Background Report Reference

AP-42 Section Number: 9.10.1.1

Background Chapter: 4

Reference Number: 1

Title: Regulatory Compliance Source Test :Particulate Emissions Test Panhouse at Amstar Sugar Corporation, Arabi, LA

Waldemar S. Nelson and Company, Inc.

Waldemar S. Nelson and Company, inc.

April 1989

AP-42 Section 9.10.1.1
Reference 6
Report Sect.
Reference

Regulatory Compliance Source Test Particulates and Opacity

Particulate — front 1/2 only — Process data — clipped @ back of Report

Amstar SUGAR CORPORATION

Arabi, Louisiana

Granulator Rotoclone Ducts 023-74 & 024-74

Environmental Sciences and Engineering Department

Waldemar S. Nelson and Company
Incorporated

Engineers and Architects

New Orleans, Louisiana

Project No. 89029
March 1989

C/S

REGULATORY COMPLIANCE SOURCE TEST
PARTICULATE EMISSIONS TEST
OF PANHOUSE
ROTOCLONE DUCTS 023-74 AND 024-74

Prepared For:

AMSTAR SUGAR CORPORATION

7417 North Peters Street
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ENGINEERS AND ARCHITECTS

NEW ORLEANS, LOUISIANA

WSNCo Project No. 89029 **April 1989**

TABLE OF CONTENTS

LIST OF DRAWINGS

LIST OF TABLES

LIST OF APPENDICES

LIST OF ABBREVIATIONS

ACS	American Chemical Society
AM-3-4	(AM) Amstar; (3) Rotoclone Duct #; (4) Run #
EPA	Environmental Protection Agency
NSPS	New Source Performance Standard
PSD	Prevention of Significant Deterioration

MEASUREMENT SYMBOLS

^oC	Degrees Centigrade
cfm	Cubic feet per minute
dcf	Dry cubic feet
DGM	Dry gas meter
DSCF	Dry standard cubic foot
dscf/min	Dry standard cubic feet per minute
DSCF/MMBtu	Dry standard cubic feet per million British Thermal Units
^oF	Degrees Fahrenheit
fpm	Feet per minute
ft	Foot/feet
g	Grams
gr/ACF	Grains per actual cubic foot
gr/dscf	Grains per dry standard cubic foot
ID	Internal diameter
in	Inches
lb/dscf	Pounds per dry standard cubic foot
lb/hr	Pounds per hour
lb/MMBtu	Pounds per million British thermal units
µg	Micrograms
µ	Micrometer
m	Meter

MEASUREMENT SYMBOLS (contd)

M	Thousand
mg	Milligram
mg/dscm	Milligrams per dry standard cubic meter
min	Minute
mL	Milliliter
mm	Millimeter
MM	Million
nm	Nanometer
N/A	Nonapplicable
N	Normality, quantitative method for expressing the concentration of solutions
ppm	Parts per million
SES	Steam electric station
SS	Stainless steel

CHEMICAL SYMBOLS

Ag	Silver
As	Arsenic
Ba	Barium
$BaCl_2{}^*{}_2H_2O$	Barium chloride dihydrate
Be	Beryllium
Cd	Cadmium
$(CH_3)_2CHOH$	Isopropanol
CO	Carbon monoxide
CO_2	Carbon dioxide
Cr	Chromium

CHEMICAL SYMBOLS (contd)

Fe	Iron
Hg	Mercury
H_2O	Distilled, deionized water
H_2O_2	Hydrogen peroxide
H_2SO_4	Sulfuric acid
KI	Potassium iodide
$KMNO_4$	Potassium permanganate
KNO_3	Potassium nitrate
Mo	Molybdenum
Mn	Manganese
N_2	Nitrogen
NaOH	Sodium hydroxide
$NaASO_2$	Sodium Arsenite
Ni	Nickel
NO_x	Nitrogen oxides
Pb	Lead
PDS	Phenoldisulfonic acid
Sb	Antimony
Se	Selenium
SO_2	Sulfur dioxide
SO_3	Sulfur trioxide
Tl	Thallium
V	Vanadium

1.0 INTRODUCTION

This study was performed pursuant to a request by Amstar Sugar Corporation in accordance with their Purchase Order No. 1935 and the pre-test meeting.

An official pre-test meeting and a site visit were conducted on February 13, 1989 at Amstar's offices in Arabi, Louisiana. Amstar was represented by Messrs. R. Mangipano and F. Goodrow; and Waldemar S. Nelson and Company, Inc. by Messrs. R. J. Acuna and C. E. Settoon.

Mr. Fred Goodrow of Amstar coordinated on-site testing with process operations.

The units tested were the panhouse rotoclone outlet ducts at Amstar's Arabi, Louisiana sugar refinery. EPA Method 5 tests for particulate and EPA Method 9 for opacity of emissions determinations were utilized to quantify emissions. The data reported herein are intended to represent maximum operating rates for the subject facility.

Actual tests were conducted on February 15 and 16, 1989. The particulate test data and opacity observations were in the expected range. Further discussion of the test results is presented herein.

This report was authored by Messrs. R. Javier Acuna, Environmental Technologist and Clinton E. Settoon, Environmental Technician of Waldemar S. Nelson and Company, Inc.

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2.0 SUMMARY OF RESULTS

2.1 Particulates

The particulate tests, analyses and calculations conducted for this compliance determination were conducted in accordance with EPA Method 5 (40 CFR 60, Appendix A).

A single EPA Method 5 test was conducted on Rotoclone Ducts 3 and 4 in the panhouse, consisting of three sample runs each (AM-3-4, AM-3-5 and AM-3-6 and AM-4-4, AM-4-5, and AM-4-6, respectively). Summaries of results are presented in Tables 2-1 and 2-2.

The isokinetic rate for each run was within the allowable range (100% +/- 10%). No major equipment or instrument malfunctions occurred which might render the data suspect. Run No. AM-4-4 was corrected to 100% isokinetic utilizing EPA's Document No. 450/2-78-042a, "A Guide For Evaluating Test Results" by R. T. Shigehara, Emission Measurement Branch, ESED, OAQPS, EPA.

TABLE 2-1

SUMMARY OF RESULTS
ROTOCLONE DUCT 3
PARTICULATE TEST

Date	Run No.	Percent Isokinetic	Particulates lbs/hr
02/15/89	AM-3-4	94	2.18
02/15/89	AM-3-5	90	2.90
02/15/89	AM-3-6	91	2.64
Average:			2.57
Allowable: (LaDEQ-AQD Permit No. **Grandfathered**)			N/A

Complete particulate results are presented in Section 9.

TABLE 2-2

SUMMARY OF RESULTS
ROTOCLONE DUCT 4
PARTICULATE TEST

Date	Run No.	Percent Isokinetic	Particulates lbs/hr
02/16/89	AM-4-4	100	1.90
02/16/89	AM-4-5	95	0.79
02/16/89	AM-4-6	93	1.08
Average:			1.26
Allowable: (LaDEQ-AQD Permit No. **Grandfathered**)			N/A

Complete particulate results are presented in Section 9.

2.2 Opacity of Emissions Determination

The opacity of emissions determinations and calculations were conducted in accordance with EPA Method 9 (40 CFR 60, Appendix A).

The ducts were observed simultaneously for eighteen (18) consecutive minutes with observations recorded each fifteen (15) seconds.

Results are presented for rotoclone Ducts 3 and 4 in Tables 2-3 and 2-4, respectively.

TABLE 2-3

SUMMARY RESULTS
OPACITY OF EMISSIONS DETERMINATION
ROTOCLONE DUCT 3

Date	Time (0000-2400)	Duration (min)	Number of Observations	Average Opacity (%)
02/15/89	1310-1315	6	24	5
02/15/89	1316-1321	6	24	5
02/15/89	1322-1327	6	24	2.7
Average:				4.2
Allowable: (LaDEQ-AQD Permit No. **Grandfather**)				20

TABLE 2-4

SUMMARY RESULTS
OPACITY OF EMISSIONS DETERMINATION
ROTOCLONE DUCT 4

Date	Time (0000-2400)	Duration (min)	Number of Observations	Average Opacity (%)
02/16/89	1330-1335	6	24	3.1
02/16/89	1336-1341	6	24	1.4
02/16/89	1342-1347	6	24	3.9
Average:				2.8
Allowable: (LaDEQ-AQD Permit No. **Grandfathered**)				20

3.0 REGULATORY HISTORY (RESERVED)

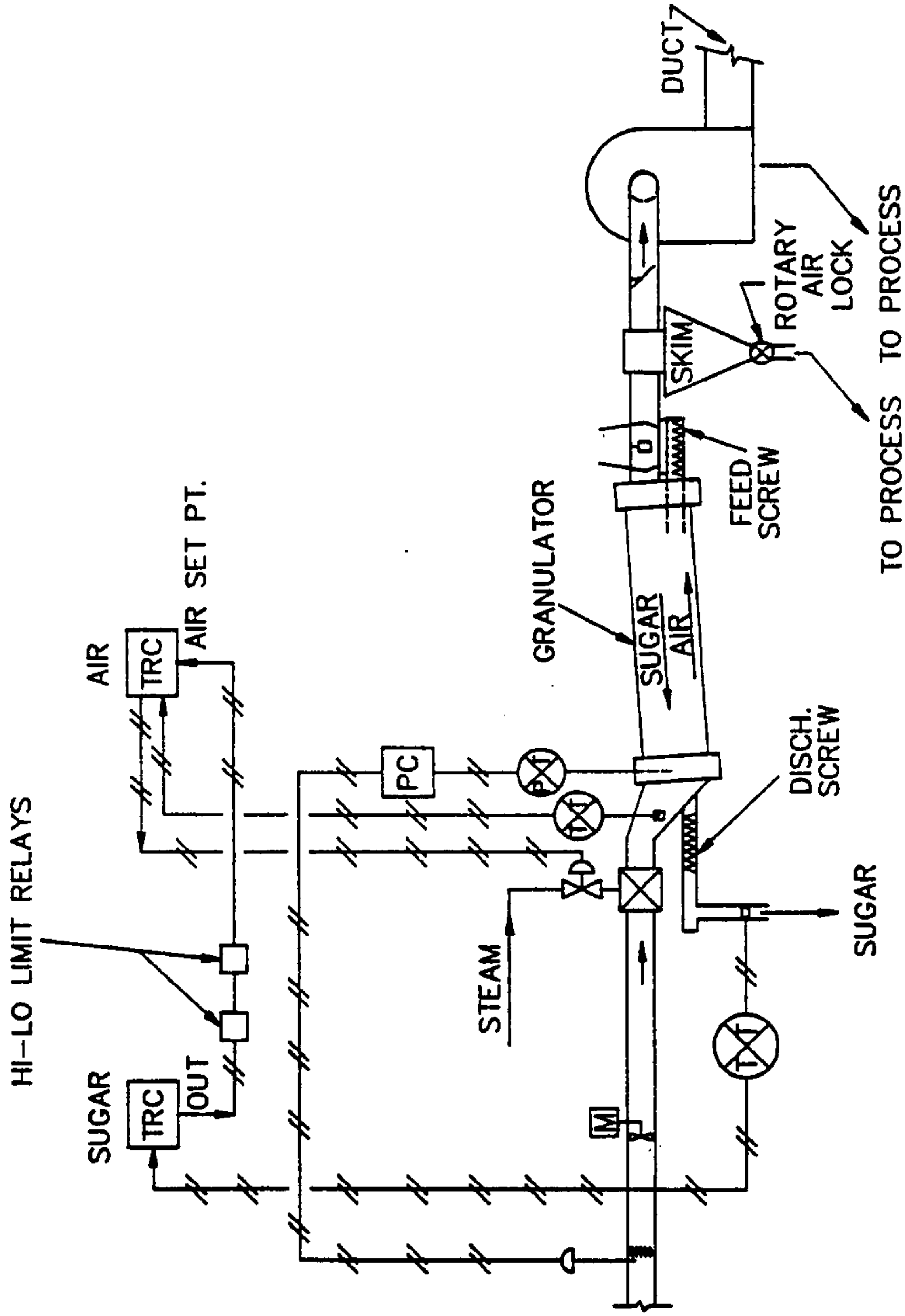
Grandfathered, therefore no permit required.

4.0 PROCESS DESCRIPTION/PRODUCTION PROFILE

Amstar is engaged in the refining of raw cane sugar into various granulated and liquid sugar products.

In the process of producing granulated sugar, batch centrifugal machines separate the sugar crystals from the syrup in which they were grown. These centrifugal machines feed wet sugar via screw conveyors to rotary driers called granulators. In these granulators, heated air flows counter-current to the sugar, drying the product. Air laden with moisture and sugar dust exiting the granulator goes through a skimmer (a cyclone-type separator). Sugar dust recovered by the skimmer is returned to the process through an air lock. Exiting the skimmer, the air next goes through a final dust collector called a rotoclone, which is a wet-type scrubber. Air exiting the rotoclone is discharged to the atmosphere via ductwork. The sugar recovered by the rotoclone is returned to the process. (See Drawing R-005 for a typical granulator and air control system.)

The discharges of granulator rotoclone ducts 023-74 and 024-74 were chosen for this study.



GRANULATORS NO.1 THRU NO.6

WALDEMAR S. NELSON AND COMPANY INCORPORATED ENGINEERS AND ARCHITECTS 1200 ST. CHARLES AVE. NEW ORLEANS, LA.	GRANULATORS NO. 1 THRU NO. 6			
DATE	SCALE	JOB NO.	DWG.NO.	REV.
3/21/89	NONE	89029	R-005	0

89029R05

5.0 TEST PROCEDURES

5.1 Particulate - EPA Method 5

5.1.1 Particulate Sampling

The particulate emissions test (EPA Method 5) followed the guidelines and procedures of 40 CFR 60, Appendix A.

Dimensions of the stack and test location along with sample points are presented in Drawing Nos. R-001 and R-002.

The average of three "runs" (samples) constitutes one test.

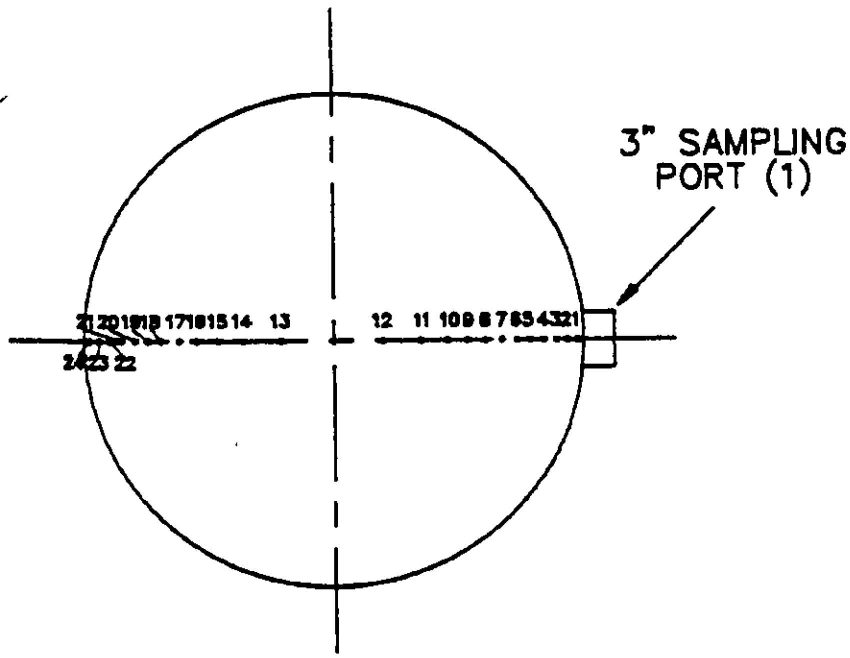
Stack emissions were measured by traversing via one port using a 4-1/2 foot (4.5-ft.) probe with a heated SS liner. A total of twenty-four (24) points were sampled during each run of a period of three (3) minutes per point for runs AM-3-4, AM-3-5, AM-3-6, AM-4-4, AM-4-5, and AM-4-6.

One port was utilized pursuant to discussions with Mr. Jim Courville of LDEQ-AQD. An obstruction prevented 90° port sampling, thus twice as many points were sampled on a single traverse to ensure representative sampling.

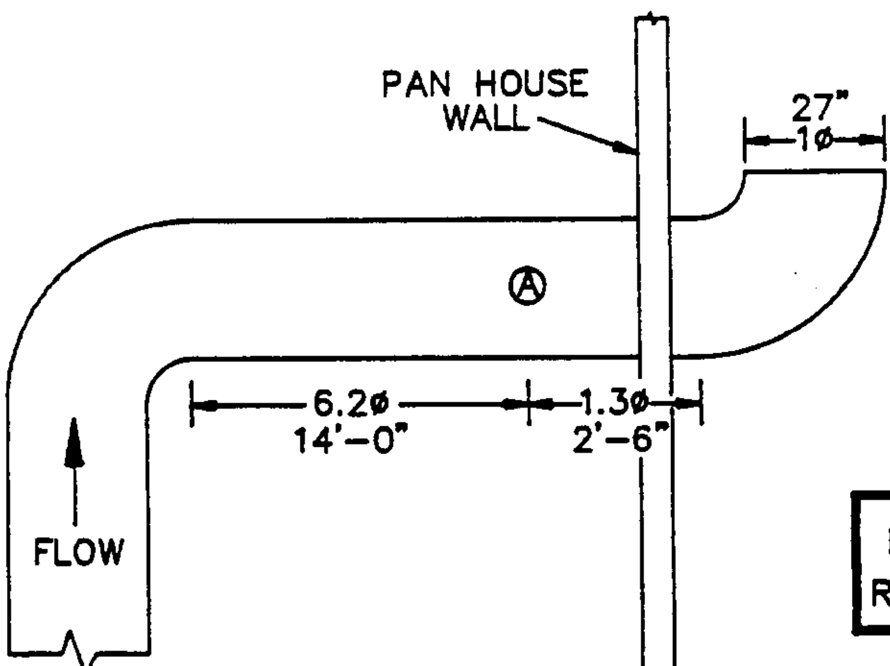
The sampling train used was a NAPP, Inc., Model 31 Manual Stack Sampler. The sample train consisted of a buttonhook-type nozzle, the 4.5-foot probe, a two-section sample box, a 50-foot umbilical cord, and a control console.

The control console contained a leak-free diaphragm pump, a DGM, coarse and fine adjust valves, a dual inclined manometer, a selectable pyrometer, a vacuum gauge, and umbilical cord connections. The diaphragm pump moved the stack gases through the sampling system while the DGM measured the volume of gas sampled. Gas flow through the system was controlled with the coarse and fine flow valves. The range of the dual inclined manometer was 0 to 10 inches H_2O graduated in 0.01-inch H_2O divisions from 0 to 1 inch and 0.1-inch H_2O from 1 to 10 inches. The manometer provided for simultaneous measurement of the pressure drop across the orifice in the control console and the differential pressure of the stack gas velocity at the sampling point. The umbilical cord and connectors united the metering/control console with the sample box. One portion of the sample box held a heating element which maintained the temperature in the filter holder compartment at approximately 250°F. The other compartment of the sample box contained an ice bath with four glass impingers connected in series by glass U-tubes. The first and second impingers contained 100 mL of deionized distilled water. The third impinger was dry and the fourth contained approximately 200 g of indicating silica gel. The ice bath-impinger combination cooled and dried the flue gases sampled to prevent damage to either the pump or DGM while allowing a determination of the stack gas moisture content for each run.

DISTANCE FROM OUTSIDE PORT TO SAMPLE POINT:			
1.	3.27	13.	19.25
2.	3.86	14.	21.28
3.	4.49	15.	22.66
4.	5.13	16.	23.79
5.	5.84	17.	24.76
6.	6.50	18.	25.65
7.	7.35	19.	26.44
8.	8.24	20.	27.17
9.	9.21	21.	27.87
10.	10.29	22.	28.52
11.	11.72	23.	29.14
12.	13.75	24.	29.70



SECTION ELEVATION: ROTOCLONE EXHAUST STACK



FOR EMISSIONS REPORTING ONLY

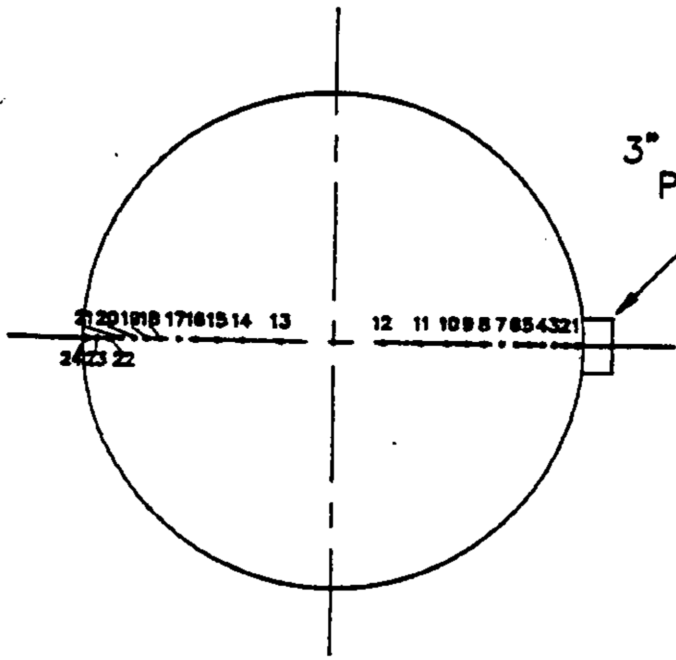
ELEVATION: ROTOCLONE EXHAUST STACK

WALDEMAR S. NELSON AND COMPANY INCORPORATED ENGINEERS AND ARCHITECTS 1200 ST. CHARLES AVE. NEW ORLEANS, LA.	SAMPLE PORT/POINT LOCATION ROTOCLONE NO.3			
DATE	SCALE	JOB NO.	DWG.NO.	REV.
3/21/89	NONE	89029	R-001	0

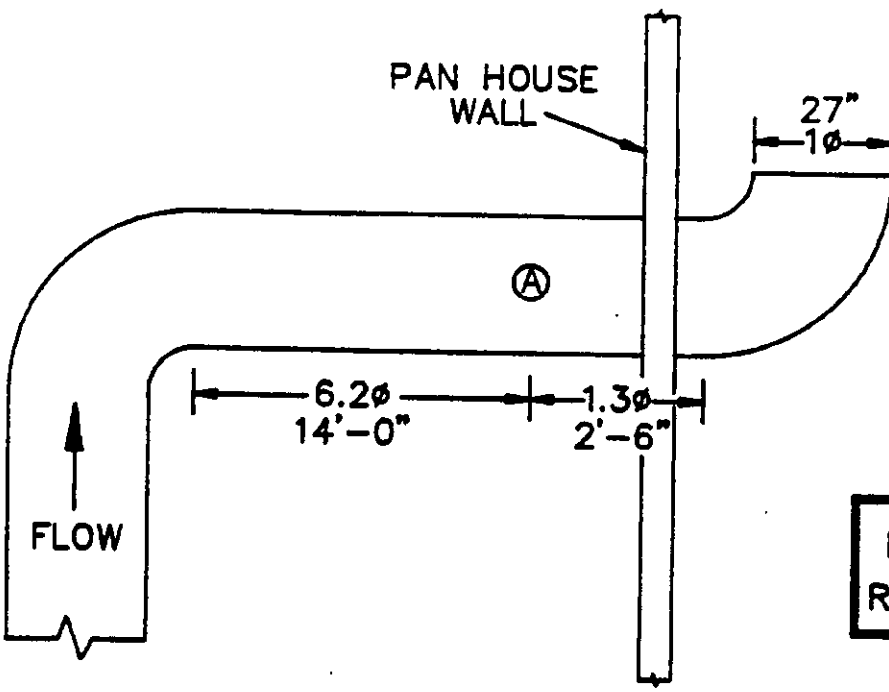
89029R01
PLOT 1

DISTANCE FROM OUTSIDE PORT TO SAMPLE POINT:

1.	3.27	13.	19.25
2.	3.86	14.	21.28
3.	4.49	15.	22.66
4.	5.13	16.	23.79
5.	5.84	17.	24.76
6.	6.50	18.	25.65
7.	7.35	19.	26.44
8.	8.24	20.	27.17
9.	9.21	21.	27.87
10.	10.29	22.	28.52
11.	11.72	23.	29.14
12.	13.75	24.	29.70



SECTION ELEVATION: ROTOCLONE EXHAUST STACK



FOR EMISSIONS REPORTING ONLY

ELEVATION: ROTOCLONE EXHAUST STACK

WALDEMAR S. NELSON AND COMPANY
INCORPORATED
ENGINEERS AND ARCHITECTS
1200 ST. CHARLES AVE. NEW ORLEANS, LA.

