Note: This is a reference cited in *AP 42, Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources.* AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

The file name refers to the reference number, the AP42 chapter and section. The file name "ref02_c01s02.pdf" would mean the reference is from AP42 chapter 1 section 2. The reference may be from a previous version of the section and no longer cited. The primary source should always be checked.

State of Washington Department of Ecology

Summary & Description Pages _____

SOURCE TEST

SUMMARY OF EMISSIONS TO ATMOSPHERE

Report No. 85-10

Report Date 8/28/85

Test Date 8/15/85

Name of plant INLAND ASPHALT COMPANY

Location of plant SPOKANE, WASHINGTON

Person contacted JERRY PALM, PLANT OPERATOR

Type of operation ASPHALT BATCH PLANT

Source tested ROTARY DRYER MAIN STACK

Requesting Agency SPOKANE COUNTY AIR POLLUTION CONTROL AUTHROITY

Purpose TEST FOR PARTICULATE EMISSIONS

Applicable Standard SCAPCA REG. II

SUMMARY OF MEASUREMENTS

Pollutant	Measured Emission	Allowable Emission	Emission/Process Factor	Methods
PARTICULATE				
Front Half	0.011 gr/DSCF 5.83 lb/hr.	0.040 gr/DSCF	0.017 lb/ton	WDOE Method 5
Total	0.015 gr/DSCF 7.77 lb/hr.		0.022 lb/ton	" " 5

TEST ENGINEER ALAN T. BUTLER, P. E.

FIELD PERSONNEL

Alan T. Butler

John Drabek

Test Witnessed by: Chris McKenany

LAB ANALYSIS

Susan Cupps

ECY 020-1-62
Rev. 1/79

I. Purpose

This test was done for the purpose of measuring particulate emissions from the Inland Asphalt Company Sullivan Street Batch Plant during normal operation. Results will be used in the determination of compliance.

II. Description of the Unit Tested

The Inland Asphalt Company batch plant number 8 is located on Sullivan Street, in an industrial area north of Interstate 90, east of Spokane.

The facility was last tested by Washington Department of Ecology (WDOE) in 1977, very soon after the presently used control equipment, a Standard Havens baghouse, was installed. The result of that test (STAT report 7731) was 0.025 gr/DSCF at a 400 ton per hour production rate.

Presently, the rated production capacity is 360 ton per hour. (Rated capacity can vary, depending upon weather and aggregate conditions). Actual production during our test was a relatively constant 350 tons per hour of asphaltic concrete hot-mix. Inland Asphalt Company personnel present during the test were:

Mr. Jim Krolick - Equipment Manager
Mr. Jerry Palm - Plant Operator

The natural gas-fired main dryer is 31.7 feet long by 10 feet in diameter, serial number 3040 1060133. The aggregate feed contained 5.2% silt, and an unknown moisture fraction. Dried aggregate temperature was 300 degrees. After drying and transport to the elevated hopper for sorting and blending, 4.8% asphalt was added.

Effluent from the drier passes through a "drop-out box" and then passes to the baghouse. Pressure taps across the baghouse were not available. A magnehelic gauge read 1.0 inch H_2O across the baghouse. After passing through the baghouse the effluent goes through a centrifugal fan (rated 350 amps at 460 volts; actual 250 amps) turning at 600 rpm. The effluent then enters the 10 foot diameter stack tangentially. Two 90 degree separated ports are available approximately two stack diameters downstream from the nearest flow disturbance, but only one of them has a platform.

III. Test Procedure

Three WDOE Method 5 particulate samples were collected, using a 20 point, 1 port traverse. Concurrently with particulate sampling, WDOE Method 3 gas samples were collected, for the quantification of stack CO_2, O_2, and dry molecular weight. Chris McKenany of Spokane County Air Pollution Control Authority gathered plant operational data.

All three test runs were accomplished with no problems either during testing or the subsequent post-test leak checks. Upon return from the field, probe rinse, filter, and back-half (the liquid portion, in impingers after the filter) samples were sent to the WDOE/EPA Manchester Environmental Laboratory for analysis.

IV. Results

Results are detailed in Table 1 of this report. Particulate concentrations averaged 0.011 grains per dry standard cubic foot of stack effluent, or 5.83 pounds per hour, counting only the front half of the sampling train. If the back half is included, the total concentration is 0.015 gr/DSCF or 7.77 lb/hr.

Approximately 27% of the total catch (front and back portions) is composed of condensible organics.

During the course of the test, we noticed that the stack plume was at, or very near to, zero percent opacity. We also noticed that fugitive emissions were minimal.

State of Washington Department of Ecology

Table 1

EMISSION TEST DATA SUMMARY

Plant Name INLAND ASPHALT CO., Plant 8
NEDS 49-2060-0069-01
Address P. O. Box 11036
City Spokane
County Spokane
State Washington Zip Code 99022
Industry Type Asphalt Batch Plant
Process Tested Rotary Dryer
SCC 35000201
Unit Capacity 360 ton/hr.
Fuel Type
Type of Control Equipment Baghouse
Tested at Inlet Outlet

Reason Tested: Spec. Study ____ Compliance w/Fed. ____ State ____ Local x
Tested by: Owner ____ Contractor ____ State x Local ____ Other ____
Personnel Present A. Butler, J. Drabek

Pollutant Measured Particulate
Method WDOE Method 5

Stack Height, Ft. 35
Cross-Sectional Area, Sq. Ft. 78.54
Sampling Location: Diameters Downstream of a Disturbance
Test Number 85-10

