TRA-DET INC.
COAL TECHNICAL SERVICES

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SHIPPING ADDRESS
BATTLE RUN ROAD
RD 2, BOX 227A
TRIADELPHIA, WV 26059

October 29, 1992

Mr. Harold Strohmeyer
NORTHERN OHIO VALLEY AIR AUTHORITY
814 Adams Street
Steubenville, OH 43952

Dear Mr. Strohmeyer:

Enclosed is the report on the particulate and sulfur dioxide emission test for Lash Paving and Excavating, Inc. of Martins Ferry, Ohio.

Should you have any questions or need additional information, please contact this office.

Sincerely,

Richard P. Whitt

RPW:jk
Enclosure
cc: Mr. David Lash
Lash Paving and Excavating

PARTICULATE AND SULFUR DIOXIDE EMISSION TEST LASH PAVING AND EXCAVATING, INC. MARTINS FERRY, OHIO

By

TraDet, Inc.
P. O. Box 2019
Wheeling, West Virginia 26003
(304) 547-9094

October 1992

PROCESS DESCRIPTION

The facility that was tested is an Asphalt Drum Mixers, Inc. (ADM) asphalt plant, owned and operated by Lash Excavating and Paving. The facility is located on South First Street in Martins Ferry, Ohio. This unit is an ADM Model 6026 and is designed to produce 100 TPH of hot asphalt mix at 5% product moisture. A typical mixture of 40% sand, 60% gravel, and AC-20 asphalt bitum is heated in a rotary kiln by combustion of #2 fuel oil.

Process emissions consist of combustion by-products, mainly CO_2 and H_2O, water vapor from the dried sand and gravel, and fine particulate matter which has become entrained in the hot gas stream. A 40 HP blower provides combustion air at the burner end of the rotating kiln. A 60 HP induced draft fan is used to remove the water vapor and combustion gases from the kiln and force them through a venturi scrubber and mist eliminator. The scrubber consists of a series of nozzles ahead of the venturi plate which consumes 75 gallons per minute of water at a delivery pressure of 40 psi. The water exits the system through the bottom of the mist eliminator and is discharged to a setting basin with the clarified water recycled back to the scrubber. The scrubbed gas stream is then fed into a rectangular exhaust duct and from there into a 48-inch by 36-inch rectangular stack. The fan is designed to move 16,000 ACFM of gas through the scrubber and stack.

The facility is designed to produce 100 TPH, and was tested as close to this tonnage throughput as possible based on limitations imposed by the storage bin and throughput in the product conveyors. During the three emission tests the average product output was 84.4 TPH.

REGULATIONS

The emissions from the Lash Excavating and Paving asphalt drum mix plant are required to meet the standards specified in 40 CFR, Part 60.90 - 60.92, Subpart I, *Standards of Performance for Hot Mix Asphalt Facilities.* This standard states that particulate emissions shall not exceed 0.04 grains per DSCF as determined by Method 5 for the concentration of particulate matter and associated moisture content.

PARTICULATE AND SO_2 SAMPLING PROCEDURE

PARTICULATE SAMPLING

Principle - Particulates were sampled isokinetically according to Federal Test Methods 1, 2, 3, 4, and 5 as given in the Federal Register, Volume 36, Number 247, of December 23, 1971, and as amended in the Federal Register, Volume 40, Number 60, of July 1, 1984. The weight of the particulate was determined gravimetrically after the removal of uncombined water. The molecular weight of the stack gas was determined by FYRITE analysis and the percent moisture by the condensation method. Particulate grain loading was then be calculated using filter and probe catch weights.

Procedure - After allowing 30-minutes for stabilization of the plant after startup, the stack was sampled for 3.0 minutes at each of 25 traverse points, 5 points taken from each traverse as shown in Figure 1. Figure 2 is the stack schematic showing the location of the sampling ports. This resulted in a sampling time of 75 minutes per test, plus the time required to change traverses.

Sampling Media - The major portion of the particulate was collected on a

FIGURE 1. TRAVERSE POINT LOCATIONS

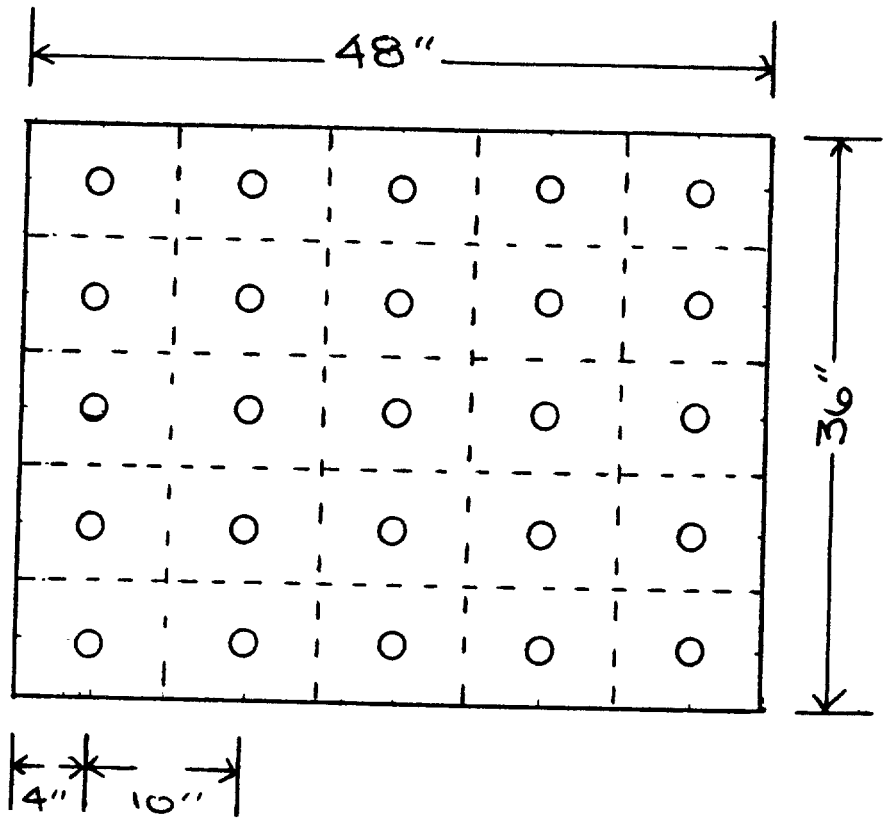
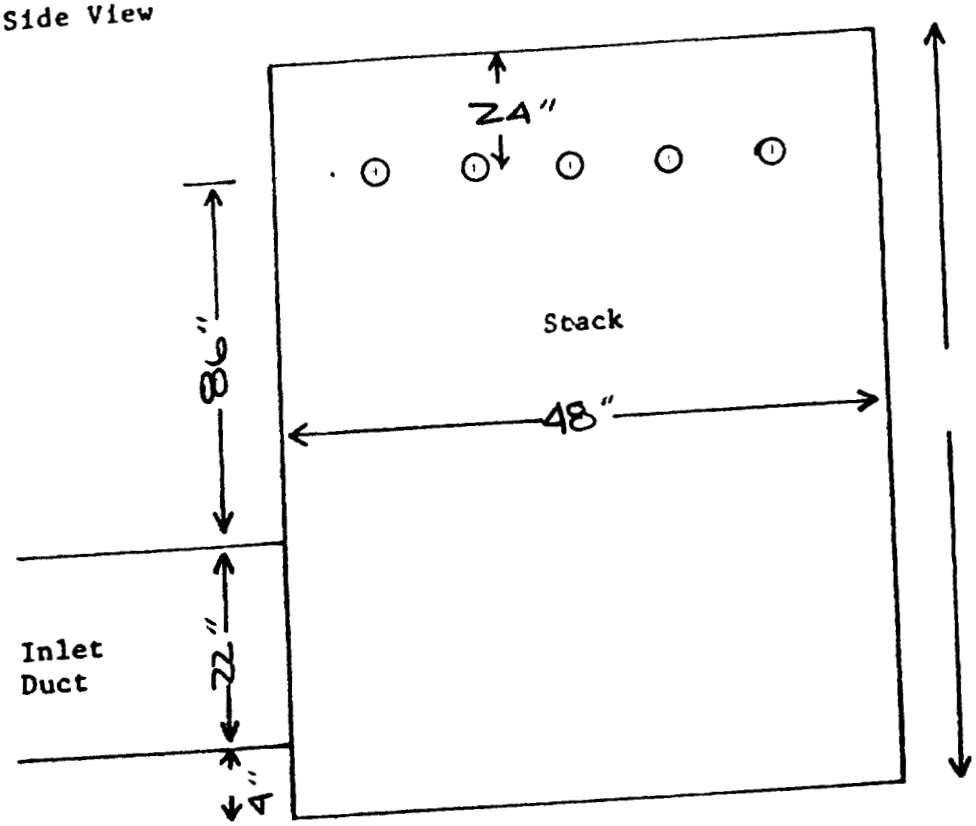
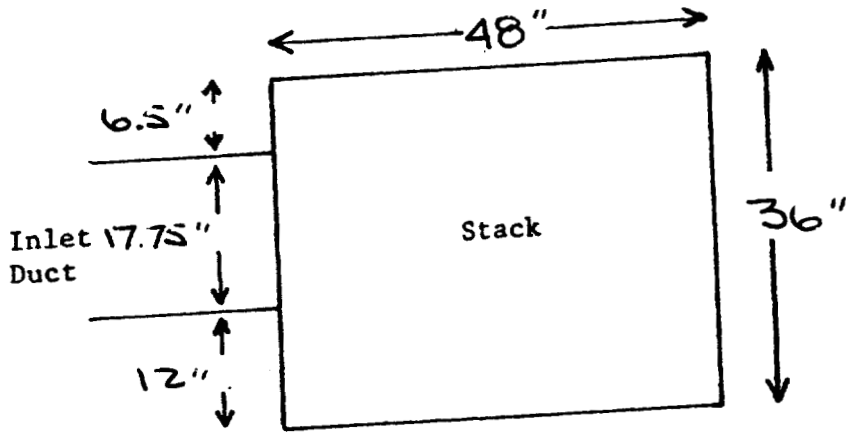


