ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF ENFORCEMENT
EPA-330/2-77-025

Emission Tests Powerine Oil Company Santa Fe Springs, California

(September 12-13, 1977)

NATIONAL ENFORCEMENT INVESTIGATIONS CENTER
DENVER, COLORADO
AND
REGION IX, SAN FRANCISCO

ENVIRONMENTAL PROTECTION AGENCY
Office of Enforcement
EPA-330/2-77-025

EMISSION TESTS

POWERINE OIL COMPANY

Santa Fe Springs, California
(September 9-11, 1977)

December 1977

National Enforcement Investigations Center - Denver
and
Region IX - San Francisco

CONTENTS

I	INTRODUCTION	1
II	SUMMARY AND CONCLUSIONS	2
III	PROCESS DESCRIPTION	4
IV	TEST PROCEDURES	6
	SAMPLING LOCATIONS	6
	SAMPLING PROCEDURES	6
	Particulate Sampling	6
	Sulfur Dioxide Sampling	9
	PROCESS MONITORING PROCEDURES	11
V	TEST RESULTS	12

FIGURES

1	FCC Pollution Control Equipment	5
2	FCC Stack	7

TABLES

1	Data Summary	14
2	FCC Unit Particulate Emissions	15
3	Sulfur Dioxide Emissions	16
4	Process Weight Summary	17
5	Visible Emission Observation Summary	18

APPENDICES

A Presurvey Inspection Report
B Stack Sampling Equipment Description
C Calibration and Data Procedures
D Analytical Procedures and Data
E Chain-of-Custody Procedures and Records
F Production Data and Process Weight Calculations
G Test Data and Emission Calculations

I. INTRODUCTION

The Powerine Oil Company operates a 7,900 m^3 (50,000 bbl)/day integrated crude oil refinery in Santa Fe Springs, California. On November 5, 1975, at the request of Region IX Environmental Protection Agency (EPA), the National Enforcement Investigations Center (NEIC) inspected this facility to determine compliance with the regulations of the Los Angeles Air Pollution Control District (LAAPCD).* The subsequent State Implementation Plan (SIP) inspection report recommended that the Powerine fluid catalytic cracking (FCC) unit stack be source tested to determine compliance with the applicable particulate regulations.

On February 28, 1977, the EPA Region IX requested that the NEIC source test the Powerine FCC stack. A presurvey inspection of the facility was performed by NEIC personnel on July 18, 1977, to evaluate sampling locations and obtain process information [Appendix A]. It was determined that sampling would be feasible provided that minor modifications be made to the sampling location.

From September 9 to 11, 1977, the Powerine FCC stack emissions were tested by NEIC to determine compliance with LAAPCD Rules 52 (concentration) and 54 (emission rate) for particulate emissions. Visible emission observations were also made and compared to Rule 50 of the LAAPCD regulations, which limits these emissions to less than Ringelmann shade No. 1 (20% opacity) except for three minutes per hour.

---

* *The Agency title has since been changed to Metropolitan Zone, South Coast Air Quality Management District; however, not all the SIP revisions have been approved by EPA. The LAAPCD regulations are considered applicable by EPA.*

II. SUMMARY AND CONCLUSIONS

1. From September 9 to 11, 1977, NEIC tested the Powerine FCC stack emissions to determine compliance with LAAPCD Rules 52 and 54 for particulate emissions. Three particulate sampling runs [illegible] sulfur dioxide sampling run were performed according to Methods 5 and the required LAAPCD procedures. In addition, opacity readings were also made to determine compliance with LAAPCD Rule 50 which requires that visible emissions not equal or exceed 20% opacity.

2. LAAPCD defines "particulate" as the particulate less the sulfate (as $H_2SO_4 \cdot H_2O$) collected by the filter, acetone wash and impingers 1, 2 and 3. Using the LAAPCD definition of particulate, the average FCC particulate concentration was 110 mg/m^3 (0.048 gr/std. ft^3) and the average particulate emission was 5.3 kg (12.0 lb)/hr. These emissions are in compliance with Rule 52 (128 mg/m^3 or 0.056 gr/scf) and Rule 54 (13.6 kg/hr or 30 lb/hr) by 14% and 61%, respectively.

3. Test results for the FCC stack were also calculated using the following definitions of particulate matter:

Method 5	-	Particulate collected at a temperature of 120°C (248°F) by the filter and acetone wash
[illegible]		[illegible] Method 5 plus the inorganic, nonsulfate (as $H_2SO_4 \cdot 2\ H_2O$) particulate collected by impingers 1, 2 and 3)

As indicated below, particulate concentrations determined by both Method 5 and Method 5 (+) procedures exceeded the 128 mg/m^3 limitation (Rule 52) by 2% and 9%, respectively. The average particulate emission rates were less than the allowable 13.6 kg/hr (30 lb/hr).

	Concentration		Emission Rate	
	mg/m^3	$gr/std.\ ft^3$	kg/hr	lb/hr
Method 5	130	0.058	6.5	14
Method 5 (+)	140	0.061	6.8	15

4. The sulfur dioxide test determined that the FCC emissions had an SO_2 concentration of 1,020 parts per million volume (ppmv), and an SO_2 emission rate of 134 kg (295 lb)/hr.

5. The FCC visible emissions complied with Rule 50 which limits the emission opacity to less than 20%. The average opacity readings were less than 18% and in most cases (6 of 8) were less than 10%.

III. PROCESS DESCRIPTION

The Powerine Oil Company produces liquified petroleum gas (LPG), gasoline, jet fuel, diesel fuel, fuel oil, and asphalt at this 7,900 m^3 (50,000 bbl)/day integrated crude oil refinery. Major processes include crude desalting, atmospheric distillation, vacuum distillation, catalytic cracking, catalytic reforming, hydrotreating, alkylation, asphalt manufacturing, and sulfur recovery.

The major particulate emissions source in the refinery is the FCC unit[1] [Figure 1]. Spent catalyst in this process is continuously removed from the reactor portion and introduced through piping into the catalyst regeneration portion. Here the petroleum coke, tars, and other residual deposits which form on the catalyst surface are burned off. The recovered catalyst is then recycled to the reactor. Catalyst particles which are entrained in the exhaust gases are captured by a series of cyclone separators internal to the regenerator unit.
Particles captured by these cyclones are returned to the regenerator.

The regenerator unit exhaust gases contain considerable amounts of carbon monoxide, particulate matter, aldehydes, sulfur oxides, ammonia, and oxides of nitrogen. To minimize the emission of particulates and carbon monoxide (CO) and to recover the fuel value of this material, the regenerator exhaust gases are routed through a CO boiler for combustion, then through an electrostatic precipitator (ESP), and into the stack.

---

[1] *"State Implementation Plan Air Pollution Inspection of Powerine Oil Company", Los Angeles County, California, EPA-NEIC, EPA 330/2-76-014, February, 1976.*

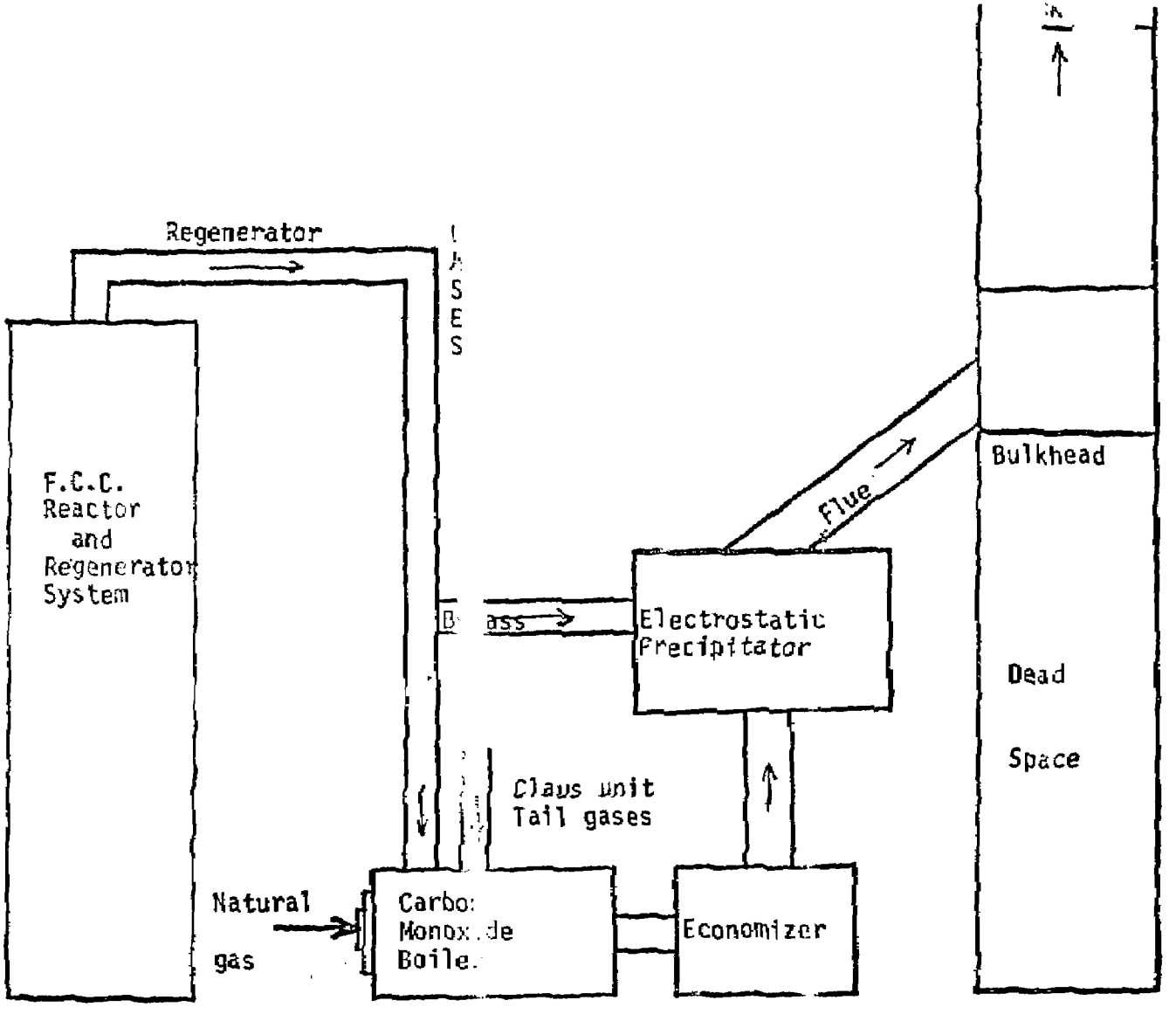


Figure 1: Powerine Oil Company, Sante Fe Springs, California
FCC Pollution Control Equipment.

IV. TEST PROCEDURES

SAMPLING LOCATIONS

The FCC stack [Figure 2] is 58 m (190 ft) high, tapering in inside diameter incrementally from 3.6 m (12 ft) to 2.4 m (8 ft) to 1.2 m (4 ft). Because the included angle of the tapered sections is only 15°, these sections are not considered flow disturbances.[2] The sampling ports are on the south and west sides of the middle section of the stack. This site is 20 m (65 ft), or 5.4 diameters, downstream from the gas inlet, and 27 m (90 ft), or 11.2 diameters, upstream of the stack exit. The sampling platform is located 1.5 m (5 ft) below the sampling ports. Based on Method 1 criteria[3], a total of 28 sampling points were required. Each point was sampled for 3 minutes.

SAMPLING PROCEDURES

Particulate Sampling

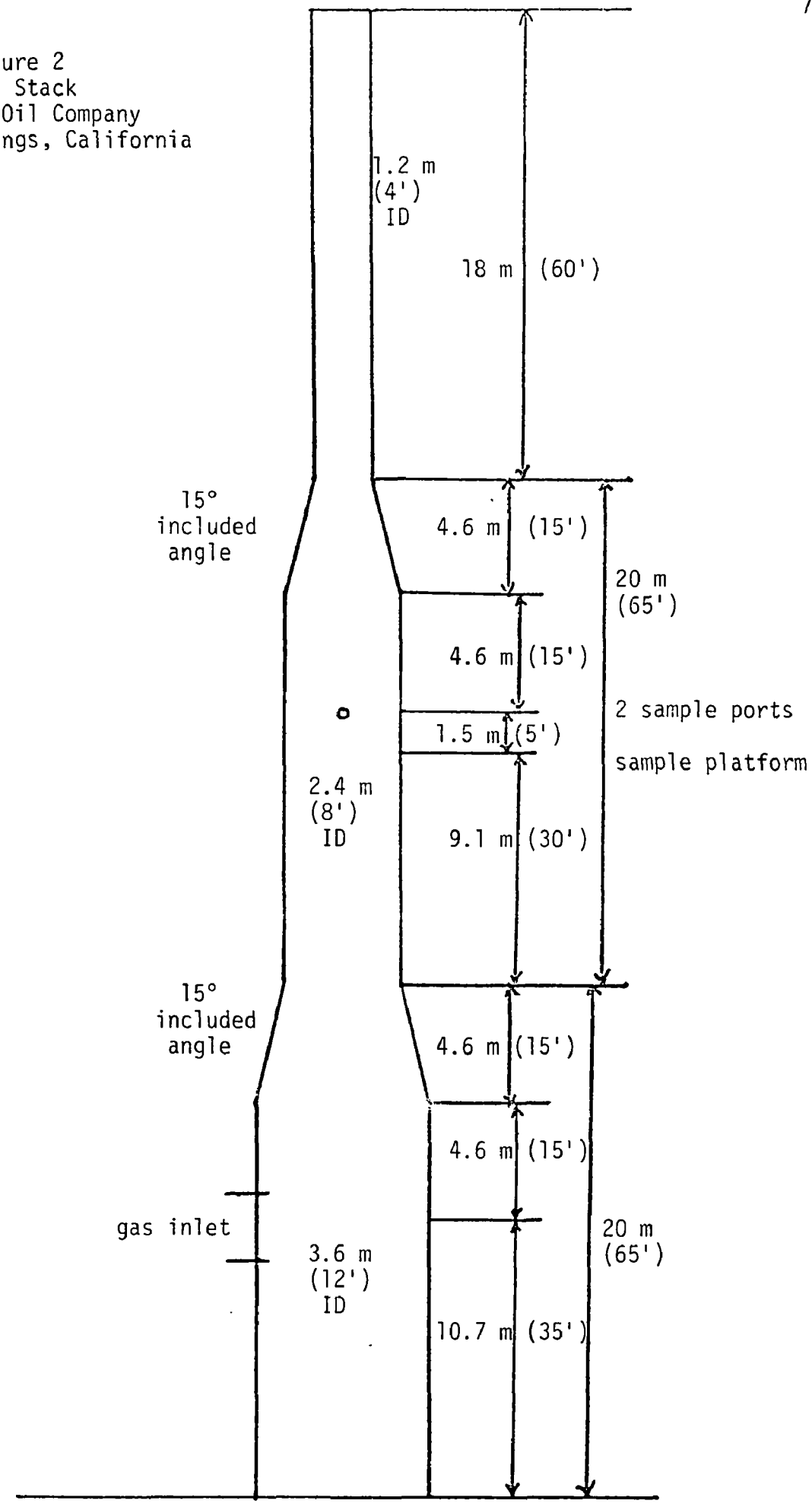
A preliminary velocity and temperature traverse was made on the FCC stack on September 9. A Lear-Siegler SO_2/NO_x analyzer with a 1.1 m (3.5 ft) long, 9 cm (3.5 in) diameter probe is located 0.3 m (1 ft) upstream of (below) the west sampling port and 5° to the right. The preliminary velocity traverse indicated that no aberrations in measured velocities occurred at any traverse points. It was concluded that the probe did not cause a flow disturbance at the sampling location.

---

[2] *"Guidelines for Sampling in Tapered Stacks" by T. G. Logan and R. T. Shigehara, Environmental Protection Agency, Research Triangle Park, North Carolina, October 1974.*

[3] *Code of Federal Regulations, Title 40, Part 60 Standards of Performance for New Stationary Sources, Appendix A - Reference Methods, August 18, 1977.*

Figure 2
FCC Stack
Powerine Oil Company
Sante Fe Springs, California



not to scale

Particulate tests were conducted from September 9 to 11, 1977. These tests were conducted in accordance with the Method 5[3] procedures.

The sampling train used was the Model AP 5000 manufactured by Scientific Glass, Inc. [Appendix B] which was configured as follows:

1. Stainless steel (316) nozzle
2. Glass-lined probe
3. Glass fiber filter (11.4 cm diameter)
4. First impinger -- modified Greenburg-Smith with 100 ml distilled water
5. Second impinger -- Greenburg-Smith with 100 ml distilled water
6. Third impinger -- modified Greenburg-Smith, empty
7. Fourth impinger -- modified Greenburg-Smith with approximately 200 g of silica gel

Moisture content of the gas stream was determined from the increase in volume in the first three impingers and the weight gain of the silica gel (Method 4).[3]

Gas samples were obtained by the grab sample technique of Method 3.[3] Analyses were performed with Fyrite* type combustion gas analyzers. Stack gas molecular weight was based on the average analyses of the three gas samples collected during each run.

Three sampling runs within the isokinetic range of 90% to 110% were performed on the FCC stack. Prior to each run, the sampling train was leak-checked at 38 cm (15 in) Hg. [illegible] of each run, a second leak check was conducted at the highest vacuum recorded during the run. These checks were acceptable if the leakage rate did not exceed 0.00057 m^3 (0.02 ft^3)/min. During each sampling run, the sampling time was 84 minutes and the minimum gas volume collected was 849 dry standard liters (30 dry std. ft^3). During the tests, probe and oven

---

* *Brand name*

temperatures were held to averages of 119°C (245°F) and 127°C (261°F), respectively within the acceptable temperature range of 120°C (248°F) ±14°C (25°F).

The pitobe assembly (10-2) and the dry gas and orifice meters used in this test had been calibrated prior to leaving Denver and were recalibrated upon return [Appendix C].

A NEIC mobile laboratory, located at the plant, was used for all sampling train preparation and sample recovery. Sample recovery proceeded as follows after each test run:

1. The filter was returned to its storage container (petri dish) and sealed with aluminum foil.
2. The nozzle, probe, cyclone, and front portion of the glass filter holder were washed with acetone and the washings collected in a glass jar with a Teflon*-lined cap.
3. The volume of the contents of impingers 1, 2, and 3 was measured as part of the moisture determination. The contents were then rinsed with distilled water into a second glass jar with a Teflon-lined cap.
4. Impinger 4, which contained silica gel, was weighed to determine the moisture gain, after which the silica gel was discarded.