Run Number	1	2	3	Average
Date: Mo., Day, Yr.	8/14/85	8/14/85	8/14/85	
Operating Rate	350	350	350	350
Gas Composition % CO_2	3.0	3.2	3.4	3.2
% O_2	16.0	15.6	15.3	15.6
% N_2	81.0	81.2	81.3	81.2
% Other				
% H_2O	19.7	20.9	21.6	20.7
Estimated Mole Wt., Wet	27.1	26.9	26.9	27.0
Excess Air, %	297	267	248	271
Gas Flow Data				
Gas Pressure, in. Hg.	28.09	28.09	28.07	28.08
Gas Temp. °F	223	221	220	221
No. of Traverse Points	20	20	20	20
Avg. Stack Velocity, AFPS	28.1	19.4	19.2	22.2
Gas Flow Rate, SCFM Dry	75,800	51,900	50,800	59,500
Sample Information				
Volume Sampled, SDCF	34.94	15.70	13.71	
Sample Duration, Min.	60.0	60.0	60.0	
Nozzle Dia. in.	.3125	0.250	0.250	
Isokinetic Rate, %	113	116	104	
Results Pollutant No. 1	Particulate, Front Half			
Conc., Gr/SDCF or PPM	0.014	0.011	0.007	0.011
Emission Rate, Lb/Hr.	9.10	5.11	3.29	5.83
Process Factor, Lb/Ton	0.026	0.015	0.009	0.017
Results Pollutant No. 2	Particulate, Total			
Conc., Gr/SDCF or PPM	0.018	0.018	0.008	0.015
Emission Rate, Lb/Hr.	11.83	7.95	3.53	7.77
Process Factor, Lb/Ton	0.034	0.023	0.010	0.022
Other Measurements				

Comments:

ECY 020-38

State of Washington Department of Ecology

Page 5

TEST NO. _____

DATE 8/14/85

METHOD 5—
PARTICULATE SAMPLING WITH A HEATED FILTER WITH IMPINGER

PLANT Inland Asphalt

SAMPLING LOCATION Dryer stack

SAMPLE TYPE Part

RUN NUMBER 1 OPERATOR JD

AMBIENT TEMPERATURE 58

BAROMETRIC PRESSURE 28.07

STATIC PRESSURE _____

STACK DIAMETER 10' Area _____ ft²

PROBE LENGTH, TYPE, FACTOR 10' SS.

NOZZLE I.D. .3125

ASSUMED MOISTURE, % 7.5

SAMPLE BOX NUMBER 1 METER _____

WATER VOLUME COLLECTED 168.5 (Impingers) + 15.9 (Silica Gel) = 184.4 ml

ORSAT CO_2 3.0 O_2 16.[illegible] CO _____

PARTICULATE WEIGHT

	WASH	FILTER	IMPINGERS
I.D. NO.		D-2	
FINAL			
TARE			
GAIN	0.0236	0.0081	0.0065

0.0317

TRAVERSE POINT NUMBER	CLOCK TIME (24 hr. clock) / SAMPLING TIME, min.	GAS METER READING (V_m), ft³	VELOCITY HEAD (P_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (H), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (H), in. H_2O ACTUAL	STACK TEMP (T_s), °F	PROBE TEMP °F	SAMPLE BOX TEMP °F	IMPINGER TEMP °F OUT	IMPINGER TEMP °F IN	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	DRY GAS METER TEMPERATURE INLET ($T_{m_{in}}$), °F	PUMP VACUUM in. Hg.
1	0 \ 4.05	17.74	11		3.2	212	245	250	64	71	66	61	4
2	3		7		2.0	207	251	252	53	226	66	64	3
3	6	22.5	8		2.3								
4	9	24.8	6		1.7	241	241	255	51	224	68	71	
5	~~12~~	26.9	0		~~7~~								
6	~~15~~		0										
7	~~18~~		0										
8	~~21~~		0										
9	~~24~~		0										
10	~~27~~		0										
11	~~30~~		0										
12	~~33~~ 12		.05		1.4	206	237	243	59	119	73	71	1
13	~~36~~ 15		5		1.4								
14	18		10		2.8								
15	21		21		5.5	217	253	247	53	241	75	82	
16	24												

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Add-2

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TRAVERSE POINT NUMBER	CLOCK TIME (24 hr. clock) / SAMPLING TIME, min.	GAS METER READING (V_m), ft^3	VELOCITY HEAD (P_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (H), in. H_2O) DESIRED	ACTUAL	STACK TEMP (T_s), °F	PROBE TEMP °F	SAMPLE BOX TEMP °F	IMPINGER TEMP °F OUT	IN	DRY GAS METER TEMPERATURE OUTLET ($T_{m_{out}}$), °F	INLET ($T_{m_{in}}$), °F	PUMP VACUUM in. Hg.
16	27	38.6	21		58								
17	30		21		58	217	253	241	61	244	80	92	8
18	33	45.6	21		58								
19	36		21		58	213	256	235	70	252	83	95	
20	39	53.2											
	42	56.06											

COMMENTS

As the stack platform limited the probe 15 was combined with 16, 17, 18, 19 and 20

ECY 020-71 (Rev. 12/84) 943

INLAND ASPHALT, SPOKANE, 8/14/85, RUN 1

STACK DATA

AREA	7.30	SQ M	78.54	SQ FT
PRESSURE	713.49	MM HG	28.09	IN HG
AVERAGE TEMPERATURE	106.2	C	223.20	F

GAS DATA

DRY PERCENT	CO2	3.00
	O2	16.00
	N2	81.00
PERCENT MOISTURE		19.70
DRY MOLE WEIGHT		29.28
WET MOLE WEIGHT		27.06
%EXCESS AIR		297.18

FLOW DATA

NO OF TRAVERSE POINTS	20		20	
AVE ACTUAL VELOCITY	8.55	AMPS	28.05	AFPS
AVE STD VELOCITY	4.98	DSMPS	16.10	DSFPS
ACTUAL FLOW RATE	3743.	ACMM	132193.	ACFM
DRY STD FLOW RATE	2181.	DSCMM	75848.	DSCFM