SAMPLE PORT/POINT LOCATION
ROTOCLONE NO.4

DATE	SCALE	JOB NO.	DWG.NO.	REV.
3/21/89	NONE	89029	R-002	0

For a schematic of the Method 5 sample train, refer to Drawings presented in the Appendices. A detailed view of the Method 5 probe is provided in the Drawings presented in the Appendices.

The control console, pitot tubes, and nozzles were calibrated prior to testing. All calibration data is contained in the Appendices. Upon completion of the tests the control console was re-calibrated as required by reference methods. The resulting data showed insignificant deviation from the original calibration within acceptable limitations. Close visual inspection of the pitot tubes and nozzle revealed no damage or misalignment thus re-calibration was not required for these components.

As required, the pitots and the sampling train were leak checked before and after each test run. In all instances, the vacuum on the pitot system remained stable for at least 15 seconds at 3 inches H_2O (or more). The sampling train leaked less than 0.02 cfm at a vacuum of 15 inches Hg in the pre-test checks and at the maximum test vacuum in the post-test checks at the nozzle inlet.

Prior to the first run, molecular weight, preliminary velocity, and temperature data were acquired from previous test data. Similarly, moisture content data was also taken from previous tests. Subsequent runs were based on acquired data. A barometer taken to the field laboratory was used to record barometric pressure.

5.1.2 Particulate Sample Recovery and Analysis

A temporary field laboratory was established on-site. The equipment needed was transferred from Waldemar S. Nelson and Company, Inc.'s laboratory in New Orleans, Louisiana.

The field laboratory was used for all cleanup operations. A quasi-dust-free area was maintained for glassware cleanup and probe cleaning. A probe cleaning brush, consisting of a 12-foot-long Teflon rod with a nylon brush, was used to clean the probe. A small nylon brush was used to clean the inlet tip and glass tubing up to the filter using deionized distilled water. The probe, probe tip, and all sample-exposed surfaces prior to the filter were rinsed and brushed after each test with deionized distilled water.

Water was utilized rather than acetone pursuant to prior discussions with Mr. Jim Courville of the LDEQ-AQD, as the acetone would not effectively dissolve the sucrose in the probe and glassware. Due to the possibility of sample loss it was mutually agreed that warm water would be utilized to maximize sample recovery.

The capture from each run, along with the filter remnants which had adhered to the filter holder gasket, was retained in a clean sample bottle (glass with Teflon-lined cap). The liquid level of the captures was marked clearly on each sample bottle so that they could be checked for loss of volume due to evaporation or spillage during transport.

A blank of the deionized distilled water used for the probe and glassware cleanup was also retained in a clean sample bottle. This allowed any bias in weight added by the acetone itself to be subtracted from the total weight of captured particulate, in accordance with the procedures outlined in 40 CFR 60, Appendix A.

Upon return to Waldemar S. Nelson and Company, Inc.'s laboratory in New Orleans, the water samples and blanks were measured volumetrically, then evaporated, desiccated, and weighed in accordance with Method 5 procedures. The complete analytical results are presented in the Appendices.

The 4-inch-diameter filters were desiccated, tared, and stored in new clean petri dishes prior to beginning the tests. After each test run, the soiled filter was carefully removed from the filter holder and returned to the original petri dish. The filters were subsequently desiccated and re-weighed at Waldemar S. Nelson and Company, Inc.'s New Orleans laboratory. Copies of the filter weight log are presented in the Appendices. The net weight gain (loss) of each filter was added to the corresponding water rinse weight (less blank correction) and reported as total particulate weight for that test.

5.2 Flue Gas Composition Sampling - EPA Method 3

An Orsat analysis was conducted to determine the stack gas concentration during the first run. This was accomplished at the stack by attaching a 4.5-foot SS tube to the Method 5 probe. The sample was collected directly by the Orsat and was analyzed immediately in the field.

The results indicated ambient molecular composition, thus subsequent Orsat analyses were unnecessary. Ambient molecular composition values of 0.8% CO_2, 20.1% O_2, and 79.1% CO + N_2 were assumed for calculations.

5.3 Opacity of Emissions Determination - EPA Method 9

Standard EPA Method 9 observation procedures were adhered to during opacity of emission determinations. The tests were conducted by a certified Visible Emissions Observer with good meteorological conditions prevailing.

6.0 QUALITY ASSURANCE PROCEDURES - EPA METHOD 5

A Model 31 Manual Stack Sampling System was purchased from NAPP, Inc. of Austin, Texas for the sampling of particulate emissions. A schematic of the sampling train and a detail of the probe are presented in the Appendices. The sample train was operated, maintained, and calibrated in accordance with procedures outlined in APTD-0576 and standard methods.

6.1 Sampling Apparatus

Probe: The sampling probe was constructed of SS tubing with an outside diameter of about 16 mm (0.625 in.) encased in a SS sheath with an outside diameter of 25.4 mm (1.0 in.). Quartz liners were used if stack temperatures were less than 480°C (900°F). The probe was constructed according to APTD-0581 specifications, thus calibration was not necessary. Instead, calibration curves from APTD-0581 were used. The heating system utilized is capable of maintaining an exit gas temperature of 120° +/- 14°C (248° +/- 25°F).

Upon receiving the probe from the manufacturer, it was visually checked for breaks or cracks and checked for leaks while connected to the sampling train. This insured a proper nozzle to the probe connection with an asbestos string. The probe heating system was checked in accordance with the Quality Assurance Handbook for Air Pollution Measurement Systems; Vol. III, (EPA 600/4-7-027b).

Probe Nozzle: The probe nozzle has a sharp, tapered leading edge and is constructed of seamless 316 SS tubing formed in a buttonhook. The tapered angle is less than or equal to 30° with the taper on the outside to preserve a constant inside diameter.

A range of nozzle IDs (0.163 to 0.5 in.) was available for isokinetic sampling.

Upon receipt of the nozzles from the manufacturer, they were inspected for roundness and for damage to the tapered edge such as nicks, dents, and burrs. The diameter was checked with a micrometer in accordance with calibration procedures. Each nozzle was engraved with an identification number for inventory and calibration purposes.

Pitot Tube: The pitot tubes, Type "S" design, meet the requirements of EPA Method 2. The pitot tube is permanently attached to the probe as illustrated. The pitot tube was visually inspected for both vertical and horizontal tip alignment. Calibration data for the pitot tubes is presented in the Appendices.

Differential Pressure Gauge: The differential pressure gauge used was a dual inclined manometer. One was utilized to monitor the stack velocity pressure, and the other to measure the orifice pressure differential.

Filter Holder: A filter holder of borosilicate glass with a glass mesh frit filter support and a silicone rubber gasket was used. The holder design provided a positive seal against leakage from the outside and around the filter. It was positioned immediately following the probe, with the filter placed toward the flow.

Filter Heating System: The heating system used was capable of maintaining the filter holder of 120° +/- $14^{\circ}C$ (248° +/- $25^{\circ}F$) during sampling. A gauge capable of measuring temperatures to within $3^{\circ}C$ ($5.4^{\circ}F$) was used to monitor the temperature around the filter during sampling.

Condenser: Four impingers were connected in series with leak-free ground-glass fittings. The first, third and fourth impingers were the Greenburg-Smith design modified by replacing the inserts with a glass tube that has an unconstricted 13 mm (0.5 in.) ID and that extends to within 13 mm (0.5 in.) of the flask bottom. The second impinger was a Greenburg-Smith with the standard tip and plate. The fourth impinger outlet connection was fitted with a thermometer capable of measuring +/- $1^{\circ}C$ ($1.8^{\circ}F$) of true value in the range of 0° to $25^{\circ}C$ (32° to $77^{\circ}F$).

Upon receipt of the standard Greenburg-Smith impingers, each impinger was checked visually for damage -- breaks, cracks, or manufacturing flaws such as poorly shaped connections.

Metering System: The metering system consisted of a vacuum gauge, a vacuum pump, thermometers capable of measuring +/- $5.4^{\circ}F$ of true value in the range of 32° to $194^{\circ}F$, a DGM with 2% accuracy at the required sampling rate; and related equipment.

When the metering system was used with a pitot tube, the system was assured verification of an isokinetic sampling rate through the use of a nomograph.

Barometer: An aneroid barometer capable of measuring atmospheric pressure to within +/- 2.5 mm (0.1 in.) Hg was used. The barometer was calibrated against the absolute barometric pressure obtained from a nearby National Weather Service station and adjusted for the elevation difference between the station and the laboratory.

Gas Density Determination Equipment: A temperature sensor and a pressure gauge as described in Method 2 were utilized. Additionally, an ambient air sample was analyzed by the Orsat to verify that the absorbing solutions were fresh and that no leaks existed.

The temperature sensor and Method 3 probe were permanently attached to both the probe and the pitot tube.

6.2 Sample Recovery Analysis

Probe Liner and Nozzle Brushes: Nylon bristle brushes with SS wire handles were used. The probe brush was slightly longer than the probe. A separate smaller and flexible brush was used for the nozzle.

Sample Storage Containers: 500 mL, narrow mouth, chemically resistant, borosilicate glass bottles were used for storage of the water rinses. The bottles have leak-proof screw caps with rubber-backed Teflon cap liners, and are constructed to preclude leakage and to resist chemical attack. Prior to field use, the cap seals and the bottle cap seating surfaces were inspected for chips, cuts, cracks, and manufacturing deformities which would allow leakage.

Petri Dishes: Polyethylene petri dishes were used for storage and for transportation of the filters and collected sample filters.

Graduated Cylinder and/or Triple Beam Balance: A triple beam balance was used to measure the solutions added and the water condensed in the impingers before and after sampling. Additionally, a graduated cylinder was used to measure the solutions initially placed in the first and second impingers. The graduated cylinder has subdivisions less than or equal to 2 mL and the triple beam balance is capable of weighing to the nearest 0.1 g.

Plastic Storage Containers: Several airtight plastic or metal containers were used for storage of silica gel. The silica gel used was weighed at the test site.

6.3 Analytical Equipment

Glassware: 250 mL glass beakers used for evaporation of the water rinses. Petri dishes, as specified previously, were used to facilitate filter transport.

Balance: An analytical grade balance capable of weighing the filters and the sample beakers to within +/- 0.1 mg was used. A triple beam balance as described in Section 6.2 was used for field weighings.

Reagents and Other Supplies: All reagents used met or exceeded specifications established by the Committee on Analytical Reagents of the ACS, or specified in 40 CFR 60, Appendix A.

6.4 Calibration of Apparatus - EPA Method 5

Calibration procedures were conducted for the EPA method test equipment specified herein in accordance with the applicable test method. A detailed log of calibration data is maintained in the laboratory and is presented in the Appendices.

Calibration Meter System - Method 5. A reference DGM calibrated against a bell prover was purchased from NAPP, Inc. with the necessary calibration data. This meter is used for pre-and post-test calibration checks as specified in APTD-0576. The DGM was calibrated after field use according to procedure outlined in Paragraph 5.3 of EPA Method 5. The DGM was well within its required calibration limits of 5% from initial calibration.

Sample Train Thermometer - Method 5. The thermometer used to measure the temperature of the gas leaving the impinger train was calibrated using a mercury-in-glass thermometer in accordance with standard methods.

Dry Gas Meter Thermometer - Method 5. The DGM thermometers were checked in accordance with APTD-0576.

Stack Temperature Sensor - Method 5. The stack temperature sensor (type "K" Thermocouple) was calibrated upon receipt and checked before and after field use. It was uniquely marked for identification. The calibration was carried out in accordance with APTD-0576.

Probe Heater - Method 5. The probes were constructed according to APTD-0581, therefore, the calibration curves of APTD-0576 were used.

Barometer - Method 5. The field barometer was adjusted initially and before each test series to agree within +/- 2.5 mm (0.1 in.) Hg of the National Weather Service station pressure value. With a correction for the altitude difference between the station and the sampling point applied at a rate of -2.4 mm Hg/30m (-0.1 in. Hg/100 ft.).

Probe Nozzle - Method 5. Probe nozzles were calibrated before initial use in the field. Using a micrometer, the nozzle ID was measured to the nearest 0.025 mm (0.001 in.). Three measurements were made using different diameters each time, and an average was obtained. The difference between the high and low readings did not exceed 0.1 mm (0.004 in.). Each nozzle was permanently and uniquely identified.

Pitot Tube - Method 5. The type "S" pitot tube assembly was calibrated by the manufacturer. However, the tubes were inspected for damage or misalignment before and after each run.

Analytical Balance - All Methods. The analytical balance was initially checked and is checked before each use with Class S weights, and the data is recorded on an analytical balance calibration log. The balance agreed within +/- 2 mg of the Class S weights.

6.5 Pre-sampling Quality Assurance Checks

Probe and Nozzle. The probe and nozzle were cleaned internally by brushing first with deionized-distilled water, and finally with acetone; both were allowed to dry in the air. The objective was to leave the probe liner free from contaminants. The probe's heating system was checked to insure that it was operating properly. The probe was sealed at the inlet and checked for leaks at a vacuum of 15 inches Hg.

Impingers, Filter Holder, Glass Connectors, Flasks, etc.: All glassware was cleaned first with detergent and tap water and then with deionized-distilled water. All glassware was visually inspected for cracks or breakage.

Pump. The vacuum pump was checked for any erratic behavior (nonuniform or insufficient flow).

Filters. The filters were visually checked against light for irregularities, flaws, and pinhole leaks. Petri dishes were labeled and the filters were kept in their respective dishes except during actual sampling and weighing.

The filters were desiccated at 60^{o} +/- 10^{o}F and at ambient pressure for at least 24 hours, and then weighed at 6 hour intervals until weight changes of less than or equal to 0.5 mg from the previous weighings were achieved. During each weighing, the filter was not exposed to the laboratory atmosphere for greater than 2 minutes or to a relative humidity of greater than 50%. The analytical balance was calibrated with Class S standard weights each day used. A data form was kept with the balance at all items for recording the dates and acceptabilities of the balance checks.

Equipment Packing. Equipment was packed to withstand severe treatment during shipping and field handling operations. The following containers were used:

Probe. The inlet and outlet of the probe were sealed to protect the probe from breakage. The probe was then packed inside a section of PVC pipe and the ends were sealed.

Impingers, Connectors, and Assorted Glassware. All impingers and glassware were packed in a rigid container specifically designed for the glassware by NAPP, Inc.

Volumetric Glassware: Assorted laboratory glassware is generally packed in the manufacturer's original packing or equivalent.

Meter Box: The meter box housing was sufficient to protect components during travel.

7.0 CHAIN-OF-CUSTODY

The chain-of-custody procedures were followed according to the EPA Quality Assurance Handbook, Volume III. A Chain-of-Custody Form was established for each set of samples. Each form remained with the samples under lock and key until analysis was completed.

The Chain-of-Custody Form(s) is presented in the Appendices.

8.0 PROJECT PERSONNEL

Members of the Environmental Sciences and Engineering Department of Waldemar S. Nelson and Company, Inc. conducted the particulate and opacity emissions tests at Amstar Sugar Corporation. Members of the test crew are listed below with the resumes presented in the Appendices.

- Lawrence R. Schumer
  Staff Scientist
- R. Javier Acuna
  Environmental Technologist
- Clinton E. Settoon
  Environmental Technician
- Mariano Mata
  Environmental Engineering Technologist

9.0 DISCUSSION OF PROCEDURES AND RESULTS

9.1 Sampling

The NAPP, Inc., EPA Method 5 sample train functioned properly throughout testing. No instrumentation or equipment malfunctions were noted.

The leak check option for probe liners sealed with an asbestos string was not exercised for these tests. Thus, the pre-test leak checks were performed by leak checking the train at 10 to 15 inches Hg at the nozzle inlet. Following the completion of each sample run, post-test leak checks were conducted at the maximum vacuum recorded during testing through the probe tip.

9.1.1 Sampling - Rotoclone Duct 3

The testing of Duct 3 commenced on February 15, 1989 and consisted of three runs (AM-3-4, AM-3-5, and AM-3-6). EPA Method 5 was utilized for particulate sampling.

Each run was comprised of 24 three minute points for a total sample time fo 72 minutes.

One port was utilized pursuant to discussions with Mr. Jim Courville of the LDEQ-AQD. An obstruction prevented 90^{o} port sampling, thus twice as many points were sampled on a single traverse to ensure representative sampling.

During Run 2 of the Method 5 test an EPA Method 9 opacity of emissions determination was conducted by Waldemar S. Nelson and Company, Inc. personnel. The field data form is presented in the Appendices.

9.1.2 Sampling - Rotoclone Duct 4

The testing of Duct 4 commenced on February 16, 1989 and consisted of three runs (AM-4-4, AM-4-5, and AM-4-6). EPA Method 5 was utilized for particulates sampling.

Each run was comprised of 24 three minute points for a total sample time of 72 minutes.

One port was utilized pursuant to discussions with Mr. Jim Courville of the LDEQ-AQD. An obstruction prevented 90^{o} port sampling, thus twice as many points were sampled on a single traverse to ensure representative sampling.

During Run 2 of the Method 5 test and EPA Method 9 opacity of emissions determination was conducted by Waldemar S. Nelson and Company, Inc. personnel. The field data form is presented in the Appendices.

9.2 Sample Recovery

Method 5: Sample recovery for both tests was conducted in accordance with standard methods as presented in 40 CFR 60, Appendix A.

Water was utilized rather than acetone pursuant to prior discussions with Mr. Jim Courville of the LDEQ-AQD, as the acetone would not effectively dissolve the sucrose in the probe and glassware. Due to the possibility of sample loss, it was mutually agreed that warm water would be utilized to maximize sample recovery.

Refer to comments in Section 9.4 regarding difficulties of handling the particulate captured (sucrose).

9.3 Sample Analysis

Method 5: The particulate samples for both tests were analyzed per 40 CFR 60, Appendix A. No complications were noted during analyses. However, two acetone rinse sample bottles contained significant layers of sucrose. Rinsing with acetone failed to dissolve the sugar; thus, 2 to 5 mL washings of deionized distilled water were utilized to transfer the sucrose to beakers for evaporation.

9.4 Results

The particulate results indicate good repeatability given the low concentrations the tests attempted to quantify. At no time during the two days of emissions testing were any sampling complications noted. The EPA Method 9 opacity of emissions determinations were conducted during the particulate tests for Ducts 3 and 4. The isokinetic rates for each run were well within acceptable limits (100 +/- 10%). Run No. AM-4-4 was corrected to 100% isokinetic, utilizing EPA Document No. 450/2--78-042a, "A Guide for Evaluating Test Results" by R. T. Shigehara, Emissions Measurement Branch, ESED, OAQPS, EPA.

Due to the nature of the operation, it is reasonable to assume that the resultant particulate loadings at the rotoclone ducts vary based upon the operation of the subject process equipment. However, the units were reported to be operating near maximum levels during testing. Process data recorded by Amstar Sugar during testing are presented in the Section 4.

During sampling and sample recovery, the particulate matter, predominantly sucrose, was difficult to handle. The sucrose in the rotoclone ducts, and as emitted, is in a syrup form, apparently due to the water sprays associated with the rotoclones. Thus, the nozzle was checked for blockage after each port. Thus, particular care was taken in cleaning of all sample-exposed surfaces to achieve maximum particulate capture in the rinse.

The syrup form of the sucrose emissions may also explain the low particulate emission rates. The emissions as sampled contain a high moisture content which, when desiccated yield a minimal particulate capture.

The average of the three test runs for Duct 3 is 2.57 lb/hr. A complete listing of Method 5 test results and a table of uniform stack parameters for Duct 3 are presented in Tables 9-1 and 9-2, respectively.

The average of the three test runs for Duct 4 is 1.26 lb/hr. A complete listing of Method 5 test results and a table of uniform stack parameters for Duct 4 are presented in Tables 9-3 and 9-4, respectively.

9.5 Opacity of Emissions Determination

The opacity of emissions determinations and calculations were conducted in accordance with EPA Method 9 (40 CFR 60, Appendix A).

The ducts were observed simultaneously for eighteen (18) consecutive minutes with observations recorded each fifteen (15) seconds.

Results are presented for rotoclone Ducts 3 and 4 in Tables 9-1 and 9-2, respectively.

TABLE 9-1

RESULTS
OPACITY OF EMISSIONS DETERMINATION
ROTOCLONE DUCT 3

Date	Time (0000-2400)	Duration (min)	Number of Observations	Average Opacity (%)
02/15/89	1310-1315	6	24	5
02/15/89	1316-1321	6	24	5
02/15/89	1322-1327	6	24	2.7
Average:				4.2
Allowable: (LaDEQ-AQD Permit No. Grandfathered)				20

TABLE 9-2

RESULTS
OPACITY OF EMISSIONS DETERMINATION
ROTOCLONE DUCT 4

Date	Time (0000-2400)	Duration (min)	Number of Observations	Average Opacity (%)
02/16/89	1330-1335	6	24	3.1
02/16/89	1336-1341	6	24	1.4
02/16/89	1342-1347	6	24	3.9
Average:				2.8
Allowable: (LaDEQ-AQD Permit No. **Grandfathered**)				20

9.6 Results - Supporting Documentation

The Appendices of this report contain copies of the field data forms, analytical work sheets, calibration data, and other data pertinent to this report.

WALDEMAR S. NELSON & COMPANY
ENGINEERS AND ARCHITECTS
ENVIRONMENTAL SCIENCE AND ENGINEERING DEPARTMENT
STACK TESTING AND AREA MONITORING

AMSTAR CORPORATION - ARABI, LOUISIANA - 89029
PARTICULATE TEST - ROTOCLONE DUCT # 4 (PAN HOUSE)
EPA METHOD 5 - RUNS NOS. 4,5 & 6 - MAY 15-16, 1985

UNIFORM STACK PARAMETERS

VARIABLE	DESCRIPTION	UNITS	VALUES		
	RUN NO.		1	2	3
VM	DRY GAS VOLUME, METER CONDITIONS	DCF	33.507	29.689	39.405
PB	BAROMETRIC PRESSURE	IN. HG	30.31	30.31	30.31
PM	AVERAGE ORIFICE PRESSURE DROP	IN. H2O	1.064	0.587	1.220
TM	AVERAGE METER TEMPERATURE	DEG. F	88.	95.	100.
(1) VMSTD	DRY GAS VOLUME, STANDARD CONDITIONS	DSCF	34.75	30.32	40.00
VW	TOTAL WATER COLLECTED	ML	41.9	40.3	68.8
VWV	VOLUME OF WATER VAPOR, STANDARD CONDITIONS	ML	1.97	1.90	3.24
(2) PMOS	PERCENT MOISTURE BY VOLUME	%	5.4	5.9	7.5
(3) MD	MOLE FRACTION OF DRY GAS	-	0.946	0.941	0.925
PCO2	PERCENT CO2 BY VOLUME, DRY	%	0.1	0.1	0.1
PO2	PERCENT O2 BY VOLUME, DRY	%	20.6	20.6	20.6
* PCO	PERCENT CO BY VOLUME, DRY	%	-	-	-
* PN2	PERCENT N2 BY VOLUME, DRY	%	79.3	79.3	79.3
(4) MWD	MOLECULAR WEIGHT, DRY STACK GAS	-	28.84	28.84	28.84
(5) MW	MOLECULAR WEIGHT, WET STACK GAS	-	28.26	28.20	28.03
DPS	AVERAGE STACK VELOCITY HEAD	IN. H2O	0.77	0.61	0.84
TS	AVERAGE STACK TEMPERATURE	DEG. F	96.	101.	99.
PS	STACK PRESSURE, ABSOLUTE	IN. HG	30.29	30.29	30.29
(6) VS	AVERAGE STACK GAS VELOCITY	FPM	2680.	2130.	2940.
ID	INSIDE STACK DIAMETER	IN.	27.	27.	27.
AS	STACK AREA	SQ. IN.	572.6	572.6	572.6
(7) QS	STACK FLOWRATE, DRY, STANDARD CONDITIONS	DSCFM	9700.	7610.	10400.

