#1

Let's protect our earth

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL QUALITY

CN 027
TRENTON, N.J. 08625

AP-42 Section 9.13.2
Reference 7
Report Sect. ______
Reference ______

July 9, 1987

MEMORANDUM

TO: Don Patterson through Lou Mikolajczyk

FROM: Edward Choromanski

SUBJECT: Premium Coffee - Wall, New Jersey
DEP ID No. 20004

Emission tests were conducted at the above referenced facility on the Afterburner Stack (NJ Stack No. 002). The purpose of the tests was to determine the particulate emission rate from the Afterburner Stack.

Dipak Ghayal reviewed the final test report. His review indicates that the particulate emission rates from the Afterburner Stack during Runs No. 1 and 2 exceeded the standard and during Run. No. 3 was within the standard stated on Permit No. P-75409, as filed under N.J.A.C. 7:27-8.

During the tests the coffee bean rate was 67.5% of the permit standard. Also, the temperature of the Afterburner was between 1300 and 1400^{o}F. Permit No. P-75409 required a afterburner temperature of 1500^{o}F.

Since two of the three test runs exceeded the permit standard at 67.5% of the operating conditions proper enforcement action is recommended.

Edward M. Choromanski
Supervisor/Technical Review
Bureau of Technical Services

cc Milt Polakovic
Harold Christiff
Rich Craig
Joe DePierro
Dipak Ghayal

Let's protect our earth

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF ENVIRONMENTAL QUALITY
CN 027
TRENTON, N.J. 08625

July 1, 1987

MEMORANDUM

TO: Edward Choromanski

FROM: Dipak Ghayal

SUBJECT: Premium Coffee, Wall New Jersey
N.J.D.E.P. I.D. No. 20322

Stack tests were conducted at Premium Coffee, Wall, NJ on Roaster After Burner Exhaust (N.J. Stack No. 002) by Princeton Testing Lab, Princeton, NJ on January 14, 1987. The purpose of the test was to determine particulates emission rate from Roaster After Burner Exhaust, covered by Tracking No. 86-2269, filed under N.J.A.C. 7:27-8.2 and N.J.A.C. 7:27-6.2.

The test results are as follows:

PARTICULATES EMISSION RATE

Run No.	Allowable Emission Rate (as per 86-2269) lbs/hr	Actual Emission Rate lbs/hr
1	0.09	0.152
2	0.09	0.138
3	0.09	0.081

Technical Services calculations using the raw data supplied, produced substantially the same results.

The operating conditions reported are as follows:

Run No.	Afterburner Temp. ^oF	Natural Gas Burning Rate CF/hr	Coffee Bean Feed Rate lbs/hr
1	1300 - 1400	1876	1350
2	1300 - 1400	1821	1350
3	1300 - 1400	1864	1350

As per Log No. 86-2269, minimum required afterburner temperature is 1500°F and coffee beans feed rate is 2000 lbs/hr.

As per reported test results, particulates emission rates from Roaster Afterburner exhaust exceeds the standards during Run No. 1 and 2 and are within standards during Run No. 3.

As per reported operating conditions, Coffeebean feed rate is 67.5% of the required feed rate, during all tests. The reported emission rates during Run No. 3 is close to allowable emission rate.

Considering above conditions, the particulates emission rate from Roaster Afterburner Exhaust (N.J. Stack No. 002) are out of compliance with standards stated on Log No. 86-2269.

As per reported operating conditions and emission rates, proper enforcement actions are recommended.

Dipak B. Ghayal
Assistant Env. Engineer
Bureau of Technical Services

DBG:ss

CONTENTS

SECTION 1.0

Summary of Results

SOURCE TEST REPORT

Particulate Emissions

Premium Coffee
Wall, New Jersey

Roaster/Cyclone/Afterburner

Client: Premium Coffee
Route #34
Wall, New Jersey

Testing Firm: Princeton Testing Lab
P.O. Box 3108
Princeton, New Jersey

CLIENT:	Premium Coffee Hwy 34 & Ridgewood Road Wall, New Jersey Ø7719
TEST LOCATION:	Premium Coffee Hwy 34 & Ridgewood Road Wall, New Jersey Ø7719
UNIT TESTED:	Roaster/Cyclone Collector/Afterburner
TEST PURPOSE:	Determine the particulate emission rate as required by the State of New Jersey to determine compliance with applicable air pollution control regulations.
TEST EQUIPMENT:	Research Appliance Company "STAKSAMPLR" Portable Gas Sampler, Model #2343.
TEST METHOD:	Particulates: New Jersey Air Test Method 5
TEST PERSONNEL:	Michael J. Mease Tony Damato
TEST OBSERVERS:	Edward Choromanski Scott T. Hawthorne New Jersey State Department of Environmental Protection
TESTING FIRM:	Princeton Testing Laboratory P.O. Box 31Ø8 Princeton, New Jersey Ø854Ø 6Ø9-452-9Ø5Ø
TEST ENGINEER:	

