APPENDIX K

OEPA STACK TEST REVIEW SUMMARY FORM

Bruce Weinberg OEPA

3-05-002-05

APPLICATION NUMBER 1409000018

FACILITY NAME The Southern Ohio Asphalt Company

SOURCE DESCRIPTION (OR SCC CODE) P901

CONTROL EQUIPMENT Wet Scrubber

DATE(S) OF TEST November 11, 1990

FINAL TEST REPORT RECEIVED ON December 11, 1990

POLLUTANT(S) TESTED Particulate Emissions (all size fractions)

TEST METHOD U.S. EPA Reference Methods 1-5

TEST FIRM The Shelly Company

EMISSION RATES*:

ACTUAL (lb(s)/Hr) 24.57 ALLOWABLE** 63.2

OPERATING RATES*:

DURING TEST** 180 tons/HR MAXIMUM** 280 tons/HR

EMISSION FACTOR***

COMMENTS:

I HEREBY VERIFY THAT THE INFORMATION CONTAINED WITHIN THE STACK TEST REPORT HAS BEEN REVIEWED AND IT HAS BEEN DETERMINED THAT THE TEST PROCEDURES, ANALYSES AND CALCULATIONS ARE:

[X] AN ACCEPTABLE DEMONSTRATION OF CONFORMANCE WITH THE APPROVED TESTING METHODOLOGY.

[ ] AN UNACCEPTABLE DEMONSTRATION OF CONFORMANCE WITH THE APPROVED TESTING METHODOLOGY.

December 17, 1990
DATE OF REVIEW

Prepared By: Alan C. Harrington, AQT

REVIEWED BY

LKL

* BASED ON - RUN AVERAGE
** SPECIFY APPLICATION UNITS
*** SPECIFY IN UNITS OF MASS/INPUT

ACH/sal

Observer's Report

For Particulate Emissions

Conducted On: November 11, 1990

Source: The Southern Ohio Asphalt Company
107 River Circle Drive
Fairfield, Ohio

Premise Number: 1409000018

Test Firm: The Shelly Company

Prepared By: Alan C. Harrington, AQT
Date Prepared: December 17, 1990

SOUTHWESTERN OHIO AIR POLLUTION CONTROL AGENCY
(S.W.O.A.P.C.A.)

The Southern Ohio Asphalt Company

Testing for particulate emissions was conducted on November 12, 1990 at the Southern Ohio Asphalt Company on P090's aggregate dryer. Emissions from the dryer are controlled by a wet scrubber. The Ohio Administrative Code 3745-17-11 sets an emission limit of 63.2 LBS/HR particulate. This test was conducted to ascertain compliance with OAC regulations and to determine if proper maintenance on the wet scrubber was being performed.

Particulate emissions for three one-hour runs averaged 24.58 LBS/HR. The material throughput was an average 180 tons/HR. This is only 64.3% of the rated maximum (280 tons/HR) and does not satisfy the proper testing protocol of operating within 90% of rated maximum. Material was measured in the 200 ton silo at test start and test stop to determine the operating rate. Ohio type 404 asphalt was produced.

The stack volumetric flow was 78,333 dscfm at 12.6% moisture and a stack temperature of 127 degree F. These values are comparable to the 1989 test values of 81,700 dscfm at 11% moisture and a stack temperature of 107 degree F.

The wet scrubber was at 5 inches pressure drop. The 3 inch feedwater main was at 110 psi. The nozzles and lines in the wet scrubber were replaced in the winter of 1989. Maintenance should be performed on yearly basis at the least.

Visible emissions during testing average 10% for the heaviest six-minute average. Some fugitive emissions were occasionally seen coming from the plant.

Sample ports and points were in accord with the September 1983 Federal Register. Cyclonic flow was checked for, and none was found. All calculations were checked and found to be correct within the report. Adequate documentation of equipment calibrations were provided. Leak checks, manometer, zeroing, leveling, probe orientation, probe rinse, and isokinetic flow was all properly performed.

In conclusion, the data is of sufficient accuracy to determine compliance with regulations. Due to the fact that the plant was operating at 63.4% of its rated maximum and that 1989 emissions showed to be at 85% of the allowable, retesting is recommended on a yearly basis.

Prepared By: Alan C. Harrington, AQT
Date Prepared: December 17, 1990
ACH/sal

EPA METHOD 5 STACK TEST ANALYSIS

CILITY NAME: SOUTHERN OHIO ASPHALT #42
EMISE #: 1409000018
URCE DESCRIPTION: P901

REVIEWER: ACH
TEST DATE: 11-12-90
PRINTED: 12-17-1990

PUT DATA:	RUN #1	RUN #2	RUN #3
TER VOLUME (ACF)	32.012	40.575	40.3
TER CORRECTION	.99	.99	.99
ROMETRIC PRESSURE (IN HG)	29.92	29.92	29.99
IFICE PRESSURE (IN H2O)	.845	1.865	1.873
TER TEMPERATURE (F)	69.52	75.29	78.5
LUME WATER (ML H2O)	97.5	108.1	129.5
2 IN STACK GAS (%)	4.2	3.5	3.2
2 IN STACK GAS (%)	13.5	13.3	13.2
2 IN STACK GAS (%)	82.3	83.2	88.6
) IN STACK GAS (%)	0	0	0
ITOT COEFFICIENT	.84	.84	.84
VERAGE SQUARE ROOT VELOCITY PRESS	.7541	.6926	.6999
TACK TEMPERATURE (F)	131.37	124.42	126.67
TACK PRESSURE (IN HG)	29.895	29.895	29.966
TACK DIAMETER (IN)	84	84	84
TACK AREA (SQ FT)	38.48451	38.48451	38.48451
ARTICULATE CATCH (MG)	74.5	89.9	100.1
OZZLE DIAMETER (IN)	.218	.244	.244
OZZLE AREA (SQ FT)	0.000259	0.000325	0.000325
EST LENGTH (MIN)	60	60	60

EST RESULTS:

IETER VOLUME @STP (DSCF)	31.6539	39.7879	39.3749
OLUME OF WATER VAPOR @STP (CF)	4.589325	5.088267	6.095565
OLE FRACTION OF WATER IN STACK GAS	0.126626	0.113385	0.134056
RY MOLECULAR WEIGHT OF STACK GAS	29.2120	29.0920	30.4400
OLECULAR WEIGHT OF STACK GAS	27.7923	27.8343	28.7724
TACK GAS VELOCITY (FT/SEC)	45.6869	41.6821	41.4596
TACK GAS FLOW (DRY STD CF/HR)	%4931651.0	%4621888.0	%4483439.0
ARTICULATE CONCENTRATION (GR/DSCF)	0.036316	0.034864	0.039227
SOKINETIC RATIO	95.3382	102.0694	104.1297
ASS RATE OF EMISSION (LB/HR)	25.5853	23.0195	25.1243

$\bar{x} = 24.5$

TACK TEST COMMENTS:

ONE

OHIO EPA — VISIBLE EMISSION OBSERVATION FORM

SOURCE NAME: Southern Asphalt

ADDRESS: River Circle Dr

COUNTY | ZIP CODE | TELEPHONE

SOURCE ID NUMBER | OBSERVATION DATE: 11-12-90

PROCESS: Asphalt Plant | OPERATING MODE: 4.0" Ap @ 110PSI

CONTROL EQUIPMENT: wet scrubber | OPERATING MODE: 200TPH

DESCRIBE EMISSION POINT: stack

DISTANCE FROM OBSERVER: 5 stk hts | DIRECTION FROM OBSERVER

HEIGHT ABOVE GROUND LEVEL | HEIGHT RELATIVE TO OBSERVER

DESCRIBE EMISSIONS: dust

EMISSION COLOR: brown | PLUME TYPE: INTERMITTENT ☐ CONTINUOUS ☑ FUGITIVE ☐

WATER DROPLETS PRESENT: YES ☑ NO ☐ | IF YES, IS PLUME: ATTACHED ☑ DETACHED ☐

AT WHAT POINT WAS OPACITY DETERMINED: 1 stk ht from stack top

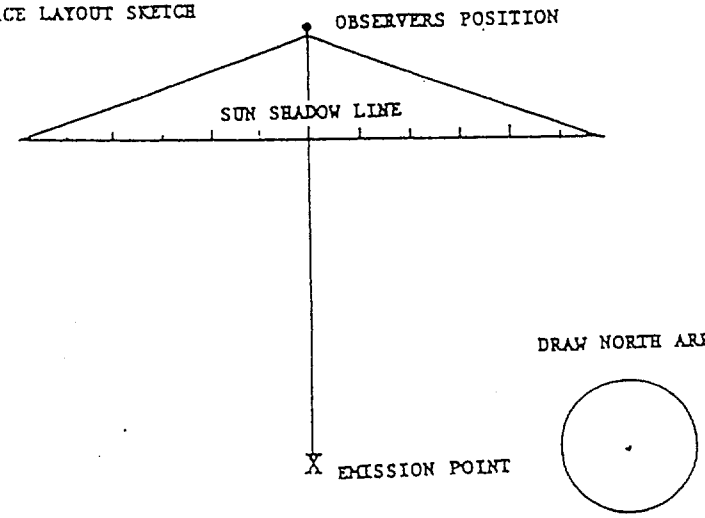
DESCRIBE BACKGROUND: sky

BACKGROUND COLOR: blue | SKY CONDITIONS: C/R

WIND SPEED | WIND DIRECTION

AMBIENT TEMPERATURE: 50° | RELATIVE HUMIDITY

SOURCE LAYOUT SKETCH



START TIME 1310	0	15	30	45	STOP TIME	0	15	30	45
1	5	10	10	10	31				
2	10	5	15	10	32				
3	10	10	15	10	33				
4	15	10	10	15	34				
5	15	15	15	10	35				
6	10	10	5	5	36				
7	10	10	10	5	37				
8	5	10	10	10	38				
9	10	15	15	10	39				
10	10	10	10	10	40				
11	10	10	10	10	41				
12	10	10	10	5	42				
13	5	10	10	10	43				
14	10	5	5	5	44				
15	5	0	5	5	45				
16	0	0	0	5	46				
17	5	5	5	5	47				
18	5	0	0	0	48				
19	0	10	0	0	49				
20	0	5	5	5	50				
21	5	0	0	5	51				
22	5	0	0	0	52				
23	0	0	0	0	53				
24	0	0	5	0	54				
25	0	0	0	0	55				
26	0	5	10	10	56				
27	10	10	10	10	57				
28	10	5	5	10	58				
29	10	10	10	—	—				
30	10	15		10	60				

SOURCE NAME: Southern OHV Asphalt

ADDRESS: River Circle Dr.

COUNTY | ZIP CODE | TELEPHONE

SOURCE ID NUMBER: 14090000 18 P901

OBSERVATION DATE: 11-12-90

PROCESS: Asphalt Plant

OPERATING MODE: ~220 TPH

CONTROL EQUIPMENT: wet scrubber

OPERATING MODE: Δp 4.5" 110 PSI H_2O

DESCRIBE EMISSION POINT: stack

DISTANCE FROM OBSERVER: 5 stk Hts

DIRECTION FROM OBSERVER

HEIGHT ABOVE GROUND LEVEL

HEIGHT RELATIVE TO OBSERVER

DESCRIBE EMISSIONS: dust

EMISSION COLOR: brown

PLUME TYPE: INTERMITTENT ☐ CONTINUOUS ☑ FUGITIVE ☐

WATER DROPLETS PRESENT: YES ☑ NO ☐

IF YES, IS PLUME: ATTACHED ☑ DETACHED ☐

AT WHAT POINT WAS OPACITY DETERMINED: after dissapation of H_2O about 1 stk length

DESCRIBE BACKGROUND: sky

BACKGROUND COLOR: blue

SKY CONDITIONS: c/r

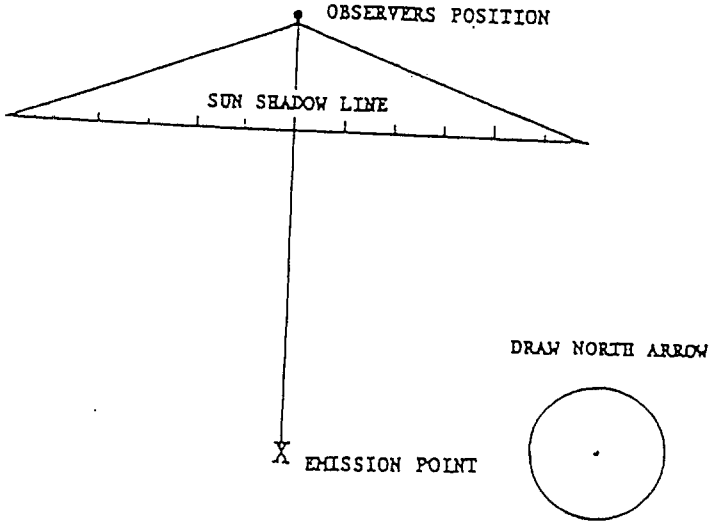
WIND SPEED: light

WIND DIRECTION

AMBIENT TEMPERATURE: 45°

RELATIVE HUMIDITY

SOURCE LAYOUT SKETCH



START TIME: 1520

STOP TIME

	0	15	30	45		0	15	30	45
1	5	5	5	5	31				
2	5	5	5	5	32				
3	5	0	0	0	33				
4	0	5	5	5	34				
5	5	5	5	5	35				
6	5	5	5	0	36				
7	0	0	0	0	37				
8	0	0	0	0	38				
9	0	5	5	0	39				
10	5	5	5	5	40				
11	5	5	5	5	41				
12	5	5	5	5	42				
13	5	10	10	10	43				
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23	5	5	0	0	53				
24	0	0	0	0	54				
25	0	10	5	5	55				
26	0	0	0	0	56				
27	0	0	0	0	57				
28	5	0	0	0	58				
29	0	0	5	10	59				
30	10	15	/	/	60				

T K Benton

ASPHALT PLANT WETWASHER OUTLET

COMPLIANCE EMISSION EVALUATION

for the

SOUTHERN OHIO ASPHALT PLANT #42

I, Larry E. Shively, certify that to best of my knowledge all applicable State and Federal test procedures were followed. All filters and data remained under my direct control.