All samples were returned to the NEIC laboratories for particulate and sulfate analyses [Appendix D], which specifies that sulfate particulate not be included in particulate emissions calculations.

Chain-of-Custody procedures were followed at all times [Appendix E].

Sulfur Dioxide Sampling

Testing for sulfur dioxide (SO_2) emissions was conducted at the FCC stack on September 11, 1977, in accordance with procedures in the LAAPCD

---

* *Brand name*

Source Testing Manual, which require that all sulfate material be included into the sample.[4] Therefore, no isopropanol solution (for removal of SO_3) or filter (for removal of particulate and acid mist) was used in the sampling train, as required in EPA Method 6.[3] To ensure complete capture of all sulfur compounds, a 5% hydrogen peroxide solution was used in the impinger train (impingers 1 and 2). The sampling train used was the Model AP 5000 manufactured by Scientific Glass, Inc. [Appendix B] which was configured as follows:

1. Stainless steel (316) nozzle
2. Glass-lined probe
3. Glass oven bypass
4. First impinger -- modified Greenburg-Smith with 100 ml of 5% hydrogen peroxide solution
5. Second impinger -- Greenburg-Smith with 100 ml of 5% hydrogen peroxide solution
6. Third impinger -- modified Greenburg-Smith, empty
7. Fourth impinger -- modified Greenburg-Smith with approximately 200 g of silica gel

The moisture content was determined as previously described for the particulate tests.

One sampling run was performed at a constant sampling rate on the FCC stack. The stack center point was sampled for 60 minutes. Leak checks, oven and probe temperatures, and equipment calibrations were as those described above in Particulate Sampling.

The mobile laboratory was used for all sampling train preparation and sample recovery. Sample recovery proceeded as follows:

1. The nozzle, probe, and oven bypass were washed with acetone, and the washings were collected in a glass jar with a Teflon-lined cap.
2. The volume of the contents of impingers 1, 2 and 3 was measured as part of the moisture determination. The contents were then rinsed with distilled, deionized water into a second glass jar with a Teflon-lined cap.

---

[4] *Air Pollution Source Testing Manual, 1972, LAAPCD, Rev. Ed., Chapter 4.*

3. Impinger 4, which contained silica gel, was weighed to determine the moisture gain, after which the silica gel was discarded.

Samples were retained for sulfate analysis.

PROCESS MONITORING PROCEDURES

To ensure normal operating conditions and to determine the process weight rate, the FCC unit was monitored during source testing [Appendix F].

The three most important process parameters observed and recorded were:

1. The oil feed rate to the FCC reactor
2. The catalyst circulation rate to the FCC reactor
3. The air feed to the FCC regenerator

The first two parameters were added together to determine the FCC process weight. However, only the first and third process parameters were read in the FCC control room. The second parameter, catalyst circulation rate, was calculated by the Company and provided to the process observer.

The FCC pollution control equipment instrumentation was also monitored primarily to determine whether the equipment was operated steady-state during the sampling periods. The process observer recorded the ESP primary and secondary current, primary voltage, spark rate, CO boiler flue gas BTU value, and air feed rate at periodic intervals [Appendix F]. Any changes observed in the instrument values were considered possible process upsets; the unit operators were asked to explain and/or to correct the upset.

V. TEST RESULTS

The Powerine FCC stack was sampled four times--three particulate runs and one sulfur dioxide run. Isokinetic sampling rates for the three particulate runs ranged from 100.4% to 103%, which is within the specified range of 90% to 110%. Sulfur dioxide testing was performed at a constant sampling rate at the stack center point. Test data [Appendix G] are summarized in Tables 1, 2, and 3.

During testing, the FCC unit was operating at a rate of about 1,800 m^3 (11,300 bbl)/day of oil [Table 4]. The catalyst circulation rate and air feed rate did not vary [Appendix F]. The FCC process weight averaged 0.80 (1.74) million kg(lb)/hr which, based on LAAPCD Rule 54, allows 13.6 kg (30 lb)/hr of particulate to be emitted. A particulate concentration of 128 mg/m^3 (0.056 gr/std. ft^3) is allowed by Rule 52 when the volumetric flow rate is 800 m^3 (28,000 std. ft^3)/min [Table 1].

The test results presented in Table 2 have been interpreted using the following definitions of particulate:

1. LAAPCD - Inorganic particulate less the sulfate collected by the filter, acetone wash, and impingers.
2. Method 5 - Particulate collected at a temperature of 120°C (248°F) by the filter and acetone wash, i.e., the front half.
3. Method 5 (+) - Particulate matter as defined in item 2 plus the inorganic, nonsulfate particulate collected by impingers 1, 2, and 3.

Based on the LAAPCD definition of particulate, the average FCC particulate concentration was 110 mg/m^3 (0.048 gr/std. ft^3) and the average particulate emission rate was 5.3 kg (12.0 lb)/hr. According to

Rule 52, the allowed concentration is 128 mg/m^3 (0.056 gr/std. ft^3), and thus the source is in compliance. Since the average particulate emission rate is 5.3 kg (122 lb)/hr, or 39% of the allowed 13.6 kg (30 lb)/hr, the source is also in compliance with Rule 54.

Method 5 results were 130 mg/m^3 (0.058 gr/std. ft^3) and 6.5 kg (14 lb)/hr. This particulate concentration (130 mg/m^3) is about 2% over the allowable concentration. The average particulate emission rate was only 48% of the allowed 13.6 kg (30 lb)/hr.

The Method 5 (+) calculations resulted in an average emission concentration of 140 mg/m^3 (0.061 gr/std. ft^3) and particulate emissions of 6.8 kg (15 lb)/hr. The emission concentration (140 mg/m^3) exceeded the Rule 52 limitation of 128 mg/m^3 by 9%. However, the average emission rate was only 50% of the allowed 13.6 kg (30 lb)/hr.

The sulfur dioxide test determined that the FCC emissions had an SO_2 concentration of 1,020 ppmv and SO_2 emission rate of 134 kg (295 lb)/hr [Table 3].

According to Rule 50, the FCC visible emissions are limited to less than 20%. The highest average opacity during the source testing was 18% [Table 5], which is in compliance with Rule 50. In most cases (6 of 8), the average readings never exceeded 10%, and only twice did individual opacity readings exceed 20%.

Table 1
DATA SUMMARY
POWERINE OIL COMPANY
SANTA FE SPRINGS, CALIFORNIA

Parameter	1 9/9-10	2 9/10	3 9/11	4† 9/11
Volume Sampled (STP)††				
liters	1032	1095	956	662
ft^3	36.44	38.66	33.76	23.39
Moisture %	12.0	12.0	12.0	13.1
Barometric Pressure				
cm Hg	77.2	77.2	76.1	76.1
in Hg	30.40	30.40	29.95	29.95
Stack Gas Temperature				
°C	253	248	251	252
°F	488	478	483	495
Molecular Weight (dry)	30.53	30.31	30.54	30.54
% Isokinetic	103.0	100.4	101.3	-
Stack Gas Velocity				
m/sec	5.7	6.2	5.5	-
ft/sec	18.8	20.2	17.9	-
Volumetric Flow Rate (STP)††				
m^3/min	800	871	753	-
ft^3/min	28,330	30,830	26,670	-

† *Run #4 was for SO_2; Runs 1-3 were for particulate.*
†† *STP-Standard Temperature (68°F) and Pressure (29.92 in. Hg) - dry.*

Table 2
FCC UNIT PARTICULATE EMISSIONS
POWERINE OIL COMPANY
SANTA FE SPRINGS, CALIFORNIA

Parameter	Run Number 1	2	3	Avg.
Particulate Collected (mg)				
Filter	138	66	67	
Acetone wash	45	58	40	
Impinger catch (inorganic)	31	41	151	
Total	214	165	258	
Sulfate Collected as $H_2SO_4 \cdot 2\ H_2O$				
Filter	17	20	11	
Acetone wash	20	10	20	
Impinger catch	31*	41*	130	
Total	68	71	161	
LAAPCD Procedure Particulate Results				
Particulate catch (mg)	146	94	97	
Concentration				
gr/std. ft^3	0.062	0.037	0.044	0.048
mg/m^3	140	85	100	110
Emission Rate				
lb/hr	15	9.9	10	12
kg/hr	6.8	4.5	4.5	5.3
Method 5 Procedure Particulate Results				
Particulate catch (mg)	183	124	107	
Concentration				
gr/std, ft^3	0.077	0.049	0.049	0.058
mg/m^3	180	110	110	130
Emission Rate				
lb/hr	19	13	11	14
kg/hr	8.6	5.9	5.0	6.5
Method 5 (+) Procedure Particulate Results				
Particulate catch (mg)	183	124	128	
Concentration				
gr/std. ft^3	0.077	0.049	0.058	0.061
mg/m^3	180	110	130	140
Emission Rate				
lb/hr				
kg/hr	8.6	5.9	5.9	6.8

* *Actual value was greater than particulate catch, therefore, the value of the particulate catch was substituted.*

Table 3
SULFUR DIOXIDE EMISSIONS
POWERINE OIL COMPANY
SANTA FE SPRINGS, CALIFORNIA

Parameter	Run No. 4
Sulfate collected (mg)	
Acetone wash	9.5
Impingers	2740
Total	2749.5
Volume sampled (STP)†	
liters	662
Sulfur dioxide concentration	
ppmv	1020
Volumetric flow rate (STP)†	
m^3/min††	808
Sulfur dioxide emissions	
lb/hr	295
kg/hr	134

† *STP-Standard Temperature (68°F) and Pressure (29.92 in. Hg) - dry.*
†† *Average of Runs 1, 2, and 3.*

Table 4
PROCESS WEIGHT SUMMARY
POWERINE OIL COMPANY
SANTA FE SPRINGS, CALIFORNIA

Date (September)	Catalyst* Circulation Rate m. tons/hr (tons/hr)	Oil Feed Rate		Total Process Weight Rate		Allowable Emissions kg/hr (lb/hr)
		m^3/day (bbl/day)	m. tons/hr (tons/hr)	m. tons/hr (tons/hr)	kg/hr (lb/hr)	
9	760 (840)	1,800 (11,300)	27 (30)	797 (870)	797,000 (1,740,000)	13.6 (30)
10	760 (840)	1,810 (11,400)	27 (30)	797 (870)	797,000 (1,740,000)	13.6 (30)
11	760 (840)	1,840 (11,550)	27 (30)	797 (870)	797,000 (1,740,000)	13.6 (30)

* *Calculated by Company* [*Appendix F*].

Table 5
VISIBLE EMISSION OBSERVATION SUMMARY
POWERINE OIL COMPANY
SANTA FE SPRINGS, CALIFORNIA

Date (September)	Run No.	Range of Emission Opacity (%)	Average† Opacities (%)
9	1	5-20	7.1
	1	5-15	9.2
10	1	5-20	7.1
	2	10-30	17.5
11	3	0-15	7.9
	3	0-10	6.5
	4	5-10	8.1
	4	10-25	14.0

† *Average of 24 readings (6 minutes)*

APPENDIX A

PRESURVEY INSPECTION REPORT

Chief, Field Operations Branch August 10, 1977

Paul R. dePercin

Presurvey Inspection of the Powerine Oil Company, Sante Fe Springs, California

On July 18, 1977, Art Powell, Los Angeles Air Pollution Control District (LA APCD) and the writer inspected the Powerine Oil Company, Sante Fe Springs, California, to obtain information necessary to conduct a source test of the fluid catalytic cracking (FCC) unit stack. This information included the FCC and sulfur recovery process description, air pollution control equipment configuration, source test feasibility, and process and control equipment operating data availability. Of particular interest were the available sampling locations and whether modifications to such locations were necessary in order to conduct the source test safely and acquire representative data.

The plant representatives contacted were Messrs. Walter Ziemba, Environmental Affairs Coordinator, and David Drayt, Operations Manager.

EPA, Region IX, requested NEIC to source test the FCC stack for particulates and sulfur dioxide (SO_2), the FCC unit and the sulfur recovery unit emissions are emitted from the same stack. The results of a June 5, 1969, source test by the LA APCD were 15.8 kg (34.9 lb)/hr of particulate, which exceeded the allowable rate (LA APCD, Rule 54) of 13.6 kg (30 lb)/hr. A source test conducted January 7, 1976, by KVB Engineering determined that the sulfur dioxide concentration was 579 ppmv (wet) and the mass emission rate was 243 kg (536 lb)/hr. The FCC unit SO_2 emissions are limited to 2,000 ppmv (dry) (LA APCD, Rule 53.1) while the sulfur recovery unit SO_2 emissions are limited to 500 ppmv (dry) and 91 kg (200 lb)/hr (LA APCD, Rule 53.2). Since the two units emit through the same stack, compliance of the stack emissions depends on the applicable SO_2 regulation.

PROCESS DESCRIPTION

Powerine Oil Company operates a petroleum refinery at Sante Fe Springs with a rated capacity of 50,000 bbl/day of crude oil. Major processes at this refinery include crude desalting, atmospheric distillation, vacuum distillation, catalytic cracking, catalytic reforming,

hydrotreating, alkylation, asphalt manufacturing and sulfur recovery. Of these processes, two--catalytic cracking and sulfur recovery--are more fully described below.

Fluid Catalytic Cracking Unit[1]

Spent catalyst from the FCC unit is continuously removed from the reactor portion and introduced through piping into the catalyst regeneration portion. Here the petroleum coke, tars, and other residual deposits which form on the catalyst surface are burned off the catalyst fines. The recovered catalyst is then recycled to the reactor. Catalyst particles which are entrained in the exhaust gases are partially captured by a series of cyclone separators internal to the regenerator unit. Particles captured by these cyclones are returned to the regenerator.

Sulfur Recovery Unit[2]

The hydrogen sulfide H_2S rich off-gases from the amine stripping plant are processed in a 24 m. tons (24 long tons)/day Claus unit to convert the H_2S to elemental sulfur. The Claus plant is a two-stage unit and is currently producing between 10 and 14 m. tons (10 and 14 long tons)/day of sulfur. In the Claus process, H_2S is burned to form sulfur dioxide (SO_2). The SO_2 and H_2S react in the presence of a bauxite catalyst to form elemental sulfur and water vapor. Typical sulfur recovery efficiencies for Claus plants are 85% for one catalytic stage and 95% for two stages.

AIR POLLUTION CONTROL EQUIPMENT

The regenerator portion of the FCC unit exhaust gases contain carbon monoxide, particulate matter, aldehydes, sulfur oxides, ammonia, and oxides of nitrogen. To minimize the particulates and carbon monoxide (CO) emissions and recover the fuel value of this material, the regenerator exhaust gases are combusted in a CO boiler [Figure 1]. The tail gases from the sulfur recovery unit are incinerated in the same CO boiler to convert all sulfur compounds to SO_2. Hot gases from the CO boiler pass through an economizer and a Research-Cottrell electrostatic precipitator (ESP) before exiting out the stack.

SOURCE SAMPLING FEASIBILITY

[1] State Implementation Plan Air Pollution Inspection of Powerine Oil Company, Los Angeles, California, by NEIC, EPA 330/2-76-014, February 1976, page 9.
[2] Ibid, pages 11 and 12.

Sampling Location

The FCC and sulfur recovery unit emissions are exhausted from a tapered 55 m (180 ft) stack [Figure 2]. Sampling ports are situated 15.3 m (50 ft) downstream of the gas inlet and 27.4 m (90 ft) upstream of the stack exit where the stack diameter is 2.4 m (8 ft). The two tapered sections of stack are not considered flow disturbances because the included angle is 15°.* The ports are 5.6 and 11.3 diameters downstream and upstream of a flow disturbance, respectively.

A sampling platform allows access to one fourth of the stack circumference, where the two sampling ports (south and west) are located. The 10 cm (4 in) ports are 1.5 m (5 ft) above the sample platform, which has a railing 1.1 m (3.5 ft) high. In front of the south and west ports, the platform is 0.9 m (3 ft) and 1.8 m (6 ft) wide, respectively.

A Lear-Siegler SO_2/NOx monitor, protected with a 0.8 m (2.7 ft) by 0.5 m (1.5 ft) cover, is usually housed only 0.3 m (1 ft) below the west port. This monitor has a probe 9 cm (3.5 in) in diameter and 1.1 m (3.5 ft) long. Prior to the presurvey inspection, the monitor had been removed and returned to Lear-Siegler for repair.

Modifications

No major modifications to the sampling facilities are needed. The Company should be required to perform the minor modifications listed below:

a. Install a padeye 1.8 m (6 ft) above each port (south and west) to support a monorail.

b. Remove the temporary gas sample probe in the south port.

c. Do not install the Lear-Siegler SO_2/NOx monitor and cover until the source test is complete.

Miscellaneous

The NEIC air sampling van can be parked near the base of the FCC stack where electrical power is available. Adequate electric power (110v-20 amp) is also available at the test platform. The ladders to the platform are caged and have rest stops every 7.6 m (25 ft). Eq Equipment can be hauled to the test platform by an existing pulley system.

* "Guidelines for Sampling in Tapered Stacks" by T. J. Logan and R. T. Shigehara, EPA, RTP, N.C., October 1974.

PROCESS AND CONTROL EQUIPMENT OBSERVATIONS

Instruments in the FCC unit control room monitor operating conditions of the FCC unit, the sulfur recovery unit, and the CO boiler. Instruments at a ground-level panel monitor operating conditions of the ESP's. All instruments will be observed during each source test run to determine whether steady-state operations existed.

The FCC unit process weight is defined as the sum of the oil feed rate and the catalyst circulation rate to the reactor portion of the FCC unit.* The oil feed rate has a direct instrument readout in the FCC control room, but the catalyst circulation rate must be calculated. The Company should be requested to supply the oil feed rate and catalyst circulation rate for each source test run. This will insure agreement between EPA and the Company on the applicable process weight for each run.

SUMMARY AND CONCLUSIONS

The Powerine Oil FCC stack emissions can be source tested for particulate and sulfur dioxide. A good sampling location is available which with minimal modifications will allow EPA Method 5 and 6 sampling. These modifica[illegible] [illegible] below, are required:

a. Install padeyes 1.8 m (6 ft) above the FCC stack south and west ports, i.e., the two ports 90° apart.

b. Remove the temporary gas sample probe from the south port.

c. Remove the Lear-Siegler SO_2/NOx monitor weather cover and do not install the monitor until the sampling is complete.

