APPENDIX K

OEPA STACK TEST REVIEW SUMMARY FORM

APPLICATION NUMBER 1409000018 P901

FACILITY NAME Southern Ohio Asphalt Company, Plant 42

SOURCE DESCRIPTION (OR SCC CODE) Asphalt Batch Production

CONTROL EQUIPMENT Wet Scrubber

DATE(S) OF TEST 11/6/91

FINAL TEST REPORT RECEIVED ON 12/2/91

POLLUTANT(S) TESTED Particulate

TEST METHOD USEPA Federal Register 1, 2, 3, 4, 5

TEST FIRM The Shelly Company, Thornville, Ohio

EMISSION RATES*:

ACTUAL (lb(s)/hr) 29.71 ALLOWABLE** 63.2

OPERATING RATES*:

DURING TEST** 239 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 DEMONSTATION OF CONFORMANCE WITH THE APPROVED TESTING METHODOLOGY.

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

12/13/91 Hollie M. Barger, ETI

DATE OF REVIEW REVIEWED BY
LeRoy Gruber, AQE

* BASED ON 3 RUN AVERAGE
** SPECIFY APPLICABLE UNITS
*** SPECIFY UNITS OF MASS/INPUT

OBSERVER'S REPORT:

COMPLIANCE TEST

for

Particulate Emissions

Facility:	Southern Ohio Asphalt Company, Plant 42 107 River Circle Drive Fairfield, Ohio 45014
Premise Number:	1409000018
Source:	Asphalt batch production
Source Number:	P901
Conducted On:	November 6, 1991
Test Firm:	The Shelly Company Thornville, Ohio
Prepared By:	Hollie M. Barger, ETI
Date Prepared:	November 7, 1991 Revised December 23, 1992

SOUTHWESTERN OHIO AIR POLLUTION CONTROL AGENCY
(SWOAPCA)
1632 CENTRAL PARKWAY, CINCINNATI, OHIO 45210
(513) 651-9319

Southern Ohio Asphalt Company, #42
P.N. 1409000018

Testing for particulate emissions was conducted on November 6, 1991, at Southern Ohio Asphalt Company, P901, which produces batches of asphalt for various jobs. Emissions from the dryer are controlled by a wet scrubber, which has an OAC 3745-17-11 emission limit of 63.2 #/hr for particulate. Testing resulted from Permit-to-Operate requirements, to determine OAC compliance, and because of low production rates during the last test, which was conducted on November 11, 1990.

Methods of sampling were performed in accord with 40 CFR Part 60, July 1989. For testing, Ohio type 404 asphalt was produced for use by Hamilton County. Particulate emissions, collected through a 0.304 diameter nozzle, for three one-hour runs averaged 29.71 #/hr and 0.0589 grains/dry standard cubic foot. The material throughput was an average 239 tons/hr, which is 85.36% of the rated maximum of 280 tons/hr. However, the facility was operating at maximum throughput given the wetness of the aggregate.

The average stack volumetric flow rate was 58,667 dscfm at 14.9 % moisture and stack temperature of 586 degrees F; while, stack static pressure averaged -0.58" water. Fyrites for oxygen and carbon dioxide were found to average 14.00% and 4.00%, respectively. Last testing showed 78,333 dscfm at 12.6% moisture.

Visible emissions were monitored throughout the test, but were not recorded because inclement weather did not allow the steam to clear enough to get accurate readings. Some fugitive emissions were occasionally seen in the air from the trucks.

Quality assurance measures included leak checks before and after each run, zeroing of instruments, proper probe orientation, neat and thorough probe washing, cyclonic flow checks, and appropriate data documentation, among other things. Calculations were checked and found to be accurate. Isokinetic flow was also within an acceptable range.

Based on test results, it is recommended that **testing** be performed on a triennial basis. During the annual inspection, the SWOAPCA representative should be sure to check that scrubber flow pressure is at the usual 110 psi mark and that the scrubber nozzles have been inspected.

EPA METHOD 5 STACK TEST ANALYSIS

FACILITY NAME: Southern Ohio Asphalt Co. # 42
PREMISE #: 1409000018
SOURCE DESCRIPTION: asphalt batch production

REVIEWER: HMB
TEST DATE: 11/06/91
PRINTED: 12-24-1991

INPUT DATA:	RUN #1	RUN #2	RUN #3
METER VOLUME (ACF)	50.436	54.605	54.839
METER CORRECTION	1.014	1.012	1.023
BAROMETRIC PRESSURE (IN HG)	29.2	29.2	29.2
ORIFICE PRESSURE (IN H2O)	2.9375	3.3025	3.3396
METER TEMPERATURE (F)	80.7083	98.8125	93.8958
VOLUME WATER (ML H2O)	174.9	193.7	185.5
CO2 IN STACK GAS (%)	4	4	4
O2 IN STACK GAS (%)	14	14	14
N2 IN STACK GAS (%)	82	82	82
CO IN STACK GAS (%)	0	0	0
PITOT COEFFICIENT	.84	.84	.84
AVERAGE SQUARE ROOT VELOCITY PRESS	.6329	.6492	.655
STACK TEMPERATURE (F)	124.8333	126.0833	126.5
STACK PRESSURE (IN HG)	29.1574	29.1574	29.1574
STACK DIAMETER (IN)	78	78	78
STACK AREA (SQ FT)	33.18308	33.18308	33.18308
PARTICULATE CATCH (MG)	188.7	207.6	173.3
NOZZLE DIAMETER (IN)	.304	.304	.304
NOZZLE AREA (SQ FT)	0.000504	0.000504	0.000504
TEST LENGTH (MIN)	60	60	60

