AP42 Section: 11.1

Reference Number: 347

Title: Stack Emission Test, Northeast Asphalt, Inc., Control 52 Asphalt Plant, Rio, WI,

Environmental Technology and Engineering Corp., Elm Grove, WI,

June 30, 1995.

Sec. H.1
Ref. 347

Benzene, CO, NOx

Report to

NORTHEAST ASPHALT, INC.
Green Bay, Wisconsin

for

STACK EMISSION TEST
CONTROL 52 ASPHALT PLANT
Rio, Wisconsin

June 30, 1995

by

ENVIRONMENTAL TECHNOLOGY & ENGINEERING CORPORATION
13020 West Bluemound Road
Elm Grove, Wisconsin 53122
414-784-2434

SUMMARY

On June 30, 1995, Environmental Technology & Engineering Corporation personnel performed a stack emission test on the Northeast Asphalt, Inc. Control 52 asphalt plant located in Rio, Wisconsin. The average of the three particulate tests show the emissions to be well below the limit of 0.04 grains of particulate matter per dry standard cubic foot (gr/dscf) as specified by the State of Wisconsin Department of Natural Resources (DNR) by permit. The numerical test results are summarized below:

Test	Emissions	% of Allowable
1	0.005 gr/dscf	12.5 %
2	0.005	12.5
3	0.006	15.0
AVG	0.005 gr/dscf	13.3 %

In addition, the permit also required testing for formaldehyde emissions. The following table presents the numerical results:

Test	LB/HR	LB/TON
1	0.36 lb/hr	0.0024 lb/ton
2	0.41	0.0026
3	0.43	0.0028
AVG	0.40 lb/hr	0.0026 lb/ton

1.0 GENERAL

On Friday, June 30, 1995, Environmental Technology and Engineering Corporation personnel performed a stack emission test on the Northeast Asphalt, Inc. Control 52 drum mix asphalt plant located in Rio, Wisconsin. The test was a provision of Air Pollution Control Permit No. 111008480-NO3. The State of Wisconsin Department of Natural Resources (DNR) has established a particulate emission limit of 0.04 grains per dry standard cubic foot (gr/dscf). The purpose of this test was to demonstrate the compliance status of this plant with the particulate limits set by the DNR. In addition, the permit also required a test to determine the formaldehyde emissions.

The plant tested was a drum mix asphalt plant equipped with a baghouse for particulate control. During the test period, the plant production rate was approximately 155 tons per hour and the mix was composed of 100 % virgin material. The plant was fired with drain oil. The field tests, corresponding laboratory analysis and report preparation were coordinated by Bill Dick of ETE Corp. The test procedures, plant operating conditions, and stack opacity were witnessed by Mike Sloat of the Wisconsin DNR Southern District Office.

The following sections of this report document the activities and results of the test program. The report presents all of the relevant data collected and discussions on the interpretation of the data are provided where appropriate. The report, therefore, includes much necessary detail. The results, however, have been summarized in the SUMMARY section at the beginning of this report for those readers not wishing to be burdened by the details.

2.0 RESULTS

2.1 Particulate Emissions

Isokinetic sampling for particulate matter was performed in accordance with the procedures outlined in EPA Method 17 - "Determination of Particulate Emissions from Stationary Sources" - as published in the Federal Register. A brief summary of this method is included in section 3.0 of this report. The tests were performed in the final discharge stack at the location shown in Figure 2-1. This same figure also depicts the location of the exact test points relative to the stack wall. The stack flow parameters recorded during testing and the weights of particulate collected were used to compute the emissions for each test of the three-test sequence. These data were then entered into a computer and printouts showing detailed results are included as Tables 2-1, 2-2, and 2-3.

The results of each of the three individual tests show the emissions to be well below the limit of 0.04 grains of particulate matter per dry standard cubic foot (gr/dscf) as specified by the State of Wisconsin Department of Natural Resources (DNR). The numerical test results are summarized below:

Test	Emissions	% of Allowable
1	0.005 gr/dscf	12.5 %
2	0.005	12.5
3	0.006	15.0
AVG	0.005 gr/dscf	13.3%

NORTHEAST ASPHALT — DRUM PLANT
CONTROL 52 — JUNE 30, 1995 — OIL FIRED
STACK TEST RESULTS SUMMARY — NO RECYCLE

TEST 1		CO	NOX	FORM	PRODUCTION RATE, TPH
PPM		96	50	1.85	152
MG/M3		110	94	2.31	
LB/HR		17.17	14.62	.36	
LB/TON		.1130	.0962	.0024	
FLOW	SCFM		41515		
	M3/HR		70543		

TEST 2		CO	NOX	FORM	PRODUCTION RATE, TPH
PPM		80	60	2.06	155
MG/M3		92	113	2.57	
LB/HR		14.63	17.94	.41	
LB/TON		.0944	.1157	.0026	
FLOW	SCFM		42455		
	M3/HR		72139		

TEST 3		CO	NOX	FORM	PRODUCTION RATE, TPH
PPM		88	60	2.08	154
MG/M3		101	113	2.59	
LB/HR		16.74	18.66	.43	
LB/TON		.1087	.1212	.0028	
FLOW	SCFM		44166		
	M3/HR		75047		

AVERAGE	CO	NOX	FORM
LB/HR	16.18	17.07	.40
LB/TON	.1054	.1110	.0026

NORTHEAST ASPHALT
CONTROL 52 JUNE 30, 1995
STACK TEST RESULTS SUMMARY

DRUM PLANT
OIL FIRED
NO RECYCLE

TEST 1	BENZ		PRODUCTION RATE, TPH
PPM	.08		
MG/M3	.25		152
LB/HR	.04		
LB/TON	.0003		
FLOW	SCFM	41515	
	M3/HR	70543	
TEST 2	BENZ		PRODUCTION RATE, TPH
PPM	.08		
MG/M3	.27		155
LB/HR	.04		
LB/TON	.0003		
FLOW	SCFM	42455	
	M3/HR	72139	
TEST 3	BENZ		PRODUCTION RATE, TPH
PPM	.07		
MG/M3	.23		154
LB/HR	.04		
LB/TON	.0002		
FLOW	SCFM	44166	
	M3/HR	75047	
AVERAGE	BENZ		
LB/HR	.04		
LB/TON	.0003		

Using method 18

Department of Natural Resources

SMOKE FORM
Form 4500-29 Rev. 6-85

Name of Company: Northeast Asphalt	Date: 6/30/95
Location: Rio	FID Number: 111 008 480
City, State, Zip Code: Columbia Cty, WI	Observer Certification Date: april 11, 1995
Discharge Location: Baghouse stack	Control Device: Baghouse
Height of Discharge Above Ground: 28'	Steam Plume? Attached (Yes) Detached (No)

