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AP-42 Section Number: 9.9.1

Reference Number: 29

**Title: Particulate Emission Testing For
Wayne Farms, Sandersville, Miss.**

Air Systems Testing, Inc.

September 1972

**PARTICULATE EMISSION TESTING
FOR
WAYNE FARMS
SANDERSVILLE, MISSISSIPPI
SEPTEMBER 1-2, 1992**

Submitted By:

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INTRODUCTION

On Tuesday and Wednesday, September 1 and 2, 1992, Air Systems Testing, Inc. (AST), of Marietta, Georgia, performed compliance particulate emission testing on the grinding baghouse and the cooler exhausts at the Wayne Farms plant located in Sandersville, Mississippi. The testing was performed to determine if the particulate emission levels were within the allowable rates as defined by the Mississippi Department of Environmental Quality. Field testing was performed by Bruce Lawrie and Scott Wilson.

AST would like to thank Mr. Jon Jones and his associates at Wayne Farms for their assistance and cooperation throughout the testing program. We would also like to thank Mr. Elliott Bickerstaff with the Mississippi Department of Environmental Quality for observing the testing.

SUMMARY OF TEST RESULTS

The summary of the results of the testing can be found below and on the following page. Below is shown the results of each of the test repetitions and the average of the three (used to determine compliance with state standards) for each source. The results are reported in pounds of particulates per hour.

<u>Test No.</u>	<u>Particulate Emission Rate (pounds/hour)</u>	<u>Allowable Emission Rate (pounds/hour)</u>
Grinding Baghouse HAMMER MILL		
1	0.07	8.00
2	0.04	8.00
3	0.13	8.00
Average	0.08	8.00
<u>Pellet</u> Cooler Exhaust		
1	8.37	24.00
2	5.73	24.00
3	8.40	24.00
Average	7.07	24.00

Thus, from the above tables, both systems are within allowable Mississippi standards for particulate emissions.

SUMMARY OF TEST RESULTS

Grinding Baghouse Exhaust

	Test #1	Test #2	Test #3	
Volume @ Meter (Vm):	42.345	41.432	41.463	
Sqrt Delta P:	0.620	0.606	0.605	
Sampling Time (min):	60	60	60	
Barometric Pressure (Pb):	30.00	30.00	30.00	
Delta H (H):	1.55	1.48	1.48	
Volume in Impingers (mls):	55.0	33.5	33.0	
Stack Pressure (Ps):	30.01	30.01	30.01	
Stack Temperature (Ts):	563	563	565	
Meter Coefficient (Y):	1.018	1.018	1.018	
Pitot Coefficient (Cp):	0.84	0.84	0.84	
Meter Temperature (Tm):	554	553	553	
Area Stack (As):	1.17	1.17	1.17	
Area Nozzle (An):	0.000341	0.000341	0.000341	
Percent CO2 (%):	0.0	0.0	0.0	
Percent O2 (%):	21.0	21.0	21.0	
Percent N2 (%):	79.0	79.0	79.0	
Milligrams:	9.8	4.9	17.9	
				Average
Molecular Weight Dry (Md):	28.84	28.84	28.84	28.84
Volume Water (Vwstd):	2.59	1.58	1.55	1.57
Volume Gas Sampled (Vmstd):	41.334	40.509	40.539	40.524
Wet Fraction (Bws):	0.059	0.037	0.037	0.037
Molecular Weight Wet (Ms):	28.20	28.43	28.44	28.44
Volume Gas Sampled (Vma):	46.694	44.741	44.907	44.824
Stack Gas Velocity, (Vs):	36.31	35.35	35.35	35.35
Volumetric Flowrate (Qs):	2,257	2,247	2,240	2,243
Volumetric Flowrate (Qa):	2,549	2,481	2,481	2,481
Grainloading, gr/dscf:	0.0037	0.0019	0.0068	0.0043
Emission Rate, #/Hour:	0.07	0.04	0.13	0.08
Percent Isokinetic Sampling:	104.8	103.2	103.6	103.4