* THE PERCENT VOLUMES OF NITROGEN (PN2) REPORTED INCLUDE PERCENT N2, CO, AND ALL OTHER FLUE GAS CONSTITUENTS NOT QUANTIFIED ABOVE.

WALDEMAR S. NELSON & COMPANY
ENGINEERS AND ARCHITECTS
ENVIRONMENTAL SCIENCE AND ENGINEERING DEPARTMENT
STACK TESTING AND AREA MONITORING

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AMSTAR CORPORATION - ARABI, LOUISIANA - 89029
PARTICULATE TEST - ROTOCLONE DUCT # 4 (PAN HOUSE)
EPA METHOD 5 - RUNS NOS. 4,5 & 6 - MAY 15-16, 1985

METHOD 5 - PARTICULATE EMISSIONS

RUN NO.	PERCENT ISOKINETIC %	PARTICULATE WEIGHT, TOTAL MG	PARTICULATE LOADING AT STD CONDITIONS GR/DSCF	PARTICULATE LOADING AT STACK CONDITIONS GR/ACF	PARTICULATE EMISSION RATE LBS/HR	PARTICULATE LOADING AT STD CONDITIONS LBS/DSCF
	PERI	MF	CAN	CAT	CAW	C
1	100	59.59	0.229E-01	0.208E-01	0.190E+01	0.326E-05
2	95.9738	23.89	0.122E-01	0.109E-01	0.793E+00	0.174E-05
3	93.0884	31.69	0.122E-01	0.108E-01	0.108E+01	0.175E-05

AVERAGE PARTICULATE LOADING STD CONDITIONS (CAN):	0.158E-01	GR/DSCF
AVERAGE PARTICULATE LOADING STACK CONDITIONS (CAT):	0.142E-01	GR/ACF
AVERAGE EMISSION RATE (CAW):	0.126E+01	LBS/HR
AVERAGE PARTICULATE LOADING STD CONDITIONS (C):	0.225E-05	LBS/DSCF

WALDEMAR S. NELSON & COMPANY
ENGINEERS AND ARCHITECTS
ENVIRONMENTAL SCIENCE AND ENGINEERING DEPARTMENT
STACK TESTING AND AREA MONITORING

AMSTAR CORPORATION - ARABI, LOUISIANA - 89029
PARTICULATE TEST - ROTOCLONE DUCT # 3 (PAN HOUSE)
EPA METHOD 5 - RUNS NOS. 4,5 & 6 - MAY 15, 1985

UNIFORM STACK PARAMETERS

VARIABLE	DESCRIPTION	UNITS	VALUES		
	RUN NO.		1	2	3
VM	DRY GAS VOLUME, METER CONDITIONS	DCF	37.807	37.112	38.097
PB	BAROMETRIC PRESSURE	IN. HG	30.31	30.31	30.31
PM	AVERAGE ORIFICE PRESSURE DROP	IN. H2O	1.137	1.090	1.137
TM	AVERAGE METER TEMPERATURE	DEG. F	98.	104.	111.
(1) VMSTD	DRY GAS VOLUME, STANDARD CONDITIONS	DSCF	38.52	37.36	37.88
VW	TOTAL WATER COLLECTED	ML	83.1	44.8	76.3
VWV	VOLUME OF WATER VAPOR, STANDARD CONDITIONS	ML	3.91	2.11	3.59
(2) PMOS	PERCENT MOISTURE BY VOLUME	%	9.2	5.3	8.7
(3) MD	MOLE FRACTION OF DRY GAS	-	0.908	0.947	0.913
PCO2	PERCENT CO2 BY VOLUME, DRY	%	0.1	0.1	0.1
PO2	PERCENT O2 BY VOLUME, DRY	%	20.6	20.6	20.6
* PCO	PERCENT CO BY VOLUME, DRY	%	-	-	-
* PN2	PERCENT N2 BY VOLUME, DRY	%	79.3	79.3	79.3
(4) MWD	MOLECULAR WEIGHT, DRY STACK GAS	-	28.84	28.84	28.84
(5) MW	MOLECULAR WEIGHT, WET STACK GAS	-	27.84	28.26	27.90
DPS	AVERAGE STACK VELOCITY HEAD	IN. H2O	0.81	0.80	0.82
TS	AVERAGE STACK TEMPERATURE	DEG. F	97.	98.	96.
PS	STACK PRESSURE, ABSOLUTE	IN. HG	30.29	30.29	30.29
(6) VS	AVERAGE STACK GAS VELOCITY	FPM	2850.	2770.	2860.
ID	INSIDE STACK DIAMETER	IN.	27.	27.	27.
AS	STACK AREA	SQ. IN.	572.6	572.6	572.6
(7) QS	STACK FLOWRATE, DRY, STANDARD CONDITIONS	DSCFM	9870.	9990.	9980.

* THE PERCENT VOLUMES OF NITROGEN (PN2) REPORTED INCLUDE PERCENT N2, CO, AND ALL OTHER FLUE GAS CONSTITUENTS NOT QUANTIFIED ABOVE.

WALDEMAR S. NELSON & COMPANY
ENGINEERS AND ARCHITECTS
ENVIRONMENTAL SCIENCE AND ENGINEERING DEPARTMENT
STACK TESTING AND AREA MONITORING

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AMSTAR CORPORATION - ARABI, LOUISIANA - 89029
PARTICULATE TEST - ROTOCLONE DUCT # 3 (PAN HOUSE)
EPA METHOD 5 - RUNS NOS. 4,5 & 6 - MAY 15, 1985

METHOD 5 - PARTICULATE EMISSIONS

RUN NO.	PERCENT ISOKINETIC %	PARTICULATE WEIGHT, TOTAL MG	PARTICULATE LOADING AT STD CONDITIONS GR/DSCF	PARTICULATE LOADING AT STACK CONDITIONS GR/ACF	PARTICULATE EMISSION RATE LBS/HR	PARTICULATE LOADING AT STD CONDITIONS LBS/DSCF
	PERI	MF	CAN	CAT	CAW	C
1	94.0572	64.39	0.258E-01	0.225E-01	0.218E+01	0.369E-05
2	90.0763	81.89	0.338E-01	0.306E-01	0.290E+01	0.483E-05
3	91.4356	75.79	0.309E-01	0.271E-01	0.264E+01	0.441E-05

AVERAGE PARTICULATE LOADING STD CONDITIONS (CAN):	0.302E-01	GR/DSCF
AVERAGE PARTICULATE LOADING STACK CONDITIONS (CAT):	0.267E-01	GR/ACF
AVERAGE EMISSION RATE (CAW):	0.257E+01	LBS/HR
AVERAGE PARTICULATE LOADING STD CONDITIONS (C):	0.431E-05	LBS/DSCF

WALDEMAR S. NELSON AND COMPANY
INCORPORATED

PARTICULATE EMISSION TEST
FIELD DATA FORM
(EPA METHOD 1,2,3,4,5,8,& 17)

CLIENT Amstar

FACILITY Arabi Plant

RUN NUMBER AM-3-4

WSNCO JOB NO. 89029

SAMPLING LOCATION Dryer outlet

SAMPLING DATE 2-15-86

TEST PERSONNEL

PROJECT CHIEF R. Javier Acuna

TESTING ENGINEER 1 ______ 2 ______

ENGR. TECHNICIAN 1 Clinton Settoon 2 ______

LAB TECHNICIAN 1 ______ 2 ______

OTHER 1 ______ 2 ______

RUN NO AM-3-4
DATE 2-16-89

SAMPLING TRAIN SPECIFICATIONS

RECORDED BY CES
ASSISTED BY

I. PROBE ASSEMBLY

A. PROBE LENGTH 4 1/2 FT.
B. LINER MATERIAL 316 SS
C. PITOT NUMBER 003
D. PITOT COEFFICIENT .84

II. MISC. COMPONENTS

A. NOZZLE DIAMETER .205 IN.
B. NOZZLE IDENT. NO. 1871
C. UMBILICAL LENGTH 50 FT.
D. FILTER HOLDER TYPE M-5 GLASS
E. FILTER NUMBER 38001

III IMPINGER CONTENT

NUMBER	TYPE*	NORMAL MATERIAL	NORMAL AMOUNT	USE MATERIAL	USE AMOUNT	FINAL AMOUNT	NET GAIN
1	M	DW	100ML	DW	531.0	580.1	49.1
2	GS	DW	100ML	DW	535.3	558.4	23.1
3	M	DRY	———	DRY	423.4	426.0	2.6
4	M	ADSORBENT**	~200GM.	SG	649.3	657.6	8.3

#4 CONTAINER WEIGHT = ______ GM.
WEIGHT WITH ADSORBENT= ______ GM.

TOTAL MOISTURE ADSORBED 83.1

* GS= GREENBURG-SMITH, M= MODIFIED, O= OTHER
** SG= SILICA GEL, D=DRIERITE, O= OTHER

IV. CONTROL CONSOLE: △H@ (PRE-TEST) ______ △H@ (POST-TEST) ______
Y (PRE-TEST) ______ Y(POST-TEST) ______

CONSOLE NO. ______

	VELOCITY	TEMPERATURE	PRESSURE
SENSOR	☐ STANDARD ☒ "S" SHAPED	☒ THERMOCOUPLE (TYPE ____) ☐ OTHER ______	☒ STANDARD ☐ "S" SHAPED
READING DEVICE	☒ DI MANOMETER (0-10 IN. H_2O) ☐ HIGH SENSITIVITY (RANGE ___) ☐ OTHER ______	☑ PYROMETER (TYPE K) ☐ OTHER ______	☐ DI MANOMETER (0-5 IN. H_2O) ☐ HIGH SENSITIVITY (RANGE ___) ☒ OTHER U-Tube

COMMENTS:

RUN NO. AM-3-4

DATE 2-15-89

STACK GEOMETRY

RECORDED BY [signature]

SKETCH OF FLOW PROFILE AND CROSS-SECTION
(ILLUSTRATE PORT-POINT CONFIGURATION, FLOW INTERFERENCES, ETC.)
NOTE: SAME AS RUN AM-4-9

FOR ROUND STACKS

A. DISTANCE FROM INSIDE FAR WALL TO OUTSIDE OF PORT ________ IN.
B. PORT LENGTH ________ IN.
STACK DIAMETER: (A-B) ________ IN.
STACK AREA: ________ IN.^{2}

FOR RECTANGULAR STACKS

A. DISTANCE FROM INSIDE FAR WALL TO OUTSIDE OF PORT ________ IN.
B. PORT LENGTH ________ IN.
STACK DEPTH: (A-B) ________ IN.
STACK WIDTH (INSIDE) ________ IN.
STACK AREA (DEPTH X WIDTH) ________ IN.^{2}
EQUIVALENT DIAMETER $\left(2\left[\frac{L \times W}{L + W}\right]\right)$ ________ IN.

SAMPLING CROSS-SECTION IS:

NO. OF DUCT DIAMETERS		TYPE OF FLOW OBSTRUCTION	NUMBER OF SAMPLING POINTS
________	DIAMETERS DOWNSTREAM OF	________	MIN. REQ'D. (METHOD 1) ________
________	DIAMETERS UPSTREAM OF	________	USE ________

RUN NO. AM-2-4

DATE 2-15-86

TRAVERSE POINTS

RECORDED BY [illegible]

PERCENT OF DIAMETER FROM INSIDE PORT TO POINT

NUMBER OF TRAVERSE POINTS ON A DIAMETER

POINT	2	4	6	8	10	12	14	16	18	20	22	24	DISTANCE FROM INSIDE PORT (IN.)	DISTANCE FROM OUTSIDE PORT (IN.)	USE (IN.)
1	14.6	6.7	4.4	3.2	2.6	2.1	1.8	1.6	1.4	1.3	1.1	1.1			
2	85.4	25.0	14.6	10.5	8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2			
3		75.0	29.6	19.4	14.6	11.8	9.9	8.5	7.5	6.7	6.0	5.5			
4		93.3	70.4	32.3	22.6	17.7	14.6	12.5	10.9	9.7	8.7	7.9			
5			85.4	67.7	34.2	25.0	20.1	16.9	14.6	12.9	11.6	10.5			
6			95.6	80.6	65.8	35.6	26.9	22.0	18.8	16.5	14.6	13.2			
7				89.5	77.4	64.4	36.6	28.3	23.6	20.4	18.0	16.1			
8				96.8	85.4	75.0	63.4	37.5	29.6	25.0	21.8	19.4			
9					91.8	82.3	73.1	62.5	38.2	30.6	26.2	23.0			
10					97.4	88.2	79.9	71.7	61.8	38.8	31.5	27.2			
11						93.3	85.4	78.0	70.4	61.2	39.3	32.3			
12						97.9	90.1	83.1	76.4	69.4	60.7	39.8			
13							94.3	87.5	81.2	75.0	68.5	60.2			
14							98.2	91.5	85.4	79.6	73.8	67.7			
15								95.1	89.1	83.5	78.2	72.8			
16								98.4	92.5	87.1	82.0	77.0			
17									95.6	90.3	85.4	80.6			
18									98.6	93.3	88.4	83.9			
19										96.1	91.3	86.8			
20										98.7	94.0	89.5			
21											96.5	92.1			
22											98.9	94.5			
23												96.8			
24												98.9			

NOTE: SAME AS RUN NO. AM-A-4

COMMENTS:

RUN NO. AM-3-4		RECORDED BY [signature]
DATE 2-15-89	NOMOGRAPH DATA	CHECKED BY LES

NOTE: SAME AS RUN AM-4-4

TA	AMBIENT TEMPERATURE	= 70.2	°F
Pb	BAROMETRIC PRESSURE	= 30.21	IN. Hg
ΔH @	REFERENCE ΔH	=	IN. H_2O
TM	AVG. METER TEMPERATURE	=	°F
% H_2O	MOISTURE CONTENT	=	% BY VOL.
Po	STATIC (GUAGE) PRESSURE IN STACK	=	IN. H_2O
	x 0.074	=	IN. Hg.
PS	ABSOLUTE PRESSURE IN STACK, Pb - Po	=	IN. Hg.
PM	METER PRESSURE (~Pb)	=	IN. Hg.
PS/PM	=		
C	CORRECTION FACTOR	=	
TS	STACK TEMPERATURE	=	°F
ΔP	AVERAGE STACK VELOCITY HEAD	=	IN. H_2O
ΔPMAX.	MAXIMUM STACK VELOCITY HEAD	=	IN. H_2O
D	PROBE TIP DIAMETER	=	IN.

Req'd Sampling Rate or Volume ______ Calculated Sampling Rate or Volume (Pre-test) ______

TS					
ΔPREF					

PITOT LEAK CHECKS*				
OPENING	PRE-TEST	BY	POST-TEST	BY
IMPACT	☑ STABLE ☐ LEAKING	[signature]	☑ STABLE ☐ LEAKING	[signature]
STATIC	☑ STABLE ☐ LEAKING	[signature]	☑ STABLE ☐ LEAKING	[signature]

* Vacuum must remain stable for 15 seconds @ 3 in. H_2O.

SAMPLING TRAIN LEAK CHECKS		
LEAK CHECKS*	PRE-TEST	POST-TEST
RATE OF LEAK (CFM)	0.0 cfm	0.0 CFM
TIME (24 HOUR CLOCK)	0917	1033
BY	[signature]	[signature]

*Rates ≤ 0.02 CFM @ 15 in. Hg. vacuum or 4% of average sampling rate (whichever is less) are acceptable.

RUN NO. AM-3-4

DATE 2-15-89

PARTICULATE SAMPLING

RECORDED BY [illegible]

ASSISTED BY CES

SAMPLING TIME PER POINT 3 MIN.

PORT POINT	CLOCK TIME	METER VOLUME (DCF)	ΔP VEL. HEAD (IN. H_2O)	ΔH ORIFICE (IN. H_2O)	METER TEMP. IN (°F)	METER TEMP. OUT (°F)	STACK TEMP. (°F)	BOX TEMP. (°F)	BATH TEMP. (°F)	TRAIN VACUUM (IN. Hg)	COMMENT NUMBER
A-1	0922	861.712	.22	.32	81	80	98	175	34	2	
2	0925	863.9	.35	.54	81	80	98	155	34	4	
3	0928	865.1	.35	.54	81	80	98	169	34	4	
4	0931	866.0	.32	.49	86	86	102	200	34	4	
5	0934	867.0	.40	.64	88	88	97	205	34	5	
6	0937	868.4	.32	.49	88	90	104	210	34	4	
7	0940	869.4	.34	.52	88	90	97	205	34	4	
8	0943	870.7	.40	.62	94	95	99	205	34	5	
9	0946	871.9	.45	.71	94	95	96	205	34	5	
10	0949	873.9	.49	.78	94	95	95	205	34	5	
11	0952	874.6	.49	.78	94	95	99	205	34	5	
12	0955	876.5	.76	1.23	99	100	95	205	34	8	
13	0958	878.2	.62	1.0	99	102	94	205	34	6	
14	1001	879.8	.63	1.03	99	102	94	205	34	7	
15	1004	881.7	.80	1.3	103	105	95	209	34	8	
16	1007	883.3	1.0	1.62	104	106	96	209	34	10	
17	1010	885.3	1.0	1.62	104	106	96	205	34	10	
18	1013	886.0	1.0	1.62	106	107	95	205	34	10	
19	1016	889.0	1.2	1.96	107	109	98	170	34	11	
20	1019	891.5	1.2	1.96	107	109	98	171	34	12	
21	1022	893.0	1.2	1.96	106	108	100	171	34	12	
22	1025	895.7	1.2	1.96	107	107	95	170	34	12	
23	1028	897.7	1.1	1.80	108	110	97	171	34	12	
24	1031	899.519	1.1	1.80	108	110	96	171	34	12	

COMMENTS: 1. 1034

2. 37.81 °F

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16.

RUN NO. AM-3-4

DATE 2-15-89

CARRIER GAS ANALYSIS (ORSAT)

ANALYZED BY CES

ORSAT LEAK CHECKS

PRE-ANALYSIS								POST-ANALYSIS							
NO.	TIME START	TIME STOP	BURETTE LEVEL START	BURETTE LEVEL STOP	OK	BY	NO.	TIME START	TIME STOP	BURETTE LEVEL START	BURETTE LEVEL STOP	OK	BY
1	0928	0930	1.0	1.0			1						
2							2						
3							3						
4							4						

SAMPLE IDENTIFICATION	CO_2 READING 1	READING 2	O_2 (2-1)	READING 3	CO (3-2)
AM-OR-1	0	20.4	20.4		
	0	20.4	20.4		
	0	20.3	20.3		
	AVG.= 0		AVG.= 20.4		AVG.=
	AVG.=		AVG.=		AVG.=
	AVG.=		AVG.=		AVG.=
	AVG.=		AVG.=		AVG.=

WALDEMAR S. NELSON AND COMPANY
INCORPORATED

PARTICULATE EMISSION TEST
FIELD DATA FORM
(EPA METHOD 1,2,3,4,5,8,& 17)

CLIENT Amstar

FACILITY Arabi Plant

RUN NUMBER AM-3-5

WSNCO JOB NO. ____

SAMPLING LOCATION Dryer Outlet

SAMPLING DATE 2-15-89

TEST PERSONNEL

PROJECT CHIEF R. J. Acuna

TESTING ENGINEER 1 ____
2 ____

ENGR. TECHNICIAN 1 C. E. Settoon
2 ____

LAB TECHNICIAN 1 ____
2 ____

OTHER 1 ____
2 ____

RUN NO AM-3-5
DATE 2-15-89

SAMPLING TRAIN SPECIFICATIONS

RECORDED BY CES
ASSISTED BY

I. PROBE ASSEMBLY
A. PROBE LENGTH 4 1/2 FT.
B. LINER MATERIAL 316 SS
C. PITOT NUMBER 003
D. PITOT COEFFICIENT .84

II. MISC. COMPONENTS
A. NOZZLE DIAMETER .205 IN.
B. NOZZLE IDENT. NO. 1871
C. UMBILICAL LENGTH 50 FT.
D. FILTER HOLDER TYPE M-5 GLASS
E. FILTER NUMBER 89002

III IMPINGER CONTENT

NUMBER	TYPE*	NORMAL MATERIAL	NORMAL AMOUNT	USE MATERIAL	USE AMOUNT	FINAL AMOUNT	NET GAIN
1	M	DW	100ML	DW	545.6	553.9	8.3
2	GS	DW	100ML	DW	538.0	544.3	6.3
3	~~M~~	DRY	———	DRY	433.5	436.8	3.3
4	M	ADSORBENT**	~200GM.	SG	622.6	639.5	16.9

#4 CONTAINER WEIGHT = ______ GM.
WEIGHT WITH ADSORBENT= ______ GM.

TOTAL MOISTURE ADSORBED 34.8

* GS = GREENBURG-SMITH, M= MODIFIED, O= OTHER
** SG= SILICA GEL, D= DRIERITE, O= OTHER

IV CONTROL CONSOLE: ΔH@ (PRE-TEST) ______ ΔH@ (POST-TEST) ______
CONSOLE NO. ______ Y (PRE-TEST) ______ Y (POST-TEST) ______

	VELOCITY	TEMPERATURE	PRESSURE
SENSOR	☐ STANDARD ☒ "S" SHAPED	☒ THERMOCOUPLE (TYPE ____) ☐ OTHER ______	☒ STANDARD ☐ "S" SHAPED
READING DEVICE	☒ DI MANOMETER (0-1" IN. H_2O) ☐ HIGH SENSITIVITY (RANGE ___) ☐ OTHER ______	☒ PYROMETER (TYPE K) ☐ OTHER ______	☐ DI MANOMETER (0-5 IN. H_2O) ☐ HIGH SENSITIVITY (RANGE ___) ☒ OTHER U-TUBE

COMMENTS:

RUN NO. AM-3-5

DATE 2-15-84 STACK GEOMETRY RECORDED BY [illegible]

SKETCH OF FLOW PROFILE AND CROSS-SECTION
(ILLUSTRATE PORT-POINT CONFIGURATION, FLOW INTERFERENCES, ETC.)
NOTE: SAME AS RUN AM-4-4

FOR ROUND STACKS

A. DISTANCE FROM INSIDE FAR WALL TO OUTSIDE OF PORT ______ IN.

B. PORT LENGTH ______ IN.

STACK DIAMETER: (A-B) ______ IN.

STACK AREA: ______ $IN.^2$

FOR RECTANGULAR STACKS

A. DISTANCE FROM INSIDE FAR WALL TO OUTSIDE OF PORT ______ IN.

B. PORT LENGTH ______ IN.

STACK DEPTH: (A-B) ______ IN.

STACK WIDTH (INSIDE) ______ IN.

STACK AREA (DEPTH X WIDTH) ______ $IN.^2$

EQUIVALENT DIAMETER $\left(2\left[\frac{L \times W}{L + W}\right]\right)$ ______ IN.