	Initial		Final
Time of Observation	08:00.00		08:35.30
Observer Location Distance to Discharge	80'		
Direction from Discharge	ESE		
Height of Observation Point in Relation to Discharge	10' below		
Plume Description (Color, Length, etc.)	grey, rolling		
Plume Background Description	silo Top		
Weather Conditions Wind Direction	NNE		
Wind Speed	10~15		
Ambient Temperature	70°		
Sky Conditions (clear, overcast, % clouds, etc.)	high haze		

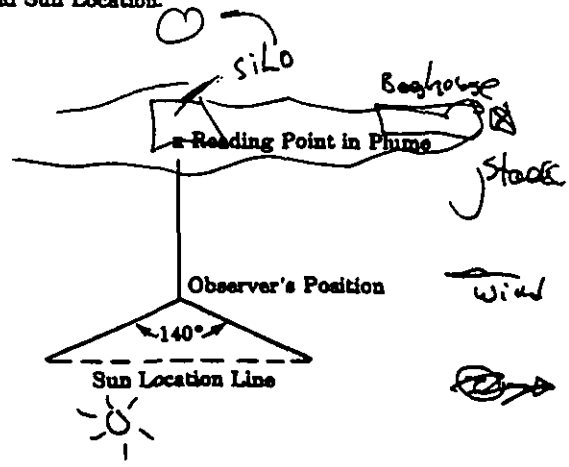
Describe Point in Plume at Which Opacity was Determined
50' downstream, w/ silos background

Remarks:

- counter flow drum plant
- Recycle fuel oil
- asphalt cement added externel to drum
- Production Rate = 151 tons/hour
- Run stopped when production stopped

Signature of Observer	Name of Observer (Please print)
Peter Tolsma	Peter Tolsma

Sketch of Observer, Discharge, and Sun Location.



SEC MIN	0	15	30	45	SEC MIN	0	15	30	45
0	0	0	0	0	30	0	0	0	0
1	0	0	0	0	31	0	0	0	0
2	0	0	0	0	32	0	0	0	0
3	0	0	0	0	33	0	0	0	0
4	0	0	0	0	34	0	0	0	0
5	0	0	0	0	35	0	0	0	
6	0	0	0	0	36				
7	0	0	0	0	37				
8	0	0	0	0	38				
9	0	0	0	0	39				
10	0	0	0	0	40				
11	0	0	0	0	41				
12	0	0	0	0	42				
13	0	0	0	0	43				
14	0	0	0	0	44				
15	0	0	0	0	45				
16	0	0	0	0	46				
17	0	0	0	0	47				
18	0	0	0	0	48				
19	0	0	0	0	49				
20	0	0	0	0	50				
21	0	0	0	0	51				
22	0	0	0	0	52				
23	0	0	0	0	53				
24	0	0	0	0	54				
25	0	0	0	0	55				
26	0	0	0	0	56				
27	0	0	0	0	57				
28	0	0	0	0	58				
29	0	0	0	0	59				

Summary of Average Opacity
(From Computer Program)

Set Number	Time: Start — End	Opacity: Sum	Opacity: Average

Allowable Source Opacity 20 %

Department of Natural Resources

SMOKE FORM
Form 4500-29 Rev. 6-85

Name of Company: Northwest Asphalt	Date: 6/30/95
Location: Rio	FID Number: 111 008 480
City, State, Zip Code: Columbia City	Observer Certification Date: April 11, 1995
Discharge Location: Baghouse Stack	Control Device: Baghouse
Height of Discharge Above Ground: 28'	Steam Plume? Yes (Attached) / (Detached) No

	Initial		Final
Time of Observation	09:11.00		09:45.45
Observer Location: Distance to Discharge	80'		
Direction from Discharge	ESE		
Height of Observation Point in Relation to Discharge	10' below		
Plume Description (Color, Length, etc.)	-		
Plume Background Description	silo		
Weather Conditions: Wind Direction	NNE		
Wind Speed	0-15		
Ambient Temperature	70°		
Sky Conditions (clear, overcast, % clouds, etc.)	high haze		

Describe Point in Plume at Which Opacity was Determined: 50' downstream, with silo as background

Remarks:

SEC MIN	0	15	30	45	SEC MIN	0	15	30	45
0	0	0	0	0	30	0	0	0	0
1	0	0	0	0	31	0	0	0	0
2	0	0	0	0	32	0	0	0	0
3	0	0	0	0	33	0	0	0	0
4	0	0	0	0	34	0	0	0	0
5	0	0	0	0	35				
6	0	0	0	0	36				
7	0	0	0	0	37				
8	0	0	0	0	38				
9	0	0	0	0	39				
10	0	0	0	0	40				
11	0	0	0	0	41				
12	0	0	0	0	42				
13	0	0	0	0	43				
14	0	0	0	0	44				
15	0	0	0	0	45				
16	0	0	0	0	46				
17	0	0	0	0	47				
18	0	0	0	0	48				
19	0	0	0	0	49				
20	0	0	0	0	50				
21	0	0	0	0	51				
22	0	0	0	0	52				
23	0	0	0	0	53				
24	0	0	0	0	54				
25	0	0	0	0	55				
26	0	0	0	0	56				
27	0	0	0	0	57				
28	0	0	0	0	58				
29	0	0	0	0	59				

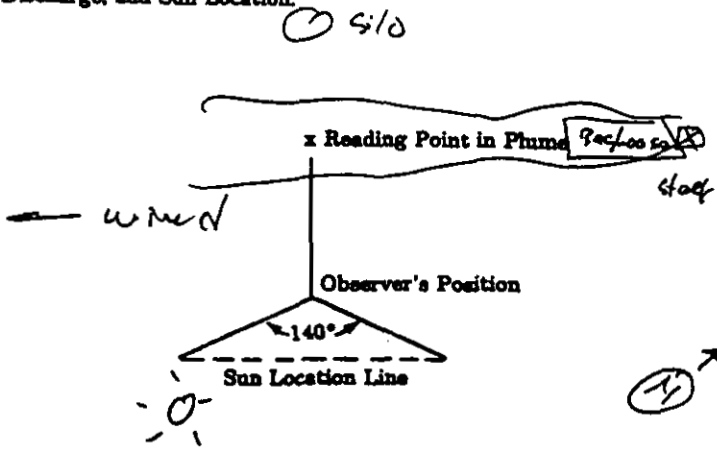
Summary of Average Opacity
(From Computer Program)

Set Number	Time: Start – End	Opacity: Sum	Opacity: Average

Signature of Observer: Peter Tolsma

Name of Observer (Please print): Peter Tolsma

Sketch of Observer, Discharge, and Sun Location.