SAMPLE DATA

VOLUME SAMPLED	1.005	DSCM	34.941	DSCF
SAMPLE DURATION	60.0	MIN	60.0	MIN
AVE METER TEMP	24.1	C	75.4	F
NOZZLE DIAMETER	0.7937	CM	0.3125	IN
ISOKINETIC RATE	113.2	%	113.2	%

EMISSION DATA	FRONT HALF	TOTAL		FRONT HALF	TOTAL	
CONC.	0.0315	0.0410	G/DSCM	0.0140	0.0182	GR/DSCF
CONC. AT 7.0% O2	0.0883	0.1148	G/DSCM	0.0392	0.0509	GR/DSCF
CONC. AT 12.0% CO2	0.1261	0.1639	G/DSCM	0.0560	0.0728	GR/DSCF
EMISSION RATE	4.14	5.38	KG/HR	9.10	11.83	LB/HR
EMISSION FACTOR	0.0130	0.0169	GM/KG	0.0260	0.0338	LB/TON

**** NOTE **** NOTE **** NOTE **** NOTE **** NOTE ****
* METRIC UNITS ARE CORRECTED TO 20 DEGREES C
* OTHER UNITS ARE CORRECTED TO 60 DEGREES F
**** NOTE **** NOTE **** NOTE **** NOTE **** NOTE ****

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GLAND ASPHALT, SPOKANE, 8/14/85, RUN 1
INPUT DATA

STACK AREA, SQ FT 78.5398
STACK PRESSURE, IN HG 28.0900
DATA POINTS 20.0000
PITOT FACTOR 0.7820
PROD RATE 350.0000
PERCENT O2 16.0000
CO2 3.0000
O2 CORRECTION 0.0

TRAVERSE POINT NUMBER	DELTA H	TEMP STACK	TEMP METER
1	11.000	212.	61.
2	7.000	207.	64.
3	8.000	207.	64.
4	6.000	241.	71.
5	0.0	241.	71.
6	0.0	241.	71.
7	0.0	241.	71.
8	0.0	241.	71.
9	0.0	241.	71.
10	0.0	241.	71.
11	0.0	241.	71.
12	0.500	206.	71.
13	5.000	206.	71.
14	10.000	206.	71.
15	21.000	217.	82.
16	21.000	217.	82.
17	21.000	217.	92.
18	21.000	217.	92.
19	21.000	212.	95.
20	21.700	212.	95.

VOLUME START, CF 17.7400
VOLUME FINAL, CF 56.0600
ATM PRESSURE IN HG 28.0900
PARTICULATE WEIGHT FRONT HALF, GM 0.0317
VOLUME OF WATER COLLECTED, ML 184.4000
NOZZLE DIAMETER IN 0.3125
SAMPLE TIME MIN 60.0000
PARTICULATE WEIGHT BACK HALF GM 0.0095

State of Washington Department of Ecology

TEST NO. 9

DATE 8/14/85

METHOD 5—
PARTICULATE SAMPLING WITH A HEATED FILTER WITH IMPINGER

PLANT Inland

SAMPLING LOCATION port. Dryer Stack

SAMPLE TYPE port.

RUN NUMBER 3 OPERATOR J.D.

AMBIENT TEMPERATURE

BAROMETRIC PRESSURE

STATIC PRESSURE

STACK DIAMETER Area ft²

PROBE LENGTH, TYPE, FACTOR 10' SS

NOZZLE I.D. .25

ASSUMED MOISTURE, % 17.4

SAMPLE BOX NUMBER 1 METER 1

WATER VOLUME COLLECTED 73.6 (Impingers) + 5.4 (Silica Gel) = 8[illegible] ml

ORSAT CO_2 3.2 O_2 [illegible] CO

PARTICULATE WEIGHT

	WASH	FILTER	IMPINGERS
I.D. NO.		D-84	
FINAL			
TARE			
GAIN	0.0055	0.0062	0.0095

0.0117

TRAVERSE POINT NUMBER	CLOCK TIME (24 hr. clock) / SAMPLING TIME, min.	GAS METER READING (V_m), ft³	VELOCITY HEAD (P_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (H), in. H_2O DESIRED	ACTUAL	STACK TEMP (T_s), °F	PROBE TEMP °F	SAMPLE BOX TEMP °F	IMPINGER TEMP °F OUT	IN	DRY GAS METER TEMPERATURE OUTLET ($T_{m\,out}$), °F	INLET ($T_{m\,in}$), °F	PUMP VACUUM in. Hg.
1	0 \10:20	56.24	10		12			279					
2	3	58.7	6		7								
3	6		2		2	213	271	287	57	180	83	82	1
4	9		1		1								
5			0										
6			0										
7			0										
8			0										
9			0										
10			0										
11			0										
12			0										
13			0										
14			0										
15	12		4		4.4	220	273	296	74	74	87	86	1
16	15		8		9								

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TRAVERSE POINT NUMBER	CLOCK TIME (24 hr. clock) / SAMPLING TIME, min.	GAS METER READING (V_m), ft³	VELOCITY HEAD (P_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (H), in. H_2O		STACK TEMP (T_s), °F	PROBE TEMP °F	SAMPLE BOX TEMP °F	IMPINGER TEMP °F		DRY GAS METER TEMPERATURE		PUMP VACUUM in. Hg.
				DESIRED	ACTUAL				OUT	IN	OUTLET ($T_{m_{out}}$), °F	INLET ($T_{m_{in}}$), °F	
17	18	64.1	15		16.5	223	246	290	64	217	88	90	3
18	21	65.9	17		19								
19	24	68.7	24		26	225	264	299	61	220	90	97	4
20	27	71.5	24		28								
	30	74.78											
		73.78											