Michael J. Mease
New Jersey Professional Engineer No. 2432Ø

TEST DATA SUMMARY

Process: Roaster/Cyclone/Afterburner

	Run #1	Run #2	Run #3
Test Date and Times	1-14-87 10:29- 11:47am	1-14-87 12:28- 1:42 pm	1-14-87 2:11- 3:25 pm
Stack Diameter, Inches	18	18	18
Sampling Nozzle Diameter, Inches	0.313	0.313	0.313
Testing Time, Minutes	72	72	72
Stack Gas Volume Sampled, ACF	37.371	37.600	37.554
Stack Gas Volume Sampled, SCF @ 70 deg. F., 29.92 in.Hg.,dry	37.3	37.1	36.9
Stack Gas Temperature, deg. F.	620	614	601
Stack Gas Moisture Content, %	11.6	12.3	12.6
Stack Gas Composition,			
%CO_2	1.90	1.90	2.00
%O_2	19.2	19.4	18.5
Stack Gas Molecular Weight	27.8	27.7	27.7
Stack Gas Velocity, Ft./Sec.	35.5	34.8	34.2
Stack Gas Flowrate, ACFM	3,760	3,690	3,620
Stack Gas Flowrate, SCFM @ 70 deg. F., 29.92 in.Hg.,dry	1,640	1,600	1,590
Particulate Captured, Grams	0.0261	0.0242	0.0143
Particulate Concentration,			
Grains/SCF	0.011	0.010	0.006
Grains/ACF	0.005	0.004	0.003
Particulate Mass Rate, Lb./Hr.	0.152	0.138	0.081
Percent Isokinetic of Test	105	106	107

TEST PROCEDURE SUMMARY

A series of three particulate source emission tests were conducted on the roaster/cyclone/afterburner exhaust. The tests were conducted January 14, 1987.

The two test ports were located on the roof approximately thirty six inches from flow disturbances (afterburner) and forty eight inches upstream from the stack exhaust. Two separate traverses of twelve sampling points were conducted for a total of twenty four sampling points on this eighteen inch diameter stack. The sampling points were located at the following distances, in inches, from the inside stack walls: 1.ØØ, 1.21, 2.12, 3.19, 4.5Ø, 6.41, 11.59, 13.5Ø, 14.81, 15.88, 16.79, and 17.ØØ. Each point was sampled for a period of three minutes each for a total test time of seventy-two minutes. Three separate tests were conducted without interruption using New Jersey Air Test Method 1 for particulates.

Prior to sampling, a cyclonic flow check was performed to determine if cyclonic flow was evident from the cyclone exhaust. Tests showed the gases to be exiting vertically; apparently straightened by the rectangular afterburner chamber and combustion.

Stack gas composition was determined with a separate test train which collected gas samples over the course of the particulate tests. This test train consisted of a probe, glass wool moisture trap, sample pump, and sample bag. Three tests were conducted simultaneously with the particulate emission tests.

SECTION 2.0

Lab & Field Data

Mease Engineering Associates

Environmental Consultants

LABORATORY WORKSHEET

Client: PREMIUM COFFEE | Run No. & Date: 1- 1-14-87

Process: ROASTER/CYCLONE | Sample Box No.: 1

Filter Analysis:
- Filter Wt.,grams 0.6509
- Filter Tare,gms 0.6280
- Part.Increase,gm. 0.0229

Impinger Water Increase:
- Silica Gel Impinger (#4):
  - Final Wt.,gms 831.5
  - Tare Wt.,gms 820.9
  - H_2O Increase 10.6

Total Water Volume Increase:

Impinger #1	77	ml
Impinger #2	15	ml
Impinger #3	1	ml
Impinger #4	10.6	ml
TOTAL INCREASE	103.6	ml

Impinger Analysis:
- Wash Bottle No. ______
- Filter Wt.,gms ______
- Filter Tare,gms ______
- Total Insoluble ______
- Final Beaker Wt. ______
- Tare Wt. (No.___) ______
- Total Soluble ______

Particulate Weight Summary:
- Filter 0.0229
- Probe Wash 0.0032
- Impingers (Sol.) ______
- Impingers (Insol.) ______
- Total (w/imp.) ______ grams
- Total (w/o imp.) 0.0261 grams

Probe Wash Analysis:
- Wash Volume,ml. 120
- Acetone Density,mg/ml ______
- Blank Volume,ml ______
- Blank Residue #34
  - Final Wt. 157.5412
  - Tare Wt. 157.5411
  - Part.Wt. 0.0001 (OK)
- Wash Analysis, Bottle No. UK
  - Beaker Wt.,gms 155.7350
  - Tare Wt.(No.31) 155.7318
  - Part.Wt.,gms 0.0032

Signature: Michael J. Mease

Date: 1-19-87

Mease Engineering Associates

Environmental Consultants

LABORATORY WORKSHEET

Client: PREMIUM COFFEE

Run No. & Date: 2 1-14-87

Process: ROASTER/CYCLONE

Sample Box No.: 2

Filter Analysis:
- Filter Wt., grams 0.6464
- Filter Tare, gms 0.6297
- Part. Increase, gm. 0.0167

Impinger Water Increase:
- Silica Gel Impinger (#4):
  - Final Wt., gms 801.8
  - Tare Wt., gms 791.5
  - H_2O Increase 10.3

