Commonwealth of Pennsylvania
Environmental Resources
February 12, 1993

Subject: Source Test Review

To: Data File
[redacted] Lancaster County

From: Richard St. Louis, Chief
Source Testing Section
Division of Source Testing and Monitoring
Bureau of Air Quality Control

Through: Acting Chief, Division of Source Testing and Monitoring

Cyclean operates a Standard Havens drum mix asphalt plant in Rapho Township, Lancaster County. The facility has a rated capacity of 250 tons per hour and it produces asphalt used to cement road pavements. The plant utilizes recycled asphalt that is injected in the middle of the rotating drum dryer. Hot asphalt oil is then added to the asphalt after exiting the drum mixer to bind the mixture together.

The effluent gases are drawn from the dryer through a baghouse consisting of a pulse jet system to clean the baghouse. The particular matter collected by this baghouse is reinjected into the drum mixer. The effluent then exits the baghouse and discharges to the atmosphere through a 4.5 feet diameter stack.

Ramcon Environmental Corporation conducted a particulate emission and a visible emission test utilizing EPA Method Nos. 5 and 9, respectively. Each test consisted of three runs in the baghouse outlet stack and conducted on October 15, 1992. Both tests appear to have been conducted in accordance with a preapproved protocol. The calculations are correct and the results appear to be valid and are acceptable to the Department.

The following data was extracted from the test report:

Particulate Emission Test

Test Run No.	Run #1	Run #2	Run #3	Allowable
Test Date	10/15/92	10/15/92	10/15/92	N/A
Concentration (gr/dscf)	0.0027	0.0020	0.0030	0.04
Mass Rate (lb/hr)	1.07	0.80	1.26	N/A
Opacity %	0	0	0	20

cc: Ronald M. Davis, Southcentral Regional Office
Permit No. 36-303-027
Reading File - Source Testing
EPA/RSL
Jim Benson, C & E

RS:kmh

Environmental Resources
January 08,1993

SUBJECT: Source Test Review
Cyclean, Inc.
36-303-027
Rapho Township, Lancaster County

TO: L. Blaine DeHaven, Chief
Source Test and Monitoring Section
Division of Technical Services and Monitoring

FROM: Ronald M. Davis
Air Pollution Control Engineer
Southcentral Regional Office

Please review the attached source tests which were conducted as a fulfillment of Conditions 6 through 11 of Plan Approval 36-303-027. Ramcon dicussed the pretest protocol with Rick St. Louis.

The following should be considered when reviewing these tests:

1. The test was performed to demonstrate compliance with Subpart I of the NSPS.

2. I observed part of the testing conducted by the Ramcon personnel. If you have any questions feel free to contact me or the company.

File No. 36-303-027

2/22

SOURCE SAMPLING
for
PARTICULATE EMISSIONS

CYCLEAN, INC.
MT. HOPE, PENNSYLVANIA
October 15, 1992

Charlie Brown
Cyclean, Inc.

W. J. Sewell
William Joseph Sewell, II
Vice President

RAMCON

ENVIRONMENTAL CORPORATION

October 26, 1992

Mr. Charlie Brown
Cyclean, Inc.
1000 S. Interstate 35
Roundrock, Texas 78681

RE: Particulate Emissions Test: October 15, 1992

Dear Mr. Brown:

Enclosed you will find four copies of our report on the particulate emissions test we conducted at your asphalt plant located in Mt. Hope, Pennsylvania. Based on our test results, the average grain loading of the three test runs do pass both EPA New Source Performance Standards and those set by the State of Pennsylvania. Therefore, the plant is operating in compliance with Federal and State Standards.

You will want to sign the report covers and send two copies to:

Mr. Ron Davis
South Central Region
Air Quality Control Bureau
Pennsylvania Department of
Environmental Resources
One Ararat Blvd.
Harrisburg, PA 17110

You will need to keep one copy of the report at the plant.

We certainly have enjoyed working with you. Please let us know if we can be of further assistance.

Sincerely,

William Joseph Sewell, II
Vice President

WJSii:wpc
Enclosures

RAMCON BUILDING, 6707 FLETCHER CREEK COVE, MEMPHIS, TENNESSEE 38134
TELEPHONE 800/458-4567 IN TENNESSEE 901/387-0500 FAX 901/387-0400

TABLE OF CONTENTS

SECTION A:

1. INTRODUCTION
2. TEST RESULTS
3. TEST PROCEDURES

SECTION A.

1. INTRODUCTION

On October 15, 1992 personnel from RAMCON Environmental Corporation conducted a source emissions test for particulate emissions compliance at Cyclean, Inc.'s Standard Havens drum-mix asphalt plant located in Mt. Hope, Pennsylvania. RAMCON personnel conducting the test were Tommy Crook, Team Leader, and Mickey Phillips. Tommy South was responsible for the laboratory analysis including taring the beakers and filters and recording final data in the laboratory record books. Custody of the samples was limited to Mr. Crook and Mr. South.

The purpose of the test was to determine if the rate of particulate emissions from this plant's baghouse is below or equal to the allowable N.S.P.S. emissions limit set by US EPA and the State of Pennsylvania.

2. TEST RESULTS

Table I summarizes the test results. The grain loading limitation for EPA is .04 gr/dscf as specified in 39 FR 9314, March 8, 1974, 60.92 Standards for Particulate Matter (1), as amended. The allowable emissions for the State of Pennsylvania are the same as those set by EPA.

Mr. Ron Davis of Pennsylvania's Dept. of Environmental Resources, Bureau of Air Quality Control observed the testing conducted by RAMCON Environmental. Ms. Karen Paige of Cyclean, Inc. conducted the opacity test which ranged from 0% to 5% on all three runs and therefore meets N.S.P.S. requirements.

SUMMARY OF TEST RESULTS

TABLE I

October 15, 1992

Test Run	Time	Allowable Emissions gr/dscf	Isokinetic Variation	Emissions lbs/hr
1	07:48 - 08:57	.0027	95.3%	1.07
2	10:14 - 11:22	.0020	102.2%	0.80
3	12:58 - 14:06	.0030	104.4%	1.26
	Average:	.0026		1.04

On the basis of these test results, the average grain loading of the three test runs is below the .04 gr/DSCF allowable emissions limitation set by EPA and the State of Pennsylvania. Therefore, the plant is operating in compliance with State and Federal Standards.

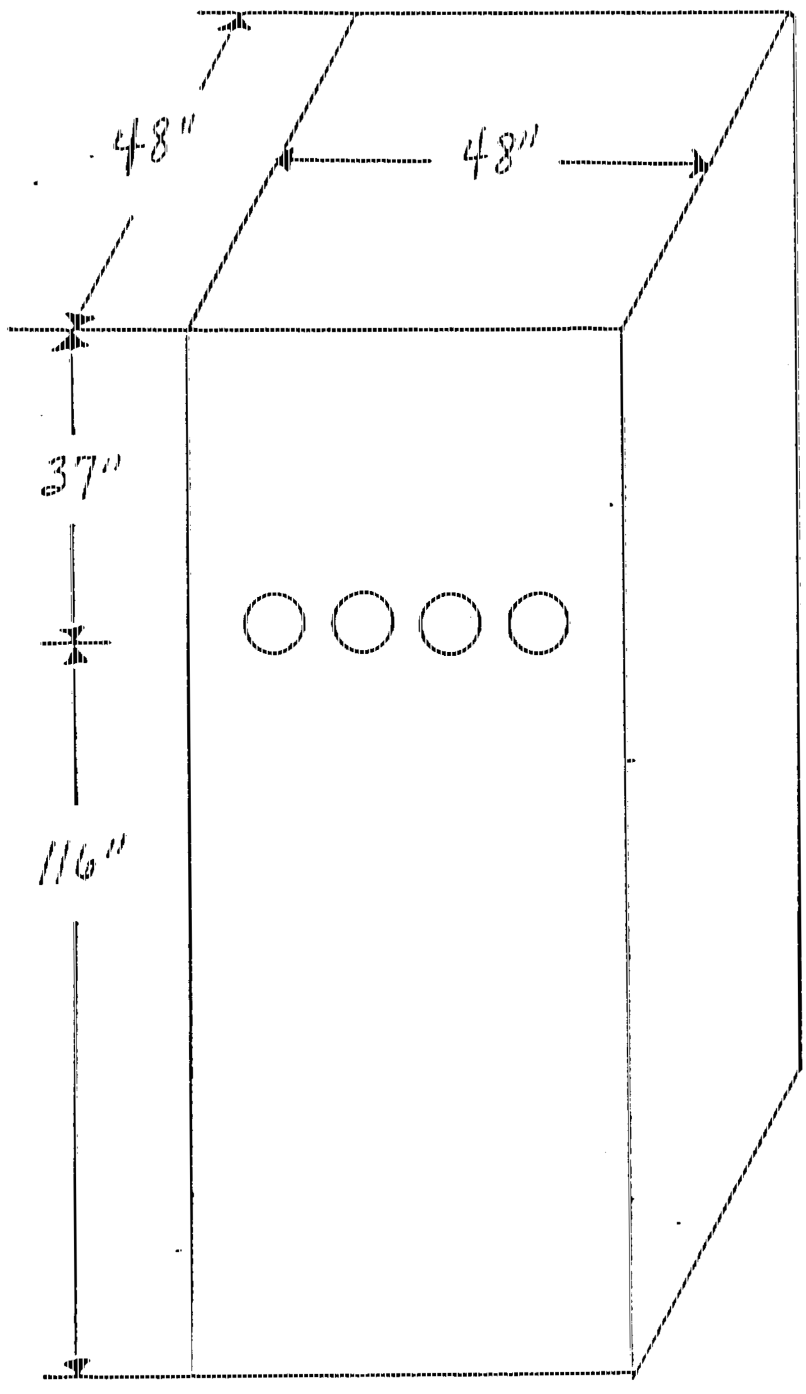
3. TEST PROCEDURES

(a) Method Used: Method 5 source sampling was conducted in accordance with requirements of the U.S. Environmental Protection Agency as set forth in 39 FR 9314, March 8, 1974, 60.93, as amended.

(b) Problems Encountered: No problems were encountered that affected testing.

(c) Sampling Site: The emissions test was conducted after a baghouse on a rectangular stack measuring 48" x 48" with an equivalent diameter of 48". Four (4) sampling ports were placed 37" down (1.2 diameters upstream) from the top of the stack and 116" up (3.6 diameters downstream) from the last flow disturbance. The ports were evenly spaced on 12" centers. The two outside ports are 6" from the side walls of the stack. Thirty-two (32) points were sampled, 8 through each port for two (2) minutes each.

Points on a Diameter	Probe Mark
1	3"
2	9"
3	15"
4	21"
5	27"
6	33"
7	39"
8	45"



SECTION B:

THE SOURCE

B. THE SOURCE

Cyclean, Inc. employs a Standard Havens drum mix asphalt plant which is used to manufacture hot mix asphalt for road pavement. The process consists of blending prescribed portions of cold feed materials (sand, gravel, screenings, chips, etc.) uniformly and adding sufficient hot asphalt oil to bind the mixture together. After the hot asphalt mix is manufactured at the plant, it is transported to the location where it is to be applied. The hot asphalt mix is spread evenly over the surface with a paver then compacted with a heavy roller to produce the final product.

The following is a general description of the plant's manufacturing process: The cold feed materials (aggregate) are dumped into separate bins which in turn feed a common continuous conveyor. The aggregate is dispensed from the bins in accordance with the desired formulation onto the cold feed system conveyor, to an inclined weigh conveyor, then to a rotating drum for continuous mixing and drying at approximately 300°F. When recycled asphalt mix is used, it is added halfway down the drum through a separate conveyor. The required amount of hot asphalt oil is then injected onto and mixed into the dried aggregate. The now newly formed hot asphalt mix is pulled to the top of a storage silo by a conveyor. The hot asphalt mix is then discharged from the storage silo through a slide gate into waiting dump trucks which transports the material to a final destination for spreading. The rated capacity of the plant will vary with each aggregate mix and moisture content with a 5% surface moisture removal.

The drum mixer uses a burner fired with propane to heat air to dry the aggregate, and the motion of the rotating drum to blend the aggregate. The air is drawn into the system via an exhaust fan. After passing through the gas burner and the mixing drum, the air passes through a baghouse. The exhaust gases are drawn through the baghouse and discharged to the atmosphere through the stack. The design pressure drop across the tube sheet is 2-6 inches of water. The particulate matter, which is removed by the baghouse, is reinjected into the drum mixer.

