State Agency method (e.g., California), no Method Validation
TIER III Unknown method, no Method Validation, good QA procedures
TIER IV Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

Emission testing was conducted on a FCC unit located at a Clark Oil facility. Emissions were tested for carbon dioxide, particulate matter, and sulfur dioxide. EPA Methods 3A, 5 and 6C were followed respectively. The O₂ and CO₂ testing were performed to correct the SO₂ reading for the quenching factor.

Sample data calculations were performed for each pollutant measured. According to the test report, all method QA/QC requirements were met. However, specific QA/QC results were not reported as such and therefore could not be verified. Final leak checks and other field QC checks were reported to be within the guidelines outlined in U.S. EPA Method 5.

QA/QC documentation such as field test data sheets, equipment calibration records, chain of custody forms, and calibration gas certificates are provided in the appendices of the test report and appear complete.

Report No.: 35

Report Title: Emission Compliance Test Program FCCU CO Boiler Stack, Marathon Oil Company, Robinson, Illinois, May 12, 1993

Docket No.: IV-D-20, Attachment 1

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Particulate	Methods 1-5			<i>EPA Method(s)</i>	None reported	None reported	Yes
Sulfur dioxide	Method 6C			<i>EPA Method(s)</i>	None reported	None reported	Yes
Nitrogen oxide	Method 7E			<i>EPA Method(s)</i>	None reported	None reported	Yes
Carbon monoxide	Method 10			<i>EPA Method(s)</i>	None reported	None reported	Yes

This report is classified: TIER I

Rating levels are defined as:

- TIER I** EPA Air Method or EPA (other than air), State, or unknown method with Method Validation
TIER II State Agency method (e.g., California), no Method Validation
TIER III Unknown method, no Method Validation, good QA procedures
TIER IV Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

An emission compliance test program was conducted on the FCCU CO Boiler stack at a Marathon Oil refinery located in Illinois. Specifically, compliance testing was conducted for particulate, sulfur dioxide, nitrogen oxides, and carbon monoxide at the exhaust stack location. According to the test report, test methods followed those as detailed in 40CFR, Part 60, Appendix A; EPA Methods 1-5, 6C, 7E and 10.

A representative from the Illinois EPA was present to observe the test series.

Review of this report included verification that sample data calculations were performed correctly. According to the test report, all method QA/QC requirements were met. However, specific QA/QC results were not reported as such and therefore could not be verified. QC documentation such as

field test data sheets, QA/equipment calibration records, chain of custody forms, and calibration gas certificates are provided in the appendices of the test report and appear complete.

Report No.: 36

Report Title: Emission Compliance Test Program FCCU CO Boiler Stack, Marathon Oil Company, Robinson, Illinois, August 4/5, 1993

Docket No.: IV-D-20, Attachment 2

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Particulate	Methods 1-5			<i>EPA Method(s)</i>	None reported	None reported	Yes
Sulfur dioxide	Method 6C			<i>EPA Method(s)</i>	None reported	None reported	Yes
Nitrogen oxides (as NO ₂)	Method 7E			<i>EPA Method(s)</i>	None reported	None reported	Yes
Opacity	Method 9			<i>EPA Method(s)</i>	None reported	None reported	None reported
Carbon monoxide	Method 10			<i>EPA Method(s)</i>	None reported	None reported	Yes

This report is classified: TIER I

Rating levels are defined as:

TIER I EPA Air Method or EPA (other than air), State, or unknown method with Method Validation

TIER II State Agency method (e.g., California), no Method Validation

TIER III Unknown method, no Method Validation, good QA procedures

TIER IV Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

Emission testing was conducted on a FCCU Boiler exhaust stack at a refinery located in Illinois. Emissions tested included particulate, sulfur dioxide, nitrogen oxides (as NO₂), opacity and carbon monoxide. Test methods followed those as detailed in 40CFR, Part 60, Appendix A; EPA Methods 1-5, 6C, 7E, 9, and 10. The test series was conducted under the following conditions: runs 1 and 3 each encompassed normal soot blowing, runs 2 and 4 each encompassed normal FCCU CO boiler operation, and runs 5 and 6 each encompassed modified soot blowing.

Representatives of the Illinois EPA were present to observe the test series.

Sample data calculations are provided in Appendix A. According to the test report, all method QA/QC requirements were met. However, specific QA/QC results were not reported as such and therefore could not be verified. QC documentation such as field test data sheets, equipment calibration records, chain of custody forms, and calibration gas certificates are provided in the appendices of the test report and appear complete.

Report No.: 37

Report Title: Particulate Emission Characterization Test Program FCCU CO Boiler Stack, Marathon Oil Company, Robinson, Illinois, March 9/10, 1994

Docket No.: IV-D-20, Attachment 3

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Particulate	Methods 1-5			<i>EPA Method(s)</i>	None reported	None reported	Yes

This report is classified: TIER I

Rating levels are defined as:

TIER I	EPA Air Method or EPA (other than air), State, or unknown method with Method Validation
TIER II	State Agency method (e.g., California), no Method Validation
TIER III	Unknown method, no Method Validation, good QA procedures
TIER IV	Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

An emission characterization test program was performed on the FCCU CO Boiler exhaust stack at a refinery located in Illinois. All methods were performed according to CFR40, Part 60, EPA Methods 1-5, the TNRCC Sampling and Laboratory Procedures Manual, and the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods. Total particulate, non-sulfate, and PM₁₀ (less than 10 µ particulate) emission rates in lbs/hr were calculated for each run and particle size distribution analysis was conducted using the Elzone[®] analysis technique (Micromeritics Instrument Corporation). The Elzone[®] analyzer counts and sizes the pulses that occur when particles in an electrolytic solution pass through an orifice tube (negative electrode).

Review of this report included verification that sample data calculations were performed correctly. QA/QC results were not reported and therefore could not be verified. QC documentation such as field test data sheets, equipment calibration records, and chain of custody forms are provided in the appendices of the test report and appear complete.

Report No.: 38

Report Title: Particulate Emission Compliance Test Program FCCU CO Boiler Stack, Marathon Oil Company, Robinson, Illinois, June 27, 1994

Docket No.: IV-D-20, Attachment 4

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Particulate	Methods 1-5			<i>EPA Method(s)</i>	None reported	None reported	Yes

This report is classified: TIER I

Rating levels are defined as:

- TIER I** EPA Air Method or EPA (other than air), State, or unknown method with Method Validation
TIER II State Agency method (e.g., California), no Method Validation
TIER III Unknown method, no Method Validation, good QA procedures
TIER IV Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

Emissions testing was conducted on the FCCU CO Boiler at a refinery in Illinois for demonstration of compliance with the particulate emission standard. Particulate emission testing was conducted following EPA Methods 1-5. Representatives of the Illinois EPA and a representative of the U.S. EPA were present to observe the test series. The test series was conducted under the following conditions: runs 1 and 2 each encompassed normal operation and run 3 encompassed soot blowing.