SUMMARY OF TEST RESULTS

Cooler Exhaust

	Test #1	Test #2	Test #3	
Volume @ Meter (Vm):	39.526	42.990	43.970	
Sqrt Delta P:	0.819	0.892	0.914	
Sampling Time (min):	60	60	60	
Barometric Pressure (Pb):	29.90	29.90	29.90	
Delta H (H):	1.36	1.63	1.70	
Volume in Impingers (mls):	55.0	68.0	58.0	
Stack Pressure (Ps):	29.39	29.39	29.39	
Stack Temperature (Ts):	569	570	568	
Meter Coefficient (Y):	1.018	1.018	1.018	
Pitot Coefficient (Cp):	0.84	0.84	0.84	
Meter Temperature (Tm):	549	553	557	
Area Stack (As):	10.56	10.56	10.56	
Area Nozzle (An):	0.000241	0.000241	0.000241	
Percent CO2 (%):	0.0	0.0	0.0	
Percent O2 (%):	21.0	21.0	21.0	
Percent N2 (%):	79.0	79.0	79.0	
Milligrams:	93.0	63.7	91.5	
				Average
Molecular Weight Dry (Md):	28.84	28.84	28.84	28.84
Volume Water (Vwstd):	2.59	3.20	2.73	2.97
Volume Gas Sampled (Vmstd):	38.786	41.908	42.563	42.235
Wet Fraction (Bws):	0.063	0.071	0.060	0.066
Molecular Weight Wet (Ms):	28.16	28.07	28.19	28.13
Volume Gas Sampled (Vma):	45.392	49.575	49.603	49.589
Stack Gas Velocity, (Vs):	48.76	53.24	54.35	53.80
Volumetric Flowrate (Qs):	26,401	28,518	29,548	29,033
Volumetric Flowrate (Qa):	30,897	33,735	34,436	34,086
Grainloading, gr/dscf:	0.0370	0.0235	0.0332	0.0283
Emission Rate, #/Hour:	8.37	5.73	8.40	7.07
Percent Isokinetic Sampling:	107.4	107.4	105.3	106.3

E.P.A. TEST PROCEDURES

The testing procedures followed were according to Methods 1, 2, 3, and 5; for location of sampling points; measuring of stack gas velocity and volumetric flow rate; determination of CO₂, O₂, and dry molecular weight; and determination of particulate concentrations. These methods can be found in the *Code of Federal Regulations*, Title 40, Parts 53-60, revised as of July 1, 1991.

Method 1, determination of number and location of sampling points, was used to calculate the location of the points used on each traverse.

EPA Method 2 was used to calculate the stack gas velocity and volumetric flow rate. The S-type pitot tube on the pitot-probe assembly was fabricated according to design criteria in Method 2 that allows a pitot coefficient of 0.84 to be used in the calculations. Stack gas temperatures used in the velocity calculations were obtained with a type "K" thermocouple and digital thermometer. Leak checks were performed on the pitot-manometer assembly after each test and showed no leak.

Method 3 was used to determine dry molecular weight, including CO₂ and O₂ concentrations. The dry molecular was assumed to be that of air, 28.84.

Method 5, Determination of Particulate Emission Concentrations, was used to determine particulate emissions. The sampling train consisted of a calibrated nozzle, union, probe with stainless steel liner heated with 60 feet of 0.4 ohms per foot nichrome wire, glass fiber filter and filter holder, three impingers, silica gel impinger, umbilical cord, pump, and control console. Stack, filter, impinger outlet, and dry gas meter temperatures were monitored throughout the test with type "K" thermocouples.

SAMPLING PROCEDURES

The sampling locations for the testing were on specially constructed platforms, downstream from the baghouse or cyclones. An eight foot monorail system was used on each of the test ports to support the filter/impinger box while the probe traversed the stack.

Prior to each test, the particulate sampling train was assembled for testing. 100 milliliters (ml) distilled water was placed in each of the first two impingers, the third impinger was left empty, and 200.0 grams (g) of silica gel was placed in impinger number 4. The probe was secured in the sampling box, the filter holder assembly was installed, and the system was ready for pre-test leak checks.

After each test, leak checks were performed on the sampling train and each side of the pitot tubes. In each of the test repetitions, all leak checks were within the allowable limitations. Next, the train was disassembled. The filter holder was removed and sealed. Next, the contents of the first three impingers were measured with a graduated cylinder, and the silica gel was returned to its container and sealed. The probe, nozzle, connecting glassware, and front half of filter holder were cleaned with reagent grade acetone, with all sample exposed surfaces brushed and rinsed at least six times to insure all of the sample was removed. This rinse was saved in a 500 ml polyethylene bottle.

LABORATORY PROCEDURES

The following procedures were followed for each repetition:

Container No. 1

A pre-numbered 81.5 millimeter glass fiber filter was desiccated for a minimum of 24 hours and weighted to a constant weight and transferred to this container. Before the test, the filter was placed in a filter holder. After the test, the filter was carefully removed from the filter holder and returned to the container.

Container No. 2

All sample exposed surfaces between the nozzle and the filter were washed with acetone, including brushing and rinsing at least six times, until no particulate matter remained. The brushes were also rinsed with the acetone to remove any particulates adhering to them.

Container No. 3

200.0 grams of indicating, 6-16 mesh silica gel was weighed and sealed in this container. Before the test, it was added to impinger number four. After the test, it was returned to the container and sealed.