Total Water Volume Increase:
- Impinger #1 80 ml
- Impinger #2 19 ml
- Impinger #3 1 ml
- Impinger #4 10.3 ml
- TOTAL INCREASE 110.3 ml

Impinger Analysis:
- Wash Bottle No. ____
- Filter Wt., gms ____
- Filter Tare, gms ____
- Total Insoluble ____
- Final Beaker Wt. ____
- Tare Wt. (No.___) ____
- Total Soluble ____

Particulate Weight Summary:
- Filter 0.0167
- Probe Wash 0.0075
- Impingers (Sol.) ____
- Impingers (Insol.) ____
- Total (w/imp.) ____ grams
- Total (w/o imp.) 0.0242 grams

Probe Wash Analysis:
- Wash Volume, ml. 125
- Acetone Density, mg/ml ____
- Blank Volume, ml ____
- Blank Residue
  - Final Wt. ____
  - Tare Wt. ____
  - Part. Wt. ____
- Wash Analysis, Bottle No. 656
  - Beaker Wt., gms 152.0843
  - Tare Wt. (No. 32) 152.0768
  - Part. Wt., gms 0.0075

Signature: Michael J. [signature]

Date: 1-19-87

Mease Engineering Associates

Environmental Consultants

LABORATORY WORKSHEET

Client: PREMIUM COFFEE

Run No. & Date: 3 1-14-87

Process: ROSTER/CYCLONE

Sample Box No.: 3

Filter Analysis:

Filter Wt., grams	0.6410
Filter Tare, gms	0.6326
Part. Increase, gm.	0.0084

Impinger Water Increase:

Silica Gel Impinger (#4):

Final Wt., gms	783.7
Tare Wt., gms	772.8
H_2O Increase	10.9

Total Water Volume Increase:

Impinger #1	85 ml
Impinger #2	16 ml
Impinger #3	1 ml
Impinger #4	10.9 ml
TOTAL INCREASE	112.9 ml

Impinger Analysis:

Wash Bottle No.	
Filter Wt., gms	
Filter Tare, gms	
Total Insoluble	
Final Beaker Wt.	
Tare Wt. (No.___)	
Total Soluble	

Particulate Weight Summary:

Filter	0.0084
Probe Wash	0.0059
Impingers (Sol.)	
Impingers (Insol.)	
Total (w/imp.)	grams
Total (w/o imp.)	0.0143 grams

Probe Wash Analysis:

Wash Volume, ml.	135
Acetone Density, mg/ml	
Blank Volume, ml	
Blank Residue	
Final Wt.	
Tare Wt.	
Part. Wt.	
Wash Analysis, Bottle No.	056
Beaker Wt., gms	158.1982
Tare Wt. (No. 33)	158.1923
Part. Wt., gms	0.0059

Signature: Michael J. Mease

Date: 1-19-87

MEASE ENGINEERING ASSOCIATES

FIELD DATA

Run no. 1
Location PREMIUM COFFEE
Date 1-14-~~86~~87
Operator MEASE/DAMATO
Sample box no. 1

Initial dry gas meter reading ~~847.85~~ 847.888

K Factor 10.25
C_P 0.84
C_M 0.987
Stack dimen. 18" Ø
Stack press., in. H_2O -0.08
Gas composition, % O_2 19.2
INTEGRATED % CO_2 1.9
% N_2
Time, start 10:29 AM
Time, finish 11:47 AM

Ambient Temp., °F 40
Bar. press., in. hg. 30.01
Assumed moisture, % 3.4
Probe tip diameter, in. 5/16
Probe length 3' GLASS
Probe heater setting 200
Box heater setting 60
Leak checks, pre: 0.01 CFM @ 20" Hg
post: 0.004 CFM @ 11" Hg
Wash bottle no. USO-6

Notes: PORTS 36" FROM A/BURNER
48" FROM TOP STACK
LEAK CHECK AT LINER INLET

Point	Clock time	Dry gas meter	Pitot in. H_2O ΔP	Orifice in. H_2O ΔH	Dry gas temp. °F Inlet	Dry gas temp. °F Outlet	Stack temp. °F	Pump vacuum in. Hg.	Impinger temp. °F	Box temp. °F	PRE-FILTER TEMP °F (GRN)	POST-FILTER TEMP °F (BL)
1	3	848.681	0.11	0.60	60	56	565	6.0	<50		~~130~~ 358	~~358~~ 130
2	3	849.935	0.12	0.58	63	61	646	6.0	<50		332	120
3	3	851.212	0.14	0.60	67	62	796	6.0	<50		344	123
4	3	852.541	0.14	0.64	68	62	725	6.5	<50		357	127
5	3	853.894	0.14	0.69	68	62	624	7.0	<50		370	131
6	3	855.352	0.16	0.80	69	62	620	7.5	<50		389	136
7	3	856.971	0.21	1.05	68	62	612	9.0	<50		401	144
8	3	858.546	0.21	1.06	69	62	606	9.0	<50		421	160
9	3	860.254	0.24	1.17	71	62	650	9.0	<50		431	145
10	3	862.048	0.25	1.22	72	62	645	9.5	<50		470	160
11	3	863.847	0.25	1.20	73	62	610	10.0	<50		472	170
12	3	865.648	0.24	1.20	73	62	622	10.0	<50		472	170
13	3	867.313	0.21	1.03	65	59	632	9.0	<50		462	167
14	3	869.008	0.23	1.17	76	63	601	9.0	<50		464	148
15	3	870.642	0.21	1.02	75	64	652	8.0	<50		470	147
16	3	872.301	0.20	1.03	76	64	591	8.0	<50		475	167
17	3	873.884	0.18	0.92	78	66	602	8.0	<50		478	171
18	3	875.1	0.18	1.00	78	66	520	8.0	<50		483	177
19	3	877.133	0.19	0.99	78	66	588	8.0	<50		488	191
20	3	878.773	0.20	1.02	77	66	603	8.5	<50		438	173
21	3	880.608	0.23	1.16	77	66	522	9.5	<50		348	167
22	3	882.216	0.21	1.09	77	66	588	9.0	<50		381	168
23	3	884.	0.17	0.88	76	66	586	8.0	<50		362	167
24	3	885.254	0.16	0.85	75	65	562				355	160
			4.3425	9.590	72.48	7 48	6 79.75	819.75				

