SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

CHAPTER II

SOURCE TEST PROGRAM OVERVIEW

TECHNICAL SUPPORT SERVICES
APPLIED SCIENCE AND TECHNOLOGY
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CHAPTER II

SOURCE TEST PROGRAM OVERVIEW

INTRODUCTION

For source test results to have value they must meet several objectives:

1. Completeness
2. Precision
3. Accuracy
4. Representativeness
5. Comparability

This chapter describes how a source test should be planned and executed to meet these objectives. Source testers must maintain records to show the level of attainment.

PLANNING THE SOURCE TEST

Intelligent planning of a source requires an understanding of the purposes and ultimate uses of the test data, and adequate information on the nature of the source to be tested.

Establishing Purpose of the Test

Source tests generally are conducted either to determine compliance with District, State or Federal regulations, or to obtain data for engineering purposes. Compliance testing requires that the source be tested as it normally operates. This means the source tester cannot request the company to change its operation to conduct the test under more "representative" conditions, such as worst case. In contrast, tests for engineering purposes often require the source to be tested under specific operating conditions. It is important to clearly establish the purpose of the test and the use of the data before conducting the test.

Proper coordination with the source operator often makes it possible to conduct a source test to obtain the data required for both compliance and engineering purposes.

A major problem in combining a compliance test with an engineering test is achieving completeness. While the data obtained may be sufficient to determine proper equipment operation and compliance with emission limits, it may be insufficient to establish representativeness of process operation. Information on representative operation is useful in enforcement proceedings if the test indicates noncompliance. Therefore, all equipment operating parameters that have any effect on process emissions or control device efficiencies should be documented. Parameters to be monitored must be established before the test is conducted.

The requestor can usually provide information on the purpose of the test, but may not be aware of the capabilities and limitations of source testing. The request may need modification. The source tester may need to contact the company or others familiar with the operation to fully establish exactly what tests should be conducted and what parameters should be monitored.

Establishing Applicable Rules

Different rules have different testing requirements. For instance, rules for sulfur compounds, sulfur oxides, and sulfur dioxide each require different testing techniques. Some rules limit emissions as a function of process parameters. Therefore, the accurate determination of process rates (e.g. fuel usage, process weight) is just as important as accurate measurement of emission rates.

The applicability of a rule often depends on compliance dates or specific definitions of an operation. This information can be obtained from the equipment owner or operator, the engineer processing the company permits, or the inspector responsible for enforcing the rules. In cases where some doubt exists as to the applicability, the appropriate District staff must be consulted.

Performing a Pretest Inspection

Depending on the complexity of the test or familiarity with the facility, the source tester may need to inspect the plant. Figure II-1 is a guide to determine the need for an on-site inspection. Figures II-2 and II-3 indicate typical items to be checked during the inspection. Important considerations include the following:

1. Type of process or operation. (Obtain a flow diagram if available.)

2. Type of emissions.

3. Effect of plant operating conditions on emissions.

4. Location and condition of process instrumentation.

5. Duct size.

6. Temperature, pressure, velocity, and moisture content of the effluent gas stream.

7. Location and accessibility of the sampling points.

8. Adequacy of platforms, sampling ports, and power supply outlets.

9. Safety hazards and special equipment needs. (Obtain approval from appropriate safety officials, if necessary.)

Establishing Sampling Strategy and Data Requirements

The process being tested may be steady state or cyclic. If the process is cyclic, the sampling period should be planned to include at least one complete cycle. If the cycle is short it may be necessary to sample over several cycles to obtain an adequate sample. If the cycle is long it may be preferable to sample the cycle in separate but definable parts. Data obtained during each part may often be more useful than an average over the entire cycle.

Where process data are used in source test calculations, the accurate measurement of that data should be given as much importance as the accurate measurement of emission data. Therefore, the tester should plan to check calibrations of process instrumentation (using NBS traceability, as the highest standard of accuracy). Confirm that calculation techniques are appropriate and result in accurate information, and verify that all data used in calculations are accurate. Methods of cross-checking process data should be used wherever possible.

Assuring Proper Sampling Facilities

Adequate sampling facilities are necessary for obtaining representative samples in a safe manner. This is required by District Rules and Regulations as follows:

> "RULE 217. PROVISION FOR SAMPLING AND TESTING FACILITIES (Adopted January 9, 1976)
>
> The Air Pollution Control Officer may require the applicant or permittee to provide and maintain such facilities as are necessary for sampling and testing. In the event of such requirements, the Air Pollution Control Officer shall notify the applicant in writing of the required size, number and location of sampling ports; the size and location of the sampling platform; the access to the sampling platform; and the utilities for operating the sampling and testing equipment. The platform and access shall be constructed in accordance with the General Industry Safety Orders of the State of California."

Guidelines for Construction of Sampling and Testing Facilities

The selection of the proper sampling site is important to assure obtaining a representative measurement of the pollutant emissions and the volumetric flow rate from a stationary source. Accessibility and safety also are essential considerations. The tester must consider clearance for sampling equipment, access to electrical power, exposure of personnel to weather and process heat, presence of hazardous gases, and any other pertinent safety factors.

Minimum construction requirements for permanent, safe, and accessible sampling facilities at a stack or duct are as follows:

Sampling Ports

Port Location - Ports should be located at least eight stack or duct diameters downstream and two diameters upstream from any bend, inlet, outlet, expansion, contraction, or other flow disturbance, or from a visible flame. To determine upstream and downstream disturbances for a rectangular stack or duct, calculate the equivalent diameter as follows:

$$\text{Equivalent Diameter} = \frac{2 \times \text{Length} \times \text{Width}}{\text{Length} + \text{Width}}$$

If necessary, an alternative location at least two diameters downstream and one-half diameter upstream from any flow disturbance may be used, subject to approval by the Executive Officer or a designated representative. For any location selected, the gas should flow in a linear pattern parallel to the axis of the stack or duct, have a uniform velocity profile and not flow in a cyclonic pattern.

Port Type - A sampling port should be a 3-inch inside diameter welded nipple with a screw cap or a pipe with flange. A gate valve should be used for stacks handling hazardous gases or gases over 200^{o}F under positive pressure.

Port Installation - Ports should be flush with the interior stack wall and extend outward from the exterior wall at least 2 inches and not more than 6 inches. Ports should be located at least 4 feet and not more than 5 feet above the work platform floor and meet clearance zone requirements described below. The ports should be located parallel and perpendicular to the centerline of the upstream disturbances. A 1-inch eyehook should be installed 24 inches above each port.

Monorails should be permanently installed at the stack for the equipment which is under Regulation IX (NSPS).

Number of Ports - If the sum of the stack inside diameter plus the port length is 5 1/2 feet or less, two ports should be installed 90 degrees apart. If this sum is over 5 1/2 feet, four ports should be installed 90 degrees apart. In case of rectangular stack or duct locate the ports on the widest of the two sides. Number of ports will depend on the grid configuration. (Follow Method 1.1, Section 2.3.)

Work Platform

Size - The work platform should be at least 4 feet wide. For two-port installation the platform should serve that quarter of the stack and extended at least 3 feet beyond each port. For a four-port installation the platform should serve the full circumference of the stack. The platform should be at least 5 feet wide.

Construction - Safe and easy access to the work platform should be provided by stairway, caged ladder, or other suitable means approved by the Executive Officer. The platform should have a safe guardrail and toeboard and be able to support 1000 pounds live load.

All construction must conform to the General Industry Safety Orders of the State of California.

For platforms over 30 feet high a pulley stand with a 3 feet swinging arm equipped with 10-12 inch pulley wheel with a 1/2 inch continuous manila rope should be provided.

Clearances - There should be no obstructions within a 3-foot radius on the platform beneath each port. There should be a clearance zone around each port extending one foot above, two feet below, and two feet on each side of the port. The zone should extend outward from the end of the port at least one stack diameter plus three feet.

Power Supply

Four electrical outlets, each capable of supplying 115-volt, 20-ampere, 60-cycle AC should be provided, preferably at each sampling site; or, alternatively, they may be located within 50 feet of each sampling site.

Additional Requirements

These guidelines cover situations requiring permanent sampling facility installations. Additional requirements may be specified for situations with special needs such as flow pattern adjustment, hoist equipment, or variations in the number and location of sampling ports.

Sampling Methods

Selection of the most appropriate sampling method for a specific test operation must consider the chemical and physical properties of the sample to be collected and the types and limitations of analytical methods available for specific contaminants. Sampling methods available are integrated sampling, grab sampling, continuous sampling, or a combination of these. A description of these methods and the potential problems associated with each of them are presented below.

Integrated Sampling

Integrated sampling involves passing exhaust gases through a filter, a chemical absorbing solution, water, or any combination of these throughout the test period. The filter, solution, and/or container contents are then analyzed in the laboratory. This method determines average emissions but cannot discern variations in emissions during the test. Most sampling for particulate matter is done by the integrated method.

Integrated sampling normally requires more handling of test equipment than other methods, and the sample analysis techniques offer more possibilities for error. Therefore, careful quality control must be exercised during both the sampling and analytical procedures. Using a checklist will help reduce errors.

Grab Sampling

A grab sample is a gaseous sample taken during a short time period. These samples can be collected in several ways: by drawing directly into an evacuated container, by inflating a flexible bag, in a syringe, or by running several volumes of the gas through a container to purge the air contents and leave pure sample. After collection, samples are submittted for laboratory analysis.

Problems associated with grab sampling are:

- Contamination by container or bag. The material of the container or sample train should not react with either the sample being collected or the sampling medium. Containers to be reused must be properly passivated for the contaminant gas. A record of sample collections and the passivation process should be kept for each container.

- Loss of concentration of sample due to condensation on container walls. In some cases use of an extracting solution or a heated container can eliminate this loss.
- Non-representative sample due to cyclic processes. Integrated sample is preferred in this case.

Continuous Sampling

Continuous sampling techniques can be categorized as either extractive or in-situ (in-stack). A description of these techniques and the potential problems associated with each of them are presented below.

Extractive

Extractive sampling is the primary continuous sampling technique used by air pollution control agencies. It is accomplished by drawing a sample from the stack through a probe and into electronic instruments that analyze the gases. Both variations in real time emissions and average emissions can be determined by this method. Problems associated with this technique include the following:

- Conditioning of the gases before passing through the measuring device. The conditioning must not change the concentration of the specific pollutant to be measured.

- Interference from components of the gas stream other than the specific pollutant to be measured. False responses from other than the pollutant of interest and species interactions during measurement, may cause inaccurate results. Information on such interferences may be obtained from the instrument manufacturer or by quality control testing.

- Accuracy of calibration gases and possible influence of the carrier gas (balance or make-up gas) on the response of the analyzer. For periodic calibration of the analyzer NBS traceable calibration gas must be used. When inert carrier gas is required its influence on the response of the analyzer must be determined prior to its use.

In-situ

In-situ sampling instruments analyze the flue gases as they flow by sensors located in the stack. These instruments are usually permanent installations used for continuous stack monitoring purposes. Quality control of this equipment can be accomplished by periodic comparison testing with other approved sampling methods.

CONDUCTING THE SOURCE TEST

General Test Requirements

To meet the test objectives the source test must be performed by qualified personnel using proper test methods and equipment. The source test team leader must be properly trained in source sampling and experienced in using field test procedures under field conditions. Adequate staff must be available at each test station to perform the required sampling.

To assure the validity of a test, appropriate and properly calibrated sampling equipment must be used.   Since calibration and maintenance of test equipment are subject to legal review, test personnel should keep a written record of each calibration. Standardized practices and complete documentation are emphasized as means of ensuring the validity and legal soundness of results. Calibration requirements are described in detail in Chapter III.