Allowable Source Opacity: 20 %

FIGURE 2-1

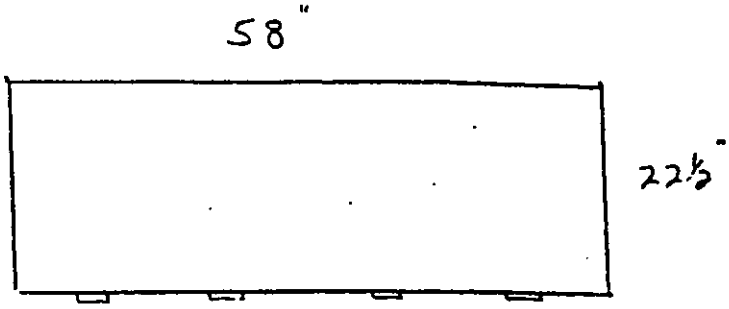
PLANT NORTHEAST ASPHALT

LOCATION RIO

PROCESS ASPHALT PLANT

DIMENSIONS 58 x 22½

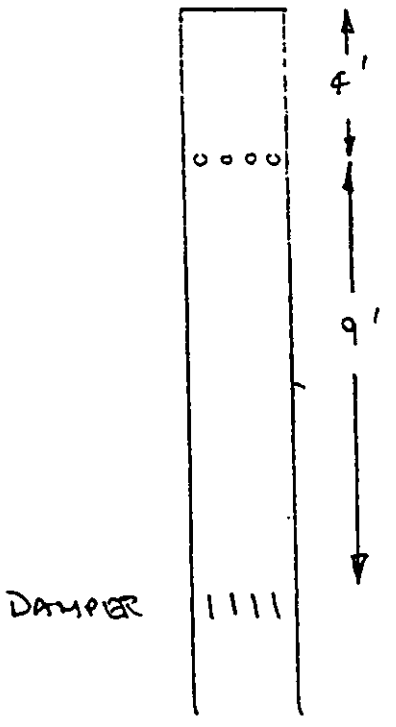
COMMENTS



TEST SECTION

POINT	DISTANCE FROM STACK WALL
1	1.9
2	5.6
3	9.4
4	13.1
5	16.9
6	20.7

SAMPLING LOCATION



13000 WEST BLUEMOUND ROAD • ELM GROVE, WISCONSIN 53122-2655
TELEPHONE (414) 784-2434 • FAX (414) 784-2436

NORTHEAST ASPHALT CONTROL 52 TEST 1 6-30-95 TABLE 2-1

BAROMETRIC PRESSURE, in Hg = 29.100
TIP DIAMETER, in = .2500
STACK AREA, sq ft = 20.444
SAMPLING TIME PER POINT, min = 2.50
NUMBER OF POINTS = 24
GAS METER VOLUME, acf = 42.15
WATER COLLECTED, ml = 298
PARTICULATE COLLECTED, grams = 0.0128
ORSAT RESULTS
CO2 = 5.00 O2 = 13.00 CO = 0.00 N2 = 82.00

SAMPLING POINT	STACK TEMP deg F	PITOT DEL P inches	ORIFICE METER inches	GAS METER OUTLET T deg F	GAS VELOCITY fps
1	240	1.200	2.40	72	74.88
2	240	1.150	2.30	72	73.30
3	245	0.850	1.70	73	63.25
4	250	0.850	1.70	73	63.47
5	250	1.000	2.00	73	68.84
6	250	1.000	2.00	74	68.84
7	250	0.500	1.00	76	48.68
8	250	0.500	1.00	76	48.68
9	250	0.550	1.10	77	51.05
10	250	0.550	1.10	78	51.05
11	250	0.600	1.20	78	53.32
12	250	0.300	0.60	79	37.71
13	250	0.800	1.60	80	61.57
14	250	0.700	1.40	80	57.60
15	250	0.600	1.20	81	53.32
16	250	0.500	1.00	82	48.68
17	250	0.700	1.40	82	57.60
18	250	0.500	1.00	82	48.68
19	255	1.800	3.60	83	92.69
20	255	1.200	2.40	84	75.68
21	250	1.000	2.00	84	68.84
22	250	1.000	2.00	85	68.84
23	250	1.200	2.40	85	75.41
24	245	1.800	3.60	86	92.04
AVG VALUES	249		1.738	79	62.67

TOTAL GAS WITHDRAWN, scf = 55.33
DRY GAS WITHDRAWN, scf = 41.30
WATER VAPOR WITHDRAWN, scf = 14.03
PERCENT WATER VAPOR = 25.35
ACTUAL WET FLOW RATE, acfm = 76,871
STANDARD DRY FLOW RATE, scfm = 41,516
, m3/hr = 70,543
PARTICULATE CONCENTRATION, grains/dscf = 0.005
PARTICULATE EMISSION RATE, lb/hr = 1.70
LB PARTICULATE PER 1000 LB GAS = 0.007
PERCENT OF ISOKINETIC SAMPLING = 99.5

NORTHEAST ASPHALT CONTROL 52 TEST 2 6-30-95 TABLE 2-2

BAROMETRIC PRESSURE, in Hg = 29.100
TIP DIAMETER, in = .2500
STACK AREA, sq ft = 20.444
SAMPLING TIME PER POINT, min = 2.50
NUMBER OF POINTS = 24
GAS METER VOLUME, acf = 43.21
WATER COLLECTED, ml = 318
PARTICULATE COLLECTED, grams = 0.0135
ORSAT RESULTS
CO2 = 5.20 O2 = 12.80 CO = 0.00 N2 = 82.00

SAMPLING POINT	STACK TEMP deg F	PITOT DEL P inches	ORIFICE METER inches	GAS METER OUTLET T deg F	GAS VELOCITY fps
1	245	1.800	3.60	87	92.16
2	245	1.500	3.00	87	84.13
3	250	1.200	2.40	87	75.51
4	250	1.200	2.40	88	75.51
5	250	1.200	2.40	88	75.51
6	250	1.800	3.60	88	92.48
7	255	0.850	1.70	90	63.78
8	255	0.750	1.50	90	59.91
9	260	0.700	1.40	90	58.08
10	260	0.600	1.20	90	53.77
11	260	0.700	1.40	90	58.08
12	255	0.700	1.40	90	57.88
13	255	0.500	1.00	90	48.91
14	250	0.450	0.90	90	46.24
15	255	0.500	1.00	90	48.91
16	255	0.600	1.20	91	53.58
17	255	0.650	1.30	91	55.77
18	255	0.400	0.80	91	43.75
19	255	1.100	2.20	91	72.55
20	255	1.000	2.00	92	69.18
21	255	0.850	1.70	92	63.78
22	255	0.850	1.70	92	63.78
23	250	1.150	2.30	93	73.92
24	250	1.200	2.40	93	75.51
AVG VALUES	253		1.854	90	65.11

TOTAL GAS WITHDRAWN, scf = 57.38
DRY GAS WITHDRAWN, scf = 42.41
WATER VAPOR WITHDRAWN, scf = 14.97
PERCENT WATER VAPOR = 26.09
ACTUAL WET FLOW RATE, acfm = 79,868
STANDARD DRY FLOW RATE, scfm = 42,455
, m3/hr = 72,139
PARTICULATE CONCENTRATION, grains/dscf = 0.005
PARTICULATE EMISSION RATE, lb/hr = 1.79
LB PARTICULATE PER 1000 LB GAS = 0.008
PERCENT OF ISOKINETIC SAMPLING = 99.9