TEST RESULTS:			
METER VOLUME @STP (DSCF)	49.0792	51.3600	52.6084
VOLUME OF WATER VAPOR @STP (CF)	8.232543	9.117458	8.731486
MOLE FRACTION OF WATER IN STACK GAS	0.143645	0.150758	0.142346
DRY MOLECULAR WEIGHT OF STACK GAS	29.2000	29.2000	29.2000
MOLECULAR WEIGHT OF STACK GAS	27.5912	27.5115	27.6057
STACK GAS VELOCITY (FT/SEC)	38.7513	39.8493	40.1510
STACK GAS FLOW (DRY STD CF/HR)	%3487774.0	%3549225.0	%3608946.0
PARTICULATE CONCENTRATION (GR/DSCF)	0.059325	0.062369	0.050829
ISOKINETIC RATIO	92.6787	95.3066	96.0076
MASS RATE OF EMISSION (LB/HR)	29.5591	31.6231	26.2054

STACK TEST COMMENTS:

NONE

Source SOUTHERN OHIO ASPHALT CO., #42

Premise No. 140900000 18 P901

By HMB

Date 12-23-91

DATA SHEET

Examples		RUN 1	RUN 2	RUN 3
38.847	Vm(dcf)	50.436	54.605	54.839
1.01	Y	1.014	1.012	1.023
27.93	Pbar(inHg)	29.2	29.2	29.2
2.35	DHP(H2O)	2.9375	3.3025	3.3396
96°	Tm, °F	80.7083	98.8125	93.8958
78.5	Vlc(ml)	174.9	193.7	185.5
12.0	CO2(percent)	4	4	4
08.7	Ø2	14	14	14
80.8	N	82	82	82
00.1	CO	Θ	Θ	Θ
.84	Cp	0.84	0.84	0.84
.4201	SQPD avg.	0.6329	0.6492	0.655
230	Ts(°F)	124.8333	126.0833	126.5000
27.91	Ps(in,Hg.Pb+Ps)	29.1574	29.1574	29.1574
21"	Stack diam	78.0	78.0	78.0
110.6	Mn(mg.)	188.7	207.6	173.3
.25"	Dn(in)	0.304	0.304	0.304
72	Theta(min)	60.0	60.0	60.0
9820	F (Optional)			
4	H			
Ø	C			
Ø	S			
4	N			
6	O			
	Allowable GCV (Optional) BTU/lb.			

Rec'd 12/2-91 LRS

ASPHALT PLANT BAGHOUSE OUTLET

COMPLIANCE EMISSION EVALUATION

FOR

SOUTHERN OHIO ASPHALT

PLANT #42 FAIRFIELD, OHIO

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

SOUTHERN OHIO ASPHALT INC.
THE SHELLY CO.
QUALITY CONTROL LABORATORY
P.O. BOX 266
THORNVILLE, OHIO 43076

11/21/91

Ohio EPA
Southwest District Office
2400 Beekman Street
Cincinnati, Ohio 45214

Attention: Mr. Lee Gruber

Gentlemen:

Please find enclosed the stack test for Plant #42.

Very truly yours,
THE SHELLY CO.

Larry E. Shively
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 wet washer outlet stack of SOUTHERN OHIO ASPHALT PLANT #42 located at Fairfield, Ohio.
The test was conducted on 11-06-91.

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 .0589 grains per dry standard cubic foot and 29.71 pounds per hour.

2.0 THE SOURCE

The following is information concerning THE SOURCE:

A. SOURCE IDENTIFICATION: PLANT #42

B. LOCATION: FAIRFIELD

C. PLANT DESCRIPTION: BATCH

D. TYPE OF EMISSION CONTROL EQUIPMENT: WET WASHER

E. STACK DIMENSIONS: (SEE NEXT PAGE)

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

G. TEST TIME: 60 minutes

H. TEST DATE: 11-06-91

I. TESTING COMPANY: THE SHELLY CO.

J. SAMPLING TEAM: TED GREEN, KEITH OLIVE, DENNY PAUL

K. EPA REPRESENTATIVE: HOLLIE BARGER

L. REMARKS:

* TRAVERSE POSITIONS IN ROUND STACK *

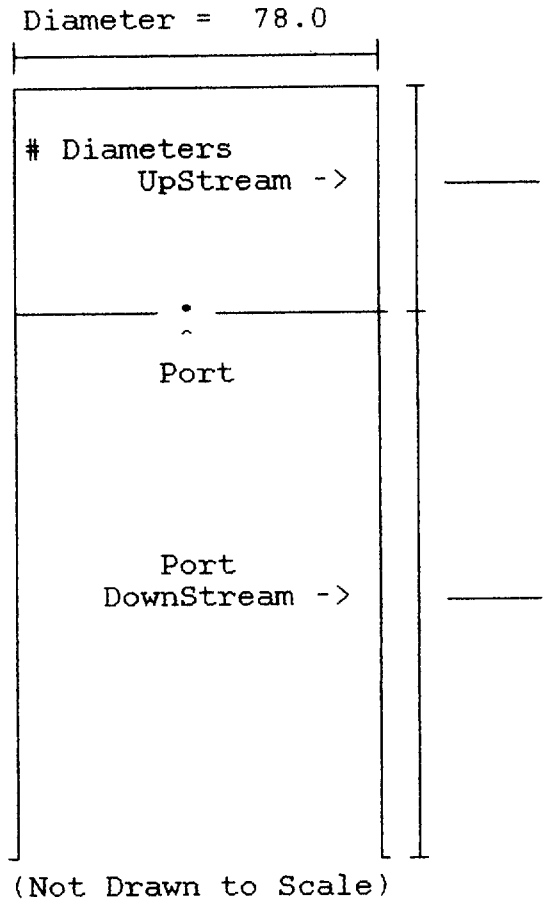
Plant : SOUTHERN OHIO ASPHALT 42

Inside of Near Wall to
outside of Nipple : 0.0 inches

Number of Points : 12

Area of Round Stack : 33.18 sq. ft.

Point	Distance	Nipple	Total Dist
1	1.7	0.00	1.7
2	5.2	0.00	5.2
3	9.2	0.00	9.2
4	13.8	0.00	13.8
5	19.5	0.00	19.5
6	27.7	0.00	27.7
7	50.3	0.00	50.3
8	58.5	0.00	58.5
9	64.2	0.00	64.2
10	68.8	0.00	68.8
11	72.8	0.00	72.8
12	76.3	0.00	76.3



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 figure 1 for outline of equipment)

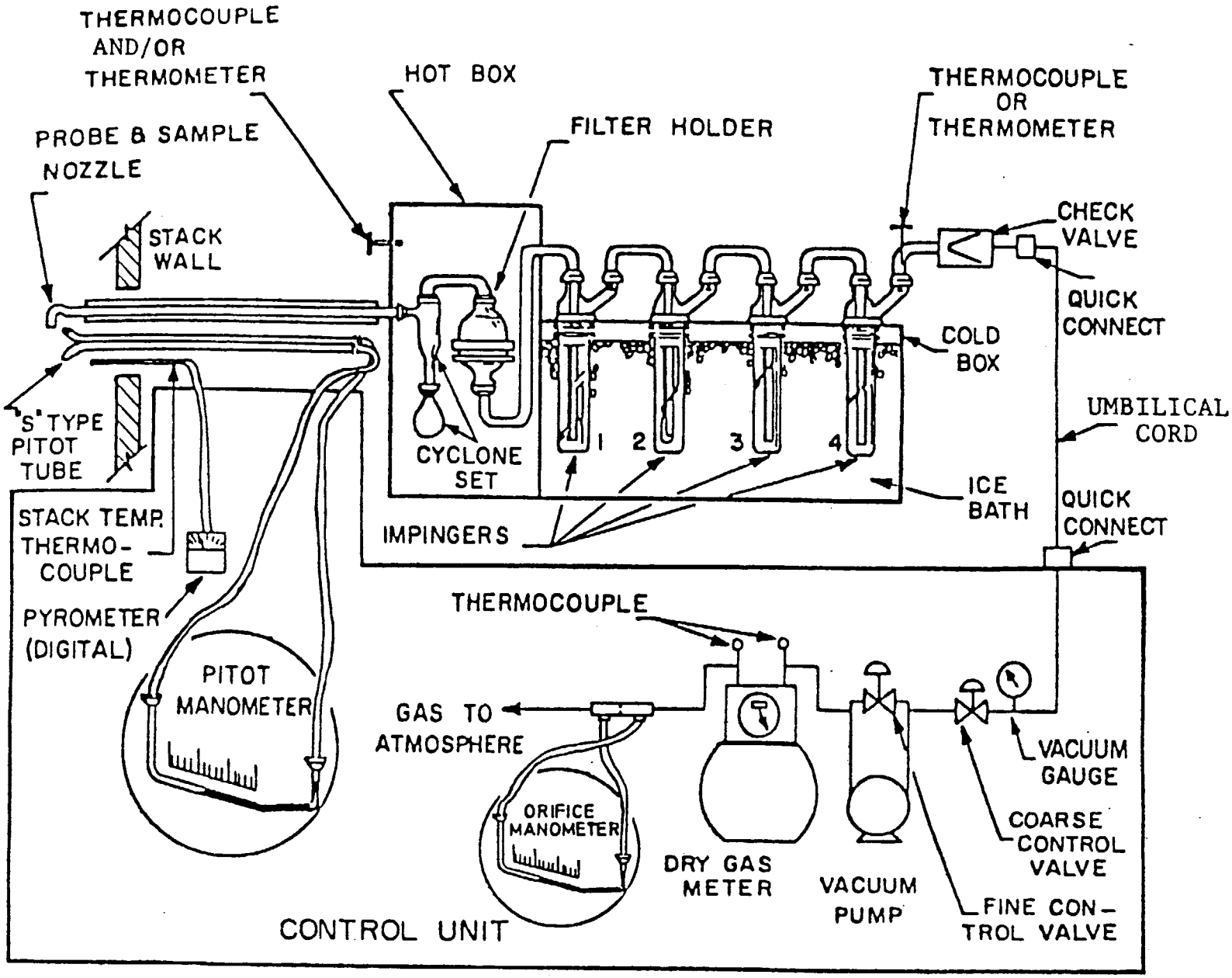


FIGURE 1: SAMPLING TRAIN SCHEMATIC

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.