Standard source test procedures should be used, and modified only when they are necessary to obtain representative samples. Changes in methodology must be based on sound engineering and scientific judgment. Modifications must be documented and approved by the Executive Officer before use.

During the test it is essential that the process operates at normal conditions. For new source performance tests several operational conditions may be stipulated. For compliance tests no such conditions are stipulated to the operator. Test equipment should be functioning properly and operated to ensure the collection of a representative sample.

Changes in the normal operation of the process must be documented. Variations in the quantity or quality of the effluent gas, such as opacity, stack gas velocity, or temperature, should be investigated and the reasons documented.

Since source test results are frequently used as proof of compliance, the tester must pay close attention to quality control checks and documentation. Performance and documentation of pretest preparation and post-test checks are important. For reagents, containers, or filters, a record should include the date, the person who prepared them, and the location of these items from preparation until actual use for sampling. Because these items become an integral part of the sampling process, their integrity must be maintained from preparation through analysis. Each test method includes field data forms for record keeping purposes.

Recording Data

Since test data is physical evidence in legal proceedings, standardized field data forms manual should be used to gather all required information. Typical forms are shown in

Each field data form identifies the process tested, date and time, test location, testing and recording person. Data should be recorded in indelible ink. Erroneous values should be crossed out and corrections entered above them with tester's initials.

Sample Handling

Once the sample is collected it should be handled carefully to ensure that the sample submitted to the laboratory for analysis represents the actual sample taken at the reported test conditions.

Contamination and deterioration of the sample must be avoided. Security measures should be documented in a written record signed by the handlers of the samples. Sample identification should be verified throughout the test and analytical procedures.

One member of the source testing team should serve as sample custodian and be responsible for receiving equipment items from the laboratory and entering the information on the field data forms. A label form to identify samples is shown in Figure II-4.

Chain of Custody

Legal rules of evidence require systematic sample identification at all processing points. Samples must be marked to ensure positive identification. Samples should be transported with precautions taken to eliminate the possibility of tampering, accidental destruction, and physical or chemical damage. Testing personnel must thoroughly understand the characteristic of the samples and deliver them to the laboratory on the same day as the sampling. When this delivery is impractical, the samples should be placed in a location secure from tampering, breakage, contamination, deterioration, and loss.

The sample custodian of the source test team must ensure and document that the samples have been transported to the laboratory custodian according to the precautions described in the test method. The chain of custody form shown in Figure II-5 establishes the identity of the sample. Such documentation ensures that the sample analyzed was the sample taken at a particular condition. Samples should be handled only by persons associated with the test. Ideally, all samples are transported from the test site to the vehicle and from the vehicle to the laboratory by the same person.

1. If no one is available to receive the samples, indicate where the samples are stored. Notify the Chem Lab Custodian as soon as possible.

2. If no sample is collected, state in the I.D. Nos. column that analysis is not required.

To help each person remember from whom the sample was received and to whom, it was delivered, it is recommended that each recipient signs the receipt form for the sample. The chain-of-custody procedures should not delay the sample analysis. If the sample must be kept for future reference, store it in a secure area. To comply with legal rules all test reports should be filed in a secure place by a custodian. Although the field notes and calculations are generally included in the source test report, the original materials must be kept in the secure file. Do not take the original file to the field.

Sample Recovery and Analysis

Special care must be used in recovery and analysis of samples by personnel qualified to perform the specified laboratory procedures. Analytical procedures are included in the test methods. Any deviation from these procedures requires prior approval of the Executive Officer.

Field Calculations

Field calculations must be checked for possible calculation errors due to procedural or mathematical mistakes, preferably by a team member other than the person who performed the original calculations. If a difference greater than typical round-off error is detected, the source of error must be found and corrected. If a standardized computer program is used, check the original data entry. If differences are observed, make a new computer run.

Experienced persons are able to recognize unusual test results which are due to entry errors.

Calculations should be carried out to at least one significant digit beyond that of the acquired data and then should be rounded off after final calculation to two significant digits for each run. All rounding off of numbers should be in accordance with the ASTM E380-82 procedures.

Test Report

A complete and clearly written report is a vital part of the source test, since the information will be used by a wide audience with varied needs and backgrounds. Some users will be highly skilled and need the most technical portions of the data, but will have little use for a discussion of standard, well-known test techniques. Others may need a detailed discussion of test methods. In legal proceedings the report serves as the official record of the testing process. Because of many uses of a source test report all test data should be included in each report. To assure that reports are complete it is advisable to prepare them in a standardized format. The general format for a source test report is outlined below. A complete example report is in the Appendix.

SOURCE TEST REPORT - GENERAL FORMAT

TITLE PAGE

1. Source test report number
2. Company name and address
3. Test report title
4. Test date, issue date, report author
5. Report reviewer

SUMMARY

Introduction

1. Firm tested and location
2. Basic equipment and control equipment tested
3. Person requesting test and reason
4. Date of test
5. Source test team members
6. Firm contact for test arrangements
7. Test observers

Results

1. Flow Rate.
2. Process Weight.
3. Contaminants measured
   - A. Emissions measured
   - B Emissions allowed
   - C. Applicable rules

GENERAL INTRODUCTION

The general introduction is a brief narrative listing the test date and location, basic and control equipment, applicable rules, and purpose of the test.

EQUIPMENT AND PROCESS DESCRIPTION

This section includes a brief description of the process and its basic equipment and control equipment, a schematic of the process, and the location of the test sampling port. It also includes process data or parameters that were monitored.

SAMPLING AND ANALYTICAL PROCEDURES

This section describes the sampling and analytical procedures, sampling apparatus with a schematic diagram, deviations from standard procedures, and the calculations performed with the sample components.

TEST CRITIQUE

The critique reports problems encountered in the test operations and abnormal conditions in the process operations. Deviations from standard procedures are described in detail. The section concludes with a discussion of the validity of the results.

ATTACHMENTS

1. Process diagrams
2. Sampling equipment diagrams
3. Meter data tables
4. Velocity data tables
5. Calculation sheets
6. Analytical laboratory reports

All original field report material should be filed with other documentation regarding checks and calibrations, chain of custody, process data, original recording, memos, inspection reports, test request, and lab request.

OTHER PROGRAM CONSIDERATIONS

Test Equipment

The specifications, criteria, and design features of the source testing equipment must meet the acceptable standards shown in Chapter III. A procurement log should be maintained to record the description of equipment, identification number, and acceptance check results. When an acceptance check includes calibration, the results are entered in a calibration log book. Repair and maintenance logs also should be maintained. Figures II-6 and II-7 show procurement log and maintenance and repair record forms.

Equipment Preventive Maintenance

Systematic errors arise from deficiencies inherent in the equipment or from inaccurate calibration. To minimize systematic errors, effective preventive maintenance and calibration programs must be implemented. The calibration program is described in Chapter III.

Preventive maintenance is intended to reduce equipment downtime, improve reliability of source test results, and increase confidence in results. The program involves cleaning, lubricating, rebuilding, and adjusting equipment at predetermined intervals. A spare parts inventory should be maintained to help reduce equipment downtime. A recommended spare part list can usually be obtained from the equipment manufacturer.

Preventive maintenance should be performed on the following equipment:

1. Sampling pumps
2. Flow meters
3. Pressure gauges
4. Sampling instruments

5. Integrated sampling tanks
6. Mobile van sampling systems
7. Laboratory equipment
8. Other designated equipment

Maintenance service frequency is based on experience and manufacturer recommendations. Equipment maintenance should be performed on a scheduled basis or when indicated by performance deterioration or excessive wear. An equipment identification and service record should be kept on a maintenance log sheet. Figure II-8 lists acceptance limits and frequencies of maintenance for the equipment listed above.

One qualified individual should be responsible for:

1. Planning and implementing an equipment maintenance program.
2. Ensuring that all maintenance and calibration work is performed on schedule.
3. Maintaining current equipment logs service records.

Instructions for periodic maintenance, calibration, and special care of instruments and equipment are frequently updated. Abstracts from manufacturer's service and maintenance manuals are primary information sources for these updates. The accuracy and life of test equipment can be increased by employing the assistance of factory representatives in initial installation and performance testing and following manufacturer's operating instructions.

Initial Examination of Data

Test data should be examined for obvious abnormal values. These values should be corrected whenever possible and changes recorded and initialed. The presence of an error does not automatically require that an entire test be rejected.

Generally, determinate errors can be resolved and corrected. If the error is indeterminate, it still may be possible to calculate its significance and judge the acceptability of the final results. Test values judged to be invalid or suspicious should still be recorded and identified as such.

Data Reduction

Data reduction requires a standard calculation form or computer. The form should include step wise procedures to obtain accurate results. Computers are useful for handling large amounts of data and simplifying complex calculations. All calculations and computer inputs must be checked by at least two people. Then the supervisor must review the data to judge its validity.

Data from continuous emission analyzers are recorded on strip charts. Strip chart data should be integrated with a planimeter or similar device unless the recording is relatively constant with time. Data strip charts must be checked by a supervisor.

All reviewers must initial the calculation sheets and printouts.

Data Validation

When test results have been calculated, with precautions taken to assure accuracy, they are evaluated for representativeness of actual emissions. Variability in results of multiple tests on the same source at different times may be due to the following:

1. Variations in source operating parameters
2. Equipment and personnel variations in the field and the laboratory
3. Uncertainties or randomness of test method

Variation in source operation often is the most significant factor in the variation of the results. Knowledge of source operation and monitoring of key parameters will help identify these variations.

A good training program can reduce variations caused by personnel and a good preventive maintenance program can minimize variations in equipment performance..

Uncertainty of results is an important aspect in determining test reliability. Uncertainty may be measured by statistical methods or with control charts to compare test results with historical control limits. Several points should be considered when test results fall outside the control limits:

1. Was the test method appropriate for the source tested?
2. Was the source operation varying?
3. Were equipment problem, or probable human error encountered during the test?
4. Was test data recorded and reduced properly?

If the cause of variations in results can be determined it should be noted in the test report. Another test should be conducted, if necessary. When possible, test results for each run should include the confidence interval (for example, 120 ppm ± 10 ppm). The confidence interval is obtained from the uncertainty analysis or from other statistically sound methods.

Quality Assurance Audits

A quality assurance audit should be conducted by someone not a regular member of the source test team. This person conducts periodic performance audits and checks source test results. There are three types of performance audits:

1. Sampling audits
2. Analysis audits
3. Data processing audits

Sampling Audit

A complete sampling audit involves simultaneous testing with different equipment and operators, though it often is impractical from a cost and personnel standpoint. In most cases, an acceptable sampling audit consists of a qualitative appraisal of the test procedures and test equipment used during the test. The auditor verifies that all equipment was functioning properly during the test and that personnel performed all pre-test and post-test performance and calibration checks.

Analysis Audit

An analysis audit consists of separate analyses of commonly collected integrated samples. Samples of known concentration can be submitted to two or more independent laboratories. Samples may also be evaluated by separate chemists in the same laboratory.

Data Processing Audit

Data processing audits involve spot checks of data reduction and calculation procedures. Computation methods are checked by inserting "dummy" data sets into computer programs and calculation sheets.

Audit Checklist

Checklists are helpful in conducting most parts of an audit but an auditor must rely on good judgment. The auditor should attempt to resolve problems found and also record them for later review. See Figures II-9 through II-12 for audit checklists.