COMMENTS

[illegible] SPOTANE [illegible]

STACK DATA

AREA	7.30	SQ M	78.54	SQ FT
PRESSURE	713.49	MM HG	28.09	IN HG
AVERAGE TEMPERATURE	[illegible].2	C	221.30	F

GAS DATA

DRY [illegible]	CO2	3.20
	O2	15.[illegible]
	N2	81.20

PERCENT MOISTURE	20.86
DRY MOLE WEIGHT	29.30
WET MOLE WEIGHT	26.94
%EXCESS AIR	267.[illegible]

FLOW DATA

NO OF [illegible]AVERSE POINTS	20		20	
AVE ACTUAL VELOCITY	5.91	AFPS	19.40	AFPS
AVE STD VELOCITY	3.41	DSMPS	11.00	DSFPS
ACTUAL FLOW RATE	2589.	ACMM	91434.	ACFM
DRY STD FLOW RATE	1491.	DSCMM	51853.	DSCFM

SAMPLE [illegible]

VOLUME SAMPLE	0.452	DSCM	15.703	DSCF
SAMPLE DURATION	60.[illegible]	MIN	60.0	MIN
AVE METER TEMP	29.3	C	[illegible]	F
NOZZLE DIAMETER	0.6350	CM	0.2500	IN
ISOKINETIC RATE	116.3	%	116.3	%

EMISSION DATA	FRONT HALF	TOTAL	FRONT HALF	TO[illegible]
CONC.	0.0259	0.0403 G/DSCM	0.0115	0.0179 GR/DSCF
CONC. AT 7.0% O2	0.0671	0.[illegible]44 G/DSCM	0.0298	0.0464 GR/DSCF
CONC. AT 12.0% CO2	0.0971	0.1511 G/DSCM	[illegible]	0.0671 GR/DSCF
EM[illegible]N RATE	2.32	3.61 KG/HR	5.11	7.95 LB/[illegible]
EMISSION FACTOR	0.0073	0.0114 GM/KG	0.0146	0.0227 LB/TON

**** NOTE **** NOTE **** NOTE **** NOTE **** [illegible] ****
* METRIC UNITS ARE CORRECTED TO 20 DEGREES C
* OTHER UNITS ARE CORRECTED TO 60 DEGREES F
**** N[illegible] **** NOTE **** NOTE **** NOTE **** NOTE ****

INLAND ASPHALT, SPOKANE, 8/14/85, RUN 2
INPUT DATA

STACK AREA, SQ FT 78.5398
STACK PRESSURE, IN HG 28.0900
DATA POINTS 20.0000
PITOT FACTOR 0.7820
PROD RATE 350.0000
PERCENT O2 15.6000
CO2 3.2000
O2 CORRECTION 0.0

TRAVERSE POINT NUMBER	DELTA H	TEMP STACK	TEMP METER
1	10.000	271.	82.
2	6.000	271.	82.
3	2.000	213.	82.
4	1.000	213.	82.
5	0.0	213.	82.
6	0.0	213.	82.
7	0.0	213.	82.
8	0.0	213.	82.
9	0.0	213.	82.
10	0.0	213.	82.
11	0.0	213.	82.
12	0.0	213.	82.
13	0.0	213.	82.
14	0.0	213.	82.
15	4.000	220.	86.
16	8.000	220.	86.
17	15.000	223.	90.
18	17.000	223.	90.
19	24.000	221.	97.
20	24.000	221.	97.

VOLUME START, CF 56.2600
VOLUME FINAL, CF 73.7800
ATM PRESSURE IN HG 28.0900
PARTICULATE WEIGHT FRONT HALF, GM 0.0117
VOLUME OF WATER COLLECTED, ML 89.0000
NOZZLE DIAMETER IN 0.2500
SAMPLE TIME MIN 60.0000
PARTICULATE WEIGHT EACH HALF GM 0.0065

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TEST NO. _____

DATE 8/14/85

METHOD 5—
PARTICULATE SAMPLING WITH A HEATED FILTER WITH IMPINGER

PLANT: Inland

SAMPLING LOCATION: Dome Stack

SAMPLE TYPE: part

RUN NUMBER: 1 OPERATOR: J.D

AMBIENT TEMPERATURE: ~~84~~ 84

BAROMETRIC PRESSURE: 28.07

STATIC PRESSURE: _____

STACK DIAMETER: _____ Area: _____ ft²

PROBE LENGTH, TYPE, FACTOR: 10' SS

NOZZLE I.D.: .35

ASSUMED MOISTURE, %: 17

SAMPLE BOX NUMBER: 3 METER: 1

WATER VOLUME COLLECTED: 75.1 (Impingers) + 5.7 (Silica Gel) = 81.1 ml

ORSAT CO_2: 3.4 O_2: 15.[illegible] CO: _____

PARTICULATE WEIGHT

	WASH	FILTER	IMPINGERS
I.D. NO.		D-45	
FINAL			
TARE			
GAIN	0.0063	0.0004	0.0005

0.0067

TRAVERSE POINT NUMBER	CLOCK TIME (24 hr. clock) / SAMPLING TIME, min.	GAS METER READING (V_m), ft³	VELOCITY HEAD (P_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (H), in. H_2O DESIRED	ACTUAL	STACK TEMP (T_s), °F	PROBE TEMP °F	SAMPLE BOX TEMP °F	IMPINGER TEMP °F OUT	IN	DRY GAS METER TEMPERATURE OUTLET ($T_{m\,out}$), °F	INLET ($T_{m\,in}$), °F	PUMP VACUUM in. Hg.
1	0	73.94	5.0		.6	216	214	251	74	133	93	88	2
2	3	75.2	1.5		.3								
3	6	75.7	1.5		.2	215	262	257	77	216	93	90	
4	9	76.4	1.5		.2	211	268	254	74	196	94	92	2
5	12	77	.5		.5								
6	15	77.3	.5		.5	210	296	232	76	197	94	94	
7	18	78.8	.5		.5	220							
8	21		0										
9			0										
10			0										
11			0										
12			0										
13	21	78.1	1.5		.2	220	253	250	79	161	95	93	1
14	24	78.6	3.5		.4								
15	27	79.5	11		1.2	223	277	210	71	245	96	96	
16	30	80.9	5		.6								