In addition, to perform source testing, the following must be provided by the Company:

a. A parking spot for the NEIC air sampling van (8 ft x 40 ft) near the base of the FCC stack.

b. Electric power to the van. Either a standard range plug or two-110 volt, 20 amp lines wi[illegible] [illegible]tory.

Process operations will be monitored in the FCC unit control room to determine whether normal operations exist. Therefore, access to

* Telephone conversation with James Nance, LA APCD, on July 19, 1977.

this room will be required by the process observer. To determine the FCC unit process weight, after each sampling run the Company should supply the following process data for the sampling period:

a. Oil feed rate to the FCC unit (bbls/day).
b. Catalyst circulation rate (tons/min).

A determination of the applicable sulfur dioxide regulation is needed. The SO_2 emissions must meet either the sulfur plant or the general process SO_2 regulations.

APPENDIX B

STACK SAMPLING EQUIPMENT DESCRIPTION

APPENDIX B

STACK SAMPLING EQUIPMENT

The Scientific Glass Model AP-5000 modular STAC-O-LATUR^{tm} sampling train consists of a control unit, a sampling unit and a vacuum unit. The units are connected together with quick disconnect electrical and air lines and umbilical cords.

The AP-5000 control unit contains the following:

1. Dual-inclined manometer (range 0-5" H_2O) for indicating the pitot tube velocity pressure and the orifice pressure drop.

2. Temperature control for the oven and probe.

3. A flow valve and a bypass valve for adjusting sampling rates.

4. Digital Temperature Indicator (DTI) which gives an instant readout from six (6) points; stack, probe, oven, impinger outlet, meter inlet, meter outlet by the use of a selector switch.

5. Umbilical cords of (50 and 100 ft lengths) which interconnect the control and sampling units.

6. Communications sets are wired through control unit, umbilical cord to the sampling unit.*

The sampling unit is made up of three distinct sections: impinger case, oven, and probe. All three sections can be converted to form one sampling unit or can be separated for unusual sampling conditions. Below are the individual component descriptions.

1. Probe Sheath - Made of 316 stainless steel. The nozzle end is packed with asbestos string. The ball joint (sampling unit) end has a woven teflon O Ring as packing material.

2. Probe Liner - 5/8" O.D. medium wall glass (pyrex) or stainless steel (316) tubing logarithmically wrapped with nicrome heating element, having a resistance of 2 ohms/ft. The liner is insulated with fiberglass and asbestos with a type K thermocouple imbedded for sensing the probe temperature.

3. Filter Frit - Porous glass frit (coarse) banded to silicone rubber.

---

* *Separate communication system used during this test program.*

4. Oven - Fiberglass insulated capable of maintaining 120°C (248°F) in cold weather (0°C).

The vacuum unit (pump) is capable of drawing a high vacuum (50 cm Hg) and a moderate volume (14 lpm) of air. The pump is rotary fiber vane type which does not require lubrication, but oil bath filters are used for pump protection.

APPENDIX C

CALIBRATION AND DATA PROCEDURES

APPENDIC C

Discussion of Calibration

As discussed in the text, the pitobe assembly and the dry gas meter were calibrated before and after the source test survey. Each piece of equipment met the accuracy criteria contained in the procedures in this Appendix prior to the source test survey. Post-survey calibrations are conducted and compared with pre-survey calibrations.

The dry gas meter accuracy coefficient changed from 0.98 to 0.96. However, the coefficient did not change by more than 5% as allowed in Section 5.3 of Method 5 (40 CFR Part 60, Appendix A).

The calibration coefficient of pitobe 10-2 changed from 0.76 to 0.80 (+5.3%). However, Method 2 (40 CFR Part 60, Appendix A) makes no mention of using the post-survey pitobe calibration coefficients, inferring initial coefficients should be used in all calculations, i.e., for isokinetic and emission rate determinations.

Using the pre-survey pitobe coefficients the isokinetic rates ranged from 100.4% to 103.0%. With the post-survey pitobe coefficients, the isokinetic rates would range from 95.3% to 97.8%.

If the post-survey coefficients for the dry gas meter and pitobe assembly were used to recalculate the mass emission rate, the effect would be to reduce the report results (12 lb/hr) by 3%.

NEIC PROCEDURE FOR CALIBRATION OF DRY GAS METER AND ORFICE METER

Dry gas meters are used in source testing units to accurately measure sample volumes drawn during testing. A critical orfice is also installed to provide a known sampling rate so that isokinetic sampling can be maintained. These units will be calibrated before and after each sampling trip.

Calibration is accomplished by making simultaneous total volume measurements with a calibrated wet test meter and the dry gas meter. The wet test meter must be previously calibrated from a primary standard. Calibration is performed follows:

1. Level wet test meter and adjust the water level to the proper point.
2. Level and zero the manometer on sampling control unit.
3. Leak check unit and air hoses at 15 inch Hg (leakage rate must be zero). Assemble vacuum line to the wet test meter. (Caution: NO NOT Leak Check System by Plugging the Inlet to the Wet Test Meter, this will cause internal damage to the meter.)
4. Warm up control [illegible] vacuum pump for 30 minutes with wet test meter connected in series.
5. Close the course valve and open the fine adjust (by-pass) valve.
6. Turn or vacuum pump, open course adjust valve and turn the fine adjust valve until manometer reads 0.5" H_2O (ΔH).

7. Simultaneously record the dry gas meter reading, wet test meter reading and time. Record temperature of wet test meter, inlet and outlet temperature of dry gas meter and atmospheric pressure during the test run.

8. Allow pump to run until the wet test meter indicates exactly 5 cubic feet of air have passed through the system (10 cubic feet when a ΔH of 2, 3 and 4 inches H_2O are used) and record time.

9. Repeat steps 5-9 for ΔH of 1", 2" 3" and 4" H_2O.

10. Calibration record will be kept in a permanent file at NEIC. Copies will be made for field use.

Calculations

Calculate the accuracy of the dry gas meter (γ) as follows:

$$\gamma = \frac{Vw\ Pb\ (td + 460)}{Vd\ (Pb + \frac{\Delta H}{13.6})\ (tw + 460)}$$

Where:

V_w = Volume of gas metered, wet test meter, $ft.^3$

V_d = Volume of gas metered, dry gas meter, $ft.^3$

P_b = Atmospheric pressure, inches Hg

t_d = Dry gas meter temperature, ^oF $\left(\frac{t_d\ in - t_d\ out}{2}\right)$

t_w = Wet test meter temperature, ^oF

If $\gamma \neq 1.00$ (± 0.02) then gas meter will be taken to Public Service Company of Colorado gas meter shop for adjustment and/or repair.

Orfice meter coefficient $(\Delta H@ = \frac{0.317\ \Delta H}{P_b(td+460)} \left[\frac{(tw+460)\ \theta}{\ \ w}\right]$

Where:

V_w = Volume of gas metered, wet test meter, ft^3

P_b = Atmospheric pressure

t_d = Dry gas meter temperature, ^oF

t_w = Wet test meter temperature, ^oF

θ = Time elapsed, minutes

NEIC Procedure for Pitot Tube Calibration

Introduction

The Type-S pitot tube is used by NEIC to measure stack gas velocity during source sampling. The pitot tube coefficient (Cp) of this instrument is determined by calibration against a traceable National Bureau of Standards (NBS) standard pitot tube. The Type-S pitot tube is calibrated on a probe sheath with a ½ inch dia nozzle attached. All pitot tubes are calibrated from 305 m/min (1000 ft/min) to 1524 m/min (5000 ft/min). Pitot tubes used during tests will subsequently be recalibrated at a minimum of 3 points within the velocity range observed during testing. Tubes which have been damaged or suspected of being damaged during field use will be recalibrated over the entire range (i.e. 305 to 1524 m/min).

I. Equipment Required

A. Flow System - Calibration is performed in a flow system meeting the following minimum requirements:

(1) The air stream is confined in a well-defined cross sectional area, either circular or rectangular. The minimum size is 30.5 cm (12 inches) diameter for circular ducts and at least 25 cm (10 inches), as the shortest dimension for rectangular ducts.

(2) Entry ports provided in the test section, shall be a minimum of 8 duct diameters downstream and 2 diameters upstream of any flow disturbance, e.g. bend, expansion, contraction, opening, etc.

(3) The flow system must have the capacity to generate over the range of 305 m to 1524 m (1000 ft. - 5000 ft.)/min. Velocities in this range must be constant with time to guarantee steady flow during calibration.

B. Calibration Standard

A standard type pitot tube either calibrated directly by N.B.S. or traceable to an N.B.S. standard shall be the calibration standard.

C. Differential Pressure Gauge

An inclined or expanded scale manometer shall be used to measure velocity head (ΔP). Such gauges shall be capable of measuring ΔP to within $\pm$ 0.13 mm (0.005 inches) H_2O. A micro-manometer capable of measuring with 0.013 mm (0.0005 in) H_2O will be used to measure ΔP of less than 13 (0.5") H_2O.

D. Pitot Tube Lines

Flexible lines made of tygon or similar tubing shall be used.

E. Thermometer

A mercury in glass or other type thermometer checked agains a mercury in glass thermometer is considered suitable.

F. Barometer

A mercury column barometer shall be available to determine atmospheric pressure.

II. Physical Check

1. The openings are sharp and do not have a rolled edge.
2. The impact planes of sides A & B are perpendicular to the Traverse Tube axis [Figure 2].

3. The impact planes are parallel to the longitudinal tube axis [Figure 3].

III. Calibration Procedure

The Type-S pitot tube shall be assigned an identification number. The first digit of the number is the effective length of the tube, followed by a dash and consecutive numbers for the number of tubes of the same effective length. i.e. 5-1 signifies a five foot pitot tube and is the number one tube. Calibration proceeds as follows.

A. Fill manometer with clean oil of the proper specific gravity. Attach and leak check all pitot tube lines.

B. Level and zero monometer.

C. Position the standard pitot tube in the test section at the calibration point. If the flow system is large enough and does no interfere with the Type-S [illegible] the standard tube may be left in the system.

D. [illegible] the Type-S tube into the flow system.

E. Checks for the effect of turbulance are made as follows:

1. Read ΔP on both Type-S and standard pitot tubes with the standard pitot tube in place and compare with readings when the standard tube is withdrawn from system.

2. Read ΔP on the Type-S tube at centerline of flow system, then take readings while moving the tube to the side of the system. This will define the boundary turbulance layer.

3. Position the Type-S tube so that there impact openings are perpendicular to the duct cross sectional area and

check for null (zero) reading. Absence of a null reading at this position indicates non-laminar flow conditions.

F. Read ΔP_{std} and record on data table.

G. With the Type-S "A" leg orientated into the flow read ΔP_s and record on data table.

H. Repeat steps F and G until three sets of velocity data have been obtained.

I. Remove Type-S pitot tube and rotate probe nozzle until it aligns with side "B" impact openings.

J. Insert the Type-S pitot tube and proceed as in steps F through H.

K. Adjust flow system to new volocity and repeat F-J.

L. Record air temperature in the test system and barometric pressure during testing.

IV. <u>Calculations</u>

1. At each "A"-side and "B"-side velocity setting, calculate the three valves of Cp (s) as follows:

$$Cps = Cp\ std \sqrt{\frac{\Delta P\ std}{\Delta Ps}}$$

Where:

C_{Ps}

Cp_{std} - Standard pitot tube coefficient (NBS)

ΔP_{std} - Velocity head, measured by Standard pitot tubing inches H_2O

ΔP_s - Velocity head, measured by the Type-S pitot tube, inches H_2O

2. Calculate $\overline{Cp}$, the average (mean of the three Cp(s) valves.

3. For each $\overline{CP}$ calculated in step 2, calculate σ, the average deviation from the mean as follows:

$$\sigma(\text{Side "A" or "B"}) = \frac{\sum_{1}^{3} \left| Cp\ (s) - \overline{Cp}\ (A \text{ or } B) \right|}{3}$$

4. The pitot is acceptable if:

   (a) The "A" and "B" side average deviations calculated by equation 2 are $\leq$ 0.01.

   (b) The difference of the "A" and "B" sides $\overline{Cp}$ calculated by equation 1 is $\leq$ 0.01 for each individual velocity.

5. Calculate the test section velocity as follows:

$$\overline{V} = KCp \sqrt{\frac{T\ \overline{\Delta P}\ std}{PM}}$$

Where:

$\overline{V}$ = Average test-section velocity, ft/min

K = 5130 (constant)

Cp = Coefficient of standard pitot tube

T = Temperature of gas stream ^{o}R

P = Barometric pressure, inches Hg

M = Molecular weight of air = 29.0

$\overline{\Delta P}$ std = Average of the three standard pitot tube readings, inches H_2O

V. <u>Record Keeping</u>

Flow system data and information on each pitot tube shall be recorded in a bound book.

The flow system data shall include:

1. The tunnel cross-sectional area and length up-stream and down-stream of the test site)ft.) from disturbances.

2. Time tunnel used (hrs)
3. Air temperature (^{o}F) in flow system and barometric pressure (inches Hg).
4. All checks for turbulance and flow distribution.
5. Velocity range (ft/min).

The pitot tube information shall include:

1. I.D. number
2. Checks for physical damages, errors noted and modifications.
3. Dates and surveys pitot tubes were used.
4. Date of calibrations, coefficient and dates of re-calibration.

The calibration records will be kept on file at NEIC. Copies of the appropriate calibration dates will be furnished for each source test project.

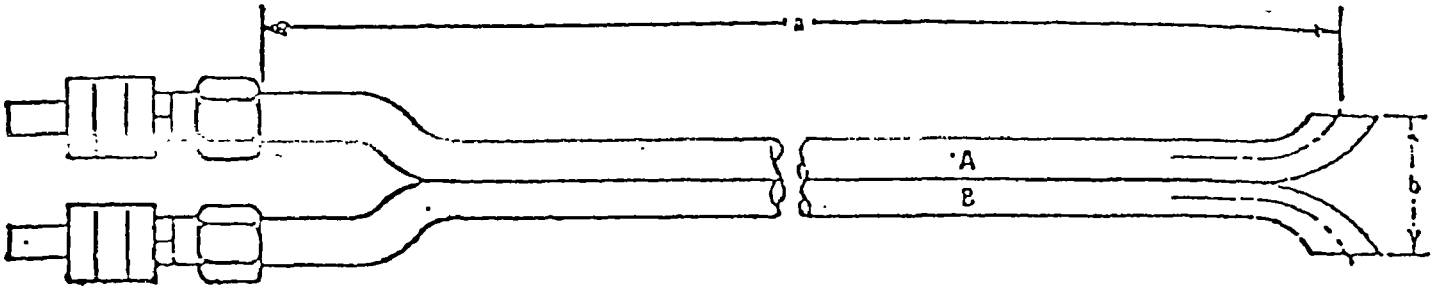


Figure 1. Measurement of Type-S pitot tube length (dimension "a") and impact-plane separation distance (dimension "b").

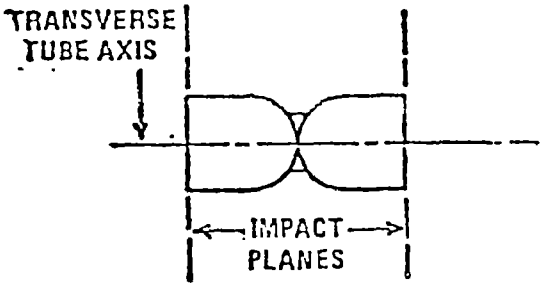


Figure 2. Type-S pitot tube, end view; impact-opening planes perpendicular to transverse tube axis.

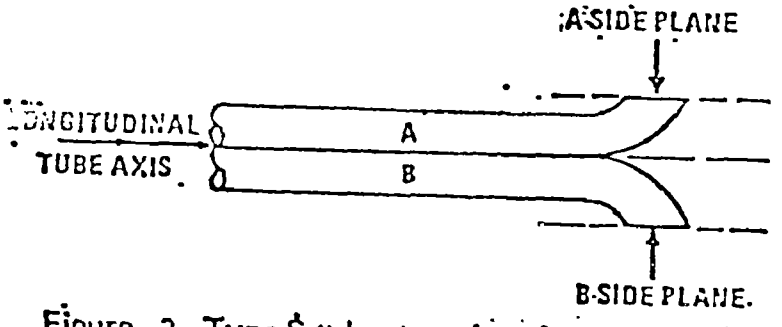


Figure 3. Type-S tube, top view; impact-opening planes parallel to longitudinal tube axis.