A periodic review of the preventive maintenance program, based on monitoring equipment downtime, should be part of the audit process.

Training

Errors by test personnel are due to carelessness, insufficient knowledge, or inadequate training and can be reduced by establishing a training program covering the following areas:

1. Operation and maintenance of equipment.
2. Detection of electronic problems.
3. Detection of sensor problems.
4. Detection of mechanical problems.
5. Performance of routine field repairs.
6. Calibration of instruments.
7. Limitations of instruments (range, responses, interference, functions, temperature, and moisture limits).
8. Quality assurance.
9. Technical writing.
10. Legal requirements of evidence.

A safety training program is mandatory. Personnel involved in field inspection and source testing must be adequately trained in using self-contained breathing apparatus, emergency life support apparatus, and personal monitors. Safety rules and guidelines must be given to the employees and strictly enforced. Periodic refresher training must be provided for the use of all safety equipment.

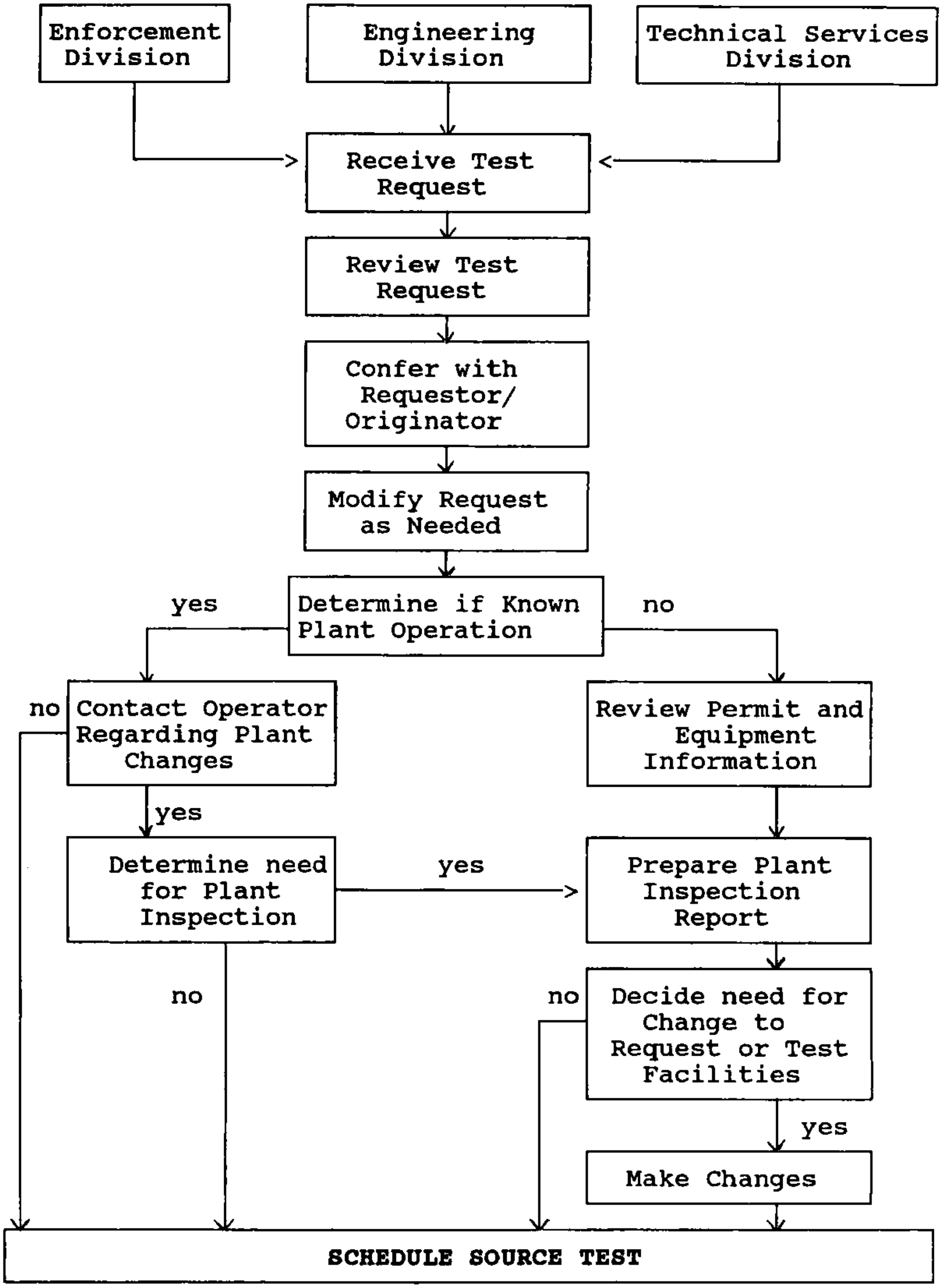


Figure II-1

PROCEDURE FOR PLANNING A SOURCE TEST

PLANT INSPECTION REPORT

DATE OF INSPECTION:

COMPANY AND UNIT:

COMPANY ADDRESS:

COMPANY PERSONNEL CONTACTED:

TELEPHONE NUMBER: INSPECTED BY:

I. Process and Equipment

1. Basic and Control Equipment.
2. Manufacturing Process and Schedule and Level of Plant Operation.
3. Process Flow Sheet of Basic and Control Equipment.

II. Emissions

1. Location(s) of Emissions.
2. Temperature of the flue gases.
3. Types of Contaminants.
4. Estimated Contaminant Concentration.

Figure II-2

TYPICAL PLANT INSPECTION REPORT

III. Test Method and Sampling Equipment

1. Contaminants to be tested.
2. Test Equipment Needed.
3. Modification of Test Method and/or Equipment.

IV. Request for Test Facility and Estimated Installation Date

V. Safety Precautions for Hazardous Conditions

VI. Recommendation for Modification of Source Test Request

VII. Test Schedule

VIII. Test Fee Applicability

Figure II-2 (Cont.)

STACK AND GAS STREAM DATA REQUIREMENTS

Date of Inspection____________

Company ____

Equipment Basic____
Control____

Stack (Vent) Number___________

Process Parameter____

Comments____

Process Vented____

Platform Height, ft____

Platform Width, ft____

Platform Length,ft____

Stack Inside Diameter, in. at Port_________________________

Stack Wall Thickness, in. at Port__________________________

Stack Material of Construction____________________________

Sampling Ports:

Existing____

Size opening______________________________________

Distance from platform____________________________

Straight Distance before Ports, ft_________________________

Type of Restriction before Ports__________________________

Environment at Sampling Site______________________________

Work Space Area____

Ambient Temperature at Sampling Site, ^{o}F____________________

Average Pitot Reading, in. H_2O
and Range of ΔP____

Figure II-3

FORM FOR RECORD OF STACK AND GAS STREAM DATA

Date of Inspection____________

Company____

Equipment Basic____
Control____

Stack Gas Velocity, ft/min______________________________

Stack Gas Flow Rate, ft/min_____________________________

Stack (Vent) Number________________

Moisture, Percent by Volume_____________________________

Stack Gas Temperature ,^{o}F_________________________________

Particulate Loading, gr/scf_____________________________

Particle Size____

Gases Present____

Stack Static Pressure, in H_2O_____________________________

Water Spray Prior to Site_________________________________

Dilution Air Prior to Site________________________________

Elevator to Site____

Available Electricity and Distance, ft______________________

Number of Outlets_____________Type of Plug__________________

Comments

Figure II-3 (Cont.)

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

TECHICAL SERVICES DIVISION

Source____

Item No.__________________	Method_________________
Source Test No.__________	Sampling Point_________
Preparation No.__________	Run No.________________
Analysis No._____________	Date___________________

Figure II-4

Sample Label

Source Name________________________Source Test No.____________
Address ________________________________ Date____________
Process ________________________Control Equipment____________

Requested by______________ For Compliance, Rule(s)____________
Team No. ______________ Other (specify)____________

EQUIPMENT REQUEST

Laboratory No.____________

Quantity and Description	I.D. Nos.

EQUIPMENT CHAIN OF CUSTODY

From	To	For	Date	Time

ANALYSIS REQUEST

Source Test No.______________ Laboratory No.____________

Sample Description	Analysis Requested

SAMPLE CHAIN OF CUSTODY

Sample No.	From	To	For	Date	Time

Additional Comments:____
____
____
____

Figure II-5

Form for Equipment and Analysis Requests and Chain of Custody

PROCUREMENT LOG

Item Description	Quality	Purchase Order #	Vendor	Date		Cost	Disposition	Comments
				Ordered	Received			

Figure II-6

FORM FOR RECORD OF EQUIPMENT PROCUREMENT AND ACCEPTANCE CHECK

SOURCE TESTING EQUIPMENT - RECORDS OF MAINTENANCE AND REPAIR

Equip. I.D. #	Date Inact.	Reason for Inactivation	Date To Shop	Date From Shop	Date Calib.	Date Re-Activ.	Remark

Figure II-7

FORM FOR RECORD OF TEST EQUIPMENT MAINTENANCE AND REPAIR

Equipment	Acceptance Limits	Frequency of Service	Methods of Service
Pump	1. Absence of leaks 2. Ability to draw manuf. reg. vacuum and flow	Every 500 hrs. or operation or 6 months, whichever is less	1. Visual insp. 2. Clean 3. Replace parts 4. Leak check
Flow Meter	1. Free mechanical movement 2. Absence of malfunction	Every 500 hrs. of operation or 6 months, whichever is less	1. Visual insp. 2. Clean 3. Calibrate
Sampling Instrument	1. Absence of malfunction 2. Proper response to zero, span gas	As recommended by manufacturer	As recommended by manufacturer
Integrated Sampling Tank	1. Absence of leaks	Depends on nature of use	1. Steam clean 2. Leak check
Mobile Van Sampling System	1. Absence of leaks	Depends on nature of use	1. Change Filters 2. Change gas dryer 3. Leak check 4. Check for system contamination
Sampling	Sampling degradation after each test Lines less than one percent of test series		Flush with solvent. Blow air through line until dry.

Figure II-8

TEST EQUIPMENT MAINTENANCE SCHEDULE

METHOD 1.1 AND 2.1 AUDIT CHECKLIST

Yes	No	Operation
		Presampling Preparation
		1. Knowledge of process conditions.
		2. Calibration of pertinent equipment prior to each field test, including date.
		On-Site Measurements
		3. Pitot tube meets geometry requirements.
		4. Differential pressure gauge (DPG)is level and the liquid column set exactly on zero.
		5. DPG has the correct sensitivity.
		6. Traverse points adequately located.
		7. Check for absence of cyclonic flow.
		8. Leak check before and after sample run. (Both sampling train and Pitot tube).
		9. Sampling port adequately plugged.
		10. Process at correct operating conditions.
		11. Pitot tube properly aligned along its roll and pitch axes throughout the traverse.
		12. Pitot tube frequently cleared when measuring in a dust-laden gas.
		13. System stabilized at each traverse point during sampling.
		14. Stack gas static pressure, temperature and barometric pressure measurements taken.
		15. Velocity at the reference point being monitored.

Figure II-9

Yes	No	Operation
		Postsampling
		16. All information recorded on data form as obtained.
		17. Any unusual conditions recorded.
		18. Independent check of calculations.
		19. Temperature sensor calibrated.

COMMENTS

Figure II-9 (Cont.)