NORTHEAST ASPHALT CONTROL 52 TEST 3 6-30-95 TABLE 2-3

BAROMETRIC PRESSURE, in Hg = 29.100
TIP DIAMETER, in = .2500
STACK AREA, sq ft = 20.444
SAMPLING TIME PER POINT, min = 2.50
NUMBER OF POINTS = 24
GAS METER VOLUME, acf = 43.75
WATER COLLECTED, ml = 299
PARTICULATE COLLECTED, grams = 0.0177
ORSAT RESULTS
CO2 = 5.00 O2 = 12.80 CO = 0.00 N2 = 82.20

SAMPLING POINT	STACK TEMP deg F	PITOT DEL P inches	ORIFICE METER inches	GAS METER OUTLET T deg F	GAS VELOCITY fps
1	250	1.200	2.40	91	75.32
2	250	1.000	2.00	91	68.75
3	250	0.900	1.80	91	65.23
4	255	0.850	1.70	92	63.61
5	255	1.100	2.20	92	72.36
6	255	1.200	2.40	92	75.58
7	255	0.500	1.00	92	48.79
8	255	0.550	1.10	92	51.17
9	255	0.550	1.10	92	51.17
10	255	0.600	1.20	92	53.44
11	255	0.650	1.30	92	55.63
12	255	0.400	0.80	92	43.64
13	250	0.900	1.80	92	65.23
14	250	0.850	1.70	93	63.39
15	250	0.750	1.75	93	59.54
16	250	0.750	1.50	93	59.54
17	250	0.700	1.40	93	57.52
18	250	0.950	1.90	93	67.01
19	250	1.750	3.50	93	90.95
20	250	1.500	3.00	94	84.21
21	250	1.200	2.40	94	75.32
22	250	1.200	2.40	94	75.32
23	250	1.250	2.50	94	76.87
24	245	1.800	3.60	95	91.92
AVG VALUES	252		1.935	93	66.31

TOTAL GAS WITHDRAWN, scf = 57.03
DRY GAS WITHDRAWN, scf = 42.96
WATER VAPOR WITHDRAWN, scf = 14.07
PERCENT WATER VAPOR = 24.68
ACTUAL WET FLOW RATE, acfm = 81,341
STANDARD DRY FLOW RATE, scfm = 44,166
, m3/hr = 75,047
PARTICULATE CONCENTRATION, grains/dscf = 0.006
PARTICULATE EMISSION RATE, lb/hr = 2.37
LB PARTICULATE PER 1000 LB GAS = 0.010
PERCENT OF ISOKINETIC SAMPLING = 97.2

2.2 Formaldehyde Emissions

The formaldehyde emissions were determined concurrently with the particulate testing using EPA Method 0011 (non-isokinetic). A brief description of the method is included in section 3.0 of this report. The numerical results are presented below:

Test	LB/HR	LB/TON
1	0.36 lb/hr	0.0024 lb/ton
2	0.41	0.0026
3	0.43	0.0028
AVG	0.40 lb/hr	0.0026 lb/ton

A summary of the field and lab data is included as Table 2-4.

3.0 METHOD OF TEST

3.1 Particulate Matter

The equipment used to sample was the Western Precipitation Division of the Joy Manufacturing Company Emission Parameter Analyzer. Samples were collected and analyzed in accordance with procedures outlined in 40 CFR 60 Appendix A, Method 17 - Determination of Particulate Emissions from Stationary Sources.

The sampling train consisted of a stainless steel probe tip, an in-stack filter, a heated stainless steel lined probe, a glass cyclone and flask, and a heated 125 millimeter Whatman 934-AH fiberglass back-up filter. A series of four impingers followed in an ice bath. The first was a modified Greenburg-Smith impinger with 100 ml of distilled water; the second was a Greenburg-Smith impinger with 100 ml water; the third was a modified Greenburg-Smith impinger dry; the fourth was also a modified Greenburg-Smith impinger containing a tared quantity of silica gel. The gas then passed through a vacuum pump, calibrated dry gas meter, and a calibrated orifice. A schematic drawing of the sampling train is included.

NORTHEAST ASPHALT CONTROL 52 PLANT
FORMALDEHYDE RESULTS JUNE 30, 1995
TABLE 2-4

TEST NO	METER VOLUME Vm	METER TEMP Tm	STD DRY VOLUME VmSTD	METER FACTOR GAMA	BAR PRESS IN HG	FORM ug	FORM CONC ug/m3	FLOW RATE m3/hr	FORM ER lb/hr	PROD RATE tph	FORM EM lb/ton
1	2.00	525	2.01	1.026	29.10	131.0	2.31	70543	.36	152	.0024
2	2.00	529	1.99	1.026	29.10	145.1	2.57	72139	.41	155	.0026
3	2.00	530	1.99	1.026	29.10	146.1	2.59	75047	.43	154	.0028
					AVERAGE RESULTS		2.49	72576	.40	154	.0026

The temperatures at strategic locations within the sampling devices, were monitored by RTDs and read directly from a gauge on the control unit.

The initial gas stream velocity was obtained from a preliminary traverse using an "S" type pitot tube. The initial moisture was estimated from previous tests of similar processes. This data, along with the stack temperature, was used to set a nomograph so that rapid calculations of isokinetic sampling conditions could be made.