From "A TYPE-S PITOT TUBE CALIBRATION STUDY"

Robert F. Vollaro, October 15, 1975

Orifice Meter Calibration

Date 6/7/77 Box No. SGI-2

Barometric pressure, P_b = 24.63 in. Hg Dry gas meter No. 2
At Quail

LEAK Check @ 15" Hg = 0.0 CFM

Orifice Manometer setting, ΔH in. H_2O	Gas volume wet test meter V_w, ft^3	Gas volume dry gas meter V_d, ft^3	Temperature: Wet Test Meter t_w, °F	Dry gas meter Inlet t_{di}, °F	Dry gas meter Outlet t_{do}, °F	Dry gas meter Average t_d, °F	Time θ, min	Y	ΔH@
0.5	5	5.1	72	74	73	73.5	11.28	.98	1.73
1.0	5	5.09	73	76	73	74.5	8.06	.98	1.77
2.0	10	10.17	73	79	74	76.5	11.36	.98	1.76
3.0	10	10.2	76	84	78	81	9.43	.98	1.81
4.0	10	10.19	77	86	80	83	8.12	.98	1.81
						Average		.98	1.78

Calculations

ΔH	$\frac{\Delta H}{13.6}$	Y: $\frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6})(t_w + 460)}$	ΔH@: $\frac{0.0317 \Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460)\theta}{V_w}\right]^2$
0.5	0.0368	$\frac{5 \times 24.63 (73.5+460)}{5.1 (24.63+.0368)(72+460)}$	$\frac{0.0317 \times 0.5}{24.63(73.5+460)} \left[\frac{(72+460)11.28}{5}\right]^2$
1.0	0.0737	$\frac{5 \times 24.63 (74.5+460)}{5.09 (24.63+.0737)(73+460)}$	$\frac{0.0317 \times 1.0}{24.63(74.5+460)} \left[\frac{(73+460)8.06}{5}\right]^2$
2.0	0.147	$\frac{10 \times 24.63 (76.5+460)}{10.17 (24.63+0.147)(73+460)}$	$\frac{0.0317 \times 2.0}{24.63(76.5+460)} \left[\frac{(73+460)11.36}{10}\right]^2$
3.0	0.219	$\frac{10 \times 24.63 (81+460)}{10.2 (24.63+.219)(76+460)}$	$\frac{0.0317 \times 3.0}{24.63(81+460)} \left[\frac{(76+460)9.43}{10}\right]^2$
4.0	0.294	$\frac{10 \times 24.63 (83+460)}{10.19 (24.63+.294)(77+460)}$	$\frac{0.0317 \times 4.0}{24.63(83+460)} \left[\frac{(77+460)8.12}{10}\right]^2$

Where: V_w = Volume, wet test meter
V_d = Volume Dry gas meter
T_w = Temperature, Wet Test Meter
T_d = Temperature, Dry Gas Meter
P_b = Atmospheric Pressure, Inches Hg
θ = Time, minutes

Calibration by: [signature]

Checked by: _____

Remarks:

4/29/77

Orifice Meter Calibration

Date 9/29/77 Box No. SCI-2

Barometric pressure, P_b = 24.43 in. Hg Dry gas meter No. 2

LEAK CHECK @ 15" Hg = 0.0 CFM

Orifice Manometer setting, ΔH in. H_2O	Gas volume wet test meter V_w, ft^3	Gas volume dry gas meter V_d, ft^3	Temperature: Wet Test Meter t_w, °F	Dry gas meter Inlet t_{di}, °F	Dry gas meter Outlet t_{do}, °F	Dry gas meter Average t_d, °F	Time θ, min	γ	ΔH@
0.5	5	5.17	80	75	73	74	11.27	.95	1.80
1.0	5	5.17	80	75	73	74	8.07	.95	1.85
2.0	10	10.29	80	77	73	75	11.38	.96	1.83
3.0	10	10.31	79.5	80	75	77.5	9.32	.96	1.83
4.0	10	10.32	77	81	76	78.5	8.13	.96	1.85
						Average		.96	1.83

Calculations

ΔH	$\frac{\Delta H}{13.6}$	γ: $\frac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6})(t_w + 460)}$	ΔH@: $\frac{0.0317\Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460)\theta}{V_w}\right]^2$
0.5	0.0368	$\frac{5 \times 24.43(74+460)}{5.17(24.43+.0368)(80+460)}$	$\frac{.0317 \times .5}{24.43(74+460)} \left[\frac{(80+460)11.27}{5}\right]^2$
1.0	0.0737	$\frac{5 \times 24.43(74+460)}{5.17(24.43+.0737)(80+460)}$	$\frac{.0317 \times 1}{24.43(74+460)} \left[\frac{(80+460)8.07}{5}\right]^2$
2.0	0.147	$\frac{10 \times 24.43(75+460)}{10.29(24.43+.147)(80+460)}$	$\frac{.0317 \times 2}{24.43(75+460)} \left[\frac{(80+460)11.38}{10}\right]^2$
3.0	0.219	$\frac{10 \times 24.43(77.5+460)}{10.31(24.43+.219)(79.5+460)}$	$\frac{.0317 \times 3}{24.43(77.5+460)} \left[\frac{(79.5+460)9.32}{10}\right]^2$
4.0	0.294	$\frac{10 \times 24.43(78.5+460)}{10.32(24.43+.294)(77+460)}$	$\frac{.0317 \times 4}{24.43(78.5+460)} \left[\frac{(77+460)8.13}{10}\right]^2$

Where: V_w = Volume, wet test meter
V_d = Volume Dry gas meter
T_w = Temperature, Wet Test Meter
T_d = Temperature, Dry Gas Meter
P_b = Atmospheric Pressure, Inches Hg
θ = Time, minutes

Calibration by: [signature]

Checked by:

Remarks:

4/24/77

US Environmental Protection Agency
National Enforcement Investigations Center-Denver

Calibration Pitot Tube: ID Number NIES-1 Cp .99
Type-S Pitot Tube ID Number: 10-2

ΔP Standard Pitot	ΔP S-Type Pitot		Cp		Comments
	A leg	B leg	A	B	
.120	.190	.185	.786	.797	.790 .793
	.190	.185	.786	.797	Δ.003
.120	.185	.190	.797	.786	
.170	.295	.290	.752	.757	.752 .754
	.295	.295	.752	.752	Δ.002
.170	.295	.295	.752	.752	
.205	.355	.355	.752	.752	.754 .754
	.350	.355	.757	.752	Δ.000
.205	.355	.350	.752	.757	
.290	.500	.495	.761	.758	.760 .758
	.500	.495	.761	.758	Δ.002
.290	.495	.495	.758	.758	
			.763	.764	Leg Average Cp

During Pitot Calibration:
probe sheath attached YES
nozzle attached YES
sampling isokinetically NO

Performed By: [signature] Calibration Date: 6/28/77

[signature]

US Environmental Protection Agency
National Enforcement Investigations Center-Denver

Calibration Pitot Tube: ID Number [illegible] Cp .77
Type-S Pitot Tube ID Number: [illegible]

69.4° F
623 mm of Hg
24.53 In Hg

ΔP Standard Pitot	ΔP S-Type Pitot		Cp		Comments
	A leg	B leg	A	B	
.97	1.46	1.50	.807	.796	
	1.46	1.50	.807	.796	
.97	1.46	1.51	.807	.793	
.80	1.21	1.22	.805	.802	
	1.21	1.23	.805	.798	
.80	1.21	1.23	.805	.798	
.60	.865	.920	.825	.799	
	.865	.915	.825	~~.797~~	
.60	.865	.915	.825	.802	
.40	.595	.605	.817	.805	
	.595	.605	.817	.805	
.40	.593	.607	.813	.804	
.20	.302	.305	.806	.802	
	.304	.305	~~.808~~ .803	.802	
[illegible]	.304	.305	.803	.802	
			.811	.800	Leg Average Cp

During Pitot Calibration:
probe sheath attached YES
nozzle attached YES
sampling isokinetically

Performed By: [signature] Calibration Date: 9/23/77

APPENDIX D

ANALYTICAL PROCEDURES AND DATA

APPENDIX D

ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF ENFORCEMENT
NATIONAL ENFORCEMENT INVESTIGATIONS CENTER
BUILDING 53, BOX 25227, DENVER FEDERAL CENTER
DENVER, COLORADO 80225

TO Mr. Paul dePercin
Field Operations Branch

DATE December 2, 1977

FROM Deputy Chief
Chemistry Branch

SUBJECT. Detection Limits for L.A. Source Test Data

The data transmitted on October 14, 1977, included less than values for the particulate acetone, organic and inorganic impinger samples. All weighings were performed on an analytical balance to the nearest 0.1 mg. Positive results for the blank samples are from random contamination during sample collection, handling and analysis. It is important that results not be reported as real when in fact the positive values are from contamination. This possibility is minimized by determining the detection limit based on the determined blank values.

The detection limit is calculated by adding two standard deviations (95% confidence level) of the blank values to the mean of the blank values. If the mean blank is subtracted from all results, then this value is excluded from the detection limit. Typically, only a few blank measurements are made and one high blank value can bias the detection limit. However, this will provide a conservative reporting of positive values. If any error is made, it will be on the side of not reporting some real values, but will guard against reporting values as real that resulted from contamination.

Mark J. Carter

Mark J. Carter

cc: Meiggs
Young

NAME OF SURVEY Lab. Source Test

DATES COVERED 9/10 - 9/18/77

SAMPLE NUMBER	STATION DESCRIPTION	TIME	ANALYSES PERFORMED (IN mg.) Particulate Acetone	Particulate Filter	Particulate Impinger (Org)	Particulate Impinger (Inorg.)	$SO_4^=$ mg/sample	[illegible]
1801-01-0910	Powerline Oil Co.	1537	~~377.5~~ 144 *	45.0	4.0	40		
1801-02-0910	" " "	0345	72	58.0	2.0	50		
1801-03-0910	" " "	1000	73	40.5	2.5	160		
1801-04-0911	" " "	—	25				2740	
1801-02-0910	Field Blank	—	<6		<0.5	<9		

* Contaminate present - Broken probe liner

...IAL ...CAL DATA REPORTING FORM

Page_____

NAME OF SURVEY L.A. Source Test FIELD DATA DATES COVERED 9/10 – 9/18/77

SAMPLE NO.	STATION DESCRIPTION	TIME	ANALYSES PERFORMED					
			Acetone Wash SO_4, mg	Filter SO_4, mg	Impinger SO_4, mg			
1801-01-0910	Powerine Oil Co.	1537	19	12	30			
1801-02-0910	"	0345	12	14	38			
1801-03-0910	"	1000	19	8	93			
1801-04-0911	"	—	—	—				
1801-02-0910	Field blank	—	5	—				

METHOD 5 DETERMINATION OF PARTICULATE EMISSIONS FROM STATIONARY SOURCES

ANALYTICAL PROCEDURES

Filters

The filters to be tared are desiccated at 20 ±5.6°C (68 ±10°F) and ambient pressure for at least 24 hours and weighed at 6 or more hour intervals to a constant weight, i.e., ≤ 0.5 mg. change from previous weighing, and results recorded to the nearest 0.1 mg. During each weighing the filter is not exposed to the laboratory atmosphere for a period greater than 2 minutes and a relative humidity above 50 percent.

The filters are received from the field in aluminum foil wrapped Petri dishes. The aluminum foil is removed and the Petri dishes placed into a dessicator using indicating drierite as the dessicant. This dessicant removes the uncombined water on the filters. The filters are desiccated at 20 + 5.6°C (68 ±10°F) and ambient pressure for at least 24 hours and weighed in the same manner as in taring.

Prior to weighing the filters, both tared and gross, the single pan analytical balanced is calibrated against [illegible] weights. Also, prior to each weighing, dessicator and weighing room temperature and humidity readings are recorded.

The filters in the Petri dishes are individually removed from the dessicator immediately prior to weighing. Removal and all other handling of the filters are performed with tweezers.

Acetone Wash

The acetone probe washes are received in quart glass jars with Teflon lined lids. The contents of each jar are transferred into tared 250 ml beakers along with the acetone used to rinse the jars after transferral. The beakers are then placed into a hood at ambient temperature for acetone

In the ~~hand~~ hood, the beakers are placed in an aluminum foil tunnel which is designed to prevent any possible contamination by particulates and to allow an efficient air flow for escape of acetone vapors. The hood door is kept closed and tared beakers used as blanks are included to verify that the samples did not become contaminated.

After at least 24 hours in the evaporating tunnel, beakers are removed and placed into dessicators using drierite as the dessicant. The beakers remain in the dessicator for at least 24 hours and weighed to a constant weight. The final weights are reported using a single pan analytical balance calibrated against Class "S" weights. Room temperature and humidity are measured during the dessication and weighing process.

No filters or acetone residues are discarded after analysis. The residue from the beakers are rinsed with a minimal amount of acetone back into the mason jars in which they were.collected.

The filters and residues along with their respective sample tags are stored in a predetermined place for at least a year.

Raw Data Bench Cards

OHIO POWER PLANT STUDY

CARDINAL STATION

FILTER METHOD #5

SAMPLE DATE	STATION NUMBER	SEQUENCE NUMBER	FILTER NUMBER	FILTER SIZE	DESICCATED GROSS WT.		FILTER TARE WT.	FINAL NET WT.	FINAL WEIGHING DATE
					1ST WT. @ 24 HRS.	2ND WT. @ + 6 HRS.			

OHIO POWER PLANT STUDY

CARDINAL STATION

ACETONE WASH METHOD #5

SAMPLE DATE	STATION NUMBER	SEQUENCE NUMBER	BEAKER NUMBER	VOL. OF SAMPLE	DESICCATED GROSS WT.		BEAKER TARE WT.	FINAL NET WT.	FINAL WEIGHING DATE
					1ST WT. @ 24 HRS.	2ND WT. @ + 6 HRS			

Field and Laboratory Blanks

Field filter blanks are collected and weighed one in every ten samples with a minimum of two if less than ten filters are collected.

Acetone blanks are collected and analyzed at approximately the same rate as the filters. In addition, laboratory blanks are analyzed during each batch analysis.

PARTICULATES AND SULFATES ON WATER IMPINGERS

General

The impinger solutions are received in quart jars with Teflon lined caps. After logging sample in, the volume in each jar is measured and a 250 ml aliquot is removed for analysis.

Analysis

Particulates

a) Total - transfer the 250 ml aliquot into a desiccated and tared 250 ml beaker, place in 90°C oven until dry.

b) Organic - transfer the 250 ml aliquot into a 500 ml separatory funnel and extract 3 consecutive times with 20 ml aliquots of chloroform, collecting the chloroform extract in a desiccated and tared 100 ml beaker. Evaporate the chloroform extract to dryness by blowing a small stream of nitrogen over it in a hood.

c) Inorganic - transfer aqueous portion of (b) into a desiccated and tared 250 ml beaker. Place in 90°C oven until dry.

Place and leave dry beakers in a desiccator using (indicating desiccant) for at least 24 hours and until the gross weight of each beaker is stabilized.

Sulfates

100 ml of deionized distilled water was added to each beaker. The beakers were swirled gently, covered with parafilm and allowed to equilibrate for 24 hours before aliquots were removed for sulfate analysis. (Described on following page.)

Methodology for Sulfate Analysis

Sulfate analyses were performed according to Method 8 (Federal Register, Vol. 36, No. 246--Thursday, December 23, 1971, pp. 24893-24895). Briefly, the method is as follows:

Into a 250 ml Erlenmeyer flask was placed:

1. A known aliquot of sample
2. Deionized distilled water bringing the volume to 25 ml
3. 100 ml of isopropanol
4. 4 drops of thorin indicator

This orange solution was titrated to a pink endpoint using a 0.01 N barium perchlorate solution.

Each day the $Ba(ClO_4)_2$ solution was standardized against a 0.01 N H_2SO_4 standard solution which had been standardized against a 0.01 N NaOH standard solution.

SAMPLE INFORMATION				PARTICULATES				SULFATES					FINAL RESULTS		
SAMPLE #	DESCRIPTION	TOTAL VOLUME	ALIQUO USED	BEAKER #	GROSS WT.	TARE WT.	NET WT.	SAMPLE ALIQUO	ML TITRANT	INITIAL (SO_4)	DIL FACTOR	TOTAL $SO_4^=$	SAM. VOL. LIQ. USED	TOTAL $SO_4^=$	TOTAL PARTIC.

SULFUR DIOXIDE EMISSIONS FROM STATIONARY SOURCES

Sampling Procedure

Stack gas samples are collected in an impinger train of Greenburg-smith design which consists of four impingers. The train is cooled in an ice bath to minimize evaporative loss of the absorbing solutions and to enhance the tetention of stack gas components in these fluids.

The first and second impingers contains 100 ml each of 5% hydrogen peroxide (10 ml of 30% H_2O_2 diluted to 100 ml with deionized-distilled water, the third impinger is empty and the fourth impinger contains approximately 200 g of indicating type 6-16 mesh silica gel.

Particulates, sulfites, and sulfates and SO_2 are caught in the first and second impingers. The sulfur dioxide is oxidized by the hydrogen peroxide to sulfate ($SO_4^{=}$):

$$SO_2 + H_2O \rightarrow H_2SO_3$$

$$H_2SO_3 + H_2O_2 \rightarrow H_2O + H_2SO_4$$

The third impinger collects and carry over from the second and the fourth impinger removes water vapor from the stack gas.

The impinged solutions are transported from the stack site to the laboratory in mason jars sealed with Teflon lid inserts. Chain-of-custody procedures are followed. The liquid level in the jars is marked in the field and checked in the laboratory for losses.

Analytical Procedures

All sulfur-containing species are collected as or converted to sulfate. The sulfate is determined by titration with a standardized barium [illegible] The [illegible] are carried out in 80% isopropanol, which enhances the formation of barium sulfate and sharpens the end-point of the reaction. Thorin is used as an indicator and changes from yellow to pink at the end-point of the titration when there is an excess of barium present.

Standardization of Barium Solution

A standard solution prepared from acidimetric grade potassium hydrogen phthalate (KHP) is used to standardize a sodium hydroxide

solution. The sodium hydroxide solution is used to standardize a sulfuric acid solution, which is used in turn to standardize a barium perchlorate solution. The reactions and stoiciometry are described below:

$KHP + NaOH \text{ -- } NaKP + H_2O$

$2NaOH + H_2SO_4 \text{ -- } Na_2SO_4 + 2H_2O$

$H_2SO_4 + Ba(ClO_4)_2 \text{ -- } BaSO_4 + 2HClO_4$

$$\frac{\text{weight KHP}}{204.2 \text{ g/eg}}(g) = (\text{vol. NaOH}) \cdot (\text{N NaOH})$$

$$(\text{N NaOH}) = \frac{(\text{weight KHP}\ (g))}{(204.2 \text{ g/eq})} \quad (1 \text{ NaOH})$$

$$(\text{vol. NaOH})\ (\text{N NaOH}) = (\text{vol. } H_2SO_4)\ (\text{N } H_2SO_4)$$

$$(\text{N } H_2SO_4) = \frac{(\text{vol. NaOH})\ (\text{N NaOH})}{(\text{vol. } H_2SO_4)}$$

$2N\ H_2SO_4\ 1\ M\ H_2SO_4 = 1\ M\ SO_4 =$

$$(\text{vol. } H_2SO_4)\ (M\ H_2SO_4) = (\text{vol. } Ba(ClO_4)_2)\ (M\ Ba(ClO_4)_2)$$

$$(M\ Ba(ClO_4) = \frac{(\text{vol. } H_2SO_4)\ (M\ H_2SO_4)}{(\text{vol. } Ba(ClO_4)_2)}$$

Analysis of Hydrogen Peroxide Samples

Since hydrogen peroxide samples are mostly water, 100% isopropanol must be added to the aliquots to obtain an optimum concentration of 80% isopropanol. Table I indicates what volumes of 100% isopropanol are required for various aliquot volumes to meet the optimum 80% final volumes.

Table I

Sample Aliquot ml	20	15	10	5	2	1	0.5
Required 100% Isopropanol ml	80	60	40	20	8	4	2

Before the mixture is titrated with the standardized barium perchlorate, the total volume in the flask is adjusted to 100 ml with 80% isopropanol. Four drops of thorin indicator are added and the solution is titrated to a pink end-point. Replicate titrations should agree within 1%.