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Add-2

TRAVERSE POINT NUMBER	CLOCK TIME (24 hr. clock) / SAMPLING TIME, min.	GAS METER READING (V_m), ft³	VELOCITY HEAD (P_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (H), in. H_2O		STACK TEMP (T_s), °F	PROBE TEMP °F	SAMPLE BOX TEMP °F	IMPINGER TEMP °F		DRY GAS METER TEMPERATURE		PUMP VACUUM in. Hg
				DESIRED	ACTUAL				OUT	IN	OUTLET ($T_{m_{out}}$), °F	INLET ($T_{m_{in}}$), °F	
17	33	82.1	9		10	231	271	248	71	259	109	100	2
18	36		15		20								
19	39		5		6	223	275	212	54	236	99	105	
20	42		18		20								
	45	89.53											

COMMENTS

[illegible] SAND ASPHALT, SPOKANE, 8/14.85, [illegible]

STACK DATA

AREA	[illegible] SQ M	78.54 SQ FT
PRESSURE	712.98 MM HG	28.07 IN HG
AVERAGE TEMPERATURE	104.4 C	219.95 F

GAS DATA

DRY PERCENT	CO2	[illegible]
	O2	15.30
	N2	81.30
PERCENT MOISTURE		21.57
DRY MOLE WEIGHT		29.32
WET MOLE WEIGHT		26.88
PERCENT AIR		24M [illegible]

FLOW DATA

NO OF TRAVERSE POINTS	20	20
AVE ACTUAL VELOCITY	[illegible] AMPS	19.17 AFPS
AVE STD VELOCITY	3.34 DSMPS	10.79 DSFPS
ACTUAL [illegible] RATE	2559. ACMM	90357. ACFM
DRY S[illegible] RATE	1462. DSCMM	50846. DSCFM

[illegible] DATA

VOLUME SAMPLED	0.394 DSCM	13.714 DSCF
SAMPLE DURATION	60.0 MIN	60.0 MIN
AVE METER TEMP	34.8 C	[illegible]
NOZZLE DIAMETER	0.6350 CM	[illegible] IN
ISOKINETIC RATE	103.6 %	103.6 %

! EMISSION DATA

	FRONT HALF	TOTAL	FRONT HALF	TOTAL
CONC.	0.0170	0.0182 G/DSCM	0.0075	0.0081 GR/DSCF
CONC. AT [illegible] % O2	0.0417	0.0448 G/DSCM	0.0185	0.0199 GR/DSCF
CONC. AT 12.0% CO2	0.0599	0.0644 G/DSCM	[illegible]	0.0286 GR/DSCF
EMISSION RATE	1.49	1.60 [illegible]	3.29	3.53 LB/HR
EMISSION FACTOR	0.0047	0.0050 GM/KG	0.0094	0.0101 LB/TON

**** NOTE **** NOTE **** NOTE **** NOTE **** NOTE ****
* METRIC UNITS ARE [illegible] 20 DEGREES C
[illegible] 68 TO 80 DEGREES F
[illegible] **** NOTE **** NOTE ****
[illegible]

INLAND ASPHALT, SPO 8/14/85, RUN 3
INPUT DATA

STACK AREA, SQ FT 78.5398
STACK PRESSURE, IN HG 28.0700
DATA POINTS 20.0000
PITOT FACTOR 0.7820
PROD RATE 350.0000
PERCENT O2 15.3000
CO2 3.4000
O2 CORRECTION 0.0

TRAVERSE POINT NUMBER	DELTA H	TEMP STACK	TEMP METER
1	5.000	216.	88.
2	1.500	216.	88.
3	1.500	215.	90.
4	1.500	211.	92.
5	0.500	211.	92.
6	0.500	216.	94.
7	0.500	2[illegible]	94.
8	0.0	220.	94.
9	0	220.	94.
10	0.0	220.	94.
11	0.0	220.	94.
12	0.0	220.	94.
13	1.500	220.	93.
14	3.500	220.	93.
15	11.000	223.	96.
16	5.000	223.	96.
17	9.000	231.	100.
18	18.000	231.	100.
19	5.000	223.	103.
20	18.000	223.	103.

VOLUME START, CF 73.9400
VOLUME FINAL, CF 89.5300
ATM PRESSURE IN HG 28.0700
PARTICULATE WEIGHT FRONT HALF, GM 0.0067
VOLUME OF WATER COLLECTED, ML 81.1000
NOZZLE DIAMETER IN 0.2500
SAMPLE TIME MIN 60.0000
PARTICULATE WEIGHT BACK HALF GM 0.00[illegible]

[illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
AVERAGE TEMPERATURE	105.5 C		221.49 F	

GAS DATA

DRY PERCENT	CO2	3.20
	O2	15.63
	N2	81.17
PERCENT MOISTURE		20.71
DRY MOLE WEIGHT		29.30
WET MOLE WEIGHT		26.96
%EXCESS AIR		270.90

FLOW DATA

NO. OF TRAVERSE POINTS	20		20	
AVE ACTUAL VELOCITY	6.77	AMPS	22.21	AFPS
AVE STD VELOCITY	3.91	DSMPS	12.83	DSFPS
ACTUAL FLOW RATE	2964.	ACMM	104661.	ACFM
DRY STD FLOW RATE	1711.	DSCMM	59516.	DSCFM