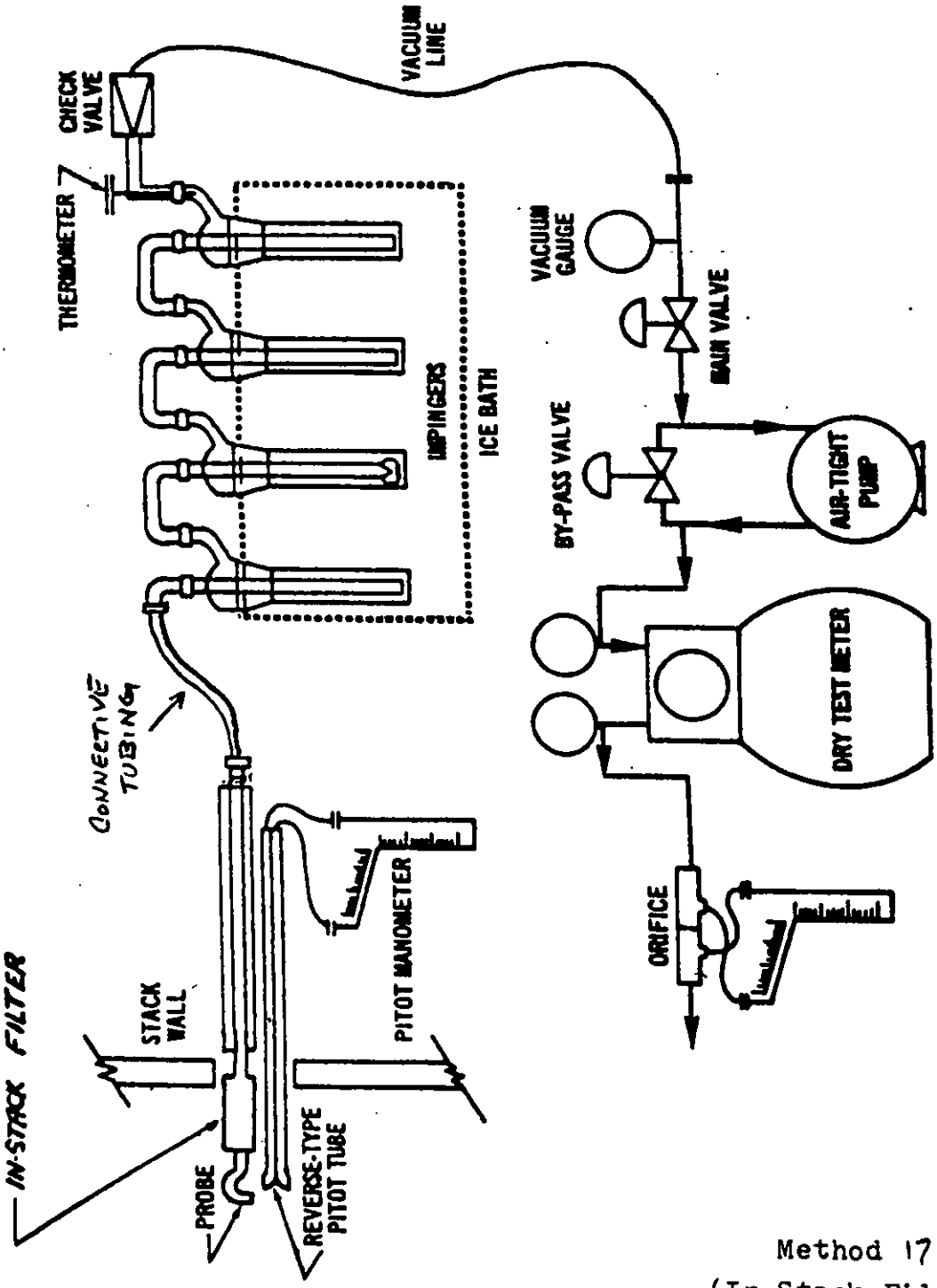
The principle of the method was to collect the sample representative of the exhaust by adjusting the sample collection velocity to match the exhaust gas stream velocity at the point of collection. The velocity at the point of collection was measured with an "S" type pitot tube attached to the probe and the collection velocity was matched to the stack gas velocity by adjusting the flow as indicated by the calibrated orifice.

To determine the molecular weight of the stack gas, samples were drawn into an Orsat analyzer and analyzed for percentage CO2, O2, CO, and N2.

At the completion of the test, the probe tip preceding the filter was washed with acetone which was placed in a tared beaker and evaporated to dryness at room temperature. The filter and beaker were then desiccated to the tared humidity conditions and weighed. The impinger contents were measured and weighed for determination of the actual moisture content of the exhaust gas stream.

The combined weight of the filter catch and the probe tip washing residue was used to determine the particulate emission rates.

A computer was used to calculate the stack velocities, emission concentrations, emission rates and volumetric flow rates using the field and laboratory data.



Particulate sampling train.

Method 17
(In-Stack Filter)

Benzene

Sampling for benzene was performed in accordance with EPA Method 18 - "Measurement of Gaseous Organic Compound Emissions by Gas Chromatography." Samples were drawn from the exhaust gas stream onto solid sorbent tubes (charcoal for benzene) using an SKC pump with a stroke counter to measure the sample volume. A minimum of two tubes were placed in series. A "drip" impinger was used prior to the tubes to eliminate moisture. At the completion of the tests the tubes were desorbed and analyzed by a gas chromatograph equipped with a flame ionization detector.

Standard concentrations of the benzene were prepared by injecting a known quantity into a tube and then desorbing and analyzing the tube in the same manner as the samples. Recovery studies have previously been done for these compounds and found to be acceptable.

The concentrations of the exhaust gas stream were then determined by comparing the response of the standards to the response to the exhaust stack samples. Sample retention times and peak heights were used to quantify both the benzene and chlorobenzene emissions. The compound concentrations were then used in conjunction with the exhaust gas flow rates to determine organic compound emission rates in units of pounds per hour (lb/hr).

3.2 Formaldehyde

The sampling and analysis were performed using procedures outlined in EPA Method 0011, the method required by the Wisconsin Department of Natural Resources for determining formaldehyde emissions.

Sampling was performed by drawing a known quantity of stack exhaust through appropriate sampling media by means of a battery operated pump. The media consisted of a train of three midget impingers; the first two contained 10 ml of a DNPH solution and were followed by an empty impinger and a water trap. The impingers were set in an ice water bath to accommodate the temperature of the gas stream sampled. The sampling volumes were determined through the use of a calibrated dry gas meter.

Following the sampling, the samples were sealed and returned to the lab for analysis. The samples were analyzed via HPLC methods as described by the EPA. A blank was handled in the field in a method identical to the samples and also submitted for analysis.

4.0 CALIBRATIONS

The probe tip, pitot tube, dry gas meter, and orifice were calibrated prior to the test according to procedures outlined in the Maintenance, Calibration, and Operation of Isokinetic Source-Sampling Equipment as published by the EPA. The values obtained were:

Probe tip diameter	d =	0.250"
Pitot tube coeff.	Cp =	0.84
Orifice coeff.	dH@ =	1.848

The dry gas meter presently installed in the control box is a temperature compensating meter. The correction factor for this dry gas meter is represented by:

$$\text{Gama} = 1.002 + (Td - 70) \times .00012$$

where: Td = Dry Gas Meter Temperature

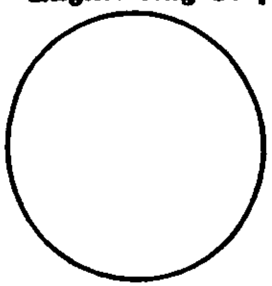
The most recent calibration was performed May 22, 1995.

APPENDIX A

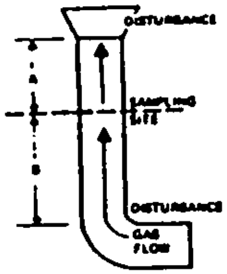
FIELD & LABORATORY DATA SHEETS

Environmental Technology & Engineering Corp.