Larry E. Shively
THE SHELLY COMPANY
Air Quality Control Manager

TABLE OF CONTENTS

HOT MIX ASPHALT PLANT

COMPLIANCE EMISSION EVALUATION

1.0 INTRODUCTION

The Shelly Co. conducted a compliance emission test on the wetwash outlet stack of SOUTHERN OHIO ASPHALT PLANT #42 located at Fairfield, Ohio.
The test was conducted on 11-12-90.

The tests were conducted in order to determine compliance with current Ohio EPA and U.S. EPA particulate emission regulations. All tests were performed in accordance with procedures and requirements established by U.S. EPA and the Ohio EPA.

The emissions for three test runs at the outlet stack averaged .0370 grains per dry standard cubic foot and 24.92 pounds per hour.

2.0 THE SOURCE

The following is information concerning THE SOURCE:

A. **SOURCE IDENTIFICATION:** SOUTHERN OHIO ASPHALT PLT #42

B. **LOCATION:** FAIRFIELD, OHIO

C. **PLANT DESCRIPTION:** BATCH PLANT

D. **TYPE OF EMISSION CONTROL EQUIPMENT:** WETWASH

E. **STACK DIMENSIONS:** 84 INCHES

F. **TEST LOCATION (See next page for locations):**

G. **TEST TIME:** 60 minutes

H. **TEST DATE:** 11-12-90

I. **TESTING COMPANY:** THE SHELLY CO.

J. **SAMPLING TEAM:** LARRY SHIVELY, GARRY MILLER, HARRY GOLDSBERRY, DENNY PAUL

K. **EPA REPRESENTATIVE:** LEE GRUBER

L. **REMARKS:**

* TRAVERSE POSITIONS IN ROUND STACK *

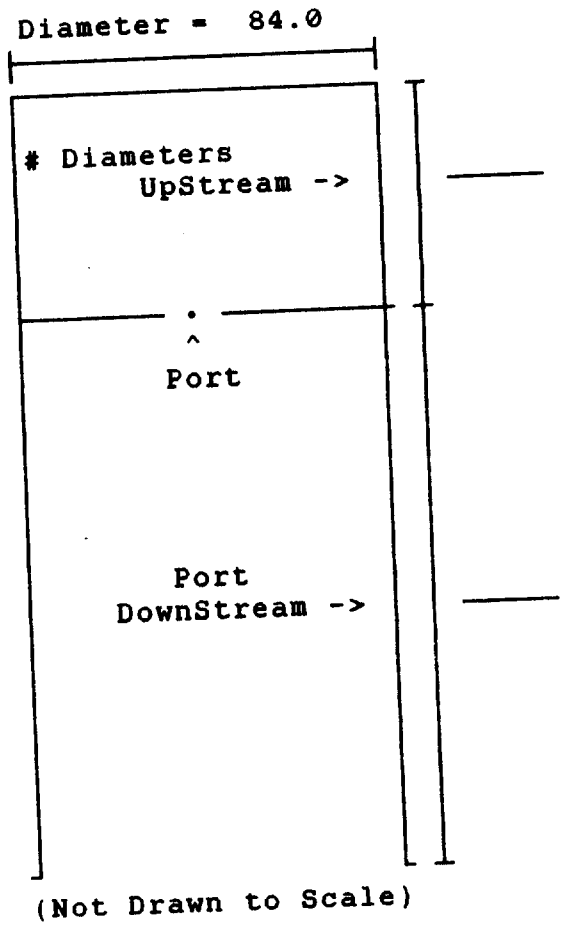
Plant : SOUTHERN OHIO ASPHALT 42

Inside of Near Wall to outside of Nipple : 0.0 inches

Number of Points : 12

Area of Round Stack : 38.48 sq. ft.

Point	Distance	Nipple	Total Dist
1	1.8	0.00	1.8
2	5.6	0.00	5.6
3	9.9	0.00	9.9
4	14.9	0.00	14.9
5	21.0	0.00	21.0
6	29.9	0.00	29.9
7	54.1	0.00	54.1
8	63.0	0.00	63.0
9	69.1	0.00	69.1
10	74.1	0.00	74.1
11	78.4	0.00	78.4
12	82.2	0.00	82.2



3.0 TEST PROCEDURE SUMMARY

3.1 SCOPE AND OBJECTIVES

Testing was conducted to determine the following:

A. Gas Volume - ACFM and SCFM
B. Gas Temperature - F
C. Moisture - % by volume
D. Flue Gas Molecular Weight - % by volume O_2, CO_2 and (N_2 & CO) by difference.
E. Stack Gas Velocity - feet per second
F. Particulate Emissions - grains/DSCF, lbs./hr.

3.2. METHODS OF SAMPLING

A. Sampling and traverse locations were determined as per Method One of the 40 CFR PART 60, JULY 1989.

B. Gas Flow, gas temperature, and static pressure measurements were made as per Method Two of the 40 CFR PART 60, JULY 1989.

C. Excess air and molecular weight determinations were made as per Method Three of 40 CFR PART 60, JULY 1989.

D. Moisture content sampling was conducted as per Method Four of 40 CFR PART 60, JULY 1989.

E. Particulate sampling was conducted as per Method Five of 40 CFR PART 60, JULY 1989.

3.3. SAMPLING PROCEDURES

A. Test Station and Traverse Locations

The location of the sampling station and traverse points are critical to the performance of the project. The location of test points can be found at the begining of Section 4.

B. Equipment

The equipment used in the test was manufactured by Anderson Samplers, Inc. in Atlanta, Ga. The control boxes are the Universal Stack Sampler. (See fiqure 1 for outline of equipment)