EMISSION DATA	FRONT HALF	TOTAL		FRONT HALF	TOTAL	
CONC.	0.0248	0.0332	G/DSCM	0.0110	0.0147	GR/DSCF
CONC. AT 7.0% O2	0.0657	0.0880	G/DSCM	0.0292	0.0391	GR/DSCF
CONC. AT 12.0% CO2	0.0944	0.1265	G/DSCM	0.0419	0.0561	GR/DSCF
EMISSION RATE	2.65	3.53	KG/HR	5.83	7.77	LB/HR
EMISSION FACTOR	0.0083	0.0	GM/KG	0.0167	0.0	LB/TON

**** NOTE **** NOTE **** NOTE **** NOTE **** NOTE ****
* METRIC UNITS ARE CORRECTED TO 20 DEGREES C
* OTHER UNITS ARE CORRECTED TO 60 DEGREES F
**** NOTE **** NOTE **** NOTE **** NOTE **** NOTE ****

Edit SAS data set: SAS.AETEST | Screen 1
Command ===> | New 85

WEDSNO: ____ COMPANY NAME: INLAND ASPHALT PLANT NO 8
ADDRESS: PO BOX 11036
CITY, STATE & ZIP: SPOKANE WA 99211-22
PLANT NAME: #8 REGISTRATION NO: _____
LOCATION: SULLIVAN ROAD
DRYER SERIAL NO: 3040 1060133 / 210-6137 / 210-6159
CONTROL SERIAL NO: 10958 PROD.CAPACITY: 360 T/HR
DRYER LENGTH: 31.7" DRYER DIAM: 10' FAN AMPS: 350 (Name plate) FAN VOLTS: 460

SOURCE TEST
CYCLONE INPUT P: ____ CYCLONE INPUT T: ____
CYCLONE OUTPUT P: ____ CYCLONE OUTPUT T: ____
SCRUB/BAGHOUSE P: 10" SCRUB/BAGHOUSE T: 260 TYPE: STANDARD HAVENS
SCRUB WATER GAL/MIN: ____ POND/TANK VOL (GAL): _____
STACK: TEMP: ____ % OPACITY: 0 GRAIN/FT3: ____
DRY AGGR: % H2O: ____ % <200 MESH: 5.2% TEMP: 300°F
HOT MIX: T/HR: 350 % ASPH: 4.8 DATE: 8-14-85
FAN RPM: 600 FAN AMPS: 250 (measured) FUEL TYPE: NAT GAS

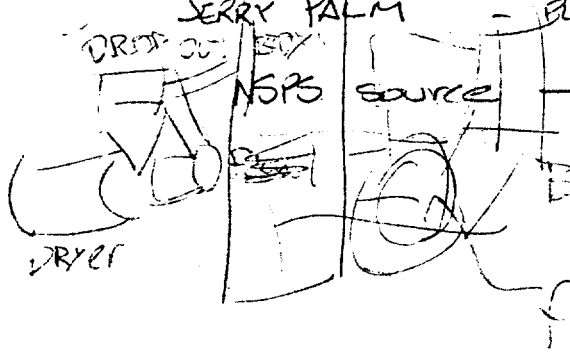
REMARKS: _____ DATE: 8/14/85

Edit SAS data set: SAS.AETEST | Screen 2
Command ===> | New 85

COMPLIANCE INSPECTION DATA
CYCLONE INPUT P: ____ CYCLONE INPUT T: ____
CYCLONE OUTPUT P: ____ CYCLONE OUTPUT T: ____
SCRUB/BAGHOUSE P: ____ SCRUB/BAGHOUSE T: ____ TYPE: ____
SCRUB WATER GAL/MIN: ____ POND/TANK VOL (GAL): ____
STACK: TEMP: ____ % OPACITY: ____ GRAIN/FT3: ____
DRY AGGR: %H2O: ____ % <200 MESH: ____ TEMP: ____
HOT MIX: T/HR: ____ %ASPH: ____ DATE: _____
FAN RPM: ____ FAN AMPS: ____ FUEL TYPE: _

REMARKS: _____ DATE: _____

Stack
JIM KROLICK - EQUIP MANAGER
JERRY PALM - PLANT OPERATOR



State of Washington Department of Ecology

REQUEST FOR ANALYSIS

Date 8/15/85

SOURCE Inland Asphalt REQUESTED BY STAT

LOCATION Spokane : Spokane COUNTY COLLECTED BY STAT

DATE WERE (WILL BE) COLLECTED 8/14/85 APPROVED BY

SAMPLES WILL ARRIVE: DATE APPROXIMATE TIME CARRIER Barb

PRIORITY: REASONABLY SOON Y AS SOON AS POSSIBLE EMERGENCY

ROUTE DATA SUMMARY TO: A. Butler, NWRD (SCAN 731-1111)

PROGRAM CODE 2 - D - 3 ☐ Amb. Mon. ☒ Compliance ☐ Inspection ☐ Class, #

☐ Investigation ☐ Survey ☐ Spill ☐ Complaint ☐ Other (describe)

OTHER INFORMATION: Total Particulate ΔWt on filters and probe rinses. Total ΔWt and organic extractible ΔWt on impinger samples. Measure vol. of liquid samples prior to analysis

Type of Analyses Required	Number of Samples	Approx. Range	Preservative Type-Vol.	For Lab Use Only: Laboratory Number	Analyst	Date	Notes
					SC	8/22	
Run 1							
probe			34	7446 - 7454	0.0236g		(407ml Total)
Filter D-2			34	7447	ΔWt = 0.0081g		
impingers				-7448	.0065		(360ml T.)
Run 2				7449	.0055		(500ml T.)
probe							
Filter D84				7450	ΔWt = 0.0062g		
Impingers				7451	.0095		(379ml T.)
Run 3				7452	.0063		(700ml T.)
probe							
Filter D-75				7453	ΔWt = .0004g		
Impingers				7454	.0005		(272ml T.)