MEASE ENGINEERING ASSOCIATES

FIELD DATA

Run no. 2
Location PREMIUM COFFEE
Date 1-14-87
Operator MEASE / DAMATO
Sample box no. 2

Initial dry gas meter reading 885.517

K Factor 10.25
C_P 0.84
C_M 0.987
Stack dimen. 18" ⌀
Stack press., in. H_2O
Gas composition, % O_2 19.4
% CO_2 1.9
% N_2
Time, start 12:28 PM
Time, finish 1:42 PM

Ambient Temp., °F 50
Bar. press., in. hg. 30.01
Assumed moisture, % 3-5
Probe tip diameter, in. 5/16
Probe length 3' GLASS
Probe heater setting 60
Box heater setting 220
Leak checks, pre: 0.011 CFM @ 17" Hg
post: 0.003 CFM @ 9" Hg
Wash bottle no. USG-7
INTEGRATED ORSAT
Notes: LEAK CHECKS AT LINER INLET

Point	Clock time	Dry gas meter	Pitot in. H_2O ΔP	Orifice in. H_2O ΔH	Dry gas temp. °F Inlet	Dry gas temp. °F Outlet	Stack temp. °F	Pump vacuum in. Hg.	Impinger temp. °F	Box temp. °F	PRE-FILTER TEMP °F	POST-FILTER TEMP °F
1	3	886.941	0.24	1.18	66	64	632	9.0	<50		296	91
2	3	889.048	0.25	1.27	69	68	606	9.0	<50		366	130
3	3	890.796	0.23	1.17	73	68	612	9.0	<50		390	143
4	3	892.1	0.22	1.07	74	69	656	9.0	<50		428	196
5	3	894.178	0.23	1.15	75	69	631	9.0	<50		415	186
6	3	895.831	0.21	1.06	75	69	621	8.5	<50		408	189
7	3	897.314	0.15	0.77	77	69	601	8.0	<50		384	190
8	3	898.741	0.15	0.75	77	69	630	7.5	<50		370	184
9	3	900.141	0.14	0.72	77	69	603	7.0	<50		369	190
10	3	901.470	0.13	0.66	77	69	610	7.0	<50		365	194
11	3	902.791	0.12	0.62	77	69	587	7.0	<50		361	162
12	3	904.113	0.12	0.63	77	70	576	6.5	<50		345	163
13	3	905.796	0.23	1.13	73	69	647	9.0	<50		345	163
14	3	907.461	0.23	1.11	75	70	666	9.0	<50		401	194
15	3	909.136	0.22	1.11	77	70	621	9.0	<50		433	202
16	3	910.741	0.18	0.92	77	70	609	8.0	<50		350	200
17	3	912.296	0.17	0.89	76	70	589	8.0	<50		420	210
18	3	913.909	0.18	0.93	76	70	599	8.0	<50		386	217
19	3	915.531	0.23	1.17	75	70	615	9.0	<50		376	221
20	3	917.311	0.21	1.07	76	70	611	8.5	<50		349	211
21	3	918.837	0.16	0.83	76	70	595	8.5	<50		330	206
22	3	920.343	0.16	0.81	78	70	622	8.0	<50		300	196
23	3	921	0.14	0.70	78	71	631	7.0	<50		286	193
24	3	923.117	0.13	0.69	78	71	576	6.5			282	184
			.42667	.9344	532.354	72.354	1074.42	614.42				

MEASE ENGINEERING ASSOCIATES

FIELD DATA

Run no 3
Location PREMIUM COFFEE
Date 1-14-87
Operator DAMATO/MEASE
Sample box no. 3

Initial dry gas meter reading 923.228

K Factor 10.25
C_P 0.84
C_M 0.987
Stack dimen. 18" ϕ
Stack press., in. H_2O
Gas composition, % O_2 18.5
INTEGRATED % CO_2 2.0
% N_2
Time, start 2:11 PM
Time, finish 3.25 PM