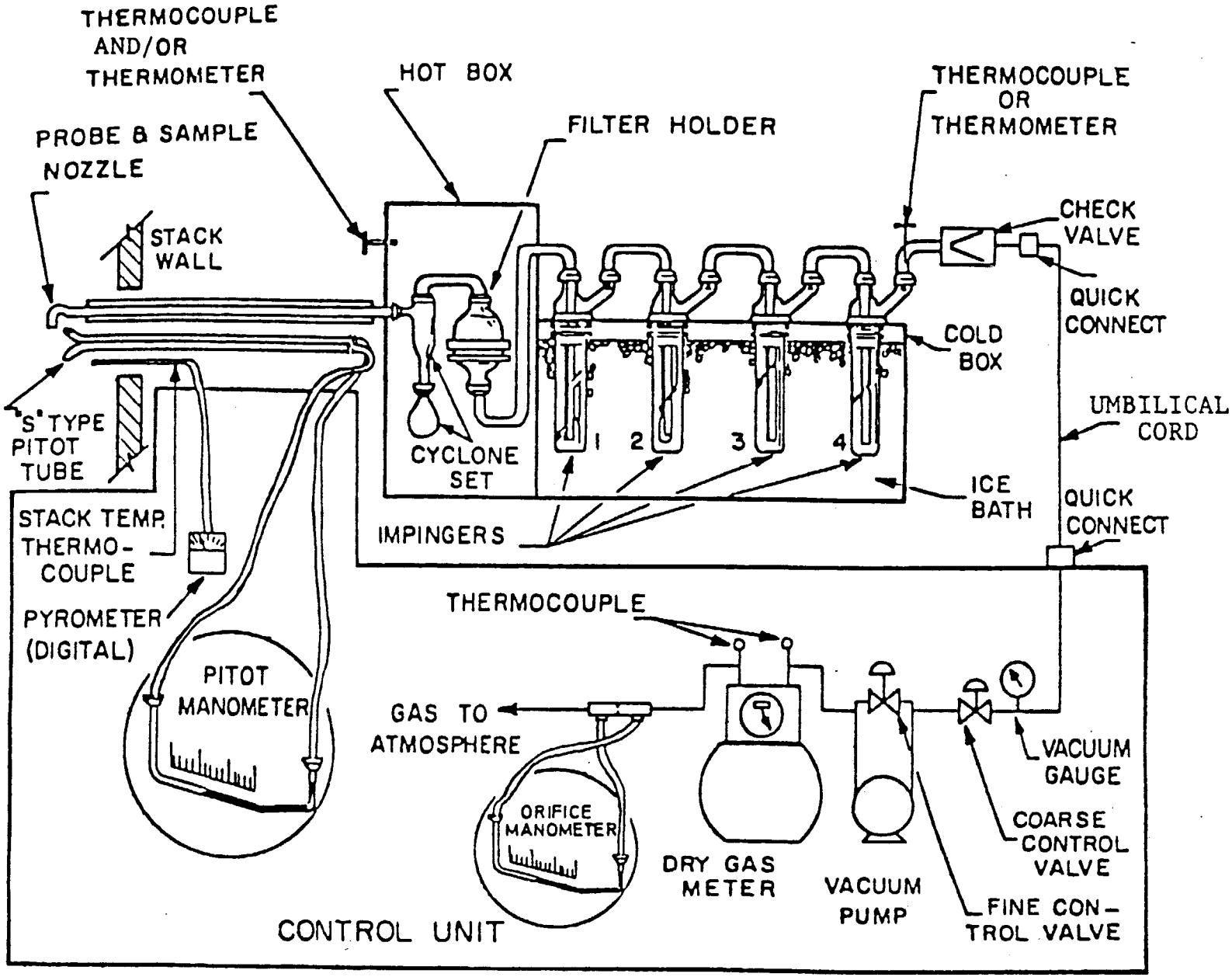


FIGURE 1: SAMPLING TRAIN SCHEMATIC

the nozzle and the probe. All washings were stored in sealed glass sample bottles for transfer to the laboratory. The silica gel used in the fourth impinger was removed and stored in a sealed sample bottle. The contents of the first second, and third impingers were combined and measured volumetrically.

3.4 ANALYTICAL METHODS

A. Laboratory Analysis

All samples generated during the test program were analyzed by The Shelly Company at The Shelly Company Laboratory in Thornville, Ohio. All samples are under the direct control of the sampling team. The following discussions describe the analytical methods employed.

B. Particulate samples

All glass fiber filters used in the sampling program had been tare weighed following twenty-four (24) hour desiccation period prior to their use in the field. Upon their return to the laboratory, they were desiccated and reweighed. The weight difference was the amount of sample collected.

Nozzle, probe, and filter holder washings were evaporated to dryness in tared beakers. The residue was desiccated and the beakers were reweighed to a constant weight. The weight difference was the amount of particulate matter collected at these locations in the sampling train.

An acetone blank was evaporated to dryness in a tared beaker, desiccated and reweighed. Any residue which remained was a contaminant in the reagent and was considered a blank weight which was used as a correction factor in subsequent calculations.

C. Gas Flow and Gas Temperature Determinations

The gas flow rate and temperature profile were measured by conducting a simultaneous velocity and temperature traverse. Gas velocity heads were measured with a calibrated "S" type Pitot tube which was connected to an inclined manometer. A Chromel-Alumel Thermocouple connected to a potentiometer was used to determine the gas temperature.

D. Excess Air and Molecular Weight Determinations

Fyrite gas analyzer was used to determine the weight of the flue gas. The following parameters were measured in order to calculate molecular weight: volume percent carbon dioxide (CO_2), volume percent oxygen (O_2), the volume percentage of nitrogen plus carbon minoxide (N_2 & CO) was determined by difference. These parameters were measured using the principle of gas absorption in specific absorbing solutions. A controlled flue gas sample was drawn through the plastic manifold to the sample chamber by the use of a hand pump following purging in the sample line. The system was then closed by adjusting the valve at the inlet to the manifold. The sample was bubbled through each absorbing solution which selectively collects a different gaseous component of the stack gas. The volume of a specific gaseous component collected in an individual absorbing solution was determined by the change in volume of the absorbent in the sample chamber after the bubbling process through that solution was complete. Since the original

absorbant volume was adjusted to 0 ml any change in volume was also the percentage of the specific gaseous component found in the stack gas stream. Fyrite analyses performed in triplicate for each particulate run.

E. Moisture Content

Sampling was conducted employing the principles presented in E.P.A. Method Four and concurrently with particulate sampling. Parameters evaluated in order to determine the gas streams moisture content were: sample gas volume, sample gas temperature, sample gas pressure, impinger moisture gain, and silica gel moisture gain. Some minor modifications were made to the Method Four train to allow concurrent particulate and moisture content sampling; these modifications involved no deviations from sampling principles. Such modifications as the substitution of a glass fiber filter for Pyrex wool as a filtering medium, and the substitution of calibrated orifice for a rotameter as a flow metering device were incorporated.

Silica gel had been tare-weighed prior to its use in the field. Upon completion of a test run, the silica gel was reweighed. Weight gain was considered to be all to water vapor. The total volume of the impinger solutions minus the original volume of water in the impingers plus the volume of moisture and/or vapors collected by the silica gel equalled the total moisture gain of the sampling train. This volume was used as a basis for the percent moistureby volume.

F. Particulate Sampling

All sampling procedures and sampling equipment employed were those outlined in Method Five of the 40 CFR PART 60, JULY 1989.

The size of the nozzle required to maintain isokinectic sampling was calculated from the results of the previously completed velocity and temperature traverses. The sampling train utilized a stainless steel probe, which was heated to 248 F. by an internal heating element. A nozzle of the calculated size was attached to the end of probe which was inserted into the stack. A calibrated "S" type pitot tube and a Chromel-Alumel thermocouple were clamped to the probe and were used to monitor the velocity head and the temperature at the traverse points during the sampling period. Sampled gas passed through the nozzle and the probe to a glass fiber filter for the removal of the suspended particulates. The filter was housed in a heated chamber whose temperature was maintained at above 250 F. The in-stack filter holder was not heated. From the filter the stack gas passed to the impinger train. The first two impinger each contained 150 ml. of deionized water. The third impinger contained no reagents and was a knockout impinger. The fourth impinger contained approximately 200 grams of coarse silica gel which collected any moisture and /or vapors which had not been captured in preceding impingers.

The second impinger was a 500 ml. Greenburg-Smith impinger, while the first, third, and fourth were 500 ml.

impingers of the Greenburg-Smith design, modified by replacing the tip with a 1/2 inch ID glass tube. It should be noted that the impinger train was immersed in an ice bath for the entire test period in order that the exit gas temperature would not exceed 70 F.