Sample data calculations and process data are provided in the appendices of the test report. Specific QA/QC results were not reported and therefore could not be verified. QC documentation such as field test data sheets, equipment calibration records, and chain of custody forms are provided in the appendices of the test report and appear complete.

Report No.: 39

Report Title: Particulate Emission Compliance Test Program FCCU CO Boiler Stack, Marathon Oil Company, Robinson, Illinois, August 9, 1994

Docket No.: IV-D-20, Attachment 5

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Particulate	Methods 1-5			<i>EPA Method(s)</i>	None reported	None reported	Yes
Opacity	Method 9			<i>EPA Method(s)</i>	None reported	None reported	Yes

This report is classified: TIER I

Rating levels are defined as:

- TIER I** EPA Air Method or EPA (other than air), State, or unknown method with Method Validation
TIER II State Agency method (e.g., California), no Method Validation
TIER III Unknown method, no Method Validation, good QA procedures
TIER IV Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

A particulate emission compliance test program was performed on the FCCU CO Boiler stack at a refinery located in Illinois. A continuous soot blowing system was installed prior to this test program and was operational during the particulate testing. Three 60-minute runs were conducted to determine total particulate emission rates and visible emissions. Test methods followed those as detailed in the CFR40, Part 60, Appendix A; EPA Methods 1-5 and 9. Representatives of the Illinois EPA were present to observe the test series.

Review of this report included verification that sample data calculations were performed correctly. Specific QA/QC results were not reported and therefore could not be verified. QC documentation such as field test data sheets, equipment calibration records, and chain of custody forms are provided in the appendices of the test report and appear complete.

Report No.: 40

Report Title: Emission Compliance Test Program FCCU CO Boiler Stack, Marathon Oil Company, Robinson, Illinois, March 14, 1995

Docket No.: IV-D-20, Attachment 6

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Particulate	Methods 1-5			<i>EPA Method(s)</i>	None reported	None reported	Yes
Sulfur dioxide	Method 6C			<i>EPA Method(s)</i>	None reported	None reported	Yes
Carbon monoxide	Method 10			<i>EPA Method(s)</i>	None reported	None reported	Yes
Opacity	Method 9			<i>EPA Method(s)</i>	None reported	None reported	None reported
Oxygen	Method 3			<i>EPA Method(s)</i>	None reported	None reported	None reported

This report is classified: TIER I

Rating levels are defined as:

TIER I EPA Air Method or EPA (other than air), State, or unknown method with Method Validation

TIER II State Agency method (e.g., California), no Method Validation

TIER III Unknown method, no Method Validation, good QA procedures

TIER IV Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

This test summary includes data from emission testing on a FCCU CO Boiler stack as well as emission sampling from a FCCU Regenerator Duct. Emissions testing conducted on the boiler stack included particulate, sulfur dioxide, and carbon monoxide. Sampling of carbon dioxide, carbon monoxide, and oxygen were conducted on the Regenerator Duct and used to calculate the material balance over the CO Boiler. A continuous soot blowing system installed on the CO Boiler was operational during the emission testing. Representatives of the Illinois EPA were present to observe the test series.

Test methods followed those as detailed in 40CFR, Part 60, Appendix A; U.S. EPA Methods 1-5, 6C, 9, and 10 and the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods.

Review of this report included verification that sample data calculations were performed correctly. According to the test report, all method QA/QC requirements were met. However, specific QA/QC results were not reported as such and therefore could not be verified. QC documentation such as field test data sheets, equipment calibration records, chain of custody forms, and calibration gas certificates are provided in the appendices of the test report and appear complete.

Report No.: 41

Report Title: Superior Refinery FCCU Stack Test Reports, Murphy Oil, USA, Incorporated, Superior, Wisconsin, January 1995

Docket No.: IV-D-21, Attachment 1

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Particulate	Methods 1-5 and 5F			<i>EPA Method(s)</i>	None reported	None reported	Yes
Sulfur dioxide	Method 6C			<i>EPA Method(s)</i>	None reported	None reported	Yes
Nitrogen oxides	Method 7E			<i>EPA Method(s)</i>	None reported	None reported	Yes
Total VOC	Method 25A with THC Analyzer			<i>EPA Method(s)</i>	None reported	None reported	Yes
Nickel	Method 29 with ICP			<i>EPA Method(s)</i>	None reported	None reported	Yes
Formaldehyde			Method 0011 (SW-846)	<i>EPA Method(s)</i>	None reported	None reported	Yes
Ammonia		Sampling train was similar to U.S. EPA Method 5 and analysis was performed by HPLC		None reported	None reported	None reported	Yes
Polycyclic Organic Matter		Method 23 with HPLC		<i>EPA Method(s)</i>	None reported	None reported	Yes

This report is classified: TIER I

Rating levels are defined as:

TIER I	EPA Air Method or EPA (other than air), State, or unknown method with Method Validation
TIER II	State Agency method (e.g., California), no Method Validation
TIER III	Unknown method, no Method Validation, good QA procedures
TIER IV	Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

A comprehensive emission compliance test program was conducted on the FCCU ESP exhaust stack at a refinery located in Wisconsin. Test methods followed those as detailed in the 40CFR, Part 60, U.S. EPA Methods 1 - 4, 5/5F, 6C, 7E, 23, 25A, and 29, 40CFR, Part 266, Method 0011, SW-846 Method 0010 (Modified Method 5) and the Wisconsin DNR test methods and procedures described in NR440 and NR445. A representative of the Wisconsin Department of Natural Resources (DNR) was present to observe the test series.

Review of this report included verification that sample data calculations were performed correctly. According to the report, all method QA/QC requirements were met. However, specific QA/QC results were not reported as such and therefore could not be verified. Comprehensive QC documentation including field test data sheets, equipment calibration records, chain of custody forms, standard certificates of analysis, and calibration gas certificates are provided in the appendices of the test report and appear complete.

Report No.: 42

Report Title: Particulate Emissions Test Program FCCU-ESP Exhaust Stack, Murphy Oil, USA, Incorporated, Superior, Wisconsin, November 20, 1996

Docket No.: IV-D-21, Attachment 2

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Particulate	Methods 1- 5 and 5F			<i>EPA Method(s)</i>	None reported	None reported	Yes

This report is classified: TIER I

Rating levels are defined as:

TIER I	EPA Air Method or EPA (other than air), State, or unknown method with Method Validation
TIER II	State Agency method (e.g., California), no Method Validation
TIER III	Unknown method, no Method Validation, good QA procedures
TIER IV	Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

An informal emission test was conducted on a FCCU-ESP Exhaust stack. Particulate emissions were sampled using EPA Method 5 and samples were analyzed by EPA Methods 5 and 5F to determine total particulates and non-sulfate particulates respectively. Test methods followed the requirements in 40CFR, Part 60, Appendix A; U.S. EPA Methods 1-4, 5, and 5F as well as the Quality Assurance Handbook for Air Pollution Measurement Systems; Volume III, Stationary Sources Specific Methods. Specifically, analysis of the front half particulate was conducted with U.S. EPA Method 5 and 5F to determine the total particulate and non-sulfate particulate. The back half impinger catch was analyzed for particulate in accordance with the Wisconsin DNR procedures for total back half particulate determination.