PARTICULATE FIELD DATA



CROSS SECTION



PLANT Vo[illegible]-Asu[illegible]
DATE 6-30-75
LOCATION R[illegible]/W[illegible]
OPERATOR [illegible]
STACK NO. C[illegible] 5[illegible]
RUN NO. 1
SAMPLE BOX NO. 1
METER BOX NO. 1

AMBIENT TEMPERATURE 60
BAROMETRIC PRESSURE 29.10
ASSUMED MOISTURE, % 25
PROBE LENGTH, in. 4'+
NOZZLE DIAMETER, in. 1/4
STACK DIAMETER, in. 58 × 22'
PROBE HEATER SETTING -
HEATER BOX SETTING -

METER ΔH
C FACTOR
PROCESS WEIGHT RATE

ORSAT RESULTS
NT
CO2 [illegible]
O2 [illegible]
CO
N2 [illegible]
589

LEAK CHECKS
Pre [illegible]
Pitot [illegible]
Post [illegible]
Pitot [illegible]

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	STATIC PRESSURE (in. H_2O)	STACK TEMPERATURE (T_s), °F	VELOCITY HEAD (ΔP_s)	($\sqrt{\Delta P_s}$)	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (V_m), ft³	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET ($T_{m_{in}}$), °F	OUTLET ($T_{m_{out}}$), °F	Foxn γ-1.026 SAMPLE BOX TEMPERATURE °F	Bout SK 1 TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER °F	PUMP VACUUM in. Hg gauge	VELOCITY fps
								103.00		72	400.00/64	[illegible]	3	
A 1	0730		240	1.2		2.40		05.1		72	420.0/66	846645		
2	37		240	1.15		2.30		07.2		73	200/65			
3	35	-.4	245	.85		1.70		09.0		73				
4	3[illegible]		250	.85		1.70		10.8		73	2.01 scf			
5	[illegible]		250	1.0		2.00		12.8		74	.057 m³			
6	[illegible]		250	1.0		2.00		14.8		76	56.9[illegible] l			
B 7	[illegible]		250	.50		1.00		16.1		76				
8	4[illegible]		250	.50		1.00		17.5		77	2.31 mg/l			
9	[illegible]	-.3	250	.55		1.10		19.0		78				
10	5[illegible]		250	.55		1.10		20.4		78				
11	5[illegible]		250	.60		1.20		21.9		79				
12	58		250	.30		.60		23.0		80				
C 13	0[illegible]/01		250	.80		1.60		24.7		80				
14	03[illegible]		250	.70		1.40		26.3		81				
15	0[illegible]	-.3	250	.60		1.20		27.7		82				
16	[illegible]		250	.50		1.00		29.4		82				
17	11		250	.70		1.40		30.7		82				
18	134		250	.50		1.00		32.1		83				
D 19	16/16[illegible]		255	1.80		3.60		34.7		84			5	
20	19		255	1.20		2.40		36.8		84				
21	214		250	1.0		2.00		38.6		85				
22	2[illegible]	-.5	250	1.0		2.00		40.5	42.15	85				
23	2[illegible]		250	1.2		2.40		42.4		86				
24	[illegible]		245	1.8		3.60		145.15						

Environmental
Technolo[illegible]k
Engineering Corp.

PARTICULATE FIELD DATA

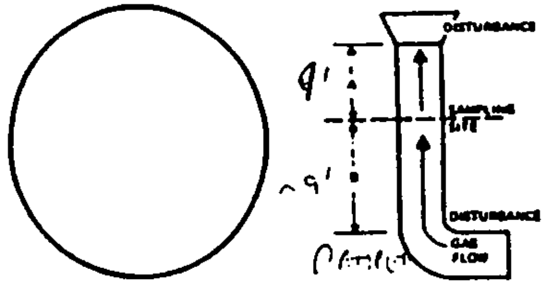
PLANT [illegible]
DATE 6-3-93
LOCATION Rio/Virginia
OPERATOR [illegible]
STACK NO. Control 5 2
RUN NO. 2
SAMPLE BOX NO. 2
METER BOX NO. 1

AMBIENT TEMPERATURE 72
BAROMETRIC PRESSURE
ASSUMED MOISTURE, % 25
PROBE LENGTH, in. 9'+
NOZZLE DIAMETER, in. 1/4
STACK DIAMETER, in. 58 x 32
PROBE HEATER SETTING –
HEATER BOX SETTING –

Y 1.002
METER ΔH 1.8 [illegible]
C FACTOR
PROCESS WEIGHT RATE

ORSAT RESULTS
CO2 5.2
O2 12.3
CO
N2 [illegible]
5 9 0

LEAK CHECKS
Pre <.01 @ 21
Pitot ok
Post <.01 @ 9
Pitot ok

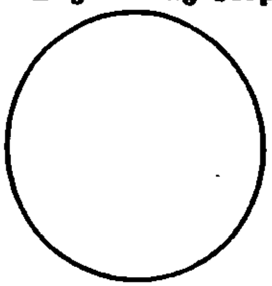


CROSS SECTION

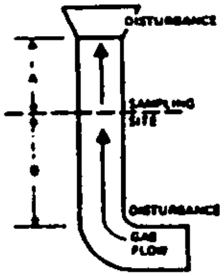
TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	STATIC PRESSURE (in. H2O)	STACK TEMPERATURE (Ts), °F	VELOCITY HEAD (ΔPs)	(√ΔPs)	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (Vm), ft³	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET (Tm in), °F	OUTLET (Tm out), °F	Furn. SAMPLE BOX TEMPERATURE °F	Froth Sec. TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER °F	PUMP VACUUM in. Hg gauge	VELOCITY fps
D 1	0852 33		245	1.8		2.60		46.00		87	422.07/66	896/69	7	
2	55		245	1.5		3.00		48.7		87	424.07/72	92 43 85		
3	57	-.6	250	1.2		2.40		51.0		87	2.00/63			
4	0900		250	1.2		2.40		53.2		88				
5	02		250	1.2		2.40		55.2		88				
6	05		250	1.8		3.60		57.3		88	1.99 scf			
C 7	07/08		255	.85		1.70		59.9		90	.0564			
8	10+		255	.75		1.50		61.6		90				
9	13		260	.70		1.40		63.3		90	56.90 g			
10	15+	-.4	260	.60		1.20		64.9		90				
11	18		260	.70		1.40		66.3		90	2.57 mg/m³			
12	21		255	.70		1.40		67.9		90				
B 13	23/23+		255	.50		1.00		69.5		90				
14	26		250	.45		0.90		70.8		90				
15	28+		255	.50		1.00		72.2		90				
16	31		255	.60		1.20		73.5		91				
17	33+	-.4	255	.65		1.30		74.9		91				
18	36		255	.40		0.80		76.5		91				
A 19	38/39		255	1.1		2.20		77.8		91				
20	41+		255	1.0		2.00		79.7		92				
21	44		255	.85		1.70		81.6		92				
22	46+	-.5	255	.85		1.70		83.4		92				
23	49		250	1.15		2.30		85.3	(43.21)	93				
24	51+		250	1.2		2.40		87.1		93				
	0954							89.21						

Environmental Technology & Engineering Corp.