SAMPLING CROSS-SECTION IS:

NO. OF DUCT DIAMETERS		TYPE OF FLOW OBSTRUCTION
______	DIAMETERS DOWNSTREAM OF	______
______	DIAMETERS UPSTREAM OF	______

NUMBER OF SAMPLING POINTS

MIN. REQ'D. (METHOD 1) ______

USE ______

RUN NO. AM-3-5
DATE 2-15-89

TRAVERSE POINTS

RECORDED BY [illegible]

PERCENT OF DIAMETER FROM INSIDE PORT TO POINT

NUMBER OF TRAVERSE POINTS ON A DIAMETER

POINT	2	4	6	8	10	12	14	16	18	20	22	24	DISTANCE FROM INSIDE PORT (IN.)	DISTANCE FROM OUTSIDE PORT (IN.)	USE (IN)
1	14.6	6.7	4.4	3.2	2.6	2.1	1.8	1.6	1.4	1.3	1.1	1.1			
2	85.4	25.0	14.6	10.5	8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2			
3		75.0	29.6	19.4	14.6	11.8	9.9	8.5	7.5	6.7	6.0	5.5			
4		93.3	70.4	32.3	22.6	17.7	14.6	12.5	10.9	9.7	8.7	7.9			
5			85.4	67.7	34.2	25.0	20.1	16.9	14.6	12.9	11.6	10.5			
6			95.6	80.6	65.8	35.6	26.9	22.0	18.8	16.5	14.6	13.2			
7				89.5	77.4	64.4	36.6	28.3	23.6	20.4	18.0	16.1			
8				96.8	85.4	75.0	63.4	37.5	29.6	25.0	21.8	19.4			
9					91.8	82.3	73.1	62.5	38.2	30.6	26.2	23.0			
10					97.4	88.2	79.9	71.7	61.8	38.8	31.5	27.2			
11						93.3	85.4	78.0	70.4	61.2	39.3	32.3			
12						97.9	90.1	83.1	76.4	69.4	60.7	39.8			
13							94.3	87.5	81.2	75.0	68.5	60.2			
14							98.2	91.5	85.4	79.6	73.8	67.7			
15								95.1	89.1	83.5	78.2	72.8			
16								98.4	92.5	87.1	82.0	77.0			
17									95.6	90.3	85.4	80.6			
18									98.6	93.3	88.4	83.9			
19										96.1	91.3	86.8			
20										98.7	94.0	89.5			
21											96.5	92.1			
22											98.9	94.5			
23												96.8			
24												98.9			

NOTE: SAME AS RUN NO. AM-4-4

COMMENTS:

RUN NO. AM-3-5
DATE 2-15-89

NOMOGRAPH DATA

RECORDED BY [signature]
CHECKED BY LES

NOTE: SAME AS RUN AM-4-4

TA	AMBIENT TEMPERATURE	=	°F
Pb	BAROMETRIC PRESSURE	=	IN. Hg.
ΔH @	REFERENCE ΔH	=	IN. H_2O
TM	AVG. METER TEMPERATURE	=	°F
% H_2O	MOISTURE CONTENT	=	% BY VOL.
Po	STATIC (GUAGE) PRESSURE IN STACK	=	IN. H_2O
	x 0.074	=	IN. Hg.
PS	ABSOLUTE PRESSURE IN STACK, Pb - Po	=	IN. Hg.
PM	METER PRESSURE (~Pb)	=	IN. Hg.
PS/PM	=		
C	CORRECTION FACTOR	=	
TS	STACK TEMPERATURE	=	°F
ΔP	AVERAGE STACK VELOCITY HEAD	=	IN. H_2O
ΔPMAX.	MAXIMUM STACK VELOCITY HEAD	=	IN. H_2O
D	PROBE TIP DIAMETER	=	IN.

Req'd Sampling Rate or Volume ______ Calculated Sampling Rate or Volume (Pre-test) ______

TS					
ΔPREF					

PITOT LEAK CHECKS*				
OPENING	PRE-TEST	BY	POST-TEST	BY
IMPACT	☑ STABLE ☐ LEAKING	[signature]	☑ STABLE ☐ LEAKING	[signature]
STATIC	☑ STABLE ☐ LEAKING	[signature]	☑ STABLE ☐ LEAKING	[signature]

* Vacuum must remain stable for 15 seconds @ 3 in. H_2O.

SAMPLING TRAIN LEAK CHECKS		
LEAK CHECKS*	PRE-TEST	POST-TEST
RATE OF LEAK (CFM)	0.0 CFM @ 10" Hg	0.0 CFM @ 10" Hg
TIME (24 HOUR CLOCK)	1232	1351
BY	[signature]	[signature]

*Rates ≤ 0.02 CFM @ 15 in. Hg. vacuum or 4% of average sampling rate (whichever is less) are acceptable.

RUN NO. AM-3-5 | PARTICULATE SAMPLING | RECORDED BY [illegible]

DATE 2-15-89 | ASSISTED BY [illegible]

SAMPLING TIME PER POINT 3 MIN.

PORT POINT	CLOCK TIME	METER VOLUME (DCF)	Δ P VEL. HEAD (IN. H_2O)	Δ H ORIFICE (IN. H_2O)	METER TEMP. IN (°F)	METER TEMP. OUT (°F)	STACK TEMP. (°F)	BOX TEMP. (°F)	BATH TEMP. (°F)	TRAIN VACUUM (IN. Hg)	COMMENT NUMBER
A-1	1236	~~899.837~~ 901.7	.4.3	.68	96	97	106	170	34	3	
2	1234	902.4	.37	.57	97	97	118	171	34	3	
3	1242	903.8	.35	.54	97	97	97	171	34	2	
4	1245	904.7	.35	.54	97	98	97	171	34	2	
5	1248	905.8	.35	.54	94	96	97	175	34	2	
6	1251	907.1	.35	.54	99	101	95	175	34	2	
7	1254	908.2	.35	.54	99	102	95	179	34	2	
8	1257	909.4	.37	.57	101	103	95	179	34	3	
9	1300	910.6	.37	.57	103	104	100	179	34	3	
10	1303	911.8	.37	.57	103	104	100	178	34	3	
11	1306	913.3	.40	.62	102	104	97	179	34	3	
12	1309	914.5	.40	.62	102	104	97	179	34	3	
13	1312	915.0	.49	.78	103	104	97	179	34	3	
14	1315	917.2	.50	.79	103	105	97	179	34	3	
15	1318	919.2	.90	1.46	103	104	95	179	34	5	
16	1321	921.1	.90	1.46	103	104	100	179	34	5	
17	1324	923.1	.95	1.55	103	104	100	179	34	5	
18	1327	925.1	1.00	1.62	105	109	96	181	34	5	
19	1330	926.4	1.00	1.62	106	110	96	181	34	5	
20	1333	928.0	1.20	1.96	112	114	92	190	34	5	
21	1336	930.6	1.25	2.0	113	114	94	190	34	5	
22	1339	932.9	1.3	2.1	113	114	94	190	34	7	
23	1342	934.9	1.2	1.96	113	114	99	190	34	7	
24	1345	936.944	1.2	1.96	112	114	103	190	34	7	

COMMENTS: 1. 1348 STOP

2. 37.112

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RUN NO. AM-3-5 | CARRIER GAS ANALYSIS (ORSAT) | DATE 2-15-89 | ANALYZED BY CES

ORSAT LEAK CHECKS

PRE-ANALYSIS					POST-ANALYSIS				
NO.	TIME START / STOP	BURETTE LEVEL START / STOP	OK	BY	NO.	TIME START / STOP	BURETTE LEVEL START / STOP	OK	BY
1					1				
2					2				
3					3				
4					4				

SAMPLE IDENTIFICATION	CO_2 READING 1	READING 2	O_2 (2-1)	READING 3	CO (3-2)
	AVG.=		AVG.=		AVG.=
	AVG.=		AVG.=		AVG.=
	AVG.=		AVG.=		AVG.=
	AVG.=		AVG.=		AVG.=

WALDEMAR S. NELSON AND COMPANY
INCORPORATED

PARTICULATE EMISSION TEST
FIELD DATA FORM
(EPA METHOD 1,2,3,4,5,8,& 17)

CLIENT AMSTAR

FACILITY Arabi Plant

RUN NUMBER AM-3-6

WSNCO JOB NO. ______

SAMPLING LOCATION Dryer Outlet

SAMPLING DATE 2-15-89

TEST PERSONNEL

PROJECT CHIEF R.J. Aaron

TESTING ENGINEER 1 ______
2 ______

ENGR. TECHNICIAN 1 C.E. SETTOON
2 ______

LAB TECHNICIAN 1 ______
2 ______

OTHER 1 ______
2 ______

RUN NO AM-3-6
DATE 2-15-89

SAMPLING TRAIN SPECIFICATIONS

RECORDED BY CES
ASSISTED BY

I. PROBE ASSEMBLY
A. PROBE LENGTH 4 1/2 FT.
B. LINER MATERIAL 316 SS
C. PITOT NUMBER 003
D. PITOT COEFFICIENT .84

II. MISC. COMPONENTS
A. NOZZLE DIAMETER .205 IN.
B. NOZZLE IDENT. NO. 1671
C. UMBILICAL LENGTH 50 FT.
D. FILTER HOLDER TYPE M-5 GLASS
E. FILTER NUMBER 85003

III. IMPINGER CONTENT

NUMBER	TYPE*	NORMAL MATERIAL	NORMAL AMOUNT	USE MATERIAL	USE AMOUNT	FINAL AMOUNT	NET GAIN
1	M	DW	100ML	DW	505.6	606.3	100.7
2	GS	DW	100ML	DW	516.5	492.8	-23.7
3	M	DRY	———	DRY	435.6	435.4	-0.2
4	S	ADSORBENT**	~200GM.	SG	630.5	630.0	-0.5

#4 CONTAINER WEIGHT = ______ GM.
WEIGHT WITH ADSORBENT = ______ GM.
TOTAL MOISTURE ADSORBED 76.3

* GS = GREENBURG-SMITH, M = MODIFIED, O = OTHER ______
** SG = SILICA GEL, D = DRIERITE, O = OTHER ______

IV. CONTROL CONSOLE: $\Delta H@$ (PRE-TEST) ______ $\Delta H@$ (POST-TEST) ______
Y (PRE-TEST) ______ Y (POST-TEST) ______

CONSOLE NO. ______

	VELOCITY	TEMPERATURE	PRESSURE
SENSOR	☒ STANDARD ☐ "S" SHAPED	☒ THERMOCOUPLE (TYPE ____) ☐ OTHER ______	☒ STANDARD ☐ "S" SHAPED
READING DEVICE	☒ DI MANOMETER (0-5IN. H_2O) 0-10 ☐ HIGH SENSITIVITY (RANGE ___) ☐ OTHER ______	☒ PYROMETER (TYPE K) ☐ OTHER ______	☐ DI MANOMETER (0-5 IN. H_2O) ☐ HIGH SENTIVITY (RANGE ___) ☒ OTHER U-Tube

COMMENTS: ______

RUN NO. AM-3-6

DATE 2-15-89 STACK GEOMETRY RECORDED BY [illegible]

SKETCH OF FLOW PROFILE AND CROSS-SECTION
(ILLUSTRATE PORT-POINT CONFIGURATION, FLOW INTERFERENCES, ETC.)
NOTE: SAME AS RUN AM-2-A

FOR ROUND STACKS

A. DISTANCE FROM INSIDE FAR WALL TO OUTSIDE OF PORT ______ IN.

B. PORT LENGTH ______ IN.

STACK DIAMETER: (A-B) ______ IN.

STACK AREA: ______ $IN.^2$

FOR RECTANGULAR STACKS

A. DISTANCE FROM INSIDE FAR WALL TO OUTSIDE OF PORT ______ IN.

B. PORT LENGTH ______ IN.

STACK DEPTH: (A-B) ______ IN.

STACK WIDTH (INSIDE) ______ IN.

STACK AREA (DEPTH X WIDTH) ______ $IN.^2$

EQUIVALENT DIAMETER $\left(2\left[\frac{L \times W}{L + W}\right]\right)$ ______ IN.

SAMPLING CROSS-SECTION IS:

NO. OF DUCT DIAMETERS		TYPE OF FLOW OBSTRUCTION	NUMBER OF SAMPLING POINTS
______	DIAMETERS DOWNSTREAM OF	______	MIN. REQ'D. (METHOD 1) ______
______	DIAMETERS UPSTREAM OF	______	USE ______

RUN NO. AM-A-6

DATE 2-15-84

TRAVERSE POINTS

RECORDED BY [illegible]

POINT	PERCENT OF DIAMETER FROM INSIDE PORT TO POINT — NUMBER OF TRAVERSE POINTS ON A DIAMETER: 2	4	6	8	10	12	14	16	18	20	22	24	DISTANCE FROM INSIDE PORT (IN.)	DISTANCE FROM OUTSIDE PORT (IN.)	USE (IN.)
1	14.6	6.7	4.4	3.2	2.6	2.1	1.8	1.6	1.4	1.3	1.1	1.1			
2	85.4	25.0	14.6	10.5	8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2			
3		75.0	29.6	19.4	14.6	11.8	9.9	8.5	7.5	6.7	6.0	5.5			
4		93.3	70.4	32.3	22.6	17.7	14.6	12.5	10.9	9.7	8.7	7.9			
5			85.4	67.7	34.2	25.0	20.1	16.9	14.6	12.9	11.6	10.5			
6			95.6	80.6	65.8	35.6	26.9	22.0	18.8	16.5	14.6	13.2			
7				89.5	77.4	64.4	36.6	28.3	23.6	20.4	18.0	16.1			
8				96.8	85.4	75.0	63.4	37.5	29.6	25.0	21.8	19.4			
9					91.8	82.3	73.1	62.5	38.2	30.6	26.2	23.0			
10					97.4	88.2	79.9	71.7	61.8	38.8	31.5	27.2			
11						93.3	85.4	78.0	70.4	61.2	39.3	32.3			
12						97.9	90.1	83.1	76.4	69.4	60.7	39.8			
13							94.3	87.5	81.2	75.0	68.5	60.2			
14							98.2	91.5	85.4	79.6	73.8	67.7			
15								95.1	89.1	83.5	78.2	72.8			
16								98.4	92.5	87.1	82.0	77.0			
17									95.6	90.3	85.4	80.6			
18									98.6	93.3	88.4	83.9			
19										96.1	91.3	86.8			
20										98.7	94.0	89.5			
21											96.5	92.1			
22											98.9	94.5			
23												96.8			
24												98.9			

NOTE: SAME AS RUN NO. AM-A-4

COMMENTS:

RUN NO. AM-3-6
DATE 2-15-86

NOMOGRAPH DATA

RECORDED BY [signature]
CHECKED BY [signature]

NOTE: SAME AS RUN AM-4-4

TA	AMBIENT TEMPERATURE	=	°F
Pb	BAROMETRIC PRESSURE	=	IN. Hg.
ΔH @	REFERENCE ΔH	=	IN. H_2O
TM	AVG. METER TEMPERATURE	=	°F
% H_2O	MOISTURE CONTENT	=	% BY VOL.
Po	STATIC (GUAGE) PRESSURE IN STACK	=	IN. H_2O
	x 0.074	=	IN. Hg.
PS	ABSOLUTE PRESSURE IN STACK, Pb - Po	=	IN. Hg.
PM	METER PRESSURE (~Pb)	=	IN. Hg.
PS/PM	=		
C	CORRECTION FACTOR	=	
TS	STACK TEMPERATURE	=	°F
ΔP	AVERAGE STACK VELOCITY HEAD	=	IN. H_2O
ΔPMAX.	MAXIMUM STACK VELOCITY HEAD	=	IN. H_2O
D	PROBE TIP DIAMETER	=	IN.

Req'd Sampling Rate or Volume ______ Calculated Sampling Rate or Volume (Pre-test) ______

TS					
ΔPREF					

PITOT LEAK CHECKS*				
OPENING	PRE-TEST	BY	POST-TEST	BY
IMPACT	☑ STABLE ☐ LEAKING	[signature]	☐ STABLE ☐ LEAKING	[signature]
STATIC	☑ STABLE ☐ LEAKING	[signature]	☐ STABLE ☐ LEAKING	[signature]

* Vacuum must remain stable for 15 seconds @ 3 in. H_2O.

SAMPLING TRAIN LEAK CHECKS		
LEAK CHECKS*	PRE-TEST	POST-TEST
RATE OF LEAK (CFM)	0.0 CFM @ 10" Hg	0.0 CFM @ 10" Hg
TIME (24 HOUR CLOCK)	1457	1402
BY	[signature]	[signature]

*Rates ≤ 0.02 CFM @15in. Hg. vacuum or 4% of average sampling rate (whichever is less) are acceptable.

RUN NO. 2-15-89 **PARTICULATE SAMPLING** RECORDED BY [illegible]

DATE 2-15-89 ASSISTED BY CFS

SAMPLING TIME PER POINT 3 MIN.

PORT POINT	CLOCK TIME	METER VOLUME (DCF)	Δ P VEL. HEAD (IN. H_2O)	Δ H ORIFICE (IN. H_2O)	METER TEMP. IN (°F)	METER TEMP. OUT (°F)	STACK TEMP. (°F)	BOX TEMP. (°F)	BATH TEMP. (°F)	TRAIN VACUUM (IN. Hg)	COMMENT NUMBER
A-1	1444	~~937.844~~ 939.0	.45	.71	107	109	100	100	34	3	
2	1448	940.0	.39	.60	107	108	102	120	34	3	
3	1450	941.8	.40	.62	107	108	89	130	34	3	
4	1453	943.2	.39	.60	107	108	95	130	34	3	
5	1456	944.2	.35	.54	107	108	98	140	34	3	
6	1454	945.4	.32	.49	107	108	97	145	34	3	
7	1502	946.5	.30	.46	107	109	93	145	34	2	
8	1505	947.6	.30	.46	107	108	95	155	34	2	
9	1509	948.8	.30	.46	107	108	95	155	34	2	
10	1511	950.1	.35	.54	107	109	96	160	34	3	
11	1514	951.2	.35	.54	108	109	95	160	34	3	
12	1517	952.5	.41	.64	110	113	94	165	34	3	
13	1520	954.0	.45	.71	111	113	95	170	34	3	
14	1523	955.9	.86	1.39	113	115	95	170	34	5	
15	1526	957.6	.92	1.49	113	114	97	170	34	5	
16	1529	959.6	1.0	1.62	113	114	97	170	34	5	
17	1532	961.7	1.05	1.07	114	115	94	170	34	6	
18	1535	964.0	1.3	2.1	114	115	96	170	34	8	
19	1538	966.4	1.3	2.1	114	115	95	170	34	8	
20	1541	968.6	1.3	2.1	115	116	97	170	34	9	
21	1544	970.7	1.3	2.1	115	116	97	170	34	8	
22	1547	973.2	1.3	2.1	114	116	98	170	34	8	
23	1550	974.1	1.2	1.96	114	116	98	170	34	7	
24	1553	975.991	1.2	1.96	114	116	95	170	34	7	

COMMENTS: 1. 1556 STOP

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WALDEMAR S. NELSON AND COMPANY
INCORPORATED

PARTICULATE EMISSION TEST
FIELD DATA FORM
(EPA METHOD 1,2,3,4,5,8,& 17)

CLIENT Amstar
FACILITY Arabi Plant
RUN NUMBER AM-4-4

WSNCO JOB NO. ______
SAMPLING LOCATION Dryer Outlet
SAMPLING DATE 2-15-89

TEST PERSONNEL

PROJECT CHIEF R. J. Aevum

TESTING ENGINEER 1 ______
2 ______

ENGR. TECHNICIAN 1 C. E. Settoon
2 ______

LAB TECHNICIAN 1 ______
2 ______

OTHER 1 ______
2 ______

RUN NO. AM-3-6
DATE 2-15-89

CARRIER GAS ANALYSIS (ORSAT)

ANALYZED BY CES

ORSAT LEAK CHECKS									
PRE-ANALYSIS					POST-ANALYSIS				
NO.	TIME START / STOP	BURETTE LEVEL START / STOP	OK	BY	NO.	TIME START / STOP	BURETTE LEVEL START / STOP	OK	BY
1					1				
2					2				
3					3				
4					4				

SAMPLE IDENTIFICATION	CO_2 READING 1	READING 2	O_2 (2-1)	READING 3	CO (3-2)
An-or-2	0	20.4	20.4		
	0	20.3	20.3		
	0	20.3	20.3		
	AVG.= 0		AVG.= 20.3		AVG.=
	AVG.=		AVG.=		AVG.=
	AVG.=		AVG.=		AVG.=
	AVG.=		AVG.=		AVG.=

RUN NO AM-4-4
DATE 2-16-89

SAMPLING TRAIN SPECIFICATIONS

RECORDED BY CES
ASSISTED BY RJA

I. PROBE ASSEMBLY
A. PROBE LENGTH 4 1/2 FT.
B. LINER MATERIAL 316 SS
C. PITOT NUMBER 003
D. PITOT COEFFICIENT .84

II. MISC. COMPONENTS
A. NOZZLE DIAMETER .205 IN.
B. NOZZLE IDENT. NO. 1871
C. UMBILICAL LENGTH 50 FT.
D. FILTER HOLDER TYPE H-S GLASS
E. FILTER NUMBER 89004

III. IMPINGER CONTENT

NUMBER	TYPE*	NORMAL MATERIAL	NORMAL AMOUNT	USE MATERIAL	USE AMOUNT	FINAL AMOUNT	NET GAIN
1	M	DW	100ML	DW	545.6	572.5	26.9
2	GS	DW	100ML	DW	549.9	556.7	6.8
3	M	DRY	———	DRY	424.9	426.5	1.6
4	M	ADSORBENT**	~200GM.	SG	657.8	664.4	6.6

#4 CONTAINER WEIGHT = ______ GM.
WEIGHT WITH ADSORBENT = ______ GM.
TOTAL MOISTURE ADSORBED 41.9

* GS = GREENBURG-SMITH, M = MODIFIED, O = OTHER ______
** SG = SILICA GEL, D = DRIERITE, O = OTHER ______

IV. CONTROL CONSOLE: ΔH@ (PRE-TEST) ______ ΔH@ (POST-TEST) ______
Y (PRE-TEST) ______ Y (POST-TEST) ______

CONSOLE NO. ______

	VELOCITY	TEMPERATURE	PRESSURE
SENSOR	☒ STANDARD ☐ "S" SHAPED	☒ THERMOCOUPLE (TYPE ____) ☐ OTHER ______	☒ STANDARD ☐ "S" SHAPED
READING DEVICE	☒ DI MANOMETER (~~0-5~~ 0-10 IN. H_2O) ☐ HIGH SENSITIVITY (RANGE ____) ☐ OTHER ______	☒ PYROMETER (TYPE K) ☐ OTHER ______	☐ DI MANOMETER (0-5 IN. H_2O) ☐ HIGH SENTIVITY (RANGE ____) ☒ OTHER U-TUBE

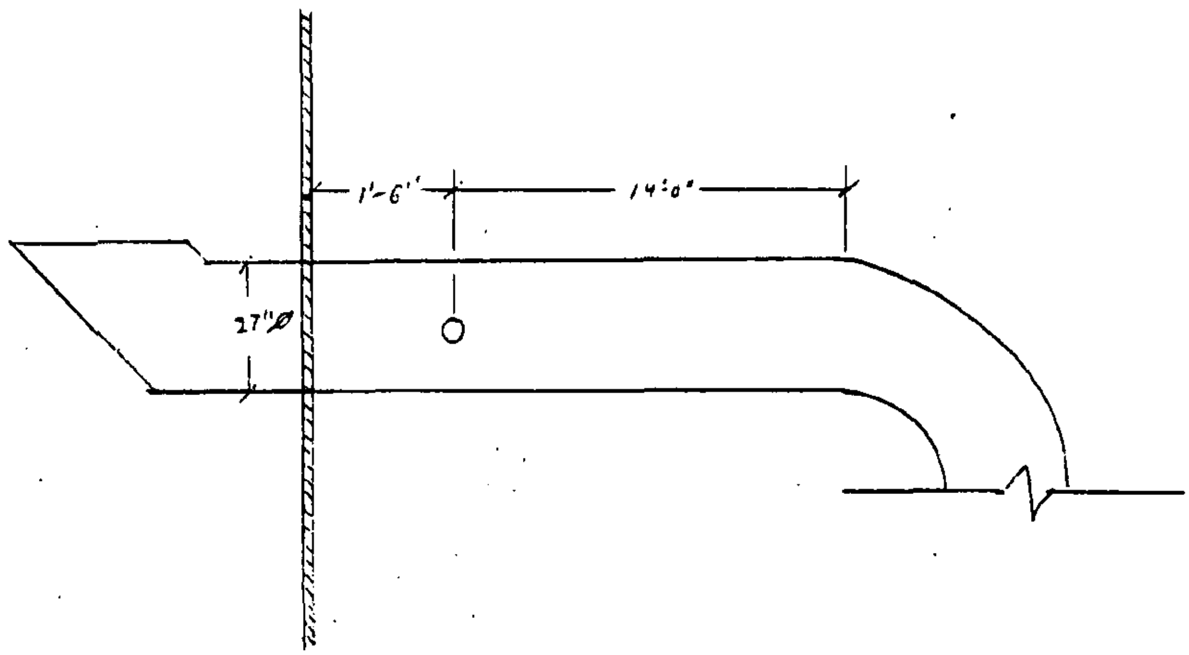
COMMENTS: ______

WSNCO FORM NO. ST008

RUN NO. AH-4-1

DATE 2/10/84 **STACK GEOMETRY** RECORDED BY [illegible]

SKETCH OF FLOW PROFILE AND CROSS-SECTION
(ILLUSTRATE PORT-POINT CONFIGURATION, FLOW INTERFERENCES, ETC.)
NOTE: SAME AS RUN ______



FOR ROUND STACKS

A. DISTANCE FROM INSIDE FAR WALL TO OUTSIDE OF PORT 30 IN.
B. PORT LENGTH 3 IN.
STACK DIAMETER:(A-B) 27 IN.
STACK AREA: 572.56 IN^2

FOR RECTANGULAR STACKS

A. DISTANCE FROM INSIDE FAR WALL TO OUTSIDE OF PORT ______ IN.
B. PORT LENGTH ______ IN.
STACK DEPTH: (A-B) ______ IN.
STACK WIDTH (INSIDE) ______ IN.
STACK AREA (DEPTH X WIDTH) ______ IN^2
EQUIVALENT DIAMETER $\left(2\left[\frac{L \times W}{L + W}\right]\right)$ ______ IN.