PLANT 42 Southern Ohio Asphalt
LOCATION Fairfield Ohio
DATE 11-6-91 RUN NO. 1
STACK INNER DIAMETER, m (in.) 78"
BAROMETRIC PRESSURE, mm Hg (in. Hg) 29.2
CROSS SECTIONAL AREA, m^2 (ft^2) 33.18
OPERATORS Greg Olive
PITOT TUBE I.D. NO.
AVG. COEFFICIENT, Cp = .84
LAST DATE CALIBRATED

SCHEMATIC OF STACK CROSS SECTION

Cyclonic Flow

TRAVERSE PT. No.	VEL. Hd. Δp mm (in.) H_2O	STACK TEMPERATURE t_s °C (°F)	STACK TEMPERATURE T_s °K (°R)	P_g mm Hg (in. Hg)	$\sqrt{\Delta p}$
A1	.74	145			
2	.80	145			
3	.76	145			
4	.83	148			
5	.70	147	-.183		
6	.41	147			
7	.10	147			
8	.29	147	-.32		
9	.39	147			
10	.40	147			
11	.43	146			
12	.53	146			
B1	.31	123			
2	.45	124			
3	.57	131	-.58		
4	.70	141			
5	.93	144			
6	.99	143			
7	.75	141			
8	.39	141			
9	.30	141			
10	.20	138			
11	.08	138			
12	.14	140			
	.51	AVERAGE			

1/80

EPA Method 5

Run No. 1

File Name:"PLANT_42"

Plant No. 42 Date 11/06/91
Sample Location : FAIRFIELD OH
Sample Type : 1-5
Operator : Green Olive
Ambient Temp. : 40
Baro. Pressure : 29.2
Static Pres, (Ps) : -.58
Filter No. (S) : 541
Pitot Tube No. & Cp. : .84
EPA Representative : Hollie Barger

Probe Length and Type : 8' SS
Nozzle I.D. : .304
Assumed Moisture % 17
Sample Box Number : 1
Meter _____ H @ _____
K Factor 6.8
Pre-Test Leak Check Rate .004 CPM @ 65
Post Test Leak Check Rate .001 CPM @ 8
Production Rate 240 TPH
Fyrite: O^2 14 CO^2 4

Schematic of Traverse Point Layout
Read and Record all data every 2.5 minutes

Note: dPs=Delta Ps, dH = Delta H

TRAV. Point No.	Elapsed TIME (minutes)	Clock Time 24 hr	GAS Meter Reading	VELOC HEAD dPs in H^2O		ORIFICE Prs dH in H^2O		STK Temp °F	PROB Temp °F	DRY GAS MTR Inlet		BOX Temp °F	IMPNGR Temp °F	PUMP VAC. Hg
					$\sqrt{dP}$	Desir	Act.			Inlet	Outlet			
A-01	0.0- 2.5	11:05	495.702	0.45	0.67	3.06	3.06	132	237	62	59	239	48	4
A-02	2.5- 5.0	11:08	497.900	0.45	0.67	3.06	3.06	129	237	72	59	259	46	4
A-03	5.0- 7.5	11:10	500.000	0.49	0.70	3.33	3.33	128	233	77	59	254	44	5
A-04	7.5-10.0	11:13	502.100	0.46	0.68	3.13	3.13	127	231	81	60	255	45	5
A-05	10.0-12.5	11:16	504.400	0.18	0.42	1.22	1.22	126	252	83	62	250	44	3
A-06	12.5-15.0	11:18	506.100	0.10	0.32	0.68	0.68	125	267	81	63	254	44	3
A-07	15.0-17.5	11:24	507.200	0.15	0.39	1.02	1.02	125	237	80	66	262	42	3
A-08	17.5-20.0	11:26	508.000	0.09	0.30	0.61	0.61	125	235	84	67	265	42	2
A-09	20.0-22.5	11:28	509.700	0.20	0.45	1.36	1.36	125	235	87	68	265	42	3
A-10	22.5-25.0	11:30	511.100	0.30	0.55	2.04	2.04	126	231	91	68	256	42	4
A-11	25.0-27.5	11:33	512.800	0.35	0.59	2.38	2.38	126	223	94	70	252	42	4
A-12	27.5-30.0	11:35	514.700	0.45	0.67	3.06	3.06	126	234	97	71	252	43	5
B-01	30.0-32.5	11:48	516.885	0.72	0.85	4.90	4.90	125	254	76	70	248	41	6
B-02	32.5-35.0	11:51	519.600	0.80	0.89	5.44	5.44	124	225	88	69	256	40	7
B-03	35.0-37.5	11:53	522.500	0.84	0.92	5.71	5.71	124	225	95	69	255	41	8
B-04	37.5-40.0	11:55	525.400	0.84	0.92	5.71	5.71	124	235	99	70	264	42	8

Run No. 1

File Name:"PLANT_42"