Extensive sample data calculations are provided in the appendix of the test report. Specific QA/QC results were not reported and therefore could not be verified. However, QC documentation such as field test data sheets and equipment calibration records are provided in the appendices of the test report and appear complete.

Report No.: 43

Report Title: Particulate Emission Compliance Test Program FCCU ESP Exhaust Stack, Murphy Oil, USA, Incorporated, Superior, Wisconsin, August 20, 1997

Docket No.: IV-D-31, Attachment 3

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Particulate	Methods 1-5 and 5F			<i>EPA Method(s)</i>	None reported	None reported	Yes, see below

This report is classified: TIER I

Rating levels are defined as:

- TIER I** EPA Air Method or EPA (other than air), State, or unknown method with Method Validation
TIER II State Agency method (e.g., California), no Method Validation
TIER III Unknown method, no Method Validation, good QA procedures
TIER IV Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

A formal particulate emission compliance test program was conducted on the FCCU ESP stack at a refinery located in Wisconsin. Test methods followed the requirements specified in the 40CFR, Part 60, 1996, Appendix A, U.S. EPA Methods 1-4 and 5/5F, the Quality Assurance Handbook for Air Pollution Measurements Systems; Volume III, Stationary Sources Specific Methods and the Wisconsin DNR test methods and procedures described in NR 415 and NR 440.

Review of this report was to include verification that sample data calculations were performed correctly. However, the value for λ was not reported, making the calculations and results impossible to verify. QC documentation such as field test data sheets, equipment calibration records, and calibration gas certificates are provided in the appendices of the test report and appear complete.

Report No.: 44

Report Title: Stack Emissions Test, Coastal Eagle Point Oil Company, Westville, New Jersey, August 15, 1996 and December 11, 1996

Docket No.: IV-D-51

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Particulate	None reported			None reported	None reported	None reported	None reported
Sulfur oxides (as SO ₂)	None reported			None reported	None reported	None reported	None reported
SO ₃ & H ₂ SO ₄ (as H ₂ SO ₄)	None reported			None reported	None reported	None reported	None reported
Nitrogen oxides (as NO ₂)	None reported			None reported	None reported	None reported	None reported
Carbon monoxide	None reported			None reported	None reported	None reported	None reported
Non-methane hydrocarbons	None reported			None reported	None reported	None reported	None reported
Benzene	None reported			None reported	None reported	None reported	None reported
Ammonia	None reported			None reported	None reported	None reported	None reported
Cyanide	None reported			None reported	None reported	None reported	None reported

This report is classified: TIER IV

Rating levels are defined as:

TIER I EPA Air Method or EPA (other than air), State, or unknown method with Method Validation

TIER II State Agency method (e.g., California), no Method Validation

TIER III Unknown method, no Method Validation, good QA procedures

TIER IV Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

The purpose of this test was to compare emissions from a FCC unit to the allowable emissions given from a referenced permit. Emissions listed included particulate, sulfur oxides, sulfuric acid mist, nitrogen oxides, carbon monoxide, total non-methane hydrocarbons, benzene, ammonia, and cyanide. Results of nitrogen oxide emissions were found to have exceeded allowable limits. There was no report of which methods were used nor of any quality assurance/quality control procedures being carried out.

No QA/QC documentation such as field test data sheets, equipment calibration records, chain of custody forms, or calibration gas certificates are provided.

Report No.: 45

Report Title: Evaluation Test Report: Determination of Emissions from the No. 3 Reformer at Tosco Refining, San Francisco, California, February 26, 1999

Docket No.: IV-D-62

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Carbon dioxide			CARB Method 100-Nondispersive infra-red (NDIR)	None reported	Yes	See below	Yes
Carbon monoxide			CARB Method 100-Gas filter correlation (NDIR)	None reported	Yes	See below	Yes
Nitrogen oxides			CARB Method 100-Chemiluminescence	None reported	Yes	See below	Yes
Sulfur dioxide			CARB Method 100-Ultraviolet photometry	None reported	Yes	See below	Yes
Total hydrocarbons			CARB Method 100-Flame ionization detector	None reported	Yes	See below	Yes
Oxygen			CARB Method 100-Paramagnetic	None reported	Yes	See below	Yes

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
PCDD/PCDF	Method 23	Continuous sampling according to CARB Method 100 for stack gas molecular weight	HRGC/HRMS	None reported	Yes	See below	Yes
Polychlorinated biphenyls (PCBs)	Method 23	See below*	HRGC/HRMS	None reported	Yes	See below	Yes
Polycyclic aromatic hydrocarbons (PAHs)			CARB Method 429 with HRGC/HRMS	None reported	Yes	See below	Yes

This report is classified: TIER II

Rating levels are defined as:

TIER I	EPA Air Method or EPA (other than air), State, or unknown method with Method Validation
TIER II	State Agency method (e.g., California), no Method Validation
TIER III	Unknown method, no Method Validation, good QA procedures
TIER IV	Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

The California Air Resources Board (CARB) conducted emissions tests at a catalytic reforming unit at a refinery located in San Francisco. The source test was the second in a series of tests to collect emissions data to supplement the existing HAP emissions data for refinery processes.

QA/QC procedures include several different types of blanks, including trip blanks, method blanks, etc. There were also cleaning and contamination checks to limit possible contamination from glassware, filters and resin. Isokinetic sampling was kept at $100 \pm 10\%$ for all sampling trains, and leak

checks were all within allowed levels. Surrogate, internal, and alternate standard recoveries were used to determine both levels within samples and the ability of the resin to both sample and then retain the target analytes. Finally, laboratory control samples (LCS) were created to test recoveries, and all recoveries were within the $100 \pm 50\%$ range (for pollutants-PCDD/PCDF, PCBs, PAHs). A performance evaluation sample (PE) was also sent by the EPA to the lab, and the results have been submitted to the EPA (pg. 62-78).

Review of this report included verification that sample data calculations were performed correctly. QC documentation such as field test data sheets, equipment calibration records, chain of custody forms, and calibration gas certificates are provided in the appendices of the test report and appear complete. Extensive charts of all the results from both continuous sampling and calculation results are provided.

Target PAH analytes: naphthalene, 2-methylnaphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, anthracene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(e)pyrene, benzo(a)pyrene, perylene, indeno(1,2,3-cd)pyrene, dibenzo(a,h)anthracene, benzo(ghi)perylene.