SAMPLING CROSS-SECTION IS:

NO. OF DUCT DIAMETERS		TYPE OF FLOW OBSTRUCTION	NUMBER OF SAMPLING POINTS
6.2	DIAMETERS DOWNSTREAM OF	ELBOW	MIN. REQ'D. (METHOD 1) ______
1.3	DIAMETERS UPSTREAM OF	END OF STACK	USE ______

RUN NO. AM-4-A

DATE 2-16-84

TRAVERSE POINTS

RECORDED BY [illegible]

POINT	PERCENT OF DIAMETER FROM INSIDE PORT TO POINT — NUMBER OF TRAVERSE POINTS ON A DIAMETER: 2	4	6	8	10	12	14	16	18	20	22	24	DISTANCE FROM INSIDE PORT (IN.)	DISTANCE FROM OUTSIDE PORT (IN.)	USE (IN.)
1	14.6	6.7	4.4	3.2	2.6	2.1	1.8	1.6	1.4	1.3	1.1	1.1	.27	3.27	3.50
2	85.4	25.0	14.6	10.5	8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2	.86	3.86	3.75
3		75.0	29.6	19.4	14.6	11.8	9.9	8.5	7.5	6.7	6.0	5.5	1.49	4.49	4.50
4		93.3	70.4	32.3	22.6	17.7	14.6	12.5	10.9	9.7	8.7	7.9	2.13	5.13	5.25
5			85.4	67.7	34.2	25.0	20.1	16.9	14.6	12.9	11.6	10.5	2.84	5.84	5.75
6			95.6	80.6	65.8	35.6	26.9	22.0	18.8	16.5	14.6	13.2	3.56	6.56	6.50
7				89.5	77.4	64.4	36.6	28.3	23.6	20.4	18.0	16.1	4.35	7.35	7.25
8				96.8	85.4	75.0	63.4	37.5	29.6	25.0	21.8	19.4	5.24	8.24	8.25
9					91.8	82.3	73.1	62.5	38.2	30.6	26.2	23.0	6.21	9.21	9.25
10					97.4	88.2	79.9	71.7	61.8	38.8	31.5	27.2	7.29	10.29	10.25
11						93.3	85.4	78.0	70.4	61.2	39.3	32.3	8.72	11.72	11.75
12						97.9	90.1	83.1	76.4	69.4	60.7	39.8	10.75	13.75	13.75
13							94.3	87.5	81.2	75.0	68.5	60.2	16.25	19.25	19.25
14							98.2	91.5	85.4	79.6	73.8	67.7	18.28	21.28	21.25
15								95.1	89.1	83.5	78.2	72.8	19.66	22.66	22.75
16								98.4	92.5	87.1	82.0	77.0	20.79	23.79	23.75
17									95.6	90.3	85.4	80.6	21.76	24.76	23.75
18									98.6	93.3	88.4	83.9	22.65	25.65	25.75
19										96.1	91.3	86.8	23.44	26.44	26.50
20										98.7	94.0	89.5	24.17	27.17	27.25
21											96.5	92.1	24.87	27.87	27.75
22											98.9	94.5	25.52	28.52	28.50
23												96.8	26.14	29.14	29.25
24												98.9	26.7	29.70	29.50

NOTE: SAME AS RUN NO. ______

COMMENTS: ______

RUN NO. AM-A-4
DATE 2-16-89

NOMOGRAPH DATA

RECORDED BY [signature]
CHECKED BY CBS

NOTE: SAME AS RUN ______

TA	AMBIENT TEMPERATURE	= 70 °F
Pb	BAROMETRIC PRESSURE	= 30.31 IN. Hg.
$\Delta H_@$	REFERENCE ΔH	= 1.76 IN. H_2O
TM	AVG. METER TEMPERATURE	= ______ °F
% H_2O	MOISTURE CONTENT	= ~6 % BY VOL.
Po	STATIC (GUAGE) PRESSURE IN STACK	= .297 IN. H_2O
	x 0.074	= .022 IN. Hg.
PS	ABSOLUTE PRESSURE IN STACK, Pb - Po	= 30.29 IN. Hg.
PM	METER PRESSURE (~Pb)	= ______ IN. Hg.
PS/PM	= ______	
C	CORRECTION FACTOR	= .987
TS	STACK TEMPERATURE	= 100 °F
ΔP	AVERAGE STACK VELOCITY HEAD	= .76 IN. H_2O
ΔPMAX.	MAXIMUM STACK VELOCITY HEAD	= .65 IN. H_2O
D	PROBE TIP DIAMETER	= .205 IN.

Req'd Sampling Rate or Volume ______. Calculated Sampling Rate or Volume (Pre-test) ______.

TS					
ΔPREF					

PITOT LEAK CHECKS*				
OPENING	PRE-TEST	BY	POST-TEST	BY
IMPACT	☑ STABLE ☐ LEAKING	[signature]	☑ STABLE ☐ LEAKING	[signature]
STATIC	☑ STABLE ☐ LEAKING	[signature]	☑ STABLE ☐ LEAKING	[signature]

* Vacuum must remain stable for 15 seconds @ 3 in. H_2O.

SAMPLING TRAIN LEAK CHECKS		
LEAK CHECKS*	PRE-TEST	POST-TEST
RATE OF LEAK (CFM)	0.0 CFM @ 10" Hg	.005 CFM @ 10" Hg
TIME (24 HOUR CLOCK)	0814	0931
BY	[signature]	[signature]

*Rates ≤ 0.02 CFM @ 15 in. Hg. vacuum or 4% of average sampling rate (whichever is less) are acceptable.

RUN NO. AM-A-4 PARTICULATE SAMPLING RECORDED BY [illegible]

DATE 2-16-89 ASSISTED BY CB

SAMPLING TIME PER POINT 3 MIN.

PORT POINT	CLOCK TIME	METER VOLUME (DCF)	ΔP VEL. HEAD (IN. H_2O)	ΔH ORIFICE (IN. H_2O)	METER TEMP. IN (°F)	METER TEMP. OUT (°F)	STACK TEMP. (°F)	BOX TEMP. (°F)	BATH TEMP. (°F)	TRAIN VACUUM (IN. Hg)	COMMENT NUMBER
A-1	0826	~~978.0~~ 977.692	.41	.69	75	76	100	175	34	4	
2	0829	979.7	.16	.12	73	76	96	175	34	1	
3	0832	980.5	.24	.36	73	70	96	175	34	3	
4	0835	981.4	.28	.42	74	76	94	178	34	3	
5	0838	982.2	.20	.28	77	78	98	178	34	3	
6	0841	983.0	.20	.28	77	78	98	178	34	2	
7	0844	984.1	.30	.46	80	82	96	178	34	4	
8	0847	985.6	.30	.46	82	84	94	178	34	3	
9	0850	987.0	.28	.42	84	86	95	160	34	3	
10	0853	987.8	.37	.57	86	88	94	165	34	4	
11	0856	988.9	.40	.62	87	89	96	165	37	4	
12	0859	990.2	.47	.74	88	90	97	165	34	4	
13	0902	991.8	.43	.68	89	91	96	170	34	5	
14	0905	[illegible]	.68	1.16	91	93	95	170	34	7	
15	0908	994.5	.70	1.14	91	93	96	170	34	7	
16	[illegible]	996.1	.63	1.1	91	93	96	170	34	6	
17	0914	998.2	1.29	2.0	91	93	94	170	34	11	
18	0917	000.2	1.2	1.96	91	94	94	170	34	12	
19	0920	002.7	1.2	1.96	96	97	96	175	34	12	
20	0923	004.7	1.3	2.1	96	97	96	175	34	15	
21	0926	006.7	1.3	2.1	97	97	95	175	34	13	
22	0929	009.0	1.3	2.1	97	98	96	175	34	13	
23	0932	011.2	1.2	1.96	97	98	96	175	34	12	
24	0935	013.159	1.2	1.96	97	98	96	175	34	12	

COMMENTS: 1. 0938

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WSNCO FORM NO. ST008

RUN NO. AM-4-4 CARRIER GAS
DATE 2-16-89 ANALYSIS (ORSAT) ANALYZED BY CES

ORSAT LEAK CHECKS									
PRE-ANALYSIS					POST-ANALYSIS				
NO.	TIME START / STOP	BURETTE LEVEL START / STOP	OK	BY	NO.	TIME START / STOP	BURETTE LEVEL START / STOP	OK	BY
1					1				
2					2				
3					3				
4					4				

SAMPLE IDENTIFICATION	CO_2 READING 1	READING 2	O_2 (2-1)	READING 3	CO (3-2)
AM-OP-8	.1	20.8	20.7		
	.1	20.1	20.0		
	.1	21.0	20.9		
	AVG = .1		AVG = 20.5		AVG =
	AVG =		AVG =		AVG =
	AVG =		AVG =		AVG =
	AVG =		AVG =		AVG =

WALDEMAR S. NELSON AND COMPANY
INCORPORATED

PARTICULATE EMISSION TEST
FIELD DATA FORM
(EPA METHOD 1,2,3,4,5,8, & 17)

CLIENT Amstar
FACILITY Arabi Plant
RUN NUMBER AM-4-5

WSNCO JOB NO. 89029
SAMPLING LOCATION Dryer Outlet
SAMPLING DATE 2-16-89

TEST PERSONNEL

PROJECT CHIEF R. J. Acuna

TESTING ENGINEER 1 ______
2 ______

ENGR. TECHNICIAN 1 C. E. Settoon
2 ______

LAB TECHNICIAN 1 ______
2 ______

OTHER 1 ______
2 ______

RUN NO AM- 4- 5 | DATE 2-16-89

SAMPLING TRAIN SPECIFICATIONS

RECORDED BY CES
ASSISTED BY ______

I. PROBE ASSEMBLY

A. PROBE LENGTH 4 1/2 FT.
B. LINER MATERIAL 316 SS
C. PITOT NUMBER 003
D. PITOT COEFFICIENT .84

II. MISC. COMPONENTS

A. NOZZLE DIAMETER .1871 IN.
B. NOZZLE IDENT. NO. .205
C. UMBILICAL LENGTH 50 FT.
D. FILTER HOLDER TYPE M-5 Glass
E. FILTER NUMBER 89005

III IMPINGER CONTENT

NUMBER	TYPE*	NORMAL MATERIAL	NORMAL AMOUNT	USE MATERIAL	USE AMOUNT	FINAL AMOUNT	NET GAIN
1	M	DW	100ML	DW	525.9	575.1	49.2
2	GS	DW	100ML	DW	538.8	522.1	-16.7
3	M	DRY	———	DRY	436.7	438.1	1.4
4	M	ADSORBENT**	~200GM.	DW	639.0	645.4	6.4

#4 CONTAINER WEIGHT = ______ GM.
WEIGHT WITH ADSORBENT = ______ GM.

TOTAL MOISTURE ADSORBED 40.3

* GS = GREENBURG-SMITH, M= MODIFIED, O= OTHER ______
** SG= SILICA GEL, D=DRIERITE, O= OTHER ______

IV CONTROL CONSOLE: $\Delta H@$ (PRE-TEST) ______ $\Delta H@$ (POST-TEST) ______

Y (PRE-TEST) ______ Y(POST-TEST) ______

CONSOLE NO. ______

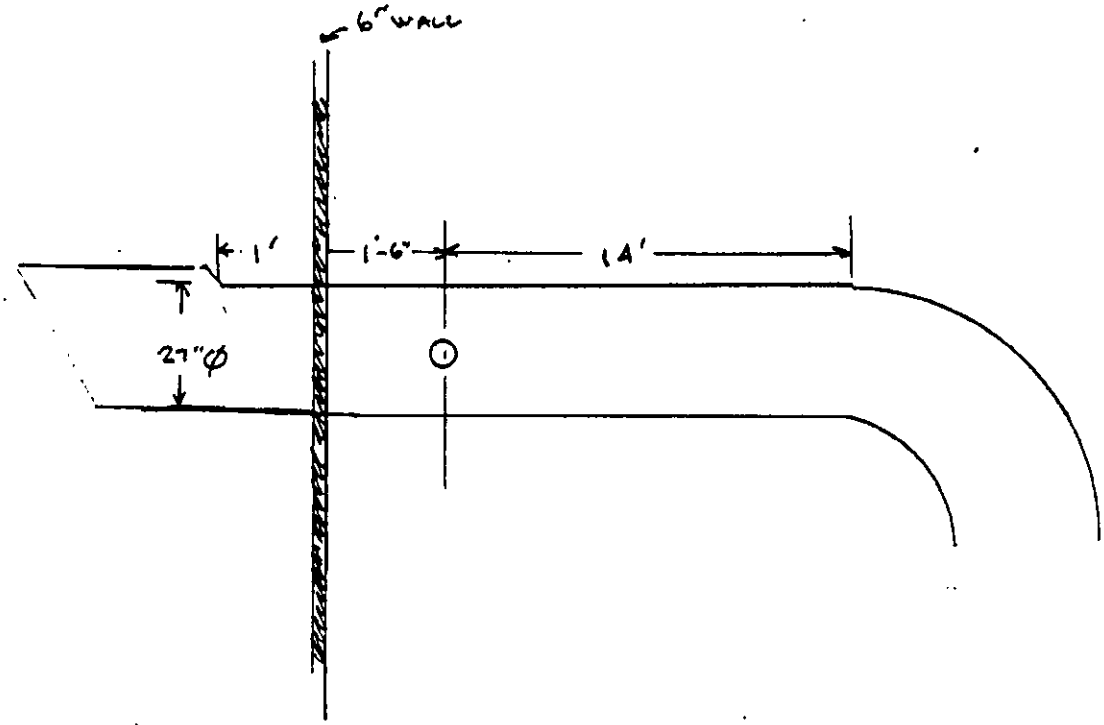
	VELOCITY	TEMPERATURE	PRESSURE
SENSOR	☒ STANDARD ☐ "S" SHAPED	☒ THERMOCOUPLE (TYPE ____) ☐ OTHER ______	☒ STANDARD ☐ "S" SHAPED
READING DEVICE	☒ DI MANOMETER (0-10 IN. H_2O) ☐ HIGH SENSITIVITY (RANGE ___) ☐ OTHER ______	☒ PYROMETER (TYPE K) ☐ OTHER ______	☐ DI MANOMETER (0-5 IN. H_2O) ☒ HIGH SENSITIVITY (RANGE ___) ☒ OTHER U-Tube

COMMENTS: ______

RUN NO. 1M-4-5

DATE 2-16-89 **STACK GEOMETRY** RECORDED BY [illegible]

SKETCH OF FLOW PROFILE AND CROSS-SECTION
(ILLUSTRATE PORT-POINT CONFIGURATION, FLOW INTERFERENCES, ETC.)
NOTE: SAME AS RUN ______



FOR ROUND STACKS		
A. DISTANCE FROM INSIDE FAR WALL TO OUTSIDE OF PORT	30	IN.
B. PORT LENGTH	3	IN.
STACK DIAMETER: (A-B)	27	IN.
STACK AREA:	572.56	IN.^{2}

FOR RECTANGULAR STACKS		
A. DISTANCE FROM INSIDE FAR WALL TO OUTSIDE OF PORT		IN.
B. PORT LENGTH		IN.
STACK DEPTH: (A-B)		IN.
STACK WIDTH (INSIDE)		IN.
STACK AREA (DEPTH X WIDTH)		IN.^{2}
EQUIVALENT DIAMETER $\left(2\left[\frac{L \times W}{L + W}\right]\right)$		IN.

SAMPLING CROSS-SECTION IS:

NO. OF DUCT DIAMETERS		TYPE OF FLOW OBSTRUCTION
6.2	DIAMETERS DOWNSTREAM OF	ELBOW
1.3	DIAMETERS UPSTREAM OF	END of STACK

NUMBER OF SAMPLING POINTS

MIN. REQ'D. (METHOD 1) ______

USE ______

RUN NO. AM-4-89
DATE 2-16-89

TRAVERSE POINTS

RECORDED BY [illegible]

POINT	PERCENT OF DIAMETER FROM INSIDE PORT TO POINT — NUMBER OF TRAVERSE POINTS ON A DIAMETER: 2	4	6	8	10	12	14	16	18	20	22	24 ☒	DISTANCE FROM INSIDE PORT (IN.)	DISTANCE FROM OUTSIDE PORT (IN.)	USE (IN.)
1	14.6	6.7	4.4	3.2	2.6	2.1	1.8	1.6	1.4	1.3	1.1	1.1	.29	3.27	~~3.25~~ 3.50
2	85.4	25.0	14.6	10.5	8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2	.86	3.86	3.75
3		75.0	29.6	19.4	14.6	11.8	9.9	8.5	7.5	6.7	6.0	5.5	1.49	4.49	4.50
4		93.3	70.4	32.3	22.6	17.7	14.6	12.5	10.9	9.7	8.7	7.9	2.13	5.13	5.25
5			85.4	67.7	34.2	25.0	20.1	16.9	14.6	12.9	11.6	10.5	2.84	5.84	5.75
6			95.6	80.6	65.8	35.6	26.9	22.0	18.8	16.5	14.6	13.2	3.56	6.56	6.50
7				89.5	77.4	64.4	36.6	28.3	23.6	20.4	18.0	16.1	4.35	7.35	7.25
8				96.8	85.4	75.0	63.4	37.5	29.6	25.0	21.8	19.4	5.24	8.24	8.25
9					91.8	82.3	73.1	62.5	38.2	30.6	26.2	23.0	6.21	9.21	9.25
10					97.4	88.2	79.9	71.7	61.8	38.8	31.5	27.2	7.29	10.29	10.25
11						93.3	85.4	78.0	70.4	61.2	39.3	32.3	8.72	11.72	11.75
12						97.9	90.1	83.1	76.4	69.4	60.7	39.8	10.75	13.75	13.75
13							94.3	87.5	81.2	75.0	68.5	60.2	16.25	19.25	19.25
14							98.2	91.5	85.4	79.6	73.8	67.7	18.28	21.28	21.25
15								95.1	89.1	83.5	78.2	72.8	19.66	22.66	22.75
16								98.4	92.5	87.1	82.0	77.0	20.79	23.79	23.75
17									95.6	90.3	85.4	80.6	21.76	24.76	24.75
18									98.6	93.3	88.4	83.9	22.65	25.65	25.75
19										96.1	91.3	86.8	23.44	26.44	26.50
20										98.7	94.0	89.5	24.17	27.17	27.25
21											96.5	92.1	24.87	27.87	27.75
22											98.9	94.5	25.52	28.52	28.50
23												96.8	26.14	29.14	29.25
24												98.9	26.7	29.70	29.50

NOTE: SAME AS RUN NO. ________

COMMENTS: ________

RUN NO. AM-4-89 RECORDED BY [illegible]

DATE 2/15/89 PRELIMINARY TRAVERSE ASSISTED BY CGS

PORT-POINT	CLOCK TIME	VELOCITY HEAD ΔP (IN. H_2O)	STACK TEMP (F°)	PORT-POINT	CLOCK TIME	VELOCITY HEAD ΔP (IN. H_2O)	STACK TEMP (F°)
A		~~T.2~~	100				
		~~T.3~~					
		T.1					
		~~.83~~					
		.30					
		.35					
		.45					
		.47					
		.65					
		.46 AVG					
APPROX. AVERAGE				APPROX. AVERAGE			

STATIC PRESSURE = ______ IN. H_2O

☐ POS. ☐ NEG.

PITOT LEAK CHECKS*			
OPENING	PRE-TRAVERSE	POST-TRAVERSE	BY
IMPACT	☐ STABLE ☐ LEAKING	☐ STABLE ☐ LEAKING	
STATIC	☐ STABLE ☐ LEAKING	☐ STABLE ☐ LEAKING	

* Vacuum must remain stable for 15 seconds @ 3 in. H_2O.

RUN NO. AM-~~2~~-85
DATE 2-16-89

RECORDED BY [signature]
CHECKED BY CES

NOMOGRAPH DATA

NOTE: SAME AS RUN ________

TA	AMBIENT TEMPERATURE	= 70 °F
Pb	BAROMETRIC PRESSURE	= 30.31 IN. Hg
ΔH @	REFERENCE ΔH	= 1.76 IN. H_2O
TM	AVG. METER TEMPERATURE	= ________ °F
% H_2O	MOISTURE CONTENT	= ~6 % BY VOL.
Po	STATIC (GUAGE) PRESSURE IN STACK	= ~~.022~~ .297 IN. H_2O
	x 0.074	= .022 IN. Hg.
PS	ABSOLUTE PRESSURE IN STACK, Pb - Po	= 30.29 IN. Hg.
PM	METER PRESSURE (~Pb)	= ________ IN. Hg.
PS/PM	= ________	
C	CORRECTION FACTOR	= .987
TS	STACK TEMPERATURE	= 100 °F
ΔP	AVERAGE STACK VELOCITY HEAD	= .46 IN. H_2O
ΔPMAX.	MAXIMUM STACK VELOCITY HEAD	= .65 IN. H_2O
D	PROBE TIP DIAMETER	= .205 IN.

Req'd Sampling Rate or Volume ________ Calculated Sampling Rate or Volume (Pre-test) ________

TS					
ΔPREF					

PITOT LEAK CHECKS*				
OPENING	PRE-TEST	BY	POST-TEST	BY
IMPACT	☑ STABLE ☐ LEAKING	[initials]	☑ STABLE ☐ LEAKING	CES
STATIC	☑ STABLE ☐ LEAKING	[initials]	☑ STABLE ☐ LEAKING	CES

* Vacuum must remain stable for 15 seconds @ 3 in. H_2O.

SAMPLING TRAIN LEAK CHECKS		
LEAK CHECKS*	PRE-TEST	POST-TEST
RATE OF LEAK (CFM)	.005 cfm @ 10" Hg	0.0 CFM @ 10" Hg
TIME (24 HOUR CLOCK)	1057	12:48
BY	[signature]	CES

*Rates ≤ 0.02 CFM @ 15 in. Hg. vacuum or 4% of average sampling rate (whichever is less) are acceptable.

RUN NO. AM-4-5 | PARTICULATE SAMPLING | RECORDED BY [illegible]

DATE 2-16-89 | | ASSISTED BY CES

SAMPLING TIME PER POINT 3 MIN.

PORT POINT	CLOCK TIME	METER VOLUME (DCF)	Δ P VEL. HEAD (IN. H_2O)	Δ H ORIFICE (IN. H_2O)	METER TEMP. IN (°F)	METER TEMP. OUT (°F)	STACK TEMP. (°F)	BOX TEMP. (°F)	BATH TEMP. (°F)	TRAIN VACUUM (IN. Hg)	COMMENT NUMBER
A-1	1124	~~014.232~~ 015.3	.26	.38	87	88	95	175	45	2	
2	1127	016.6	.26	.38	88	84	107	175	43	2	
3	1130	017.6	.30	.46	88	89	106	175	45	2	
4	1132	018.7	.33	.50	88	89	98	175	45	2	
5	1134	019.7	.35	.54	88	89	101	200	45	2	
6	1137	021.0	.35	.58	87	88	95	200	45	2	
7	1140	022.0	.35	.54	91	93	99	200	45	2	
8	1143	023.2	.35	.54	91	92	99	200	45	2	
9	1146	024.0	.34	.52	91	92	102	200	45	2	
10	1149	025.7	.40	.62	91	93	101	250	45	2	
11	1152	026.9	.42	.66	94	97	103	250	45	3	
12	1155	028.5	.42	.66	94	97	102	250	43	3	
13	1158	029.5	.69	1.04	94	101	102	255	43	4	
14	1201	031.7	.67	1.06	96	100	102	255	43	4	
15	1204	032.6	.42	.61	95	100	102	255	42	3	
16	1207	033.0	.42	.66	98	100	99	255	43	2	
17	1213	035.7	.42	.66	99	101	99	255	43	2	
18	1216	036.9	.41	.64	101	102	99	255	43	3	
19	1219	038.1	.38	.58	100	102	101	255	43	3	
20	1222	039.4	.36	.56	100	102	103	255	43	3	
21	1225	040.6	.35	.54	101	103	103	250	43	3	
22	1228	041.7	.36	.56	101	103	101	250	43	3	
23	1231	042.7	.28	.42	101	104	101	250	43	2	
24	1234	043.921	.26	.38	101	104	100	250	43	2	

COMMENTS: 1. STOP 12:38	9.
2.	10.
3.	11.
4.	12.
5.	13.
6.	14.
7.	15.
8.	16.