Ambient Temp., °F 50
Bar. press., in. hg. 30.01
Assumed moisture, % 3-5
Probe tip diameter, in. 5/16
Probe length 3' GLASS
Probe heater setting 60 %
Box heater setting 220
Leak checks, pre: 0.008 CFM @ 15" Hg
post: 0.009 CFM @ 15" Hg
Wash bottle no. USC-9

Notes: LEAK CHECK AT LINER INLET

Point	Clock time	Dry gas meter	Pitot in. H_2O ΔP	Orifice in. H_2O ΔH	Dry gas temp. °F Inlet	Dry gas temp. °F Outlet	Stack temp. °F	Pump vacuum in. Hg	Impinger temp. °F	Box temp. °F	PRE-FILTER °F	POST-FILTER °F
1	3	924.096	0.25	1.27	69	68	602	9.5	<50		224	94
2	3	926.891	0.24	1.21	73	71	622	9.5	<50		262	138
3	3	928.664	0.23	1.19	76	71	601	9.5	<50		285	157
4	3	930.330	0.20	1.06	78	71	576	9.0	<50		303	188
5	3	932.022	0.21	1.08	79	71	602	9.0	<50		302	187
6	3	933.681	0.21	1.07	79	71	619	9.0	<50		308	186
7	3	935.140	0.15	0.77	80	71	610	8.0	<50		293	189
8	3	936.488	0.13	0.65	80	71	630	7.5	<50		280	191
9	3	937.801	0.12	0.61	80	72	615	7.0	<50		273	192
10	3	939.099	0.12	0.62	79	71	602	7.0	<50		276	198
11	3	940.501	0.13	0.69	79	71	577	7.5	<50		277	210
12	3	941.943	0.14	0.75	79	72	569	7.5	<50		250	186
13	3	943.624	0.22	1.10	74	71	633	9.0	<50		242	187
14	3	945.315	0.22	1.12	79	72	614	9.0	<50		266	194
15	3	947.967	0.21	1.07	81	73	621	9.0	<50		302	203
16	3	948.560	0.18	0.95	81	73	583	9.0	<50		324	213
17	3	950.143	0.18	0.92	81	73	612	9.0	<50		333	216
18	3	951.743	0.18	0.94	81	73	598	9.0	<50		330	210
19	3	953.440	0.22	1.13	81	73	611	9.0	<50		302	206
20	3	955.134	0.21	1.11	81	74	576	9.5	<50		303	202
21	3	956.706	0.17	0.91	81	74	566	9.0	<50		311	207
22	3	958.096	0.14	0.72	81	74	610	8.5	<50		306	200
23	3	959.363	0.11	0.57	80	74	602	8.0	<50		300	192
24	3	960.787	0.14	0.74	79	74	576	8.0	<50		290	186
			.4207	.9276	535.417	75.417	1061.12	601.12				

SECTION 3.0

Test Procedures

SAMPLING TRAIN COMPONENTS, METHOD OF USE, AND ANALYTICAL TECHNIQUES

A. Components

1. Stainless steel or glass probe with minimum 3/16 inch diameter opening, heated above the dew point of the gas stream to be sampled.

2. Glass cyclone efficient for removal of particles of 5 microns or greater, and cyclone collection flask. In cases of low particulate loadings, a glass cyclone eliminator may be substituted.

3. In-line filter of 0.3 micron porosity.

4. Heated chamber for maintaining glass fiber filter and cyclone above the dew point of the gas stream to be sampled.

5. Impingers placed in the following order:

   a. A 500 ml. modified Greenburg-Smith impinger filled with 100 mls. of distilled deionized water.

   b. A 500 ml. Greenburg-Smith impinger filled with 100 mls. of distilled deionized water.

   c. A 500 ml. modified Greenburg-Smith impinger left dry to act as a water trap to remove entrained water.

   d. A 500 ml. modified Greenburg-Smith impinger containing approximately 200 grams of precisely weighed silica gel.

6. An ice bath in which the impingers are partially submerged to maintain exit temperature well below the dew point of the gas to be sampled.

7. Dry gas meter equipped with a vacuum gage registering up to 30 inches of mercury, and a calibrated orifice.

B. General Sampling Procedure

1. Starting with clean equipment, a leak check is performed by drawing a vacuum of 15 inches on system as indicated on the vacuum gage. Leak checks are also performed post-test and corrections may be necessary to account for increases in the leakage rate.

2. The sample is collected at isokinetic rates based upon a velocity profile determined with the use of an "S" type pitot tube.

3. Samples are taken at multiple points across the gas stream representing equal areas of cross-sectional flow, and each point is sampled for as long a time as is feasible.

4. Moisture content of the gas stream is determined by the condensation method, using a series of cooled impingers described above (A-5).

5. The duration of the test depends on the number of sample points and the time required to equally sample each point. In no case will the sample time be less than that required to collect a sufficient sample for complete analysis.

C. Analytical Techniques

1. Before use, the filter is desiccated for a period of 24 hours and weighed to the nearest 0.1 mg.

2. When processing the sample, any material deposited inside the sample probe, glass cyclone (or cyclone eliminator) and the front half of the filter holder is washed into a container using acetone, or other suitable solvent, evaporated to dryness at either ambient conditions or below the boiling point of acetone ($55^{\circ}C$), desiccated for a period of 25 hours, and weighed to the nearest 0.1 mg.