DATA ON FACILITY BEING STACK TESTED

COMPANY NAME Cyclean Inc. COMPANY REP. ______ PHONE ( ) ______

LOCATION OF FACILITY ______ PA. ORIGINAL START-UP DATE ______ DESIGNED CAPACITY ______

OEM ______ MODEL NO. ______ TYPE ______ AC TYPE ______

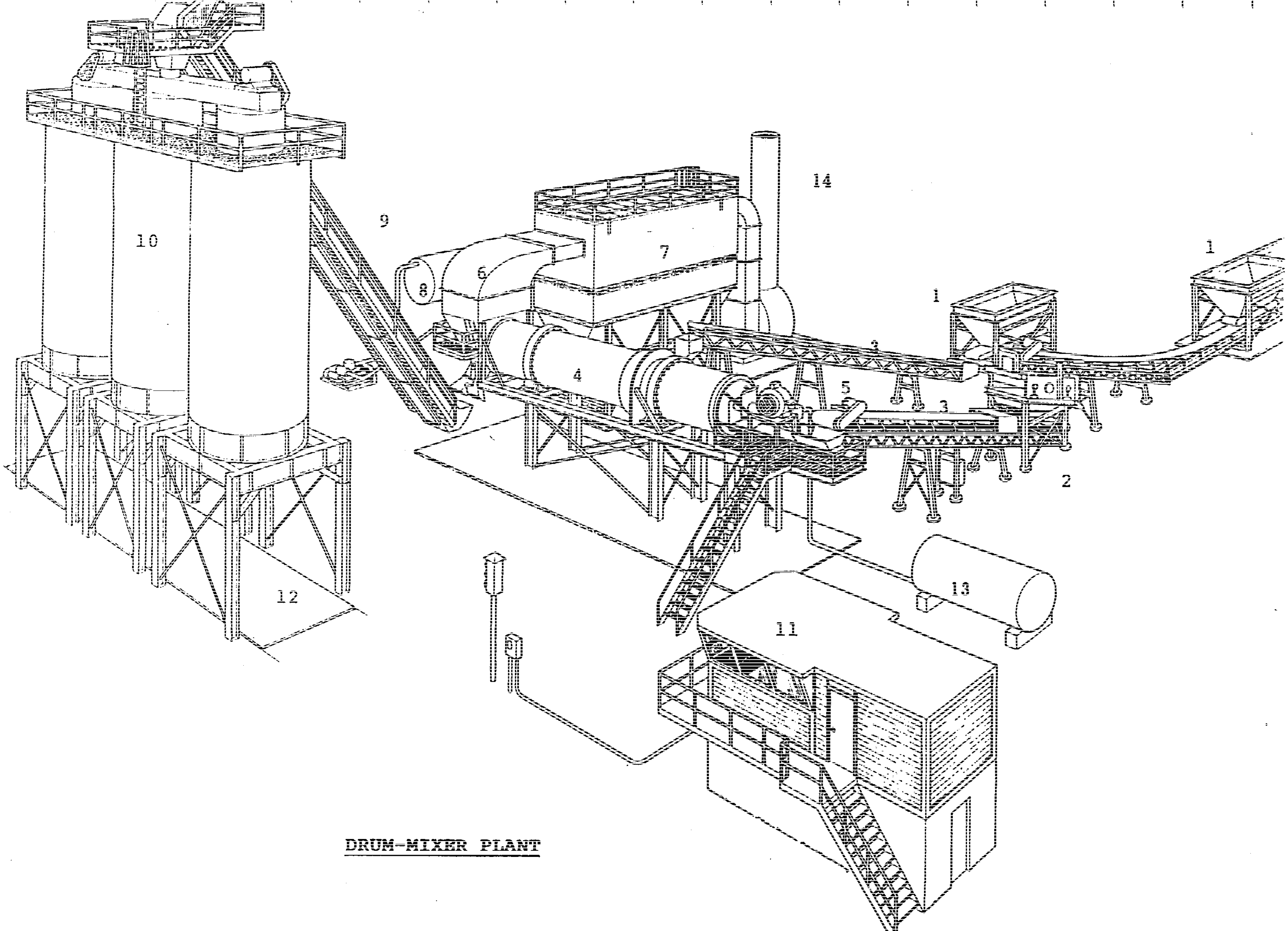
1 Time (24 HR) NOTE: check small box in column when moisture sample is taken		2 Fuel Use: #Fuel Oil __ Nat. Gas __ Propane ✓ Coal __ other	3 Drum Burner Setting	4 Blower Pressure	5 Production Rate: Mix Aggregate TPH	5 Production Rate: ✓ RAP TPH	6 REJ. ~~Asphalt Cement~~ % .7%	7 Mix Temp. °F	8 Exhaust Gas Temp. °F	9 Venturi Scrubber / Baghouse: Pressure Drop in w.g.	9 Water Pressure psi	10 Ambient Temp. °F	11 Relative Humidity %	12 Exhaust Damper Position
7:00			1150			156		323	1325	.8				68
7:15			1175			160		306	1332	.8				68
7:30			1175			160		320	1342	.8				68
7:45	*		1175			160		320	1322	.8				72
8:00			1175			160		311	1309	.8				72
8:15			1175			160		315	1314	.9				72
8:30			1175			170		315	1332	.9				72
8:45			1175			168		309	1329	.9				72
9:00			1175			171		309	1340	.9				72
9:15			1175			170		315	1336	.9				72
		2nd Test												
10:15			1200			170		306	1316	.9				75
10:30			1200			165		310	1326	.9				75
10:45			1200			174		320	1353	.9				75
11:00			1200			171		320	1325	.9				75
11:15			1200			169		304	1324	1.0				75
11:30			1200			165		304	1311	1.0				75

Moisture 3.8%

CYCLEAN INC.
PA.

1 Time (24 HR) NOTE: check small box in column when moisture sample is taken	2 Fuel Use #Fuel Oil Nat. Gas Propane ✓ Coal other	3 DRUM Burner Setting	4 Blower Pressure	5 Production Rate Mix Aggregate TPH	5 Production Rate ✓RAP TPH	6 REJ. ~~Asphalt~~ Cement % .7%	7 Mix Temp. °F	8 Exhaust Gas Temp. °F	9 Venturi Scrubber / Baghouse Pressure Drop in w.g.	9 Venturi Scrubber / Baghouse Water Pressure psi	10 Ambient Temp. °F	11 Relative Humidity %	12 Exhaust Damper Position %
	3RD Test												
1:00		1215			169		331	1320	1.0				81%
1:15		1200			167		327	1316	1.0				78%
1:30		1200			164		325	1330	1.1				75%
1:45		1200			170		327	1332	1.1				75%
2:00		1200			169		325	1343	1.1				75%

3.8% moisture



DRUM-MIXER PLANT

1. Aggregate bins: Virgin aggregate is fed individually into bins by type. It is metered onto a conveyor belt running under the bins to a shaker screen. The proportion to each aggregate type is determined by the job mix formula and pre-set to be metered out to meet these specifications.

2. Preliminary oversize screen: The aggregate is fed through a shaker screen where oversize rocks and foreign material is screened out of the mix.

3. Weigh conveyor belt: The aggregate is conveyed to the rotary drum dryer on a conveyor belt which weighs the material. The production rate is determined by this weight reading.

4. Rotary drum/dryer mixer: The aggregate is fed into the rotary drum dryer where it is tumbled by flighting into a veil in front of a flame which drives off the moisture. Further mixing is also accomplished in an outer shell of this drum. Hot liquid asphalt is injected in the outer shell of the drum where it is mixed with the aggregate.

5. Burner: The fuel fired burner is used to provide the flame which drys the aggregate.

6. Knock off baffling: A baffling plate is inserted in the "dirty" side plenum as a knock out for heavy particles in the air stream. These particles fall to the bottom of the baghouse.

7. Baghouse: The hot gases are pulled through the bags into the clean air plenum. The solid particulate matter is trapped on the dust coat buildup on the bags. A bag cleaning cycle consisting of jet burst of air from the inside (or clean air side) of the bags sends a large bubble of air down the inside of the bags shaking loose buildup on the bag surface. This particulate matter is collected at the bottom of the baghouse and reinjected into the drum mixer where it is used as part of the finished product.

8. Liquid asphalt storage: The liquid asphalt is stored in this heated tank until it is needed in the mixer. The amount of asphalt content and its temperature are pre-set for each different type job.

9. Conveyor to surge/storage bin: The finished product of aggregate mixed with liquid asphalt is conveyed to a surge bin.

10. Surge/Storage bin: The asphaltic cement is dumped into this surge bin and metered out to dump trucks which pull underneath a slide gate at the bottom of the bin.

11. Control/operators house: The entire plant operation is controlled from this operator's house.

12. Truck loading scale: As the trucks receive the asphalt from the storage/surge bin, they are weighed on the lading scale which tells the plant operator the amount of asphalt that is being trucked on each individual load.

13. Fuel storage.

14. Stack

SECTION C:

EQUIPMENT USED

EQUIPMENT USED

Equipment used to conduct the particulate emissions test was:

A. A Lear Siegler PM-100 stack sampler with appropriate auxiliary equipment and glassware (with train set up according to the schematic on the next page).

B. An Airguide Instruments Model 211-B (uncorrected) aneroid barometer for checking the barometric pressure.

C. Weston dial thermometers to check meter temperatures or an Analogic Model 2572 Digital Thermocouple to check stack temperatures.

D. A Hays 621 Analyzer to measure the oxygen, carbon dioxide and carbon monoxide content of the stack gases or, for non-combustion sources, a Bacharach Instrument Company Fyrite for gas analysis.

E. Schleicher and Schuell Type 1-HV filters with a porosity of .03 microns.

F. Reagent- or ACS-grade acetone with a residue of ≤ .001.

SECTION D:

LABORATORY PROCEDURES AND RESULTS

LABORATORY PROCEDURES FOR PARTICULATE SAMPLING

I. Field Preparation

A. FILTERS: Fiberglass 4" sampling filters are prepared as follows:

Filters are removed from their box and numbered on the back side with a felt pen. The numbering system is continuous from job to job. The filters are placed in a desiccator to dry for at least 24 hours. Clean plastic petri dishes, also numbered, top and bottom, are placed in the desiccator with the filters. After desiccation, the filters are removed, one at a time, and weighed on the Sartorius analytical balance then placed in the correspondingly numbered petri dish. Weights are then recorded in the lab record books. Three filters are used for each complete particulate source emissions test and there should be several extra filters included as spares.

B. SILICA GEL: Silica Gel used for the test is prepared as follows:

Approximately 200 g of silica gel is placed in a wide mouth "Mason" type jar and dried in an oven at 175°C for two hours. The open jars are removed and placed in a desiccator until cool for two hours and then tightly sealed. The jars are then numbered and weighed on the triple beam balance to the closest tenth of a gram. This weight is recorded for each sealed jar. The number of silica gel jars used is the same as the number of filters. Silica gel should be indicating type, 6-16 mesh.

II. Post - Testing Lab Analysis

A. FILTERS: The filters are returned to the lab in their sealed petri dishes. In the lab, the dishes are opened and placed into a desiccator for at least 24 hours. Then the filters are weighed continuously every six hours until a constant weight is achieved. All data is recorded on the laboratory forms that will be bound in the test report.

B. SILICA GEL: The silica gel used in the stack test is returned to the appropriate mason jar and sealed for transport to the laboratory where it is reweighed to a constant weight on a triple beam balance to the nearest tenth of a gram.

C. PROBE RINSINGS: In all tests where a probe washout analysis is necessary, this is accomplished in accordance with procedures specified in "EPA Reference Method 5". These samples are returned to the lab in sealed mason jars for analysis. The front half of the filter holder is washed in accordance with the same procedures and included with the probe wash. Reagent or ACS grade acetone is used as the solvent. The backhalf of the filter holder is washed with deionized water into the impinger catch for appropriate analysis.

D. IMPINGER CATCH: In some testing cases, the liquid collected in the impingers must be analyzed for solid content. This involves a similar procedure to the probe wash solids determination, except that the liquid is deionized water.

E. ACETONE: A blank analysis of acetone is conducted from the one gallon glass container used in the field preparation. This acetone was used in the field for rinsing the probe, nozzle, and top half of the filter holder. A blank analysis is performed prior to testing on all new containers of acetone received from the manufacturer to insure that the quality of the acetone used will be exceed the .001% residual purity standard.

SPECIAL NOTE

When sampling sources high in moisture content, (such as asphalt plants) the filter paper sometimes sticks to the filter holder. When removing the filter, it may tear. In order to maintain control of any small pieces of filter paper which may be easily lost, they are washed with acetone into the probe washing. This makes the filter weight light (sometimes negative) and the probe wash correspondingly heavier. this laboratory procedure is taught by EPA in the "Quality Assurance for Source Emissions Workshop" at Research Triangle Park and is approved by EPA.