WSNCO FORM NO. ST008

RUN NO. AM-4-5

DATE

CARRIER GAS ANALYSIS (ORSAT)

ANALYZED BY CES

ORSAT LEAK CHECKS									
PRE-ANALYSIS					POST-ANALYSIS				
NO.	TIME START / STOP	BURETTE LEVEL START / STOP	OK	BY	NO.	TIME START / STOP	BURETTE LEVEL START / STOP	OK	BY
1					1				
2					2				
3					3				
4					4				

SAMPLE IDENTIFICATION	CO_2 READING 1	READING 2	O_2 (2-1)	READING 3	CO (3-2)
	AVG.=		AVG.=		AVG.=
	AVG.=		AVG.=		AVG.=
	AVG.=		AVG.=		AVG.=
	AVG.=		AVG.=		AVG.=

WALDEMAR S. NELSON AND COMPANY
INCORPORATED

PARTICULATE EMISSION TEST
FIELD DATA FORM
(EPA METHOD 1,2,3,4,5,8,& 17)

CLIENT Amstar
FACILITY Arabi Plant
RUN NUMBER AM-4-6

WSNCO JOB NO. 88029
SAMPLING LOCATION Dryer Outlet
SAMPLING DATE 2-15-89

TEST PERSONNEL

PROJECT CHIEF R. J. Acuna

TESTING ENGINEER 1
2

ENGR. TECHNICIAN 1 C. E. SETTOON
2

LAB TECHNICIAN 1
2

OTHER 1
2

WSNCO FORM NO. ST008

RUN NO ~~AMSTAR~~ AM-A-6
DATE 2-16-89

SAMPLING TRAIN SPECIFICATIONS

RECORDED BY CES
ASSISTED BY ______

I. PROBE ASSEMBLY
A. PROBE LENGTH 4 1/2 FT.
B. LINER MATERIAL 316 SS
C. PITOT NUMBER 003
D. PITOT COEFFICIENT .84

II. MISC. COMPONENTS
A. NOZZLE DIAMETER .205 IN.
B. NOZZLE IDENT. NO. 1871
C. UMBILICAL LENGTH 50' FT.
D. FILTER HOLDER TYPE M-S GLASS
E. FILTER NUMBER 39006

III IMPINGER CONTENT

		NORMAL		USE		FINAL	NET
NUMBER	TYPE*	MATERIAL	AMOUNT	MATERIAL	AMOUNT	AMOUNT	GAIN
1	M	DW	100ML	DW	545.9	575.5	29.6
2	GS	DW	100ML	DW	540.5	548.2	7.7
3	M	DRY	———	DRY	435.6	438.4	2.8
4	M	ADSORBENT**	~200GM.	SG	630.0	658.7	28.7
#4 CONTAINER WEIGHT = ______ GM.				TOTAL MOISTURE ADSORBED			68.8
WEIGHT WITH ADSORBENT= ______ GM.							

* GS= GREENBURG-SMITH, M= MODIFIED, O= OTHER ______
** SG= SILICA GEL, D=DRIERITE, O= OTHER ______

IV. CONTROL CONSOLE: ΔH@ (PRE-TEST) ______ ΔH@ (POST-TEST) ______
Y (PRE-TEST) ______ Y(POST-TEST) ______

CONSOLE NO. ______

	VELOCITY	TEMPERATURE	PRESSURE
SENSOR	☒ STANDARD ☐ "S" SHAPED	☒ THERMOCOUPLE (TYPE ____) ☐ OTHER ______	☒ STANDARD ☐ "S" SHAPED
READING DEVICE	☒ DI MANOMETER (~~0-5~~ 0-10 IN. H_2O) ☐ HIGH SENSITIVITY (RANGE ___) ☐ OTHER ______	☒ PYROMETER (TYPE K) ☐ OTHER ______	☒ DI MANOMETER (0-5 IN. H_2O) ☐ HIGH SENSITIVITY (RANGE ___) ☒ OTHER U-Tube

COMMENTS: ______

RUN NO. AM-4-6

DATE 2-16-89

STACK GEOMETRY

RECORDED BY [illegible]

SKETCH OF FLOW PROFILE AND CROSS-SECTION
(ILLUSTRATE PORT-POINT CONFIGURATION, FLOW INTERFERENCES, ETC.)
NOTE: SAME AS RUN AM-4-4

FOR ROUND STACKS

A. DISTANCE FROM INSIDE FAR WALL TO OUTSIDE OF PORT ________ IN.

B. PORT LENGTH ________ IN.

STACK DIAMETER: (A-B) ________ IN.

STACK AREA: ________ $IN.^2$

FOR RECTANGULAR STACKS

A. DISTANCE FROM INSIDE FAR WALL TO OUTSIDE OF PORT ________ IN.

B. PORT LENGTH ________ IN.

STACK DEPTH: (A-B) ________ IN.

STACK WIDTH (INSIDE) ________ IN.

STACK AREA (DEPTH X WIDTH) ________ $IN.^2$

EQUIVALENT DIAMETER $\left(2\left[\frac{L \times W}{L + W}\right]\right)$ ________ IN.

SAMPLING CROSS-SECTION IS:

NO. OF DUCT DIAMETERS		TYPE OF FLOW OBSTRUCTION
________	DIAMETERS DOWNSTREAM OF	________
________	DIAMETERS UPSTREAM OF	________

NUMBER OF SAMPLING POINTS

MIN. REQ'D. (METHOD 1) ________

USE ________

RUN NO. AM-4-6
DATE 2-16-89

TRAVERSE POINTS

RECORDED BY [illegible]

POINT	2	4	6	8	10	12	14	16	18	20	22	24	DISTANCE FROM INSIDE PORT (IN.)	DISTANCE FROM OUTSIDE PORT (IN.)	USE (IN.)
	PERCENT OF DIAMETER FROM INSIDE PORT TO POINT — NUMBER OF TRAVERSE POINTS ON A DIAMETER														
1	14.6	6.7	4.4	3.2	2.6	2.1	1.8	1.6	1.4	1.3	1.1	1.1			
2	85.4	25.0	14.6	10.5	8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2			
3		75.0	29.6	19.4	14.6	11.8	9.9	8.5	7.5	6.7	6.0	5.5			
4		93.3	70.4	32.3	22.6	17.7	14.6	12.5	10.9	9.7	8.7	7.9			
5			85.4	67.7	34.2	25.0	20.1	16.9	14.6	12.9	11.6	10.5			
6			95.6	80.6	65.8	35.6	26.9	22.0	18.8	16.5	14.6	13.2			
7				89.5	77.4	64.4	36.6	28.3	23.6	20.4	18.0	16.1			
8				96.8	85.4	75.0	63.4	37.5	29.6	25.0	21.8	19.4			
9					91.8	82.3	73.1	62.5	38.2	30.6	26.2	23.0			
10					97.4	88.2	79.9	71.7	61.8	38.8	31.5	27.2			
11						93.3	85.4	78.0	70.4	61.2	39.3	32.3			
12						97.9	90.1	83.1	76.4	69.4	60.7	39.8			
13							94.3	87.5	81.2	75.0	68.5	60.2			
14							98.2	91.5	85.4	79.6	73.8	67.7			
15								95.1	89.1	83.5	78.2	72.8			
16								98.4	92.5	87.1	82.0	77.0			
17									95.6	90.3	85.4	80.6			
18									98.6	93.3	88.4	83.9			
19										96.1	91.3	86.8			
20		NOTE: SAME								98.7	94.0	89.5			
21		AS RUN NO.									96.5	92.1			
22		AM-4-4									98.9	94.5			
23												96.8			
24												98.9			

COMMENTS:

RUN NO. AM-4-6		RECORDED BY [signature]
DATE 2-16-84	NOMOGRAPH DATA	CHECKED BY

NOTE: SAME AS RUN

TA	AMBIENT TEMPERATURE	= 70	°F
Pb	BAROMETRIC PRESSURE	= 30.31	IN. Hg.
ΔH @	REFERENCE ΔH	= 1.76	IN. H_2O
TM	AVG. METER TEMPERATURE	=	°F
% H_2O	MOISTURE CONTENT	= ~6	% BY VOL.
Po	STATIC (GUAGE) PRESSURE IN STACK	= .297	IN. H_2O
	x 0.074	= .022	IN. Hg.
PS	ABSOLUTE PRESSURE IN STACK, Pb - Po	= 30.29	IN. Hg.
PM	METER PRESSURE (~Pb)	=	IN. Hg.
PS/PM	=		
C	CORRECTION FACTOR	= .987	
Ts	STACK TEMPERATURE	= 100	°F
ΔP	AVERAGE STACK VELOCITY HEAD	= .46	IN. H_2O
ΔPMAX.	MAXIMUM STACK VELOCITY HEAD	= .65	IN. H_2O
D	PROBE TIP DIAMETER	= .205	IN.

Req'd Sampling Rate or Volume ________ Calculated Sampling Rate or Volume (Pre-test) ________

TS					
ΔPREF					

PITOT LEAK CHECKS*				
OPENING	PRE-TEST	BY	POST-TEST	BY
IMPACT	☒ STABLE ☐ LEAKING	[initials]	☒ STABLE ☐ LEAKING	[initials]
STATIC	☒ STABLE ☐ LEAKING	[initials]	☒ STABLE ☐ LEAKING	[initials]

* Vacuum must remain stable for 15 seconds @ 3 in. H_2O.

SAMPLING TRAIN LEAK CHECKS		
LEAK CHECKS*	PRE-TEST	POST-TEST
RATE OF LEAK (CFM)	0.0 cfm @ 10" Hg	0.0 cfm 10" Hg
TIME (24 HOUR CLOCK)	1305	1425
BY	[initials]	[initials]

*Rates ≤ 0.02 CFM @ 15 in. Hg. vacuum or 4% of average sampling rate (whichever is less) are acceptable.

RUN NO. AM-4-6 | PARTICULATE SAMPLING | RECORDED BY [illegible]

DATE 2-16-88 | ASSISTED BY OES/MM

SAMPLING TIME PER POINT 3 MIN.

PORT POINT	CLOCK TIME	METER VOLUME (DCF)	ΔP VEL. HEAD (IN. H_2O)	ΔH ORIFICE (IN. H_2O)	METER TEMP. IN (°F)	METER TEMP. OUT (°F)	STACK TEMP. (°F)	BOX TEMP. (°F)	BATH TEMP. (°F)	TRAIN VACUUM (IN. Hg)	COMMENT NUMBER
A-1	1310	045.241 / 045.80	.35	.54	98	100	105	210	35	2	
2	1313	047.1	.35	.54	98	100	105	210	35	2	
3	1316	048.1	.32	.49	96	99	102	210	35	2	
4	1319	049.1	.35	.54	96	99	102	230	35	2	
5	1322	050.3	.35	.54	96	99	102	230	35	2	
6	1325	051.8	.35	.54	96	99	98	235	35	2	
7	1328	052.0	.35	.54	96	99	98	235	35	2	
8	1331	054.2	.42	.66	97	99	100	235	35	3	
9	1334	055.6	.42	.66	97	98	101	235	35	3	
10	1337	056.8	.45	.71	98	100	100	235	35	3	
11	1340	058.6	.45	.71	98	101	97	235	35	3	
12	1343	059.9	.50	.79	98	100	99	240	35	3	
13	1346	061.4	.55	.87	99	99	98	240.	35	3	
14	1349	063.4	1.0	1.62	99	101	96	245	35	5	
15	1352	065.1	1.0	1.62	99	102	96	245	35	5	
16	1355	067.2	1.0	1.62	99	101	97	245	35	6	
17	1358	069.6	1.25	2.00	100	103	97	245	35	7	
18	1401	071.8	1.3	2.1	100	103	97	245	35	7	
19	1404	074.3	1.3	2.1	101	102	98	245	37	7	
20	1407	076.3	1.3	2.1	101	102	98	245	37	7	
21	1410	078.0	1.25	2.0	100	101	97	245	37	6	
22	1413	080.9	1.25	2.0	100	101	99	245	37	6	
23	1416	082.6	1.25	2.0	102	103	96	245	27	6	
24	1419	084.696	1.25	2.0	102	103	96	245	27	6	

COMMENTS: 1. 1422 -

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WSNCO FORM NO. ST008

WALDEMAR S. NELSON AND COMPANY
INCORPORATED

PARTICULATE EMISSION TEST
Analytical Worksheet
(EPA METHOD 5)

CLIENT: AMSTAR WSNCo JOB NO.: 89029

RUN NO.: AM-3-4 AM-3-5 & AM-3-6 BY: CLINTON E SETTOON DATE: 2/20/89

~~ACETONE~~ WATER BLANK

BY: Clinton E. Settoon DATE: 2-21-89

Visual Observations: Clear Blank

Sample No.: AM-3-B Final Beaker Weight: 97.6631 mg.

~~Acetone~~ WATER Volume: 200 ML (G) Beaker Tare Weight: 97.6554 mg.

Any Noted ~~Acetone~~ WATER Loss: none ~~Acetone~~ WATER Blank Net Weight: 7.7 mg.

BLANK RESIDUAL = ~~ACETONE~~ WATER BLANK NET WEIGHT ÷ ~~ACETONE~~ WATER WEIGHT

Blank Residual = 7.7 mg. ÷ 200 ml. = .038 mg/ml

% BLANK RESIDUAL = BLANK RESIDUAL ÷ DENSITY OF ~~ACETONE~~ WATER (1000 mg/ml) x 100

% Blank Residual = .038 mg/ml ÷ 1000 mg/ml x 100 = .000038 %

If BLANK RESIDUAL is less than 0.001% then:

ALLOWABLE BLANK RESIDUAL = BLANK RESIDUAL

ALLOWABLE BLANK RESIDUAL = .000038 mg/ml

If % BLANK RESIDUAL is greater than or equal to 0.001% then:

ALLOWABLE BLANK RESIDUAL = DENSITY OF ACETONE x 0.00001 = ______ mg/ml

WALDEMAR S. NELSON AND COMPANY
INCORPORATED

PARTICULATE EMISSION TEST

Analytical Worksheet

WATER ~~ACETONE~~ RINSE

BY: CLINTON ESETTOON DATE: 2-21-89

Visual Observations: CLOUDY - FILTER REMANTS

Sample No.: AM-3-4 (8) Final Beaker Weight: 108,029.8 mg.

Acetone Volume: 258 ml ml. Beaker Tare Weight: 107,970.5 mg.

Blank Correction = WATER ~~Acetone~~ Volume x Allowable Blank Residual

WATER ~~Acetone~~ Rinse Net Weight: 59.3 mg.

Minus Blank Correction: .009804 mg.

Blank Correction =

258 ml. x .000038 mg/ml = .009804 mg.

Corrected Net Weight: 59.29 mg.

Any Noted WATER ~~Acetone~~ Loss: NONE

FILTER WEIGHT

BY: CLINTON E SETTOON DATE: 2-24-89

Visual Observations: White Filter Cake

Filter No.: 89001 Final Filter Weight: 527.6 mg.

Sample No.: 89001-F1 Filter Tare Weight: 522.5 mg.

Filter Net Weight: 5.1 mg.

SAMPLE WEIGHT

BY: CLINTON E SETTOON DATE: 2-24-89

Acetone Rinse Corrected Net Weight: 59.29 mg.

Filter Net Weight: 5.1 mg.

Total Sample Weight: 64.39 mg.

ANALYST: Clinton E Settoon DATE: 2-24-89
Signature

WALDEMAR S. NELSON AND COMPANY
INCORPORATED

PARTICULATE EMISSION TEST

Analytical Worksheet

~~ACETONE~~ WATER RINSE

BY: CLINTON E SETTOON DATE: 2/21/89

Visual Observations: Clear with Filter Remnants

Sample No.: AM-3-5 (2)

~~Acetone~~ WATER Volume: 182 ml.

Blank Correction = ~~Acetone~~ WATER Volume x Allowable Blank Residual

Blank Correction =

182 ml. x .000038 mg/ml = .006916 mg.

Final Beaker Weight: 109,626.9 mg.

Beaker Tare Weight: 109,563.5 mg.

~~Acetone~~ WATER Rinse Net Weight: 63.4 mg.

Minus Blank Correction: .006916 mg.

Corrected Net Weight: 63.39 mg.

Any Noted ~~Acetone~~ WATER Loss: NONE

FILTER WEIGHT

BY: CLINTON E SETTOON DATE: 2/24/89

Visual Observations: white Filter Cake

Filter No.: 89002

Sample No.: 89002-F2

Final Filter Weight: 534.7 mg.

Filter Tare Weight: 516.2 mg.

Filter Net Weight: 18.5 mg.

SAMPLE WEIGHT

BY: CLINTON E SETTOON DATE: 2/24/89

Acetone Rinse Corrected Net Weight: 63.39 mg.

Filter Net Weight: 18.5 mg.

Total Sample Weight: 81.89 mg.

ANALYST: Clinton E Settoon DATE: 2/24/89
Signature

WALDEMAR S. NELSON AND COMPANY
INCORPORATED

PARTICULATE EMISSION TEST

Analytical Worksheet

~~ACETONE~~ WATER RINSE

BY: Clinton E. Settoon DATE: 2-21-89

Visual Observations: Clear

Sample No.: AM-3-6

Final Beaker Weight: 100,087.9 mg.

~~Acetone~~ WATER Volume: 223 (3) ml.

Beaker Tare Weight: 100,042.5 mg.

Blank Correction = ~~Acetone~~ WATER Volume x Allowable Blank Residual

~~Acetone~~ WATER Rinse Net Weight: 45.4 mg.

Minus Blank Correction: .008474 mg.

Blank Correction =

Corrected Net Weight: 45.39 mg.

223 ml. x .000038 mg/ml = .008474 mg.

Any Noted ~~Acetone~~ WATER Loss: NONE

FILTER WEIGHT

BY: CLINTON E SETTOON DATE: 2/24/89

Visual Observations: White Filter Cake

Filter No.: 89003

Final Filter Weight: 549.6 mg.

Sample No.: 89003-F3

Filter Tare Weight: 519.2 mg.

Filter Net Weight: 30.4 mg.

SAMPLE WEIGHT

BY: CLINTON E SETTOON DATE: 2/24/89

Acetone Rinse Corrected Net Weight: 45.39 mg.

Filter Net Weight: 30.4 mg.

Total Sample Weight: 75.79 mg.

ANALYST: [signature] DATE: 2/24/89

Signature

WSNCO FORM NO. ST010

WALDEMAR S. NELSON AND COMPANY
INCORPORATED

PARTICULATE EMISSION TEST

Analytical Worksheet

(EPA METHOD 5)

CLIENT: AMSTAR WSNCo JOB NO.: 89029

RUN NO.: AM-4-4 BY: CLINTON E SETTOON DATE: 2/20/89

AM-4-5 & AM-4-6

WATER ~~ACETONE~~ BLANK

BY: CLINTON E SETTOON DATE: 2/21/89

Visual Observations: Clear Blank

Sample No.: AM-4-B Final Beaker Weight: 107,347.4 mg.

Acetone Volume: 200 mL (8) Beaker Tare Weight: 107,339.6 mg.

Any Noted WATER ~~Acetone~~ Loss: NONE WATER ~~Acetone~~ Blank Net Weight: 7.8 mg.

BLANK RESIDUAL = WATER ~~ACETONE~~ BLANK NET WEIGHT ÷ WATER ~~ACETONE~~ WEIGHT

Blank Residual = 7.8 mg. ÷ 200 ml. = .039 mg/ml

% BLANK RESIDUAL = BLANK RESIDUAL ÷ DENSITY OF WATER ~~ACETONE~~ (1000 mg/ml) x 100

% Blank Residual = .039 mg/ml ÷ 1000 mg/ml x 100 = .000039 %

If BLANK RESIDUAL is less than 0.001% then:

ALLOWABLE BLANK RESIDUAL = BLANK RESIDUAL

ALLOWABLE BLANK RESIDUAL = .000039 mg/ml

If % BLANK RESIDUAL is greater than or equal to 0.001% then:

ALLOWABLE BLANK RESIDUAL = DENSITY OF ACETONE x 0.00001 = ______ mg/ml

WALDEMAR S. NELSON AND COMPANY
INCORPORATED

PARTICULATE EMISSION TEST

Analytical Worksheet

~~ACETONE~~ WATER RINSE

BY: CLINTON E SETTOON DATE: 2-21-89

Visual Observations: Yellowish in Color

Sample No.: AM-4-4 (4) Final Beaker Weight: 107,945.6 mg.

~~Acetone~~ WATER Volume: 151 ml. Beaker Tare Weight: 107,904.3 mg.

Blank Correction = ~~Acetone~~ WATER Volume x Allowable Blank Residual ~~Acetone~~ WATER Rinse Net Weight: 41.3 mg.

Minus Blank Correction: .005889 mg.

Blank Correction = Corrected Net Weight: 41.29 mg.

151 ml. x .000039 mg/ml = .005889 mg. Any Noted ~~Acetone~~ WATER Loss: NONE

FILTER WEIGHT

BY: CLINTON E SETTOON DATE: 2-24-89

Visual Observations: White Filter Cake

Filter No.: 89004 Final Filter Weight: 537.8 mg.

Sample No.: 89004, F4 Filter Tare Weight: 519.5 mg.

Filter Net Weight: 18.3 mg.

SAMPLE WEIGHT

BY: CLINTON E. SETTOON DATE: 2-24-89

Acetone Rinse Corrected Net Weight: 41.29 mg.

Filter Net Weight: 18.3 mg.

Total Sample Weight: 59.59 mg.

ANALYST: Clinton E Settoon DATE: 2/24/89
Signature

WALDEMAR S. NELSON AND COMPANY
INCORPORATED

PARTICULATE EMISSION TEST

Analytical Worksheet

~~ACETONE~~ WATER RINSE

BY: CLINTON E SETTOON DATE: 2-21-89

Visual Observations: Clear with Filter Remnants

Sample No.: AM-4-5 (5)

~~Acetone~~ WATER Volume: 140 ml.

Blank Correction = ~~Acetone~~ WATER Volume x Allowable Blank Residual

Blank Correction =

140 ml. x .000039 mg/ml = .00546 mg.

Final Beaker Weight: 109,352.0 mg.

Beaker Tare Weight: 109,326.4 mg.

~~Acetone~~ WATER Rinse Net Weight: 25.6 mg.

Minus Blank Correction: .00546 mg.

Corrected Net Weight: 25.59 mg.

Any Noted ~~Acetone~~ WATER Loss: NONE

FILTER WEIGHT

BY: CLINTON E SETTOON DATE: 2/24/89

Visual Observations: White Filter Cake

Filter No.: 89005

Sample No.: 89005-F5

Final Filter Weight: 513.7 mg.

Filter Tare Weight: 515.4 mg.

Filter Net Weight: -1.7 mg.

SAMPLE WEIGHT

BY: CLINTON E SETTOON DATE: 2/24/89

~~Acetone~~ WATER Rinse Corrected Net Weight: 25.59 mg.

Filter Net Weight: -1.7 mg.

Total Sample Weight: 23.89 mg.

ANALYST: Clinton E Settoon DATE: 2/24/89
Signature

WALDEMAR S. NELSON AND COMPANY
INCORPORATED

PARTICULATE EMISSION TEST

Analytical Worksheet

~~ACETONE~~ WATER RINSE

BY: CLINTON E SETTOON DATE: 2-21-89

Visual Observations: Clear with Filter Remnants

Sample No.: AM-4-6 (C)

~~Acetone~~ WATER Volume: 122 ml.

Blank Correction = ~~Acetone~~ WATER Volume x Allowable Blank Residual

Blank Correction =

122 ml. x .000039 mg/ml = .004758 mg.

Final Beaker Weight: 106,734.2 mg.

Beaker Tare Weight: 106,709.0 mg.

~~Acetone~~ WATER Rinse Net Weight: 25.2 mg.