*Minor method modifications were necessary to determine PCBs in the same sample and to meet the ARB Method 428 reporting requirements for the target compounds (dioxins and furans).

Report No.: 46

Report Title: Emission Test Report, Marathon Ashland Petroleum LLC, Garyville, Louisiana, January 1, 1998 through June 30, 1998

Docket No.: IV-J-5

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Total particulate hazardous air pollutants (HAP)	Not given			None reported	None reported	None reported	None reported
Weighted particulate hazardous air pollutants	Not given			None reported	None reported	None reported	None reported
Total gaseous hazardous air pollutants	Not given			None reported	None reported	None reported	None reported
Weighted gaseous hazardous air pollutants	Not given			None reported	None reported	None reported	None reported

See discussion below for details of emissions reported.

This report is classified: TIER IV

Rating levels are defined as:

- TIER I** EPA Air Method or EPA (other than air), State, or unknown method with Method Validation
TIER II State Agency method (e.g., California), no Method Validation
TIER III Unknown method, no Method Validation, good QA procedures
TIER IV Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

This test report is the second semiannual report of emissions for 1998 at a Marathon Ashland Louisiana refinery which is required under their *early reductions specialty permit*. A summary of the total actual HAP emissions as well as the established Alternate Emission Limit (AEL) are provided in the report. The procedures used to determine emissions from each emission unit are not provided, however the emission results are summarized in the appendices of the report.

The following permit items were in compliance during the testing period (first half of 1998) according to the report: dock flow meters; MVC infrared detector; MVC color camera; vapor tightness; MVC annual leak test; PCE injection meter; FCCU catalysts metals analyses; and continuous monitoring of FCCU scrubber performance parameters.

FCCU vent pollutants measured: arsenic; chromium; mercury; nickel; cadmium; lead; selenium.

Speciated particulate emissions reported: arsenic; barium; cadmium; chromium; copper; lead; mercury; nickel; selenium; silver; vanadium; zinc.

Platformer regenerator vent pollutants measured: HCl and Cl₂.

Stack test data reported: catalyst regeneration rate; perchloroethylene injection rate; HCl emission rate; Cl₂ emission rate.

Marine and barge loading operations emissions reported: n-hexane; benzene; toluene; ethylbenzene; xylene; 2,2,4-trimethylpentane; cresols; naphthalene.

Shipments made over the docks by barge and ship were reported in barrels with marine loading emission factors. In addition, semiannual loading emissions were reported for gasoline (ship/barge), fuel oil, turbine fuel, kerosene, platformate, naphtha, cracking stock, n-butane, i-butane, asphalt, and alkylates.

Lastly, speciated VOC emissions contributed by product loading was reported for 24 VOCs. QA/QC results were not reported and therefore could not be verified.

Report No.: 47

Report Title: RCRA Trial Burn Report for CO Boiler No. 1 at the Shell Oil Manufacturing Complex, Martinez, California, April 1989 (Revised October 1989)

Docket No.: IV-J-8

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Toluene feed			Method S004 Method 8015 (SW-846)	<i>EPA Method(s)</i>	Yes	Yes, see below	Yes
Toluene	Method 18			<i>EPA Method(s)</i>	Audit cylinder AAL-17620	Yes, see below	Yes
Benzene	Method 18			<i>EPA Method(s)</i>	None reported	Yes, see below	None reported
Particulate	Methods 1-5			<i>EPA Method(s)</i>	None reported	Yes, see below	None reported
Carbon monoxide	Method 10			<i>EPA Method(s)</i>	None reported	Yes, see below	None reported
Carbon dioxide	Method 3A			<i>EPA Method(s)</i>	None reported	Yes, see below	None reported
Oxygen	Method 3A			<i>EPA Method(s)</i>	None reported	Yes, see below	None reported
Total unburned hydrocarbons	Method 25A			<i>EPA Method(s)</i>	None reported	Yes, see below	None reported
Van condensate	Method 6C		Method 602 (SW-846)	<i>EPA Method(s)</i>	None reported	Yes, see below	None reported
Probe wash/ condensate			Method 602 (SW-846)	<i>EPA Method(s)</i>	None reported	Yes, see below	None reported
Metals (stack gas)	Method 5		Method 3050 (SW-846)	<i>EPA Method(s)</i>	None reported	Yes, see below	None reported

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Metals (waste liquid feed)			Method S004 Method 3050 ^A (SW-846)	<i>EPA Method(s)</i>	None reported	Yes, see below	None reported

This report is classified: TIER I

Rating levels are defined as:

TIER I EPA Air Method or EPA (other than air), State, or unknown method with Method Validation
TIER II State Agency method (e.g., California), no Method Validation
TIER III Unknown method, no Method Validation, good QA procedures
TIER IV Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

This test report contains the results of a trial burn conducted for the Shell Oil catalytic cracker CO boiler system over a 3-4 week time period in 1989. This trial burn was to support an operating permit application under RCRA. The tests were designed to demonstrate that the boiler met the performance requirements of RCRA. The trial burn was performed under the regulatory authority of the California Department of Health Services and Region IX of the U.S. EPA.

The report states that QA/QC procedures were in accordance with EPA protocols. The report contains a detailed explanation of the QA/QC procedures that were enacted in the analytical portion of the study including trip blanks, storage blanks, laboratory blanks, duplicate and spike recovery analysis. An audit analysis was performed for the onsite GC/PID. QC documentation such as field test data, equipment calibration records, and chain of custody forms are listed in the table of contents but not appended to the test report.

^ASamples were prepared using Method 3050 and depending on the metals species, SW-846, Method 6010, 7041, 7060, 7420, 7470, 7740, or 7841 was used for analysis. Metals measured in stack gas particulate: aluminum; antimony; arsenic; barium; beryllium; cadmium; chromium; cobalt; copper; iron; lead; manganese; nickel; selenium; silver; sodium; thallium; vanadium; zinc.

Review of this report was to include verification that sample data calculations were performed correctly. However, no verifiable sample data calculations were provided in the test report.