The following procedures were followed for each sample:

Container No. 1

The filter was desiccated for at least 24 hours and weighed to a constant weight.

Note: Before each weighing, the SP 180 electronic analytical balance was calibrated internally with a 100 gram class S weight.

Container No. 2

The contents of this container were transferred to a tared beaker. The volume of the rinse was recorded and the contents evaporated. When the beaker was dry, it was desiccated and weighed to a constant weight.

Container No. 3

The silica gel was weighed to the nearest 0.5 gram.

APPENDIX A
LABORATORY RESULTS

PARTICULATE LABORATORY DATA SHEET

Test No. 1 Source: Grinding Baghouse

Acetone Blank Volume: 250 ml Net Wt.: 1.7 mg.

Acetone Density: 0.786 mg/ml Residue: 0.009 mg/g

FILTER

Filter No.: 1226

Final Weight: 0.4115 0.4113 Average: 0.4114 g.

Tare Weight: 0.4098 0.4099 . Average: 0.4099 g.

Net Weight: Average: 0.0016 g.

PROBE WASH

Probe Wash Beaker No.: 21

Volume: 275 ml.

Final Weight: 122.4722 122.4720 Average: 122.4721 g.

Tare Weight: 122.4621 122.4618 Average: 122.4620 g.

Net Weight: Average: 0.0101 g.

Less Blank Residue: 0.0019 g.

TOTAL PARTICULATE MATTER COLLECTED: 0.0098 g.

PARTICULATE LABORATORY DATA SHEET

Test No. 2 Source: Grinding Baghouse
Acetone Blank Volume: 250 ml Net Wt.: 1.7 mg.
Acetone Density: 0.786 mg/ml Residue: 0.009 mg/g

FILTER

Filter No.: 1203

Final Weight:	<u>0.4093</u>	<u>0.4094</u>	Average:	<u>0.4094</u> g.
Tare Weight:	<u>0.4065</u>	<u>0.4064</u>	Average:	<u>0.4065</u> g.
Net Weight:			Average:	<u>0.0029</u> g.

PROBE WASH

Probe Wash Beaker No.: 3	Volume:	200 ml.		
Final Weight:	<u>128.9443</u>	<u>128.9448</u>	Average:	<u>128.9446</u> g.
Tare Weight:	<u>128.9413</u>	<u>128.9410</u>	Average:	<u>128.9412</u> g.
Net Weight:			Average:	<u>0.0034</u> g.
Less Blank Residue:				<u>0.0014</u> g.

TOTAL PARTICULATE MATTER COLLECTED: 0.0049 g.

PARTICULATE LABORATORY DATA SHEET

Test No. 3 Source: Grinding Baghouse
Acetone Blank Volume: 250 ml Net Wt.: 1.7 mg.
Acetone Density: 0.786 mg/ml Residue: 0.009 mg/g

FILTER

Filter No.: 1225

Final Weight:	<u>0.4083</u>	<u>0.4081</u>	Average:	<u>0.4082</u> g.
Tare Weight:	<u>0.4063</u>	<u>0.4065</u>	Average:	<u>0.4064</u> g.
Net Weight:			Average:	<u>0.0018</u> g.

PROBE WASH

Probe Wash Beaker No.: 16	Volume:	225 ml.		
Final Weight:	<u>120.4230</u>	<u>120.4225</u>	Average:	<u>120.4228</u> g.
Tare Weight:	<u>120.4050</u>	<u>120.4052</u>	Average:	<u>120.4051</u> g.
Net Weight:			Average:	<u>0.0177</u> g.
Less Blank Residue:				<u>0.0015</u> g.

TOTAL PARTICULATE MATTER COLLECTED: 0.0179 g.

PARTICULATE LABORATORY DATA SHEET

Test No. 1 Source: Cooler Exhaust
Acetone Blank Volume: 250 ml Net Wt.: 1.7 mg.
Acetone Density: 0.786 mg/ml Residue: 0.009 mg/g

FILTER

Filter No.: 1227

Final Weight:	<u>0.4124</u>	<u>0.4123</u>	Average:	<u>0.4124</u> g.
Tare Weight:	<u>0.4118</u>	<u>0.4120</u>	Average:	<u>0.4119</u> g.
Net Weight:			Average:	<u>0.0005</u> g.

PROBE WASH

Probe Wash Beaker No.: 8	Volume:	240 ml.		
Final Weight:	<u>130.2497</u>	<u>130.2497</u>	Average:	<u>130.2497</u> g.
Tare Weight:	<u>130.1554</u>	<u>130.1556</u>	Average:	<u>130.1555</u> g.
Net Weight:			Average:	<u>0.0942</u> g.
Less Blank Residue:				<u>0.0016</u> g.