Minus Blank Correction: .004758 mg.

Corrected Net Weight: 25.19 mg.

Any Noted ~~Acetone~~ WATER Loss: NONE

FILTER WEIGHT

BY: CLINTON E SETTOON DATE: 2-24-89

Visual Observations: White Filter Cake

Filter No.: 89006

Sample No.: 89006-F6

Final Filter Weight: 524.3 mg.

Filter Tare Weight: 517.8 mg.

Filter Net Weight: 6.5 mg.

SAMPLE WEIGHT

BY: CLINTON E SETTOON DATE: 2-24-89

Acetone Rinse Corrected Net Weight: 25.19 mg.

Filter Net Weight: 6.5 mg.

Total Sample Weight: 31.69 mg.

ANALYST: [signature] DATE: 2-24-89
Signature

LIST OF EQUATIONS
(EPA METHODS 1 THRU 5)

VOLUME OF DRY GAS SAMPLED AT STANDARD CONDITIONS (68 DEGREES F, 29.921 IN. HG.), DSCF

VM = DRY GAS VOLUME, METER CONDITIONS (DCF)
Y = DRY GAS METER CALIBRATION FACTOR
PB = BAROMETRIC PRESSURE (IN. HG.)
PM = AVERAGE ORIFICE PRESSURE DROP (IN. H2O)
TM = AVERAGE METER TEMPERATURE (DEGREES F)

$$VMSTD = \frac{17.636 * VM * [PB + \frac{PM}{13.6}]}{(TM + 459.69)} = \quad DSCF$$

VOLUME OF WATER VAPOR AT STANDARD CONDITIONS, SCF
VW = TOTAL WATER COLLECTED

$$VWV = 0.04707 * VW = SCF$$

PERCENT MOISTURE IN STACK GAS

$$PMOS = \frac{100 * VWV}{VMSTD + VWV} = \quad \%$$

MOLE FRACTION OF DRY GAS, MD

$$MD = 1 - \frac{VWV}{VMSTD + VWV}$$

MOLECULAR WEIGHT OF DRY STACK GAS, MWD

$$MWD = (\%CO2 * 0.440) + (\%O2 * 0.320) + (\%CO + \%N2) * 0.280$$

MOLECULAR WEIGHT OF WET STACK GAS

$$MW = MWD * MD + 18.015\ (1 - MD)$$

AVERAGE STACK GAS VELOCITY AT STACK CONDITIONS, FPM

CP = PITOT COEFFICIENT
DPS = AVERAGE STACK VELOCITY HEAD
PS = STACK PRESSURE, ABSOLUTE (IN. HG.)
TS = AVERAGE STACK TEMPERATURE (DEGREES F)

$$VS = 5129.4 * CP * DPS \sqrt{\frac{TS + 459.69}{PS * MW}} = \quad FPM$$

VOLUMETRIC FLOWRATE AT STANDARD CONDITIONS, DSCFM

AS = STACK AREA (SQ. IN.)

$$QS = \frac{0.12247 * VS * AS * MD * PS}{(TS + 459.69)} = \quad DSCFM$$

PERCENT ISOKINETIC

TT = NET TIME OF RUN (MIN.)
DN = NOZZLE DIAMETER (IN.)

$$PERI = \frac{1039.6 * (TS + 459.69) * VMSTD}{VS * TT * PS * MD * (DN)^2} = \quad \%$$

PARTICULATE LOADING AT STANDARD CONDITIONS, GR/DSCF

MF = PARTICULATE WEIGHT, TOTAL (MG.)

$$CAN = 0.015432 * (MF/VMSTD) = \quad GR/DSCF$$

PARTICULATE LOADING AT STACK CONDITIONS, GR/ACF

$$CAT = \frac{17.636 * CAN * PS * MD}{(TS + 459.69)} = \quad GR/ACF$$

PARTICULATE EMISSION RATE, LBS/HR

$$CAW = 0.008571 * CAN * QS = \quad LBS/HR$$

PARTICULATE LOADING AT STANDARD CONDITIONS, LB/DSCF

$$C = CAN / 7{,}000 = \quad LB/DSCF$$

EMISSION RATE, LB/MMBTU

F = DSCF/MMBTU, USE 9820 FOR BITUMINOUS COAL AND O2

$$E = C * F * \frac{20.9}{20.9 - \%O2} = \quad LB/MMBTU$$

WALDEMAR S. NELSON AND COMPANY
INCORPORATED

ANALYTICAL BALANCE CALIBRATION FORM

BALANCE NAME: TORBAL MODEL - EA-1AP NUMBER: 160530

CLASSIFICATION OF STANDARD WEIGHTS: S-1

DATE	0.500 g	1.0000 g	10.0000 g	50.0000 g	100.0000 g	ANALYST
3/7/88	0.5004g	1.0005g	10.0005g	50.0001g	100.0001g	[illegible]
3/8/88	0.5002	1.0002	10.0003	50.0000	100.0000	[illegible]
3/9/88	0.5002	1.0002	10.0001	50.0001	100.0001	[illegible]
3/11/88	0.5001	1.0000	10.0000	50.0001	100.0002	[illegible]
3/14/88	0.5002	1.0002	10.0000	50.0004	100.0000	[illegible]
3/15/88	0.5002	1.0003	10.0003	50.0003	100.0002	[illegible]
4/7/88	0.5002	1.0003	10.0003	50.0002	100.0001	[illegible]
4/8/88	0.5000	1.0001	10.0001	50.0000	100.0001	[illegible]
4/14/88	0.5000	1.0003	10.0002	50.0004	100.0005	[illegible]
4/15/88	0.5000	1.0002	10.0001	50.0000	100.0002	[illegible]
4/16/88	0.5001	1.0001	10.0000	50.0003	100.0001	[illegible]
4/18/88	0.5000	1.0002	10.0000	50.0000	100.0000	[illegible]
2/6/89	0.5004	1.0004	10.0004	50.0000	100.0004	[illegible]
2/9/89	0.5000	1.0002	10.0000	50.0002	100.0000	[illegible]
2/10/89	0.5002	1.0003	10.0002	50.0002	100.0000	[illegible]
2/17/89	0.5005	1.0004	10.0005	50.0006	100.0006	[illegible]
2/20/89	0.5004	1.0005	10.0004	50.0006	100.0006	[illegible]
2/21/89	0.5004	1.0004	10.0004	50.0004	100.0003	[illegible]
2/22/89	0.5004	1.0004	10.0004	50.0006	100.0006	[illegible]
2/23/89	0.5003	1.0003	10.0004	50.0005	100.0005	[illegible]
2/24/89	0.5004	1.0004	10.0003	50.0005	100.0005	[illegible]

WALDEMAR S. NELSON AND COMPANY
INCORPORATED

FILTER WEIGHT LOG
(EPA METHOD 5, 8, & 17)

			DESICCATION DATA (INITIAL)			TARE WEIGHT DETERMINATION									DESICCATION DATA (FINAL)			TARE WEIGHT DETERMINATION									
Filter Serial Number	Filter Type	WSNCo Job No.	Date	Time (24-hour Clock)	By	First Weight (g.)	Date	Time (24-hour Clock)	By	Second Weight (g.)	Date	Time (24-hour Clock)	By	Tare Weight w_T (g.)	Date	Time (24-hour Clock)	By	First Weight (g.)	Date	Time (24-hour Clock)	By	Second Weight (g.)	Date	Time (24-hour Clock)	By	FINAL WEIGHT w_f (g.)	NET WEIGHT ($w_f - w_T$) (g.)
89001	M-5	89029	2-3-89	1430	RJA	.5224	2-9-89	0830	CES	.5225	2-10-89	1605	CES	.5225	2-17-89	1430	RJA	.5274	2-23-89	1130	CES	.5276	2-24-89	0900	CES	.5276	.0051
89002	M-5	89029	2-3-89	1430	RJA	.5163	2-9-89	0830	CES	.5162	2-10-89	1605	CES	.5162	2-17-89	1430	RJA	.5346	2-23-89	1130	CES	.5347	2-24-89	0900	CES	.5347	.0185
89003	M-5	89029	2-3-89	1430	RJA	.5194	2-9-89	0830	CES	.5192	2-10-89	1605	CES	.5192	2-17-89	1430	RJA	.5493	2-23-89	1130	CES	.5496	2-24-89	0900	CES	.5496	.0304
89004	M-5	89029	2-3-89	1430	RJA	.5197	2-9-89	0830	CES	.5195	2-10-89	1605	CES	.5195	2-17-89	1430	RJA	.5377	2-23-89	1130	CES	.5378	2-24-89	0900	CES	.5378	.0183
89005	M-5	89029	2-3-89	1430	RJA	.5154	2-9-89	0830	CES	.5154	2-10-89	1605	CES	.5154	2-17-89	1430	RJA	.5137	2-23-89	1130	CES	.5132	2-24-89	0900	CES	.5137	-.0017
89006	M-5	89029	2-3-89	1430	RJA	.5179	2-9-89	0830	CES	.5178	2-10-89	1605	CES	.5178	2-17-89	1430	RJA	.5243	2-23-89	1130	CES	.5243	2-24-89	0900	CES	.5243	.0065
89007	M-5	89029	2-3-89	1430	RJA	.5248	2-9-89	0830	CES	.5248	2-10-89	1605	CES	.5248													
89008	M-5	89029	2-3-89	1430	RJA	.5280	2-9-89	0830	CES	.5279	2-10-89	1605	CES	.5279													
28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1

COMMENTS:

WSNCO FORM NO. ST009

WALDEMAR S. NELSON AND COMPANY
INCORPORATED

~~FILTER~~ BEAKER WEIGHT LOG

(EPA METHOD 5, 8, & 17)

BEAKERS

Filter Serial Number	Filter Type	WSNCo Job No.	Desiccation Data (Initial): Date	Desiccation Data (Initial): Time (24-hour Clock)	Desiccation Data (Initial): By	Tare Weight Determination: First Weight (g.)	Tare Weight Determination: Date	Tare Weight Determination: Time (24-hour Clock)	Tare Weight Determination: By	Tare Weight Determination: Second Weight (g.)	Tare Weight Determination: Date	Tare Weight Determination: Time (24-hour Clock)	Tare Weight Determination: By	Tare Weight Determination: Tare Weight W_t (g.)
1	250ml	89029	2-10-89	1110	CES	107.9705	2-18-89	1100	CES	107.9706	2-20-89	0900	CES	107.9705
2	250ml	89029	2-10-89	1610	CES	109.5639	2-18-89	1100	CES	109.5635	2-20-89	0900	CES	109.5635
3	250ml	89029	2-10-89	1610	CES	100.0224	2-18-89	1100	CES	100.0225	2-20-89	0900	CES	100.0225
4	250ml	89029	2-10-89	1610	CES	102.9047	2-18-89	1100	CES	102.9043	2-20-89	0900	CES	102.9043
5	250ml	89029	2-10-89	1610	CES	109.3265	2-18-89	1100	CES	109.3264	2-20-89	0900	CES	109.3264
6	250ml	89029	2-10-89	1610	CES	106.7091	2-18-89	1100	CES	106.7090	2-20-89	0900	CES	106.7090
7	250ml	89029	2-10-89	1610	CES	97.6551	2-18-89	1100	CES	97.6557	2-20-89	0900	CES	97.6554
8	250ml	89029	2-10-89	1610	CES	102.3396	2-18-89	1100	CES	102.3396	2-20-89	0900	CES	102.3396
28	27	26	25	24	23	22	21	20	19	18	17	16	15	14

Filter Serial Number	Desiccation Data (Final): Date	Desiccation Data (Final): Time (24-hour Clock)	Desiccation Data (Final): By	Tare Weight Determination: First Weight (g.)	Tare Weight Determination: Date	Tare Weight Determination: Time (24-hour Clock)	Tare Weight Determination: By	Tare Weight Determination: Second Weight (g.)	Tare Weight Determination: Date	Tare Weight Determination: Time (24-hour Clock)	Tare Weight Determination: By	Final Weight W_f (g.)	Net Weight $(W_f - W_t)$ (g.)
1	2-22-89	1735	CES	108.0298	2-23-89	1140	CES	108.0297	2-24-89	0915	CES	108.0298	.0593
2	2-22-89	1735	CES	109.6266	2-23-89	1140	CES	109.6269	2-24-89	0916	CES	109.6269	.0634
3	2-22-89	1735	CES	100.0682	2-23-89	1140	CES	100.0679	2-24-89	0915	CES	100.0679	.0454
4	2-22-89	1735	CES	102.9455	2-23-89	1140	CES	102.9457	2-24-89	0916	CES	102.9456	.0413
5	2-22-89	1735	CES	109.3520	2-23-89	1140	CES	109.3520	2-24-89	0916	CES	109.3520	.0256
6	2-22-89	1735	CES	106.7341	2-23-89	1140	CES	106.7342	2-24-89	0915	CES	106.7342	.0252
7	2-22-89	1735	CES	97.6633	2-23-89	1140	CES	97.6631	2-24-89	0915	CES	97.6631	.0077
8	2-22-89	1735	CES	102.3470	2-23-89	1140	CES	102.3474	2-24-89	0915	CES	102.3474	.0078
28	13	12	11	10	9	8	7	6	5	4	3	2	1

COMMENTS:

WSNCO FORM NO. ST009

napp inc.

2104 KRAMER LANE • AUSTIN, TEXAS 78758 • 512/836-5110 • TWX 910 874 1385

MODEL 31 MANUAL STACK SAMPLER
GAS FLOW MEASUREMENT INSTRUMENTS - CALIBRATION

DRY GAS METER NO: 75291 **AND/OR ORIFICE NO: 952 **

CALIBRATED BY: TMF DATE: 3/30/88

BAROMETRIC PRESSURE P_b = 29.30 in Hg

ORIFICE SETTING ΔH (in H_2O)	TEST METER VOLUME V_w (ft^3)	DRY GAS METER VOLUME V_d (ft^3)	TEMPERATURE TEST METER T_w (°F)	TEMPERATURE DRY GAS METER INLET T_{di} (°F)	TEMPERATURE DRY GAS METER OUTLET T_{do} (°F)	TEMPERATURE DRY GAS METER AVG. T_d (°F)	TIME θ (min.)	DRY GAS METER Y	ORIFICE $\Delta H@$
0.2	2	1.892	70	71	71	71	7.81	1.062	1.75
0.8	3	2.846	70	72	72	72	5.88	1.060	1.76
1.8	5	4.731	70	71	71	71	6.53	1.058	1.76
3.4	5	4.702	70	72	72	72	4.68	1.062	1.70
5.0	5	4.738	70	73	73	73	3.93	1.052	1.76
8.0	5	4.671	70	73	73	73	3.15	1.059	1.81
								1.059	1.76

$$Y = \frac{V_w (P_b + .11)(T_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(T_w + 460)}$$

$$\Delta H@ = \frac{(0.0317)\,\Delta H}{P_b\,(T_{do} + 460)} \left[\frac{(T_w + 460)\,\theta}{V_w}\right]^2$$

**Usually one dry gas meter and one orifice are calibrated together because the calibration time is half that required for two separate runs. However, the calibrations are not unique to each other and only one may appear on a form if an item is calibrated alone.

M. 31-601-4½1 | Pilot Jacket Assembly | 1680 | 10/24/83
PART NO. | DESCRIPTION | SERIAL NO. | DATE

D TO: W. S. Nelson | 124654 | 16733 | 10/24/83
COMPANY | P.O. NO. | S.O. NO. | DATE

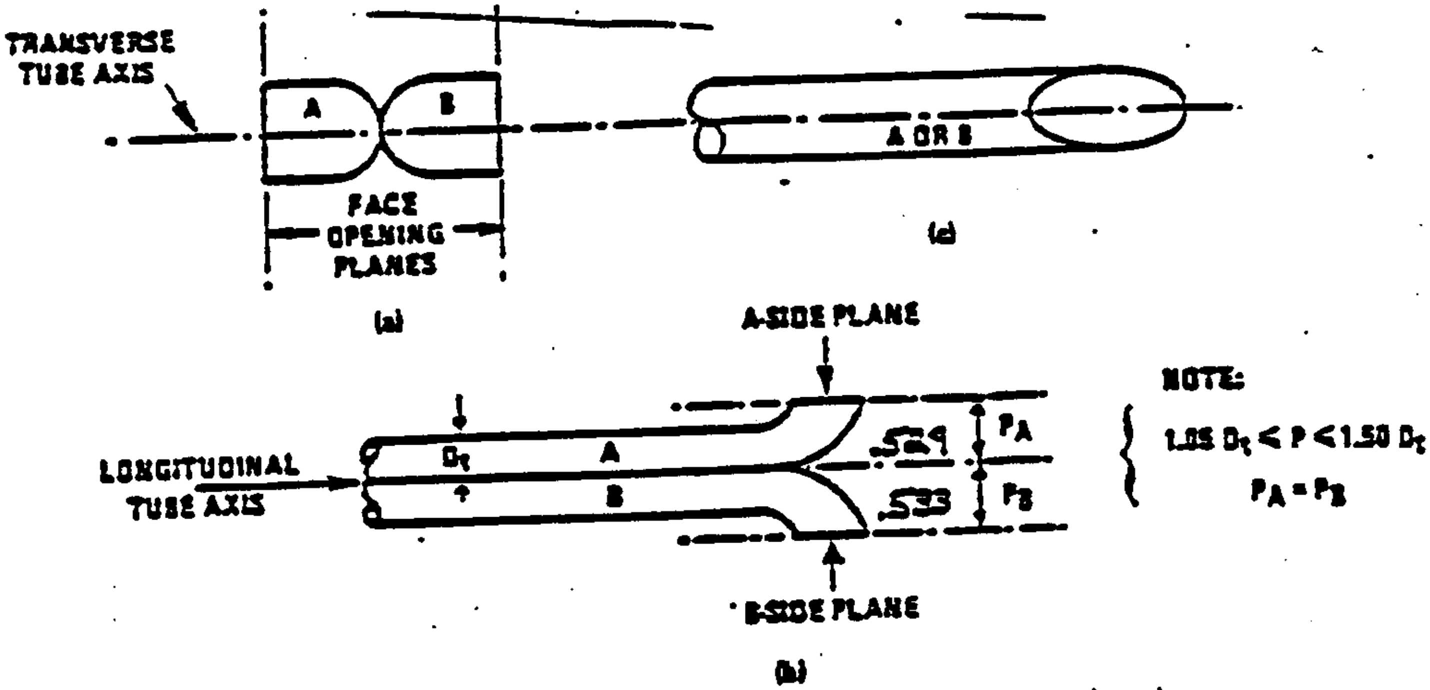
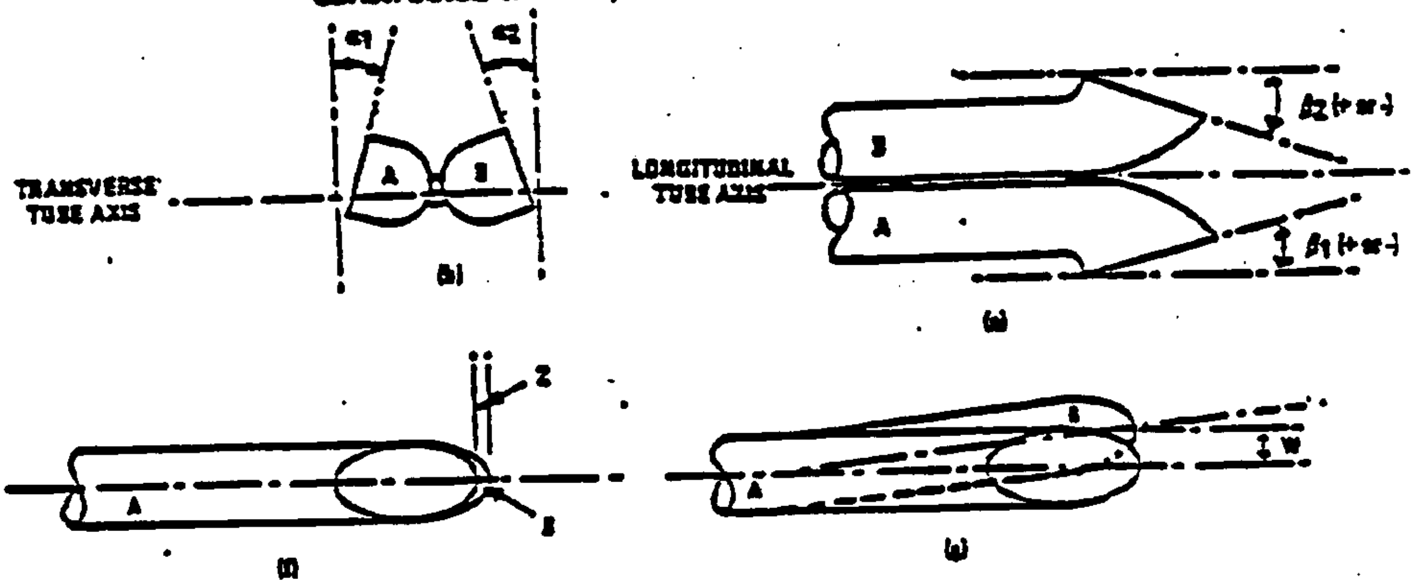


Figure 2-2. Properly constructed Type S pitot tube, shown in: (a) end view; face opening planes perpendicular to transverse axis; (b) top view; face opening planes parallel to longitudinal axis; (c) side view; both legs of equal length and centerlines coincident, when viewed from both sides. Baseline coefficient values of 0.84 may be assigned to pitot tubes constructed this way.



α1 0° LESS THAN 10°
α2 0°
z .010" LESS THAN .32cm (1/8")

β1 0° LESS THAN 5°
β2 0°
w 0" LESS THAN .08cm (1/32")

Figure 2-3. Types of face-opening misalignment that can result from field use or im- ... the baseline value

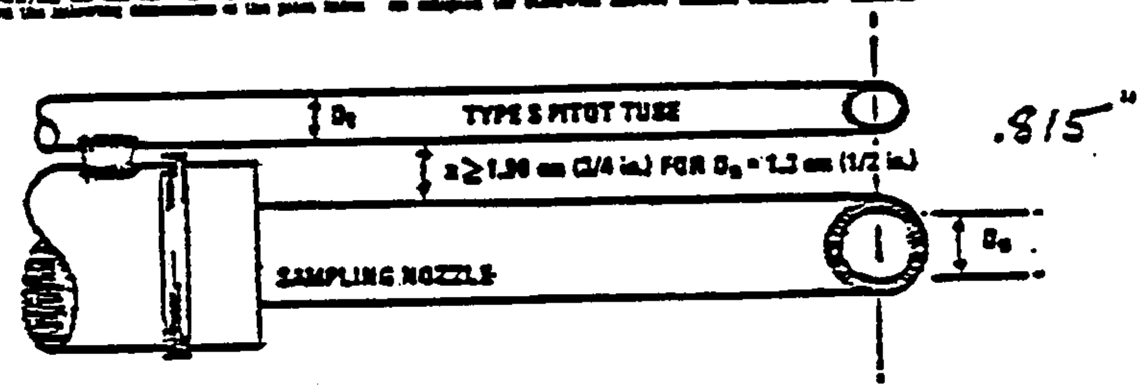
M: 31-601-4½	Probe Jacket Assembly	680	10/24
PART NO.	DESCRIPTION	SERIAL NO.	DATE

D TO: W. S. Nelson	24654	6738	10/24
COMPANY	P.O. NO.	S.O. NO.	DATE

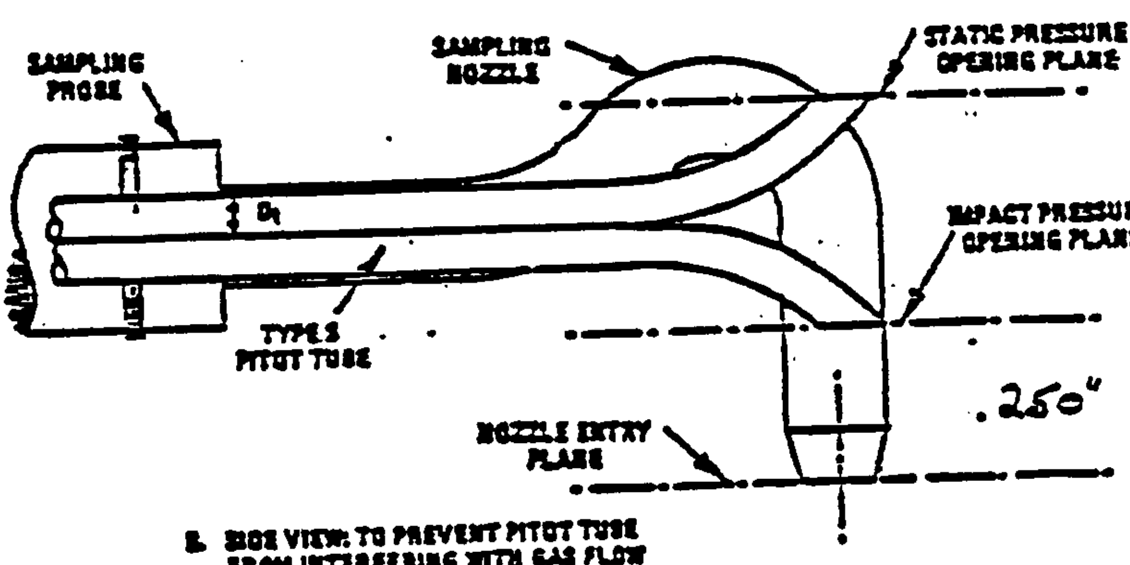
[illegible]

[illegible]

[illegible]



A. BOTTOM VIEW; SHOWING MINIMUM PITOT-NOZZLE SEPARATION.



B. SIDE VIEW; TO PREVENT PITOT TUBE FROM INTERFERING WITH GAS FLOW STREAMLINES APPROACHING THE NOZZLE, THE IMPACT PRESSURE OPENING PLANE OF THE PITOT TUBE SHALL BE EVEN WITH OR ABOVE THE NOZZLE ENTRY PLANE.