CHECKLIST FOR METHOD 3.1 AUDIT CHECKLIST

Yes	No		Operations
		1.	Availability of theoretical values.
		2.	Use of $O_2$and/or CO_2 analyzer.
		3.	Adequately sensitive range used.
			On-Site Measurements
		4.	Sampling train setup and leak tested.
		5.	Sampling train purged with stack gas prior to collecting the sample.
		6.	Constant rate sampling.
		7.	Transfer of sample from collapsible bag to gas analyzers.
		8.	Analyzer operation.
		9.	Sample transfer to evacuated flasks.
		10.	Perform independent calculations using data from audit.
		11.	Compare the audit value with the field team's test value.
		12.	Minimize volumetric reading error.
		13.	Check/verify applicable records of equipment calibration.

Comments

Figure II-10

METHOD 4.1 AUDIT CHECKLIST

Yes	No	Operations
		<u>Presampling Preparation</u>
		1. Knowledge of process conditions.
		2. Calibration of pertinent equipment; in particular, the dry gas meter before each test.
		<u>On-Site Measurements</u>
		3. Leak testing of sample train before and after sample run.
		4. Addition of water and silica gel to impingers, and correct location of impingers.
		5. Constant sampling rate not exceeding specified limits.
		6. Measurement of condensed water to within specified limits.
		7. Pertinent process condition during sample collection.
		8. Probe maintained at given temperature.
		<u>Postsampling</u>
		9. Calculation procedure check.
		10. Calibration checks.

Comments

Figure II-11

METHOD 5.1 AUDIT CHECKLIST

Yes	No	Operation
		Presampling Preparation
		1. Knowledge of process conditions.
		2. Calibration of pertinent equipment; In particular, the dry gas meter, orifice meter, and Pitot tube.
		On-Site Measurements
		3. Sample train assembly.
		4. Pre-test and post test leak check of train.
		5. Isokinetic sampling rate.
		6. Post-test check for the setup.
		7. Sample recovery and integrity.
		8. Recording of pertinent process information during sample collection.
		Postsampling
		9. Check of analytical balance.
		10. Use of acceptable detection blanks in correcting field sample results.
		11. Check of calculation procedure.

Comments

Figure II-12

APPENDIX

SOURCE TEST REPORT

99-0000

CONDUCTED AT

Alpha Specific Resources
Champion Petroleum Company
999 E. Street
El Monte, CA

PARTICULATE MATTER, SULFUR OXIDES AND CARBON MONOXIDE EMISSIONS FROM AN FCCU REGENERATOR CONTROLLED BY AN ELECTROSTATIC PRECIPITATOR, PLUS DETERMINATION OF CONTINUOUS MONITOR ACCURACY

TESTED: November 9, 1999

ISSUED:

REPORT BY: Assistant A.Q. Engineer

REVIEWED BY:

Senior A.Q. Engineer

Manager

Supervising A.Q. Engineer

SOURCE TESTING AND MONITORING BRANCH

DIRECTOR, TECHNICAL SERVICES DIVISION

INTRODUCTION

a. Firm Tested................Alpha Specific Resources

b. Test Location..............Champion Petroleum Company

c. Unit Tested................FCCU

d. Test Requested by..........Source Testing

e. Reason for Test Request.....Rule Compliance

f. Date of Test...............November 9, 1999

g. Source Test Performed by....AA, BB, CC

h. Test Arrangements Made Through....................Telephone No.

i. Source Test Observed by.....FF

j. Company I.D. Number.........000000

k. Permit Number...............000000

l. Application Number..........000000

Flow Rate 2,188 dscmm (77,260 dscfm)
Process Weight 1.808 kg/hr (3.986x10^6 lb/hr)

Contaminant	Emissions Measured	Emissions Allowed	Applicable Rule
Particulate Matter			
-Concentration	27.5 mg/dscm (0.012 gr/dscf)	84.3 mg/dscm (0.037 gr/dscf)	404 (a)
-Solid Mass Rate	2.82 kg/hr (6.22 lb/hr)	23.6 kg/hr (30.0 lb/hr)	405 (a)
Carbon Monoxide	None Detected	2000 ppm	407 (a)(1)
SO_x as SO_2 from FCCU Regenerator	17.5 kg/1000 bbl (38.5 lb/1000 bbl)	60 kg/1000 bbl (132 lb/1000 bbl)	1105 (a)(2)
-Particulate Mass Rate -Per 1000 lbs Coke Burn off	0.23 kg/1000 kg (0.23 lb/1000 lb)	1.0 kg/1000 kg (2.0 lb/1000 lb)	Reg. IX Subpart J 40 CFR60.102 (a)(1)
Relative Accuracy of SO_2 CEM Expressed as percent of:			
Actual Conc.	+ 6.3%	± 20 %	218 (C)(2)(A) (viii)*
Allowed Conc.	+ 1.8%	± 10%	

* See Test Critique

INTRODUCTION

On November 9, 1999, personnel from the South Coast Air Quality Management District (SCAQMD) conducted a source test on the Electrostatic Precipitator (ESP) serving a Fluid Catalytic Cracking Unit (FCCU) operated by Alpha Specific Resources Champion Petroleum Company, Utopia, CA.

The purpose of the test was to verify compliance with District rules for emissions of particulate matter (Rules 404, 405), carbon monoxide (Rule 407), sulfur oxides (Rule 1105), New Source Performance Standards for Petroleum Refineries (Regulation IX), and relative accuracy of CEM (Rule 218). This test was a part of the District program to conduct quarterly tests on all FCCUs.

EQUIPMENT AND PROCESS DESCRIPTION

The FCCU catalytically converts gas oil into lighter petroleum products, mainly gasoline.

Oil feed from the Hydrodesulfurization Unit is combined with Slurry Settler Bottoms from the FCCU gas plant and regenerated catalyst, and fed to the FCCU reactor. The hydrocarbon vapors from the reactor are further processed in the FCCU gas plant. Spent catalyst from the reactor, flows to the regenerator for burn off of carbon deposits. The regenerated catalyst is recycled to the reactor.

The regenerator gases exhaust to cyclone separators and electrostatic precipitators for removal of particulate matter before venting to the atmosphere as shown in Figure 1.

The operating parameters during the test were:

FCCU Feed Rate	34,950 Bbl/day
Catalyst Circulation Rate	3,570,000 lb/hr
Coke Burn off Rate	26,794 lb/hr
Air to FCCU Regenerator	5.164×10^6 cfm

Process Weight:

FCCU Feed Rate

34,950 Bbl/day x 1 day/24 hr x 286 lb/Bbl =

416,000 lb/hr

Total Process Weight

3,570,000 lb/hr + 416,000 lb/hr = 3,986,000 lb/hr

SAMPLING AND ANALYTICAL PROCEDURES

Flow Rate

The gas velocity in the outlet stack was measured simultaneously with particulate sampling (traverse sampling). This was done using an S-type Pitot tube strapped to the particulate sampling probe, a differential pressure gauge, and a type "K" thermocouple with a digital reading device. The gas flow rate was calculated from the temperature, pressure, density, stack area, and moisture content of the sampled gases. See Figures 1 and 2 for sampling point and equipment schematic.

Particulate Sampling

A particulate sample was collected using the District Method 5.2 (Draft) sampling train consisting of a stainless steel nozzle, a stainless steel probe with a heated glass liner, a heated fiberglass filter, two impingers each filled with 100 ml of deionized water, an empty bubbler, and a bubbler filled with tared silica gel. The system was connected to a leak-free vacuum pump, a temperature compensated dry gas meter and a calibrated orifice,as shown in Figure 2. The temperature of the probe and filter was maintained above the dew point (180-200°F) of the sample gases to prevent condensation of moisture but sufficiently low to catch sulfuric acid mist. The two impingers and two bubblers were contained in an ice bath to condense water vapor and other condensable matter contained in the sample stream.

The particulate sample was collected for a period of one hour using a 24 point traverse through two portholes 90 degrees apart, two and one-half minutes per point.

Particulate matter deposited in the probe liner and impinger solutions, and caught on the filter was determined by gravimetric techniques.

Sulfuric acid dihydrate ($H_2SO_4.2H_2O$) in the impinger, filter and probe wash solutions was determined by both the Sodium Hydroxide Titration Method and the Barium Chloride Precipitation Method.

Moisture content was determined by volumetric and gravimetric techniques.

For Rule 404 compliance, total particulate was calculated by adding the weights of: Particulate matter deposited in the nozzle, probe liner, and filter; adjusted impinger residue (aqueous residue minus sulfuric acid dihydrate and neutral sulfates as ammonium sulfate); and organic extraction from the impinger solutions.

For Rule 405 compliance, the solid particulate was calculated by adding the weights of: Particulate matter deposited in the nozzle, probe liner, and filter; and adjusted impinger residue (aqueous residue minus sulfuric acid dihydrate and neutral sulfates as ammonium sulfate); and subtracting the lesser of the two weights of sulfuric acid dihydrate, as determined by the Sodium Hydroxide Titration Method and the Barium Chloride Precipitation Method, from the probe liner and filter.

Sulfur Oxides Sampling

The exhaust from the ESP stack was sampled continuously for 72 minutes using the District Method 6.1 (Draft) sulfur oxide (SO_x) sampling train. The train consisted of a glass probe, a Whatman paper thimble, one impinger filled with 200 ml of 2-propanol, an empty bubbler, two impingers filled with 100 ml of hydrogen peroxide (3 percent), an empty bubbler, a bubbler filled with tared silica gel, a vacuum pump, and a temperature-compensated dry gas meter, as shown in Figure 3.

At the conclusion of the sampling the SO_x train was purged with ambient air for fifteen minutes at an average flow rate of 0.5 cfm.

For Rule 1105 compliance the weight of total sulfur oxides, calculated as sulfur dioxide (SO_2) from the regenerator, was determined by adding the weights of: Sulfur trioxide (SO_3) in the 2-propanol, calculated as SO_2; and the SO_2 in the hydrogen peroxide.

Integrated Gas Sample

An integrated gas sample was collected in a Tedlar bag for 28 minutes at the stack using a peristaltic pump as shown in Figure 4. The sample was transferred into three, two-liter evacuated glass bulbs and analyzed for CO, CO_2, and O_2 in the District laboratory using District Method 10.1 (Draft). The gases were separated by gas chromatography. Carbon dioxide was analyzed by nondispersive infrared spectrometry. Carbon monoxide was combusted to produce carbon dioxide and also was analyzed by nondispersive infrared spectrometry. Oxygen was analyzed by thermal conductivity.

TEST CRITIQUE

The test was conducted under normal operating conditions, during daylight hours of operation on a pre arranged basis. Neutral sulfates, as ammonium sulfate were subtracted from the particulate catch since Alpha Specific Resources (Champion) injects ammonia into the electrostatic precipitator.

Exposure to high stack temperatures (498^{O}F), high stack pressures (+4.1 inches H_2O) and high SO_2 concentrations (71 ppm) made source testing dangerous. In addition, particulate sampling was difficult because of the narrow platform, the lack of four available portholes, and the length limitation of the sample probe. Point number 12 on sample porthole number 1 could not be sampled, because of the tight fit of the sample probe/Pitot tube boot used to minimize escape of the stack gases into the work area. Therefore, a five minute particulate sample was collected at point number 11.

The test results indicate compliance with Rules 404, 405, 407 and 1105.

The Continuous Emission Monitor for sulfur dioxide was not certified at the time the test was conducted. However, the test results show compliance with Rule 218.