APPENDIX E

CHAIN-OF-CUSTODY PROCEDURES AND RECORDS

ENVIRONMENTAL PROTECTION AGENCY
NATIONAL ENFORCEMENT INVESTIGATIONS CENTER

CHAIN OF CUSTODY PROCEDURES
June 1, 1975

GENERAL

The evidence gathering portion of a survey should be characterized by the minimum number of samples required to give a fair representation of the water, air or solid waste sampled. To the extent possible, the quantity of samples and sample locations will be determined prior to the survey.

Chain of Custody procedures must be followed to maintain the documentation necessary to trace sample possession from the time taken until the evidence is introduced into court. A sample is in your "custody" if:

1. It is in your actual physical possession, or

2. It is in your view, after being in your physical possession, or

3. It was in your physical possession and then you locked it up in a manner so that no one could tamper with it.

All survey participants will receive a copy of the survey study plan and will be knowledgeable of its contents prior to the survey. A pre-survey briefing will be held to re-appraise all participants of the survey objectives, sample locations and Chain of Custody procedures. After all Chain of Custody samples are collected, a de-briefing will be held in the field to determine adherence to Chain of Custody procedures and whether additional evidence type samples are required.

SAMPLE COLLECTION

1. To the maximum extent achievable, as few people as possible should handle the sample.

2. Water, air, or solid waste samples shall be obtained, using standard field sampling techniques.

3. Sample tags (Exhibit I) shall be securely attached to the sample container at the time the complete sample is collected and shall contain, at a minimum, the following information: station number, station location, data taken, time taken, type of sample, sequence number (first sample of the day - sequence No. 1, second sample - sequence [illegible] analyses required and samplers. The [illegible] must be [illegible] in ballpoint (waterproof ink).

4. Blank samples shall also be taken with preservatives which will be analyzed by the laboratory to exclude the possibility of container or preservative contamination.

5. A pre-printed, bound Field Data Record logbook shall be maintained to record field measurements and other pertinent information necessary to refresh the sampler's memory in the event he later takes the stand to testify regarding his actions during the evidence gathering activity. A separate set of field notebooks shall be maintained for each survey and stored in a safe place where they could be protected and accounted for at all times. Standard formats (Exhibits II and III) have been established to minimize field entries and include the date, time, survey, type of samples taken, volume of each sample, type of analysis, sample numbers, preservatives, sample location and field measurements such as temperature, conductivity,

DO, pH, flow and any other pertinent information or observations. The entries shall be signed by the field sampler. The preparation and conservation of the field logbooks during the survey will be the responsibility of the survey coordinator. Once the survey is complete, field logs will be retained by the survey coordinator, or his designated representative, as a part of the permanent record.

6. The field sampler is responsible for the care and custody of the samples collected until properly dispatched to the receiving laboratory or turned over to an assigned custodian. He must assure that each container is in his physical possession or in his view at all times, or locked in such a place and manner that no one can tamper with it.

7. Colored slides or photographs should be taken which would visually show the outfall sample location and any water pollution to substantiate any conclusions of the investigation. Written documentation on the back of the photo should include the signature of the photographer, time, date and site location. Photographs of this nature, which may be used as evidence, shall be handled recognizing Chain of Custody procedures to prevent alteration.

TRANSFER OF CUSTODY AND SHIPMENT

1. Samples will be accompanied by a Chain of Custody Record which includes the name of the survey, samplers' signatures, station number, station location, date, time, type of sample, sequence number, number of containers and analyses required (Fig. IV). When turning over the possession of samples, the transferor and transferee will sign, date and time the sheet. This record sheet allows transfer of custody of a group of samples in the field, to the mobile laboratory or when samples are dispatched to the NEIC - Denver laboratory. When transferring a portion of the samples identified on the sheet to the field mobile laboratory, the individual samples must be noted in the column with the signature of the [illegible] relinquishing the samples. The field laboratory person receiving the samples will acknowledge receipt by signing in the appropriate column.

2. The field custodian or field sampler, if a custodian has not been assigned, will have the responsibility of properly packaging and dispatching samples to the proper laboratory for analysis. The "Dispatch" portion of the "Chain of Custody Record shall be properly filled out, dated, and signed.

3. Samples will be properly packed in shipment containers such as ice chests, to avoid breakage. The shipping containers will be padlocked for shipment to the receiving laboratory.

4. All packages will be accompanied by the Chain of Custody Record showing identification of the contents. The original will accompany the shipment, and a copy will be retained by the survey coordinator.

5. If sent by mail, register the package with return receipt requested. If sent by common carrier, a Government Bill of Lading should be obtained. Receipts from post offices, and bills of lading will be retained as part of the permanent Chain of Custody documentation.

6. If samples are delivered to the laboratory when appropriate personnel are not there to receive them, the samples must be locked in a designated area within the laboratory in a manner so that no one can tamper with them. The same person must then return to the laboratory and unlock the samples and deliver custody to the appropriate custodian.

LABORATORY CUSTODY PROCEDURES

1. The laboratory shall designate a "sample custodian." An alternate will be designated in his absence. In addition, the laboratory shall set aside a "sample storage security area." This should be a clean, dry, isolated room which can be securely locked from the outside.

2. All samples should be handled by the minimum possible number of persons.

3. All incoming samples shall be received only by the custodian, who will indicate receipt by signing the Chain of Custody Sheet accompanying the samples and retaining the sheet as permanent records. Couriers picking up samples at the airport, post office, etc. shall sign jointly with the laboratory custodian.

4. Immediately upon receipt, the custodian will place the sample in the sample room, which will be locked at all times except when samples are removed or replaced by the custodian. To the maximum extent possible, only the custodian should be permitted in the sample room.

5. The custodian shall ensure that heat-sensitive or light-sensitive samples, or other sample materials having unusual physical characteristics, or requiring special handling, are properly stored and maintained.

6. Only the custodian will distribute samples to personnel who are to perform tests.

7. The analyst will record in his laboratory notebook or analytical worksheet, identifying information describing the sample, the procedures performed and the results of the testing. The notes shall be dated and indicate who performed the tests. The notes shall be retained as a permanent record in the laboratory and should note any abnormalties which occurred during the testing procedure. In the event that the person who performed the tests is not available as a witness at time of trial, the government may be able to introduce the notes in evidence under the Federal Business Records Act.

8. Standard methods of laboratory analyses shall be used as described in the "Guidelines Establishing Test Procedures for Analysis of Pollutants," 38 F.R. 28758, October 16, 1973. If laboratory personnel deviate from standard procedures, they should be prepared to justify their decision during cross-examination.

9. Laboratory personnel are responsible for the care and custody of the sample once it is handed over to them and should be prepared to testify that the sample was in their possession and view or secured in the laboratory at all times from the moment it was received from the custodian until the tests were run.

10. Once the sample testing is completed, the unused portion of the sample together with all identifying tags and laboratory records, should be returned to the custodian. The returned tagged sample will be retained in the sample room until it is required for trial. Strip charts and other documentation of work will also be turned over to the custodian.

11. Samples, tags and laboratory records of tests may be destroyed only upon the order of the laboratory director, who will first confer with the Chief, Enforcement Specialist Office, to make certain that the information is no longer required or the samples have deteriorated.

EXHIBIT I

EPA, NATIONAL ENFORCEMENT INVESTIGATIONS CENTER

Station No.	Date	Time	Sequence No.

Station Location

_____Grab
_____Comp.

_____BOD
_____Solids
_____COD
_____Nutrients

_____Metals
_____Oil and Grease
_____D.O.
_____Bact.
_____Other

Remarks/Preservative:

Samplers:

Front

ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF ENFORCEMENT
NATIONAL ENFORCEMENT INVESTIGATIONS CENTER
BUILDING 53, BOX 25227, DENVER FEDERAL CENTER
DENVER, COLORADO 80225

Back

ENVIRONMENTAL PROTECTION AGENCY
Office Of Enforcement
NATIONAL ENFORCEMENT INVESTIGATIONS CENTER
Building 53, Box 25227, Denver Federal Center
Denver, Colorado 80225

CHAIN OF CUSTODY RECORD

SURVEY: Louisiana Oil

SAMPLERS: (Signature)

STATION NUMBER	STATION LOCATION	DATE	TIME	SAMPLE TYPE Water Comp	SAMPLE TYPE Water Grab	SAMPLE TYPE Air	SEQ NO.	NO OF CONTAINERS	ANALYSIS REQUIRED
1801	Louisiana Oil Barge	9/8/77	537			X	01	1	[illegible]
[illegible]	"	9/[illegible]/77	[illegible]			X	[illegible]	1	[illegible]
[illegible]	"	[illegible]/77				X		1	[illegible]
[illegible]	"	[illegible]/77	[illegible]			X			[illegible]
1801	"	9/10/77				X		1	Distilled H2O Blank
1801	"	9/10/77	1515			X	02	1	[illegible]
[illegible]	"	9/10/77	[illegible]			X	02	1	Impinger [illegible]
1801	"	9/10/77	[illegible]			X	03	1	[illegible]
1801	"	9/10/77	1000			X	03	1	Impinger [illegible]
1801	"	9/10/77				X	04	1	Acetone wash [illegible]
1801	"	9/10/77	0240			X	05	1	Filter #47 [illegible]
1801	"	9/10/77	1400			X	01	1	Filter #46 Particulate

Relinquished by: (Signature)	Received by: (Signature)	Date/Time
[signature]		
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by Mobile Laboratory for field analysis: (Signature)	Date/Time
Dispatched by: (Signature) / Date/Time	Received for Laboratory by: [signature]	Date/Time 9/21/77 900
Method of Shipment:		

Distribution: Orig. – Accompany Shipment
1 Copy – Survey Coordinator Field Files

ENVIRONMENTAL PROTECTION AGENCY
Office Of Enforcement
NATIONAL ENFORCEMENT INVESTIGATIONS CENTER
Building 53, Box 25227, Denver Federal Center
Denver, Colorado 80225

CHAIN OF CUSTODY RECORD

SURVEY: [illegible]

SAMPLERS: (Signature) [illegible]

STATION NUMBER	STATION LOCATION	DATE	TIME	SAMPLE TYPE Water Comp	SAMPLE TYPE Water Grab	SAMPLE TYPE Air	SEQ NO	NO OF CONTAINERS	ANALYSIS REQUIRED
1801	POWERINE OIL FIELD BACK	9/11/77	1000			X	03	1	FLEETWAX PARAMETERS
1801	"	9/11/77	1100			X	04	1	[illegible]

Relinquished by: (Signature) [illegible]	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by: (Signature)	Date/Time
Relinquished by: (Signature)	Received by Mobile Laboratory for field analysis: (Signature)	Date/Time
Dispatched by: (Signature) — Date/Time	Received for Laboratory by: [illegible]	Date/Time 9/24/77 900
Method of Shipment:		

Distribution: Orig. – Accompany Shipment
1 Copy – Survey Coordinator Field Files

APPENDIX F

PRODUCTION DATA AND PROCESS WEIGHT CALCULATIONS

Refinery Process Data

Name: Fowin · Oil

Date: 9/11

Clock Time	FCC Feed Oil(bbls)	FCC Feed ~~Cat/Oil~~ 9.4 CO2/NO	Air(cfm)	CO Boiler Air Feed	CO Boiler Gas BTU Val	ESP Primary Voltage	ESP Primary Amperage	ESP Secondary Amperage	ESP Spark Rate
2:15 PM	8.73 (1/250)	38.2/15.1	7.1	55	69	230	33.5	169 ma	10
4:15	8.7	62/18	70	55	69	236	33.2	169	0

Refinery Process Data

Name: Florida Oil

Date: 9/9/77 - 9/10/77
9/11/77

Clock Time	Fresh Feed Oil (bbls)	FCC Feed ~~Catalyst~~ STACK GAS SO_2 / NOX	Air blower suct flow (red) Air (cfm)	COMB AIR TO CO Boiler FR 249 Air Feed	Gas BTU Val	ESP Primary Voltage	Primary Amperage	PRECIPITATOR AVG CURRENT Secondary Amperage	Spark Rate
4:07 pm	8.8 (11352)	—	7.2	61	71	228 V	33.5 A	169 mA	73
9:50 am	8.95 (11600)	22 / 24.0	7.3	58	70	223	33.5	169	40
12:40 am	8.95 (11600)	24 / 22	7.2	59	70	225	33.5	169	58
2:35 pm	8.95 (11600)	24.0 / 20.0	7.2	59	69	226	33.5	169	40
4:35 pM	8.84 (11400)	27.5 / ~~18.8~~ 18.0	7.2	60	70	227	33.5 A	168 ma	72
10:15 Am	9.0 (11610)	23.0 / ~~14.~~ 19.5	7.2	59	71	227	33.5	168	38
11:25 am	8.8 (11352)	26 / 16.0	7.1	54	69	234	33.3	168	0

Telephone conversation with
Walter Elemba, Paducah Oil
10/10/77 10:00 AM

F.C.C. PROCESS DATA 9/8-11/77

CAT CIR		OIL FEED RATE	AIR FEED RATE
9	14 Tons/hour	11,900 BBL/DAY	17200 SCFM
10	14	11,900	17000
11	14	11,500	17,250

P. de Perin

APPENDIX G

TEST DATA AND EMISSIONS CALCULATIONS

EXAMPLE CALCULATION

POWERINE OIL

STATION 1801 – RUN 1

REPORTED ANALYTICAL RESULTS (mg)

	PARTICULATE		SO_4 (INORGANIC)	
	Sample	blank	Sample	blank
ACETONE WASH	144	6	17	5
FILTER	45	0	12	0
IMPINGERS	40	9	30	9

PARTICULATES

ACETONE WASH : 144 – 6 = 138

FILTER : 45 – 0 = 45

IMPINGERS : 40 – 9 = 31

SULF

$H_2SO_4 \cdot nH_2O$

ACETONE WASH : 17 – 5 = 14 × $\frac{134}{96}$ = 20

FILTER : 12 – 0 = 12 × $\frac{134}{96}$ = 17

IMPINGERS : 30 – 9 = 21 × $\frac{134}{96}$ = 31

THEREFORE,

	PARTICULATES	SULFATES (AS $H_2SO_4 \cdot 2H_2O$)
ACETONE WASH	138	20
FILTER	45	17
IMPINGERS	31	31

LAPCD PROCEDURE (138 − 20) = 118
+ (45 − 17) = 28
+ (31 − 31) = 0
TOTAL = 146 mg

METHOD 5 PROCEDURES
(138
+ 45
TOTAL 183 mg

METHOD 5 (+) PROCEDURE 183
+ (31 − 31) = 0
TOTAL 183 mg

Plant Pomeroy

Run No. PBB. Traverse

Location 1201

Date 9/9/87

Operator

Sample Box No. 2

Meter Box No. 2

Meter ΔH@ 1.78

C_p Factor .86

VE IMPORTANT - FILL IN ALL BLANKS

Re and record at the start of
ea test point.

Time: Start Time

End Time

FCC STACK

Velocity Traverse

Ambient Temp °F 96

Bar. Pres.. "Hg

Assumed Moisture % 14

Probe Tip Dia. In. .250

Pitot Tube No. 10-2

Probe Length/type

Filter No. 46, , ,

Point	Clock	Dry Gas Meter, CF	Pitot in. H_2O ΔP	Orifice ΔH in H_2O		Dry Gas Temp. °F		Pump Vacuum In. Hg	Impinger Temp. °F	Oven Temp. °F	Probe Temp. °F	Stack Temp. °F	Stack Temp. °F (°F+460)
				Desired	Actual	Outlet	Inlet						
A-1			0.1										340
2			0.07										
3			0.06										360
4			0.06										450
5			0.06										
6			0.07										
7			0.07										486
8			0.08										488
9			0.08										489
10			0.08										490
11			0.09										490
12			0.08										490
13			0.08										490
14			0.08										489

Comments:

Plant Powerine Location FCC Stack

Unit _____ Run No. 1 Date 9/9/77

V_m - volume of gas metered		36.99	Ft^3
P_b - barometric pressure		30.40	in Hg
ΔH - average orifice pressure		0.60	in H_2O
Tm - average meter temperature	85.5	545.5	°R
V_{Lc} - volume of water collected		106.8	ml
CO_2 - concentration of CO_2		15.2	%
O_2 - concentration of O_2		2.5	%
CO - concentration of CO		0	%
C_p - Pitot tube coefficient		0.76	
ΔP - average velocity pressure		0.078	in H_2O
T_s - average stack temperature		948	°R
Ps - average stack pressure = $P_b \pm$ static pressure		30.42	in H_2O
As - area of the stack		50.26	Ft^2
Theta - sample time		84	min.
An - area of the nozzle		.00075	Ft^2
ms - weight collected		229*	mg
H - energy input			10^6 BTU's

* Broken glass in sample

Plant [illegible] Location FCC Stack

Unit _____ Run No. _____ Date _____

1. Meter Volume

$$Vm_{std} = 17.65 \quad Vm \left[\frac{P_b + \frac{\Delta H}{13.6}}{Tm} \right]$$

$$= 17.65 \quad (36.99) \left[\frac{29.70 + \frac{[illegible]}{13.6}}{545.5} \right]$$

$$= 36.44 \ Ft^3$$

2. Volume of water collected

$$V_w = .0472 \quad V_{Lc}$$

$$= .0472 \ (106.8)$$

$$= 5.04 \ Ft^3$$

3. Moisture

$$B_{ws} = V_w/(V_w + Vm_{std})$$

$$= 5.04 \ /(5.04 + 36.44)$$

$$= 0.12$$

4. Dry Molecular Weight

$$M_d = .44 \ (CO_2) + .32 \ (O_2) + .28 \ (N_2 + CO)$$

$$= .44 \ (15.2) + .32 \ (2.5) + .28 \ (82.3)$$

$$= 30.53 \ lb/lb\text{-}mole$$

5. Wet Molecular Weight

$$M_s = M_d\ (1 - B_{ws}) + 18\ (B_{ws})$$

$$= 30.42(1 - 0.12) + 18\ (0.12\ )$$

$$= 29.03 \text{ lb/lb-mole}$$

$0.05^{1/2} = 0.224$ 1 0.224
$0.06^{1/2} = 0.245$ 1 0.245
$0.07^{1/2} = 0.265$ 6 1.590
$0.08^{1/2} = 0.283$ 15 4.245
$0.09^{1/2} = 0.300$ 5 1.500
6.504