From the impinger train the gas was conducted through an umbilical cord to the control console, an Anderson Universal Stack Sampler which contained the following pieces of equipment (listed in the order in which sampled gas passed through them): a main valve, a by-pass valve for flow adjustment, an airtight vacuum pump, a dry gas meter, and a calibrated orifice. The orifice was equipped with pressure taps which were connected across the inclined manometer used to insure that isokinectic conditions were being maintained.

The sampling train was subject to a leak check prior to and after each sample was run. The inlet of the nozzle was plugged and the pump vacuum was held at the highest vacuum attained during that period of testing. In all cases the leakage rate was minimal and did not exceed the maximum allowable leakage rate of 0.02 cfm.

Upon completion of a test, the soiled glass fiber filter was removed from it's filter holder and placed in a petri dish which was subsequently sealed. The probe and nozzle were washed internally with acetone; the particulate matter remaining in the probe was removed with a nylon brush attached to a polythylene line. The front half of the glass filter holder was also rinsed with acetone and the washings obtained were added to those collected from

The same procedure was used for the back half analysis.

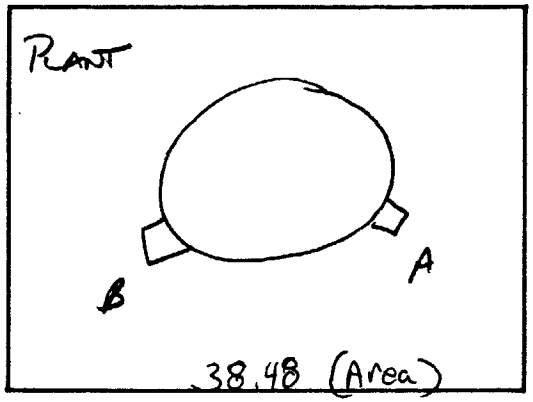
4.0. FIELD DATA SHEETS

The flue gas velocity head, the flue gas temperature, the inlet and outlet dry gas meter temperatures, the orifice pressure differential, the sample volume, the sampling time, the pump vacuum, the filter temperature, and the impinger train outlet gas temperature were recorded during the sampling program. The field data sheets generated during the test are contained in the next section.

EPA METHOD 5

PLANT 42
DATE 11-12-90
SAMPLE LOCATION OUTLET
SAMPLE TYPE 1-5
OPERATOR LES
AMBIENT TEMPERATURE 46
BAROMETRIC PRESSURE 29.52
STATIC PRESSURE, (P_s) -.33
FILTER NUMBER (S) 489
PITOT TUBE NO. & CP. .84
EPA REPRESENTATIVE LEE GRUMER

RUN NO. 1



PROBE LENGTH AND TYPE 8' SS
NOZZLE I.D. #5 .218
ASSUMED MOISTURE, % 11
SAMPLE BOX NUMBER 1
METER Δ H@
K FACTOR 1.46
PRE-TEST LEAK CHECK RATE 0 CPM@ 15 "Hg
POST TEST LEAK CHECK RATE .003 CPM@ 11 "Hg
REFERENCE p
PRODUCTION RATE TPH 240

Pre Pitot leak check : OK LS
Post " " " OK

SCHEMATIC OF TRAVERSE POINT LAYOUT
READ AND RECORD ALL DATA EVERY 2.5 MINUTES

TRAVERSE POINT NUMBER	ELAPSED SAMPLING TIME, MIN.	CLOCK TIME (24 hr. CLOCK)	GAS METER READING (V_S). Ft3	VELOCITY HEAD Δp_s). in. H_2O		ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O		STACK TEMPERATURE (T_s), °F	PROBE TEMPERATU °F	DRY GAS METER TEMPERATURE		SAMPLE BOX TEMPERATURE °F	IMPINGER TEMPERATURE °F	PUMP VACUUM in. Hg
					$\sqrt{\Delta P}$	DESIRED	ACTUAL			INLET °F	OUTLET °F			
A1	0-2.5	11:55	867.314	.5	.71	.73	.73	130	224	52	49	257	41	4
2	2.5-5.0		869.2	.58	.76	.85	.85	131	232	59	49	253	38	5
3	5.0-7.5		873.4	.68	.82	.99	.99	132	229	66	50	265	35	5
4	7.5-10.0		874.7	.70	.84	1.02	1.02	130	241	71	51	260	35	6
5	10-12.5		876.2	.64	.80	.935	.94	129	251	76	53	263	35	5
6	12.5-15		877.3	.64	.80	.94	.94	130	257	79	55	260	35	5
7	15-17.5		878.7	.31	.56	.45	.45	130	250	80	59	249	35	4
8	17.5-20		879.5	.35	.59	.51	.51	128	254	80	60	250	37	4
9	20-22.5		880.4	.33	.57	.48	.48	129	249	82	61	258	37	2
10	22.5-25		881.6	.45	.67	.66	.66	131	239	86	63	263	36	4
11	25-27.5		882.4	.50	.71	.73	.73	131	235	89	65	241	37	4
12	27.5-30		883.3	.53	.73	.77	.77	133	234	91	66	227	38	4
			884.510											
			17.196											

Pre-leak 881 c/p .003 cfm @ 13
Post leak 884.613

PLANT NO. A2 DATE 11-12-90 RUN NO. 1

TRAVERSE POINT NUMBER	ELAPSED SAMPLING TIME, MIN.	CLOCK TIME (24 hr. CLOCK)	GAS METER READING (V_S). Ft3	VELOCITY HEAD Δp_s). in. H_2O		ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O		STACK TEMPERATURE (T_s). °F	PROBE TEMPERATU °F	DRY GAS METER TEMPERATURE		SAMPLE BOX TEMPERATURE °F	IMPINGER TEMPERATURE °F	PUMP VACUUM in. Hg
					$\sqrt{\Delta p}$	DESIRED	ACTUAL			INLET °F	OUTLET °F			
B 1	30-32.5	1:21	884.613	.85	.92	1.2	1.2	127	238	63	62	247	38	5
2	32.5-35		886.1	.83	.91	1.21	1.2	129	248	69	62	241	39	5
3	35-37.5		887.7	.80	.89	1.16	1.2	131	256	75	62	243	40	5
4	37.5-40		888.8	.75	.87	1.09	1.1	132	258	77	62	241	39	5
5	40-42.5		890.1	.63	.79	.92	.92	134	267	79	63	245	39	5
6	42.5-45		891.3	.40	.63	.58	.58	133	258	78	64	245	38	4
7	45-47.5		892.5	.61	.78	.89	.89	134	249	82	65	240	38	5
8	47.5-50		893.5	.55	.74	.73	.73	133	240	83	66	240	39	4
9	50-52.5		894.5	.52	.72	.76	.76	133	243	85	67	238	39	5
10	52.5-55		895.8	.63	.79	.92	.92	133	245	90	69	238	40	5
11	55-57.5		896.9	.71	.84	1.04	1.1	136	245	92	69	238	38	5
12	57.5-60		898.4	.41	.64	.54	.60	134	240	91	70	235	39	4
			899.326	13.10	18.04		20.27	.3153		1875	1462			
				.58	.75		.845	131.4		78.12	60.92			
				.58	.75		.845	460		78.12	60.92			
		Port A	17.196					591		78				
		Port B	14.713							60/28	68.02			
			31.909					131.4		2√6	52802			
								591.4						