WEIGHING PROCEDURE - SARTORIUS ANALYTICAL BALANCE

The Sartorius balance is accurate to 0.1 mg and has a maximum capacity of 200 grams. The balance precision (standard deviation) is 0.05 mg. Before weighing an item, the balance should first be zeroed. This step should be taken before every series of weighings. To do this, the balance should have all weight adjustments at the "zero" position. The beam arrest lever (on the lower left hand side toward the rear of the balance) is then slowly pressed downward to the full release position. The lighted vernier scale on the front of the cabinet should align with the "zero" with the mark on the cabinet. If it is not so aligned, the adjustment knob on the right hand side (near the rear of the cabinet) should be turned carefully until the marks align. Now return the beam arrest to the horizontal arrest position. The balance is now "zeroed".

To weigh an item, it is first placed on the pan. And the sliding doors are closed to avoid air current disturbance. The weight adjustment knob on the right hand side must be at "zero". The beam arrest is then slowly turned upward. The lighted scale at the front of the cabinet will now indicate the weight of the item in grams. If the scale goes past the divided area, the item then exceeds 100 g weight (about 3 1/2 ounces) and it is necessary to arrest the balance (beam arrest lever) and move the lever for 100 g weight away from you. It is located on the left hand side of the cabinet near the front, and is the knob closest to the side of the cabinet. The balance will not weigh items greater than 200 grams in mass, and trying to do this might harm the balance. Remember, this is a delicate precision instrument.

After the beam is arrested in either weight range, the procedure is the same. When the weight of the item in grams is found, "dial in" that amount with the two knobs on the left hand side (near the 100 g lever) color coded yellow and green. As you dial the weight, the digits will appear on the front of the cabinet. When the proper amount is dialed, carefully move the arrest lever down with a slow, steady turn of the wrist. The lighted dial will appear, and the right hand side knob (front of cabinet) is turned to align the mark with the lower of the two lighted scale divisions which the mark appears between. when these marks are aligned, the two lighted digits along with the two indicated on the right hand window on the cabinet front are fractional weight in grams (the decimal would appear before the lighted digits) and the whole number of grams weight is the amount "dialed in" on the left.

In general, be sure that the beam is in "arrest" position before placing weight on or taking weight off of the pan. Don't "dial in" weight unless the beam is arrested. The balance is sensitive to even a hand on the table near the balance, so be careful and painstaking in every movement while weighing.

CYCLEAN
Company Name

10-15-92
Date

REFERENCE METHOD 3: GAS ANALYSIS BY FYRITE

FUEL	F_o FACTORS
WOOD	1.0540
BARK	1.0830
ANTHRACITE	1.0699
BITUMINOUS	1.1398
LIGNITE	1.0761
OIL	1.3465
GAS	1.7489
PROPANE	1.5095
BUTANE	1.4791

$O_2\% = 20.9 - [F_o \times CO_2\%]$

RUN #1: ______ = 20.9 - [______ x ______]

RUN #2: ______ = 20.9 - [______ x ______]

RUN #3 ______ = 20.9 - [______ x ______]

RUN 1:	$CO_2\%$	/	$CO_2\%$	/	$CO_2\%$	/	AVG.	/
	$O_2\%$		$O_2\%$		$O_2\%$		AVG.	
	$N_2\%$		$N_2\%$		$N_2\%$		AVG.	
RUN 2:	$CO_2\%$	/	$CO_2\%$	/	$CO_2\%$	/	AVG.	/
	$O_2\%$		$O_2\%$		$O_2\%$		AVG.	
	$N_2\%$		$N_2\%$		$N_2\%$		AVG.	
RUN 3:	$CO_2\%$	/	$CO_2\%$	/	$CO_2\%$	/	AVG.	/
	$O_2\%$		$O_2\%$		$O_2\%$		AVG.	
	$N_2\%$		$N_2\%$		$N_2\%$		AVG.	

PENNSYLVANIA METHOD 5 ANALYSIS
ANALYSIS RESULTS SUMMARY

PLANT: CYCLEAN
LOCATION: PA

1. Particulate values used for emission determination:

	RUN 1	RUN 2	RUN 3
A. Method 5 filter weight (g)	.0054	.0046	.0064
B. Front-half acetone wash (g)	.0007	.0002	.0002
C. Front-half water wash (g)	.0003	.0001	.0010
D. Impinger catch filter (.22um) weight (g) Insoluble	.0036	.0030	.0049
TOTAL: (g)	0.0100	0.0079	0.0125

2. Particulate values reported only:

	RUN 1	RUN 2	RUN 2
E. Water filtrate weight (g)	0.0136	0.0240	0.0275
F. Back-half acetone wash (g)	0.0042	0.0055	0.0062
G. Back-half water wash (g)	0.0041	0.0035	0.0068
TOTAL: (g)	0.0219	0.0330	0.0405

F:\DONNA\FORMS\RESULTS.SUM

PENNSYLVANIA METHOD 5
SAMPLE ANALYTICAL DATA FORM

Company Name CYCLEAN

Sample Location PA

Blank Volume (V_a) 100 ml

Date/Time wt. blank 10/19 8:00A

Date/Time wt. blank 10/19 2:00p

Relative Humidity in Lab 49 %

Density of Acetone (ρ_a) .7852 mg/ml

Gross wt. 66.3071 g

Gross wt. 66.3071 g

Ave. Gross wt. 66.3071 g

Tare wt. 66.3070 g

Weight of blank (m_{ab}) .0001 g

Acetone blank residue concentration (C_a) : (C_a) = (m_{ab}) / (V_a) (ρ_a) = (.000001 mg/g)

Acetone Blank Wt. : $W_a = C_a V_{aw} \rho_a$ = (.000001) (300) (.7857) = (.0002 g)

		Run # 1	Run # 2	Run # 3
Acetone rinse volume (V_{aw})	ml	300	300	300
Date/Time of wt. 10/19 8:00A Gross wt.	g	161.7693	165.9962	165.0528
Date/Time of wt. 10/19 2:00p Gross wt.	g	161.7690	165.9958	165.0529
Average Gross wt.	g	161.7692	165.9960	165.0529
Tare wt.	g	161.7683	165.9956	165.0507
Less Acetone blank wt. (W_a)	g	.0002	.0002	.0002
Weight of particulate in acetone rinse (m_a)	g	.0007	.0002	.0002

Filter Numbers	#	TS 6515	TS 6546	TS 6547
Date/Time of wt. 10/19 8:00A Gross wt.	g	.5630	.5743	.5777
Date/Time of wt. 10/19 2:00p Gross wt.	g	.5630	.5740	.5775
Average Gross wt.	g	.5630	.5742	.5776
Tare wt.	g	.5576	.5696	.5712

Weight of particulate on filter (m_f) (ITEM A)	g	.0054	.0046	.0064
Weight of particulate in acetone rinse (m_a) (ITEM B)	g	.0007	.0002	.0002

NOTE: In no case should a blank residue greater than 0.01 mg/g (or 0.001% of the blank weight) be subtracted from the sample weight.

Remarks:

Signature of Analyst Thomas Smith Signature of Reviewer

D:\DONNA\FORMS\LAB\SAMPL2.TBL

PENNSYLVANIA FRONT HALF ANALYSIS:
Evaporation *F H_2O FRONT HALF WASH

COMPANY NAME: CYCLEAN DATE: 10/20/92

Relative humidity in lab 49 %

Blank volume of Water (Va) 150 ml

Date/Time wt. blank 10/22 9:00A Gross wt. 101.2921 g

Date/Time wt. blank 10/23 9:00A Gross wt. 101.2921 g

Ave. Gross wt. 101.2921 g

Tare wt. 101.2920 g

Weight of blank (M_{ab}) .0001 g

H_2O Blank Residue Concentration (C_a): $C_a = M_{ab}/V_a =$ .000001 mg/g

Blank Weight: $W_a = C_a V_{aw}$

		RUN 1	RUN 2	RUN 3
H_2O rinse volume (V_{aw})	ml	340	300	350
Date/Time of wt. 10/22 9:00A Gross wt.	g	101.5006	97.7569	112.5551
Date/Time of wt. 10/23 9:00A Gross wt.	g	101.5005	97.7569	112.5551
Avg. Gross wt.	g	101.5006	97.7569	112.5551
Tare wt.	g	101.5000	97.7565	112.5537
Weight of Front Half particulate from water wash	g	.0006	.0004	.0014
Less Blank wt (W_a)	g	.0003	.0003	.0004
Total weight of particulate (m_n) in H_2O Fronthalf wash (ITEM C)	g	.0003	.0001	.0010

Remarks:

*SEE FILTRATION ANALYSIS

Signature of Analyst: Thomas Scott

Signature of Reviewer:

D:\DONNA\FORMS\LAB\50.TBL

PENNSYLVANIA BACK-HALF (METHOD 5)

FILTRATION ANALYSIS

Company Name: CYCLEAN	RUN #1	RUN #2	RUN #3
Filter Size (µm): 0.8			
Date/Time of wt. 10/18 11:00 Gross wt.	.0777	.0823	.0790
Date/Time of wt. 10/20 10:00 Gross wt.	.0774	.0820	.0789
Filter Ave. Gross wt.	.0776	.0822	.0790
Filter Tare wt.	.0761	.0800	.0783
Net	.0015	.0022	.0007
Filter Size (µm): 0.8			
Date/Time of wt. 10/18 11:00 Gross wt.	.0749	.0800	.0770
Date/Time of wt. 10/20 10:00 Gross wt.	.0747	.0800	.0769
Filter Ave. Gross wt.	.0748	.0800	.0770
Filter Tare wt.	.0742	.0798	.0761
Net	.0006	.0002	.0009
Filter Size: (µm): 0.8			
Date/Time of wt. 10/18 11:00 Gross wt.	.0767	.0801	.0778
Date/Time of wt. 10/20 10:00 Gross wt.	.0767	.0801	.0776
Filter Ave. Gross wt.	.0767	.0801	.0777
Filter Tare wt.	.0765	.0800	.0751
Net	.0002	.0001	.0026
Filter Size (µm): .45			
Date/Time of wt. 10/18 11:00 Gross wt.	.0801	.0730	.0700
Date/Time of wt. 10/20 10:00 Gross wt.	.0801	.0730	.0700
Filter Ave. Gross wt.	.0801	.0730	.0700
Filter Tare wt.	.0800	.0730	.0698
Net	.0001	.0000	.0002
Filter Size (µm): .45			
Date/Time of wt. 10/18 11:00 Gross wt.	.0736	.0723	.0702
Date/Time of wt. 10/20 10:00 Gross wt.	.0736	.0721	.0702
Filter Ave. Gross wt.	.0736	.0722	.0702
Filter Tare wt.	.0733	.0721	.0700
Net	.0003	.0001	.0002
NET TOTAL:	— O	VER	—

Signature of Analyst: [illegible signature] Date: 10/23/92

Signature of Reviewer: Date:

PENNSYLVANIA BACK-HALF (METHOD 5)

FILTERATION ANALYSIS

Company Name: CYCLEAN	RUN #1	RUN #2	RUN #3
Filter Size (µm): 0.2			
Date/Time of wt. 10/19 1100A Gross wt.	.0875	.0828	.0887
Date/Time of wt. 10/20 1030A Gross wt.	.0874	.0827	.0887
Filter Ave. Gross wt.	.0875	.0878	.0887
Filter Tare wt.	.0868	.0876	.0887
Net	.0007	.0002	.0000
Filter Size (µm): 0.2			
Date/Time of wt. 10/19 1100A Gross wt.	.0869	.0873	.0885
Date/Time of wt. 10/20 1030A Gross wt.	.0869	.0871	.0886
Filter Ave. Gross wt.	.0869	.0872	.0886
Filter Tare wt.	.0869	.0871	.0884
Net	.0000	.0001	.0002
Filter Size: (µm): 0.2			
Date/Time of wt. 10/19 1100A Gross wt.	.0872	.0881	.0877
Date/Time of wt. 10/20 1030A Gross wt.	.0872	.0881	.0877
Filter Ave. Gross wt.	.0872	.0881	.0877
Filter Tare wt.	.0870	.0880	.0876
Net	.0002	.0001	.0001
Filter Size (µm):			
Date/Time of wt. Gross wt.			
Date/Time of wt. Gross wt.			
Filter Ave. Gross wt.			
Filter Tare wt.			
Net			
Filter Size (µm):			
Date/Time of wt. Gross wt.			
Date/Time of wt. Gross wt.			
Filter Ave. Gross wt.			
Filter Tare wt.			
Net			
NET TOTAL:	.0036	.0030	.0049

Signature of Analyst: Thomas Scott Date: 10/23/92

Signature of Reviewer: Date:

PENNSYLVANIA BACK HALF ANALYSIS:
Evaporation of Filtrate

COMPANY NAME: CYCLEAN   DATE: 10/20/92

Relative humidity in lab 49 %

Blank volume of Water (Va) 100 ml

Date/Time wt. blank 10/22 9:00A   Gross wt. 101.2922 g

Date/Time wt. blank 10/23 9:00A   Gross wt. 101.2922 g

Ave. Gross wt. 101.2922 g

Tare wt. 101.2920 g

Weight of blank (M_{ab}) .0002 g

H_2O Blank Residue Concentration (C_a) : $C_a = M_{ab}/V_a$ = .000002 mg/g

Blank Weight: $W_a = C_a V_{aw}$

		RUN 1	RUN 2	RUN 3
Filtrate volume (V_{aw})	ml	360	400	380
Date/Time of wt. 10/22 9:00A	Gross wt. g	102.1384	101.4239	102.3681
Date/Time of wt. 10/23 9:00A	Gross wt. g	102.1380	101.4240	102.3684
	Avg. Gross wt. g	102.1382	101.4240	102.3683
	Tare wt. g	102.1239	101.3992	102.3400
Weight of soluble particulate from water	g	.0143	.0248	.0283
Less Blank wt (W_a)	g	.0007	.0008	.0008
Total weight of soluble particulate in Filtrate (m_n) (ITEM E)	g	.0136	.0240	.0275

Remarks:

Signature of Analyst: Thomas Smith

Signature of Reviewer:

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PENNSYLVANIA BACK HALF ANALYSIS:
Evaporation of Backhalf Acetone Wash

COMPANY NAME: CYCLEAN DATE: 10/20/92

Relative humidity in lab 47 %

Blank volume of Acetone (Va) 100 ml

Date/Time wt. blank 10/21 3:00pm Gross wt. 66.3071 g

Date/Time wt. blank 10/22 9:00A Gross wt. 66.3071 g

Ave. Gross wt. 66.3071 g

Tare wt. 66.3070 g

Weight of blank (M_{ab}) .0001 g

Acetone Blank Residue Concentration (C_a : $C_a = (M_{ab})/V_a(P_a)$ = .000001 mg/g

Blank Weight: $W_a = C_a V_{aw} P_a$

		RUN 1	RUN 2	RUN 3
Acetone rinse volume (V_{aw})	ml	250	230	230
Date/Time of wt. 10/21 3:00P Gross wt.	g	98.6829	108.5944	101.1795
Date/Time of wt. 10/22 9:00A Gross wt.	g	98.6825	108.5942	101.1795
Avg. Gross wt.	g	98.6827	108.5943	101.1795
Tare wt.	g	98.6783	108.5886	101.1731
Weight of soluble particulate from Acetone	g	.0044	.0057	.0064
Less Blank wt (W_a)	g	.0002	.0002	.0002
Total weight of particulate in Acetone Backhalf Wash (m_a) (ITEM F)	g	.0042	.0055	.0062

Remarks:

Signature of Analyst: Thomas Smith

Signature of Reviewer:

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PENNSYLVANIA BACK HALF ANALYSIS:
Evaporation of Backhalf H_2O Wash

COMPANY NAME: CYCLEAN   DATE: 10/20/92

Relative humidity in lab 47 %

Blank volume of Water (Va) 100 mℓ

Date/Time wt. blank 10/22 9:00A   Gross wt. 101.2922 g

Date/Time wt. blank 10/23 9:00A   Gross wt. 101.2922 g

Ave. Gross wt. 101.2922 g

Tare wt. 101.2920 g

Weight of blank (M_{ab}) .0002 g

H_2O Blank Residue Concentration (C_a) : $C_a = M_{ab}/V_a =$ .000002 mg/g

Blank Weight: $W_a = C_a V_{aw}$

		RUN 1	RUN 2	RUN 3
Impinger rinse volume (V_{aw})	mℓ	240	240	235
Date/Time of wt. 10/22 9:00A Gross wt.	g	161.5358	154.4800	165.9222
Date/Time of wt. 10/23 9:00A Gross wt.	g	161.5358	154.4801	165.9220
Avg. Gross wt.	g	161.5358	154.4801	165.9221
Tare wt.	g	161.5348	154.4791	165.9197
Weight of soluble particulate from water	g	.0010	.0010	.0024
*Total Weight of insoluble particulate on Filters	g	.0036	.0030	.0049
Less Blank wt (W_a)	g	.0005	.0005	.0005
Total weight of particulate in H_2O Backhalf Wash (m_n) (ITEM G)	g	.0041	.0035	.0068

Remarks:

*SEE FILTRATION ANALYSIS

Signature of Analyst: Thomas Smith

Signature of Reviewer:

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SECTION E:

CALCULATIONS

CYCLEAN, INC.
MT. HOPE, PENNSYLVANIA

SUMMARY OF TEST DATA

		10-15-92	10-15-92	10-15-92
		RUN #1	RUN #2	RUN #3
SAMPLING TRAIN DATA				
	start	07:48	10:14	12:58
	finish	08:57	11:22	14:06
1. Sampling time, minutes	Θ	60.0	60.0	60.0
2. Sampling nozzle diameter, in.	D_n	.2500	.2500	.2500
3. Sampling nozzle cross-sect. area, ft^2	A_n	.000340	.000340	.000340
4. Isokinetic variation	I	95.3	102.2	104.4
5. Sample gas volume - meter cond., cf.	V_m	57.862	60.986	66.316
6. Average meter temperature, ^oR	T_m	551	543	548
7. Avg. oriface pressure drop, in. H_2O	dH	2.34	2.67	3.10
8. Total particulate collected, mg.	M_n	10.00	7.90	12.50
VELOCITY TRAVERSE DATA				
9. Stack area, ft^2.	A	16.00	16.00	16.00
10. Absolute stack gas pressure, in. Hg.	P_s	30.01	30.01	30.01
11. Barometric pressure, in. Hg.	P_{bar}	30.01	30.01	30.01
12. Avg. absolute stack temperature, R^o	T_s	1785	1742	1762
13. Average -\/vel. head, (C_p= .84)	-\/dP	1.75	1.74	1.81
14. Average stack gas velocity, ft./sec.	V_s	187.01	183.96	191.67
STACK MOISTURE CONTENT				
15. Total water collected by train, ml.	V_{ic}	176.20	202.40	179.10
16. Moisture in stack gas, %	B_{ws}	12.83	13.59	11.42
EMISSIONS DATA				
17. Stack gas flow rate, dscf/hr.(000's)	Q_{sd}	2785	2783	2939
18. Stack gas flow rate, cfm	acfm	179530	176602	184003
19. Particulate concentration, gr/dscf	C_s	0.0027	0.0020	0.0030
20. Particulate concentration, lb/hr	E	1.07	0.80	1.26
21. Particulate concentration, lb/mBtu	E'	0.00000	0.00000	0.00000
ORSAT DATA				
22. Percent CO_2 by volume	CO_2	1.00	1.00	1.00
23. Percent O_2 by volume	O_2	.00	.00	.00
24. Percent CO by volume	CO	.00	.00	.00
25. Percent N_2 by volume	N_2	99.00	99.00	99.00

Format: summryR3

Dry Gas Volume

$$V_{m(std)} = V_m \left[\frac{T_{(std)}}{T_m} \right] \left[\frac{P_{bar} + \frac{dH}{13.6}}{P_{(std)}} \right] = 17.64 \frac{^{o}R}{in.Hg} \; Y \; V_m \left[\frac{P_{bar} + \frac{dH}{13.6}}{T_m} \right]$$

Where:

$V_{m(std)}$ = Dry Gas Volume through meter at standard conditions, cu. ft.

V_m = Dry Gas Volume measured by meter, cu. ft.

P_{bar} = Barometric pressure at oriface meter, in. Hg.

P_{std} = Standard absolute pressure,(29.92 in. Hg.).

T_m = Absolute temperature at meter ^{o}R.

T_{std} = Standard absolute temperature ($528^{o}R$).

dH = Average pressure drop across oriface meter, in. H_2O.

Y = Dry gas meter calibration factor.

13.6 = Inches water per inches Hg.

RUN 1:

$$V_{m(std)} = (17.64)(1.009)(\ 57.862) \left[\frac{(30.01) + \frac{2.34}{13.6}}{551} \right] = 56.413 \text{ dscf}$$

RUN 2:

$$V_{m(std)} = (17.64)(1.009)(\ 60.986) \left[\frac{(30.01) + \frac{2.67}{13.6}}{543} \right] = 60.383 \text{ dscf}$$

RUN 3:

$$V_{m(std)} = (17.64)(1.009)(\ 66.316) \left[\frac{(30.01) + \frac{3.10}{13.6}}{548} \right] = 65.130 \text{ dscf}$$

Total Contaminants by Weight: GRAIN LOADING
Compliance Determination

Particulate concentration C_s' gr./dscf.

$$C_s' = \left[0.0154 \frac{gr}{mg}\right] \left[\frac{M_n}{V_{m(std)}}\right]$$

Where:

C_s' = Concentration of particulate matter in stack gas, dry basis, corrected to standard conditions, gr./dscf.

M_n = Total amount of particulate matter collected, mg.

$V_{m(std)}$ = Dry gas volume through meter at standard conditions, cu. ft.

Run 1:

$$C_s' = \left[0.0154 \frac{gr}{mg}\right] \left[\frac{10.00}{56.413}\right] = 0.0027 \text{ gr./dscf.}$$

Run 2:

$$C_s' = \left[0.0154 \frac{gr}{mg}\right] \left[\frac{7.90}{60.383}\right] = 0.0020 \text{ gr./dscf.}$$

Run 3:

$$C_s' = \left[0.0154 \frac{gr}{mg}\right] \left[\frac{12.50}{65.130}\right] = 0.0030 \text{ gr./dscf.}$$

Total Contaminants by Weight: GRAIN LOADING
Reported Values for Pennsylvania

Particulate concentration C_s' gr./dscf.

$$C_s' = \left[0.0154 \frac{gr}{mg} \right] \left[\frac{M_n}{V_{m(std)}} \right]$$

Where:

C_s' = Concentration of particulate matter in stack gas, dry basis, corrected to standard conditions, gr./dscf.

M_n = Total amount of particulate matter collected, mg.

$V_{m(std)}$ = Dry gas volume through meter at standard conditions, cu. ft.

Run 1:

$$C_s' = \left[0.0154 \frac{gr}{mg} \right] \left[\frac{21.90}{56.413} \right] = 0.0060 \text{ gr./dscf.}$$

Run 2:

$$C_s' = \left[0.0154 \frac{gr}{mg} \right] \left[\frac{33.00}{60.383} \right] = 0.0084 \text{ gr./dscf.}$$

Run 3:

$$C_s' = \left[0.0154 \frac{gr}{mg} \right] \left[\frac{40.50}{65.130} \right] = 0.0096 \text{ gr./dscf.}$$

Dry Molecular Weight

$$M_d = 0.44(\%CO_2) + 0.32(\%O_2) + 0.28(\%CO + \%N_2)$$

Where:

M_d = Dry molecular weight, lb./lb.-mole.

$\%CO_2$ = Percent carbon dioxide by volume (dry basis).

$\%O_2$ = Percent oxygen by volume (dry basis).

$\%N_2$ = Percent nitrogen by volume (dry basis).

$\%CO$ = Percent carbon monoxide by volume (dry basis).

0.264 = Ratio of O_2 to N_2 in air, v/v.

0.28 = Molecular weight of N_2 or CO, divided by 100.

0.32 = Molecular weight of O_2 divided by 100.

0.44 = Molecular weight of CO_2 divided by 100.

Run 1:

$$M_d = 0.44(1.00\%) + 0.32(.00\%) + 0.28(.00\% + 99.00\%) = 28.16 \frac{lb}{lb\text{-}mole}$$

Run 2:

$$M_d = 0.44(1.00\%) + 0.32(.00\%) + 0.28(.00\% + 99.00\%) = 28.16 \frac{lb}{lb\text{-}mole}$$

Run 3:

$$M_d = 0.44(1.00\%) + 0.32(.00\%) + 0.28(.00\% + 99.00\%) = 28.16 \frac{lb}{lb\text{-}mole}$$

Water Vapor Condensed

$$V_{wc_{std}} = \left[V_f - V_i \right] \left[\frac{P_w \; R \; T_{(std)}}{M_w \quad P_{(std)}} \right] = 0.04707 \left[V_f - V_i \right]$$

$$V_{wsg_{std}} = \left[W_f - W_i \right] \left[\frac{R \quad T_{(std)}}{M_w \quad P_{(std)}} \right] = 0.04715 \left[W_f - W_i \right]$$

Where:

0.04707 = Conversion factor, $ft.^3/ml.$

0.04715 = Conversion factor, $ft.^3/g.$

$V_{wc_{std}}$ = Volume of water vapor condensed (standard conditions), scf.