FIGURE 2. Stack Schematic

Side View



Top View



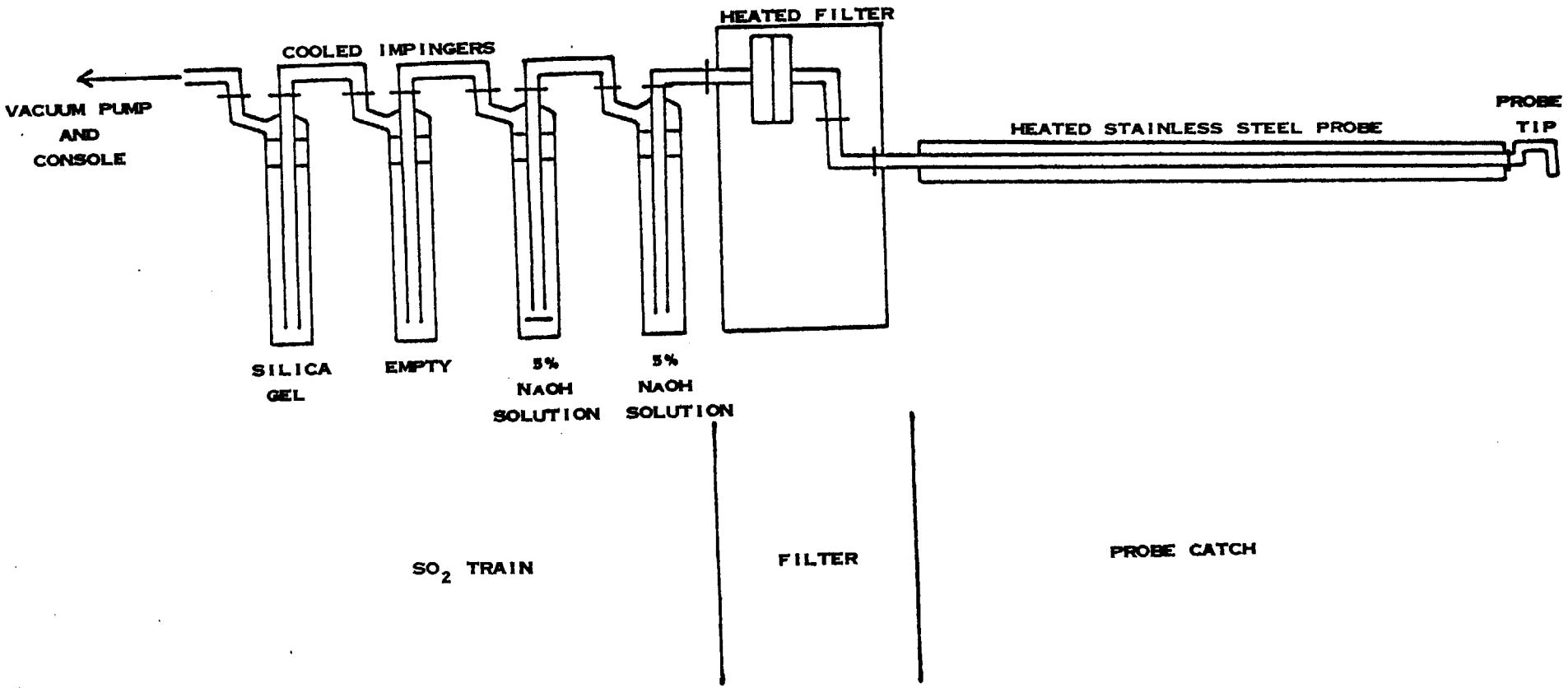
four inch desiccated and pre-weighed glass fiber filter contained in a glass filter holder, with a sintered glass frit, and enclosed in a heated compartment to prevent moisture condensation from plugging the filter during sampling. Some particulate was also deposited in the stainless steel lining of the probe and on other exposed glass surfaces prior to the filter. These were cleaned after each test by rinsing with acetone and brushing.

In order to simplify sampling procedures and to allow for simultaneous particulate and SO_x determination, the Los Angeles Air Pollution Control procedure, as utilized by the Pennsylvania Department of Environmental Resources, was used in place of separately sampling particulate by Method 5 and then sampling SO_2 by Method 6 or Method 8. A copy of the LAAPC procedure, as provided by the Pennsylvania DER, is included as Appendix VII.

The impinger train, shown in Figure 3 for concurrent moisture collection and sulfur oxide determination, consisted of four impingers connected in series with glass ball joint fittings. The first, third, and fourth were of the straight bubbler type (modified Greenburg-Smith) and the second is of the standard Greenburg-Smith type. For combined particulate and sulfur oxide sampling, the first two impingers contained 100-ml of a 5% sodium hydroxide solution each, the third is empty, and the fourth contained between 200 and 300 grams of pre-weighed silica gel. After the test, the volume of the condensate was measured and the percent moisture of the gas stream calculated. The impinger solutions were then transferred to sample containers for shipment to the laboratory and analysis for sulfur oxide concentrations.

The dry molecular weight of the stack gas was determined by FYRITE analysis for CO_2 and O_2 (CO and N_2 by difference) on a series of grab samples during each run.

FIGURE 3. SCHEMATIC DIAGRAM OF PENNSYLVANIA DER ISOKINETIC SAMPLING TRAIN FOR SIMULTANEOUS PARTICULATE AND SO_2 DETERMINATION.



Sample Analysis - Each sample filter and any loose particulate matter from the filter container was heated at 103°C for two hours, cooled in a desiccator, and then weighed to the nearest 0.1 mg on an analytical balance. The filters were then desiccated for another 24-hours and reweighed. This was repeated until successive weighings agreed within 0.5 mg or until a weight increase was noted. Control filters (extra pre-weighed filters taken through the same handling, desiccation, and weighing as the sample filters) were used to determine an average net change in weight, which was then applied as a blank to the sample filter weights.

The acetone washings from the probe and glassware forward of the filter were transferred to a previously desiccated and tared beaker, and evaporated to near dryness in a hood at room temperature and pressure. The nearly dry weighings were then placed in a laboratory drying oven at 103 - 105°C for two hours to drive off any residual water, then cooled in a desiccator and weighed. The oven drying, desiccator cooling cycle, and weighing, was repeated until successive weights agreed within 0.5 mg or until a weight increase was noted. Acetone blanks from the same lot of acetone used for the probe washings were carried through the above evaporation and drying procedure along with the samples and the average net weight change found in the blanks was applied as a correction to the particulate weight obtained for the samples.

SULFUR DIOXIDE SAMPLING

Pennsylvania DER SO_X Procedure - For the simultaneous determination of sulfur oxides, only the impinger solutions of the sampling trains were used. These were analyzed according to the gravimetric procedure utilized by the Pennsylvania DER. This procedure is presented in Appendix VII. This

method consists of oxidizing the SO_x absorbed in the 5% sodium hydroxide solution to sulfate with bromine water, precipitating the sulfate as barium sulfate, and then weighing the resultant solid. An unused 100 ml 5% sodium hydroxide solution and a deionized water sample was taken through the same procedure for the determination of reagent blanks. In addition, a 100 ml portion of the 5% sodium hydroxide solution containing a known amount of sulfate was also taken through the above procedure to be used as a standard.

VISIBLE EMISSIONS

Opacity was read in accordance with Federal Method 9 as set forth in the Federal Register, Vol. 39, No. 219, of November 12, 1974. A representative of the Northern Ohio Valley Air Authority monitored the visible emissions.

RESULTS AND DISCUSSION

The combined particulate and sulfur dioxide emission tests were conducted on October 14 and 15, 1992. Each of the three runs were completed without interruption of the process.

The results of the particulate emission portion of the tests are summarized in Table 1. The three determinations had an average particulate emission concentration of 0.0074 grs./DSCF compared to the emission standard of 0.04 grs./DSCF. The average particulate emission rate was 0.32 lb./hr.

The results of the sulfur dioxide emission portion of the tests are summarized in Table 2. The three determinations had an average sulfur dioxide concentration of 0.004 g/DSCM. Sulfur dioxide emissions were determined since the process used fuel oil in the combustion process. The average total sulfur

.004 g/DSCm

Stack Gas Particulate Sampling Summary

Table 1.

Sampling Data	Symbol	Run 1	Run 2	Run 3
Volume of Dry Gas Sampled at Standard Conditions,[a] DSCF[b]	$V_{m,std}$	24.268	65.477	66.545
@ Percent Isokinetic	%I	115.63	92.48	92.48
Stack Gas Composition and Flow				
Molecular Weight of Stack Gas, Dry Basis	MW_d	30.16	30.18	30.03
Molecular Weight of Stack Gas, Wet Basis	MW	24.67	24.99	25.94
Mole Fraction of Dry Gas	M_d	0.5487	0.5694	0.6600
Percent Moisture in Stack Gas, by Volume	%M	45.13	43.06	34.00
Average Stack Gas Temperature, ^oF	T_s	175.48	175.7	167.7
Stack Gas Velocity at Stack Conditions, fpm	V_a	803.5	1072.5	813
Stack Gas Volumetric Flow Rate at Stack Conditions, ACFM[c]	Q_a	9,642.0	12,870	9,756
Dry Stack Gas Volumetric Flow Rate at Standard Conditions, DSCFM[d]	Q_s	4,364	5,880	5,387
Total Particulate Emissions				
Concentration of Particulates in Stack Gas, gr./DSCF	C_s'	0.0096	0.0057	0.0069
Total Particulate Emission Rate, lb/hr.	P_{tr}	0.36	0.29	0.32

[a]Standard Conditions are 70°F and 29.92 in. Hg. [b]Dry Standard Cubic Feet. [c]Actual Cubic Feet per Minute (stack conditions). [d]Dry Standard Cubic Feet per Minute.