The particulate filter temperature exceeded the recommended limit of 200^{O}F. Therefore, the correction for $H_2SO_4.2H_2O$ was obtained, by (1) subtracting the combined weight of the $H_2SO_4.2H_2O$ obtained on the particulate filter (< 1 mg) and the pre-filter residue (1 mg), from the combined weight of the pre-filter residue, the filter catch and the organic residue and (2) adding the prorated weight of $H_2SO_4.2H_2O$ (< 1 mg) obtained from the SO_x train thimble. For this test the corrections are negligible. Since the EPA sampling method was not strictly followed, compliance with Regulation IX cannot be confirmed. Since the particulate filter was maintained below 248^{O}F $\pm$ 25^{O}F during the test, the weight of particulate obtained from the pre-filter and filter residue would be overstated for Reg. IX compliance purposes. However, under the conditions of the test the results did show compliance with Reg. IX limits.

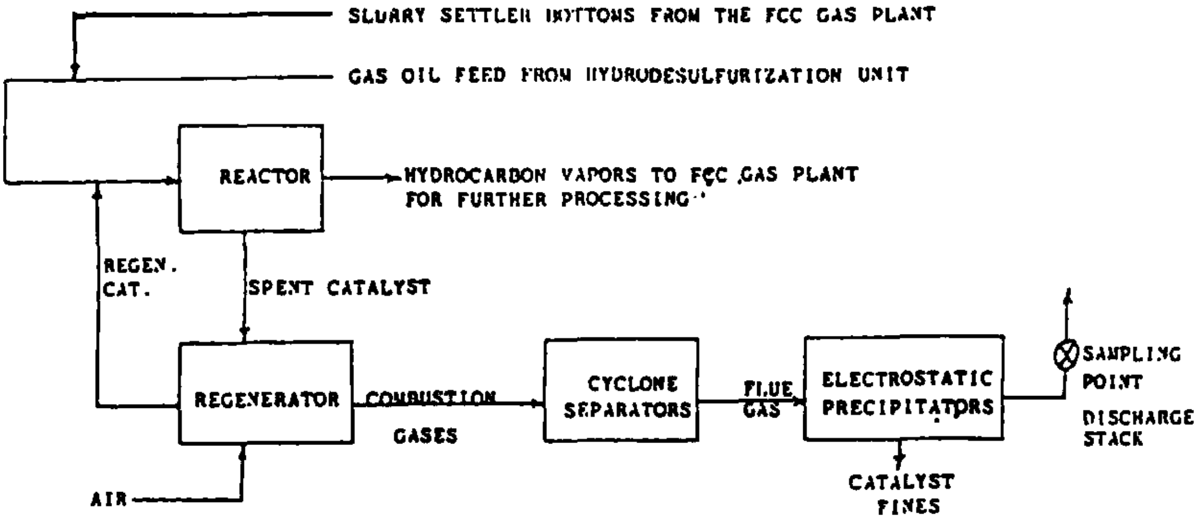
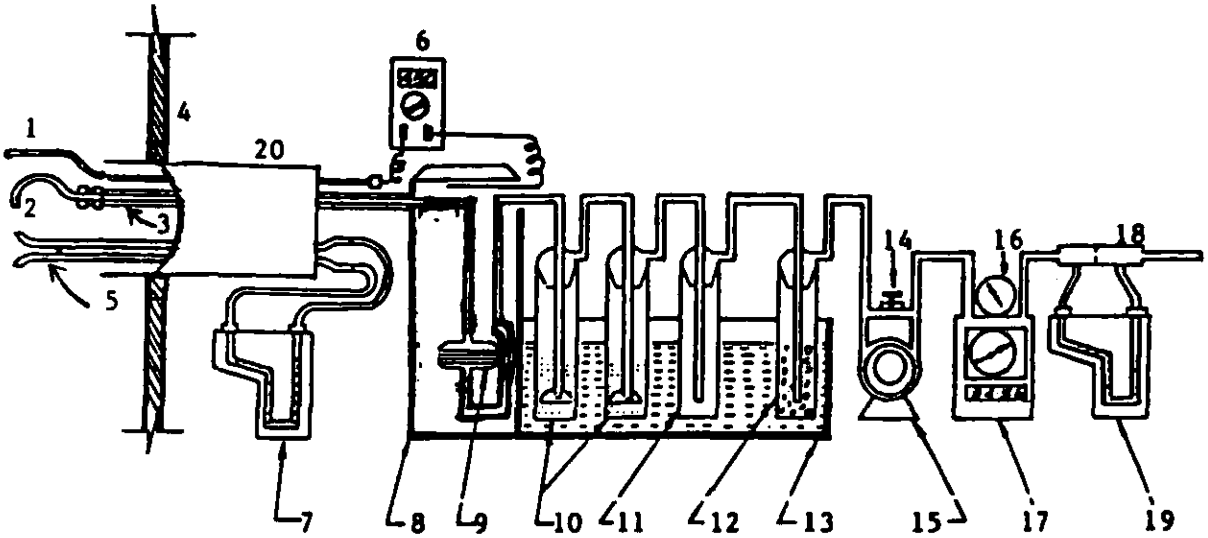


Figure 1

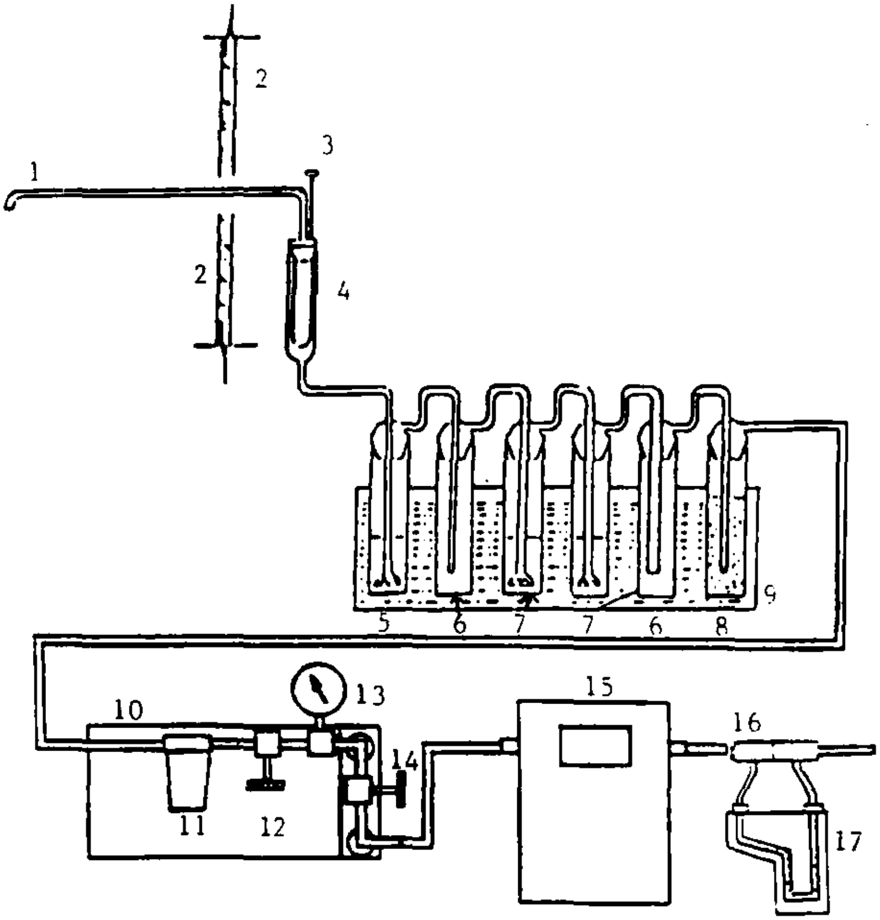
Fluid Catalytic Cracking Flow Process
Champion Petroleum Company



1. Temperature Sensor
2. Nozzle
3. Heated Probe Glass Lined Stainless Steel
4. Stack Wall
5. S-type Pitot Tube
6. Temperature Sensor Meter
7. Pitot Tube Inclined Monometer
8. Heated Box
9. Filter Holder
10. Impinger with 100 ml H_2O
11. Empty Bubbler
12. Bubbler with Tared Silica Gel
13. Ice Bath
14. By-Pass Valve
15. Sealed Pump
16. Thermometer
17. Dry Gas Meter
18. Orifice
19. Orifice Inclined Manometer
20. 2 3/8" Steel Tubing Assembly Packed with Glass Wool

FIGURE 2

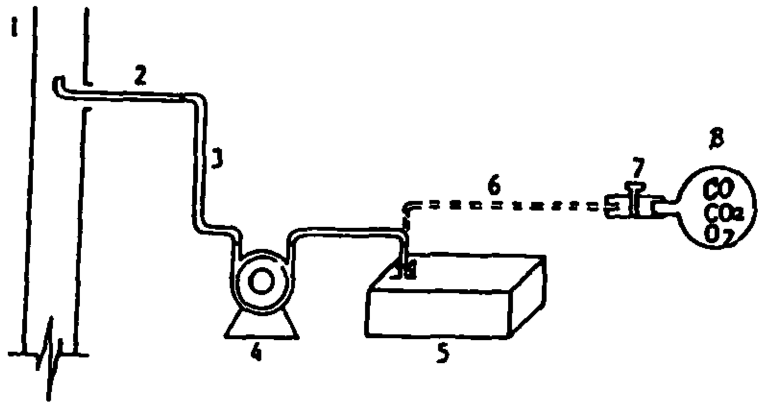
PARTICULATE SAMPLING APPARATUS WITH A HEATED PROBE AND HEATED FILTER



1. Glass Probe
2. Stack Wall
3. Dial Thermometer
4. Whatman Thimble Filter
5. Impinger with 200 ml Isopropanol
6. Empty Bubbler
7. Impinger with 100 ml H_2O_2 (3%)
8. Bubbler with Silica Gel
9. Ice Bath
10. Sealed Pump (Leak Free)
11. Filter for pump
12. Metering Valve
13. Vacuum Gauge
14. By-pass Valve
15. Temperature Compensated Dry Gas Meter
16. Orifice
17. Orifice Inclined manometer

Figure 3

Sulfur Oxides Impinger Train Setup



1. Exhaust Stack
2. Sample Probe
3. Suction Line
4. Pump
5. Sample Bag
6. Transfer Line
7. Pinch Valve
8. Evacuated 2-Liter Grab Bulb

FIGURE 4

GAS SAMPLE COLLECTION SYSTEM. SAMPLE IS INTEGRATED OVER A MINIMUM FIFTEEN MINUTE INTERVAL

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Test No. 99-0000 Sampling Train PARTICULATE Date 11/9/99

Calculated By C.S. Checked By

SOURCE TEST CALCULATIONS

SUMMARY

A. Average Traverse Velocity (Pre-Test) .... ________ fp

B. Average Reference Point Velocity (Pre-Test) .... ________ fp

C. Average Traverse Velocity (During Test) .... (Computer) . 1272 fp

D. Gas Meter Temperature (Use 60°F, for Temp. Comp. Meters) ...... 94 °F

E. Gas Meter Correction Factor 1.0231

F. Average Stack Temp. ... 498 °F

G. Stack Cross-Sect. Area 25.22 ft²

H. Barometric Pressure ... 30.4 "HgA

I. Gas Meter Pressure .... 30.4 "HgA

J. Total Stack Pressure .. 30.7 "HgA

K. Pitot Correction Factor 0.835

L. Sampling Time .... 60 mi

M. Nozzle Cross-Sect. Area 0.0001651 ft

N. Net Sample Collection . 23 mg

O. Net Solid Collection .. 18 mg

P. Water Vapor Condensed . 93 ml

Q. Gas Volume Metered .... 30.244 dc

R. Corrected Gas Volume Metered $\left[(Q \times I/29.92) \times \frac{520}{(460 + D)} \times E\right]$. 29.55 dsc

PERCENT MOISTURE / GAS DENSITY

S. Percent Water Vapor in Gas Sample $\left[\frac{4.64 \times P}{(0.0464 \times P) + R}\right]$ .... 12.74 %

T. Average Molecular Weight (Wet):

(Component)	(Volume % / 100) x	(1 - S/100) x	(Molec. Wt.) =	(Wt./Mole
Water	0.1274	1.00	18.0	2.29
Carbon Dioxide	0.1427 Dry Basis	0.8726	44.0	5.48
Carbon Monoxide	0.0 Dry Basis	0.8726	28.0	0.0
Oxygen	0.0333 Dry Basis	0.8726	32.0	0.93
Nitrogen/Inerts	0.824 Dry Basis	0.8726	28.2	20.28
			(Sum)	28.83