TOTAL PARTICULATE MATTER COLLECTED: 0.0930 g.

PARTICULATE LABORATORY DATA SHEET

Test No. 2 Source: Cooler Exhaust
Acetone Blank Volume: 250 ml Net Wt.: 1.7 mg.
Acetone Density: 0.786 mg/ml Residue: 0.009 mg/g

FILTER

Filter No.: 1215

Final Weight:	<u>0.4185</u>	<u>0.4183</u>	Average: <u>0.4184</u> g.
Tare Weight:	<u>0.4160</u>	<u>0.4159</u>	Average: <u>0.4160</u> g.
Net Weight:			Average: <u>0.0025</u> g.

PROBE WASH

Probe Wash Beaker No.: 24	Volume: 200 ml.
Final Weight:	<u>125.2812</u> <u>125.2808</u> Average: <u>125.2810</u> g.
Tare Weight:	<u>125.2182</u> <u>125.2186</u> Average: <u>125.2184</u> g.
Net Weight:	Average: <u>0.0626</u> g.
Less Blank Residue:	<u>0.0014</u> g.

TOTAL PARTICULATE MATTER COLLECTED: 0.0637 g.

PARTICULATE LABORATORY DATA SHEET

Test No. 3 Source: Cooler Exhaust

Acetone Blank Volume: 250 ml

Net Wt.: 1.7 mg.

Acetone Density: 0.786 mg/ml

Residue: 0.009 mg/g

FILTER

Filter No.: 1216

Final Weight: 0.4100 0.4101 Average: 0.4101 g.

Tare Weight: 0.4090 0.4089 Average: 0.4090 g.

Net Weight: Average: 0.0011 g.

PROBE WASH

Probe Wash Beaker No.: 6

Volume: 200 ml.

Final Weight: 128.0126 128.0130 Average: 128.0128 g.

Tare Weight: 127.9208 127.9212 Average: 127.9210 g.

Net Weight: Average: 0.0918 g.

Less Blank Residue: 0.0014 g.

TOTAL PARTICULATE MATTER COLLECTED: 0.0915 g.

AIR SYSTEMS TESTING, INC.

CHAIN OF CUSTODY

Plant: WAYNE FARMS

Source: GRINDING & COOLER

Date Sampled: 9/1-2/92

Run No.: 1-3 on each

Sample Recovery

Container No.:

Description:

As marked

As marked

As marked

Filters 1226, 1203, 1225, 1227, 1215, 1216

Probe wash test 1, 2, 3, - 1, 2, 3

Acetone blank

Person Engaged In Sample Recovery:

Signature: JOB

Recovery Location: WAYNE FARMS

Date of Recovery: AFTER EXCN TEST

Laboratory Person Receiving Sample:

Signature: JOB

Date of Receipt: 9/3/92

Sample Storage: LAB

PARTICULATE TEST FIELD DATA

Company: WAYNE FRAMS Source: GRINDING 3/4" Test No.: 1
 Date: SEPT 1, 1992 Test Team: LAWRIE / NILSON
 Nozzle Diameter: 0.250 in. Nozzle Area (Sq.Ft.): 0.000341
 Console No.: 2 Meter Calibration: 1.018 $K_m = 0.71$
 Stack Diameter: 12x14 in. Stack Area: 1.167 Sq. Ft.
 Assumed Moisture: 1 % Stack Static Pressure: +0.1 " w.c.
 Stack Temperature: ~100 oF Meter Temperature: ~90 oF
 Pressures: Barometric: 30.00 in. Hg. Stack: in. Hg.
 Probe No.: 3' #2 Filter/Impinger Box No.: 1 Cp = 0.84
 Orsat/Fyrite: % CO2 = 0 %O2 = 21 %N2 = 79
 Molecular Weight of Gas: Dry: Wet:
 K Factor: 4 Minutes/Point: 2.5
 Time Start: 12:55 PM Time End: 2:01 PM