Report No.: 48

Report Title: RCRA Trial Burn Report for CO Boiler No. 2 at the Shell Oil Manufacturing Complex, Martinez, California, November 1991

Docket No.: IV-J-12

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Waste Liquid Feed: Flow			EPA 625/6-89/021	<i>EPA Method</i>	None reported	Yes, see below	None reported
Heating value			ASTM D 240 87 EPA S004 and EPA 600/8-84-0023	None reported	None reported	Yes, see below	None reported
Ash, % by weight			ASTM D482-87 EPA S004	None reported	None reported	Yes, see below	None reported
Viscosity			ASTM D 445-88 EPA S004	None reported	None reported	Yes, see below	None reported
Water, % by weight			ASTM D 4281-83 EPA S004	None reported	None reported	Yes, see below	None reported
Organic phase, % w			ASTM D 4281-83 EPA S004	None reported	None reported	Yes, see below	None reported
Ultimate analysis			ASTM D 3178-84, ASTM D 3179-84, ASTM D 3174-88 EPA S004	None reported	None reported	Yes, see below	None reported
Metals*:			EPA S004, EPA SW-846 3040	<i>EPA Method</i>	None reported	Yes, see below	None reported
Antimony			EPA SW-846 7041	<i>EPA Method</i>	None reported	Yes, see below	None reported

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Arsenic			EPA SW-846 7060	<i>EPA Method</i>	None reported	Yes, see below	None reported
Barium			EPA SW-846 6010	<i>EPA Method</i>	None reported	Yes, see below	None reported
Beryllium			EPA SW-846 6010	<i>EPA Method</i>	None reported	Yes, see below	None reported
Cadmium			EPA SW-846 6010	<i>EPA Method</i>	None reported	Yes, see below	None reported
Chromium			EPA SW-846 6010	<i>EPA Method</i>	None reported	Yes, see below	None reported
Copper			EPA SW-846 6010	<i>EPA Method</i>	None reported	Yes, see below	None reported
Lead			EPA SW-846 7421	<i>EPA Method</i>	None reported	Yes, see below	None reported
Mercury			EPA SW-846 7471	<i>EPA Method</i>	None reported	Yes, see below	None reported
Molybdenum			EPA SW-846 6010	<i>EPA Method</i>	None reported	Yes, see below	None reported
Nickel			EPA SW-846 6010	<i>EPA Method</i>	None reported	Yes, see below	None reported
Selenium			EPA SW-846 7740	<i>EPA Method</i>	None reported	Yes, see below	None reported
Silver			EPA SW-846 6010	<i>EPA Method</i>	None reported	Yes, see below	None reported

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Thallium			EPA SW-846 7841	<i>EPA Method</i>	None reported	Yes, see below	None reported
Vanadium			EPA SW-846 6010	<i>EPA Method</i>	None reported	Yes, see below	None reported
Zinc			EPA SW-846 6010	<i>EPA Method</i>	None reported	Yes, see below	None reported
Organics-waste liquid feed			EPA S004, EPA SW-846 8240/8270	<i>EPA Method(s)</i>	None reported	Yes, see below	None reported
Toluene/benzene feed			EPA S004 Modified EPA SW-846 8020	None reported	None reported	Yes, see below	None reported
Toluene/benzene feed flow			EPA 625/6-89/021	EPA Method(s)	None reported	Yes, see below	None reported
<u>Stack Gas:</u> Toluene			VOST SW-846 0030/5040	EPA Method(s)	Yes	Yes, see below	None reported
Benzene			VOST SW-846 0030/5040	EPA Method(s)	Yes	Yes, see below	None reported
Carbon monoxide	Method 10			<i>EPA Method</i>	None reported	Yes, see below	None reported
TUHC	Method 25A			<i>EPA Method</i>	None reported	Yes, see below	None reported
Particulate	Methods 1-5			EPA Method(s)	None reported	Yes, see below	None reported

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
HCl			CARB Method 421	None reported	None reported	Yes, see below	None reported
Metals*	Draft metals sampling train			<i>EPA Method</i>	None reported	Yes, see below	None reported

See discussion below for a more detailed description of pollutants measured.

This report is classified: TIER II

Rating levels are defined as:

TIER I EPA Air Method or EPA (other than air), State, or unknown method with Method Validation

TIER II State Agency method (e.g., California), no Method Validation

TIER III Unknown method, no Method Validation, good QA procedures

TIER IV Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

This test report presents the results of the trial burn for a CO Boiler which was required to comply with Federal EPA performance standards determined by RCRA and California EPA for industrial boilers burning hazardous waste. Seven test runs were conducted during the trial burn in August, 1991. The tests were conducted under each of two worst-case boiler operating conditions. Representative liquid hazardous waste containing principal organic hazardous constituents was used in the emission testing.

During the trial burn, liquid waste feed was analyzed for heating value, ash, viscosity, water and organic phase content, ultimate analysis, metals content, and 40CFR 261 Appendix VIII constituents. The POHC feed rate and concentration was also measured. The POHCs selected for these tests were toluene and benzene. Particulate matter was analyzed for total weight and metals content. HCl and metals emissions were also sampled in the stack gas. Carbon monoxide, carbon dioxide, oxygen, total hydrocarbons, waste feed and stack gas flow rates were monitored by continuous emission analyzers and flow monitors.

The following results are also reported: composition of the catalytic cracker regenerator offgas (CO); composition of flexicoker gas; composition of refinery fuel gas; composition of low sulfur fuel oil; waste liquid characteristics including the following metals*: antimony, arsenic, barium,

beryllium, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc. Results are also reported for heating value; viscosity; water; ash content; chlorine; and ultimate analysis (carbon, oxygen, hydrogen, nitrogen, phosphorus, ash, sulfur).

Waste feed volatile organics: methylene chloride; carbon disulfide; chloroform; 1,2-dichloroethane; 2-butanone; 1,4-dioxane; 1,1,1-trichloroethane; 1,2-dichloropropane; trichloroethene; 1,2-dibromoethane; benzene; tetrachloroethene; 1,1,2,2-tetrachloroethane; toluene; chlorobenzene; ethylbenzene; styrene; zylene (total).

Waste feed semi-volatile organics: pyridine; phenol; aniline; 2-chlorophenol; 1,3-dichlorobenzene; 1,4-dichlorobenzene; 1,2-dichlorobenzene; 2-methylphenol; 4-methylphenol; nitrobenzene; 2,4-dimethylphenol; naphthalene; 2,4,6-trichlorophenol; dimethylphthalate; 2,4-dinitrophenol; 4-nitrophenol; 2,4-dinitrotoluene; diethylphthalate; 4,6-dinitro-2-methylphenol; phenanthrene; anthracene; di-n-butylphthalate; fluoroanthene; pyrene; butylbenzylphthalate; benzo(a)anthracene; bis(2-ethylhexyl)phthalate; chrysene; di-n-octylphthalate; benzo(b)fluoranthene; benzo(k)fluoranthene; benzo(a)pyrene; indeno(1,2,3-cd)pyrene; dibenzo(a,h)anthracene; 7,12-dimethylbenz(a)anthracene; dibenz(a,h)acridine.

The test report describes the equipment, test methods, operating procedures, and quality assurance methodology employed during the test. Quality assurance procedures were thoroughly implemented according to section 5.0. A failed pitot tube, post-test leak check invalidated run 3. The data for run 3 is provided in table 4-6 along with the replacement run 7. Quality assurance performance is presented in table 5-1 of the test report for all methods and pollutants. According to this table, all quality parameters met requirements.

Documentation of all calibrations and chain of custody are said to be provided in Appendix E, which is not attached.

An audit analysis of the VOST was conducted at the end of the trial burn. Two audit cylinders were analyzed for benzene and toluene by sampling the cylinders via a manifold system.