O_2 14 13 13.5 AVE 13.5

CO_2 4.5 4.0 4.0 AVE 4.2

WATER COLLECTED 97.50

PARTICULATE MG 24.5 14.713

REMARKS:

EPA METHOD 5

PLANT Y2
DATE 11-12-90
SAMPLE LOCATION OUTLET
SAMPLE TYPE 1-5
OPERATOR LES
AMBIENT TEMPERATURE 46
BAROMETRIC PRESSURE 29.92
STATIC PRESSURE, (P_s) -.33
FILTER NUMBER (S)
PITOT TUBE NO. & CP. . 84
EPA REPRESENTATIVE Lee Gruber

RUN NO. 2

38.48 (Area)

PROBE LENGTH AND TYPE 8' SS
NOZZLE I.D. #15 .244
ASSUMED MOISTURE, % 11
SAMPLE BOX NUMBER
METER Δ H@ 2
K FACTOR 3.5 ≈ 3.6
PRE-TEST LEAK CHECK RATE .002 CPM@ 11 ^{12}Hg
POST TEST LEAK CHECK RATE .005 CPM@ 15 ^{12}Hg
REFERENCE Δ p
PRODUCTION RATE TPH 260

Post Pitot Leak ✓ = ok/es

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 2½ MINUTES

TRAVERSE POINT NUMBER	ELAPSED SAMPLING TIME, MIN.	CLOCK TIME (24 hr. CLOCK)	GAS METER READING (V_S). Ft3	VELOCITY HEAD Δp_s). in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O)		STACK TEMPERATURE (T_s), °F	PROBE TEMPERATU °F	DRY GAS METER TEMPERATURE		SAMPLE BOX TEMPERATURE °F	IMPINGER TEMPERATURE °F	PUMP VACUUM in. Hg
				$\sqrt{\Delta p}$	DESIRED	ACTUAL			INLET °F	OUTLET °F			
A1	0-2.5	3:12	899.491	.82	.91	2.9	2.9	124	260	66	64	270	34	7
2	2.5-5		901.7	.80	.89	2.88	2.9	129	249	76	64	270	33	7
3	5-7.5		903.8	.79	.89	2.84	2.8	129	240	82	64	266	34	7
4	7.5-10		905.9	.74	.86	2.66	2.7	131	236	87	66	253	37	7
5	10-12.5		907.9	.55	.74	1.98	1.9	130	235	91	67	252	38	6
6	12.5-15		909.7	.25	.50	.9	.9	132	246	90	69	245	38	3
7	15-17.5		911.0	.23	.47	.83	.83	133	249	91	70	243	39	3
8	17.5-20		912.1	.25	.50	.90	.90	131	241	92	72	239	38	4
9	20-22.5		913.4	.31	.56	1.11	1.1	128	249	95	72	239	39	4
10	22.5-25		914.7	.45	.67	1.62	1.6	127	257	98	74	239	38	5
11	25-27.5		916.3	.53	.73	1.91	1.9	122	250	103	76	239	39	6
12	27.5-30		918.0	.58	.76	2.1	2.1	120	230	104	77	238	39	6

9.881.4
919.939

PLANT NO. 42 DATE _____ RUN NO. 2

TRAVERSE POINT NUMBER	ELAPSED SAMPLING TIME, MIN.	CLOCK TIME (24 hr. CLOCK)	GAS METER READING (V_s). Ft3	VELOCITY HEAD Δp_s). in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O		STACK TEMPERATURE (T_s), °F	PROBE TEMPERATU °F	DRY GAS METER TEMPERATURE		SAMPLE BOX TEMPERATURE °F	IMPINGER TEMPERATURE °F	PUMP VACUUM in. Hg
				$\sqrt{\Delta p}$	DESIRED	ACTUAL			INLET °F	OUTLET °F			
B1	5-32.5	4:46	919.939	.64	.8	2.30	2.3	120	239	62	63	240	35	6
2	32.5-35		921.7	.64	.8	2.30	2.3	121	234	72	63	232	33	7
3	35-37.5		923.8	.68	.82	2.44	2.4	124	228	79	63	226	33	7
4	37.5-40		925.5	.72	.85	2.59	2.6	126	235	85	64	250	33	7
5	40-42.5		927.8	.74	.86	2.66	2.7	127	242	90	65	267	35	8
6	42.5-45		929.5	.41	.64	1.47	1.5	122	245	91	66	257	36	5
7	45-47.5		931.5	.22	.46	.79	.79	124	252	90	68	253	37	4
8	47.5-50		932.6	.15	.39	.54	.54	125	261	87	68	252	37	2
9	50-52.5		933.6	.30	.55	1.08	1.1	126	267	90	70	254	36	4
10	52.5-55		934.8	.48	.69	1.73	1.7	122	259	93	71	254	36	5
11	55-57.5		936.4	.59	.77	2.1	2.1	120	252	95	72	254	36	6
12	57.5-60		938.1	.60	.77	2.116	2.2	122	250	96	73	256	37	5
		5:16	940.066											
					16.88		41.76	3015		2105	1611			
			40.575		.68		1.86	125.6	125.6	84.0	68.4			
			40.575		.70		1.86			87.7	69.1			
								585.6	585.6		76.2			
											78.0			
										53	20.2			
	Vol gas Port C		20.448								538.0			
	Vol gas Port B		20.127											
			40.575											

O_2 13.5 12.5 14 AVE 13.3 WATER COLLECTED 108.1 REMARKS: _____

CO_2 4.0 3.5 3.0 AVE 3.5 PARTICULATE MG 89.9

EPA METHOD 5

PLANT A2
DATE 11-13-90
SAMPLE LOCATION
SAMPLE TYPE 1-5
OPERATOR LES
AMBIENT TEMPERATURE 44
BAROMETRIC PRESSURE 29.79
STATIC PRESSURE, (P_s) -.33
FILTER NUMBER (S) 491
PITOT TUBE NO. & CP. .84
EPA REPRESENTATIVE

RUN NO. 3

38.48 (Area)

PROBE LENGTH AND TYPE 8' SS
NOZZLE I.D. .244
ASSUMED MOISTURE, % 11
SAMPLE BOX NUMBER 1
METER ΔH@
K FACTOR 3.6
PRE-TEST LEAK CHECK RATE .001 CPM@ 15 "Hg
POST TEST LEAK CHECK RATE CPM@ "Hg
REFERENCE Δ p
PRODUCTION RATE TPH 240