3. After sampling, the in-line glass fiber filter is desiccated for a period of 24 hours and weighedto the nearest 0.1 mg.

4. The moisture content is determined by collecting the liquid in the impingers described above and measuring. The difference between 200 ml. and the measurement is recorded as increase in water. The spent silica gel is weighed to the nearest 0.1 gram and the increase is included in the moisture content determination.

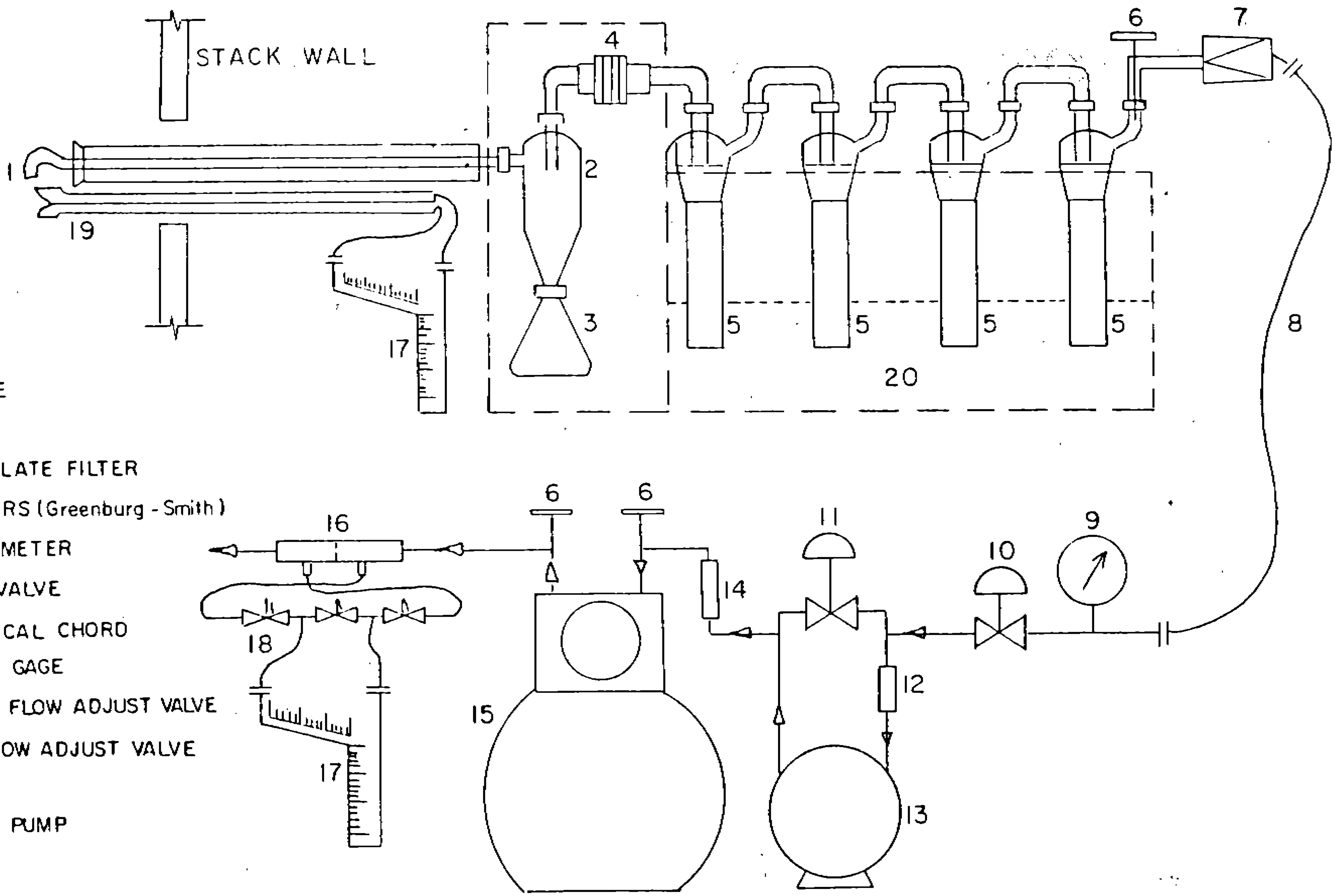
5. The liquid in the impingers may be analyzed for particulate matter and the weights may be included in the particulate catch.

6. The total particulate in the system is the sum of that collected in Nos. 2,3 and possibly 5. The contribution of each portion shall be individually identified. The inclusion of the impinger particulate catch is to be considered on an individual basis.

7. The emission rate and calculations are made from suitable measurements of gas temperature, moisture content, velocities and materials collected. In order for a test to be considered valid, isokinetic sampling rates shall be between 90% and 110%.

8. All equipment, including orifice meter, probe tip nozzles, dry gas meter, and temperature measuring devices is calibrated on a regular basis, dependent on the frequency of equipment use.

9. The stack gas content is determined by collecting a sample of stack gas and analyzing the contents with an Orsat analyzer or Fyrite analyzer.