ASTM Method description:

ASTM D240-87	Standard Test Method for Heat of Combustion of Liquid Hydrocarbon Fuels by Bomb Calorimeter
ASTM D482-87	Standard Test method for Ash from Petroleum Products
ASTM D445-88	Standard Test Method for Kinematic Viscosity of Transparent and Opaque Liquids (Calculation of Dynamic Viscosity)
ASTM D4281-83	Standard Test Method for Oil and Grease (Fluorocarbon Extractable Substances) by Gravimetric Determination
ASTM D 3178-84	Standard Test Method for Carbon and Hydrogen in the Analysis Sample of Coal and Coke
ASTM D 3179-84	Standard Test Method for Nitrogen in the Analysis of Coal and Coke
ASTM D 3174-88	Standard Test Method for Ash in the Analysis Sample of Coke from Coal

Report No.: 49

Report Title: Trial Burn Report for CO Boiler No. 3 at the Shell Oil Manufacturing Complex, Martinez, California, December 16, 1993

Docket No.: IV-J-13

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Volatile organics including toluene and benzene			Method 8240	<i>EPA Method</i>	Yes	See below	None reported
Semivolatile organics			Method 8270	<i>EPA Method</i>	None reported	See below	None reported
Ash			ASTM D482-91	None reported	None reported	See below	None reported
Water			ASTM D1744	None reported	None reported	See below	None reported
Viscosity			ASTM D88	None reported	None reported	See below	None reported
Chloride			Method D9252	<i>EPA Method</i>	None reported	See below	None reported
Ultimate analysis (% by weight) Carbon Oxygen Hydrogen Nitrogen Phosphorous Ash			ASTM D5291-92 ASTM D3176-89 ASTM D5291-92 ASTM D3179-84 AO21 ASTM D3174-89	None reported	None reported	See below	None reported
Antimony			Method 7041 (GFAAs)	<i>EPA Method</i>	None reported	See below	None reported
Arsenic			Method 7060 (GFAAs)	<i>EPA Method</i>	None reported	See below	None reported

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Barium			Method 6010 (GFAAs)	<i>EPA Method</i>	None reported	See below	None reported
Beryllium			Method 6010 (GFAAs)	<i>EPA Method</i>	None reported	See below	None reported
Cadmium			Method 6010 (GFAAs)	<i>EPA Method</i>	None reported	See below	None reported
Chromium			Method 6010 (GFAAs)	<i>EPA Method</i>	None reported	See below	None reported
Lead			Method 7421 (GFAAs)	<i>EPA Method</i>	None reported	See below	None reported
Mercury			Method 7471 (GFAAs)	<i>EPA Method</i>	None reported	See below	None reported
Silver			Method 6010 (GFAAs)	<i>EPA Method</i>	None reported	See below	None reported
Thallium			Method 7841 (GFAAs)	<i>EPA Method</i>	None reported	See below	None reported
Toluene			Method 0030	<i>EPA Method</i>	Yes	See below	None reported
Benzene			Method 0030	<i>EPA Method</i>	Yes	See below	None reported
Particulate	Methods 1-5			<i>EPA Method</i>	None reported	See below	None reported
PCDD/PCDF	Method 23			<i>EPA Method</i>	Yes	See below	None reported
Stack gas HCl/Cl ₂			Method 0050	<i>EPA Method</i>	None reported	See below	None reported

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Stack gas total unburned hydrocarbons	Method 25A			<i>EPA Method</i>	None reported	See below	None reported

This report is classified: TIER II

Rating levels are defined as:

- TIER I** EPA Air Method or EPA (other than air), State, or unknown method with Method Validation
- TIER II** State Agency method (e.g., California), no Method Validation
- TIER III** Unknown method, no Method Validation, good QA procedures
- TIER IV** Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

Trial burn performance testing was conducted at a manufacturing complex in California. The purpose of this test program was to demonstrate the ability of CO Boiler No. 3 to meet federal RCRA performance standards while burning representative hazardous waste containing POHCs. Benzene and toluene were designated as the POHCs of interest for the trial burn. Boiler exhaust emissions were determined for particulate matter, hydrogen chloride/chlorine, multiple metals, and dioxins/furans under four different operating conditions. Three replicate sampling runs were conducted during each operating condition. The pollutants listed in the above table were measured in the waste feed and/or stack gas, as applicable.

According to the test report, QA/QC results indicated that data was well documented, reliable, and defensible and met the project data objectives as defined in the Quality Assurance Project Plan (QAPP). Extensive QA/QC procedures including blanks, surrogate recoveries, duplicates were conducted. There is some specific discussion of QC results which are outside the acceptance limits, the cause, and corrective action taken. Three dioxin/furan audit samples were by U.S. EPA. The audit samples consisted of a blank, a low level, and a medium level dioxin/furan sample that contained tetra- through octa-isomers of PCDDs and PCDFs.

A performance audit was conducted of the VOST sampling system for toluene and benzene during the trial burn. This audit consisted of collecting a gas sample of toluene and benzene from a U.S. EPA gas cylinder. A representative from the California Department of Toxic Substances Control (DTSC) observed collection of the audit samples. Results of the audits are contained in Appendix A, which is not attached to the test plan.

Review of this report was to include verification that sample data calculations were performed correctly. However, no sample data calculations were provided in the test report. According to the test report, all method QA/QC requirements were met. However, not all QA/QC results were reported as such and therefore could not be verified. The test report states that QC documentation such as field test data sheets, equipment calibration records, chain of custody forms, and calibration gas certificates are provided in the appendices of the test report, however the appendices are not present.

The individual 4 VOCs and 19 SVOCs detected are presented in tables in the test report.

ASTM Method Description:

ASTM D482-91	Standard Test Method for Ash from Petroleum Products
ASTM D1744	Standard Test Method for Determination of Water in Liquid Petroleum Products by Karl Fischer Reagent
ASTM D88	Standard Test Method for Saybolt Viscosity
ASTM D5291-92	Standard Test Method for Instrumental Detection of Carbon, Hydrogen, and Nitrogen in Petroleum Products/Lubricants
ASTM D3176-89	Standard Test Method for Ultimate Analysis of Coal and Coke
ASTM D3179-84	Standard Test Method for Nitrogen in the Analysis of Coal and Coke
ASTM D3174-89	Standard Test Method for Ash in the Analysis Sample of Coke from Coal

Report No.: 50

Report Title: Test Report for E00on Company, USA, Benecia, California, February 12-20, 1990

Docket No.: IV-J-9

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Polycyclic aromatic hydrocarbons (PAHs)			CARB 429	None reported	None reported	See below	Yes
Phenols			CARB 429	None reported	None reported	See below	Yes
Formaldehyde			CARB 430	None reported	None reported	See below	Yes
Acetaldehyde			CARB 430	None reported	None reported	See below	Yes
H ₂ S			CARB 11	None reported	None reported	See below	
Total and hexavalent chromium			CARB 425/EPA 7191	None reported	None reported	See below	Yes
Benzene			CARB 410A	None reported	None reported	See below	
1,3-Butadiene			CARB 410A	None reported	None reported	See below	
NH ₃			BAAQMD ST-1B	None reported	None reported	See below	Yes
Total Metals*	EPA Metals Method**		See below	<i>EPA Method</i>	None reported	See below	Yes

This report is classified: TIER II

Rating levels are defined as:

TIER I	EPA Air Method or EPA (other than air), State, or unknown method with Method Validation
TIER II	State Agency method (e.g., California), no Method Validation
TIER III	Unknown method, no Method Validation, good QA procedures
TIER IV	Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

Emission testing was conducted on a FCCU stack at an Exxon refinery. Tests were conducted for PAHs, NH₃, H₂S, benzene and 1,3-butadiene in triplicate while five tests were performed for total metals at the main stack.