PARTICULATE FIELD DATA



CROSS SECTION



PLANT Northeast [illegible]
DATE 6-30-95
LOCATION R10/[illegible]
OPERATOR WJD
STACK NO. Control 50
RUN NO. 3
SAMPLE BOX NO. 3
METER BOX NO. 1

AMBIENT TEMPERATURE 70
BAROMETRIC PRESSURE
ASSUMED MOISTURE, % 25
PROBE LENGTH, in. 9'4
NOZZLE DIAMETER, in. 1/4
STACK DIAMETER, in. 58 x 22½
PROBE HEATER SETTING -
HEATER BOX SETTING -

METER ΔH
C FACTOR
PROCESS WEIGHT RATE

ORSAT RESULTS
CO_2 [illegible]
O_2 17.3
CO
N_2 [illegible]
591

LEAK CHECKS
Pre [illegible]
Pitot [illegible]
Post [illegible]
Pitot [illegible]

TRAVERSE POINT NUMBER	SAMPLING TIME (θ), min.	STATIC PRESSURE (in. H_2O)	STACK TEMPERATURE (T_s), °F	VELOCITY HEAD (ΔP_s)	($\sqrt{\Delta P_s}$)	PRESSURE DIFFERENTIAL ACROSS ORIFICE METER (ΔH) in. H_2O ACTUAL	DESIRED	GAS SAMPLE VOLUME (V_m), ft³	GAS SAMPLE TEMPERATURE AT DRY GAS METER INLET ($T_{m_{in}}$), °F	OUTLET ($T_{m_{out}}$), °F	Form SAMPLE BOX TEMPERATURE °F	Bent TEMPERATURE OF GAS LEAVING CONDENSER OR LAST IMPINGER °F	PUMP VACUUM in. Hg gauge	VELOCITY fps
A 1	1005/10		250	1.2		2.40		190.00		91	424.11/70	924385	3	
2	07½		250	1.0		2.00		92.1		91	424.11/70	948.55[illegible]		
3	10	-.4	250	0.9		1.80		94.0		91	2.00/70			
4	12½		255	.95		1.70		95.7		92				
5	15		255	1.1		2.20		97.6		92				
6	17½		255	1.2		2.40		99.6		92	1.99 scf			
B 7	20/20½		255	0.5		1.00		01.6		92	.057 m³			
8	23		255	0.55		1.10		03.0		92				
9	25½	-.3	255	.55		1.10		04.4		92	56.321			
10	28		255	.60		1.20		05.8		92				
11	30½		255	.65		1.30		07.3		92	2.59 mg/m³			
12	33		255	.40		[illegible]		08.8		92				
C 13	35½/36		250	.90		1.80		10.0		92				
14	38½		250	.85		1.70		11.9		93				
15	41	-.5	250	.75		1.50		13.6		93				
16	43½		250	.75		1.50		15.3		93				
17	46		250	.70		1.40		17.0		93				
18	48½		250	.95		1.90		18.8		93				
D 19	51/51½		250	1.75		3.50		20.6		93				
20	54		250	1.5		3.00		22.9		94				
21	56½		250	1.2		2.40		25.2		94				
22	59	-.6	250	1.2		2.40		27.2		94				
23	61½		250	1.25		2.50		29.2	43.75	94				
24	64		245	1.8		3.60		31.4		95				
	[illegible]							133.75						

LABORATORY DATA SHEET
PARTICULATE & WATER COLLECTED

JOB NAME Payne & Dolan #52 DATE OF TEST 6-30-95

JOB NO. _____ TEST ENGINEER WJD

RUN NO. 1 STACK Baghouse

Sample Box 1 Filter T-589 Wash Bottle —

Beaker No. 13

WATER COLLECTED

Impinger No.	Final Wt. g	Initial Wt. g	Collected grams
1	294	100	194
2	193	100	93
3	2	0	2
Silica Gel	670	661	9
		TOTAL	298

PARTICULATE COLLECTED

	Final Wt. g	Tare Wt. g	Collected grams
Filter	1.1265	1.1156	0.0109
Washings 0.0003	105.8490	105.8468	0.0019
		TOTAL	0.0128

WATER COLLECTED 298 GRAMS

PARTICULATE COLLECTED 0.0128 GRAMS

NOTES:

LABORATORY DATA SHEET
PARTICULATE & WATER COLLECTED

JOB NAME Payne : Dolan #52 DATE OF TEST 6-30-95

JOB NO. _____ TEST ENGINEER WJD

RUN NO. 2 STACK Baghouse

Sample Box 2 Filter T-590 Wash Bottle —

Beaker No. 14

WATER COLLECTED

Impinger No.	Final Wt. g	Initial Wt. g	Collected grams
1	316	100	216
2	190	100	90
3	4	0	4
[illegible]	662	654	8
		TOTAL	318

PARTICULATE COLLECTED

		Final Wt. g	Tare Wt. g	Collected grams
Filter		1.0936	1.0809	0.0127
Washings	0.0003	103.2230	103.2219	0.0008
			TOTAL	0.0135

WATER COLLECTED 318 GRAMS

PARTICULATE COLLECTED 0.0135 GRAMS

NOTES:

LABORATORY DATA SHEET
PARTICULATE & WATER COLLECTED

JOB NAME Payne + Dolan #52 DATE OF TEST 6-30-95

JOB NO. _____ TEST ENGINEER WJO

RUN NO. 3 STACK Baghouse

Sample Box 3 Filter 7.591 Wash Bottle —

Beaker No. 15

WATER COLLECTED

Impinger No.	Final Wt. g	Initial Wt. g	Collected grams
1	300	100	200
2	194	100	94
3	2	0	2
Silica Gel	647	644	3
		TOTAL	299

PARTICULATE COLLECTED

		Final Wt. g	Tare Wt. g	Collected grams
Filter		1.1752	1.1620	0.0132
Washings	0.0003	95.5282	95.5234	0.0045
			TOTAL	0.0177

WATER COLLECTED [299] GRAMS

PARTICULATE COLLECTED [0.0177] GRAMS

NOTES:

DATA SUMMARY OF FORMALDEHYDE ANALYSIS (METHOD TO-5)
Project #0795004.