FLOW RATE

U. Gas Density Correction Factor ($\sqrt{28.95/T}$) 1.002

V. Flue Correction Factor (A/B) 1.000

W. Velocity Pressure Correction Factor ($\sqrt{29.92/J}$) ... 0.987

X. Corrected Velocity (C x K x U x V x W) .... 105.0 fps

Y. Flow Rate (X x G x 60) .... 158947 cfm

Z. Flow Rate $\left[Y \times \frac{J}{29.92} \times \frac{520}{(460 + F)}\right]$ .... 88543 scfm

AA. Flow Rate $\left[Z \times (1 - S/100)\right]$ .... 77260 dscfm

SAMPLE CONCENTRATION/EMISSION RATE

0012

BB. Sample Concentration (0.01543 x N/R) .... ________ gr/dscf

CC. Sample Concentration (54,143 x BB/____Molec. Wt.) ... ~~ ppm (dry

DD. Sample Emission Rate (0.00857 x AA x BB) .... ~~ lb/hr

EE. Solid Emission Rate $\left(\frac{0.0001322 \times O. \times AA}{R}\right)$ .... 6.22 lb/hr

FF. Isokinetic Sampling Rate $\left(\frac{G \times R \times V \times 100}{L \times M \times AA}\right)$ .... 97 %

DRAFT - Do not cite or quote

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
ENFORCEMENT DIVISION
SOURCE TESTING AND MONITORING BRANCH
CALCULATION SHEET

PAGES	PAGE
	19
TEST NO. 99-0000	DATE 11/9/99
PROCESSED BY C.S.	CHECKED BY

LAB ANALYSIS

A. Filter Catch .... 4 mg
B. (1) Filter Acid .... <1 mg $H_2SO_4 \cdot 2H_2O$
(2) Filter Total Sulfate .... 2 mg $H_2SO_4 \cdot 2H_2O$
C. Probe Catch .... 14 mg
D. (1) Probe Acid .... 1 mg $H_2SO_4 \cdot 2H_2O$
(2) Probe Total Sulfate .... 8 mg $H_2SO_4 \cdot 2H_2O$
E. Impinger Catch .... 130 mg
F. (1) Impinger Acid .... 12 mg $H_2SO_4 \cdot 2H_2O$
(2) Impinger Total Sulfate .... 131 mg $H_2SO_4 \cdot 2H_2O$
G. Organic Extract .... 4 mg
H. $H_2SO_4 \cdot 2H_2O$ from SO_x Train Thimble .... <1 mg
I. Particulate Train Corrected Gas Volume Metered .... 29.55 dscf
J. SO_x Train Corrected Gas Volume Metered .... 33.60 dscf
K. Prorated $H_2SO_4 \cdot 2H_2O$ Mass $(\frac{H x I}{J})$ .... 0 mg

FILTER (PARTICULATE) TEMPERATURE GREATER THAN 200°F

L. Total Particulate (A-B*+C-D*+E-F*+G+K) .... ________ mg
M. Solid Particulate (L-G-K) .... ________ mg
N. Total Particulate (Corrected for Ammonium Sulfate)
$(A-B^*+C-D^*+E-F(1)+G+K-[F(2)-(1)] \cdot \frac{132}{134})$ .... ________ mg
O. Solid Particulate (Corrected for Ammonium Sulfate)
(N-G-J) .... ________ mg

FILTER TEMPERATURE LESS THAN 200°F

P. Total Particulate (A+C+E-F*+G) .... ________ mg
Q. Solid Particulate (P-B*-D*-G) .... ________ mg
R. Total Particulate (Corrected for Ammonium Sulfate)
$(A+C+E-F(1)+G-[F(2)-F(1)] \cdot \frac{132}{134})$ $A+14+130-12+4-[(131-12)\frac{132}{134}]$ = 23 mg
S. Solid Particulate (Corrected for Ammonium Sulfate)
(R-B*-D*-G) .... 23 - <1 - 1 - 4 .... 18 mg

* USE LOWER OF (1) AND (2)

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
TECHNICAL SERVICES DIVISION
SOURCE TESTING AND MONITORING BRANCH

CALCULATION SHEET

PAGES	PAGE 20
TEST NO. 99-0000	DATE 11/9/99
PROCESSED BY C.S.	CHECKED BY

Particulate Matter EPA Reg. IX

(Particulate from front part of train x $1.322 \times 10^{-4} \times AA/R$) =

$18 \times 1.322 \times 10^{-4} \times 77260/29.55$ = 6.22 lbs/hr

*Coke Burn-off Rate = 26,794 lbs/hr

Particulate/1,000 lb coke burn-off = 6.22/26.794x1000 = 0.23 lb/1000 lb coke burn-off

```
SOURCE TEST 99-0000 SUMMARY PREPARED ON 12-17-99   AT 13:30:34
*****************************************************************************************
(1)   Barometric Pressure .........(''Hg Abs.) =  30.4
(2)   Stack Static Pressure .........( ''H2O ) =  4.1
(3)   Nozzle Size .......................(In.) =  .174
(4)   Total Sampling Time ..............(min.) =  60
(5)   Pitot Correction Factor ................ =  .835
(6)   Magnehelic Calibration Factor .......... =  1
(7)   Gas Meter Calibration Factor ........... =  1.0231
(10)  Filter Catch .+Probe.................(mg) =  18  ← Total Part. (corrected for amm.s
(11)  Organic Extraction Residue .........(mg) =  5 ← Adjusted (Tot Part. - Solid Part.) Corr.
(12)  Insoluble and Soluble Residue ......(mg) =  0         (23 - 18)
(13)  Process Weight ..................(lbs/hr) =  3986490
(15)  Stack Size (In.) :  68     Length :  0    Width :  0
Average Traverse Velocity Head........(''H2O) = 2.11
Average Traverse Velocity...............(fps) = 127.2
Average Stack Temperature............(Deg. F) = 498
Average Orifice Pressure..............(''H2O) = 0.66
Percent Water Vapor in Gas Sample.........(%) = 12.74
Flow Rate ............................(dscfm) =  77260
RULE 404: Particulate Concentration (gr/dscf) = 0.012
                                    (mg/dscm) = 27.5
RULE 405: Solid Emission Rate.........(lb/hr) = 6.22
                                      (kg/hr) = 2.82
RULE 407: Average ppm Carbon Monoxide....(CO) =  0

Isokinetic Sampling Rate..................(%) = 97

RULE Allowable.....404(a)...........(gr/dscf) = 0.037
 ...................................(mg/dscm) = 84.3
RULE Allowable.....405(a).............(lb/hr) = 30.00
......................................(kg/hr) = 13.61
RULE Allowable.....407(a)...............(ppm) = 2000
*****************************************************************************************
Point    Veloc. Head    Stack Temp.    Velocity    Orifice Press.    Meter Temp.
-----    -----------    -----------    --------    --------------    -----------
 (#)       (''H2O)        (DEG F)      (ft/sec)       (''H2O)          (Deg F)

  1         2.80            499          150.27         0.88              82.0
  2         2.80            501          150.43         0.88              84.0
  3         2.70            500          147.64         0.84              86.0
  4         2.80            498          150.2          0.88              88.0
  5         2.70            498          147.49         0.85              89.5
  6         2.60            497          144.66         0.82              92.0
  7         2.10            497          130.01         0.66              92.5
  8         1.70            500          117.15         0.53              93.5
  9         1.70            500          117.15         0.53              94.5
 10         1.30            498          102.34         0.41              96.0
 11         0.74            494          77.05          0.23              96.5
 12         0.74         •• 494          77.05          0.23              96.5
 13         2.70            496          147.34         0.85              88.0
 14         2.70            500          147.64         0.84              89.5
 15         2.70            500          147.64         0.84              92.0
 16         2.70            498          147.49         0.84              93.5
 17         2.60            498          144.73         0.81              95.5
 18         2.70            500          147.64         0.84              97.5
 19         2.40            499          139.13         0.75              99.5
 20         2.30            499          136.2          0.72             101.0
 21         2.30            497          136.06         0.72             102.0
 22         2.00            496          126.81         0.63             103.5
 23         0.40            495          56.68          0.12             102.5
 24         0.50            495          63.37          0.16             104.0
```

```
Source Test  99-0000  Summary Prepared on 12-17-99    at 13:25:04
==========================================================

Average Traverse Velocity Head........(''H2O) = 2.11
Average Traverse Velocity..............(fps) = 127.2
Corrected Velocity.....................(fps) = 105.0

Average Stack Temperature...........(Deg. F) = 498
Average Meter Temperature...........(Deg. F) = 94

Stack Cross- Sectional Area............(ft2) = 25.22
Nozzle Cross-Sectional Area............(ft2) = 0.0001651

Barometric Pressure..................(''HgA) =  30.4
Stack Total Pressure.................(''HgA) = 30.70
Average Orifice Pressure.............(''H2O) = 0.66

Percent Water Vapor in Gas Sample........(%) = 12.74
Water Vapor Condensed...................(mg) =  93


Hit any key to continue ...


Source Test  99-0000  Summary Prepared on 12-17- 99   at 13:25:04
==========================================================

Pitot Correction Factor ......................= 0.835
Gas Density Correction Factor ................= 1.002
Flue Correction Factor (A/B)..................= 1.000
Velocity Pressure Correction Factor ..........= 0.987
Dry Gas Meter Calibration Factor .............=  1.0231
Magnehelic Calibration Factor ................=  1
Total Sampling Time.................(minute) =  60
Gas Volume Metered.....................(dcf) = 30.244
Corrected Gas Volume Metered..........(dscf) = 29.55
Average Wet Molecular Weight .................= 28.83

Average Percent Oxygen..................(O2) =  3.33
Average Percent Carbon Dioxide.........(CO2) = 14.27

Flow Rate...............................(cfm) = 178947
.......................................(scfm) =  88543
......................................(dscfm) =  77260
......................................(dscmm) =   2188

Hit any key to continue ...
```

```
Source Test  99-0000  Summary Prepared on 12-17-99   at 13:25:04
===============================================================

  rocess Weight.......................(lbs/hr)  =  3986490
......................................(kgs/hr)  =  1808272
Total Particulate.......................(mg)  =  23
Solid Particulate.......................(mg)  =  18

RULE 404: Particulate Concentration (gr/dscf) = 0.012
                                    (mg/dscm) = 27.5
RULE 405: Solid Emission Rate.........(lb/hr) = 6.22
                                      (kg/hr) = 2.82
RULE 407: Average ppm Carbon Monoxide....(CO) =  0

Isokinetic Sampling Rate..................(%) = 97

RULE Allowable.....404(a)...........(gr/dscf) = 0.037
....................................(mg/dscm) = 84.3
RULE Allowable.....405(a)..............(lb/hr) = 30.00
......................................(kg/hr) = 13.61
RULE Allowable.....407(a)................(ppm) = 2000

Hit any key to continue ...
```

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Test No. 99-0000

Date 11/9/99

Sampling Location FCCU - ESP STACK

Sample Train SOx

(Lab Results)	SO2	TOTAL SULFUR	SULF. PARTS
FILTER (TRIMBLE) CATCH, AS SO3, mg <1x64/80	–	0	—
IPA CATCH, AS SO3 (TITRATION), mg 1x64/80	–	1	1
PEROXIDE CATCH, SO2, mg	183	183	183
TOTAL	183	184	184

Calculated By C.S.