Pre-test C.O.T. leak checks OK

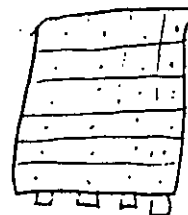
Point	Meter Volume	ΔP	ΔH		TEMPERATURES					Vacuum
			Desire	Actual	Stack	Box	Imp	Meter In	Meter Out	
1	449.087	0.36	1.44	1.44	97	264	52	92	92	2
2	450.82	0.40	1.60	1.60	101	259	50	93	92	2
3	452.64	0.43	1.72	1.72	101	256	49	93	91	2
4	454.47	0.43	1.72	1.72	102	252	51	94	91	2
5	456.33	0.45	1.80	1.80	101	250	54	94	92	2
6	458.22	0.45	1.80	1.80	102	247	56	94	92	2
1	460.01	0.35	1.40	1.40	104	249	52	95	93	3
2	461.72	0.37	1.48	1.48	104	247	52	95	93	3
3	463.46	0.40	1.60	1.60	105	242	51	96	93	3
4	465.22	0.41	1.64	1.64	104	246	50	96	93	3
5	467.07	0.42	1.68	1.68	104	244	49	97	93	3
6	468.90	0.46	1.84	1.84	104	245	50	97	93	3
1	470.85	0.36	1.44	1.44	99	252	48	95	93	3
2	472.60	0.37	1.48	1.48	103	250	48	95	93	3
3	474.33	0.40	1.60	1.60	103	247	48	95	93	3
4	476.13	0.40	1.60	1.60	104	246	48	95	93	3
5	478.93	0.41	1.64	1.64	104	242	49	95	93	3
6	479.74	0.48	1.92	1.92	105	243	53	95	93	3
1	481.71	0.28	1.12	1.12	105	247	53	95	93	3
2	483.27	0.23	0.92	0.92	105	246	55	96	93	2
3	484.62	0.30	1.20	1.20	104	247	54	96	93	3
4	486.21	0.33	1.32	1.32	105	249	56	97	93	3
5	487.84	0.37	1.48	1.48	107	250	59	97	93	3
6	489.59	0.43	1.72	1.72	104	253	62	97	94	3
END	491.432									

Comments:

Post test leak check 0.00 CFM @ 5 " Hg.

Pitots: OK

~~Not used for test~~



Moisture

Imp 1-3: 26

S. Gel: 9.5

Total: 35.5

PARTICULATE TEST FIELD DATA

Company: WAYNE FARMS Source: GRINDING B/H Test No.: 2
 Date: SEPT 1, 1992 Test Team: LAWKIE / WILSON
 Nozzle Diameter: 0.250 in. Nozzle Area (Sq.Ft.): 0.000341
 Console No.: 2 Meter Calibration: 1.018 $K_m =$ 0.72
 Stack Diameter: 12x14 in. Stack Area: 1.167 Sq. Ft.
 Assumed Moisture: 1 % Stack Static Pressure: +0.1 " w.c.
 Stack Temperature: -100 of Meter Temperature: -95 of
 Pressures: Barometric: 30.00 in. Hg. Stack: in. Hg.
 Probe No.: 3142 Filter/Impinger Box No.: 1 $C_p =$ 0.84
 Orsat/Fyrite: % CO2 = 0 %O2 = 21 %N2 = 77
 Molecular Weight of Gas: Dry: Wet:
 K Factor: 4 Minutes/Point: 2.5
 Time Start: 2:38 pm Time End: 3:45 pm

Point	Meter Volume	ΔP	ΔH		TEMPERATURES					Vacuum
			Desire	Actual	Stack	Box	Imp	Meter In	Meter Out	
1	491.528	0.33	1.32	1.32	100	250	55	94	94	3
2	493.18	0.36	1.44	1.44	104	249	54	94	94	3
3	494.88	0.40	1.60	1.60	104	248	54	93	94	3
4	496.65	0.42	1.68	1.68	104	247	55	93	93	3
5	498.47	0.43	1.72	1.72	104	247	53	93	93	3
6	500.34	0.45	1.80	1.80	104	240	64	94	93	3
1	502.24	0.37	1.28	1.28	104	249	55	93	93	3
2	503.29	0.35	1.40	1.40	104	247	56	92	92	3
3	505.53	0.39	1.56	1.55	104	248	57	93	92	3
4	507.38	0.40	1.60	1.60	103	248	53	93	92	3
5	509.18	0.41	1.64	1.64	103	248	60	94	92	3
6	511.01	0.45	1.80	1.80	103	247	62	94	92	3
1	512.92	0.33	1.32	1.32	103	240	67	94	92	3
2	514.58	0.35	1.40	1.40	103	249	68	94	92	3
3	516.26	0.38	1.52	1.52	103	249	70	94	92	3
4	518.03	0.40	1.60	1.60	103	248	70	94	92	3
5	519.83	0.42	1.68	1.68	102	247	70	95	92	3
6	521.65	0.45	1.80	1.80	104	246	70	95	92	3
1	523.54	0.24	0.96	0.96	103	249	68	94	92	2
2	524.96	0.24	0.96	0.96	103	252	68	94	92	2
3	526.37	0.25	1.00	1.00	103	252	68	94	92	3
4	527.77	0.35	1.40	1.40	103	252	67	94	92	3
5	529.45	0.36	1.44	1.44	103	251	67	94	92	3
6	531.17	0.40	1.60	1.60	103	250	66	94	92	3
END	532.960									

Comments: Post test leak check 0.002 CFM @ 5 " Hg.