Table 2. **SULFUR DIOXIDE CONCENTRATION**

Run 1	***Run 2***	***Run 3***
0.0008 g/DSCM	**0.0091 g/DSCM**	**0.0015 g/DSCM**

=.0038

Chemistry Handbook

F-304

X .4369957 = gr/CU FT

.00166 gr/DSCF 5210 SCFM x 60 ÷ 7000 = .074#/HR

dioxide emission rate was 0.081 lbs./hr.

Process monitoring conducted during the three emission tests is summarized in Table 3. Total product rate was held fairly consistent during each of the three tests averaging 84.9 TPH. AC-20 asphalt bitum feedrate averaged 3.88 GPM. The fuel feed rate averaged 2.2 GPM with an average exhaust temperature of 266.5°F.

Table 3. PROCESS MONITORING SUMMARY
LASH EXCAVATING AND PAVING, INC.

	Run #1	Run #2	Run #3	Average	Units
Sand Feed Rate	38.5	37.1	35.3	37.0	TPH
No. 8 Stone Feed Rate	45.2	43.5	43.0	43.9	TPH
No. 57 Stone Feed Rate	-- 964# .5	-- 2539.8 1.25	43.0 2 250.8	43.0 1932.2 1.6	TPH
AC-20 Feed Rate	1.94	5.1	4.6	3.88	GPM
Product Rate	86.9	85.3	82.6	84.9	TPH
Fuel Feed Rate	894 2.1	1022.4 2.4	894 2.1	937 2.2	GPM
Exhaust Set Point	284.1	274.1	270.1	276.1	°F
Exhaust Temperature	266.7	267.9	264.8	266.5	°F
Scrubber Water Pressure	40	40	40	40	PSIG
Scrubber Static Pressure	11.7	11	11	11.2	inches WC

645 [illegible]#/TE 20
54.9#/gal

APPENDIX I

PROCESS MONITORING DATA

Date 10/14/92
Run 1

PROCESS MONITORING
LASH EXCAVATING AND PAVING

Time	Sand Feed Bin 1 TPH	#8 Stone Feed Bin 2 TPH	#57 Limestone Feed Bin 3 TPH	Aggregate TPH	AC-20 TPH	Product TPH	Fuel Feed Rate %	Exhaust Set Point °F	Exhaust Temp. °F
12.05	35	40	—	70	4.6 TPH	77	2GPM	287	286
12:10	35	40	—	70	.06	77	2GPM	287	264
12:15	37	43	—	70	.06	77	2GPM	287	290
12:20	39	46	—	80	.06	88	2GPM	287	280
12:25	39	46	—	83	.06	90	2¼GPM	287	255
12:30	39	46	—	83	.06	90	2½GPM	287	245
12:35	39	46	—	83	.06	90	2½GPM	287	260
12:40	39	46	—	83	.06	90	2½GPM	287	261
12:45	39	46		80	.06	85	2GPM	287	286
12:50	39	46	—	82	.06	89	2GPM	287	260
12:55	39	46	—	83	.06	89	2GPM	287	257
1:00	37	46	—	83	.06	89	2GPM	287	245
1:05	39	46		85	.06	84	2GPM	287	268
1:10	39	46		85	5.3TPH	88	2GPM	287	265
1:15	39	46		84	5.3TPH	89	2GPM	275	267

Date 10/14/92

Run 1 + 2

PROCESS MONITORING

LASH EXCAVATING AND PAVING

Time	Sand Feed Bin 1 TPH	#8 Stone Feed Bin 2 TPH	#57 Limestone Feed Bin 3 TPH	Aggregate TPH	AC-20 TPH	Product TPH	Fuel Feed Rate %	Exhaust Set Point °F	Exhaust Temp. °F
1:20	39	46	~~85~~	85	5.3	90	2¼GPM	275	270
1:25	39	46		85	5.1	90	2¼GPM	275	277
1:30	39	46		85	5.2	90	2.GPM	~~280~~	278
1:35	39	46		85	5.3	90	2GPM	275	254
~~STOP~~	STOP	OF	1ST	Test					
AVG RUN 1	38.5 ✓	45.2 ✓		81.3 ✓	1.94 ✓	86.9	2.12	284.1	266.7 ✓
start 2nd			RUN	NO2	10/14/92				
5:15	35	40		75	4.6	78	2.5	275	265
5:20	35	40		75	4.7	80	2.5	275	270
5:25	35	40		75	4.7	80	2.5	275	273
5:30	39	46		~~85~~	5.3	90	2.5	275	272
5:35	39	46		85	5.3	90	2.5	275	280
5:40	39	46		85	5.3	90	2.5	275	290
5:45	39	46		85	5.3	90	2.4	275	281
5:50	39	46		85	5.3	90	2.5	270	275

Date 10.14-12

Run 2

PROCESS MONITORING

LASH EXCAVATING AND PAVING

Time	Sand Feed Bin 1 TPH	#8 Stone Feed Bin 2 TPH	#57 Limestone Feed Bin 3 TPH	Aggregate TPH	AC-20 TPH	Product TPH	Fuel Feed Rate %	Exhaust Set Point °F	Exhaust Temp. °F
5.55	39	46		~~85~~	5.3	90	2.5	275	265
6:00	40	47		86	5.4	91	2.5	275	263
6:05	40	47		86	5.4	91	2.5	275	263
6:10	40	47		86	5.4	91	2.4	275	269
6:15	~~35~~	41		76	5.0	81	2.2	275	260
6:20	35	41		76	5.0	81	22	~~275~~	254
6:25	34	40		74	4.8	79	2.1	270	254
6:30	34	40		74	4.8	79	2.1	270	258
6:35	34	40		74	4.8	79	2.1	270	262
Avg Run 2	37.1 ✓	43.5		80.4 ✓	5.1 ✓	85.3 ✓	2.4 ✓	274.1 ✓	267.9

Date 10-15-92

Run 3

PROCESS MONITORING

LASH EXCAVATING AND PAVING

Time	Sand Feed Bin 1 TPH	#8 Stone Feed Bin 2 TPH	#57 Limestone Feed Bin 3 TPH	Aggregate TPH	AC-20 TPH	Product TPH	Fuel Feed Rate %	Exhaust Set Point °F	Exhaust Temp. °F
8:50	25		40	65	2.9	68	1.9 GPM	265	257
:55	27		43	70	2.9	73	2.0	~~265~~	283
9:00	29		46	75	3.2	78	2.0	265	279
9:05	37	43	~~46~~	80	4.8	85	2.0	265	245
9:10	37	43	~~46~~	~~80~~	4.8	85	2.1	265	270
9:15	37	43		80	4.8	85	2.1	265	271
9:20	37	43		80	4.8	85	2.1	265	245
9:25	37	43		80	5.0	85	2 1/4	265	250
9:30	37	43		80	5.0	85	2 1/4	265	250
9:35	37	43		80	5.0	85	2 1/4	265	250
9:40	37	43		80	5.0	85	2 1/4	270	255
9:45	37	43		80	4.9	85	2	270	265
9:50	37	43		80	5.1	85	2.1	270	265
9:55	37	43		80	5.0	85	2	265	265
10:00	37	43		80	5.0	85	2 1/4	280	275

Date 10-15-92

Run 3

PROCESS MONITORING

LASH EXCAVATING AND PAVING

Time	Sand Feed Bin 1 TPH	#8 Stone Feed Bin 2 TPH	#57 Limestone Feed Bin 3 TPH	Aggregate TPH	AC–20 TPH	Product TPH	Fuel Feed Rate %	Exhaust Set Point °F	Exhaust Temp. °F
10:05	37	43		80	←4.9		2.1	285	280
10:10	37	43		80	←5.0		2.1	285	282
10:15	37	43		80	←5.0		2 1/4	285	280
10:20									
10:25									
10:30									
10:35									
10:40									
10:45									
Avg Run 3	35.3	43.0	43.0	78.3	4.10	82.60	2.1	270.0	264.8

percent AC 6% 315°

Lash WO #251

Lash Excavating and Paving:

Exhaust Fan Amps

Run 1 Time	TPH		AC Temp	Process temp	Pressure Drop	Water Pressure	
V20	80	46	300	291	12	40	33
1210	76	49	300	266	12	40	42%
1215	77	49	300	291	12	40	34.5
220	88	47	300	280	12	40	39.9
12:25	90	47	300	244	12	40	48%
:30	90	47	300	245	12	40	52.3
12:35	90	47	300	260	12	40	50.00
:40	90	47	300	261	12	40	49.2
:45	88	47	300	282	12	40	37.4
12:50	89	47		260	12	40	44.0
:55	89	47	300	257	12	40	42.7
1:00	89	47	300	245	12	40	43.6
:05	84	47	300	268	12	40	40.0
1:10	88	47	300	256	11	40	40.6
:15	89	47	287	297	11	40	47
:20	90	47	285	270	11	40	52
:25	90	47	290	270	11	40	46.1
:30	90	47	300	278	11	40	46.7
135	90	47	290	254	11	40	47.4
			End of First Test				
Run 2							
515	77	48	301	258	11	40	47
20	80	48	320	290	11	40	38
25	80	48	301	280	11	40	42
30	90	47	305	280	11	40	42
40	90	47	300	285	11	40	43
		47	305	262	11	40	43