LEGEND:

1. PROBE
2. CYCLONE
3. FLASK
4. PARTICULATE FILTER
5. IMPINGERS (Greenburg - Smith)
6. THERMOMETER
7. CHECK VALVE
8. UMBRILICAL CHORD
9. VACUUM GAGE
10. COURSE FLOW ADJUST VALVE
11. FINE FLOW ADJUST VALVE
12. OILER
13. VACUUM PUMP
14. FILTER
15. DRY GAS METER
16. ORFICE TUBE
17. INCLINE MANOMETER
18. SOLENOID VALVES
19. PITOT
20. ICE BATH

MEASE ENGINEERING ASSOC.
GENERAL ARRANGEMENT
SOURCE SAMPLING TRAIN

SECTION 4.0

Calibrations

8.6

Mease Engineering Associates

Environmental Consultants

DRY GAS METER AND ORIFICE METER CALIBRATION

Model Number 2343

Serial Number 1984

Meter Box No. "C"

Wet Test Meter No. AL-20 14524

Calibration Date 1-13-87

Signature Michael J. Mease

Barometric Pressure, Pb 29.77

Orifice Manometer ΔH in. H_2O	Gas Volume Wet V_w ft^3	Gas Volume Dry V_d ft^3	Temperature Wet t_w °F	Temperature Dry In t_{di} °F	Temperature Dry Out t_{do} °F	Time θ Min.	Y	$\Delta H_@$
0.5	5.000	4.966	74	83	70	12.97	1.010	1.90
1.0	5.000	5.047	74	92	78	9.165	1.009	1.87
2.0	10.000	10.262	74	101	86	13.75	1.005	2.074
3.0	10.000	10.381	74	109	92	10.98	1.004	1.96
						AVERAGE	1.007	1.95

$$Y = \frac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)\left(t_w + 460\right)}$$

$$\Delta H_@ = \frac{0.0317 \Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460)\,\theta}{V_w}\right]^2$$

Mease Engineering Associates

Environmental Consultants

DRY GAS METER AND ORIFICE METER CALIBRATION

Model Number 2343 Calibration Date 1-13-87

Serial Number 1895 Signature [signature]

Meter Box No. "D" NEW Barometric Pressure, P_b 29.77

Wet Test Meter No. AL-20 14524

02	03	04	05	06	07	08		
Orifice Manometer ΔH in. H_2O	Gas Volume Wet V_w ft^3	Gas Volume Dry V_d ft^3	Temperature Wet t_w °F	Temperature Dry In t_{di} °F	Temperature Dry Out t_{do} °F	Time θ Min.	Y	$\Delta H_@$
0.5	5.000	5.037	74	78	71	12.24	0.992	1.70
1.0	5.000	5.134	74	89	78	9.313	0.989	1.938
2.0	10.000	10.472	74	100	86	13.563	0.984	2.02
3.0	10.000	10.618	74	111	93	11.217	0.984	2.04
						AVERAGE	0.987	1.93

$$Y = \frac{V_w P_b (t_d + 460)}{V_d \left(P_b + \frac{\Delta H}{13.6}\right)\left(t_w + 460\right)} \qquad \Delta H_@ = \frac{0.0317 \Delta H}{P_b (t_d + 460)} \left[\frac{(t_w + 460)\ \theta}{V_w}\right]$$

Certificate OF TRACEABILITY

This is to certify that the undersigned checked for Mease Engineering,
Ainsworth, Model TC Balance Number 18185 on December 15, 1986

The following readings were obtained:

Sensitivity reciprocal unloaded .8 Mg.
Sensitivity reciprocal at 100 Gm. .73 Mg.
Arm length error 4 PPM
Chain weight NA Mg. NA Mg.
Rider 10 Mg. ±0 Mg.

Readability .1 Mg.
Optical scale NA Gm. NA Mg.
Reading at half scale NA NA Mg.
Taring device error NA Mg.

Traceability is through National Bureau of Standards Test No. 732/221797 and/or New Jersey Test No. NJ 82419

Dated: December 30, 1986
MATAWAN, NEW JERSEY

OMEGA BALANCE SERVICE, INC.

(C) GOES 17

PITOT TUBE CALIBRATION

All pitot tubes are geometrically aligned and within the limits as prescribed in the Federal Register. Therefore, they are assigned a value of 0.84. In the event that a pitot tube tip is altered during transport, and the geometric qualifications cannot be met, the pitot tube is calibrated according to the Federal Register. In this case, the new calibration factor is listed in the report and used in the calculations.

TEMPERATURE SENSING DEVICE CALIBRATIONS

All temperature sensing devices used during a test series, including thermocouples and thermometers are calibrated after each test series, as specified in the Federal Register. In the event that these calibration factors fall within the limits as specied, no corrections are necessary. In the evnt that a device is outside the limits, as specified, the correction factor is listed and used in the calculations.

SAMPLING NOZZLE CALIBRATION

The sampling nozzle used during the test series is determined after each test series using a micrometer on several diameters as specified in the Federal Ragister.

CARL POE CO., INC. 99 REINERMAN ST. • HOUSTON, TEXAS 77007 • 713-861-3816

December 9, 1986

Princeton Testing Lab
P.O. Box 3108
Princeton, NJ 08543
Attn: Glenn

Dear Sir/Madam:

This is to certify that your Model AL-20 American Wet Test Meter, Serial No. 14524, has been calibrated with an American 5 Ft. Bell Prover, Serial No. 1045. It is traceable to the Bureau of Standards.