Pitots: OK

Method ~~1~~ ~~2~~ ~~3~~ ~~4~~ ~~5~~ ~~6~~ ~~7~~ ~~8~~ ~~9~~ ~~10~~ ~~11~~ ~~12~~ ~~13~~ ~~14~~ ~~15~~ ~~16~~ ~~17~~ ~~18~~ ~~19~~ ~~20~~ ~~21~~ ~~22~~ ~~23~~ ~~24~~ ~~25~~ ~~26~~ ~~27~~ ~~28~~ ~~29~~ ~~30~~ ~~31~~ ~~32~~ ~~33~~ ~~34~~ ~~35~~ ~~36~~ ~~37~~ ~~38~~ ~~39~~ ~~40~~ ~~41~~ ~~42~~ ~~43~~ ~~44~~ ~~45~~ ~~46~~ ~~47~~ ~~48~~ ~~49~~ ~~50~~ ~~51~~ ~~52~~ ~~53~~ ~~54~~ ~~55~~ ~~56~~ ~~57~~ ~~58~~ ~~59~~ ~~60~~ ~~61~~ ~~62~~ ~~63~~ ~~64~~ ~~65~~ ~~66~~ ~~67~~ ~~68~~ ~~69~~ ~~70~~ ~~71~~ ~~72~~ ~~73~~ ~~74~~ ~~75~~ ~~76~~ ~~77~~ ~~78~~ ~~79~~ ~~80~~ ~~81~~ ~~82~~ ~~83~~ ~~84~~ ~~85~~ ~~86~~ ~~87~~ ~~88~~ ~~89~~ ~~90~~ ~~91~~ ~~92~~ ~~93~~ ~~94~~ ~~95~~ ~~96~~ ~~97~~ ~~98~~ ~~99~~ ~~100~~

#6

Moisture
 Imp 1-3: 25
 S. Gel: 8.5
 Total: 33.5

PARTICULATE TEST FIELD DATA

Company: WAYNE FARMS Source: GRINDING B/H Test No.: 3
 Date: SEPT 1, 1952 Test Team: LAWRIE / WILSON
 Nozzle Diameter: 0.250 in. Nozzle Area (Sq. Ft.): 0.000391
 Console No.: 2 Meter Calibration: 1.018 $K_m = 0.72$
 Stack Diameter: 12x14 in. Stack Area: 1.167 Sq. Ft.
 Assumed Moisture: 1 % Stack Static Pressure: ~0.1 " w.c.
 Stack Temperature: ~100 °F Meter Temperature: ~95 °F
 Pressures: Barometric: 30.00 in. Hg. Stack: 30.01 in. Hg.
 Probe No.: 3 #2 Filter/Impinger Box No.: 1 $C_p = 0.84$
 Orsat/Fyrite: % CO₂ = 0 % O₂ = 21 % N₂ = 79
 Molecular Weight of Gas: Dry: _____ Wet: _____
 K Factor: 4 Minutes/Point: 2.5
 Time Start: 3:56 pm Time End: 4:52 pm

Point	Meter Volume	ΔP	ΔH		TEMPERATURES					Vacuum
			Desire	Actual	Stack	Box	Imp	Meter In	Meter Out	
1	533.154	0.33	1.32	1.32	105	197	76	93	93	2
2	534.82	0.35	1.40	1.40	104	203	68	92	92	2
3	536.48	0.40	1.60	1.60	107	208	62	92	91	2
4	538.29	0.42	1.68	1.68	108	216	57	92	91	2
5	540.10	0.42	1.68	1.68	104	218	55	93	92	2
6	541.92	0.45	1.80	1.80	102	224	50	94	92	2
1	543.84	0.32	1.28	1.28	104	223	50	93	91	2
2	545.47	0.35	1.40	1.40	104	228	49	94	92	2
3	547.15	0.40	1.60	1.60	105	229	49	94	91	2
4	548.96	0.40	1.60	1.60	104	229	48	95	91	2
5	550.77	0.41	1.64	1.64	105	232	48	95	92	2
6	552.60	0.44	1.76	1.76	105	234	48	95	92	2
1	554.48	0.32	1.28	1.28	105	235	48	95	92	2
2	556.31	0.35	1.40	1.40	106	237	49	95	92	2
3	557.91	0.38	1.52	1.52	106	239	49	95	92	2
4	559.56	0.40	1.56	1.56	105	241	49	96	92	2
5	561.35	0.40	1.60	1.60	106	240	50	96	92	2
6	563.15	0.46	1.84	1.84	106	239	50	96	93	2
1	565.00	0.24	0.96	0.96	106	240	52	95	93	2
2	566.48	0.26	1.04	1.04	107	242	52	95	93	2
3	567.26	0.26	1.04	1.04	107	242	53	95	92	2
4	568.93	0.32	1.28	1.28	106	241	53	95	92	2
5	570.04	0.37	1.48	1.48	106	241	55	95	92	2
6	572.89	0.41	1.64	1.64	105	246	56	95	93	2
END	574.67									

Comments: Post test leak check 0.000 CFM @ 4 " Hg.