	TPH	Mix	Process	Damper	Water Pressure	Burner
6:10	81	290°	250°	11 inches	40#	33 %
6:20	81	292	251	11.	40	34 %
6:30	79	295	251	11	40	34%
6:40	79	292	251	11	40	36%

3rd Run3

8:00	81	280	262	11.5	40	42%
9:15	85	300	282	11	40	37 %
9:20	85	290	295	11	40	40 %
9:25	85	290	250	11	40	42.0
9:30	85	285	250	11	40	42.2
9:35	85	285	250	11	40	41.5
9:40						
9:45						
9:50						
9:55						
10:00						
10:05						
10:10						
10:15						
10:20						
10:25						
10:30						
10:35						
10:40						
10:45						

APPENDIX II

FIELD DATA

FIELD DATA

PLANT Lash Excavating & Paving
DATE 10/14/92
SAMPLING LOCATION Asphalt Plant
SAMPLE TYPE Pavt. E 30 x
RUN NUMBER 1
OPERATOR Whitt / Mozok
AMBIENT TEMPERATURE 50°F
BAROMETRIC PRESSURE 29.160
STATIC PRESSURE, (P_s)
FILTER NUMBER (s) 920805

49° wet / 540 dry @ 0835

PROBE LENGTH AND TYPE
NOZZLE I.D.
ASSUMED MOISTURE, % 31% @ 158°
SAMPLE BOX NUMBER
METER BOX NUMBER
METER $\Delta H_@$
C FACTOR Cp = 0.8184
PROBE HEATER SETTING
HEATER BOX SETTING 250°F
REFERENCE Δp K = 1.6 7.4

Post Leak Ck @ 8.1 Hg
208.026
208.03

Pre Leak Ck
183.165 @ 11
183.175 15 Hg

SCHEMATIC OF TRAVERSE POINT LAYOUT

COPY - ORIGINAL ON FILE

READ AND RECORD ALL DATA EVERY 3 MINUTES

TRAVERSE POINT NUMBER	SAMPLING TIME, min / CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O		STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE		PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
				DESIRED	ACTUAL		INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F			
	0	ST. 183.236									
A 1	3	ST = 183.236	0.07	0.14	0.14	170	80	73	<1	239	50
2	6		0.03	0.21	0.21	169	84	77	<1	243	46
3	9		0.04	0.31	0.31	165	91	77	<1	243	42
4	12		0.07	0.51	0.51	169	97	78	<1	249	43
5	15	188.004	0.12	0.88	0.88	174	104	79	1	256	42
B 1	3	188.004	0.03	0.18	0.18	176	92	83	<1	254	49
2	6		0.03	0.18	0.18	176	97	83	<1	256	49
3	9		0.03	0.18	0.18	176	99	84	<1	248	50
4	12		0.04	0.23	0.23	176	104	85	<1	245	49
5	15	193.6666	0.11	0.62	0.62	177	112	86	<1	243	45
C 1	3	ST. 193.6666	0.04	0.23	0.23	173	100	87	<1	264	52
2	6		0.03	0.18	0.18	176	104	88	<1	260	52
3	9		0.02	0.12	0.12	175	103	88	<1	250	50
4	12		0.03	0.18	0.18	179	106	89	<1	250	50
5	15	198.182	0.07	0.40	0.40	179	115	88	<1	250	50
D 1	3	198.124	0.05	0.28	0.28	171	105	91	<1	249	49
2	6		0.03	0.18	0.18	173	111	91	<1	246	48
3	9		0.03	0.18	0.18	176	111	92	<1	251	49
4	12		0.03	0.18	0.18	180	113	93	<1	253	51
5	15	202.794	0.05	0.28	0.28	184	118	94	<1	251	48

COMMENTS:

CO_2	9.5	12.0	12.0	11.5	15.0
O_2	7.0	4.5	5.5	9.0	4.0

Avg 2 12.0% CO_2

Avg 2 6.0% O_2

EPA (Dur) 235
4 72

LAST Graduating Run

TRAVERSE POINT NUMBER	SAMPLING TIME, min / CLOCK TIME (24 hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in H_2O		STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE		PUMP VACUUM, in Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
				DESIRED	ACTUAL		INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F			
E 1	3	202.794	0.07	0.40	0.40	177	115	97	<1	254	49
2	6		0.05	0.28	0.28	176	116	97	<1	247	45
3	9		0.03	0.18	0.18	180	117	97	<1	251	44
4	12		0.03	0.18	0.18	181	118	99	<1	253	40
5	15	207.993	0.04	0.23	0.23	184	121	100	<1	255	45
			0.0448	0.2768		175.5	1053	87.8		250.2	47.0
			$\sqrt{\Delta p}$ = 0.2052								

ΔV_m = 24.757

Y = 1.0443

$V_{m\,corr}$ = 25.8525

EPA (Dun) 236
4 72

FIELD DATA

Pre-test @ 10" Hg
208.982
208.985

PLANT Lasa Excavation
DATE 10/14/92
SAMPLING LOCATION Asphalt Plant
SAMPLE TYPE Part. & SO2
RUN NUMBER (2)
OPERATOR Mozek / Wade
AMBIENT TEMPERATURE 79°F Dry 64°F Wet @ 1620
BAROMETRIC PRESSURE ~~29.14~~ 28.8
STATIC PRESSURE, (P_s)
FILTER NUMBER (s)

PROBE LENGTH AND TYPE 3' S/S
NOZZLE I.D. 0.625
ASSUMED MOISTURE, % 47% @ 176°
SAMPLE BOX NUMBER
METER BOX NUMBER
METER $\Delta H_@$ 1.36
C FACTOR Cp = 0.8184
PROBE HEATER SETTING
HEATER BOX SETTING
REFERENCE Δp ~~K = 34 33~~

SCHEMATIC OF TRAVERSE POINT LAYOUT

COPY - ORIGINAL ON FILE

READ AND RECORD ALL DATA EVERY 3 MINUTES

TRAVERSE POINT NUMBER	SAMPLING TIME, min / CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O DESIRED	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O ACTUAL	STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE INLET ($T_{m\,in}$), °F	DRY GAS METER TEMPERATURE OUTLET ($T_{m\,out}$), °F	PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
	1715 ~~57~~	208.114									
~~A~~ 1	3	208.114	0.12	3.9	3.9	169	96	87	3	258	42
(2) 2	6		0.09	2.9	2.9	174	104	89	3	256	41
3	9		0.016	1.95	1.95	174	109	89	2	255	45
4	12		0.07	2.3	2.3	173	115	89	2	255	45
5	15	222.788	0.08	2.6	2.6	179	119	90	2	254	60
~~B~~ 1	3	222.788	0.08	2.6	2.6	176	115	91	2	255	51
(D) 2	6		0.04	1.3	1.3	176	119	92	2	254	51
3	9		0.03	0.99	0.99	172	119	92	2	252	50
4	12		0.05	1.6	1.6	174	124	93	2	247	50
5	15	235.069	0.09	2.9	2.9	178	129	93	2	246	52
(C) 1	3	235.069	0.07	2.3	2.3	179	121	95	2	253	44
2	6		0.05	1.6	1.6	178	125	95	2	253	41
3	9		0.04	1.3	1.3	180	126	95	2	254	53
4	12		0.05	1.6	1.6	181	128	96	2	252	49
5	15	247.861	0.10	3.3	3.3	182	133	96	2	254	50
~~C~~ 1	3	247.861	0.07	2.3	2.3	171	124	92	3	251	49
(B) 2	6		0.06	1.95	1.95	175	129	98	3	251	48
3	9		0.05	1.6	1.6	175	130	98	3	252	47
4	12		0.07	2.3	2.3	176	134	99	3	251	46
5	15	262.977	0.14	4.6	4.6	179	138	99	3	252	45

COMMENTS:

CO_2	12.0	12.5	13.0	~~8.5~~ 11.5	~~10.95~~ 11.5	Avg = 12.1% CO_2
O_2	5.5	4.5	4.5	8.5	7.5	Avg = 6.1% O_2

EPA (Dur) 235
4 72

FI DAT

p2of2

PLANT Lasn
DATE 10/14/92
SAMPLING LOCATION
SAMPLE TYPE
RUN NUMBER (2) ~~p3 2-02~~
OPERATOR
AMBIENT TEMPERATURE
BAROMETRIC PRESSURE
STATIC PRESSURE, (P_s)
FILTER NUMBER (s)

Post Leak @ 9" Hg
276.849
276.851
Δ0.002

PROBE LENGTH AND TYPE
NOZZLE I.D.
ASSUMED MOISTURE, %
SAMPLE BOX NUMBER
METER BOX NUMBER
METER $\Delta H_@$
C FACTOR
PROBE HEATER SETTING
HEATER BOX SETTING
REFERENCE Δp

SCHEMATIC OF TRAVERSE POINT LAYOUT

COPY - ORIGINAL ON FILE

READ AND RECORD ALL DATA EVERY 3 MINUTES

TRAVERSE POINT NUMBER	SAMPLING TIME, min / CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O		STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE		PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
				DESIRED	ACTUAL		INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F			
A 1	3	262.977	0.07	2.8	2.8	174	125	100	5	250	50
2	6		0.08	2.6	2.6	170	132	99	4	249	52
3	9		0.08	2.6	2.6	175	134	99	4	244	54
4	12		0.10	3.3	3.3	177	136	100	5	236	53
5	15	276.833	0.18	5.4	5.4	176	139	100	8	230	52
			ΔB=								
		ΔVm= 68.719	0.0768		2.98	175.7	124.1	94.6	2.92	250.6	48.8
		Y= 1.057	~~ΔB~~ =								
			0.2716								
		CORR. Vm=									
		72.636									