$V_{wsg_{std}}$ = Volume of water vapor collected in silica gel (standard conditions), ml.

$V_f - V_i$ = Final volume of impinger contents less initial volume, ml.

$W_f - W_i$ = Final weight of silica gel less initial weight, g.

P_w = Density of water, 0.002201 lb/ml.

R = Ideal gas constant, 21.85 in.Hg. (cu.ft./lb.-mole)(^oR).

M_w = Molecular weight of water vapor, 18.0 lb/lb-mole.

T_{std} = Absolute temperature at standard conditions, 528^oR.

P_{std} = Absolute pressure at standard conditions, 29.92 inches Hg.

Run 1:

$V_{wc(std)}$ = (0.04707) (170.0) = 8.0 cu.ft
$V_{wsg(std)}$ = (0.04715) (6.2) = 0.3 cu.ft

Run 2:

$V_{wc(std)}$ = (0.04707) (194.0) = 9.1 cu.ft
$V_{wsg(std)}$ = (0.04715) (8.4) = 0.4 cu.ft

Run 3:

$V_{wc(std)}$ = (0.04707) (174.0) = 8.2 cu.ft
$V_{wsg(std)}$ = (0.04715) (5.1) = 0.2 cu.ft

Moisture Content of Stack Gases

$$B_{ws} = \frac{V_{wc_{std}} + V_{wsg_{std}}}{V_{wc_{std}} + V_{wsg_{std}} + V_{m_{std}}} \times 100$$

Where:

B_{ws} = Proportion of water vapor, by volume, in the gas stream.

V_m = Dry gas volume measured by dry gas meter,(dcf).

$V_{wc_{std}}$ = Volume of water vapor condensed corrected to standard conditions (scf).

$V_{wsg_{std}}$ = Volume of water vapor collected in silica gel corrected to standard conditions (scf).

Run 1:

$$B_{ws} = \frac{8.0 + 0.3}{8.0 + 0.3 + 56.413} \times 100 = 12.83\ \%$$

Run 2:

$$B_{ws} = \frac{9.1 + 0.4}{9.1 + 0.4 + 60.383} \times 100 = 13.59\ \%$$

Run 3:

$$B_{ws} = \frac{8.2 + 0.2}{8.2 + 0.2 + 65.130} \times 100 = 11.42\ \%$$

Molecular Weight of Stack Gases

$$M_s = M_d (1 - B_{ws}) + 18 (B_{ws})$$

Where:

M_s = Molecular weight of stack gas, wet basis, (lb./lb.-mole).

M_d = Molecular weight of stack gas, dry basis, (lb./lb.-mole).

Run 1:

M_s = 28.16 (1 - 12.83) + 18 (12.83) = 26.86 (lb./lb.-mole)

Run 2:

M_s = 28.16 (1 - 13.59) + 18 (13.59) = 26.78 (lb./lb.-mole)

Run 3:

M_s = 28.16 (1 - 11.42) + 18 (11.42) = 27.00 (lb./lb.-mole)

Stack Gas Velocity

$$V_s = K_p\, C_p \left[\sqrt{dP}\right]_{avg.} \sqrt{\frac{T_{s(avg.)}}{P_s\, M_s}}$$

Where:

V_s	=	Average velocity of gas stream in stack, ft./sec.
K_p	=	85.49 ft/sec $\left[(g/g\text{-mole})\text{-}(mm\ Hg)\ /\ (^{o}K)(\ mm\ H_2O)\right]^{1/2}$
C_p	=	Pitot tube coefficient, (dimensionless).
dP	=	Velocity head of stack gas, in. H_2O.
P_{bar}	=	Barometric pressure at measurement site, (in. Hg).
P_g	=	Stack static pressure, (in. Hg).
P_s	=	Absolute stack gas pressure, (in. Hg) = $P_{bar} + P_g$
P_{std}	=	Standard absolute pressure, (29.92 in. Hg).
t_s	=	Stack temperature, (^{o}f).
T_s	=	Absolute stack temperature, (^{o}R). = 460 + t_s.
M_s	=	Molecular weight of stack gas, wet basis, (lb/lb-mole).

Run 1:

$$V = (85.49)\ (\ .84)\ (\ 1.75) \sqrt{\frac{1785}{(30.01)(26.86)}} = 187.01 \text{ ft/sec.}$$

Run 2:

$$V = (85.49)\ (\ .84)\ (\ 1.74) \sqrt{\frac{1742}{(30.01)(26.78)}} = 183.96 \text{ ft/sec.}$$

Run 3:

$$V = (85.49)\ (\ .84)\ (\ 1.81) \sqrt{\frac{1762}{(30.01)(27.00)}} = 191.67 \text{ ft/sec.}$$

Stack Gas Flow Rate

$$Q_{sd} = 3600 \left[1 - B_{wc}\right] V_s \; A \left[\frac{T_{std}}{T_{stk}}\right] \left[\frac{P_s}{P_{std}}\right]$$

Where:

Q_{sd}	=	Dry volumetric stack gas flow rate corrected to standard conditions, (dscf/hr).
A	=	Cross sectional area of stack, ($ft.^2$).
3600	=	Conversion factor, (sec./hr.).
t_s	=	Stack temperature, (^{o}f).
T_s	=	Absolute stack temperature, (^{o}R).
T_{std}	=	Standard absolute temperature, ($528^{o}R$).
P_{bar}	=	Barometric pressure at measurement site, (in.Hg.).
P_g	=	Stack static pressure, (in.Hg.).
P_s	=	Absolute stack gas pressure, (in.Hg.); = $P_{bar} + P_g$
P_{std}	=	Standard absolute pressure, (29.92 in.Hg.).

Run 1:

$$Q_{sd}=3600(1- \; .1283 \;)(187.01)(\; 16.00) \left[\frac{528}{1785}\right] \left[\frac{30.01}{29.92}\right] = 2785829.1 \; \frac{dscf}{hr}$$

Run 2:

$$Q_{sd}=3600(1- \; .1359 \;)(183.96)(\; 16.00) \left[\frac{528}{1742}\right] \left[\frac{30.01}{29.92}\right] = 2783556.7 \; \frac{dscf}{hr}$$

Run 3:

$$Q_{sd}=3600(1- \; .1142 \;)(191.67)(\; 16.00) \left[\frac{528}{1762}\right] \left[\frac{30.01}{29.92}\right] = 2939305.5 \; \frac{dscf}{hr}$$

Emissions Rate from Stack
Compliance Determination

$$E = \frac{(C_s)(Q_{sd})}{7000 \text{ gr./lb.}} = \text{lb. / hr.}$$

Where:

E = Emissions rate, lb/hr.

C_s = Concentration of particulate matter in stack gas, dry basis, corrected to standard conditions, gr/dscf.

Q_{sd} = Dry volumetric stack gas flow rate corrected to standard conditions, dscf/hr.

Run 1:

$$E = \frac{(0.0027)(2785829.1)}{7000} = 1.07 \text{ lb. / hr.}$$

Run 2:

$$E = \frac{(0.0020)(2783556.7)}{7000} = 0.80 \text{ lb. / hr.}$$

Run 3:

$$E = \frac{(0.0030)(2939305.5)}{7000} = 1.26 \text{ lb. / hr.}$$

Emissions Rate from Stack
Reported Values for Pennsylvania

$$E = \frac{(C_s)(Q_{sd})}{7000 \text{ gr./lb.}} = \text{lb. / hr.}$$

Where:

E = Emissions rate, lb/hr.

C_s = Concentration of particulate matter in stack gas, dry basis, corrected to standard conditions, gr/dscf.

Q_{sd} = Dry volumetric stack gas flow rate corrected to standard conditions, dscf/hr.

Run 1:

$$E = \frac{(0.0060)(2785829.1)}{7000} = 2.39 \text{ lb. / hr.}$$

Run 2:

$$E = \frac{(0.0084)(2783556.7)}{7000} = 3.34 \text{ lb. / hr.}$$

Run 3:

$$E = \frac{(0.0096)(2939305.5)}{7000} = 4.03 \text{ lb. / hr.}$$

Isokinetic Variation

$$I = 100 \quad T_s \left[\frac{0.002669 \quad V_{ic} + \quad (V_m / T_m) \quad (P_{bar} + \quad dH / 13.6)}{60 \quad \Theta \quad V_s \quad P_s \quad A_n} \right]$$

Where:

I	=	Percent isokinetic sampling.
100	=	Conversion to percent.
T_s	=	Absolute average stack gas temperature, ^oR.
0.002669	=	Conversion factor, Hg - ft^3/ml - ^oR.
V_{ic}	=	Ttl vol of liquid collected in impingers and silica gel, ml.
T_m	=	Absolute average dry gas meter temperature, ^oR.
P_{bar}	=	Barometric pressure at sampling site, (in. Hg).
dH	=	Av pressure differential across the oriface meter, (in.H_2O).
13.6	=	Specific gravity of mercury.
60	=	Conversion seconds to minutes.
Θ	=	Total sampling time, minutes.
V_s	=	Stack gas velocity, ft./sec.
P_s	=	Absolute stack gas pressure, in. Hg.
A_n	=	Cross sectional area of nozzle, ft^2.

Run 1:

$$I = (100)(\ 1785) \left[\frac{(0.002669)(176.20) + \frac{57.862}{551} \left[30.01 + \frac{2.34}{13.6} \right]}{60\ (\ 60.0\ )\ (\ 187.01\ )\ (\ 30.01\ )\ (\ .000340\ )} \right] = 95.3\%$$

Run 2:

$$I = (100)(\ 1742) \left[\frac{(0.002669)(202.40) + \frac{60.986}{543} \left[30.01 + \frac{2.67}{13.6} \right]}{60\ (\ 60.0\ )\ (\ 183.96\ )\ (\ 30.01\ )\ (\ .000340\ )} \right] = 102.2\%$$

Run 3:

$$I = (100)(\ 1762) \left[\frac{(0.002669)(179.10) + \frac{66.316}{548} \left[30.01 + \frac{3.10}{13.6} \right]}{60\ (\ 60.0\ )\ (\ 191.67\ )\ (\ 30.01\ )\ (\ .000340\ )} \right] = 104.4\%$$

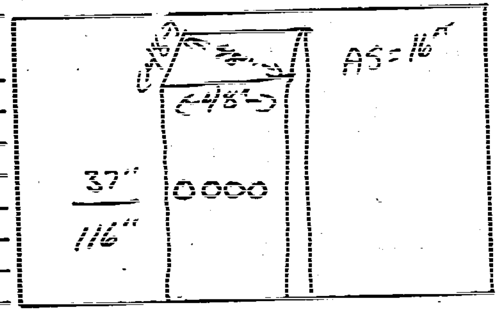
SECTION F:

FIELD DATA

RAMCON ENVIRONMENTAL CORPORATION

Plant CYClean

Location MT. Hope, Penn
Operator T.Cook
Date 10-15-92
Run No. 1
Sample Box No. 1
Meter Box No. C-185
Meter H @ 1.549
C Factor 1.005
Pitot Tube Coefficient Cp .84



Schematic of Stack Cross Section

Ambient Temperature 50
Barometric Pressure 30.01
Assumed Moisture, % .22
Probe Length, m(ft) 5 FT
Nozzle Identification No.
Avg. Calibrated Nozzle Dia., (in.)
Probe Heater Setting # NA
Leak Rate, m^3/min.(cfm) .004 at 7"
Probe Liner Material ~~Stainless~~ quartz
Static Pressure, mm Hg(in.Hg)
Filter No. TS-6505

	IMPINGER VOLUME ml	SILICA GEL WEIGHT g
FINAL	370	343.3
INITIAL	200	337.1
DIFFERENCE	170	6.2

TRAV. PT NO.	SAMPLING TIME (θ)min.	VACUUM in. Hg	STACK TEMP (T_s) °F	VELOCITY HEAD (P_s) in H2O	PRESSURE DIFF. ORF. MTR in H2O	GAS SAMPLE VOLUME ft^3	GAS SAMPLE TEMP. AT DRY GAS METER °F Inlet	Outlet	FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
A 1	7:48 / 7:50	2	1325	2.2	1.6	539.141 / 540.6	74	64	245	63
2	7:52	3	1325	2.7	2.0	542.3	78	64	244	58
3	7:54	2	1325	2.3	1.7	543.5	82	66	240	58
4	7:56	2	1325	2.3	1.7	545.4	86	68	238	58
5	7:58	2	1325	2.0	1.5	546.5	90	68	236	60
6	8:00	2	1325	2.0	1.5	548.4	92	70	237	61
7	8:02	2	1325	2.3	1.7	549.5	94	72	240	63
8	8:04	3	1325	2.5	1.8	551.5	98	72	242	64
B 1	8:06 / 8:08	3	1325	2.8	2.1	553.3	96	78	268	66
2	8:10	4	1325	4.0	3.0	555.4	102	78	271	60
3	8:12	4	1325	3.6	2.7	557.3	106	80	256	58
4	8:14	4	1325	3.5	2.6	559.3	106	80	250	59
5	8:16	4	1325	3.5	2.6	561.2	108	82	246	59