Figure 2-6. Proper pitot tube - sampling nozzle configuration to prevent aerodynamic interference; buttonhook - type nozzle; centers of nozzle and pitot opening aligned; D_t between 0.48 and 0.95 cm (3/16 and

ITEM: 31-601-4 1/2 / Probe Jacket Assembly / 680 / 10/24/9?
PART NO. — DESCRIPTION — SERIAL NO. — DATE

SOLD TO: W.S. Nelson / 24654 / 6738 / 10/24/9?
COMPANY — P.O. NO. — S.O. NO. — DATE

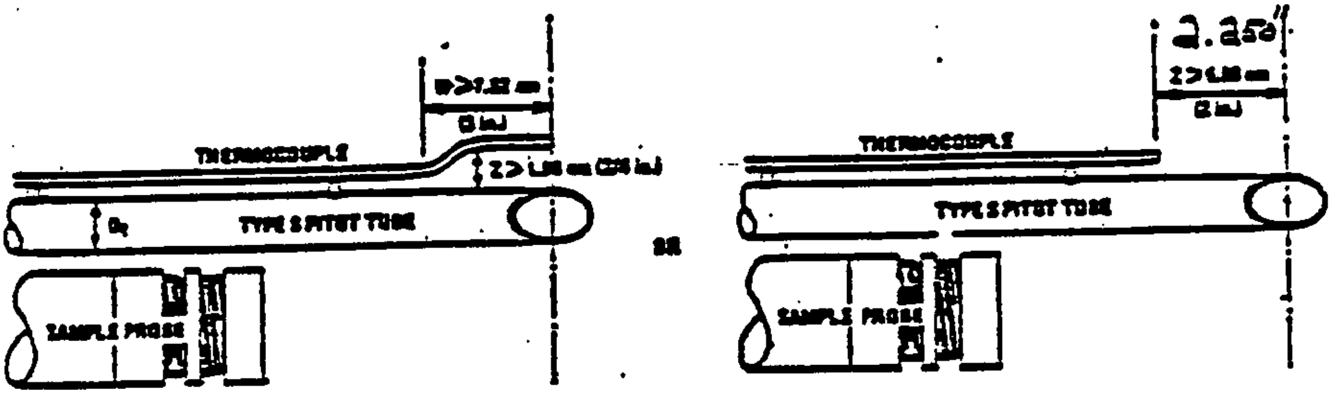


Figure 2-7. Proper thermocouple placement to prevent interference; D_t between 0.48 and 0.95 cm (3/16 and 3/8 in.).

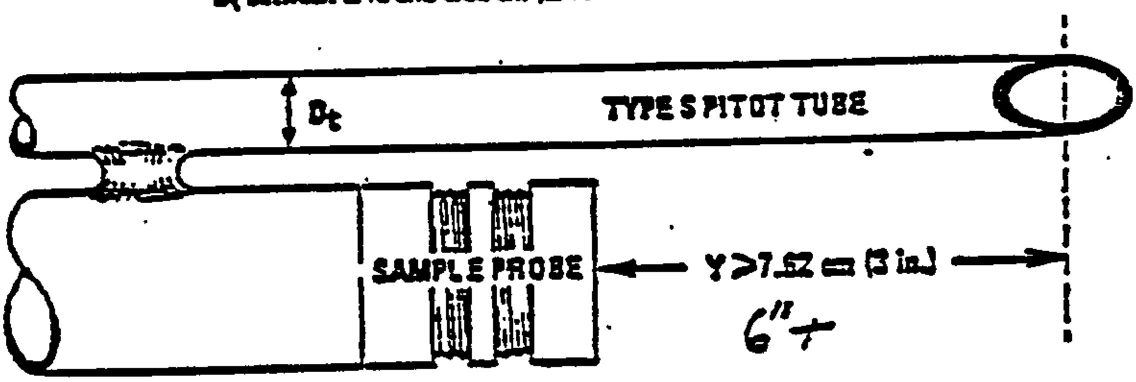


Figure 2-8. Minimum pitot-sample probe separation needed to prevent interference; D_t between 0.48 and 0.95 cm (3/16 and 3/8 in.).

[illegible]

$$D_e = \frac{2LW}{(L+W)}$$

Equation 2-1

[illegible]

Nelson

ANALYSIS REQUEST FORM AND CHAIN OF CUSTODY RECORD

WALDEMAR S. NELSON AND COMPANY
INCORPORATED
ENGINEERS AND ARCHITECTS
1200 ST. CHARLES AVENUE
NEW ORLEANS, LA. 70130
(504)-523-5281

WSNCO PROJECT NO.: 89029

PROJECT: AMSTAR

SAMPLERS: (Signature) [signature]

SAMPLE NO.	DATE	TIME	SAMPLE DESCRIPTION	NO. OF CONTAINERS	EPA METHOD 5						SPECIAL HANDLING AND/OR STORAGE REQUIRMENTS
AM-4-4	2/16/89	0931	Water	1	✓						
AM-4-5	" "	12:41	Water	1	✓						
AM-4-6	" "	1425	Water	1	✓						
89004	" "	0931	Filter	1	✓						
89005	" "	1241	Filter	1	✓						
89006	" "	1425	Filter	1	✓						

1-RELINQUISHED BY:	DATE/TIME	RECEIVED BY:	3-RELINQUISHED BY:	DATE/TIME	RECEIVED BY:
2-RELINQUISHED BY:	DATE/TIME	RECEIVED BY:	4-RELINQUISHED BY:	DATE/TIME	RECEIVED BY:
RELINQUISHED TO LABORATORY BY: [signature]	DATE/TIME: 2-17-89 0845	RECEIVED FOR LABORATORY BY: [signature]	LABORATORY NAME: WSNCO		☐ RUSH AUTHORIZED BY:

WSN-COR

Nelson

ANALYSIS REQUEST FORM AND CHAIN OF CUSTODY RECORD

WALDEMAR S. NELSON AND COMPANY
INCORPORATED
ENGINEERS AND ARCHITECTS
1200 ST. CHARLES AVENUE
NEW ORLEANS, LA. 70130
(504)-523-5281

WSNCO PROJECT NO.: 89029

PROJECT: AMSTAR

SAMPLERS: (Signature) [illegible]

SAMPLE NO.	DATE	TIME	SAMPLE DESCRIPTION	NO. OF CONTAINERS	EPA Methods						SPECIAL HANDLING AND/OR STORAGE REQUIRMENTS
AM-3-4	2/15/89	1033	Water	1	✓						
AM-3-5	" "	1351	Water	1	✓						
AM-3-6	" "	1402	Water	1	✓						
89001	" "	1033	Filter	1	✓						
89002	" "	1351	Filter	1	✓						
89003	" "	1402	Filter	1	✓						

ANALYSIS REQUESTED

1-RELINQUISHED BY:	DATE/TIME	RECEIVED BY:	3-RELINQUISHED BY:	DATE/TIME	RECEIVED BY:
2-RELINQUISHED BY:	DATE/TIME	RECEIVED BY:	4-RELINQUISHED BY:	DATE/TIME	RECEIVED BY:
RELINQUISHED TO LABORATORY BY: [illegible]	DATE/TIME 2-17-89 0815	RECEIVED FOR LABORATORY BY: [illegible]	LABORATORY NAME: WSNCO		☐ RUSH AUTHORIZED BY:

WSN-COR

NAME: LAWRENCE R. SCHUMER

TITLE: Senior Environmental Scientist

EDUCATION: 1984 M.B.A. Economics
University of New Orleans

1977 B.S. Zoology
University of Louisville

1977 To Present - EPA and Industry sponsored courses in asbestos, hazardous waste incineration, air monitoring, modeling, and instrumentation.

PROFESSIONAL EXPERIENCE:

General Experience

Project management experience includes:

- Parish-wide asbestos survey and management plan preparation for Orleans Parish School Board (9,000,000 ft^2 +).
- A state-wide asbestos survey for 400+ buildings (approx. 5,000,000 ft^2) includes development of standard sampling, analytical, and worker protection practices. Client consultation for proper employee protection.
- Manager QA/QC and authorized representative for establishment and supervision of QA/QC program for AIHA-PAT program; RTI-bulk sample QA program; and NBS-NVLAP QA program for the firm's in-house environmental laboratory.
- Project manager for industrial hygiene review of steel mill for potential heavy metals exposure to employees. Project included: identification and ranking of parameters of concern, design of sampling protocols for vegetation and soil, consultation with client regarding employee protection, development of engineering recommendations to alleviate problem.
- Project manager for industrial hygiene review of pipe plant for acid fumes; development of test protocols for air and liquid sampling; consultation with client regarding employee protection; design of clean-up alternatives.
- Project manager for in-plant identification and quantification of soil contamination, project included; development of a sampling protocol for soils and runoff, sampling, consultation with client regarding employee/ contractor personnel protection, design remedial action alternatives, on-site inspection and certification of remediation.

Project management of multi-media environmental engineering, permitting and compliance projects including: air pollution, asbestos, wastewater, and solid/hazardous waste, site remediation, industrial siting, public relations, monitoring/testing (stacks, soil, surface/groundwater, air, asbestos, etc.), modeling and EIAs.

Extensive knowledge of local, state and federal OSHA and worker protection regulations, air emission permitting processes and programs including: PSD, NSPS, and NESHAPS as well as other regulatory programs such as: NPDES, RCRA, TSCA, COE 10/404, USCG, NRC, DOT, DOE, OCS, Statewide Order 29B, noise and building/fire marshall regulations.

Established and managed in-house environmental laboratory and QA/QC program for testing and monitoring of air pollutants including asbestos.

PROFESSIONAL REGISTRATIONS:

Certified Asbestos Abatement Contractor/Supervisor, Louisiana Department of Environmental Quality, Certificate No. 88063, 1988-89

Certified in Advanced Supervision of Asbestos Abatement Projects, EPA (Ga. Tech.) 1987

Certified in Procedures, Interim Practices, and Supervision for Asbestos Abatement Practices, EPA (LSU) 1986

Certified Visible Emissions Observer, EPA (1979 - '87)

PROFESSIONAL MEMBERSHIPS

Air Pollution Control Association (APCA)
- Member, APCA TS 6.2 Hazardous Waste Combustion Committee
- Member, APCA TS 6.3 Solid Waste Treatment and Disposal Committee
- Member, APCA TE 3 Economics Committee Protocol Committee, 1982 National Convention (international delegations)
- Chairman, APCA International Specialty Conference: "Performance and Cost of Alternatives to Land Disposal of Hazardous Waste", 1986
- Chairman, Louisiana Section, 1985-86
- Executive Board, Louisiana Section, 1981-1987

American Meteorological Society
American Chemical Society

NAME: R. JAVIER ACUNA

TITLE: Environmental Technologist

EDUCATION:

1988 University of Alabama Facilities Inspection for Asbestos Containing Materials
1988 University of Alabama Management of Asbestos Materials
1986 LSU Certified: Procedures, Interim Practices, and Supervision for Asbestos Abatement Practices
1982 Vo-Tech Drafting Courses
1974 U.S. Navy Boiler Water - Feed Water Testing
1973 U.S. Navy BT/A School, Boiler Testing and Operation

PROFESSIONAL EXPERIENCE:

General Experience to Present

Responsibilities include: supervision of field survey teams, collecting ambient and industrial source air pollutant samples for process efficiency and regulatory compliance determinations, quantitative and qualitative analysis of air samples, calibration of field sampling equipment, and report preparation. Experienced in preparation of PSD applications, and Alabama/Louisiana/Mississippi Air Emissions Permit Applications and emission inventory documents.

Specific asbestos experience includes: ACM bulk surveys, preparation of ACM operation and maintenance programs, and abatement cost estimates. Preparation of asbestos abatement specifications in conjunction with renovation and/or demolition, construction inspection during abatements, and ACM ambient air/area/personnel monitoring.

Extensive knowledge of OSHA, EPA (AHERA & NESHAP), LaDEQ, NYDEP, USN, DOD, NASA and local asbestos regulations governing the testing, monitoring, sampling, analyses, abatement and disposal of ACM.

Project Experience

Supervised field sampling activities for numerous projects on a metals recovery unit utilizing EPA Methods 1-4, 5, 9, and 12 (40 CFR Appendix A). Supervised field sampling activities for a complete environmental survey, including ambient monitoring for formaldehyde.

Assisted in groundwater impact assessment for lime storage pond addressing EP Toxicity contaminants. Assisted in soil sampling for cleanup closure of nonhazardous solid waste site. Participated in water well survey of two mile radius of proposed site to satisfy solid waste permit applications. Calculated subsurface elevations and thickness for liner equivalence for solid waste site. Assisted in preliminary site investigation for closure of ash landfill/impoundment. Assisted in dye study of Mississippi River in order to develop a water quality model for MSW discharges. Supervised field sampling activities and was abatement supervisor for largest excavation abatement in EPA Region 6 in 1987. Responsibilities included: site investigation, specifications, contractor evaluation and on-site air monitoring.

PROFESSIONAL REGISTRATIONS

Certified: Visible Emissions Observer
Certified: Asbestos Abatement Supervisor
Certified: Facilities Inspector for Asbestos-Containing Materials
Certified: Management of Asbestos Materials

PROFESSIONAL MEMBERSHIPS

Louisiana Air Pollution Control Association (APCA)

NAME: CLINTON E. SETTOON

TITLE: Environmental Technician

EDUCATION: 1987 A.S. Engineering Graphics
Delgado Community College

PROFESSIONAL EXPERIENCE:

Responsibilities include assisting in the collection of ambient and industrial source air pollutant samples for process efficiency and regulatory compliance determinations, quantitative and qualitative analyses of air samples, and report preparation.

Air emissions sampling experience is as follows:

- Shell Oil Company

  Assisted in the sampling of total hydrocarbons and amine emissions, and the volumetric flow rate. EPA methods for volumetric flow rate (Methods 1 - 4) and NIOSH Methods 2002 and 1500 were used for determination of amines and total hydrocarbons, respectively.

- Allied Chemical Corporation

  Assisted in field sampling activities in order to collect information for permitting. EPA Methods 1 - 4 were used as well as Method 5.

- Amax Metals Recovery, Inc.

  Assisted in sampling activities for numerous projects on a metals recovery unit using EPA Methods 1 - 4, 5, 9, and 12.

Specific asbestos experience includes: participating in 150+ inspections of utility buildings, office buildings, grocery stores, schools, churches, garages, and DOD facility.

Experience in conducting background, abatement and clearance asbestos air sampling programs including both aggressive and passive monitoring.

Experience in assisting certified asbestos abatement supervisor during abatements.

Experience in assisting in the preparation of AHERA Inspection and Management Plans and commercial/industrial survey reports using WSNCo's Asbestos Data Management System (ADMS).

Experience in the preparation of detailed drawings of construction for the purpose of locating asbestos bulk samples.

PROFESSIONAL REGISTRATIONS

Certified: (EPA) Inspector/Management Planner
Certified: Visible Emissions Observer

PROFESSIONAL MEMBERSHIPS

Louisiana Air Pollution Control Association (APCA)
Society of American Military Engineers (SAME)

AMSTAR SUGAR CORPORATION
CHALMETTE REFINERY

By: Fred Goodrow Date: 03/01/89	Description: Granulator throughput during Rotoclone testing - 02/15/89 and 02/16/89.	Sheet 1 of 5

Granulator throughput during testing was determined by batch centrifugal event recorders. During the sampling runs, four mixers fed sugar to twenty-two (22) batch centrifugal machines, which in turn fed five identically sized granulators. Sugar flow to the granulators is split equally. Pounds of sugar per centrifugal cycle on each mixer was determined independently to achieve the best accuracy possible for the throughput determinations.

Pounds of sugar per centrifugal cycle on each mixer was determined by measuring bed depths on representative centrifugals for each mixer. Bed depths were then converted to pounds of sugar per cycle from published data.

Total granulator throughput then becomes:

```
 (# of cycles per centrifugal)*(pounds of sugar per cycle)   (#1 mixer)
+(# of cycles per centrifugal)*(pounds of sugar per cycle)   (#2 mixer)
+(# of cycles per centrifugal)*(pounds of sugar per cycle)   (#3 mixer)
+(# of cycles per centrifugal)*(pounds of sugar per cycle)   (#4 mixer)
= Total pounds of sugar fed to granulators 1-5
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Individual granulator throughput then becomes:

(Total pounds of sugar to granulators 1-5)/(5)

AMSTAR SUGAR CORPORATION
CHALMETTE REFINERY

By: Fred Goodrow Date: 03/01/89	Description: Granulator throughput during Rotoclone testing - 02/15/89 and 02/16/89.	

 # 3 Granulator Rotoclone - 02/15/89

RUN	TIME	DURATION
#1	09:22 - 10:34	72 minutes
#2	12:36 - 13:48	72 minutes
#3	14:44 - 15:56	72 minutes

Centrifugal cycles during runs:

CENTRIFUGAL MACHINES

	1 MIXER										2 MIXER					3 MIXER			4 MIXER			
RUN	1A	1B	1C	1D	1E	1F	1G	1H	1J	1K	2A	2B	2C	2E	2F	3A	3B	3C	4A	4B	4C	4D
#1	21	13	10	17	22	22	22	11	23	24	20	20	17	20	19	12	15	15	16	16	16	16
#2	22	22	18	9	15	13	21	20	24	24	18	18	15	22	22	1	0	0	16	16	16	17
#3	22	21	21	9	13	14	21	16	24	24	17	18	17	21	21	9	9	2	16	16	16	16

Total centrifugal cycles per mixer per run:

RUN	#1 MIXER	#2 MIXER	#3 MIXER	#4 MIXER
#1	185	96	42	64
#2	188	95	1	65
#3	185	94	20	64

Pounds of sugar discharged per centrifugal cycle by mixer:

#1 MIXER	#2 MIXER	#3 MIXER	#4 MIXER
707 #	660 #	641 #	631 #

RUN #1 = (185 cycles * 707#/cycle) +
(96 cycles * 660#/cycle) +
(42 cycles * 641#/cycle) +
(64 cycles * 631#/cycle) = 261,461 pounds/run

261,461 #/5 granulators = 52,292 #/granulator.

RATE = (52,292 #)/(72 minutes)*(60 minutes/hour) = <u>43,577 #/hour</u>

AMSTAR SUGAR CORPORATION
CHALMETTE REFINERY

By: Fred Goodrow Date: 03/01/89	Description: Granulator throughput during Rotoclone testing - 02/15/89 and 02/16/89.	

RUN #2 = (188 cycles * 707#/cycle) +
(95 cycles * 660#/cycle) +
(1 cycles * 641#/cycle) +
(65 cycles * 631#/cycle) = 237,272 pounds/run

237,272 #/5 granulators = 47,454 #/granulator.

RATE = (47,454 #)/(72 minutes)*(60 minutes/hour) = <u>39,545 #/hour</u>

RUN #3 = (185 cycles * 707#/cycle) +
(94 cycles * 660#/cycle) +
(20 cycles * 641#/cycle) +
(64 cycles * 631#/cycle) = 246,039 pounds/run

246,039 #/5 granulators = 49,208 #/granulator.

RATE = (49,208 #)/(72 minutes)*(60 minutes/hour) = <u>41,007 #/hour</u>

The average throughput for all three runs then becomes:

(43,577 #/hr)+(39,545 #/hr)+(41,007 #/hr)/3 runs =

<u>41,376 pounds per hour</u> (20.69 tons/hr)

Allowable rate of emissions based on process weight rate from table 3 of the Louisiana Air Quality Regulations equalls:

4.10 * (20.69 t/hr) ^0.67 = <u>31.21 pounds per hour</u>

File: Exempt3

AMSTAR SUGAR CORPORATION
CHALMETTE REFINERY

By: Fred Goodrow Date: 03/01/89	Description: Granulator throughput during Rotoclone testing - 02/15/89 and 02/16/89.	

4 Granulator Rotoclone - 02/16/89

RUN	TIME	DURATION
#1	08:20 - 09:38	78 minutes
#2	11:24 - 12:37	73 minutes
#3	13:00 - 14:22	82 minutes

Centrifugal cycles during runs:

CENTRIFUGAL MACHINES

	1 MIXER										2 MIXER					3 MIXER			4 MIXER			
RUN	1A	1B	1C	1D	1E	1F	1G	1H	1J	1K	2A	2B	2C	2E	2F	3A	3B	3C	4A	4B	4C	4D
#1	23	24	23	24	24	24	23	14	18	21	21	21	15	23	22	14	22	14	4	11	17	13
#2	19	19	18	15	20	22	18	17	18	19	20	21	2	22	22	12	21	10	13	14	14	13
#3	26	25	18	15	20	26	24	11	23	27	20	21	16	16	22	20	24	3	16	15	15	15

Total centrifugal cycles per mixer per run:

RUN	#1 MIXER	#2 MIXER	#3 MIXER	#4 MIXER
#1	218	102	50	45
#2	185	87	43	54
#3	215	95	47	61

Pounds of sugar discharged per centrifugal cycle by mixer:

#1 MIXER	#2 MIXER	#3 MIXER	#4 MIXER
707 #	660 #	641 #	631 #

RUN #1 = (218 cycles * 707#/cycle) +
(102 cycles * 660#/cycle) +
(50 cycles * 641#/cycle) +
(45 cycles * 631#/cycle) = 281,891 pounds/run

281,891 #/5 granulators = 56,378 #/granulator.

RATE = (56,378 #)/(78 minutes)*(60 minutes/hour) = 43,368 #/hour

AMSTAR SUGAR CORPORATION
CHALMETTE REFINERY

By: Fred Goodrow Date: 02/15/89	Description: Granulator throughput during Rotoclone testing - 02/15/89 and 02/16/89.	Sheet 5 of 5

RUN #2 = (185 cycles * 707#/cycle) +
(87 cycles * 660#/cycle) +
(43 cycles * 641#/cycle) +
(54 cycles * 631#/cycle) = 249,852 pounds/run

249,852 #/5 granulators = 49,970 #/granulator.

RATE = (49,970 #)/(73 minutes)*(60 minutes/hour) = 41,071 #/hour

RUN 03 = (215 cycles * 707#/cycle) +
(95 cycles * 660#/cycle) +
(47 cycles * 641#/cycle) +
(61 cycles * 631#/cycle) = 283,323 pounds/run

283,323 #/5 granulators = 56,665 #/granulator.

RATE = (56,665 #)/(82 minutes)*(60 minutes/hour) = 41,462 #/hour

The average throughput for all three runs then becomes:

(43,368 #/hr)+(41,071 #/hr)+(41,462 #/hr)/3 runs =

41,967 pounds per hour (20.98 tons/hr)

Allowable rate of emissions based on process weight rate from table 3 of the Louisiana Air Quality Regulations equalls:

4.10 * (20.98 t/hr)^0.67 = 31.51 pounds per hour

File: Exempt4