Pitot Leak ok -LS

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 2½ MINUTES

TRAVERSE POINT NUMBER	ELAPSED SAMPLING TIME, MIN.	CLOCK TIME (24 hr. CLOCK)	GAS METER READING (V_S). Ft3	VELOCITY HEAD Δp_s). in. H_2O		ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O)		STACK TEMPERATURE (T_s), °F	PROBE TEMPERATU °F	DRY GAS METER TEMPERATURE		SAMPLE BOX TEMPERATURE °F	IMPINGER TEMPERATURE °F	PUMP VACUUM in. Hg
					$\sqrt{\Delta P}$	DESIRED	ACTUAL			INLET °F	OUTLET °F			
A 1	0-2.5	9:55	940.160	.64	.8	2.30	2.3	127	248	67	64	249	28	5
2	2.5-5.0		942.0	.69	.83	2.48	2.5	126	240	74	64	248	28	6
3	5.0-7.5		944.1	.74	.86	2.66	2.7	122	234	80	65	250	30	7
4	7.5-10.0		946.1	.77	.88	2.77	2.8	123	229	87	66	253	30	7
5	10.0-12.5		948.4	.67	.82	2.41	2.4	124	229	89	68	256	31	6
6	12.5-15		950.2	.20	.44	.72	.72	124	247	90	69	260	36	2
7	15-17.5		951.5	.15	.39	.54	.54	125	248	88	70	262	34	2
8	17.5-20		952.3	.15	.39	.54	.54	125	254	87	71	266	34	2
9	20-22.5		953.3	.27	.51	.97	.97	126	257	89	73	262	34	3
10	22.5-25		954.5	.50	.71	1.8	1.8	125	260	101	75	261	35	5
11	25-27.5		956.1	.61	.78	2.19	2.2	130	260	107	76	261	34	6
12	27.5-30		958.2	.63	.79	2.26	2.3	130	267	111	79	263	35	6
			959.880											
			19.720											

PLANT NO. 42 DATE 11-13-90 RUN NO. 3

TRAVERSE POINT NUMBER	ELAPSED SAMPLING TIME, MIN.	CLOCK TIME (24 hr. CLOCK)	GAS METER READING (V_S). Ft3	VELOCITY HEAD Δp_s). in. H_2O		ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O		STACK TEMPERATURE (T_s), °F	PROBE TEMPERATU °F	DRY GAS METER TEMPERATURE		SAMPLE BOX TEMPERATURE °F	IMPINGER TEMPERATURE °F	PUMP VACUUM in. Hg
					$\sqrt{\Delta P}$	DESIRED	ACTUAL			INLET °F	OUTLET °F			
B 1	0-2.5	10:38	959.943	.9	.95	3.2	3.2	124	229	96	83	230	39	7
2	2.5-5.0		962.2	.85	.92	3.06	3.1	126	231	106	84	231	37	8
3	5.0-7.5		964.4	.74	.86	2.66	2.7	127	230	110	84	251	36	7
4	7.5-10		967.0	.65	.81	2.34	2.3	126	253	112	85	270	38	7
5	10-12.5		969.1	.50	.71	1.80	1.8	127	267	112	87	271	36	5
6	12.5-15		970.1	.20	.44	.72	.72	127	270	107	87	260	35	3
7	15-17.5		972.1	.21	.45	.76	.76	126	260	105	87	261	38	3
8	17.5-20		974.1	.25	.5	.90	.90	128	263	106	88	252	39	3
9	20-22.5		975.1	.41	.64	1.5	1.5	129	255	107	89	247	39	5
10	22.5-25		976.9	.56	.75	2.0	2.0	130	251	111	90	246	40	5
11	25-27.5		978.0	.60	.78	2.1	2.1	131	250	112	90	244	39	5
12	27.5-30		978.9	.60	.78	2.1	2.1	132	245	113	90	243	40	5
min	60													
		11:09	980460		1.77		44.95	.3010		2:67	1881			
			40.5		.70		1.87	126.7		98.6	78.5			
											88.6			
								586.7						
		Port A	20.517								548.60			
		Port B	19.720											
			40.237											

O_2 13½ 12 14 AVE 13.2 WATER COLLECTED 129.5 REMARKS:

CO_2 3½ 3 3 AVE 3.2 PARTICULATE MG 100.1

LANT # 42 MOISTURE DETERMINATION LOCATION FAIRFIELD, Ohio

TE 11-12-90 TECHNICIAN LS

RUN #1

MPINGER #	1	2	3	4
PE	MODIFIED	STANDARD	MODIFIED	MODIFIED
OUNT(ml/gms)	150(H20)	150(H20)	0	200(H20)
IAL WT. (VOL)-	748.9	658.7	489.2	733.0
NITIAL WT (VOL)	669.7	646.5	487.9	728.2
T WT. (VOL)---	79.2	12.2	1.3	4.8
		TOTAL-------=	97.5	

RUN #2

PINGER #	1	2	3	4
PE	MODIFIED	STANDARD	MODIFIED	MODIFIED
MOUNT(ml/gms)	150(H20)	150(H20)	0	200(H20)
IAL WT. (VOL)-	709.1	712.3	521.9	731.1
NITIAL WT (VOL)	634.0	691.2	519.0	722.1
T WT. (VOL)---	75.1	21.1	2.9	9.0
		TOTAL-------=	108.1	

RUN #3

PINGER #	1	2	3	4
YPE	MODIFIED	STANDARD	MODIFIED	MODIFIED
MOUNT(ml/gms)	150(H20)	150(H20)	0	200(H20)
IAL WT. (VOL)-	751.5	677.6	527.4	735.0
ITIAL WT (VOL)	674.5	639.5	522.2	725.8
ET WT. (VOL)---	77.0	38.1	5.2	9.2
		TOTAL-------=	129.5	

PARTICULATE CALCULATIONS

P[illegible]ANT #42 _____ LOCATION_____ DATE 11-14-90 weighed LS

RUN #1 # ml-----= 160 X .000003 gm/ml RESIDUE d)_= .0005

	BEAKER#3A	BEAKER#_____	BEAKER#_____
FINAL--------=	95.6370	0.0000	0.0000
I[illegible]ITIAL------=	95.6174	0.0000	0.0000
NET-------a)=	.0196	b)= 0.0000	c)= 0.0000
TOTAL(a+b+c)=	.0196	FINAL-----=	.6790 FILTER#= 489
R[illegible]SIDUE---d)=	.0005	INITIAL---=	.6236
NET BACK 1/2=	.0191	FILTER NET	.0554 TOTAL-----= .0745

TOTAL*1000----------= 74.5 mg OF PARTICULATE

RUN #2 # ml-----= 150 X .000003 gm/ml RESIDUE d)--= .0005

	BEAKER#4A	BEAKER#_____	BEAKER#_____
FINAL--------=	97.3521	0.0000	0.0000
I[illegible]ITIAL------=	97.3391	0.0000	0.0000
NET-------a)=	.0130	b)= 0.0000	c)= 0.0000
TOTAL(a+b+c)=	.0130	FINAL-----=	.7025 FILTER#= 490
R[illegible]SIDUE---d)=	.0005	INITIAL---=	.6251
NET BACK 1/2=	.0125	FILTER NET	.0774 TOTAL-----= .0899

TOTAL*1000----------= 89.9 mg OF PARTICULATE

RUN #3 # ml-----= 110 X .000003 gm/ml RESIDUE d)--= .0003

	BEAKER#6B	BEAKER#_____	BEAKER#_____
FINAL--------=	65.7893	0.0000	0.0000
I[illegible]ITIAL------=	65.7788	0.0000	0.0000
NET-------a)=	.0105	b)= 0.0000	c)= 0.0000
TOTAL(a+b+c)=	.0105	FINAL-----=	.7103 FILTER #= 491
R[illegible]SIDUE---d)=	.0003	INITIAL---=	.6204
NET BACK 1/2=	.0102	FILTER NET	.0899 TOTAL-----= .1001

TOTAL*1000----------= 100.1 mg OF PARTICULATE

5.0 TEST SUMMARY

5.1 CALCULATIONS

Particulate, moisture content, gas flow and molecular weight calculations were accomplished using the formulas found on the page following the test results. These formulas appear in Methods Two, Three, Four, and Five, of the CFR 40 PART 60, JULY 1989.