6. Stack Gas Velocity

$$v_s = (85.48)\ C_p\ \sqrt{\Delta P}\ \sqrt{\frac{Ts}{Ps\ \ Ms}}$$

$$= 85.48\ (0.76)\ (.279)\ \sqrt{\frac{(948)}{(30.42)\ (29.03)}}$$

$$= 18.78 \text{ Ft/sec}$$

7. Stack Gas Volumetric Flow Rate

$$Q_s = 3600\ (1 - B_{ws})\ v_s\ As\ \left[\frac{530}{Ts}\right]\ \left[\frac{Ps}{29.92}\right]$$

$$= 3600\ (1 - 0.12)\ (18.78)\ (50.24)\ \left[\frac{530}{948}\right]\ \left[\frac{30.42}{29.92}\right]$$

$$= 1.7 \times 10^6 \text{ Ft}^3\text{/hr} = 28,333 \text{ ACF/min}$$

8. Mass Emission Rate (Front Half)

Allowable conc

0.0635 20000
0.0544 30000
0.0091

0.0559 gr/SCF (dry)

A. Area Basis

$$MER_a = \frac{(ms)\ \frac{(As)}{(An)}}{453.59\ (Theta)}$$

$$= \frac{(\quad)\ (\quad)}{453.59\ (\quad)}$$

$$= \qquad \text{lbs/hr}$$

B. Concentration Basis

$$MER_C = \frac{(ms)\ (Qs)}{(Vm_{std})\ (453.59)}$$

$$= \frac{(\quad)\ (\qquad)}{(\qquad)\ (453.59)}$$

= lbs/hr

C. Average Emission Rate

$$MER_{AVC} = \frac{MER_A + MER_C}{2}$$

$$= \frac{(\quad) + (\quad)}{2}$$

= lbs/hr

9. Mass Emission Rate (Total)

A. Area Basis

$$MER_A = \frac{(ms)\ \frac{(As)}{(An)}}{453.59\ (Theta)}$$

$$= \frac{(.229)\ \left(\frac{.0026}{.0005}\right)}{453.59\ (1.4)}$$

= 24.2 lbs/hr

B. Concentration Basis

$$MER_C = \frac{(ms)\ (Qs)}{(Vm_{std})\ (453.59)}$$

$$= \frac{(0.229)\ (1.7 \times 10^6)}{(36.44)\ (453.59)}$$

= 23.6 lbs/hr

Concentration Discharged

$$C = \frac{(0.229)(15.43)}{36.44}$$

= 0.0970 gr/SCF

C. Average Emission Rate

$$MER_{AVC} = \frac{MER_A + MER_C}{2}$$

$$= \frac{(24.2)+(23.6)}{2}$$

$$= 23.9 \quad \text{lbs/hr}$$

10. Emission Rate

A. Front Half

$$ER_F = \frac{MER_{AVC}}{H}$$

$$= \frac{(\qquad)}{(\qquad)}$$

$$= \qquad \text{lbs}/10^6 \text{ BTU's}$$

B. Total Catch

$$ER_T = \frac{MER_{AVC}}{H}$$

$$= \frac{(\qquad)}{(\qquad)}$$

$$= \qquad \text{lbs}/10^6 \text{ BTU's}$$

11. Isokinetic

$$I = \frac{100\ T_s \left[(.00267)\ V_{LC} + \frac{Vm}{Tm} \left(P_\Delta + \frac{\Delta H}{136} \right) \right]}{60\ (\text{Theta})\ v_s\ P_s\ A_n}$$

$$= \frac{100\ (948) \left[(.00267)\ (1068) + \frac{(36.17)}{(545.5)} \left(30.40 + \frac{0.60}{13.6} \right) \right]}{60\ (84)\ (18.78)\ (20.42)\ (0.00075)}$$

$$= \frac{(94800)\ (0.285 + 2.06)}{(2159)}$$

$$= 103 \quad \%$$

12. Point Isokinetic Equations

a. $$I = \frac{.0944 \quad T_s \quad Vm_{std}}{P_s \, v_s \quad A_n \, (Theta) \, (1 - B_{ws})}$$

$$= \frac{.0944}{(30.42) \; (34) \; (0.0080) \; (1 - 0.12)} \qquad \frac{T_s \; Vm_{std}}{v_s}$$

$$= (0.560) \; \frac{T_s \quad Vm_{std}}{v_s} = 103\%$$

b. $$Vm_{std} = 17.65 \; Vm \left[\frac{P_b + \frac{\Delta H}{136}}{Tm} \right]$$

$$= 17.65 \; Vm \left[\frac{\quad + \frac{\Delta H}{136}}{Tm} \right]$$

c. $$v_s = 85.48 \quad C_p \quad \sqrt{\Delta P} \quad \sqrt{\frac{Ts}{Ps \; Ms}}$$

$$= 85.48 \quad (\qquad) \; \sqrt{\Delta P} \; \sqrt{\frac{Ts}{(\qquad)(\qquad)}}$$

$$= (\qquad) \; \sqrt{\Delta P} \; \sqrt{\frac{Ts}{(\qquad)}}$$

PARTICULATE FIELD DATA

Plant Powerine Oil

Run No. 1 1801

Location Santa Fe Springs

Date 9/9/77

Operator P. de Perea / [illegible]

Sample Box No. 2

Meter Box No. 2

Meter Δ H@ 1.75

C_p Factor .76

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point.

Time: Start Time 3:37 pm

End Time

Ambient Temp °F 96

Bar. Press. "Hg 29.

Assumed Moisture % 14

Probe Tip Dia. In. .371

Pitot Tube No. 10 - 2

Probe Length/type 10/4

Filter No. 46

Point	Clock	Dry Gas Meter, CF	Pitot in. H_2O ΔP	Orifice ΔH in H_2O Desired	Orifice ΔH in H_2O Actual	Dry Gas Temp. °F Outlet	Dry Gas Temp. °F Inlet	Pump Vacuum In. Hg	Impinger Temp. °F	Oven Temp. °F	Probe Temp. °F	Stack Temp. °F	Stack Temp. °R (°F+460)
Leak check at 15" Hg — Leakage 0.00 cfm													
START	3:37	120.372											
A-14	3:40	121.60	0.06	.46	.46	92	92	0	84	264	262	412	472
13	3:43	122.96	0.07	.54	.54	92	92	0	83	261	282	475	472
12	3:46	124.30	0.08	.62	.62	92	91	1.5	82	264	304	486	
11	3:49	125.71	0.09	.69	.69	92	91	1.5	81	270	272	491	
10	3:52	127.07	0.08	.62	.62	92	91	1.4	81	267	253	492	
9	3:55	128.47	0.09	.69	.69	91	90	1.4	81	262	215	494	
8	3:58	129.83	0.08	.62	.62	91	90	1.4	80	260	238	492	
7	4:01	131.17	0.08	.62	.62	91	90	1.4	80	263	235	491	
6	4:04	132.44	0.07	.54	.54	91	90	1.3	80	266	252	490	
5	4:07	133.71	0.07	.54	.54	91	90	1.3	81	270	241	488	
4	4:10	134.96	0.07	.54	.54	91	90	1.2	81	267	241	485	
3	4:13	136.28	0.08	.62	.62	92	91	1.3	81	262	235	484	
2	4:17	137.63	0.08	.62	.62	92	91	1.3	81	263	235	484	

Comments:

Point	Clock	Dry Gas Meter CF	Pitot in. H_2O ΔP	Orifice ΔH in H_2O Desired	Orifice ΔH in H_2O Actual	Dry Gas Temp. °F Outlet	Dry Gas Temp. °F Inlet	Pump Vacuum In. Hg	Impinger Temp. °F	Oven Temp. °F	Probe Temp. °F	Stack Temp. °F	Stack Temp. °F (°F+460)
A 1	4:20	138.[illegible]8	.08	.62	.62	92	91	1.3	81	262	235	482	
B		163.5 LEAK CHECK @ 15" Hg = .001 CFm											
9/10/77		112.5 LEAK Check @ 16" Hg = .016 CFm											
START		143.45 ~~[illegible]~~											
B 14	11:[illegible]0A	14[illegible].53	.05	0.38	0.38	79	79	1.0	8[illegible]	245	240	457	
13	11:[illegible]3A	145.77	0.07	0.54	0.54	79	79	1.0	83	262	255	483	
12	11:46	147.00	0.07	0.54	0.54	79	80	1.0	83	256	262	494	
11	11:49	148.33	0.08	0.62	0.62	79	80	1.1	84	254	251	498	
10	11:52	149.65	0.08	0.62	0.62	79	80	1.1	84	260	253	499	
9	11:55	150.97	0.08	0.62	0.62	79	80	1.1	85	272	257	500	
8	11:58	152.30	0.08	0.62	0.62	79	80	1.1	85	259	258	501	
7	12:01	153.70	0.09	0.69	0.69	80	80	1.1	85	259	253	501	
6	12:04	155.03	0.08	0.62	0.62	80	81	1.2	85	253	249	501	
5	12:07	156.36	0.08	0.62	0.62	80	81	1.2	85	258	246	499	
4	12:10	157.75	0.09	0.69	0.69	80	81	1.2	85	262	264	499	

Comments:

3/16/77

Point	Clock	Dry Gas Meter, CF	Pitot in. H_2O P	Orifice ΔH in H_2O		Dry Gas Temp. °F		Pump Vacuum In. Hg	Impinger Temp. °F	Oven Temp. °F	Probe Temp. °F	Stack Temp. °F	Stack Temp. °F (°F+460)
				Desired	Actual	Outlet	Inlet						
B3	12:13	159.09	0.08	0.62	0.62	80	81	1.3	86	255	247	497	
2	12:16	160.48	0.09	0.69	0.69	80	81	1.4	87	231	236	496	
1	12:19	161.73	0.08	0.62	0.62	80	81	1.4	88	226	240	492	
Leak check at 15" Hg - 0.007 cfm													
STATIC Pressure +.28" H_2O													
NO SWIRLING OR CYCLONIC FLOW INDICATED													

Comments:

3/16/77

SAMPLE CLEANUP SHEET

Plant: Powerine Oil Date: 8/9/77
Address: Santa Fe Springs Operators:
Station No.: 1701 :
Run No.: 1 Ambient Temperature: 96
Barometric Pressure: Sample Box Number: 2

Impinger 1

Final Volume 176 ml of H_2O
Initial Volume 100 ml
Volume collected 76 ml

Impinger 2

Final Volume 118 ml of H_2O
Initial Volume 100 ml
Volume collected 18 ml

Impinger 3

Final Volume 0 ml of empty
Initial Volume 0 ml
Volume collected 0 ml

~~Impinger~~

~~Final Volume ml of~~
~~Initial Volume ml~~
~~Volume collected ml~~

Impinger

Final weight 665.6 gm of silica gel
Initial weight 652.8 gm
Weight collected 12.8 gm

Total Volume Collected 106.8 ml

Filters

No.	Final Weight	Tare Weight	Weight Collected
46	gm	gm	gm
	gm	gm	gm

Cleanup performed by on

Plant [illegible] Location Santa Fe Springs, Ca.

Unit FCC Stack Run No. 2 Date 9/10/77

V_m - volume of gas metered	39.06	Ft^3
P_b - barometric pressure	30.40	in Hg
ΔH - average orifice pressure	0.67	in H_2O
Tm - average meter temperature	543	°R
V_{Lc} - volume of water collected	114.8	ml
CO_2 - concentration of CO_2	14.2	%
O_2 - concentration of O_2	0.9	%
CO - concentration of CO	0	%
C_p - Pitot tube coefficient	0.76	
ΔP - average velocity pressure	0.091	in H_2O
T_s - average stack temperature	938	°R
Ps - average stack pressure	30.42	in H_2O
As - area of the stack	50.26	Ft^2
Theta - sample time	84	min.
An - area of the nozzle	0.00075	Ft^2
[illegible] - weight collected	180	mg
H - energy input		10^6 BTU's

ΔP

0.06 - 1
0.07 - 1
0.08 - 2
0.09 - 14
0.10 - 9
0.11 - 1
[illegible]

[illegible]

PA. D D

Plant Powerine Oil

Run No. 83 1121

Location Santa Fe Springs

Date 9/16/87

Operator [illegible]

Sample Box No. 2

Meter Box No. 2

Meter Δ H 1.78

CpFactor .76

V Y IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point.

Time: Start Time 1543

End Time

Ambient Temp °F 90

Bar. Press. "Hg

Assumed Moisture % 14

Probe Tip Dia. In. .371

Pitot Tube No. 102-2

Probe Length/type 10 FT - Glass

Filter No. 417

Point	Clock	Dry Gas Meter, CF	Pitot in. H_2O ΔP	Orifice ΔH in. H_2O Desired	Actual	Dry Gas Temp. °F Outlet	Inlet	Pump Vacuum In. Hg	Impinger Temp. °F	Oven Temp. °F	Probe Temp. °F	Stack Temp. °F	Stack Temp. °F (°F+460)
Leak check at 15" Hg - .011 CFM													
START			1.53	Leak Check @ 15" Hg = .002 CFM									
~~B 14~~	1543	162											
B 14	1546	16[illegible].05	0.05	.37	.37	87	87	1.0	88	250	227	469	
13	1549	16[illegible].29	0.07	.52	.52	87	86	1.0	90	252	230	476	
12	1552	16[illegible].59	0.08	.60	.60	86	85	1.0	91	256	235	480	
11	1555	16[illegible].92	0.08	.60	.60	86	85	1.0	91	244	229	480	
10	1558	16[illegible].27	0.09	.66	.66	86	84	1.1	91	246	231	481	
9	1601	17[illegible]63	0.09	.66	.66	86	84	1.1	90	250	227	482	
8	1604	171.97	0.09	.66	.66	86	84	1.1	91	241	225	484	
7	1607	173.39	0.10	.74	.74	86	84	1.1	90	254	225	483	
6	1610	174.82	0.10	.74	.74	85	83	1.2	89	253	225	483	
5	1613	176.30	0.10	.74	.74	85	83	1.2	89	259	225	482	
4	1616	177.74	0.09	.66	.66	85	83	1.2	89	263	223	481	
3	1619	179.17	0.09	.66	.66	85	83	1.2	90	264	222	477	

Comments:

Point	Clock	Dry Gas Meter, CF	Pitot in. H_2O ΔP	Orifice ΔH in H_2O Desired	Orifice ΔH in H_2O Actual	Dry Gas Temp. °F Outlet	Dry Gas Temp. °F Inlet	Pump Vacuum In. Hg	Impinger Temp. °F	Oven Temp. °F	Probe Temp. °F	Stack Temp. °F	Stack Temp. °F (°F+460)
B2	1622	180.57	0.09	.66	.66	85	83	1.3	90	267	220	475	
1	1625	182.09	0.11	.82	.82	85	83	1.5	90	260	215	443	
	1628 LEAK Check @ 15" Hg = .001 CFM						1630 LEAK Check @ 15" Hg = .002 CFM						
START	1654	183.29											
A14	1657	184.61	0.09	.66	.66	82	81	1.4	75	275	220	475	
13	1700	186.01	0.09	.66	.66	82	81	1.2	73	275	239	478	
12	1703	187.42	0.10	.74	.74	82	80	1.2	70	270	247	479	
11	1706	188.95	0.10	.74	.74	82	80	1.2	67	263	256	480	
10	1709	190.44	0.10	.74	.74	82	80	1.4	67	263	256	482	
9	1712	191.90	0.10	.74	.74	82	80	1.4	66	270	248	483	
8	1715	193.35	0.10	0.74	0.74	81	80	1.4	66	263	235	484	
7	1718	194.82	0.10	0.74	0.74	82	80	1.4	66	262	222	485	
6	1721	196.21	0.09	0.66	0.66	81	80	1.2	66	263	230	485	
5	1724	197.58	0.09	0.66	0.66	81	80	1.2	66	264	231	484	
4	1727	199.01	0.09	0.66	0.66	81	80	1.2	66	265	231	481	

Comments:

3/16/77

Point	Clock	Dry Gas Meter, CF	Pitot ΔP in H_2O	Orifice ΔH in H_2O Desired	Orifice ΔH in H_2O Actual	Dry Gas Temp. °F Outlet	Dry Gas Temp. °F Inlet	Pump Vacuum In. Hg	Impinger Temp. °F	Oven Temp. °F	Probe Temp. °F	Stack Temp. °F	Stack Temp. °F (°F+460
A3	1730	200.38	.09	0.66 ~~0.04~~	0.66	81	80	1.4	67	263	235	479	
2	1733	201.16	.09	0.66	0.66	81	80	1.4	67	262	225	475	
1	1736	203.15	.09	0.66	0.66	81	80	1.4	67	261	225	467	
	1740	LEAK CHECK @ 16 in Hg = 0.002 CFM											
	1745	STATIC PRESSURE = + 0.28 in H_2O											

Comments:

3/16/77

SAMPLE CLEANUP SHEET

Plant: Fonseca Oil Date: 9/10/77
Address: Sante Fe Springs Operators:
Station No.: 1R-1 :
Run No.: #2 Ambient Temperature: 84
Barometric Pressure: Sample Box Number: 2

Impinger 1

Final Volume 194 ml of d d water
Initial Volume 100 ml
Volume collected 94 ml

Impinger 2

Final Volume 112 ml of d. d. water
Initial Volume 100 ml
Volume collected 12 ml

Impinger 3

Final Volume 0 ml of empty
Initial Volume 0 ml
Volume collected 0 ml

Impinger

~~Final Volume ml of~~
~~Initial Volume ml~~
~~Volume collected ml~~

Impinger

Final weight 672.1 gm of silica gel
Initial weight 661.3 gm
Weight collected 10.8 gm

Total Volume Collected 114.8 ml

Filters

No.	Final Weight	Tare Weight	Weight Collected
47	gm	gm	gm
	gm	gm	gm

Cleanup performed by on

Molecular Weight Determination

Station Number 1801 1

Method of Analysis: Fryrite ✓

Orsat _____

Sample Type: Grab ✓

Integrated _____

Run No.	Time Collected	Time Analyzed	CO_2	O_2	CO
1	1130	1130	15/15/15.5	2.7/2.5/2.3	
2	1430	1430	14.0/14.2/14.4	0.8/0.8/1.0	

Leak Check: _____

O_2 Check _____ % against _____

CO_2 Check _____ % against _____

Signature: _____ Date: _____

Remarks:

Plant [illegible] Location Santa Fe Springs, Ca.