COMMENTS:

CO_2

O_2

EPA (Our) 235
4 72

PLANT LAGUNA EXCAVATING
DATE 10/15/92
SAMPLING LOCATION ASPHALT PLANT
SAMPLE TYPE PARTICULATE/SOx
RUN NUMBER 3
OPERATOR WITT/MOCZEK
AMBIENT TEMPERATURE
BAROMETRIC PRESSURE 29.65
STATIC PRESSURE, (P_s)
FILTER NUMBER (s) 920806 920807

PROBE LENGTH AND TYPE 3' S/S
NOZZLE I.D. 0.1625
ASSUMED MOISTURE, %
SAMPLE BOX NUMBER
METER BOX NUMBER
METER $\Delta H_@$
C FACTOR 0.8181
PROBE HEATER SETTING
HEATER BOX SETTING 250
REFERENCE Δp 36.5

Pre Leak @ 15" Hg
13#
270.677
270.682
282.415
272.435

0.928
67° Dry
60° Wet

Post Leak @ 15" Hg
339.340
339.353
1" Hg

COPY - ORIGINAL ON FILE

SCHEMATIC OF TRAVERSE POINT LAYOUT

READ AND RECORD ALL DATA EVERY 3 MINUTES

TRAVERSE POINT NUMBER	CLOCK TIME (24-hr CLOCK) / SAMPLING TIME, min	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O		STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE		PUMP VACUUM, in. Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
				DESIRED	ACTUAL		INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F			
	~~0930~~ 0950	ST 270.708									
A 1	3		0.03	1.1	1.1	151	75	67	3	228	39
2	6		0.04	1.4	1.4	152	90	67	4	228	39
3	9		0.06	2.2	2.2	152	97	67	5	230	37
4	12		0.07	2.5	2.5	154	103	69	6	234	36
5	15	288.289	0.15	5.0	5.0	157	110	71	15	234	40
B 1	3	288.289	0.03	1.1	1.1	167	98	73	3	250	40
2	6		0.02	0.72	0.72	170	102	73	2	240	42
3	9		0.02	0.72	0.72	168	104	74	2	234	44
4	12		0.03	1.1	1.1	167	110	75	3	241	42
5	15	300.407	0.10	3.6	3.6	169	119	76	9	255	41
C 1	3	300.407	0.04	1.4	1.4	~~172~~ ~~168~~ 173	~~108~~ 3	79	4	247	43
2	6		0.02	0.72	0.72	173	109	79	3	247	40
3	9		0.01	0.36	0.36	173	102	79	2	249	42
4	12		0.01	0.36	0.36	175	105	80	2	249	41
5	0941 15	309.974	0.07	2.5	2.5	177	124	81	6	251	47
D 1		309.974	0.05	1.8	1.8	167	114	99	5	241	39
2			0.01	0.37	0.37	168	110	83	2	233	40
3			0.01	0.37	0.37	171	110	83	2	241	41
4			0.03	1.1	1.1	169	121	83	3	249	40
5		321.693	0.10	3.6	3.6	169	130	84	9	252	38

COMMENTS:

CO_2 11.5 / O_2 12.0	11.0 / 6.5	11.5 / 7.5	9.5 / 11.0	9.0 / 9.0

EPA (Dur) 235
4 72

TRAVERSE POINT NUMBER	SAMPLING TIME, min / CLOCK TIME (24-hr CLOCK)	GAS METER READING (V_m), ft^3	VELOCITY HEAD (Δp_s), in. H_2O	ORIFICE PRESSURE DIFFERENTIAL (ΔH), in. H_2O		STACK TEMPERATURE (T_s), °F	DRY GAS METER TEMPERATURE		PUMP VACUUM, in Hg	SAMPLE BOX TEMPERATURE, °F	IMPINGER TEMPERATURE, °F
				DESIRED	ACTUAL		INLET ($T_{m\,in}$), °F	OUTLET ($T_{m\,out}$), °F			
B1	3	321.693	0.14	5.0	5.0	170	124	80	12	241	42
2	6		0.09	3.2	3.2	173	129	88	10	236	44
3	9		0.06	2.2	2.2	178	130	89	6	231	48
4	12		0.05	1.8	1.8	177	130	89	5	229	50
5	15	339.274	0.08	2.9	2.9	174	134	90	7	224	48
			$\overline{\Delta p}$:		1.89	167.7	111.5	79.4	8.2	239.8	91.7
			0.0528								
		V_m = 66.620									
			$\sqrt{\overline{\Delta p}}$ =								
		Y = 1.055	0.2144								
		Corr V_m:									
		70.284									

EPA (Dur) 236
4 72

APPENDIX III

CYCLONIC FLOW DETERMINATION

CYCLONIC FLOW DETERMINATION
LASH EXCAVATING AND PAVING, INC.

Port	Traverse Point	O Reference ΔP inches WC	Rotation Angle
A	1	0.02	+6°
A	2	0.02	+11°
A	3	0.0	0°
A	4	0.0	0°
A	5	0.0	0°
B	1	0.0	0°
B	2	0.0	0°
B	3	0.01	−9°
B	4	0.0	0°
B	5	0.0	0°
C	1	0.0	0°
C	2	0.0	0°
C	3	0.0	0°
C	4	0.0	0°
C	5	0.0	0°
D	1	0.0	0°
D	2	0.0	0°
D	3	0.0	0°
D	4	0.0	0°
D	5	0.0	0°
E	1	0.0	0°
E	2	0.0	0°
E	3	0.0	0°
E	4	0.0	0°
E	5	0.0	0°
Average		0.002	1.04°

APPENDIX IV

PARTICULATE ANALYTICAL DATA

Concentration of Particulate Matter in Stack, grs./DSCF

$$C_s' = 0.0154 \frac{M_p}{V_{m,std}}$$

Where M_p = Milligrams of particulate collected

Run 1

$$(0.0154) \frac{15.200}{24.268}$$

$C'_S = 0.0096$ grs/DSCF

Run 2

$$(0.0154) \frac{24.300}{65.477}$$

$C'_S = 0.0057$ grs/DSCF

Run 3

$$(0.0154) \frac{29.700}{66.545}$$

$C'_S = 0.0069$ grs/DSCF

TRADET LABORATORIES

P. O. BOX 2019
WHEELING, WV 26003
(304) 547-9094

SHIPPING ADDRESS
BATTLE RUN ROAD
RD 2, BOX 227A
TRIADELPHIA, WV 26059

PARTICULATE ANALYTICAL DATA

Plant Lash Excavating & Paving Run 1

Location Asphalt Plant Stack Date 10/14/92

MOISTURE:

Impinger	1	2	3	4	
Final Volume	465 ml	148 ml	1 ml	331.1	338.2
Initial Volume	100 ml	100 ml	0 ml	-26.2	-26.2
Net Volume	365 ml	48 ml + 1 ml		7.1	

Total Weight of Water Collected 421.1 grams

PARTICULATES:	Filter	Probe Wash	Wet Catch
Designation Number	920805	487 ml	—
Final Weight (1)	0.66638	80.8616	
Final Weight (2)	0.66636	80.8613	
Final Weight (3)	(0.66635)		
Final Weight (4)	0.66636		
Initial Weight (1)	0.6559 0.65558	80.8485	
Initial Weight (2)	(0.65555)		
Net Weight	0.0080	0.0128	
Blank Correction	-0.0002	0.0054	
Corrected Net Weight	0.0078	0.0074	

Total Weight Without Wet Catch 0.0152 grams

Total Weight With Wet Catch _____ grams

TRADET LABORATORIES

P. O. BOX 2019
WHEELING, WV 26003
(304) 547-9094

SHIPPING ADDRESS
BATTLE RUN ROAD
RD 2, BOX 227A
TRIADELPHIA, WV 26059

PARTICULATE ANALYTICAL DATA

Plant Lash Excavating & Paving Run 2

Location Asphalt Plant Stack Date 10/14/92

MOISTURE:

Impinger	1	2	4	3
Final Volume	321 ml	381 ml	503.6 - 26.2	370 ml
Initial Volume	100 ml	100 ml	330.8 - 26.2	0 ml
Net Volume	221	281	172.8	370 ml

Total Weight of Water Collected 1044.8 grams

PARTICULATES:

	Filter	Probe Wash	Wet Catch
Designation Number	920803	397 ml	
Final Weight (1)	0.6805	81.0524	
Final Weight (2)	0.6806	81.0521	
Final Weight (3)	0.6805		
Final Weight (4)	0.6806		
Initial Weight (1)	0.66631 / 0.66628	81.0409	
Initial Weight (2)	0.6629		
Net Weight	0.0177	0.0112	
Blank Correction	-0.0002	0.0044	
Corrected Net Weight	0.0175	0.0068	

Total Weight Without Wet Catch 0.0243 grams

Total Weight With Wet Catch _____ grams

TRADET LABORATORIES

P. O. BOX 2019
WHEELING, WV 26003
(304) 547-9094

SHIPPING ADDRESS
BATTLE RUN ROAD
RD 2, BOX 227A
TRIADELPHIA, WV 26059

PARTICULATE ANALYTICAL DATA

Plant Lash Excavating & Paving Run 3

Location Asphalt Plant - Stack Date 10/14/92

MOISTURE:

Impinger	1	2	3	4	
Final Volume	297	458	124	336.1	380.2
Initial Volume	100 ml	100 ml	0	-26.2	-26.2
Net Volume				309.9	354.0
				44.1	