*Metals that were measured: arsenic, beryllium, cadmium, total chromium, copper, lead, manganese, mercury, nickel, selenium, zinc.

**Metals samples were prepared according to EPA draft document *Methodology For The Determination of Metals Emissions in Exhaust Gases From Hazardous Waste Incineration and Similar Combustion Processes*. Analytical methods used are listed in the test report.

Analysis for hexavalent chromium resulted in unacceptable spike recoveries and use of the method of standard additions resulted in unacceptable linear correlation. Therefore, no results are reported for hexavalent chromium. According to the test report, all method QA/QC requirements were met. However, specific QA/QC results were not reported for some pollutants and therefore could not be verified.

QC documentation such as field test data sheets, equipment calibration records, and chain of custody forms are provided in the appendices of the test report and appear complete.

Method Description:

CARB Method 430	Determination of Formaldehyde in Emissions from Stationary Sources
CARB Method 425	Determination of Total Chromium and Hexavalent Chromium Emissions from Stationary Sources
CARB Method 429	Determination of PAHs Using GC/MS Scan Analysis Extended to Include Phenol
CARB Method 410A	Determination of Low Concentrations of Benzene from Stationary Sources

Report No.: 51

Report Title: Determination of Air Toxics Emission Rates - FCCU Volume I and Volume II, Mobil Oil Corporation, Torrance, California, May 16, 30, and 31, 1990

Docket No.: IV-J-10

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
PAH			CARB Method 429	None reported	None reported	Yes	Yes
Phenol			Modification of CARB Method 429	None reported	None reported	None reported	Yes
Formaldehyde			CARB Method 430	None reported	None reported	Yes	Yes
Acetaldehyde			Modification of CARB Method 430	None reported	None reported	None reported	Yes
Benzene			CARB Method 410A	None reported	None reported	Yes	Yes
Hydrogen sulfide			Modification of CARB Method 410A and CARB Method 15	None reported	Yes	Yes	Yes
Ammonia			Modification of CARB Method 421	None reported	None reported	None reported	Yes
Hydrogen cyanide			Modification of CARB Method 426	None reported	None reported	None reported	Yes
1,3-butadiene			VOST Method	<i>EPA Method(s)</i>	None reported	Yes	Yes
Arsenic	USEPA Multi-Metals Train	Modified with CARB Methods (see text)		<i>EPA Method(s)</i>	None reported	None reported	Yes

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Beryllium	USEPA Multi-Metals Train			<i>EPA Method(s)</i>	None reported	None reported	Yes
Cadmium	USEPA Multi-Metals Train			<i>EPA Method(s)</i>	None reported	None reported	Yes
Copper	USEPA Multi-Metals Train			<i>EPA Method(s)</i>	None reported	None reported	Yes
Lead	USEPA Multi-Metals Train			<i>EPA Method(s)</i>	None reported	None reported	Yes
Manganese	USEPA Multi-Metals Train			<i>EPA Method(s)</i>	None reported	None reported	Yes
Nickel	USEPA Multi-Metals Train			<i>EPA Method(s)</i>	None reported	None reported	Yes
Selenium	USEPA Multi-Metals Train			<i>EPA Method(s)</i>	None reported	None reported	Yes
Zinc	USEPA Multi-Metals Train			<i>EPA Method(s)</i>	None reported	None reported	Yes
Mercury			CARB Method 101A	None reported	None reported	None reported	Yes

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Chromium (Total)			CARB Method 425	None reported	None reported	Yes	Yes
Chromium (Hexavalent)			CARB Method 425	None reported	None reported	Yes	Yes

This report is classified: TIER II

Rating levels are defined as:

TIER I	EPA Air Method or EPA (other than air), State, or unknown method with Method Validation
TIER II	State Agency method (e.g., California), no Method Validation
TIER III	Unknown method, no Method Validation, good QA procedures
TIER IV	Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

Test series was conducted to satisfy the requirements for measurement of Air Toxics Hot Spots Information and Assessment Act of 1987. FCCU source emission testing was performed to measure the emission rates of formaldehyde, benzene, metals, PAHs, phenol, acetaldehyde, hydrogen sulfide, hydrogen cyanide, 1,3-butadiene and ammonia.

Method Description:

CARB Method 101A	Determination of Particulate and Gaseous Mercury Emissions From Sewage Sludge Incinerators
CARB Method 15	Modified for the Collection and Analysis of Reduced Sulfur Compounds
CARB Method 104	Determination of Beryllium Emissions from Stationary Sources
CARB Method 410A/410B	Determination of Low and High Concentraions of Benzene from Stationary Sources
NIOSH Method 6701	Determination of Ammonia
CARB Method 426	Modified Version to Determine Particulate and Gaseous Hydrogen Cyanide
CARB Method 425	Determination of Total Chromium and Hexavalent Chromium Emissions from Stationary Sources
CARB Method 429	Determination of Polycyclic Aromatic Hydrocarbons (PAH) Emissions from Stationary Sources
CARB Method 429	Modified for Analysis of Phenol
CARB Method 430	Determination of Formaldehyde in Emissions from Stationary Sources

CARB Method 430	Modified for the Analysis of Acetaldehyde
EPA Multi-Metals Train	Modified with CARB Methods 12, 101A, 104, 423, 424, 425 and 433
EPA VOST Procedure	Determination of Benzene, Toluene, Xylene and 1,3-Butadiene

Review of this report included verification that sample data calculations were performed correctly. According to the test report, all method QA/QC requirements were met. However, some QA/QC results were not reported and therefore could not be verified. QC documentation such as field test data sheets, equipment calibration records, chain of custody forms, and calibration gas certificates are provided in the appendices of the test report and appear complete.