5.2 TEST RESULTS

On the following pages appear the test results for all three runs.

5.3 EQUIPMENT CALIBRATION

A. Flow Measurement Equipment

All flow measurement equipment was inspected and a calibration factor of .84 was assumed as per instructions in Method 2 of 40 CFR PART 60, JULY 1989.

B. Nozzle Diameter

Probe nozzles were field calibrated with NBS traceable micrometers as per instructions in Method 5 of 40 CFR PART 60, JULY 1989.

C. Metering System

The metering system was calibrated before field use and a post-test calibration was performed after the test program in accordance with Method 5 of 40 CFR PART 60, JULY 1989.

	RUN #1	RUN #2	RUN #3	AVERAGE
DRY GAS METER CALIBRATION FACTOR---Y=	.99	.99	.99	
VOLUME OF GAS METER CONDITIONS----Vm=	31.909	40.575	40.237	
AVE SQ ROOT DELTA P----------p=	.750	.700	.700	
AVE DELTA H PRESS ACROSS ORIFICE--^H=	.85	1.86	1.87	
AVE STACK TEMPERATURE DEGREES R---Ts	591.40	585.60	586.70	
AVE METER TEMPERATURE DEGREES R---Tm=	528.02	538.00	548.60	
TOTAL WATER COLLECTED----------Vlc=	97.50	108.10	129.50	
TONS PER HOUR PRODUCTION---------tph=	240.00	260.00	240.00	
TOTAL PARTICULATE IN mg---------Pmg=	74.50	89.90	100.10	
FYRITE FOR OXYGEN----------=	13.50	13.30	13.20	13.33
FYRITE FOR CARBON DIOXIDE----------=	4.20	3.50	3.20	3.63
BAROMETRIC PRESSURE----------Pb=	29.92	29.92	29.99	29.92
STACK STATIC PRESSURE (-+)----------=	-.33	-.33	-.33	-.33
ABSOLUTE PRESSURE IN STACK--------Ps=	29.90	29.90	29.90	29.90
SAMPLING TIME IN MINUTES----------O=	60.00	60.00	60.00	
DIAMETER OF NOZZLE----------dn=	.218	.244	.244	
AREA OF STACK (SQ. FEET)----------As=	38.48	38.48	38.48	
1 VOL OF GAS AT STD COND----Vm(std)=	31.64	39.59	38.59	
2. VOL OF WATER STD COND----Vwc(std)=	4.59	5.09	6.10	
3 MOLE FRAC OF WATER VAPOR------Bws=	.1267	.1139	.1364	
4. % MOISTURE----------=	12.67	11.39	13.64	12.57
MOLECULAR Wt OF STACK GAS------Ms=	27.79	27.83	27.79	27.80
STACK VELOCITY (fps)----------Vs=	45.44	42.17	42.24	43.28
5. VOL FLOW RATE (dscf/hr)-------Qsd=	4.90e+06	4.66e+06	4.54e+06	4.70e+06
ACTUAL FLOW RATE (acf/hr)-----Acf=	5.62e+06	5.26e+06	5.26e+06	5.38e+06
6. AREA OF NOZZLE----------A=	2.59e-04	3.25e-04	3.25e-04	
% ISOKINETIC----------I=	96.70	101.56	101.58	99.95
CONCENTRATION GRAINS/DSCF-------=	3.626e-02	3.497e-02	3.995e-02	3.706e-02
7. POUNDS/DSCF----------=	5.19e-06	5.01e-06	5.72e-06	5.31e-06
POUNDS/HOUR EMISSION----------=	25.46	23.35	25.99	24.93
8. POUNDS/TON ASPHALT----------=	1.06e-01	8.98e-02	1.08e-01	1.01e-01

FORMULA TABLE

^=DELTA Y=COEFFICIENT

$$Vm(std) = \frac{Y(17.64)(Vm)(Pbar+\hat{}H/13.6)}{(Tm)}$$

$$Vwc(std) = (.04707)(Vlc)$$

Ps= BAROMETRIC PRESSURE +- STATIC PRESSURE OF STACK

$$Bws = \frac{Vwc(std)}{Vm(std)+Vwc(std)}$$

$$Ms = Md(1-Bws) + 18(Bws)$$

Vs= 85.49(Cp)(Ts/Ps*Ms)^.5 (AVE SQ. ROOT DELTA P) ^.5= SQUARE ROOT

$$Qsd = 3600*(1-Bws)*Vs*A*(528/Ts)*(Ps/29.92)$$

$$Md = .44(CO2)+.32(O2)+.28(100-(CO2+O2))$$

$$I = \frac{1.667*(Ts)(.00267(Vl)+(Vm/Tm)(Pbar+(\hat{}H/13.6)))}{O*Vs*Ps*A'}$$

Vm=VOLUME OF METER AT METER CONDITIONS

Tm=TEMPERATURE OF METER

Vlc=VOLUME OF WATER COLLECTED

O=TIME OF TEST

A'=AREA OF NOZZLE

A=AREA OF STACK

Ts=TEMPERATURE OF STACK

ATE- 11-16-90 PRETEST Y= .99 ^H@= 2.00	TEST #1	TEST #2	TEST #3
I NIMUM VOL OF GAS ----------	4.000	10.000	10.000
RIFICE MANOMETER SETTING----------^H	.500	2.000	6.000
T TEST METER INITIAL READING----Vwi	753.235	759.439	771.784
ET TEST METER FINAL READING------Vwf	758.922	771.325	783.261
T TEST METER AVERAGE TEMP---------F	70.000	72.000	72.000
Y TEST METER INITIAL READING----Vdi	980.965	987.314	1000.004
RY TEST METER FINAL READING------Vdf	986.786	999.527	1011.771
Y TEST METER AVERAGE TEMP---------F	71.000	88.000	97.000
TOTAL TEST TIME MINUTES----------O	15.040	16.470	9.250
ROMETRIC PRESSURE INCHES Hg------Pb	29.970	29.970	29.970
LUME OF WET TEST METER----------Vw	5.687	11.886	11.477
^LUME OF DRY TEST METER----------Vd	5.821	12.213	11.767
AVE WET TEST TEMPERATURE----------Rw	530.000	532.000	532.000
E DRY TEST TEMPERTURE----------Rd	531.000	548.000	557.000
(w*Pb*Rd)/(Vd*(Pb+^H/13.6)*Rw)-----Y	.978	.998	1.006
(.0317*^H)/(Pb*Rd))*((Rw*O)/Vw)^2-^H@	1.957	2.098	2.095
AVERAGE Y FOR 3 TESTS----------	.994	LIMITS= .98-1.02	
A ERAGER ^H@ FOR 3 TESTS----------	2.050	LIMITS= +-0.2 OF AVE ^H	
DIFF BETWEEN AVE=	.093	-.048	-.045

NUTE ^H=DELTA H and Y=GAMMA