CYCLEAN1

Form #REC-05

Form #REC-00

RAMCON emissions test log sheet, cont. DATE 10-15-92 LOCATION Cyclean Mt. Hope, Penn TEST NO. 1

TRAVERSE POINT	SAMPLING TIME θ (min)	VACUUM mm Hg (in. Hg)	STACK TEMP T_s (°F)	VELOCITY HEAD ΔP_s (in. H_2O)	ORIFICE DIFF. PRESSURE ΔH (in. H_2O)	GAS VOLUME V_m (ft.^{3})	GAS SAMPLE TEMP. (°F) in	GAS SAMPLE TEMP. (°F) out	SAMPLE BOX TEMP. (°F)	IMPINGER TEMP (°F)
6	8:18	4	1325	3.8	2.8	563.3	110	84	256	58
7	8:20	4	1325	4.2	3.2	565.3	110	84	258	56
8	8:22	4	1325	4.2	3.2	567.5	110	84	260	56
C 1	~~8:23~~ 8:25	3	1325	2.5	1.8	568.9	110	84	270	56
2	8:27	3	1325	2.5	1.8	570.5	110	84	268	56
3	8:29	3	1325	3.0	2.2	572.3	110	84	268	57
4	8:31	4	1325	3.5	2.6	574.4	110	84	261	56
5	8:33	4	1325	4.0	3.0	576.4	110	84	255	55
6	8:35	5	1325	4.7	3.5	578.6	110	84	250	55
7	8:37	6	1325	5.2	3.9	581.0	110	84	250	55
8	8:39	5	1325	5.0	3.7	583.2	110	84	251	56
D 1	~~8:41~~ 8:43	2	1325	1.2	.90	584.5	110	84	268	64
2	8:45	2	1325	1.5	1.1	585.8	110	84	267	60
3	8:47	3	1325	2.0	1.5	587.3	110	84	265	58
4	8:49	3	1325	2.7	2.0	589.0	110	84	266	57
5	8:51	4	1325	3.5	2.6	590.9	110	84	269	57
6	8:53	4	1325	3.5	2.6	592.5	110	84	255	55
7	8:55	4	1325	4.0	3.0	594.5	110	84	238	53
8	8:57	4	1325	4.0	3.0	597.003	110	84	245	50

RAMCON ENVIRONMENTAL CORPORATION

Plant CYCLEAN
Location MT. Hope, Penn
Operator T. Cross
Date 10-15-92
Run No. 2
Sample Box No. 1
Meter Box No. C-185
Meter H @ 1.549
C Factor 1.005
Pitot Tube Coefficient Cp .84

Ambient Temperature 60
Barometric Pressure 30.01
Assumed Moisture, % .15
Probe Length, m(ft) 5 FT
Nozzle Identification No.
Avg. Calibrated Nozzle Dia., (in.)
Probe Heater Setting NA
Leak Rate, m^3/min. (cfm) .01 AT 7"
Probe Liner Material ~~NA~~ QUARTZ
Static Pressure, mm Hg (in. Hg)
Filter No. TS-6546

	IMPINGER VOLUME ml	SILICA GEL WEIGHT g
FINAL	394	402.3
INITIAL	200	393.9
DIFFERENCE	194	8.4

Schematic of Stack Cross Section

TRAV. PT NO.	SAMPLING TIME (θ) min.	VACUUM in. Hg	STACK TEMP (Ts) °F	VELOCITY HEAD (Ps) in H2O	PRESSURE DIFF. ORF. MTR in H2O	GAS SAMPLE VOLUME ft^3	GAS SAMPLE TEMP. AT DRY GAS METER °F Inlet	GAS SAMPLE TEMP. AT DRY GAS METER °F Outlet	FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
A 1	10:14 / 10:16	2	1325	2.0	1.7	597.40 / 599.0	74	68	256	66
										58
2	10:18	2	1325	1.2	1.0	600.2	80	68	255	57
3	10:20	3	1325	2.5	2.1	601.5	82	68	246	56
4	10:22	3	1325	2.2	1.8	603.6	84	68	242	57
5	10:24	3	1325	2.0	1.7	605.2	86	68	240	58
6	10:26	3	1325	2.0	1.7	606.8	88	68	247	58
7	10:28	3	1325	2.2	1.8	608.4	90	68	252	58
8	10:30	3	1325	2.2	1.8	609.9	90	70	258	60
B 1	10:31 / 10:33	3	1325	2.5	2.1	611.5	90	70	272	57
2	10:35	4	1325	4.0	3.4	613.6	92	70	269	54
3	10:37	5	1325	4.0	3.4	615.8	94	70	252	57
4	10:39	4	1325	3.8	3.2	618.0	94	70	245	57
5	10:41	5	1325	4.2	3.5	620.3	96	72	248	57

CYCLEAN1

Form #REC-05

Form #REC-U6

RAMCON emissions test log sheet, cont. DATE 10-15-92 LOCATION CYCLEAN TEST NO. 2

TRAVERSE POINT	SAMPLING TIME θ (min)	VACUUM mm Hg (in. Hg)	STACK TEMP T_s (°F)	VELOCITY HEAD ΔP_s (in. H_2O)	ORFICE DIFF. PRESSURE ΔH (in. H_2O)	GAS VOLUME V_m (ft^3)	GAS SAMPLE TEMP. (°F) in	GAS SAMPLE TEMP. (°F) out	SAMPLE BOX TEMP. (°F)	IMPINGER TEMP (°F)
6	10:43	6	1325	5.0	4.2	622.8	96	72	249	57
7	10:45	6	1171	4.8	4.1	625.1	98	72	252	57
8	10:47	6	1102	5.0	4.2	627.5	98	72	256	57
C 1	~~10:49~~ 10:51	3	1374	2.6	2.2	629.3	90	72	267	62
2	10:53	3	1543	2.8	2.3	631.1	94	74	266	56
3	10:55	4	1498	3.4	2.8	633.1	96	74	261	54
4	10:57	5	1400	4.0	3.4	635.2	98	74	255	53
5	10:59	5	1277	4.6	3.9	637.6	100	74	250	53
6	11:01	6	1107	5.2	4.4	640.0	100	74	247	53
7	11:03	6	967	5.2	4.4	642.8	100	74	248	55
8	11:05	5	848	4.6	3.9	644.9	100	74	249	55
D 1	~~11:06~~ 11:08	2	1203	.90	.76	646.0	100	74	270	61
2	11:10	2	1473	1.2	1.0	647.1	100	74	268	59
3	11:12	3	1436	1.7	1.4	648.6	100	74	270	57
4	11:14	3	1368	2.2	1.8	650.2	100	74	262	56
5	11:16	4	1463	2.8	2.4	652.1	100	74	240	57
6	11:18	4	1180	3.3	2.8	654.2	100	74	236	55
7	11:20	4	1067	3.7	3.1	656.2	100	74	237	55
8	11:22	4	1053	3.7	3.1	658.403	100	74	228	55

RAMCON ENVIRONMENTAL CORPORATION

Plant CYCLEAN
Location MT. Hope, Penn
Operator T. Cecil
Date 10-15-92
Run No. 3
Sample Box No. 1
Meter Box No. C-185
Meter H @ 1.549
C Factor 1.005
Pitot Tube Coefficient Cp .84

Ambient Temperature 70
Barometric Pressure 30.01
Assumed Moisture, % 13
Probe Length, m(ft) 5'
Nozzle Identification No.
Avg. Calibrated Nozzle Dia., (in.)
Probe Heater Setting N/A
Leak Rate, m^3/min. (cfm) .008 @ 5"
Probe Liner Material QUARTZ
Static Pressure, mm Hg (in. Hg)
Filter No. TS-6547

	IMPINGER VOLUME ml	SILICA GEL WEIGHT g
FINAL	300	372.5
INITIAL	200	367.4
DIFFERENCE	174	5.1

Schematic of Stack Cross Section

TRAV. PT NO.	SAMPLING TIME (θ) min.	VACUUM in. Hg	STACK TEMP (T_s) °F	VELOCITY HEAD (P_s) in H20	PRESSURE DIFF. ORF. MTR in H20	GAS SAMPLE VOLUME ft^3	GAS SAMPLE TEMP. AT DRY GAS METER °F Inlet	Outlet	FILTER HOLDER TEMP °F	GAS TEMP LVG CONDENSER OR LAST IMPINGER °F
A 1	12:58 / 13:00	3	1197	3.0	2.7	658.853 / 660.8	78	72	260	67
2	13:02	3	1234	2.7	2.4	662.6	84	72	254	60
3	13:04	3	1198	2.5	2.3	664.5	88	72	247	56
4	13:06	3	1124	2.2	2.0	666.2	90	74	247	57
5	13:08	3	1069	2.2	2.0	667.9	92	74	250	60
6	13:10	2	972	2.0	1.8	669.6	94	74	257	60
7	13:12	2	896	2.0	1.8	671.3	96	76	263	53
8	13:14	2	806	2.3	2.1	672.9	96	76	267	53
B 1	13:15 / 13:17	5	1519	4.2	3.8	675.3	96	76	272	57
2	13:19	5	1542	4.2	3.8	677.5	98	76	263	54
3	13:21	5	1456	4.4	4.0	679.8	100	76	258	54
4	13:23	5	1346	4.0	3.6	682.1	100	76	255	57
5	13:25	5	1258	4.4	4.0	684.6	100	76	257	57

CYCLEAN I

Form #REC-05

Form #REC-uo

RAMCON emissions test log sheet, cont. DATE 10-15-92 LOCATION CYCLEAN TEST NO. 3

TRAVERSE POINT	SAMPLING TIME θ (min)	VACUUM mm Hg (in. Hg)	STACK TEMP T_s (°F)	VELOCITY HEAD ΔP_s (in. H_2O)	ORFICE DIFF. PRESSURE ΔH (in. H_2O)	GAS VOLUME V_m (ft^3)	GAS SAMPLE TEMP. (°F) in	GAS SAMPLE TEMP. (°F) out	SAMPLE BOX TEMP. (°F)	IMPINGER TEMP (°F)
						687.1	102	74	258	58
6	13:27	6	1209	5.4	4.9	689.8	102	76	259	59
7	13:29	7	1120	5.4	4.9	692.7	102	76	264	60
8	13:31	7	1032	5.4	4.9	694.5	102	78	270	65
C 1	13:33 / 13:35	3	1497	2.2	2.0	696.5	102	78	268	61
2	13:37	4	1588	3.0	2.7	698.6	102	78	263	59
3	13:39	4	1542	3.6	3.2	700.9	102	78	251	58
4	13:41	5	1484	4.0	3.6	703.4	104	78	236	57
5	13:43	6	1427	5.0	4.5	706.0	104	78	237	57
6	13:45	7	1329	5.4	4.9	708.7	104	80	239	57
7	13:47	7	1166	5.4	4.9	711.3	106	80	246	58
8	13:49	7	1067	5.4	4.9	712.5	106	80	269	65
D 1	13:50 / 13:52	2	1498	1.2	1.1	713.9	106	80	266	64
2	13:54	2	1568	1.5	1.3	715.3	106	80	270	62
3	13:56	2	1545	1.7	1.5	717.1	106	80	268	61
4	13:58	3	1498	2.2	2.0	718.9	106	80	258	61
5	14:00	3	1465	2.7	2.4	720.9	106	80	247	60
6	14:02	4	1422	3.0	2.7	723.0	106	80	237	61
7	14:04	4	1280	3.5	3.2	725.168	106	80	235	60
8	14:06	4	1325	3.5	3.2					

SECTION G:

CALIBRATION

4A

TYPE S PITOT TUBE INSPECTION DATA FORM

Pitot tube assembly level? ✓ yes ______ no

Pitot tube openings damaged? ______ yes (explain below) ✓ no

α_1 = 1.3 ° (<10°), α_2 = 0.6 ° (<10°), β_1 = 0.5 ° (<5°),
β_2 = 1.6 ° (<5°)

γ = 2.9 °, θ = 1.7 °, A = .97 cm (in.)

z = A sin γ = .05 cm (in.); <0.32 cm (<1/8 in.),
w = A sin θ = .03 cm (in.); <.08 cm (<1/32 in.)

P_A .48 cm (in.) P_b .49 cm (in.)

D_t = .38 cm (in.)