Unit FCC Stack Run No. 3 Date 9/11/77

V_m - volume of gas metered	34.31	Ft^3
P_b - barometric pressure	29.95	in Hg
ΔH - average orifice pressure	0.53	in H_2O
Tm - average meter temperature	538	°R
V_{Lc} - volume of water collected	98.7	ml
CO_2 - concentration of CO_2	15.3	%
O_2 - concentration of O_2	2.3	%
CO - concentration of CO	0	%
C_p - Pitot tube coefficient	0.76	
ΔP - average velocity pressure	0.070	in H_2O
T_s - average stack temperature	943	°R
Ps - average stack pressure	29.97	in H_2O
As - area of the stack	50.26	Ft^2
Theta - sample time	84	min.
An - area of the nozzle	0.00075	Ft^2
ms - weight collected	273.5	mg
H - energy input		10^6 BTU's

ΔP
0.04 - 1
0.05 - 5
0.06 - 1
0.07 - 6
0.08 - 15
.071

P/ L/ D I... S T C

Plant Prairie Coal

Run No. 3 1101

Location Saint Francisville

Date 9/11/77

Operator Crouch/Freeman

Sample Box No. 2

Meter Box No. 2

Meter Δ H 1.78

C factor 0.76

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point.

Time: Start Time 1004

End Time

Ambient Temp °F 85

Bar. Press. "Hg

Assumed Moisture % 14

Probe Tip Dia. In. 0.371

Pitot Tube No. 10-2

Probe Length/type 10 FT-GLASS

Filter No. 48

0945 LEAK CHECK @ 15" Hg = .013 CFM

Point	Clock	Dry Gas Meter, CF	Pitot in. H_2O ΔP	Orifice ΔH in H_2O Desired	Orifice ΔH in H_2O Actual	Dry Gas Temp. °F Outlet	Dry Gas Temp. °F Inlet	Pump Vacuum In. Hg	Impinger Temp. °F	Oven Temp. °F	Probe Temp. °F	Stack Temp. °F	Stack Temp. °F (°F+460)
START	1004	207.21											
B 14	1007	208.41	0.07	.52	.52	74	74	1.1	75	271	269	462	
13	1010	209.73	0.08	.60	.60	75	75	1.2	75	268	263	492	
12	1013	211.01	0.08	.60	.60	75	75	1.2	75	271	260	499	
11	1016	212.29	0.08	.60	.60	75	75	1.2	75	271	254	499	
10	1019	213.59	0.08	.60	.60	75	76	1.2	75	274	247	500	
9	1022	214.89	0.08	.60	.60	76	77	1.2	75	273	236	500	
8	1025	216.20	0.08	.60	.60	76	77	1.2	76	259	235	501	
7	1028	217.53	0.08	.60	.60	76	77	1.3	76	269	251	501	
6	1031	218.85	0.08	.60	.60	76	78	1.3	76	266	247	501	
5	1034	220.15	0.08	.60	.60	77	78	1.3	76	271	240	496	
4	1037	221.39	0.08	.60	.60	78	79	1.2	77	269	241	491	
3	1040	222.59	0.07	.52	.52	78	79	1.2	77	269	237	485	
2	1043	223.82	0.07	.52	.52	79	80	1.2	78	266	235	481	
1	1046	224.89	0.05	.37	.37	79	79	1.1	78	264	237	433	

Comments: 1050 LEAK CHECK @ 15" Hg = .015 CFM

Point	Clock	Dry Gas Meter, C	Pitot in. H_2O ΔP	Orifice ΔH in H_2O		Dry Gas Temp. °F		Pump Vacuum In. Hg	Impinger Temp. °F	Oven Temp. °F	Probe Temp. °F	Stack Temp. °F	Stack Temp. °F (°F+460)
				Desired	Act	Outlet	Inlet						
START	1109	226.0		1105 LEAK		CHECK @	17" Hg	= 0.017 CFM					
A 14	1112	227.37	0.08	.60	.60	78	78	1.5	4	249	264	486	
13	1115	228.58	0.07	.52	.52	79	79	1.2	83	250	273	477	
12	1118	229.85	0.08	.60	.60	79	79	1.3	82	259	254	490	
11	1121	231.13	0.07	.52	.52	80	79	1.3	81	261	269	491	
10	1124	232.42	0.08	.60	.60	80	80	1.3	81	263	244	492	
9	1127	233.71	0.08	.60	.60	80	80	1.3	80	265	261	492	
8	1130	235.02	0.08	.60	.60	79	79	1.3	80	266	270	491	
7	1133	236.26	0.07	.52	.52	80	80	1.3	80	266	242	490	
6	1136	237.40	0.06	.45	.45	79	79	1.2	80	264	242	489	
5	1139	238.45	0.05	.37	.37	81	81	1.1	79	257	255	487	
4	1142	239.51	0.05	.37	.37	80	80	1.1	80	258	254	487	
3	1145	240.64	0.05	.37	.37	80	80	1.1	80	259	246	485	
2	1148	241.67	0.05	.37	.37	80	81	1.1	81	259	245	482	
1	1151	242.65	0.04	.30	.30	80	80	1.0	81	257	247	454	

Comments: 1200 LEAK CHECK @ 10" Hg = .018 CFM

Static PRESSURE = +.28 IN H_2O

3/16/77

SAMPLE CLEANUP SHEET

Plant: Pomeroy Co-P Date: 9/11/77
Address: Santa Fe Springs Operators:
Station No.: 1201 :
Run No.: # 3 Ambient Temperature:
Barometric Pressure: Sample Box Number: 2

Impinger 1

Final Volume 188 ml of dd water
Initial Volume 100 ml
Volume collected 88 ml

Impinger 2

Final Volume 100 ml of dd water
Initial Volume 100 ml
Volume collected 0 ml

Impinger 3

Final Volume 2 ml of empty
Initial Volume 6 ml
Volume collected 2 ml

Impinger

Final Volume ml of
Initial Volume ml
Volume collected ml

Impinger

Final weight 695.3 gm of silica gel
Initial weight 686.6 gm
Weight collected 8.7 gm

Total Volume Collected 98.7 ml

Filters

No.		Tare Weight	Weight Collected
48	gm	gm	gm
	gm	gm	gm

Cleanup performed by on

Molecular Weight Determination

Station Number 1701 - 3

Method of Analysis: Fryrite X

Orsat _____

Sample Type: Grab X

Integrated _____

Run No.	Time Collected	Time Analyzed	CO_2	O_2	CO
1	9:50 am	9:50 am	15.0	3.0	0
2	9:55	9:55	15.5	2.0	0
3	10:00	10:00	15.5	2.0	0

Leak Check: ✓

O_2 Check 20 % against air

CO_2 Check _____ % against _____

Signature: [illegible] Date: [illegible]

Remarks:

Plant [illegible] Location [illegible]

Unit [illegible] Run No. [illegible] Date [illegible]

V_m - volume of gas metered	[illegible]	Ft^3
P_b - barometric pressure	[illegible]	in Hg
ΔH - average orifice pressure	[illegible]	in H_2O
Tm - average meter temperature	[illegible]	°R
V_{Lc} - volume of water collected	[illegible]	ml
CO_2 - concentration of CO_2		%
O_2 - concentration of O_2		%
CO - concentration of CO		%
C_p - Pitot tube coefficient		
ΔP - average velocity pressure		in H_2O
T_s - average stack temperature		°R
Ps - average stack pressure		in H_2O
As - area of the stack		Ft^2
Theta - sample time		min.
An - area of the nozzle		Ft^2
ms - weight collected		mg
H - energy input		10^6 BTU's

Pr D D.

Plant Fowler Oil

Run No. 4 1801

Location Santa Fe Springs

Date 9/8/77

Operator Newman

Sample Box No. 2

Meter Box No. 2

Meter Δ H 1.18

C factor .26

VERY IMPORTANT - FILL IN ALL BLANKS

Read and record at the start of each test point.

Time: Start Time _____

End Time _____

Ambient Temp °F 85

Bar. Press. "Hg _____

Assumed Moisture % 14

Probe Tip Dia. In. .371

Pitot Tube No. 10-2

Probe Length/type 10 FT-GLASS

Filter No. None

		1	3	2	2	6	5	7	4	2	2	
						DTI Temp			DTI Temp			
Point	Clock	Dry Gas Meter, CF	Pitot in. H_2O ΔP	Orifice ΔH in H_2O Desired	Actual	Dry Gas Temp. °F Outlet	Inlet	Pump Vacuum In. Hg	Impinger Temp. °F	Oven Temp. °F	Probe Temp. °F	Stack Temp. °F	Stack Temp. °F (°F+460)
Leak check at 10" Hg - .013 CFM													
START		243.53											
A-7	1424	245.60	0.07	.50	.50	89	89	1.0	84	259	221	470	
		247.63	0.07	.50	.50	84	90	1.0	84	254	227	482	
		249.77	0.06	.50	.50	90	90	1.0	81	252	227	485	
		251.52	0.07	.50	.50	91	92	1.0	80	252	232	485	
		253.70	0.06	.50	.50	91	92	1.0	80	256	234	486	
		255.74	0.06	.50	.50	92	92	1.0	81	255	227	487	
		257.85	0.06	.50	.50	93	93	1.0	81	253	229	486	
		259.88	0.06	.50	.50	93	93	1.0	81	256	228	485	
		261.80	0.07	.50	.50	94	93	1.0	81	257	230	484	
		263.85	0.06	.50	.50	94	94	1.0	81	251	233	484	
		265.90	0.06	.50	.50	94	94	1.0	82	255	238	484	
		267.95	0.06	.50	.50	95	95	1.0	82	256	233	485	
Leak check at 11" Hg - .011 CFM													

Comments:

SAMPLE CLEANUP SHEET

Plant: Fowler Coal Date: 9/4/77
Address: Santa Fe Springs Operators:
Station No.: 1801 :
Run No.: 4 Ambient Temperature:
Barometric Pressure: Sample Box Number: 2

Impinger 1

Final Volume 158 ml of 5% Peroxide Sol.
Initial Volume 100 ml
Volume collected 58 ml

Impinger 2

Final Volume 109 ml of 5% Peroxide Sol.
Initial Volume 100 ml
Volume collected 9 ml

Impinger 3

Final Volume 0 ml of dry
Initial Volume 0 ml
Volume collected 0 ml

Impinger

Final Volume ml of
Initial Volume ml
Volume collected ml

Impinger

Final weight 664.6 gm of silica gel
Initial weight 656.9 gm
Weight collected 7.7 gm

Total Volume Collected 74.7 ml

Filters

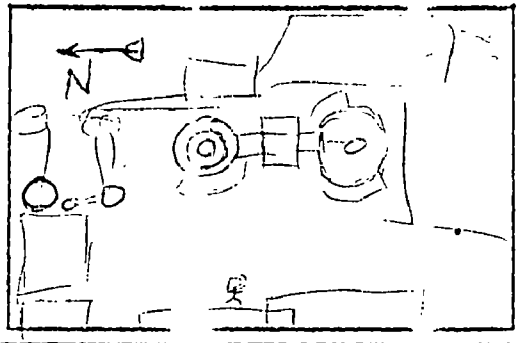
		Tare Weight	Weight Collected
none	gm	gm	gm
	gm	gm	gm

Cleanup performed by on

RECORD OF VISUAL DETERMINATION OF OPACITY

PAGE ___ OF ___

COMPANY Powerine Oil Co.
LOCATION
TEST NUMBER 1 1801
DATE 9/9/77
TYPE FACILITY Oil Refinery
CONTROL DEVICE ESP



HOURS OF OBSERVATION
OBSERVER A. Krauss
OBSERVER CERTIFICATION DATE 3/30/77
OBSERVER AFFILIATION US EPA
POINT OF EMISSIONS Stack
HEIGHT OF DISCHARGE POINT 300'

	Initial			Final
CLOCK TIME	1600			1606
OBSERVER LOCATION Distance to Discharge	400'			400'
Direction from Discharge	W			W
Height of Observation Point	Grnd			Grnd
BACKGROUND DESCRIPTION	Clr Sky			Clr Sky
WEATHER CONDITIONS Wind Direction	SE			SE
Wind Speed	5-7 Kts			5-7 Kts
Ambient Temperature	90°			90°
SKY CONDITIONS (clear, overcast, % clouds, etc.)	Clr			Clr
PLUME DESCRIPTION Color	White			White
Distance Visible	100'			100'
OTHER INFORMATION				

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start--End	Opacity S	Average
1	1600 - 1606	10	7.9

Readings ranged from 5 to 20 % opacity

The source was/was not in compliance with ___ at the time evaluation was made.

OBSERVATION RECORD PAGE ___ OF ___

COMPANY Powerine Oil Co. OBSERVER [illegible]
LOCATION ___ TYPE FACILITY Oil Refinery
TEST NUMBER ___ POINT OF EMISSIONS Stack
DATE 9/9/77

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
1:00	0	5	5	10	5			
	1	5	10	5	15			
	2	5	10	10	5			
	3	30	10	5	5			
	4	5	15	5	5			
	5	5	10	10	5			
	6							
	7							
	8							
	9							
	10							
	11							
	12							
	13							
	14							
	15							
	16							
	17							
	18							
	19							
	20							
	21							
	22							
	23							
	24							
	25							
	26							
	27							
	28							
	29							

OBSERVATION RECORD (Continued) PAGE ___ OF ___

COMPANY ___ OBSERVER ___
LOCATION ___ TYPE FACILITY ___
TEST NUMBER ___ POINT OF EMISSIONS ___
DATE ___

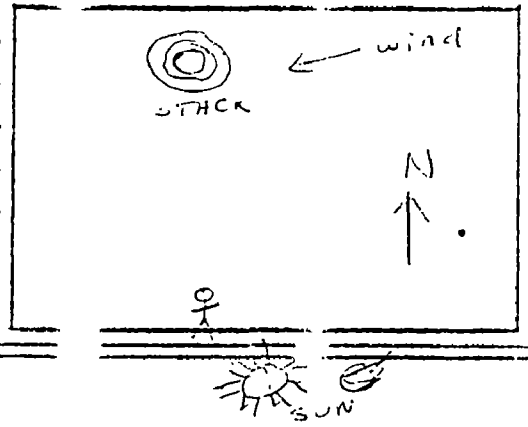
Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
	30							
	31							
	32							
	33							
	34							
	35							
	36							
	37							
	38							
	39							
	40							
	41							
	42							
	43							
	44							
	45							
	46							
	47							
	48							
	49							
	50							
	51							
	52							
	53							
	54							
	55							
	56							
	57							
	58							
	59							

[FR Doc.74-26150 Filed 11-11-74;8:45 am]

RECORD OF VISUAL DETERMINATION OF OPACITY

PAGE ___ OF ___

COMPANY Powerine
LOCATION Santa Fe Springs
TEST NUMBER #2
DATE 9/9/77
TYPE FACILITY oil Refinery
CONTROL DEVICE ESP



HOURS OF OBSERVATION 1645 1701 - 1707
OBSERVER Thomas G. Burns
OBSERVER CERTIFICATION DATE Mar 30 1977
OBSERVER AFFILIATION USEPA NEIC
POINT OF EMISSIONS FCC Stack
HEIGHT OF DISCHARGE POINT 130'

	Initial			Final
CLOCK TIME	1701			1707
OBSERVER LOCATION Distance to Discharge	400'			
Direction from Discharge	west			
Height of Observation Point	ground level			
BACKGROUND DESCRIPTION	clear			
WEATHER CONDITIONS Wind Direction	SSE			
Wind Speed	0-10			
Ambient Temperature	85			
SKY CONDITIONS (clear, overcast, % clouds, etc	clear			
PLUME DESCRIPTION Color	white			
Distance Visible	50'-100'			
OTHER INFORMATION				

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start--End	Opacity Sum	Opacity Average
1	1701 - 1707	220	7.2

Readings ranged from 5 to 20 % opacity

The source was/was not in compliance with ___ at the time evaluation was made.

OBSERVATION RECORD PAGE ___ OF ___

COMPANY Powerine
LOCATION Santa Fe Springs
TEST NUMBER 2
DATE 9/9/77

OBSERVER Thomas G. Burns
TYPE FACILITY Oil Refinery
POINT OF EMISSIONS FCC Stack

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
	0							
17	1	5	10	5	10			
	2	15	15	10	10			
	3	5	10	15	5			
	4	10	5	10	10			
	5	10	5	10	20			
	6	5	5	10	5			
	7							
	8							
	9							
	10							
	11							
	12							
	13							
	14							
	15							
	16							
	17							
	18							
	19							
	20							
	21							
	22							
	23							
	24							
	25							
	26							
	27							
	28							
	29							

OBSERVATION RECORD (Continued) PAGE ___ OF ___

COMPANY
LOCATION
TEST NUMBER
DATE

OBSERVER
TYPE FACILITY
POINT OF EMISSIONS

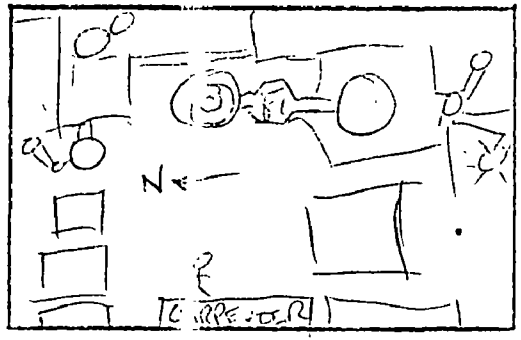
Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
	30							
	31							
	32							
	33							
	34							
	35							
	36							
	37							
	38							
	39							
	40							
	41							
	42							
	43							
	44							
	45							
	46							
	47							
	48							
	49							
	50							
	51							
	52							
	53							
	54							
	55							
	56							
	57							
	58							
	59							

[FR Doc.74-26150 Filed 11-11-74;8:45 am]

RECORD OF VISUAL DETERMINATION OF OPACITY

PAGE ___ OF ___

COMPANY Powerine Oil Co.
LOCATION Santa Fe Springs CA
TEST NUMBER 1B 801
DATE 9/10/77
TYPE FACILITY Oil Refinery
CONTROL DEVICE ESP



HOURS OF OBSERVATION
OBSERVER [illegible]
OBSERVER CERTIFICATION DATE 3/30/77
OBSERVER AFFILIATION US EPA
POINT OF EMISSIONS Stack
HEIGHT OF DISCHARGE POINT 200'

	Initial			Final
CLOCK TIME				
OBSERVER LOCATION Distance to Discharge	400'			400'
Direction from Discharge	W			W
Height of Observation Point	Grnd			Grnd
BACKGROUND DESCRIPTION	CLR SKY			CLR SKY
WEATHER CONDITIONS Wind Direction	S			S
Wind Speed	5-7 Kts			5-7 Kts
Ambient Temperature	90°			90°
SKY CONDITIONS (clear, overcast, % cloud, etc.)	CLR			CLR
PLUME DESCRIPTION Color	White			White
Distance Visible	100'			100'
OTHER INFORMATION				

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start--End		Opacity Sum	Average
1	12	6 - 12/6	[illegible]	[illegible]

Readings ranged from 15 to 20 % opacity

The source was/was not in compliance with ___ at the time evaluation was made.