Fill out as completely as possible. Some Analyses (bacteriological, biological, BOD, etc.) and large nu bers of samples must be scheduled ahead of time. Specific questions should be directed to the Anal supervising the particular analysis desired.

ECY 040-2-62
Rev. 7/81

Rev. June 8, 1982

STATE OF WASHINGTON DEPARTMENT OF ECOLOGY

SOURCE TEST LABORATORY PROCEDURE 2

SOLUBLE/INSOLUBLE PARTICULATE WEIGHT DETERMINATION

1. Principle

Particulate mass is determined gravimetrically after removal of uncombined water.

2. Equipment

a. Analytical balance to weigh particulate and crucible to $\pm$0.1 mg.

b. Oven to maintain 105°C $\pm$5°C.

c. Crucibles.

d. Hot Plate, Steam Bath

e. Desiccator

3. Procedure

Probe washes, glassware washes and impinger catches are all processed in the following manner:

The solution is first washed, using distilled water and/or acetone into preweighed, numbered crucibles. The crucibles are then placed on a hot plate or steam bath for evaporation of the liquid, then into an oven at 105° $\pm$5°C for at least four hours. Using forceps, the crucibles are removed from the oven and placed in a desiccator to cool for two hours. The crucibles are then weighed to the nearest 0.1 mg. Desiccating and weighing is repeated until a constant weight is obtained.

4. Calculation

The weight of the particulate is determined by the difference between the initial and final weights, less blank.

5. Calibration

The balance should be zeroed before each weighing and calibrated at least every 18 months with an NBS standard.

May 5, 1977

STATE OF WASHINGTON DEPARTMENT OF ECOLOGY
SOURCE TEST LABORATORY PROCEDURE 3

HYDROCARBON CONDENSIBLES DETERMINATION

I. Principle

Hydrocarbon condensibles are extracted from a solution using dichloromethane.

II. Equipment

1. An analytical balance to weigh evaporating dishes plus or minus 0.1 mg.
2. Separatory funnel.
3. Glass container, such as a 500 ml beaker.
4. 200 ml. evaporating dish.
5. Desiccator.

III. Reagents

1. Dichloromethane (CH_2Cl_2) Nanograde (or equivalent).
2. Anhydrous Sodium Sulfate (Na_2SO_4) reagent grade or equivalent dryer.
3. Dry nitrogen gas.

IV. Procedure

Determine the sample volume and place in clean glass container. Add 50 ml. of dichloromethane and shake or spin for five minutes. Using a separatory funnel, separate solvent and water solutions. Repeat extraction two more times with fresh dichloromethane. After extraction is completed, remove water from the solvent solution by passing it through the sodium sulfate dryer. Transfer the solution to a preweighed evaporating dish and dry under dry nitrogen. Desiccate and weigh on an analytical balance to constant weight. Run a blank for each series of analysis, or for every five samples. Determine the weight of the non-extractables by Source Test Laoboratory Procedure 2.

V. Calibration

The balance should be zero before each weighing, and calibrated at least every eighteen months with an NBS standard.

VI. Calculation

The weight of the condensibles is determined from the difference between the initial and final weight of the evaporating dish.

STATE OF WASHINGTON DEPARTMENT OF ECOLOGY May 1, 1977

SOURCE TEST CALCULATIONS

APPENDIX-B CALCULATIONS
Run 1 (85-10)

Volume Sampled

The volume sampled is normally expressed in standard dry cubic feet (sometimes in standard dry liters), and is determined by correction of the meter volume to standard conditions.

$$Vs = \overset{38.32}{Vm} \frac{520}{460 + \underset{75.4}{Tm}} \frac{\overset{28.09}{Pm}}{29.92} = 34.94$$

Particulate Concentration

The concentration of particulate is determined by dividing the weight of particulate collected by the volume sample and expressed in grains per standard cubic foot.

$$C_p = \frac{(.01543\ gr/mg)\overset{31.7}{(M_p)}}{Vs} = 0.014$$

Gas Pollutant

To determine the volumetric concentration of gaseous pollutants, find the number of moles of pollutants per 10^6 moles of gas. The result is expressed in parts per million, ppm.

$$Cgas = \frac{Mp}{MWp} \frac{MV}{Vs} \times 10^6$$

Excess Air

The excess air is determined by the concentration of O_2 in the gas stream at the sample point, divided by the concentration of O_2 used for combustion, with adjustments for carbon monoxide.

$$EA = \frac{\overset{16.0}{\%O_2} - 0.5\% \overset{0}{\cancel{CO}}}{0.264\ \underset{81.0}{(\%N_2)} - \%O_2 + 0.5\ \overset{0}{\cancel{(\%CO)}}} \times 100 = 297.18$$

O_2 Correction

To adjust the pollutant concentration to a 7% O_2 standard, the concentration is multiplied by the O_2 in the air, minus 7% O_2, and divided by the O_2 in the air minus the O_2 in the gas stream.

$$C_7 = \frac{(21.0 - 7.0)}{(21.0 - \%O_2)} C = \frac{14.0\ C}{21.0 - \%O_2}$$

Moisture Mole Fraction

Condensation Method -

The moisture mole fraction is determined by dividing the volume of the water vapor collected by the total volume of the sample, including water vapor.

$$Fm = \frac{0.0465\ \overset{184.4}{Ww}}{0.0465\ Ww + Vs} = 0.197$$

Saturation Method -

By the saturation assumption method, the moisture mole fraction is dividing the vapor pressure of water at the stack temperature by the absolute pressure of the stack gas.

$$Fm = \frac{Pwv}{Ps} = \frac{10^{[6.6911 - \{3149.01/(390.86 + Ts)\}]}}{Ps}$$

Molecular Weight

The molecular weight of the stack gas is determined by summing the mole fraction and the molecular weight of each constituent.