Schematic of Traverse Point Layout

Read and Record all data every 2.5 minutes

Note: dPs=Delta Ps, dH = Delta H

TRAV. Point No.	Elapsed TIME (minutes)	Clock Time 24 hr	GAS Meter Reading	VELOC HEAD dPs in H^2O	ORIFICE Prs dH in H^2O		STK Temp °F	PROB Temp °F	DRY GAS MTR Inlet Outlet		BOX Temp °F	IMPNGR Temp °F	PUMP VAC. Hg
					√dP	Desir	Act.			Inlet	Outlet			
B-05	40.0-42.5	11:58	528.400	0.74	0.86	5.03	5.03	123	234	103	72	249	45	7
B-06	42.5-45.0	12:01	531.300	0.45	0.67	3.06	3.06	122	228	104	74	250	44	5
B-07	45.0-47.5	12:03	533.800	0.15	0.39	1.02	1.02	121	258	102	76	255	43	3
B-08	47.5-50.0	12:06	535.300	0.40	0.63	2.72	2.72	122	248	101	77	258	42	5
B-09	50.0-52.5	12:08	537.200	0.40	0.63	2.72	2.72	123	229	106	79	254	43	5
B-10	52.5-55.0	12:11	539.400	0.45	0.67	3.06	3.06	123	237	108	81	252	43	5
B-11	55.0-57.5	12:13	541.600	0.53	0.73	3.60	3.60	122	246	112	83	252	43	6
B-12	57.5-60.0	12:16	544.000	0.38	0.62	2.58	2.58	123	252	114	85	251	44	5
			Final Gas: 546.138											

Vol. Vm Gas Mtr	Ave dp	Ave √P
50.436	0.43	0.63

Ave Act.	Ave Stk
2.94	125
	+460
	585

Ave Inlet	Ave Outlet
92	70
Ave+ 460	
541	

EPA Method 5

Run No. 2

File Name:"PLANT_42"

Plant No. 42 Date 11/06/91
Sample Location : FAIRFIELD OH
Sample Type : 1-5
Operator : Green / olive
Ambient Temp. : 42
Baro. Pressure : 29.2
Static Pres, (Ps) : -.58
Filter No. (S) : 542
Pitot Tube No. & Cp. : .84
EPA Representative : Hollie Barger

Probe Length and Type : 8' SS
Nozzle I.D. : .304
Assumed Moisture % 14%
Sample Box Number : 1
Meter _____ H @ _____
K Factor 7.42
Pre-Test Leak Check Rate .003 CPM @ 8
Post Test Leak Check Rate .003 CPM @ 8.5
Production Rate 237 TPH
Fyrite: O^2 14 CO^2 4

Schematic of Traverse Point Layout
Read and Record all data every 2.5 minutes

Note: dPs=Delta Ps, dH = Delta H

TRAV. Point No.	Elapsed TIME (minutes)	Clock Time 24 hr	GAS Meter Reading	VELOC HEAD dPs in H^2O		ORIFICE Prs dH in H^2O		STK Temp °F	PROB Temp °F	DRY GAS MTR Inlet	DRY GAS MTR Outlet	BOX Temp °F	IMPNGR Temp °F	PUMP VAC. Hg
					√dP	Desir	Act.			Inlet	Outlet			
A-01	0.0- 2.5	13:02	546.243	0.64	0.80	4.75	4.75	137	239	86	83	243	48	6
A-02	2.5- 5.0	13:04	548.700	0.80	0.89	5.94	5.94	134	254	98	84	255	44	8
A-03	5.0- 7.5	13:06	551.700	0.80	0.89	5.94	5.94	133	258	104	84	258	46	8
A-04	7.5-10.0	13:09	554.900	0.75	0.87	5.57	5.57	130	244	109	85	263	47	8
A-05	10.0-12.5	13:12	557.800	0.70	0.84	5.19	5.19	127	232	111	86	266	48	7
A-06	12.5-15.0	13:14	560.700	0.45	0.67	3.34	3.34	124	232	112	88	266	47	5
A-07	15.0-17.5	13:17	563.200	0.15	0.39	1.11	1.11	125	258	110	90	257	46	3
A-08	17.5-20.0	13:19	564.900	0.35	0.59	2.60	2.60	125	263	107	90	256	44	5
A-09	20.0-22.5	13:22	567.000	0.40	0.63	2.97	2.97	125	254	110	90	257	44	5
A-10	22.5-25.0	13:24	569.100	0.40	0.63	2.97	2.97	126	251	112	91	261	45	5
A-11	25.0-27.5	13:26	571.300	0.40	0.63	2.97	2.97	128	246	114	92	246	46	5
A-12	27.5-30.0	13:29	573.600	0.40	0.63	2.97	2.97	129	243	115	93	238	47	5
B-01	30.0-32.5	13:40	575.758	0.68	0.82	5.05	5.05	122	256	94	91	260	42	7
B-02	32.5-35.0	13:43	578.500	0.50	0.71	3.71	3.71	124	248	106	90	262	41	6
B-03	35.0-37.5	13:46	581.000	0.45	0.67	3.34	3.34	122	241	109	90	264	44	5
B-04	37.5-40.0	13:48	583.400	0.47	0.69	3.49	3.49	122	242	111	90	267	45	5

Run No. 2 File Name:"PLANT_42"