Total Weight of Water Collected 723.1 grams

PARTICULATES:	Filter	Probe Wash	Wet Catch
Designation Number	920807	325 ml	—
Final Weight (1)	0.6899	80.6282	
Final Weight (2)	0.6899	80.6280	
Final Weight (3)	0.6902		
Final Weight (4)	0.6904		
Initial Weight (1)	0.6678 / 0.6676	80.6172	
Initial Weight (2)	0.6674		
Net Weight	0.0225	0.0110	
Blank Correction	-0.0002	-0.0036	
Corrected Net Weight	0.0223	0.0074	

Total Weight Without Wet Catch 0.0297 grams

Total Weight With Wet Catch _____ grams

TRADET LABORATORIES

P. O. BOX 2019
WHEELING, WV 26003
(304) 547-9094

SHIPPING ADDRESS
BATTLE RUN ROAD
RD 2, BOX 227A
TRIADELPHIA, WV 26059

PARTICULATE ANALYTICAL DATA

Plant Lash Excavating & Paving Run Blanks

Location Asphalt Plant Date 10/14/92

MOISTURE:

Impinger	1	2	4
Final Volume			
Initial Volume			
Net Volume			

Total Weight of Water Collected _____ grams

PARTICULATES:	Filter	Probe Wash	Wet Catch
Designation Number	920811	Acetone 100 ml	—
Final Weight (1)	0.6791	80.9388	
Final Weight (2)	0.6792	80.9386	
Final Weight (3)			
Final Weight (4)			
Initial Weight (1)	0.6796 / 0.6794	80.9375	
Initial Weight (2)	0.6780	80.9383	
Net Weight	0.0002	0.0011	
Blank Correction			
Corrected Net Weight			

Total Weight Without Wet Catch _____ grams

Total Weight With Wet Catch _____ grams

APPENDIX V

SULFUR DIOXIDE ANALYTICAL DATA

Concentration of Sulfur Dioxide (SO_2) in Stack Gas, g/DSCM

$$C_{SO_2} = 35.314 \frac{(W_{BaSO_4} - W_{Bl}) \frac{MW_{SO_2}}{MW_{BaSO_4}} \frac{V_{sol'n}}{V_a} \frac{100}{\%R}}{V_{m,std}}$$

Where

W_{BaSO_4} = Weight of $BaSO_4$, g

W_{Bl} = Weight of Blank, g

MW_{SO_2} = Molecular weight of SO_2

MW_{BaSO_4} = Molecular weight of $BaSO_4$

%R = Percent recovery of standard

$V_{m,std}$ = Volume of dry gas sampled, DSCF

Run 1

$$35.314 \frac{(0.0010g)\left(\frac{64}{233}\right)\left(\frac{414}{200}\right)\left(\frac{100}{99.39}\right)}{24.268}$$

$C_{SO_2} = 0.0008$ g/DSCM ✓

Run 2

$$35.314 \frac{(0.0209)\left(\frac{64}{233}\right)\left(\frac{872}{300}\right)\left(\frac{100}{99.39}\right)}{65.477}$$

$C_{SO_2} = 0.0091$ g/DSCM ✓

Run 3

$$35.314 \frac{(0.0046)\left(\frac{64}{233}\right)\left(\frac{679}{300}\right)\left(\frac{100}{99.39}\right)}{66.545}$$

$C_{SO_2} = 0.0015$ g/DSCM

Total SO_2 Emission Rate, lbs./hr.

$$P_{SO_2} = 0.00374 \; (C_{SO_2}) \; (Q_s)$$

Where C_{SO_2} = Concentration of SO_2 in stack gas, g/DSCM

Q_s = Dry stack gas volumetric flow rate at standard conditions, DSCFM

Run 1

$$0.00374 (0.0008)(4,364)$$

$$P_{SO_2} = \underline{0.013} \text{ lbs/hr}$$

Run 2

$$0.00374 (0.0091)(5,880)$$

$$P_{SO_2} = \underline{0.200} \text{ lbs/hr}$$

Run 3

$$0.00374 (0.0015)(5,387)$$

$$P_{SO_2} = \underline{0.0302} \text{ lbs/hr}$$

APPENDIX VI

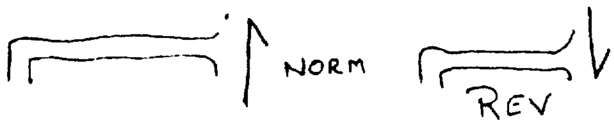
CALIBRATIONS

S-Type Pitot Tube Calibration Data

Date 13 OCT 92 Calibrated by MOCZEK / ALTMAN

S-Type Pitot Tube Identification 3' S.S w/NOZZLE + T.C. C_p= ______

Calibration Setup:



$$C_p \quad 0.99\sqrt{\frac{\Delta P\ STD}{\Delta P\ STYPE}}$$

Test No.	Pitot Tube Readings (in. H_2O)				
	Standard	S-Type			
		Normal	C_p	Reversed	C_p
1	0.82	1.20	0.8184	1.15	0.8360
2	0.82	1.20	0.8184	1.20	0.8184
3	0.82	1.20	0.8184	1.20	0.8184
		Average	0.8184	Average	0.8243

Staksamplr Calibration
MABEN EAST GULF
POST CAL.

Date 04 SEP 92

Barometric Pressure, P_b - 29.14 in. Hg

Operator(s) MOCZEK

"NEW"
Console No. TRADET *00039

Dry Gas Meter No. 3017861

Orfice Manometer Setting	Volume						Temperature				Elapsed Time
	Wet Test Meter			Dry Gas Meter			Wet Test	Dry Gas Meter			
	Start	Stop	Volume	Start	Stop	Volume	Meter	Inlet	Outlet	Average	
ΔH			V_w			V_d	T_w			T_d	θ
in. H_2O	ft^3	ft^3	ft^3	ft^3	ft^3	ft^3	°F	°F	°F	°F	min.
0.5	397.593	402.409	4.816	981.701 987	986.703	5.002	~~114~~ ~~115~~ 60°	~~90~~ 114 ~~91~~ 115 117	90 91 90	102.8	10 59.19 10.9886
1.0	402.992	407.863	4.871	987.302	992.349	5.047		116 123 128	91 91 92	106.2	7:46.17 7.7714
2.0	408.884	418.584	9.700	993.412	1003.452	10.040		119 130 131	93 94 95	110.3	11:05.33 11.0925
4.0	419.531	429.489	9.958	004.432	014.707	10.275		130 133 134	95 96 97	114.2	8:07.64 8.1344
6.0	430.550	440.291	9.7410	015.793	025.809	10,016		132 134 135	97 98 99	115.8	6:31.04 6.5178
8.0	441.954	451.774	9.820	027.504	037.562	10.058		132 134 135	99 100 100	116.7	5:36.55 5.6152

Staksamplr Calibration Calculations

ΔH	$P_b + \frac{\Delta H}{13.6}$	$T_w + 460$	$T_d + 460$	Y $\frac{V_w P_b (T_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(T_w + 460)}$	H@ $\frac{0.0317 \Delta H}{P_b (T_d + 460)} \left[\frac{(T_w + 460) \Theta}{V_w}\right]^2$
0.5	29.18	520	562.8	1.0406	1.3605
1.0	29.21	520	566.2	1.0484	1.3224
2.0	29.29	520	570.3	1.0542	1.3490
4.0	29.43	520	574.2	1.0596	1.3674
6.0	29.58	520	575.8	1.0609	1.3723
8.0	29.73	520	576.7	1.0613	1.3342