Dry Gas Basis -

$$MWd = 44.0\ (\overset{.03}{FCO_2}) + 32.0\ (\overset{.16}{FO_2}) + 28.0\ (\overset{0}{\cancel{FCO}}) +$$
$$+ 28.2\ (1.00 - FCO_2 - FO_2 - \overset{0}{\cancel{FCO}}) = 29.282$$

Wet Basis -

$$MW = MWd\ (1.00 - Fm) + 18.0\ (Fm) = 27.059$$

Average Stack Gas Velocity

The average stack gas velocity expressed in actual feet per second is determined by:

$$Vave = \frac{85.48\ \overset{.782}{Fv}}{\sqrt{Ps\ MW}}\ \frac{1}{n} \sum_{n}^{i=1} \sqrt{(460 + Ts_i)(\Delta h_i)} = 27.567$$

where n = number of traverse points

Stack Gas Flow Rate, Actual

The average stack gas flow rate is expressed in actual cubic feet per minute and found by multiplying the average stack gas velocity by the stack area and 60.0.

$$Qd = Vave(Ad)60 = 129,908$$

Stack Gas Flow Rate, Standard

The stack gas flow rate under standard conditions is expressed as standard dry cubic feet per minute, and obtained by adjusting the stack gas flow rate to standard temperature and pressure and subtracting the volume of the water vapor.

$$Qs = \frac{520}{460 + Ts} \frac{\overset{29.09}{(Ps)}}{(29.92)} (1 - Fm)Qd = 79,339.9$$

Emission Rate

Emission rate is calculated from the product of the concentration and the flow rate, and normally expressed in pounds per hour.

Particulate -

$$Rp = \frac{CP\ (Qstd.)(60\ Min/Hr)}{7000\ Gr./Lb.} = 9.52$$

$$Rgas = Cgas \frac{(Qstd)(MWp)}{(MVe)} \frac{(60\ Min.)}{(Hr.)}$$

Isokinetic Rate

The isokinetic rate ratio of the velocity of gas through the nozzle to the velocity of gas passed the nozzle and normally expressed as percent.

$$I = \frac{\overset{.138\ 34.94}{0.\cancel{230}\ Vs}\ \overset{223.2}{(460 + Ts)}}{\underset{(.3125)^2 \frac{\pi}{4}\ \ 28.08}{AnPs}\ \underset{.197}{(1 - Fm)}\ \underset{27.56}{Vave}\ \underset{60.0}{\theta}} \times 100 = \underline{115.1}$$

NOMENCLATURE FOR CALCULATIONS (CONTINUED)

Symbol	Description	Units
MWg	Molecular weight of stack gas	
MWd	Molecular weight of dry gas	
MWp	Molecular weight of pollutant	
Nr	Normality of standard reagent	
Pa, Pb	Ambient pressure	In. Hg.
Pm	Absolute pressure of the meter	In. Hg.
Ps	Absolute stack pressure	In. Hg.
Pwv	Vapor pressure of water at stack temperature	In. Hg.
Qd	Stack flow rate at stack conditions	ACFM
Qs	Stack flow rate at standard conditions	SDCFM
Qsa	Average sampling rate	SDCFM
Ra	Aliquot ratio	
Rgas	Emission rate of gaseous pollutant	Lb/Hr.
Rp	Emission rate of particulate	Lb/Hr.
Ta	Ambient temperature	°F
Tm	Meter temperature	°F °C
Ts	Average stack temperature	°F
Vab	Volume of absorbant	Mℓ
Vave	Average velocity	AFPS
Vm	Volume as measured by the meter	ACF or ℓ
Vns	Velocity of stack gas through the nozzle	SDFPS
Vs	Sample volume at standard conditions: (60°F and 29.92 In. Hg.)	
Vsa	Velocity of stack gas at standard conditions	SDFPS
Vtb	Titration volume of blank	Mℓ
Vts	Titration volume of sample	Mℓ
Ww	Weight of water collected	gm or mℓ
ρ	Density of pollutant	$Lb/Ft.^3$
Θ	Sample Time	Min.

NOMENCLATURE FOR CALCULATIONS

May 1, 1977

Symbol	Description	Units
Ad	Duct area	Sq. Ft.
An	Nozzle Area, $\frac{1}{4} \pi Dn^2$	Sq. In.
C	Concentration of Pollutant	ppm or gr/SDCF
C_7	Correction factor 7% O_2	ppm or gr/SDCF
Cgas	Concentration of gaseous pollutant	ppm, Vol.
$CVSO_2$	Volume concentration of SO_2	ppm
Dd	Duct diameter	ft.
Dn	Nozzle diameter	In.
EA	Excess Air	%
FCO, FCO_2	Mole or volume fraction of the particular gas	
FO_2, FN_2	CO, CO_2 O_2 N_2	
Fgd	Dry stack gas density with air equal to 1.0	
Fm	Mole fraction of water vapor in stack stack gas	
Fv	Pitot correction factor	
Hs	Stack height above grade	Ft.
Δh	Differential pressure on pitot	In. H_2O
$\overline{\sqrt{\Delta ha}}$	Average of $\sqrt{\Delta h}$	(in $H_2O)^{\frac{1}{2}}$
I	Isokinetic Rage	%
Mg	Mass of gaseous pollutant	gm
Mp	Mass of particulate	mg
MSO_2	Mass of SO_2 Collected	mg
MV_e	Molar volume at standard conditions; English Units = 379 ft^3/lb-mole	
MVm	Molar volume at standard conditions: Metric Units = 23.69 ℓ/g-mole	