Schematic of Traverse Point Layout

Read and Record all data every 2.5 minutes

Note: dPs=Delta Ps, dH = Delta H

TRAV. Point No.	Elapsed TIME (minutes)	Clock Time 24 hr	GAS Meter Reading	VELOC HEAD dPs in H^2O		ORIFICE Prs dH in H^2O		STK Temp °F	PROB Temp °F	DRY GAS MTR Inlet Outlet		BOX Temp °F	IMPNGR Temp °F	PUMP VAC. Hg
					√dP	Desir	Act.			Inlet	Outlet			
B-05	40.0-42.5	13:51	585.700	0.40	0.63	2.97	2.97	123	228	112	90	267	45	5
B-06	42.5-45.0	13:53	588.200	0.10	0.32	0.74	0.74	122	250	109	91	254	44	3
B-07	45.0-47.5	13:56	589.300	0.15	0.39	1.11	1.11	123	263	106	91	248	44	3
B-08	47.5-50.0	13:58	590.700	0.31	0.56	2.30	2.30	124	263	109	92	244	44	5
B-09	50.0-52.5	14:00	592.600	0.25	0.50	1.85	1.85	125	266	112	92	243	45	4
B-10	52.5-55.0	14:03	594.500	0.35	0.59	2.60	2.60	125	263	111	92	243	46	5
B-11	55.0-57.5	14:05	596.500	0.39	0.62	2.89	2.89	125	258	112	92	243	46	5
B-12	57.5-60.0	14:08	598.700	0.39	0.62	2.89	2.89	126	255	114	93	241	47	5

Final Gas: 600.848

Vol. Vm Gas Mtr	Ave dp	Ave √P
54.605	0.44	0.65

Ave Act.	Ave Stk
3.30	126
	+460
	586

Ave Inlet	Ave Outlet
108	90
Ave+ 460	
559	

EPA Method 5

Run No. 3

File Name:"PLANT_42"

Plant No. 42
Date 11/06/91
Sample Location : FAIRFIELD OH
Sample Type : 1-5
Operator : Green 01/04
Ambient Temp. : 43
Baro. Pressure : 29.2v
Static Pres, (Ps) : -.58
Filter No. (S) : 543
Pitot Tube No. & Cp. : .84
EPA Representative : Hollie Barger

Probe Length and Type : 8' SS
Nozzle I.D. : .204
Assumed Moisture % : 13%
Sample Box Number : 1
Meter _____ H @ _____
K Factor .242
Pre-Test Leak Check Rate 0 CPM @ 6
Post Test Leak Check Rate .001 CPM @ 11
Production Rate _____ TPH
Fyrite: O^2 14 CO^2 4

Schematic of Traverse Point Layout
Read and Record all data every 2.5 minutes

Note: dPs=Delta Ps, dH = Delta H

TRAV. Point No.	Elapsed TIME (minutes)	Clock Time 24 hr	GAS Meter Reading	VELOC HEAD dPs in H^2O	√dP	ORIFICE Prs dH in H^2O Desir	Act.	STK Temp °F	PROB Temp °F	DRY GAS MTR Inlet	Outlet	BOX Temp °F	IMPNGR Temp °F	PUMP VAC. Hg
A-01	0.0- 2.5	14:56	600.942	0.45	0.67	3.34	3.34	134	230	80	78	250	49	7
A-02	2.5- 5.0	14:59	603.600	0.51	0.71	3.78	3.78	135	242	90	78	254	48	7
A-03	5.0- 7.5	15:01	605.600	0.55	0.74	4.08	4.08	130	248	94	77	267	46	8
A-04	7.5-10.0	15:04	608.000	0.51	0.71	3.78	3.78	126	259	98	77	259	46	8
A-05	10.0-12.5	15:06	610.600	0.20	0.45	1.48	1.48	125	246	100	78	261	46	4
A-06	12.5-15.0	15:09	612.300	0.10	0.32	0.74	0.74	126	240	96	78	264	44	3
A-07	15.0-17.5	15:12	613.500	0.15	0.39	1.11	1.11	125	244	95	79	272	44	4
A-08	17.5-20.0	15:14	615.100	0.32	0.57	2.37	2.37	124	244	101	80	252	44	5
A-09	20.0-22.5	15:16	616.700	0.38	0.62	2.82	2.82	125	242	105	81	243	44	6
A-10	22.5-25.0	15:18	618.800	0.42	0.65	3.12	3.12	126	239	106	83	235	45	7
A-11	25.0-27.5	15:21	621.100	0.42	0.65	3.12	3.12	124	245	110	84	249	46	7
A-12	27.5-30.0	15:24	623.300	0.43	0.66	3.19	3.19	124	253	111	85	259	46	7
B-01	30.0-32.5	15:32	625.663	0.71	0.84	5.27	5.27	126	253	96	86	242	43	10
B-02	32.5-35.0	15:35	629.000	0.75	0.87	5.57	5.57	126	246	106	86	236	45	8
B-03	35.0-37.5	15:37	631.700	0.80	0.89	5.94	5.94	126	244	109	85	238	46	8
B-04	37.5-40.0	15:40	634.800	0.75	0.87	5.57	5.57	125	241	111	86	240	47	8

File Name:"PLANT_42"