Staksamplr Calibration

Date 16 OCT 92

Console No. NEW 00039

Barometric Pressure, P_b = 28.82 in. Hg

Dry Gas Meter No. 3017861

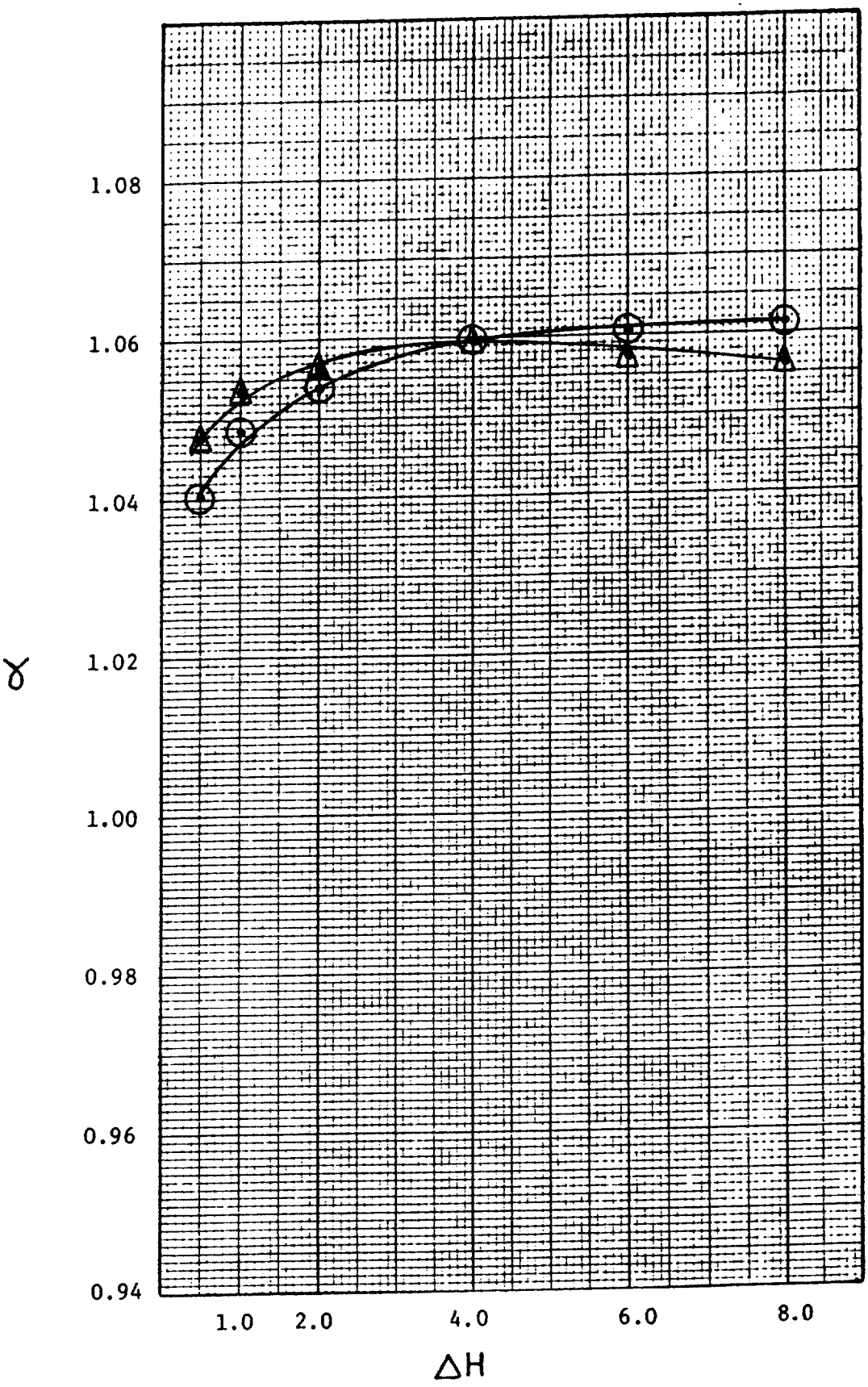
Operator(s) MOCZEK

Orfice Manometer Setting	Volume						Temperature				Elapsed Time
	Wet Test Meter			Dry Gas Meter			Wet Test	Dry Gas Meter			
	Start	Stop	Volume	Start	Stop	Volume	Meter	Inlet	Outlet	Average	
ΔH			V_w			V_d	T_w			T_d	θ
in. H_2O	ft^3	ft^3	ft^3	ft^3	ft^3	ft^3	°F	°F	°F	°F	min.
0.5	483.920	488.835	4.915	398.244	~~3~~ 403.254	5.010	COMB 60°	104 111 115	81 82 84	96.110 96.	11:16.04 11.2673
1.0	489.620	494.497	4.877	404.065	409.071	5.006		118 122 124	85 86 87	103.67 104	8:05.36 8.0883
2.0	494.800	504.533	9.733	409.372	419.390	10.018		123 128 130	88 89 91	108.10 108	11.37.22 11.6203
4.0	506.324	515.041	9.720	420.185	430.203	10.018		131 134 136	92 93 94	113.332 113	8:16.98 8.2830
6.0	516.170	525.955	9.785	431.357	441.432	10.075		134 134 135	95 95 96	114.833 115	6:51.73 6.8622
8.0	527.763	537.532	9.769	443.296	453.319	10.023	↓	131 133 135	97 97 98	115.167 115	5:56.91 5.9485

Staksamplr Calibration Calculations

ΔH	$P_b + \frac{\Delta H}{13.6}$	$T_w + 460$	$T_d + 460$	γ $\frac{V_w P_b (T_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(T_w + 460)}$	H@ $\frac{0.0317\,\Delta H}{P_b (T_d + 460)} \left[\frac{(T_w + 460)\,\theta}{V_w}\right]^2$
0.5	28.86	520	556.2	$\frac{(4.915)(28.82)(556.2)}{(5.010)(28.86)(520)} = 1.0479$	$\frac{(0.0317)(0.5)}{(28.82)(556.2)}\left[\frac{(520)(11.2673)}{(4.915)}\right]^2 = 1.4051$
1.0	28.89	520	563.7	$\frac{(4.877)(28.82)(563.7)}{(5.000)(28.89)(520)} = 1.0535$	$\frac{(0.0317)(1.0)}{(28.82)(563.7)}\left[\frac{(520)(8.0883)}{(4.877)}\right]^2 = 1.4512$
2.0	28.97	520	568.2	$\frac{(9.733)(28.82)(568.2)}{(10.018)(28.97)(520)} = 1.0516$	$\frac{(0.0317)(2.0)}{(28.82)(568.2)}\left[\frac{(520)(11.6203)}{(9.733)}\right]^2 = 1.4923$
4.0	29.11	520	573.3	$\frac{(9.720)(28.82)(573.2)}{(10.018)(29.11)(520)} = 1.0589$	$\frac{(0.0317)(4.0)}{(28.82)(573.3)}\left[\frac{(520)(8.2830)}{(9.720)}\right]^2 = 1.5069$
6.0	29.26	520	574.8	$\frac{(9.785)(28.82)(574.8)}{(10.075)(29.26)(520)} = 1.0574$	$\frac{(0.0317)(6.0)}{(28.82)(574.8)}\left[\frac{(520)(6.8622)}{(9.785)}\right]^2 = 1.5269$
8.0	29.41	520	575.2	$\frac{(9.769)(28.82)(575.2)}{(10.023)(29.41)(520)} = 1.0565$	$\frac{(0.0317)(8.0)}{(28.82)(575.2)}\left[\frac{(520)(5.9985)}{(9.769)}\right]^2 = 1.5338$

CONSOLE CALIBRATION



○ Before 9/4/92; Moczek
△ After 10/16/92; Moczek

APPENDIX VII

SO_X ANALYTICAL PROCEDURE

PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL RESOURCES

SO_x ANALYSIS FROM STATIONARY SOURCE EMISSIONS

LI 21

I. *Introduction*

The quantity of SO_x collected in emissions from a stationary source is determined gravimetrically by oxidizing the SO_2 absorbed in 5% NaOH to SO_4 with bromine water, precipitating it as $BaSO_4$ and weighing the resultant solid. Certain of the field testing supplies are prepared by the laboratory prior to their use by the Project Section. SO_x is reported as SO_2.

II. *Apparatus*

Analytical balance
Filtration equipment
Drying oven
Muffler furnace
Electrical hot plate

III. *Material*

Whatman #40, 9 cm filters (ashless)
Millipore .22μ filter, Cat. #GSWPO4700

Reagents:

a. 5% Sodium Hydroxide: Dissolve 50 gms NaOH pellets in distilled water and dilute to 1 liter.

b. 0.1% Methyl Red Indicator: Dissolve 0.1 gm methyl red in 100 ml of 95% ethyl alcohol.

c. Saturated Bromine Water: Add 500 ml distilled water to a reagent bottle and chill in a refrigerator for 3 to 4 hours. To this add 15 to 20 ml chilled liquid bromine. **Caution: Bromine should be handled only under the hood!**

d. 10% Barium Chloride: Dissolve 50 grams Barium Chloride, $BaCl_2.2H_2O$ in 500 ml distilled water.

e. Silver Nitrate Solution: Dissolve 1 gram of silver nitrate in 100 ml distilled water.

f. Concentrated Hydrochloric Acid

IV. *Pre-Test Preparation*

Collection Medium - 5% NaOH solution is supplied to the Project Section in a clean, sealable, plastic container to be used in the impingers as a collecting solution for SO_2 in the emission stack. The clean, unused portion of this, when returned to the lab by the Project Section, is used for the blank determination.

V. *Procedure - SO_2 Analysis*

From the point of collection to delivery to the laboratory the samples will be stored in ice water or in a refrigerated container to prevent loss of SO_2 from the collection medium.

1. In the laboratory - measure to the nearest ml, and record on the work sheet the liquid volume in each impinger. Transfer contents to a clean, sealed, identified container and refrigerate.

2. Thoroughly clean each impinger with a policeman and 5% NaOH solution adding washings to original contents of impinger. Measure and record as total volume the sum of the contents and washings for each impinger.

3. Place a 100 ml aliquot from the total volume of each impinger into a 400 ml, identified beaker. Dilute with 100 ml + 25 ml distilled H_2O and add saturated bromine water in 20 ml increments until the color of the bromine persists, indicating that all the SO_2 present in the sample has been oxidized to SO_4. Duplicate samples will be

analyzed whenever possible.

4. Boil solution until color disappears and no odor of bromine can be detected.

5. Add a few drops of methyl red indicator.

6. Neutralize with concentrated HCl to a pink end point and add 2-3 ml HCl in excess, making certain the pH is 5 or below.

7. Filter the sample through a .22μ millipore filter to eliminate particulate matter.

8. Heat sample to boiling and add hot 10% $BaCl_2$ solution *until no further precipitation occurs*. Stir.

9. Allow the precipitate to settle and add a few more drops hot 10% $BaCl_2$ solution to test completeness of precipitation.

10. Digest the precipitates for 3 hours $\pm$ 30 minutes at 60°C.

11. Filter through a Whatman #40 filter paper.

12. Transfer all traces of the precipitate to the filter paper using a policeman and washing with distilled water.

13. Wash the ppt on the filter paper with repeated washings of hot distilled water until the filtrate gives a negative test for chloride with silver nitrate test solution.

14. Weigh and identify a crucible which has been heated in a muffle furnace to a constant weight at 900°C and desiccated until cool. Record weight on work sheet.

15. Place filter with precipitate in crucible and place in muffle furnace raising the temperature to 300°C and holding for 30 minutes $\pm$ 5 minutes before raising temperature to 900°C for one hour.

16. Place in desiccator until cool, weigh and record weight on work sheet.

17. Run a blank of 100 ml 5% NaOH collecting solution through the entire process and record appropriate weights on work sheet.