Reference No. 26727, PI-TAPE.

Sincerely,

CARL POE CO., INC.

Carl W. Poe

Carl W. Poe

CWP:mv

SECTION 5.0

Calculations

SOURCE SAMPLING CALCULATIONS: NOMENCLATURE

An	=	Nozzle Area, $ft.^2$
As	=	Stack Area, $ft.^2$
Bwo	=	Water Vapor Proportion, by volume, dimensionless
Cm	=	Meter Correction Factor, dimensionless
Cp	=	Pitot Coefficient, dimensionless
Cs	=	Particulate Concentration, units specified
$\Delta H_{avg.}$	=	Average Pressure Drop Across Orifice, in.H_2O
$\%H_2O$	=	Water Vapor Content, dimensionless
Is	=	Percent Isokinetic of Test, dimensionless
Kp	=	85.48, unit correction
Md	=	Molecular Weight of Dry Gas
Mn	=	Total Particulate Catch, grams
Ms	=	Molecular Weight of Stack Gas
$(\sqrt{\Delta P})_{avg}$	=	Average of the Square Roots of the Velocity Head
Pbar	=	Barometric Pressure, in. Hg.
pmr	=	Pollutant Mass Rate, lb./hr.
θ	=	Time, minutes
Pstd	=	29.92 in. Hg.
Qs	=	Stack Gas Flowrate, actual cubic feet per minute
(Qs)std	=	Stack Gas Flowrate, standard cubic feet per minute
Ts	=	Stack Gas Temperature, ^oR
Tstd	=	530^oR
Vfc	=	Increase in Liquid Volume in Impingers, ml.
Vm	=	Volume Sampled at Meter Conditions, $ft.^3$
Vmstd	=	Volume of Air Metered at Standard Conditions
Vs	=	Stack Gas Velocity, ft./sec.
Vsstd	=	Stack Gas Velocity, standard conditions, ft./min.
Vwc	=	Volume of Liquid Collected, cubic feet

SAMPLE CALCULATIONS: Run #1; Roaster/Cyclone/Afterburner

1. Volume of Water Collected

$$Vwc = (0.04707)(Vfc)$$
$$= (0.04707)(103.6)$$
$$= 4.876$$

2. Volume of Air Metered

$$Vmstd = \frac{(Vm)(Tstd)(Pbar + \frac{\Delta H}{13.6})(Cm)}{(Tm)\quad(Pstd)}$$
$$= \frac{(37.371)(530)(30.01 + \frac{0.9590}{13.6})(0.987)}{(527.48)\quad(29.92)}$$

$$= 37.260 \text{ SCF}$$

3. Moisture Content

$$Bwo = \frac{Vwc}{(Vwc + Vmstd)}$$
$$= \frac{4.876}{4.876 + 37.260}$$
$$= 0.11573$$

4. Molecular Weights

$$Md = (\%CO2 \times 0.44) + (\%O2 \times 0.32) + ((\%N2 + \%CO) \times 0.28)$$
$$= (1.9 \times 0.44) + (19.2 \times 0.32) + (78.9 \times 0.28)$$
$$= 29.072$$

$$Ms = Md(1-Bwo) + 18(Bwo)$$
$$= (29.072)(1-0.11573) + 18(0.11573)$$
$$= 27.791$$

5. Velocity of Exit Gases

$$Vs = (Kp)(Cp)\sqrt{\frac{Ts}{(Ps)(Ms)}}\sqrt{(\Delta P)}\text{avg.}$$

$$= (85.48)(0.84)\sqrt{\frac{1079.75}{(30.00)(27.791)}}(0.43425)$$

$$= 35.482 \text{ FT./SEC.}$$

SAMPLE CALCULATIONS: Continued

6. Flowrates

$$Qs = (Vs)(As)(60)$$
$$= (35.482)(1.767)(60)$$
$$= 3762.1 \text{ ACFM}$$

$$Qsstd = \frac{(Qs)(Ps)(Tstd)(1-Bwo)}{(Pstd)(Ts)}$$
$$= \frac{(3762.1)(30.00)(530)(1-0.11573)}{(29.92)(1079.75)}$$
$$= 1637.5 \text{ SCFM}$$

7. Particulate Concentration

$$Cs = \frac{(Mn)(15.43)}{Vmstd}$$
$$= \frac{(0.0261)(15.43)}{37.260}$$
$$= 0.0108 \text{ GRAINS/SCF}$$

8. Particulate Emission Rate

$$pmr = \frac{(Mn)(Qsstd)(60)}{(Vmstd)(454)}$$
$$= \frac{(0.0261)(1637.5)(60)}{(37.260)(454)}$$
$$= 0.1516 \text{ POUNDS/HOUR}$$

9. Isokinetics

$$Is = \frac{Vmstd}{(An)(\theta)(Vsstd)} \quad \text{where } Vsstd = \frac{Qsstd}{As} = \frac{1637.5}{1.767} = 926$$

$$= \frac{37.260}{(0.000534)(72)(926.6)}$$

$$= 1.0452$$