Comments: ______

______

______

Calibration required? ______ yes ✓ no

4B

TYPE S PITOT TUBE INSPECTION DATA FORM

Pitot tube assembly level? ✓ yes ______ no

Pitot tube openings damaged? ______ yes (explain below) ______ no

α_1 = 2.3 ° (<10°), α_2 = .5 ° (<10°), β_1 = 1.8 ° (<5°), β_2 = 1.8 ° (<5°)

γ = 3.2 °, θ = 1.0 °, A = .98 cm (in.)

z = A sin γ = .05 cm (in.); <0.32 cm (<1/8 in.),

w = A sin θ = .02 cm (in.); <.08 cm (<1/32 in.)

P_A .49 cm (in.) P_b .49 cm (in.)

D_t = .38 cm (in.)

Comments: ______

Calibration required? ______ yes ✓ no

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date 5-5-89 Thermocouple number Hotbox

Ambient temperature 20 °C Barometric pressure 29.88 in. Hg

Calibrator S Turner Reference: mercury-in-glass ✓

other ________

Reference point number	Source[a] (specify)	Reference thermometer temperature, ~~°C~~ F	Thermocouple potentiometer temperature, ~~°C~~ F	Temperature difference,[b] %
A	Ice Bath	32	32	0
B	oven	200	200	0
C	oven	350	350	0
D	ambient			

[a]Type of calibration system used.

[b] $\left[\frac{(\text{ref temp, °C} + 273) - (\text{test thermom temp, °C} + 273)}{\text{ref temp, °C} + 273}\right] 100 \leq 1.5\%$.

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date 5-5-89 Thermocouple number [illegible]

Ambient temperature 20 °C Barometric pressure 29.88 in. Hg

Calibrator [illegible] Reference: mercury-in-glass ✓

other ______

Reference point number	Source[a] (specify)	Reference thermometer temperature, ~~°C~~ °F	Thermocouple potentiometer temperature, ~~°C~~ °F	Temperature difference,[b] %
A	Ice Bath	32	32	0
B	oven	200	200	0
C	oven	350°F	350	0
D	Ambient			

[a] Type of calibration system used.

[b] $\left[\frac{(\text{ref temp, °C} + 273) - (\text{test thermom temp, °C} + 273)}{\text{ref temp, °C} + 273}\right] 100 \leq 1.5\%.$

RAMCON ENVIRONMENTAL CORPORATION

Lear Siegler Stack Sampler

Nozzle Diameter Calibration

Date ________________ Signature ________________

Nozzle No.	Average Diameter	Nozzle No.	Average Diameter
1		7	
2		8	
3		9	
4		10	
5		11	
6		12	

Pitot Tube Calibration (S Type)

Pitot Tube Identification No. 59 Date 6-9-91

Calibrated by: S Beck

"A" SIDE CALIBRATION

Run No.	Δp std cm H_2O (in. H_2O)	Δp (s) cm H_2O (in. H_2O)	$C_p(s)$	DEVIATION $C_p(s)-\bar{C}_p(A)$
1	2.2	3.1	.842	.006
2	1.8	2.5	.848	.000
3	1.1	1.5	.856	.008
		$\bar{C}_p$ (SIDE A)	.848	

"B" SIDE CALIBRATION

Run No.	Δp std cm H_2O (in. H_2O)	Δp(s) cm H_2O in. H_2O)	$C_p(s)$	DEVIATION $C_p(s)-\bar{C}_p(B)$
1	2.2	3.1	.842	.006
2	1.8	2.5	.848	.000
3	1.1	1.5	.856	.008
		$\bar{C}_p$ (SIDE B)	.848	

$$\text{AVERAGE DEVIATION} = \sigma(\text{A OR B}) = \frac{\sum_{1}^{3} \left| C_p(s) - \bar{C}_p(\text{A OR B}) \right|}{3} \leftarrow \text{MUST BE} \le 0.01$$

$$\left| \bar{C}_p(\text{SIDE A}) - \bar{C}_p(\text{SIDE B}) \right| \leftarrow \text{MUST BE} \le 0.01$$

$$C_p(s) = C_p(std)\sqrt{\frac{\Delta p\ std}{\Delta p_s}}$$

Form No. EED-17-1

RAMCON

Lear Siegler Stack Sampler

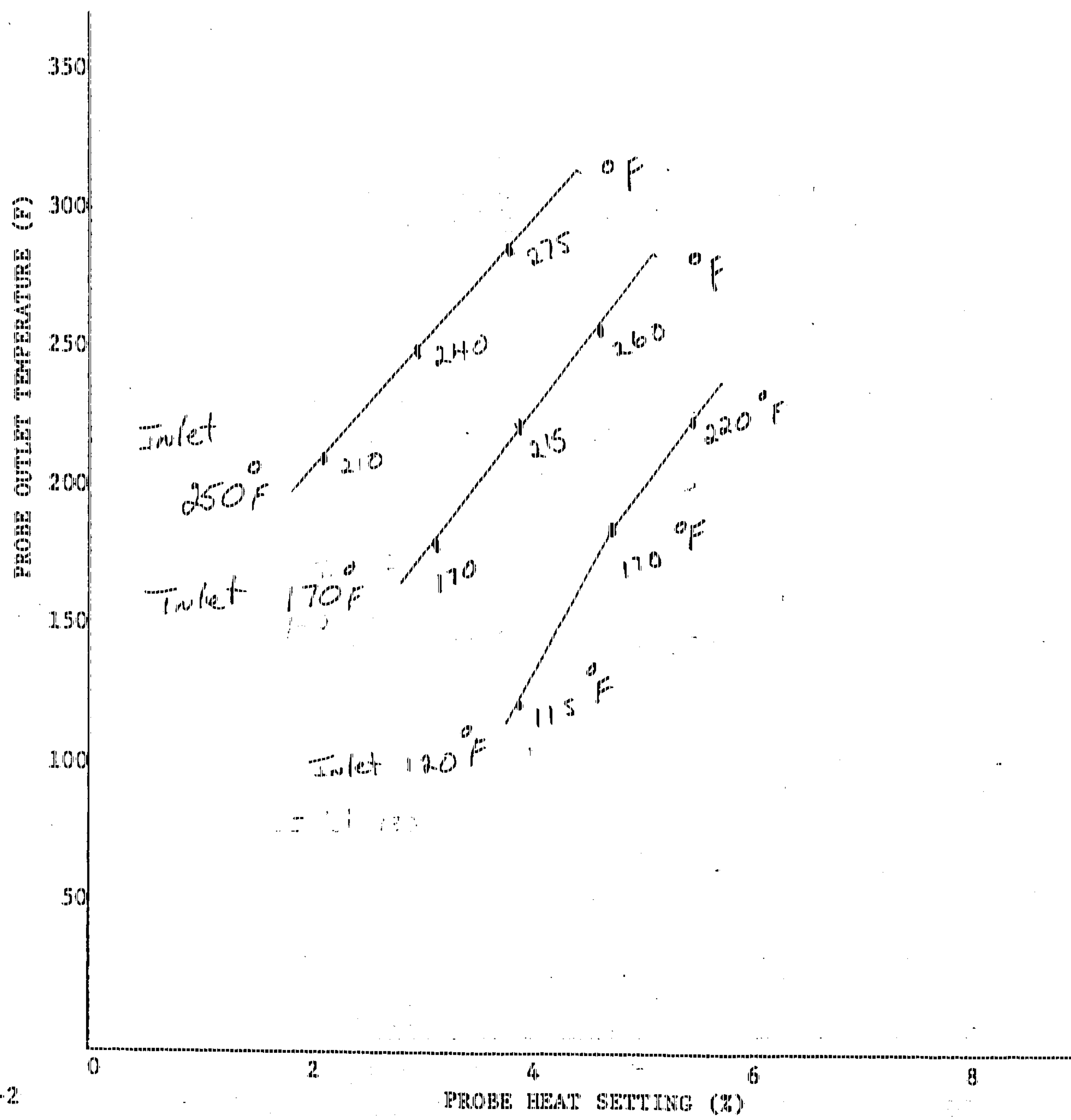
Heating Probe Calibration

Probe No. 54 Probe Length 5'

Date of Calibration 5-7-89 Signature Sam Turner

Name of Company to be tested ______

Note: 3 ft. probe - 5 min. warmup
6 ft. probe - 15 min. warmup
10 ft. probe - 30 min. warmup
Calibration flow rate = .75 CFM



Form No. EED-17-2

STACK TEMPERATURE SENSOR CALIBRATION DATA FORM

Date 5-13-90 Thermocouple number 54

Ambient temperature 20 °C Barometric pressure 29.88 in. Hg

Calibrator S Turner Reference: mercury-in-glass ✓

other ______

Reference point number	Source[a] (specify)	Reference thermometer temperature, °C	Thermocouple potentiometer temperature, °C	Temperature difference,[b] %
A	ice water	32 °F	32 °F	0 %
B	Boiling	212 °F	212 °F	0 %
C	Boiling oil	381 °F	379 °F	.007
D	Ambient			

[a] Type of calibration system used.

[b] $\left[\frac{(\text{ref temp, °C} + 273) - (\text{test thermom temp, °C} + 273)}{\text{ref temp, °C} + 273}\right] 100 \leq 1.5\%.$

METER BOX CALIBRATION DATA AND CALCULATION FORM

REBUILT
JAN 1992

(English units)

Date 1-21 Meter box number C-185

Barometric pressure, P_b = 30.11 in. Hg Calibrated by [illegible]

Orifice manometer setting (ΔH), in. H_2O	Gas volume: Wet test meter (V_w), ft^3	Gas volume: Dry gas meter (V_d), ft^3	Temperature: Wet test meter (t_w), °F	Temperature: Dry gas meter Inlet (t_{d_i}), °F	Temperature: Dry gas meter Outlet (t_{d_o}), °F	Temperature: Dry gas meter Avg[a] (t_d), °F	Time (Θ), min	Y_i	$\Delta H@_i$ in. H_2O	[illegible]
0.5	5	347.1 / 352.137	63	82 / 86	64 / 66	74.5	11.55	1.0132	1.4375	2
1.0	10	352.8 / 363.104	63	84 / 90	66 / 66	76.5	16.27	.9931	1.4209	4
1.5	10	364.1 / 374.409	63	88 / 92	66 / 68	78.5	13.36	.9951	1.4318	3
2.0	10	375.3 / 385.637	63	90 / 94	68 / 68	80	11.59	.994	1.4327	2
3.0	~~10~~ 12	386.3 / 398.667	63	92 / 96	68 / 68	81	11.34	.9964	1.4261	3
4.0	10	399.2 / 409.452	63	94 / 96	68 / 68	81.5	8.28	1.0602	1.4408	5
							Avg	.9987	1.4316	

ΔH, in. H_2O	$\frac{\Delta H}{13.6}$	$Y_i = \dfrac{V_w P_b (t_d + 460)}{V_d (P_b + \frac{\Delta H}{13.6})(t_w + 460)}$	$\Delta H@_i = \dfrac{0.0317\,\Delta H}{P_b (t_d + 460)} \left[\dfrac{(t_w + 460)\,\Theta}{V_w}\right]^2$
0.5	0.0368		
1.0	0.0737		
1.5	0.110		
2.0	0.147		
3.0	0.221		
4.0	0.294		

[a] If there is only one thermometer on the dry gas meter, record the temperature under t_d.

POSTTEST DRY GAS METER CALIBRATION DATA FORM (English units)

Test number ________ Date 10-27-92 Meter box number C-185 Plant ________

Barometric pressure, P_b = 30.02 in. Hg Dry gas meter number .638809 Pretest Y ________

	Orifice manometer setting, (ΔH), in. H_2O	Gas volume: Wet test meter (V_w), ft^3	Gas volume: Dry gas meter (V_d), ft^3	Temperature: Wet test meter (t_w), °F	Temperature: Dry gas meter: Inlet (t_{d_i}), °F	Temperature: Dry gas meter: Outlet (t_{d_o}), °F	Temperature: Dry gas meter: Average[a] (t_d), °F	Time (θ), min	Vacuum setting, in. Hg	Y_i	Y_i 545 543 $\frac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$ 535
5.009	.05	~~10~~ 5	767.433 / 772.442	75	92 / 86	72 / 74	83	11.8	1	1.01	1.55
15.002	1.0	~~10~~ 15	772.854 / 785.46	75	90 / 98	76 / 78	85	21.6	2	1.01	1.53
5.475	3	10	752.275 / 757.775	75	94 / [illegible]	71 / 73	84	9.5	7	1.01	1.504
										Y = 1.01	1.524

[a] If there is only one thermometer on the dry gas meter, record the temperature under t_d

where

V_w = Gas volume passing through the wet test meter, ft^3.

V_d = Gas volume passing through the dry gas meter, ft^3.

t_w = Temperature of the gas in the wet test meter, °F.

t_{d_i} = Temperature of the inlet gas of the dry gas meter, °F.

t_{d_o} = Temperature of the outlet gas of the dry gas meter, °F.

t_d = Average temperature of the gas in the dry gas meter, obtained by the average of t_{d_i} and t_{d_o}, °F.