18. Run a 100 ml 5% NaOH containing a known amount of SO_4 as a standard.

19. Steps 1 through 16 are repeated for each impinger in test. Each filter is soaked in 100 ml and 5% NaOH and carried through steps 3 through 16. All washings are aliquoted and carried through 3 through 16.

Calculations:

Wt. of crucible after burning filter -- empty wt. of crucible = wt. of $BaSO_4$

$$\text{Wt. } SO_2 = (\text{wt. of } BaSO_4 - \text{blank})\,(0.27446)\,\frac{\text{Final Volume}}{\text{Aliquot}}$$

$$\frac{SO_2}{BaSO_4} = 0.27446$$

Above is calculated for each impinger, filter, wash, etc. and results are totaled for total SO_2 in test.

Note: A 100 ml solution containing the equivalent of .5 to 1 gm of SO_2 + .001 gm is prepared from Na_2So_4. This solution is carried through steps 3 through 16.

Revised 10-75
6-76

APPENDIX K

OEPA STACK TEST REVIEW SUMMARY FORM

APPLICATION NUMBER 1702000183 P901

FACILITY NAME Lash Excavating & Paving

SOURCE DESCRIPTION (OR SCC CODE) 100 ton/hr drum mix asphalt plant - PORTABLE

CONTROL EQUIPMENT Venturi scrubber

DATE(S) OF TEST 10/14-15/92

FINAL TEST REPORT RECEIVED ON 10/30/92

POLLUTANT(S) TESTED TSP & SO_2 per LAAPC procedure

TEST METHOD 1-5 for PM &

TEST FIRM Tra-Det Inc

EMISSION RATES*: .074 #/hr. 5.17 #/hr SO_2

ACTUAL (lb(s)/hr) .0074 grs/DSCF ALLOWABLE** 0.04 gr/DSCF PM

OPERATING RATES*:

DURING TEST** 85 T/HR. MAXIMUM** 100 T/HR

EMISSION FACTOR*** .0009 #SO_2/ton & .004 # PM/ton

COMMENTS: Audit samples have been ordered for future tests

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:

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

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

10/02/92
DATE OF REVIEW

Kenneth A Strong
REVIEWED BY

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

SOURCE NAME: ASH EXCAVATING & ASPHALT PAVING PLANT

ADDRESS:

CITY: MARTINS FERRY | STATE: OH | ZIP:

PHONE: | SOURCE ID NUMBER:

PROCESS EQUIPMENT: ASPHALT DRUM MIXER | OPERATING MODE:

CONTROL EQUIPMENT: VENTURI SCRUBBER | OPERATING MODE: 75 GAL PER MIN

DESCRIBE EMISSION POINT
START: STACK STOP: STACK

HEIGHT ABOVE GROUND LEVEL START: STOP: | HEIGHT RELATIVE TO OBSERVER START: 15' STOP: 15'

DISTANCE FROM OBSERVER START: 50' STOP: 50' | DIRECTION FROM OBSERVER START: SW STOP: SW

DESCRIBE EMISSIONS
START: PARTICULATE STOP: PARTICULATE

EMISSION COLOR START: WHITE STOP: WHITE | PLUME TYPE: CONTINUOUS ☐ FUGITIVE ☐ INTERMITTENT ☐

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

POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED
START: 15' Above STACK STOP: 15' Above STACK

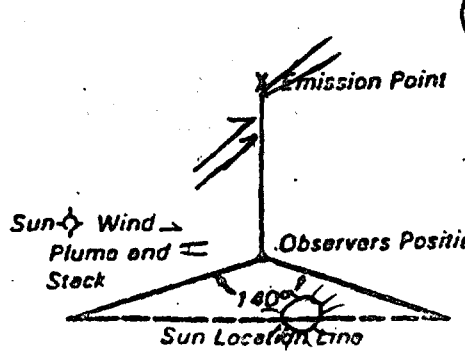
DESCRIBE BACKGROUND
START: SKY STOP: SKY

BACKGROUND COLOR START: GRAY/BLUE STOP: GRAY/BLUE | SKY CONDITIONS START: PC STOP: PC

WIND SPEED START: 2-4 STOP: 2-4 | WIND DIRECTION GOING START: E STOP: E

AMBIENT TEMP. START: STOP: | WET BULB TEMP. | RH,percent

Source Layout Sketch — Draw North Arrow



SEC / MIN	0	15	30	45	MIN	0	15	30	45
	10-14-92					12:30 PM			12:45 PM
1	0	0	0	0	31				
2	0	0	0	0	32				
3	0	0	0	0	33				
4	0	0	0	0	34				
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					46				
17					47				
18					48				
19					49				
20					50				
21					51				
22					52				
23					53				
24					54				
25					55				
26					56				
27					57				
28					58				
29					59				
30					60				

AVERAGE OPACITY FOR HIGHEST PERIOD | NUMBER OF READINGS ABOVE % WERE

RANGE OF OPACITY READINGS MINIMUM | MAXIMUM

OBSERVER'S NAME (PRINT): RICHARD KLASIC

OBSERVER'S SIGNATURE: Richard Klasic | DATE: 10-14-92

ORGANIZATION: N.O.V.A.

CERTIFIED BY: ETA | DATE: 9-13-92

VERIFIED BY | DATE

COMMENTS

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS
SIGNATURE | DATE

SOURCE NAME
LASH EXCAVATING & PAVING ASPHALT PLANT | 10-14-92 | 5:20 PM | 6:20 PM

ADDRESS

CITY: MARTINS FERRY | STATE: OH | ZIP:

PHONE | SOURCE ID NUMBER

PROCESS EQUIPMENT: ASPHALT DRUM MIXER | OPERATING MODE:

CONTROL EQUIPMENT: VENTURI SCRUBBER | OPERATING MODE: 75 GAL PER MIN

DESCRIBE EMISSION POINT
START: STACK STOP: STACK

HEIGHT ABOVE GROUND LEVEL START: STOP: | HEIGHT RELATIVE TO OBSERVER START: 15' STOP: 15'

DISTANCE FROM OBSERVER START: 50' STOP: 50' | DIRECTION FROM OBSERVER START: SW STOP: SW

DESCRIBE EMISSIONS
START: PARTICULATE STOP: PARTICULATE

EMISSION COLOR START: WHITE STOP: WHITE | PLUME TYPE: CONTINUOUS ☐ FUGITIVE ☐ INTERMITTENT ☐

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

POINT IN THE PLUME AT WHICH OPACITY WAS DETERMINED
START: 15' ABOVE STACK STOP: 15' ABOVE STACK

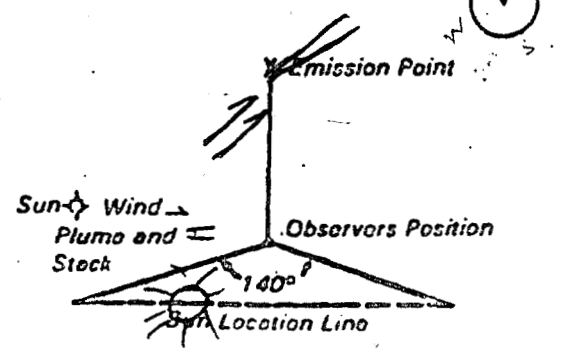
DESCRIBE BACKGROUND
START: SKY STOP: SKY

BACKGROUND COLOR START: BLUE (GRAY) STOP: BLUE | SKY CONDITIONS START: PC STOP: PC

WIND SPEED START: 5-8 STOP: 5-10 | WIND DIRECTION (blank) START: SE STOP: SE

AMBIENT TEMP. START: STOP: | WET BULB TEMP. | RH, percent

Source Layout Sketch — Draw North Arrow



SEC / MIN	0	15	30	45	SEC / MIN	0	15	30	45
1	0	0	0	0	31	0	0	0	0
2	0	0	0	0	32	0	0	0	5
3	0	0	0	0	33	0	0	0	5
4	0	0	0	0	34	0	0	0	5
5	0	0	0	0	35	0	0	0	0
6	0	0	5	5	36	0	0	5	0
7	0	0	0	5	37	0	0	0	0
8	0	5	5	0	38	0	0	5	0
9	0	0	0	0	39	0	0	0	0
10	0	0	0	0	40	0	0	0	0
11	0	0	0	0	41	0	0	5	0
12	0	0	0	0	42	5	0	0	0
13	0	0	0	0	43	0	0	0	0
14	0	0	0	0	44	0	0	0	0
15	0	0	0	0	45	0	0	0	0
16	0	0	0	0	46	0	0	0	0
17	0	0	0	0	47	0	0	0	0
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19	0	0	0	0	49	0	0	5	0
20	0	0	0	0	50	0	0	0	0
21	0	0	0	0	51	0	0	0	0
22	5	0	5	0	52	0	0	0	0
23	0	5	0	0	53	0	0	0	0
24	5	0	0	0	54	0	0	0	0
25	0	5	0	0	55	0	5	0	0
26	0	0	0	0	56	0	0	5	0
27	0	0	0	0	57	0	0	0	0
28	0	0	0	0	58	0	0	0	0
29	0	0	0	0	59	0	0	5	0
30	0	0	0	0	60	0	0	0	0

AVERAGE OPACITY FOR HIGHEST PERIOD | NUMBER OF READINGS ABOVE % WERE

RANGE OF OPACITY READINGS MINIMUM | MAXIMUM

OBSERVER'S NAME (PRINT): RICHARD KLASIC

COMMENTS

OBSERVER'S SIGNATURE: Richard Klasic | DATE: 10-14-92

ORGANIZATION: N.O.V.A.A.

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS
SIGNATURE | DATE

CERTIFIED BY: ETA | DATE: 9-13-92

VERIFIED BY | DATE