Report No.: 52

Report Title: Results of Dioxin Testing on the Catalytic Reformer Unit #1 Exhaust, Texaco Refinery, Bakersfield, California, August 8, 1991

Docket No.: IV-J-11

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
PCDD			CARB 428	None reported	None reported	Yes, see below	Yes
PCDF			CARB 428	None reported	None reported	Yes, see below	Yes

This report is classified: TIER II

Rating levels are defined as:

TIER I EPA Air Method or EPA (other than air), State, or unknown method with Method Validation
TIER II State Agency method (e.g., California), no Method Validation
TIER III Unknown method, no Method Validation, good QA procedures
TIER IV Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

Source emission testing was conducted on a Catalytic Reformer Unit No. 1 exhaust at a refinery in California to determine emissions of polychlorinated dibenzo-p-dioxins (PCDD) and polychlorinated dibenzofurans (PCDF) during the catalyst regeneration process. Testing followed CARB Method 428. Representatives from the Kern County Air Pollution Control District were present during the test series.

Review of this report included verification that sample data calculations were performed correctly. Review of the laboratory data presented in the test report reveals recovery efficiencies for the internal and surrogate standards were acceptable. QC documentation such as field test data sheets, equipment calibration records, chain of custody forms, and laboratory quality control records are provided in the appendices of the test report and appear complete.

Report No.: 53

Report Title: NO_x, SO₂, CO, Sulfates and Particulate Compliance Emission Test Program-Heavy Oil Scrubber Exhaust (EPN 121) 70,000 BBL/Day without NaHCO₃ Injection, Valero Refining Company, Corpus Christi, Texas, March 15, 1995

Docket No.: IV-J-14

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Particulate	Methods 1-5B			<i>EPA Method(s)</i>	None reported	None reported	None reported
Opacity	Method 9			<i>EPA Method(s)</i>	None reported	None reported	None reported
Sulfur dioxide	Method 8			<i>EPA Method(s)</i>	None reported	None reported	None reported
Sulfuric acid	Method 8			<i>EPA Method(s)</i>	None reported	None reported	None reported
Nitrogen oxides	Method 7E			<i>EPA Method(s)</i>	None reported	None reported	None reported
Carbon monoxide	Method 10			<i>EPA Method(s)</i>	None reported	None reported	None reported

This report is classified: TIER I

Rating levels are defined as:

- TIER I** EPA Air Method or EPA (other than air), State, or unknown method with Method Validation
TIER II State Agency method (e.g., California), no Method Validation
TIER III Unknown method, no Method Validation, good QA procedures
TIER IV Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

A formal emissions test program was conducted at a refinery located in Texas. These tests were conducted to comply with a TNRCC/U.S. EPA permit. Test methods followed those specified in 40CFR Part 60, EPA Methods 1-4, 5B, 7E, 8, 9, and 10 and the *TNRCC Sampling and Laboratory Procedures Manual*.

Review of this report was to include verification that sample data calculations were performed correctly. However, no sample data calculations were provided in the test report. QA/QC results were not reported and therefore could not be verified. QC documentation such as field test data sheets, equipment calibration records, chain of custody forms, and process data are provided in the appendices, however the appendices are not attached to the report.

Report No.: 54

Report Title: AB2588 Air Toxics Emissions Test Report FCCU CO Boiler Volume I-Main Report, Texaco Refining and Marketing, Los Angeles Plant, Wilmington, California, May 24, 1996

Docket No.: IV-J-15

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
Reduced Sulfur			CARB 15	None reported	None reported	None reported	Yes
Benzene, Ethylbenzene, Toluene, and Xylene (BTEX)			CARB 410A	None reported	None reported	None reported	Yes
Hydrogen chloride			CARB 421	None reported	None reported	None reported	Yes
Hexavalent and total chromium			CARB 425	None reported	None reported	None reported	Yes
Cyanide			CARB 426	None reported	None reported	None reported	Yes
PAH's and Phenol			CARB 429	None reported	None reported	None reported	Yes
Formaldehyde and Acetaldehyde			CARB 430	None reported	None reported	None reported	Yes
Multiple metals			CARB 436	None reported	None reported	None reported	Yes
Ammonia			SCAQMD 207.1	None reported	None reported	None reported	Yes

This report is classified: TIER II

Rating levels are defined as:

TIER I EPA Air Method or EPA (other than air), State, or unknown method with Method Validation

TIER II	State Agency method (e.g., California), no Method Validation
TIER III	Unknown method, no Method Validation, good QA procedures
TIER IV	Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

Emission testing was conducted on a FCCU CO boiler at a Texaco refinery in California. The objective of the test program was to measure the emissions of selected toxic substances for AB2588 emissions inventory. CARB methods were followed and sample calculations were conducted for each measured pollutant. CARB Methods 1-4 were followed for determination of sampling point, flue gas velocity and flow rate, flue gas composition and molecular weight, and flue gas moisture content.

According to the test report, all method QA/QC requirements were met. However, specific QA/QC results were not reported as such and therefore could not be verified. Quality documentation such as field test data sheets, equipment calibration records, chain of custody forms, and calibration gas certification are provided in the appendices of the test report and appear complete.

The emissions that were measured using Method 15 included carbon disulfide, carbonyl sulfide, dimethyl disulfide, hydrogen sulfide, methyl mercaptan.

PAHs measured using Method 429 included naphthalene, 2-methylnaphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene, anthracene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(e)pyrene, benzo(a)pyrene, perylene, indeno(1,2,3-c,d)pyrene, dibenz(a,h)anthracene, benzo(g,h,i)perylene, phenol.

Metals that were measured using Method 436 included arsenic, beryllium, cadmium, copper, lead, manganese, mercury, nickel, selenium, zinc.

Report No.: 55

Report Title: Preliminary results of emission testing at Chevron Refinery, Richmond, California, January, 1997

Docket No.: Awaiting final version for docket entry

Pollutant Measured	EPA Air Method (Stationary Source)	Deviations From EPA Method, If Any	If Other Method, List Brief Summary	If Not EPA Method, Validation By Method 301?	Was Audit Conducted?	Method QA/QC Requirements Met?	Sample Data Calculations Conducted?
PCDD/PCDF	Data package only- see below	NA	NA	NA	NA	NA	NA
PCBs	Data package only- see below	NA	NA	NA	NA	NA	NA
PAHs	Data package only- see below	NA	NA	NA	NA	NA	NA

This report is classified: TIER IV

Rating levels are defined as:

- TIER I** EPA Air Method or EPA (other than air), State, or unknown method with Method Validation
TIER II State Agency method (e.g., California), no Method Validation
TIER III Unknown method, no Method Validation, good QA procedures
TIER IV Unknown method, no QA documentation

Rating levels are based on the following comments and on information found in the report summary table.

This report contains preliminary results of emissions test conducted at a Richmond refinery. According to the report, these are considered preliminary results and are subject to change and review. This preliminary draft contains only data sheets, no actual discussions of results, QA/QC, or method used. Results are provided for dioxins/furans, PCBs, and PAHs.