ΔH = Pressure differential across orifice, in. H_2O.

Y_i = Ratio of accuracy of wet test meter to dry gas meter for each run.

Y = Average ratio of accuracy of wet test meter to dry gas meter for all three runs; tolerance = pretest Y ± 0.05Y.

P_b = Barometric pressure, in. Hg.

θ = Time of calibration run, min.

Form #REC-01

POSTTEST DRY GAS METER CALIBRATION DATA FORM (English units)

Test number __________ Date 10-9-92 Meter box number C-185 Plant __________

Barometric pressure, P_b = 30.01 in. Hg Dry gas meter number 638809 Pretest Y __________

	Orifice manometer setting, (ΔH), in. H_2O	Gas volume: Wet test meter (V_w), ft^3	Gas volume: Dry gas meter (V_d), ft^3	Temperature: Wet test meter (t_w), °F	Temperature: Dry gas meter: Inlet (t_{d_i}), °F	Temperature: Dry gas meter: Outlet (t_{d_o}), °F	Temperature: Dry gas meter: Average[a] (t_d), °F	Time (Θ), min	Vacuum setting, in. Hg	Y_i	$Y_i = \frac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)(t_w + 460)}$ 551 / 518 / 534
5.102	.05	~~10~~ 5	573.113 / 578.215	74	96 / 100	78 / 80	88.5	11.96	2	1.004	1.556
10.239	1.0	10	574.535 / 584.760	74	98 / 101	80 / 82	91	16.8	3	1.006	1.542
9.982	3.0	10	512.741 / 522.743	74	98 / 102	76 / 78	88.5	9.65	7	1.020	1.535
										Y = 1.009	1.544

[a] If there is only one thermometer on the dry gas meter, record the temperature under t_d

where

V_w = Gas volume passing through the wet test meter, ft^3.

V_d = Gas volume passing through the dry gas meter, ft^3.

t_w = Temperature of the gas in the wet test meter, °F.

t_{d_i} = Temperature of the inlet gas of the dry gas meter, °F.

t_{d_o} = Temperature of the outlet gas of the dry gas meter, °F.

t_d = Average temperature of the gas in the dry gas meter, obtained by the average of t_{d_i} and t_{d_o}, °F.

ΔH = Pressure differential across orifice, in. H_2O.

Y_i = Ratio of accuracy of wet test meter to dry gas meter for each run.

Y = Average ratio of accuracy of wet test meter to dry gas meter for all three runs; tolerance = pretest Y $\pm$0.05Y.

P_b = Barometric pressure, in. Hg.

Θ = Time of calibration run, min.

Form #[illegible] 01

SECTION H:

RAMCON PERSONNEL

Name: Mr. Sumner Buck
Title: President

Qualifications: Mr. Buck is a graduate of the University of Mississippi with graduate studies at Memphis State University and State Technical Institute of Memphis. He is a graduate of the EPA 450 "Source Sampling for Particulate Pollutant's" course and the 474 "Continuous Emissions Monitoring" courses outlined by EPA at Research Triangle Park, N.C. He has been directly involved in conducting and supervising air emission testing for over 15 years. He has personally conducted over 400 air emission tests. He currently sponsors and directs visual emission certification schools for US EPA Method 9.

Project Duties: Mr. Buck is responsible for the overall supervision of each testing project. This includes the correspondence to the State Regulatory Agency and the plant personnel regarding scheduling, testing requirements, etc. He will assist in supervision of the project preparation for each team involved and the overall organization between the testing crew(s) and facility.

Name: Mr. Joe Sewell
Title: Vice President

Qualifications: Mr. Sewell is currently serving as the Vice President of RAMCON Environmental Corporation. Mr. Sewell is a graduate of Christian Brothers University in Memphis, Tennessee where he obtained a Bachelor of Science degree in Chemical Engineering. He has conducted and supervised air emissions testing projects ranging a broad spectrum of facility process categories. His accomplishments include the development of the instrumental branch of emissions testing utilizing continuous emission monitors and gas chromatography. Mr. Sewell performs a major role in the upgrading of testing capabilities and professional quality that RAMCON Environmental Corporation offers.

Project Duties: Mr. Sewell provides staff engineering and project administration to ensure the integrity of the requested services. He serves as the primary contact person for RAMCON Environmental Corporation handling all correspondence between the facility personnel involved in the project and respective state agency representative(s). He provides project leadership to RAMCON Environmental Corporation field supervisors and managers involved in the testing project.

Name: Mr. Ray Jenkins
Title: Source Sampling Director

Qualifications: Mr. Jenkins is serving as the Source Sampling Director for RAMCON Environmental Corporation. He was promoted to this leadership position after gaining a significant amount of experience in conducting and providing field supervision of a variety of air testing projects. Mr. Jenkins has personally conducted and/or supervised all of the prevalent EPA approved procedures with expertise in the instrumental analyzer procedures. He graduated from Memphis State University obtaining a Bachelor of Science degree in Biology. He is also currently certified to conduct US EPA Reference Method 9 for the visual determination of emission opacity.

Project Duties: Mr. Jenkins provides project leadership to the Team Leaders and Field Technicians. He ensures the test crew(s) involved in the test project will be properly informed to his respective duties and responsibilities during the testing process. Mr. Jenkins also serves as the Quality Assurance/Quality Control Coordinator and provides guidance in QA/QC to each Team Leader with regard to sample integrity.

Name: Mr. Tommy South
Title: Laboratory Technician

Qualifications: Mr. South is currently serving as Laboratory Technician. He is proficient in conducting many analysis procedures such as front and back-half particulate analysis, titrations, extractions, etc.

Project Duties: Mr. South conducts the laboratory analysis on the particulate samples. He is also responsible for accepting the remaining field samples from the Field Sample Bank Manager and performing inspection as to integrity. He documents the transfer on the chain of custody forms and distributed the subcontracted samples to the respective laboratories.

Name: Mr. Tommy Crook
Title: Team Leader

Qualifications: Mr. Crook has been employed by RAMCON Environmental Corporation for three years. He has completed Team Leader training in isokinetic and proportional test methods. He currently is certified in conducting US EPA Reference Method 9 for opacity. He has been involved in conducting tests on process stacks, incinerators, boilers, etc. He has served as a Field Technician for over two years.

Project Duties: Mr. Crook is responsible for conducting isokinetic sampling procedures at the facility(s). He is responsible for preparation, calibration and cleaning of the necessary equipment for this testing. His duties on-site include assembling the sample train, leak checking the system, operation of the train and recording the test data on the field data forms.

Name: Mr. Mickey Phillips
Title: Team Leader

Qualifications: Mr. Phillips has been employed by RAMCON Environmental Corporation for one year. He is proficient in isokinetic and proportional test methods. He currently is certified in conducting Method 9 for opacity. He has conducted over 100 stack tests on process stacks, incinerators, boilers, etc. and is qualified as a Team Leader.

Project Duties: Mr. Phillips is responsible for conducting isokinetic sampling procedures at the facility(s). He is responsible for preparation, calibration and cleaning of the necessary equipment for this testing. His duties on-site include assembling the sample train, leak checking the system, operation of the train and recording the test data on the field data forms.

SECTION I:

VISIBLE EMISSIONS

SOURCE NAME: CYCLEAN, INC.

ADDRESS: EXIT 20, PENN TURNPIKE @ STATE ROAD 72 NORTH

CITY: MANHEIM | STATE: PA | ZIP: 17545

PHONE: (717) 664-4637

SOURCE ID NUMBER: PENN. D.E.R. APPROVAL No. 36-303-072

PROCESS EQUIPMENT: ASPHALT RECYCLING DRUM TYPE PLANT | OPERATING MODE: CONTINOUS

CONTROL EQUIPMENT: BAG HOUSE & THERMAL OXIDIZER | OPERATING MODE: CONTINOUS

DESCRIBE EMISSION POINT: EXHAUST STACK OF THERMAL OXIDIZER.

HEIGHT ABOVE GROUND LEVEL: 29 1/2 FT. | HEIGHT RELATIVE TO OBSERVER: 24 FT.

DISTANCE FROM OBSERVER: 95 FT. | DIRECTION FROM OBSERVER: SE-E

DESCRIBE EMISSIONS: LEAVING EXHAUST STACK. VERTICAL COLUMN W/ SLIGHT SPACE APART

EMISSION COLOR: LOOKING FOR CLEAR ANY COLOR. | PLUME TYPE: CONTINUOUS ☒ FUGITIVE ☐ INTERMITTENT ☐

FOUND SPRAY WRITE

WATER DROPLETS PRESENT: NO ☒ YES ☐ | IS WATER DROPLET PLUME ATTACHED ☐ DETACHED ☐ N/A

AT WHAT POINT IN THE PLUME WAS OPACITY DETERMINED: 5' ABOVE STACK

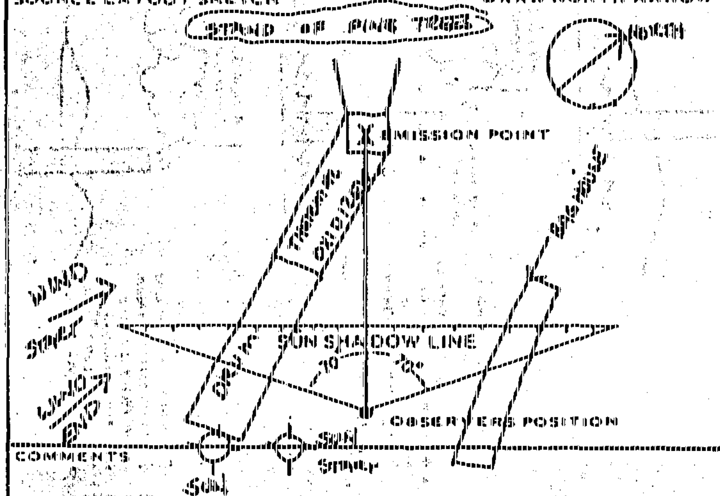
DESCRIBE BACKGROUND: STAND OF PINES TREES W/ SKY BEHIND

BACKGROUND COLOR: START: LT. BLUISH/HAZE STOP: LIGHT BLUE | SKY CONDITIONS: START: HAZY STOP: ✓

WIND SPEED: START: 15 MPH STOP: 20 MPH | WIND DIRECTION: START: S-SW STOP: S-SE

AMBIENT TEMPERATURE: 70°F | RELATIVE HUMIDITY: 74%

SOURCE LAYOUT SKETCH | DRAW NORTH ARROW



COMMENTS:

There was truck traffic to west of stack / could be causing white colored plume.

I HAVE RECEIVED A COPY OF THESE OPACITY OBSERVATIONS

SIGNATURE: [signature]

TITLE: [illegible] | DATE: 15 Oct 92

OBSERVATION DATE	START TIME	STOP TIME
10/15/92	10:15	11:15

MIN \ SEC	0	15	30	45	MIN \ SEC	0	15	30	45
1	0	0	0	0	31	0	0	5	0
2	0	0	0	0	32	0	0	0	0
3	0	0	0	0	33	0	5	0	0
4	0	0	0	0	34	0	0	0	0
5	0	0	0	0	35	0	0	0	5
6	0	0	5	0	36	0	0	0	0
7	0	0	5	0	37	0	0	0	0
8	0	0	0	0	38	0	0	0	0
9	0	0	0	0	39	0	0	0	0
10	0	0	0	0	40	0	0	0	0
11	0	5	0	0	41	0	0	0	0
12	0	0	0	0	42	0	0	0	0
13	5	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	5	0	0
18	0	0	0	0	48	0	0	0	0
19	0	5	0	0	49	0	0	0	0
20	0	0	0	0	50	5	0	0	0
21	0	0	0	0	51	0	0	0	0
22	0	0	0	0	52	0	0	0	0
23	0	0	0	0	53	0	0	0	0
24	0	0	0	0	54	5	0	0	0
25	0	0	0	0	55	0	0	0	0
26	0	5	0	0	56	0	0	0	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	0	0
30	0	0	0	0	60	0	0	0	0

AVERAGE OPACITY FOR HIGHEST PERIOD: .05 | NUMBER OF READINGS ABOVE 0 % WERE 12

RANGE OF OPACITY READINGS: 0 MINIMUM 5 MAXIMUM

OBSERVER'S NAME (PRINT): KAREN PAIGE

OBSERVER'S SIGNATURE: [signature] | DATE: 10/15/92

ORGANIZATION: CYCLEAN, INC.

CERTIFIED BY: TEXAS AIR CONTROL BOARD | DATE: 9/18/92

VERIFIED BY: | DATE:

REC#14