Run No. 2

Schematic of Traverse Point Layout

Read and Record all data every 2.5 minutes

Note: dPs=Delta Ps, dH = Delta H

TRAV. Point No.	Elapsed TIME (minutes)	Clock Time 24 hr	GAS Meter Reading	VELOC HEAD dPs in H^2O	ORIFICE Prs dH in H^2O		STK Temp °F	PROB Temp °F	DRY GAS MTR Inlet Outlet		BOX Temp °F	IMPNGR Temp °F	PUMP VAC. Hg
					√dP	Desir	Act.			Inlet	Outlet			
B-05	40.0-42.5	15:42	637.800	0.70	0.84	5.19	5.19	125	237	113	87	243	48	8
B-06	42.5-45.0	15:44	640.700	0.40	0.63	2.97	2.97	122	234	112	88	249	48	5
B-07	45.0-47.5	15:47	643.000	0.17	0.41	1.26	1.26	125	237	109	89	251	48	3
B-08	47.5-50.0	15:49	644.500	0.40	0.63	2.97	2.97	127	252	109	90	247	47	5
B-09	50.0-52.5	15:52	646.700	0.42	0.65	3.12	3.12	127	245	109	90	248	46	5
B-10	52.5-55.0	15:54	649.000	0.42	0.65	3.12	3.12	127	242	110	90	249	47	5
B-11	55.0-57.5	15:57	651.300	0.42	0.65	3.12	3.12	128	240	110	91	245	47	5
B-12	57.5-60.0	15:59	653.500	0.42	0.65	3.12	3.12	128	246	110	91	242	49	5

Final Gas: 655.781

Vol. Vm Gas Mtr	Ave dp	Ave √P
54.889	0.45	0.65

Ave Act.	Ave Stk
3.34	126
	+460
	587

Ave Inlet	Ave Outlet
104	84
Ave+ 460	
554	

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.

MOISTURE DETERMINATION

PLANT # 42 LOCATION_____FAIRFIELD OH

DATE 11-06-91 TECHNICIAN___GREEN & OLIVE

RUN #1

IMPINGER #	1	2	3	4
TYPE	MODIFIED	STANDARD	MODIFIED	MODIFIED
AMOUNT(ml/gms)	150(H20)	150(H20)	0	200(H20)
FINAL WT. (VOL)-	817.3	703.9	520.8	695.4
INITIAL WT (VOL)	676.5	682.7	519.3	684.0
NET WT. (VOL)---	140.8	21.2	1.5	11.4

TOTAL-------= 174.9

RUN #2

IMPINGER #	1	2	3	4
TYPE	MODIFIED	STANDARD	MODIFIED	MODIFIED
AMOUNT(ml/gms)	150(H20)	150(H20)	0	200(H20)
FINAL WT. (VOL)-	827.0	671.9	539.5	735.0
INITIAL WT (VOL)	679.8	641.2	536.6	722.1
NET WT. (VOL)---	147.2	30.7	2.9	12.9

TOTAL-------= 193.7

RUN #3

IMPINGER #	1	2	3	4
TYPE	MODIFIED	STANDARD	MODIFIED	MODIFIED
AMOUNT(ml/gms)	150(H20)	150(H20)	0	200(H20)
FINAL WT. (VOL)-	825.4	667.7	483.9	727.6
INITIAL WT (VOL)	679.7	642.6	481.6	715.2
NET WT. (VOL)---	145.7	25.1	2.3	12.4

TOTAL-------= 185.5

PARTICULATE CALCULATIONS

PLANT #42 LOCATION_FAIRFIELD ____ DATE 11-6-91

RUN #1 # ml----= 130 X .000003 gm/ml RESIDUE d)_= .0004

	BEAKER #3-A	BEAKER#_____	BEAKER#_____
FINAL-------=	95.6409	0.0000	0.0000
INITIAL-----=	95.6169	0.0000	0.0000
NET-------a)=	.0240	b)= 0.0000	c)= 0.0000
TOTAL(a+b+c)=	.0240	FINAL----= .8082	FILTER#=541
RESIDUE---d)=	.0004	INITIAL--= .6431	
NET BACK 1/2=	.0236	FILTER NET .1651	TOTAL----= .1887

TOTAL*1000---------= 188.7 mg OF PARTICULATE

RUN #2 # ml----= 145 X .000003 gm/ml RESIDUE d)-= .0004

	BEAKER #3-B	BEAKER#_____	BEAKER#_____
FINAL-------=	64.5105	0.0000	0.0000
INITIAL-----=	64.4886	0.0000	0.0000
NET-------a)=	.0219	b)= 0.0000	c)= 0.0000
TOTAL(a+b+c)=	.0219	FINAL----= .8278	FILTER#=542
RESIDUE---d)=	.0004	INITIAL--= .6417	
NET BACK 1/2=	.0215	FILTER NET .1861	TOTAL----= .2076

TOTAL*1000---------= 207.6 mg OF PARTICULATE

RUN #3 # ml----= 120 X .000003 gm/ml RESIDUE d)-= .0004

	BEAKER #12	0.0000 BEAKER#_____	BEAKER#_____
FINAL-------=	97.0754	0.0000	0.0000
INITIAL-----=	97.0616	0.0000	0.0000
NET-------a)=	.0138	b)= 0.0000	c)= 0.0000
TOTAL(a+b+c)=	.0138	FINAL----= .7975	FILTER #=543
RESIDUE---d)=	.0004	INITIAL--= .6376	
NET BACK 1/2=	.0134	FILTER NET .1599	TOTAL----= .1733