G-33

OBSERVATION RECORD PAGE ___ OF ___

COMPANY Powerine Oil Co OBSERVER [illegible]
LOCATION Santa Fe Springs TYPE FACILITY Oil Refinery
TEST NUMBER 113 1501 POINT OF EMISSIONS Stack
DATE 9/10/77

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
1201	0	10	10	5	5			
	1	10	5	5	5			
	2	10	5	5	5			
	3	5	5	5	5			
	4	5	10	20	5			
	5	5	10	5	10			
	6							
	7							
	8							
	9							
	10							
	11							
	12							
	13							
	14							
	15							
	16							
	17							
	18							
	19							
	20							
	21							
	22							
	23							
	24							
	25							
	26							
	27							
	28							
	29							

OBSERVATION RECORD (Continued) PAGE ___ OF ___

COMPANY ___ OBSERVER ___
LOCATION ___ TYPE FACILITY ___
TEST NUMBER ___ POINT OF EMISSIONS ___
DATE ___

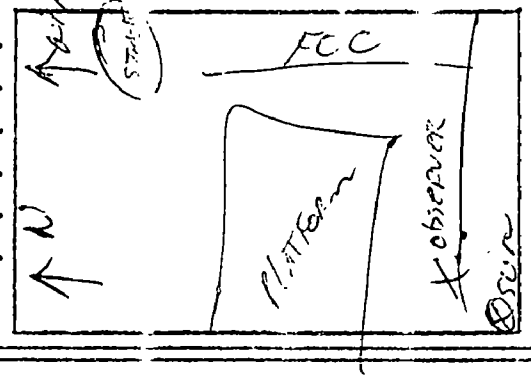
Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
	30							
	31							
	32							
	33							
	34							
	35							
	36							
	37							
	38							
	39							
	40							
	41							
	42							
	43							
	44							
	45							
	46							
	47							
	48							
	49							
	50							
	51							
	52							
	53							
	54							
	55							
	56							
	57							
	58							
	59							

[FR Doc.74-26150 Filed 11-11-74;8:45 am]

RECORD OF VISUAL DETERMINATION OF OPACITY

PAGE ___ OF ___

COMPANY Power Oil
LOCATION Santa Fe Springs
TEST NUMBER #2 1701
DATE 9/10/77
TYPE FACILITY Energy
CONTROL DEVICE CO boiler



HOURS OF OBSERVATION 6
OBSERVER Paul
OBSERVER CERTIFICATION DATE 3/16/77
OBSERVER AFFILIATION U.S. E.P.A.
POINT OF EMISSION STACK
HEIGHT OF DISCHARGE POINT 100 FT

	Initial			Final
CLOCK TIME	2:45 pm			
OBSERVER LOCATION Distance to Discharge	300 FT			
Direction from Discharge	SW			
Height of Observation Point	100 FT			
BACKGROUND DESCRIPTION	Blue			
WEATHER CONDITIONS Wind Direction	S			
Wind Speed	5-10 mph			
Ambient Temperature	85			
SKY CONDITIONS (clear, overcast, % clouds, etc.)	Clear			
PLUME DESCRIPTION Color	White			
Distance Visible	20 FT			
OTHER INFORMATION				

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start-End		Opacity Sum	Opacity Average
	1447 -	1503	420	17.5

Readings ranged from 10 to 35 % opacity

The source was/was not in compliance with ____ at the time evaluation was made.

OBSERVATION RECORD PAGE ___ OF ___

COMPANY Pennzoil
LOCATION Santa Fe Springs
TEST NUMBER #3
DATE 9/10/77

OBSERVER R. A. Parker
TYPE FACILITY Refinery
POINT OF EMISSIONS Stack

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
2:30	0							
	1							
	2							
	3							
	4							
	5							
	6							
	7							
	8							
	9							
	10							
	11							
	12							
	13							
	14							
	15							
	16							
	17	20	30	20	15	X		
	18	15	15	25	20			
	19	20	15	10	35			
	20	25	20	15	10			
	21	10	15	15	10			
	22	10	25	10	15			
	23							
	24							
	25							
	26							
	27							
	28							
	29							

OBSERVATION RECORD (Continued) PAGE ___ OF ___

COMPANY
LOCATION
TEST NUMBER
DATE

OBSERVER
TYPE FACILITY
POINT OF EMISSIONS

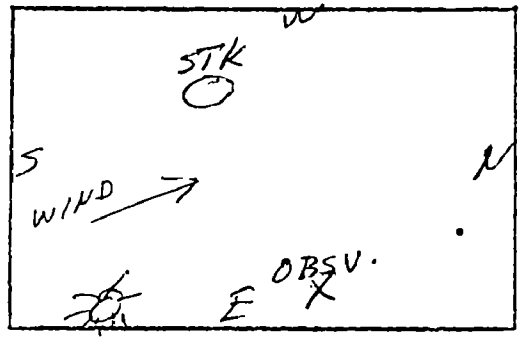
Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
	30							
	31							
	32							
	33							
	34							
	35							
	36							
	37							
	38							
	39							
	40							
	41							
	42							
	43							
	44							
	45							
	46							
	47							
	48							
	49							
	50							
	51							
	52							
	53							
	54							
	55							
	56							
	57							
	58							
	59							

[FR Doc.74-26150 Filed 11-11-74;8:45 am]

RECORD OF VISUAL DETERMINATION OF OPACITY

PAGE ___ OF ___

COMPANY Power Inc Oil
LOCATION Los Angeles
TEST NUMBER 1801 #3
DATE 9/11/7
TYPE FACILITY Refinery
CONTROL DEVICE



HOURS OF OBSERVATION
OBSERVER Tom Newman
OBSERVER CERTIFICATION DATE APR. 1-77
OBSERVER AFFILIATION EPA
POINT OF EMISSIONS STACK
HEIGHT OF DISCHARGE POINT 200'

	Initial			Final
CLOCK TIME	0955			1007
OBSERVER LOCATI Distance to Discharge	750'			
Direction fr Discharge	E			
Height of Obse vation Point	200'			
BACKGROUND DESCRIPTION	SMOG			
WEATHER CONDITIONS Wind Direction	N			
Wind Speed	3-5			
Ambient Temperature	75			
SKY CONDITIONS (clear, overcast, % clouds, etc.)	SMOG			
PLUME DESCRIPTION Color	W			
Distance Visible				
OTHER INFORMATION HUMID	65			

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start--End	Opacity Sum	Opacity Average
1	0955-1001	190	38

Readings ranged from 0 to 15 % opacity

The source was/was not in compliance with ___ at the time evaluation was made.

OBSERVATION RECORD PAGE 0

COMPANY POWERINE OIL
LOCATION LOS ANGELES
TEST NUMBER 1801 #3
DATE 9/11/77

OBSERVER TOM NAWAM
TYPE FACILITY REFINERY
POINT OF EMISSIONS STACK

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
0155	0	10	10	15	10			
	1	10	10	10	10			
	2	5	5	5	5			
	3	5	10	5	5			
	4	10	10	10	10			
	5	0	0	5	15			
	6	10	5	5	5			
	7	0	5	5	0			
	8	5	5	5	0			
	9	0	5	5	0			
1007	10	5	0	0	5			
	11							
	12							
	13							
	14							
	15							
	16							
	17							
	18							
	19							
	20							
	21							
	22							
	23							
	24							
	25							
	26							
	27							
	28							
	29							

OBSERVATION RECORD (Continued) PAGE ___ OF ___

COMPANY
LOCATION
TEST NUMBER
DATE

OBSERVER
TYPE FACILITY
POINT OF EMISSIONS

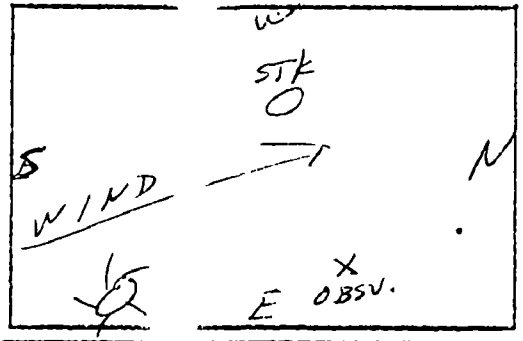
Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
	30							
	31							
	32							
	33							
	34							
	35							
	36							
	37							
	38							
	39							
	40							
	41							
	42							
	43							
	44							
	45							
	46							
	47							
	48							
	49							
	50							
	51							
	52							
	53							
	54							
	55							
	56							
	57							
	58							
	59							

[FR Doc.74-26150 Filed 11-11-74;8:45 am]

RECORD OF VISUAL DETERMINATION OF OPACITY

PAGE ___ OF ___

COMPANY POWERINE OIL
LOCATION LOS ANGELES
TEST NUMBER 1801 #4
DATE 9/11/77
TYPE FACILITY REFINERY
CONTROL DEVICE



HOURS OF OBSERVATION
OBSERVER TOM NEWMAN
OBSERVER CERTIFICATION DATE APR. 77
OBSERVER AFFILIATION EPA
POINT OF EMISSIONS STACK
HEIGHT OF DISCHARGE POINT 200'

	Initial				Final
CLOCK TIME	1120				1126
OBSERVER LOCATION Distance to Discharge	750'				
Direction from Discharge	E				
Height of Observation Point	200'				
BACKGROUND DESCRIPTION	CLEAR				
WEATHER CONDITIONS Wind Direction	CLEAR ~~3-5~~				
Wind Speed	3-5				
Ambient Temperature	76				
SKY CONDITIONS (clear, overcast, % clouds, etc.)	CLEAR				
PLUME DESCRIPTION Color	white				
Distance Visible	10'				
OTHER INFORMATION HUM.	54%				

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start--End	Opacity Sum	Opacity Average
1	1120 - 1126	[illegible]	6.5

Readings ranged from 0 to 10 % opacity

The source was/was not in compliance with ___ at the time evaluation was made.

OBSERVATION RECORD PAGE ___ OF ___

COMPANY POWERINE OIL
LOCATION LOS ANGELES
TEST NUMBER 180174
DATE 9/11/77

OBSERVER TOM NEWMAN
TYPE FACILITY REFINERY
POINT OF EMISSIONS STK

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
1120	0	5	0	5	5			
	1	5	10	10	5			
	2	10	10	5	5			
	3	10	10	5	10			
	4	5	5	5	5			
	5	5	5	10	5			
1124	6	5	5	5	5			
	7							
	8							
	9							
	10							
	11							
	12							
	13							
	14							
	15							
	16							
	17							
	18							
	19							
	20							
	21							
	22							
	23							
	24							
	25							
	26							
	27							
	28							
	29							

OBSERVATION RECORD (Continued) PAGE ___ OF ___

COMPANY ___
LOCATION ___
TEST NUMBER ___
DATE ___

OBSERVER ___
TYPE FACILITY ___
POINT OF EMISSIONS ___

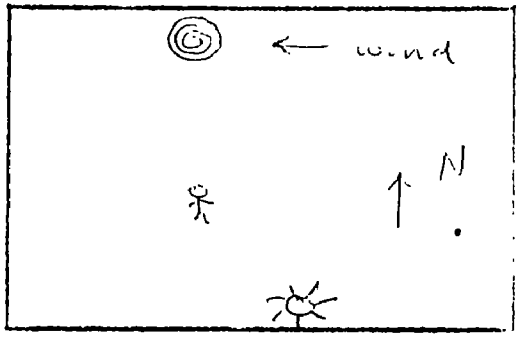
Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
	30							
	31							
	32							
	33							
	34							
	35							
	36							
	37							
	38							
	39							
	40							
	41							
	42							
	43							
	44							
	45							
	46							
	47							
	48							
	49							
	50							
	51							
	52							
	53							
	54							
	55							
	56							
	57							
	58							
	59							

[FR Doc.74-26150 Filed 11-11-74;8:45 am]

RECORD OF VISUAL DETERMINATION OF OPACITY

PAGE 1 OF 1

COMPANY Powerine Oil
LOCATION Santa Fe Springs
TEST NUMBER
DATE 9/11/77
TYPE FACILITY Oil Refinery
CONTROL DEVICE



HOURS OF OBSERVATION 1440
OBSERVER Thomas G. Burns
OBSERVER CERTIFICATION DATE 3/30/77
OBSERVER AFFILIATION USEPA - NEIC
POINT OF EMISSIONS FCC Stack
HEIGHT OF DISCHARGE POINT 180'

	Initial			Final
CLOCK TIME	1440			1446
OBSERVER LOCATION Distance to Discharge	400'			
Direction from Discharge	West			
Height of Observation Point	ground			
BACKGROUND DESCRIPTION	clear blue			
WEATHER CONDITIONS Wind Direction	South			
Wind Speed	5-10			
Ambient Temperature	80°F			
SKY CONDITIONS (clear, overcast, % clouds, etc.)	clear			
PLUME DESCRIPTION Color	white			
Distance Visible	50'			
OTHER INFORMATION				

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start--End	Opacity Sum	Opacity Average
1	1440 -- 1446	19.5	8.1

Readings ranged from 5 to 15 % opacity

The source was/was not in compliance with ____ at the time evaluation was made.

OBSERVATION RECORD PAGE ___ OF ___

COMPANY _____
LOCATION _____
TEST NUMBER _____
DATE _____

OBSERVER _____
TYPE FACILITY _____
POINT OF EMISSIONS _____

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
	0							
	1							
	2							
	3							
	4							
	5							
	6							
	7							
	8							
	9							
	10							
	11							
	12							
	13							
	14							
	15							
	16							
	17							
	18							
	19							
	20							
	21							
	22							
	23							
	24							
	25							
	26							
	27							
	28							
	29							

OBSERVATION RECORD (Continued) PAGE 1 OF 1

COMPANY Powerine
LOCATION Santa Fe Springs
TEST NUMBER _____
DATE 9/11/77

OBSERVER Thomas G Burns
TYPE FACILITY Oil Refinery
POINT OF EMISSIONS FC Stack

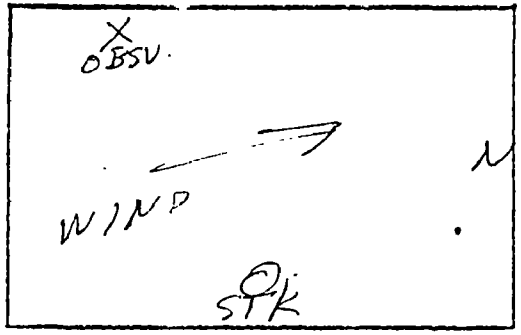
Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
	30							
	31							
	32							
	33							
	34							
	35							
	36							
	37							
	38							
	39							
2	40	5	5	10	10			
	41	10	15	10	5			
	42	10	10	10	10			
	43	10	5	10	5			
	44	10	10	5	5			
	45	5	5	5	10			
	46							
	47							
	48							
	49							
	50							
	51							
	52							
	53							
	54							
	55							
	56							
	57							
	58							
	59							

[FR Doc.74-26150 Filed 11-11-74;8:45 am]

RECORD OF VISUAL DETERMINATION OF OPACITY

PAGE ___ OF ___

COMPANY POWERINE LU
LOCATION LOS ANG LES
TEST NUMBER 1801 5
DATE 9/11/77
TYPE FACILITY REFIN ERY
CONTROL DEVICE



HOURS OF OBSERVATION
OBSERVER
OBSERVER CERTIFICATION DATE
OBSERVER AFFILIATION
POINT OF EMISSIONS
HEIGHT OF DISCHARGE POINT

	Initial			Final
CLOCK TIME	1625			1632
OBSERVER LOCATION Distance to Discharg	400			
Direction from Disch. e	West			
Height of Observatio oint	200'			
BACKGROUND DESCRIPTION	CLEAR			
WEATHER CONDITIONS Wind Direction	N			
Wind Speed	3-5			
Ambient Temperature				
SKY CONDITIONS (clear, overcast, % clouds, e .c.)	CLEAR			
PLUME DESCRIPTION Color	W			
Distance Visible	75'			
OTHER INFORMATION				

SUMMARY OF AVERAGE OPACITY

Set Number	Time Start--End	Opacity Sum	Average
1	1625 - 31	[illegible]	1-4

Readings ranged from 10 to 25 % opacity

The source was/was not in compliance with ____ at the time evaluation was made.

OBSERVATION RECORD PAGE ___ OF ___

COMPANY POWERINE
LOCATION LOS ANGELES
TEST NUMBER
DATE 9/11/77

OBSERVER TOM NEWMAN
TYPE FACILITY REFINERY
POINT OF EMISSIONS STACK

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
1625	0	15	15	10	10			
	1	10	10	15	10			
	2	10	15	10	10			
	3	15	15	20	15			
	4	15	10	15	25			
	5	20	15	15	15			
1632	6	25	25	20	15			
	7							
	8							
	9							
	10							
	11							
	12							
	13							
	14							
	15							
	16							
	17							
	18							
	19							
	20							
	21							
	22							
	23							
	24							
	25							
	26							
	27							
	28							
	29							

OBSERVATION RECORD (Continued) PAGE ___ OF ___

COMPANY
LOCATION
TEST NUMBER
DATE

OBSERVER
TYPE FACILITY
POINT OF EMISSIONS

Hr.	Min.	Seconds 0	15	30	45	STEAM PLUME (check if applicable) Attached	Detached	COMMENTS
	30							
	31							
	32							
	33							
	34							
	35							
	36							
	37							
	38							
	39							
	40							
	41							
	42							
	43							
	44							
	45							
	46							
	47							
	48							
	49							
	50							
	51							
	52							
	53							
	54							
	55							
	56							
	57							
	58							
	59							

[FR Doc.74-26150 Filed 11-11-74;8:45 am]