Checked By

SOURCE TEST CALCULATIONS

SUMMARY

A. Average Traverse Velocity (Pre-Test) .... ______ fps

B. Average Reference Point Velocity (Pre-Test) .... – fps

C. Average Traverse Velocity (During Test) .... 127.2 fps

D. Average Stack Temperature 498 °F

E. Stack Cross Sectional Area - ft²

F. Barometric Pressure .... 30.40 "HgA

G. Gas Meter Pressure .... 30.40 "HgA

H. ~~Static~~ Total Pressure .... 30.70 "HgA

I. Pitot Correction Factor ... –

J. Sampling Time .... 72 min

K. Nozzle Cross-Sectional Area – ft²

L. ~~Net Sample~~ SO2 Collection .... 183 mg

M. ~~Net Solid~~ Total Sulfur Collection as SO2 .... 184 mg also Sulf

N. Water Vapor Condensed .... – ml

O. Gas Volume Metered .... 33.07 dcf

P. Correct Gas Volume Metered $\left[O. \times G/29.92) \times \frac{520}{460+60} \times 1.0004\right]$ .... 33.60 dscf

PERCENT MOISTURE - GAS DENSITY

Q. Percent Water Vapor in Gas Sample $\left[\frac{4.64 \times N}{(0.0464 \times N) + P}\right]$ FROM PM TRAIN .... 12.74 %

R. Average Wet Molecular Weight:

(Component)	(Volume % / 100) x	(1 - Q/100) x	(Molec. Wt.) =	(Wt./Mole)
Water		1.00	18.0	
Carbon Dioxide	Dry Basis	0.8726	44.0	
Carbon Monoxide	Dry Basis	0.8726	28.0	
Oxygen	Dry Basis	0.8726	32.0	
Nitrogen & Inerts	Dry Basis	0.8726	28.2	
			(Sum)	

FLOW RATE

S. Gas Density Correction Factor $\sqrt{28.95/R}$ 1.002

T. Flue Correction Factor (A/B) 1.000

U. Velocity Pressure Correction Factor $\sqrt{29.92/H}$ 0.987

V. Corrected Velocity (C x I x S x T x U) .... 105.0 fps

W. Flow Rate (V x E x 60) .... 158,947 cfm

X. Flow Rate $\left(W \times \frac{H}{29.92} \times \frac{520}{460 + D}\right)$ .... 88,543 scfm

Y. Flow Rate $\left[X \times (1 - Q/100)\right]$ .... 77,260 dscfm

SAMPLE CONCENTRATION - EMISSION RATE R UDS oxides of S Tot. S as SO2 SO2

Z. Sample Concentration (0.01543 x L/P) .... 0.084 ... 0.084 gr/dscf

AA. Sample Concentration (54,143 x Z/ 64 Molec. Wt.) .... 71 ppm (dry)

BB. Sample Emission Rate (0.00857 x Y x Z) .... – lb/hr

CC. Solid Emission Rate $\left(\frac{1.322 \times 10^{-4} \times M \times Y}{P}\right)$ .... 56 lb/hr

DD. Isokinetic Sampling Rate $\left(\frac{E \times P \times T \times 100}{J \times K \times Y}\right)$ .... – %

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
9150 Flair Drive, El Monte, California 91731

Test No. 99-0000

Date 11/9/99

SULFUR EVALUATION AND PROCESS MASS FLOW RATE CALCULATION FOR FCCU

		TOTAL
A.	SO_2 flow rate, lb/hr	56
B.	Fuel gas flow rate, MMscfd*	–
C.	H_2S concentration, ppm	–
D.	H_2S flow rate (BC/24), scfh	–
E.	SO_2 flow rate (from fuel), lb/hr $\frac{(D \text{ scf } H_2S/hr)(1 \text{ lb mole } SO_2/\text{lb mole } H_2S)^{**}(64 \text{ lb } SO_2/\text{lb mole } SO_2)}{(379 \text{ scf } H_2S/\text{lb mole } H_2S)} =$	–
F.	SO_2 from FCCU regenerator (A-E), lb~~s~~/hr	56
G.1	FCCU Feed rate, Bbl/day*	34,950
G.2	FCCU Feed rate, $\frac{(G.1 \times 286 \text{ lb/Bbl})}{(24 \text{ hr/day})}$, lb/hr	416,490
H.	FCCU Feed rate (G.1/24000), 1000 Bbl/hr	1.456
I.	Oxides of Sulfur to the Atmosphere From the FCCU regenerator (F/H), lb~~s~~/1000 Bbl Kg/1000 Bbl	 ~ 38.5 17.5
J.	Catalyst Recycle Rate, (29.75 tons/min)(2000 lbs/ton)(60 min/hr, lb~~s~~/hr*	3,570,000 ~~686,000~~*
K.	Process weight (G.2 + J), lb/hr	3,986,000 ~~1,102,000~~

* Obtained from CHAMPION

** $O_2 + H_2S \longrightarrow SO_2 + H_2$

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
9150 Flair Drive, El Monte, California 91731

Test No. 99-0000

Date 11/9/99

RELATIVE ACCURACY OF CONTINUOUS EMISSION MONITOR

Company/Unit ------------------------------ Alpha Specific Resources (Champion) FCCU

Equipment being Monitored ------------------------------ ESP

If Time-Shared, Describe Time Sequence of Operation ------- Continuous

Monitor Manufacturer/I.D. Number ------------------------------ KVB Model C84263

Monitor SCAQMD Certification Date ------------------------------ -

NOx Analyzer Manufacturer-Model #, Serial # --------------- Thermo Electron 10AR,16803-165

CO Analyzer Manufacturer-Model #, Serial # --------------- Beckman Ind.865

O_2 Analyzer Manufacturer-Model #, Serial # --------------- Thermox WDG,2-8193

SO_2 Analyzer Manufacturer-Model #, Serial # --------------- Western Research Model 722A/62703

Gas Component Tested for ------------------------------ SO_2

A. Reference Method (AQMD Method 6.1) Value, Corrected, ppm (dry) ------------------------------ 71 ppm

B. Reference Method Sampling Time Interval --------------- 1:48 - 3:05 P.M.

C. Monitor Reading, Average and Corrected, ppm (dry) ----- 75.5 ppm

D. Monitor Recording Time Interval --------------- 1:50 - 2:35

(132) 71=
(38.5)²

E. Maximum Allowable Concentration, ppm (dry) ------ 243 ppm

F. Relative Accuracy, % ------------------------------

Deviation from Actual Conc: $\dfrac{C.-A.}{A.} \times 100 = \dfrac{75.5 - 71}{71} \times 100 = +6.34$

Deviation from Allowed Conc. $\dfrac{C.-A.}{E.} \times 100 = \dfrac{75.5 - 71}{243} \times 100 = +1.85$

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

PAGE ____

TEST NO. 99-0000

DATE 11/9/99

SAMPLING LOCATION FCCU - ESP STACK

REFINERY PROCESS DATA SHEET/FLUID CATALYTIC CRACKING UNIT

FCCU OPERATING DATA

1. Feed Rate, bbl/day	34,950
2. Percent Weight Sulfur in Feed	0.18%
3. Catalyst Circulation Rate, tons/minute	29.75
4. Coke Burnoff Rate, lb/hour	26,794
5. Regenerator Air Rate, scfm	5.164×10^6
6. Flue Gas Rate, (Regenerator), scfm	5.484×10^6
7. Flue Gas Rate, (CO Boiler), scfm	N/A
~~8. Reactor Temperature, °F.~~	N/A-CONFIDENTIAL
~~9. Reactor Pressure, psig~~	N/A-CONFIDENTIAL
10. DeSO$_x$ Catalyst Addition Rate, lb/day	~40 #/DAY
11. ~~Regenerator Top Temperature, °F~~	N/A-CONFIDENTIAL
12. ~~Regenerator~~ Top ~~Pressure, psig~~	N/A-CONFIDENTIAL

ESP DATA

1. ESP Outlet Temperature, °F	513
2. Ammonia Injection Rate and Location of the Injection Point, lb/day	~ 20 ppm, Flue Gas Ductw "T"

CEM DATA

1. CEM Manufacturer KVB Model # C84263 Cert. # ____

	Analyzer	Mfg.	Model #	S/N	Reading (Dry)		Time	Ren
2.	NO$_x$ (mg conv.)	Thermo Electron	10AR	16803-165	15	ppm	12:10 p.m.	500 p
3.	SO$_2$	Western Research	722A	6270-3	73	ppm	12:10 p.m.	
4.	O$_2$	Therm Ox	WDG CONTROL	2-8193	2.187	%	12:10 p.m.	20%
5.	CO	Beckman Ind.	865		57	ppm	12:10 p.m.	250 p
6.	CO$_2$	N/A	N/A	N/A	N/A	%	N/A	

CO BOILER -N/A

1. Combustion Air Rate, scfm	
2. Regenerator Flue Gas Inlet Temperature, °F	
3. Regenerator Flue Gas Inlet Pressure, Inches of Water Column	
4. Fuel Gas Rate, 10^3 scfh	
5. Firebox Temperature, °F	
6. Steam Rate, 10^3 lb/hour	

RECORDED BY ____ TITLE ____

I have reviewed the above process data and it is considered accurate, to the best of my knowledge.

COMPANY REPRESENTATIVE ____ (Signature) TITLE Sr. Environmental Specialist DATE ____

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Test No. 99-000

Date: 11/9/99

Sampling Location: PCOU - ESP STACK

Sample Train Particulates

TRAVERSE SOURCE TEST DATA

Pre-Test Leak Check:
Filter <0.005 cfm @ 15 "Hg vac
Probe <0.005 cfm @ 15 "Hg vac
(Pitot Tube Leak Check ok V.L.)

$K_1 = 0.174$
$K_2 = 0.835$
$K_3 = 0.86$
$K_4 = 1$
$K_5 = 0.619$

Post-Test Leak Check:
Filter <.01 cfm @ 5 "Hg vac
Probe <.01 cfm @ 5 "Hg vac
(Pitot Tube Leak Check Ok V.L.)