TOTAL*1000---------= 173.3 mg OF PARTICULATE

	RUN #1	RUN #2	RUN #3	AVERAGE
DRY GAS METER CALIBRATION FACTOR---Y=	.99	.99	.99	
VOLUME OF GAS METER CONDITIONS----Vm=	50.436	54.605	54.839	
AVE SQ ROOT DELTA P----------p=	.630	.650	.650	
AVE DELTA H PRESS ACROSS ORIFICE--^H=	2.94	3.30	3.34	
AVE STACK TEMPERATURE DEGREES R---Ts	585.00	586.00	587.00	
AVE METER TEMPERATURE DEGREES R---Tm=	541.00	559.00	554.00	
TOTAL WATER COLLECTED----------Vlc=	174.90	193.70	185.50	
TONS PER HOUR PRODUCTION---------tph=	240.00	237.00	240.00	
TOTAL PARTICULATE IN mg----------Pmg=	188.70	207.60	173.30	
FYRITE FOR OXYGEN----------=	14.00	14.00	14.00	14.00
FYRITE FOR CARBON DIOXIDE----------=	4.00	4.00	4.00	4.00
BAROMETRIC PRESSURE----------Pb=	29.20	29.20	29.20	29.20
STACK STATIC PRESSURE (-+)----------=	-.58	-.58	-.58	-.58
ABSOLUTE PRESSURE IN STACK--------Ps=	29.16	29.16	29.16	29.16
SAMPLING TIME IN MINUTES----------O=	60.00	60.00	60.00	
DIAMETER OF NOZZLE----------dn=	.304	.304	.304	
AREA OF STACK (SQ. FEET)----------As=	33.18	33.18	33.18	
1. VOL OF GAS AT STD COND----Vm(std)=	47.89	50.23	50.90	
2. VOL OF WATER STD COND----Vwc(std)=	8.23	9.12	8.73	
3. MOLE FRAC OF WATER VAPOR------Bws=	.1467	.1536	.1464	
4. % MOISTURE----------=	14.67	15.36	14.64	14.89
5. MOLECULAR Wt OF STACK GAS------Ms=	27.56	27.48	27.56	27.53
6. STACK VELOCITY (fps)----------Vs=	38.60	39.92	39.90	39.47
7. VOL FLOW RATE (dscf/hr)-------Qsd=	3.46e+06	3.54e+06	3.57e+06	3.52e+06
8. ACTUAL FLOW RATE (acf/hr)-----Acf=	4.06e+06	4.19e+06	4.18e+06	4.14e+06
9. AREA OF NOZZLE----------A=	5.04e-04	5.04e-04	5.04e-04	
10. % ISOKINETIC----------I=	91.95	94.17	94.85	93.65
11. CONCENTRATION GRAINS/DSCF-------=	6.068e-02	6.365e-02	5.243e-02	5.892e-02
12. POUNDS/DSCF----------=	8.69e-06	9.11e-06	7.51e-06	8.44e-06
13. POUNDS/HOUR EMISSION----------=	30.07	32.30	26.77	29.71
14. POUNDS/TON ASPHALT----------=	1.25e-01	1.36e-01	1.12e-01	1.24e-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

DATE-11-7-91 PRETEST Y= ^H@=

	TEST #1	TEST #2	TEST #3
MINIMUM VOL OF GAS ----------	4.000	10.000	10.000
ORIFICE MANOMETER SETTING----------^H	.500	2.000	6.000
WET TEST METER INITIAL READING----Vwi	18.528	24.615	37.206
WET TEST METER FINAL READING------Vwf	24.305	35.680	49.785
WET TEST METER AVERAGE TEMP---------F	65.000	63.000	62.000
DRY TEST METER INITIAL READING----Vdi	656.710	662.856	675.647
DRY TEST METER FINAL READING------Vdf	662.543	674.242	688.522
DRY TEST METER AVERAGE TEMP---------F	78.000	92.000	99.000
TOTAL TEST TIME MINUTES----------O	15.470	15.280	10.190
BAROMETRIC PRESSURE INCHES Hg------Pb	29.520	29.520	29.520
VOLUME OF WET TEST METER----------Vw	5.777	11.065	12.579
VOLUME OF DRY TEST METER----------Vd	5.833	11.486	12.975
AVE WET TEST TEMPERATURE----------Rw	525.000	523.000	522.000
AVE DRY TEST TEMPERTURE----------Rd	538.000	552.000	559.000
(Vw*Pb*Rd)/(Vd*(Pb+^H/13.6)*Rw)-----Y	1.014	1.012	1.023
((.0317*^H)/(Pb*Rd))*((Rw*O)/Vw)^2-^H@	1.973	2.029	2.061
AVERAGE Y FOR 3 TESTS----------	1.016 LIMITS= .98-1.02		
AVERAGER ^H@ FOR 3 TESTS----------	2.021 LIMITS= +-0.2 OF AVE ^H		
DIFF BETWEEN AVE=	.048	-.008	-.040

NOTE ^H=DELTA H and Y=GAMMA