Lab ID	Client ID	Totl ug Q
0795004-1	**CS2-1**	135.99
0795004-2	**CS2-2**	150.05
0795004-3	**CS2-3**	151.05
0795004-4	**BLANK**	4.95

NEW

ASPHALT PLANT STACK TEST DATA

Plant Location WYUCENA CONTROL 52

Date 6-30-95

FID #

Time*	Production TPH	Aggregate TPH	RAP TPH	Aggregate Moisture %	VOC Type	VOC Feed Rate	Mix Temp	Stack Temp	Photo-helic	Magno-helic	Fuel Flow Rate	CO ppm	CO2 ppm	O2 %
0930	155	145		5%			307	200	.3	.4	2			
0745	151	143		5%			309	200	.3	.4	2			
0800	152	141		5%			308	200	.35	3.5	2			
0815	150	140		5%			311	200	.35	3.5	2			
0830	152	144		5%			309	200	.30	.35	2			
	152													
0955	155	147		5%			306	200	.30	.35	2			
0910	152	148		5%			305	200	.28	.35	2			
0925	156	148		5%			305	200	.30	.39	2			
0940	155	147		5%			305	200	.30	.35	2			
0955	152	144		5%			304	200	.30	.35	2			
	153													
1010	153	144		5%			303	200	.30	.35	2			
1025	156	145		5%			301	200	.30	.35	2			
1040	153	144		5%			302	200	.30	.35	2			
1055	154	145		5%			302	200	.30	.35	2			
	154	145		5%			302	200	.30	.35	2			

Fuel Type _____

VOC Addition Location _____

Sulfur in Fuel _____ %

Plant Drum Type _____

* Record time in 15-minute intervals during stack test runs.

APPENDIX B

SAMPLE CALCULATIONS

SAMPLE CALCULATION

BAROMETRIC PRESSURE, in Hg (Pb) = 29.200
STACK PRESSURE, in Hg (Pb + Pg/13.6) = 29.178
NOZZLE DIAMETER, in (An = PI*D^2/576) = .2450
STACK AREA, sq ft (A) = 10.560
SAMPLING TIME PER POINT, min = 2.50
NUMBER OF POINTS = 24
GAS METER VOLUME, acf (Vm) = 66.06
WATER COLLECTED, ml (Vf - Vi) = 86.00
PARTICULATE COLLECTED, grams (Mn) = 0.0755
CO2 = 0.60 O2 = 21.00 CO = 0.00 N2 = 78.40
WET MOLECULAR WEIGHT, lb/mole (Ms) = 28.45

SAMPLING POINT	STACK TEMP deg F	PITOT DEL P inches	ORIFICE DEL H inches	GAS METER OUTLET T deg F	GAS VELOCITY fps
1	110	1.450	4.05	32	72.51
2	110	1.350	3.75	32	69.97
3	110	1.350	3.75	32	69.97
4	110	1.300	3.70	32	68.66
5	110	1.250	3.60	32	67.33
6	110	1.250	3.60	32	67.33
7	110	1.050	2.95	32	61.71
8	110	1.000	2.85	32	60.22
9	110	1.000	2.85	34	60.22
10	110	1.050	2.95	34	61.71
11	110	0.950	2.75	38	58.69
12	115	0.950	2.75	38	58.95
13	115	1.300	3.70	42	68.96
14	115	1.250	3.60	42	67.62
15	115	1.200	3.40	42	66.26
16	115	1.200	3.40	42	66.26
17	115	1.150	3.30	44	64.86
18	115	1.150	3.30	46	64.86
19	115	1.050	2.95	48	61.98
20	115	1.150	3.30	48	64.86
21	115	1.000	2.85	50	60.48
22	115	1.100	3.15	50	63.43
23	115	1.050	2.95	50	61.98
24	115	0.900	2.55	50	57.38
AVG VALUES	113		3.250	40	64.42

TOTAL GAS WITHDRAWN, scf = 69.39
DRY GAS WITHDRAWN, scf (Vmstd) = 65.35
WATER VAPOR WITHDRAWN, scf (Vwstd) = 4.05
PERCENT WATER VAPOR (%H2O) = 5.83
ACTUAL WET FLOW RATE, acfm = 40,819.39
STANDARD DRY FLOW RATE, scfm (Qs) = 34,558.69
PARTICULATE CONCENTRATION, grains/dscf (Cs) = 0.018
PARTICULATE EMISSION RATE, lb/hr (ER) = 5.325
PARTICULATE EMISSIONS, lb/1000 lb (EC) = 0.033
PERCENT OF ISOKINETIC SAMPLING (I) = 101.67

SAMPLE CALCULATIONS

1. DRY MOLECULAR WEIGHT (Md) lb/lb-mole

   Md = .44*% CO2 + .32*%O2 + .282*%N2 + .28*%CO

2. WATER VAPOR PERCENT (%H2O)

   Vw std = 0.04707*(Vf - Vi)

   where: Vw std = standard cubic feet of water vapor
   Vf = Final volume of impingers, ml
   Vi = Initial volume of impingers, ml

   %H2O = Vw std * 100/(Vm std + Vw std)

   where Vm std = standard cubic feet of gas sampled

3. WET MOLECULAR WEIGHT (Ms) lb/lb-mole

   Ms = Md*(1 - %H2O/100) + 18*%H2O/100

4. STACK PRESSURE (Ps) in. Hg

   Ps = Pb + Pg/13.6

   where: Pb = barometric pressure (uncorrected), in. Hg
   Pg = stack gauge pressure, in. H2O
   13.6 = specific gravity of mercury (Hg)

5. AVERAGE STACK VELOCITY (Vs) feet per second

   Vs = Kp*Cp* (DELP) Tsavg/(Ps*Ms)

   where: Kp = 85.49 unit conversion
   Cp = 0.85, pitot tube calibration factor
   DELP = square root of velocity head, in. H2O
   Tsavg = average stack temperature, deg R (460+F)
   Ps = stack pressure
   Ms = wet molecular weight

6. STACK GAS FLOW RATE (Qs) std cubic feet per minute

   Qs = 60*(1 - %H2O/100)*Vs*A*(528*Ps/Tsavg/29.92)

   where: A = stack area, ft2
   528 = std temperature, deg R
   29.92 = std pressure, in. Hg

7. DRY GAS VOLUME (Vm std) std cubic feet

Vm std = GAMA*(Vm-(AL-.02)t)*(Pb+DELH/13.6)/29.92

where: GAMA = dry gas meter calibration factor
Vm = volume of dry gas metered, cubic feet
AL = post test leak rate, cubic feet per minute
t = total time of test, minutes
DELH = average orifice pressure drop, in.H2O

8. PARTICULATE CONCENTRATION (Cs) grains/dry std cubic foot

Cs = Mn * 15.43/Vm std

where: Mn = particulate captured, grams
15.43 = grains per gram

9. EMISSION RATE (ER) pounds per hour

PMRA = Mn*A*60/(t*An*453.6) AREA METHOD lb/hr

PMRC = Cs*Qs*60/(15.43*453.6) CONC. METHOD lb/hr

ER = (PMRA + PMRC)/2

where: An = area of sampling nozzle, square feet

10. EMISSION CONCENTRATION (EC) lb/1000 lb exhaust gas

EC = ER * 386700 * (1-%H2O/100)/(Qs*60*Ms)

where: 386700 = cubic feet per lb mole * 1000

11. ISOKINETIC SAMPLING PERCENTAGE (I) %

I = PMRA/PMRC