Time On	Time Off	Sample Point #	Gas Meter Reading (dcf)	Stack Velocity Head ("H2O)	Stack Temp. °F	Calculated Velocity (fps)	Calculated Sampling Rate (cfm)	Calculated Orifice Δ P ("H2O)	Probe Temp. °F	Filter Temp. °F	Meter Temp °F In	Meter Temp °F Out	Vacuum "Hg
1231		—	597.997	—	—	—	—	—	—	—	—	—	—
2.5		1	599.4	2.8	499	150.9	.58	.88	210	182	86	78	2.5
5.0		2	600.8	2.8	501	150.4	.58	.88	220	185	88	80	2.5
7.5		3	602.6	2.7	500	147.4	.57	.84	198	196	91	81	2.5
10.0		4	603.5	2.8	498	150.2	.58	.88	228	203	96	82	3.0
12.5		5	604.6	2.7	498	147.5	.57	.85	209	208	96	83	2.5
15.0		6	606.2	2.6	497	144.7	.56	.82	200	213	98	86	2.5
17.5		7	607.7	2.1	497	130.0	.50	.66	210	208	99	86	2.0
20.0		8	608.9	1.7	500	117.2	.45	.53	220	207	100	87	2.0
22.5		9	610.1	1.7	500	117.2	.45	.53	213	209	101	88	2.0
25.0		10	611.2	1.3	498	102.3	.40	.41	212	204	102	90	2.0
27.5		11	612.2	.76	494	77.1	.30	.23	222	205	102	91	1.0
30.0	1301	12	613.1	—	—	—	—	—	—	—	—	~~91~~	~~1.0~~
			613.1										
1311		13	614.4	2.7	496	147.3	.57	.85	206	210	88	88	2.5
		14	615.9	2.7	500	147.6	.57	.84	213	215	90	89	2.5
		15	617.3	2.7	500	147.6	.57	.84	217	218	96	88	2.5
		16	618.7	2.7	498	147.5	.57	.84	215	218	98	89	2.5
		17	620.1	2.6	498	144.7	.56	.81	208	202	101	90	2.5
		18	621.5	2.7	500	147.6	.57	.84	207	204	103	92	2.5
		19	622.8	2.4	499	139.1	.54	.75	234	208	105	94	2.5
		20	624.2	2.3	499	136.2	.53	.72	218	211	107	95	2.5
		21	625.4	2.3	497	136.1	.53	.72	208	214	108	96	2.5
		22	626.6	2.0	496	126.8	.49	.63	203	207	110	97	2.0
		23	627.6	0.4	495	56.7	.22	.12	204	202	109	96	2.0
		24	628.241	0.5	495	63.4	.25	.16	208	204	108	100	2.0
(Net Vol. Uncorr.)			30.244	Avg.	498	129.4		0.68					

Nozzle # ~~SN 833~~ SN 1950
Nozzle Diameter ______ mm (0.174 ")
Barometric Pressure 30.40 "HgA
Static Pressure in Stack........................ "HgA [✓ +]/- 4.1 "H2O)

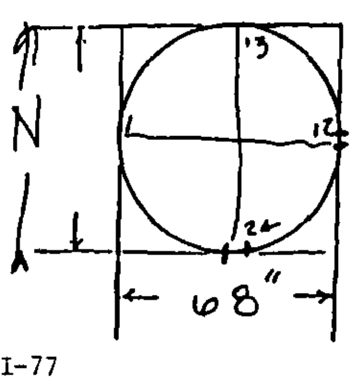
Recorded By V. ESP
Pitot Factor.......... .... .835

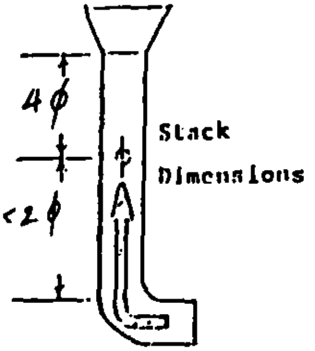
Calibration Data

Magnehelic No.	NAPP 0270(	(Cal: 10/5/87)
Pitot Tube No.	SN 833	(Cal: 10/23/87)
Potentiometer No.		(Cal:)
Thermocouple No.	~~NAPP BOX~~	(Cal: 10/5/87)
Gas Meter No.	0270(	(Cal:)
Meter Corr. Factor:	1.0231	

~~Hotbox #2~~
~~Impinger #2~~

Type Sampling Probe Glass liner
↳ SN 833, NO-3





SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Test No. 99-0000 **Date** 11/9/99

Sampling Location FCCU - ESP STACK

SOX

GAS VELOCITY DATA

Pre-Test Velocity Leak Check 1" 0.0 5" H2O

Post-Test Velocity Leak Chec * ~~0~~ @ 22" Hg
See note below.

Time	Trav. Point		Vel. Head ("H_2O)	Temp. (°F) Filter	Calc. Vel. (fps)	Vac	Vel. Head ("H_2O)	Temp (°F)	Calc. Vel. (fps)		Vel. Head ("H_2O)	Temp. (°F)	Calc. Vel. (fps)
					0.6	"							
1:48		91.845		150		15"							
2:10		97.550		178		20"							
2:16		105.410		200		20"							
2:25		107.510		210	0.48	8"		* NOTE		5 min OFF			
2:35		112.3		210	0.47	8"				TO ADJUST			
2:45		116.7		200		8"				PROBE			
2:55	120	~~118.9~~		194		14"							
3:05		~~124.9~~		196		20"							
		124.902											
	Net Vol. uncorr.	33.057											

Purged for 15 minutes

* Note to post test leak check. Impinger bubbles noted during leak check, no flow noted on the meter.

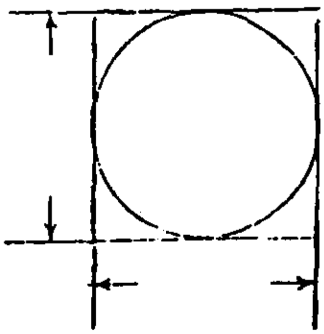
33.057 x 1.0004

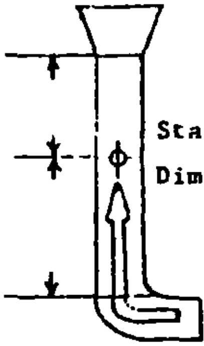
CORRECTED Vol. 33.07

Static Pressure in Stack ______ "HgA (+/- 4.1 "H_2O) (Average)
Barometric Pressure..... 30.40 "HgA Pitot Factor.................. N/A
Recorded By E. Gonzalez

Calibration Data	
Magnehelic No. —	(Cal: —)
Pitot Tube No. —	(Cal: —)
Potentiometer No. —	(Cal: —)
Thermocouple No. —	(Cal: —)
Mtr FACTOR 20702	9-27-97 1.0004

Pump # 2B





Stack Dimensi

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
9150 Flair Drive, El Monte, California 91731

TECHNICAL SERVICES DIVISION
LABORATORY SERVICES BRANCH
REPORT OF TOTAL COMBUSTION ANALYSIS (TCA) FOR CARBONACEOUS MATTER

TO: Rod Rock
Source Testing & Monitoring

Name of Company: Champion Petroleum
City: Utopia

Equipment Tested: FCCU, ESP

Date of Report: 12/9/99
Test. No.: 99-0000
Test Date: 11/9/99
Lab. No.: 11111
Ref. Book No. 22222
Requested By: C.S.

Sample Identification Items	Sampling Points					
	Outlet					
Nominal Volume-2 Liters:						
Bulb Identification	103	104	105			
Bulb Pressure, Torr	745	747	749			

Breakdown of Sample Items for Analysis:

Results of Analysis of Samples Listed Above as PPM CO_2

Bulb Contents:						
CO_2 actually present[a)]	145000	139000	144000			
CO actually present	*	*	*			
%O_2	3.4	3.3	3.3			

a) CO_2 present in sample as such.
* None detected.

**

Approved By: ____________________
G. Goodbar, Ph.D.
Manager of Laboratory Services

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
9150 Flair Drive, El Monte, California 91731

TECHNICAL SERVICES DIVISION
LABORATORY SERVICES BRANCH
REPORT FOR SOURCE TEST

TO: Rod Rock
Source Testing & Monitoring

COMPANY: Champion Petroleum
CITY: Utopia

PROCESS EQUIPMENT: FCCU

CONTROL EQUIPMENT: ESP

SAMPLE DESCRIPTION: One Method 5.2 Train

LAB REPORT DATE: December 9, 99

LABORATORY NO. 11111

REFERENCE NO. 22222

TEST NO. 99-0000

SOURCE TEST DATE: 11/9 999

DATE SAMPLE RECEIVED: 12/9/99

REQUESTED BY: C.S.

ANALYSIS REQUESTED: Particulates & Moisture Gain

ANALYTICAL WORK PERFORMED, METHOD OF ANALYSIS, AND RESULTS
Particulates by SCAQMD Method 5.2L; Moisture gain by SCAQMD Method 4.1L

Received impinger volume, mL	287
Impinger gain, mL	87
Silica gel gain, g	6
Pre-filter recovered volume, mL	300
Pre-filter residue, mg	14
Acid, as $H_2SO_4.2H_2O$, mg	1
Sulfates, as $H_2SO_4.2H_2O$, mg	8
Filter catch, mg	4
Acid, as $H_2SO_4.2H_2O$, mg	<1
Sulfates, as $H_2SO_4.2H_2O$, mg	2
Post-filter recovered volume, mL	850
Organic residue, mg	4
Aqueous residue, mg	130
Acid, as $H_2SO_4.2H_2O$, mg	12
Sulfates, as $H_2SO_4.2H_2O$, mg	131

Approved By:
G. Goodbar, Ph.D.
Manager of Laboratory Services

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
9150 Flair Drive, El Monte, California 91731

TECHNICAL SERVICES DIVISION
LABORATORY SERVICES BRANCH
REPORT FOR SOURCE TEST

TO: Rod Rock
Source Testing & Monitoring

LAB REPORT DATE: December 9, 99

LABORATORY NO. 11111

COMPANY: Champ n Petroleum
CITY: Utopia

REFERENCE NO. 22222

PROCESS EQUIPMENT: FCCU

TEST NO. 99-0000

SOURCE TEST DATE: 11/9/99

CONTROL EQUIPMENT: ESP

DATE SAMPLE RECEIVED: 12/9/99

REQUESTED BY: C.S.

SAMPLE DESCRIPTION: One one-quart can of fuel oil

ANALYSIS REQUESTED: Weight Percent Sulfur

ANALYTICAL WORK PERFORMED, METHOD OF ANALYSIS, AND RESULTS

Weight Percent Sulfur by ASTM D-129-64.

Wt. % Sulfur = 0.15

Approved By: ______________________
G. Goodbar, Ph.D.
Manager of Laboratory Services

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
9150 Flair Drive, El Monte, California 91731

LABORATORY SERVICES BRANCH
REPORT FOR SOURCE TEST

TO: Rod Rock
Source Testing & Monitoring

LAB REPORT DATE: December 9, 1999

LABORATORY NO. 11111

COMPANY: Champion Petroleum
CITY: Utopia

REFERENCE NO. 22222

PROCESS EQUIPMENT: FCCU

TEST NO. 99-0000

SOURCE TEST DATE: 11/9/99

CONTROL EQUIPMENT: ESP

DATE SAMPLE RECEIVED: 12/9/99

SAMPLE DESCRIPTION: One Method 6.1 Train(s)

REQUESTED BY: C.S.

ANALYSIS REQUESTED: SO_3, SO_2 and Moisture Gain

ANALYTICAL WORK PERFORMED, METHOD OF ANALYSIS, AND RESULTS
Sulfur oxides by SCAQMD Method 6.1L; Moisture gain by SCAQMD Method 4.1L

Received impinger vol., mL	490
Impinger gain, mL	90
Silica gel gain, g	16
Thimble catch:	
Acid, as SO_3, mg	<1
Sulfate, as SO_3, mg	11
IPA Catch:	
Acid, as SO_3, mg	1
Sulfate, as SO_3, mg	50
Peroxide Catch:	
Acid, as SO_2, mg	183
Sulfate, as SO_2, mg	192

Approved By: ______________
G. Goodbar, Ph.D.
Manager of Laboratory Services