Pitots: _____

~~Method 1 is not to be used~~

#7

Moisture
 Imp 1-3: 25
 S. Gel: 8.0
 Total: 33.0

PARTICULATE TEST FIELD DATA

Company: WAYNE FARMS Source: COOLER Test No.: 2
Date: SEPT 2, 1992 Test Team: LAWRIE / WILSON
Nozzle Diameter: 0.210 in. Nozzle Area (Sq.Ft.): 0.000241
Console No.: 2 Meter Calibration: 1.018 $K_m = 0.71$
Stack Diameter: 44 in. Stack Area: 10.56 Sq. Ft.
Assumed Moisture: 6 % Stack Static Pressure: 2.7 " w.c.
Stack Temperature: ~110 oF Meter Temperature: ~90 oF
Pressures: Barometric: 29.90 in. Hg. Stack: 29.31 in. Hg.
Probe No.: 51#2 Filter/Impinger Box No.: _____ $C_p = 0.84$
Orsat/Fyrite: % CO₂ = 0 % O₂ = 21 % N₂ = 79
Molecular Weight of Gas: Dry: _____ Wet: _____
K Factor: 2 Minutes/Point: 5.0
Time Start: 10:38 pm Time End: 12:05

[illegible]

* STOP - PELLET MILL DOWN 25 min.
Comments: Post test leak check 0.003 CFM @ 5" Hg.

Pitots: OK

~~Method 5 Train 0 XXXX W Hg XXXX~~

Moisture
Imp 1-3: 60
S. Gel: 8.0
Total: 68.0

Particulate Emission Test Calculations

Company: Wayne Farms	Source: Grinding Baghouse	Test No: 1
Date: September 1, 1992	Test Team: Bruce Lawrie / Scott Wilson	
Nozzle Diameter: 0.250 in.	Nozzle Area (Sq.Ft.): 0.000341	
Console No.: 2	Meter Calibration: 1.018	Km: 0.71
Stack Diameter: 12 X 14 in.	Stack Area: 1.17 Sq.Ft.	
Stack Moisture: 5.9%	Stack Static Pressure: 0.1 " w.c.	
Stack Temperature: 103 oF	Meter Temperature: 94 oF	
Pressures:	Barometric: 30.00 in. Hg.	Stack: 30.01 in. Hg.
Probe No.: 3' #2	Filter/Impinger Box No.: 1	Cp = 0.84
Orsat/Fyrite:	% CO2 = 0.0	%O2 = 21.0 %N2 = 79.0
Molecular Weight of Gas:	Dry: 28.84	Wet: 28.20
K Factor: 3.8	Minutes/Point: 2.5	Number of Points: 24
Mls: 55.0		

Vm	^P	Sqrt ^P	^H	Ts	Tm	Tm	I*
449.087	0.36	0.600	1.44	99	92	92	106.3
450.82	0.40	0.632	1.60	101	93	92	106.1
452.64	0.43	0.656	1.72	101	93	91	103.0
454.47	0.43	0.656	1.72	102	94	91	104.7
456.33	0.45	0.671	1.80	101	94	92	103.8
458.22	0.45	0.671	1.80	102	94	92	98.4
460.01	0.35	0.592	1.40	104	95	93	106.5
461.72	0.37	0.608	1.48	104	95	93	105.4
463.46	0.40	0.632	1.60	105	96	93	103.7
465.24	0.41	0.640	1.64	104	96	93	105.3
467.07	0.42	0.648	1.68	104	97	93	103.9
468.90	0.46	0.678	1.84	104	97	93	105.8
470.850	0.36	0.600	1.44	99	95	93	107.0
472.60	0.37	0.608	1.48	103	95	93	104.7
474.33	0.40	0.632	1.60	103	95	93	104.8
476.13	0.40	0.632	1.60	104	95	93	104.9
477.93	0.41	0.640	1.64	104	95	93	104.2
479.74	0.48	0.693	1.92	105	95	93	105.0
481.71	0.28	0.529	1.12	105	95	93	108.6
483.27	0.23	0.480	0.92	105	96	93	106.6
484.66	0.30	0.548	1.20	104	96	93	104.1
486.21	0.33	0.574	1.32	105	97	93	104.4
487.84	0.37	0.608	1.48	107	97	93	106.1
489.59	0.43	0.656	1.72	104	97	94	103.3

491.432 Final

AVERAGES

42.345	0.620	1.55
	103	94
	563 oR	554 oR
		104.9

Particulate Emission Test Calculations

Company: Wayne Farms	Source: Grinding Baghouse	Test No: 2
Date: September 1, 1992	Test Team: Bruce Lawrie / Scott Wilson	
Nozzle Diameter: 0.250 in.		Nozzle Area (Sq.Ft.): 0.000341
Console No.: 2	Meter Calibration: 1.018	Km: 0.71
Stack Diameter: 12 X 14 in.	Stack Area: 1.17 Sq.Ft.	
Stack Moisture: 3.7%	Stack Static Pressure: 0.1 " w.c.	
Stack Temperature: 103 oF	Meter Temperature: 93 oF	
Pressures:	Barometric: 30.00 in. Hg.	Stack: 30.01 in. Hg.
Probe No.: 3' #2	Filter/Impinger Box No.: 1	Cp = 0.84
Orsat/Fyrite:	% CO2 = 0.0	% O2 = 21.0 % N2 = 79.0
Molecular Weight of Gas:	Dry: 28.84	Wet: 28.43
K Factor: 3.9	Minutes/Point: 2.5	Number of Points: 24
Mls: 33.5		

Vm	^P	Sqrt ^P	^H	Ts	Tm	Tm	I*
491.528	0.33	0.574	1.32	100	94	94	103.6
493.18	0.36	0.600	1.44	104	94	94	102.5
494.88	0.40	0.632	1.60	104	93	94	101.4
496.65	0.42	0.648	1.68	104	93	93	101.8
498.47	0.43	0.656	1.72	104	93	93	103.4
500.34	0.45	0.671	1.80	104	94	93	102.6
502.24	0.32	0.566	1.28	104	93	93	105.7
503.89	0.35	0.592	1.40	104	92	92	104.3
505.59	0.39	0.624	1.56	104	93	92	104.0
507.38	0.40	0.632	1.60	103	93	92	103.2
509.18	0.41	0.640	1.64	103	94	92	103.5
511.01	0.45	0.671	1.80	103	94	92	103.2
512.920	0.33	0.574	1.32	103	94	92	104.6
514.58	0.35	0.592	1.40	103	94	92	102.8
516.26	0.38	0.616	1.52	103	94	92	104.0
518.03	0.40	0.632	1.60	103	94	92	103.1
519.83	0.42	0.648	1.68	104	95	92	101.7
521.65	0.45	0.671	1.80	104	95	92	102.1
523.54	0.24	0.490	0.96	103	94	92	104.8
524.96	0.24	0.490	0.96	103	94	92	101.9
526.34	0.25	0.500	1.00	103	94	92	103.4
527.77	0.35	0.592	1.40	103	94	92	102.8
529.45	0.36	0.600	1.44	103	94	92	103.8
531.17	0.40	0.632	1.60	103	94	92	102.5

532.960 Final

AVERAGES

41.432	0.606	1.48
	103	93
	563 oR	553 oR
		103.2

Particulate Emission Test Calculations

Company: Wayne Farms	Source: Grinding Baghouse	Test No: 3
Date: September 1, 1992	Test Team: Bruce Lawrie / Scott Wilson	
Nozzle Diameter: 0.250 in.	Nozzle Area (Sq.Ft.): 0.000341	
Console No.: 2	Meter Calibration: 1.018	Km: 0.71
Stack Diameter: 12 X 14 in.	Stack Area: 1.17 Sq.Ft.	
Stack Moisture: 3.7%	Stack Static Pressure: 0.1 " w.c.	
Stack Temperature: 105 oF	Meter Temperature: 93 oF	
Pressures:	Barometric: 30.00 in. Hg.	Stack: 30.01 in. Hg.
Probe No.: 3' #2	Filter/Impinger Box No.: 1	Cp = 0.84
Orsat/Fyrite:	% CO2 = 0.0	% O2 = 21.0
		% N2 = 79.0
Molecular Weight of Gas:	Dry: 28.84	Wet: 28.44
K Factor: 3.9	Minutes/Point: 2.5	Number of Points: 24
Mls: 33.0		

Vm	^P	Sqrt ^P	^H	Ts	Tm	Tm	I*
533.154	0.33	0.574	1.32	105	93	93	105.1
534.82	0.35	0.592	1.40	104	92	92	101.8
536.48	0.40	0.632	1.60	107	92	91	104.3
538.29	0.42	0.648	1.68	108	92	91	101.8
540.10	0.42	0.648	1.68	104	93	92	101.9
541.92	0.45	0.671	1.80	102	94	92	103.6
543.84	0.32	0.566	1.28	104	93	91	104.5
545.47	0.35	0.592	1.40	104	94	92	102.8
547.15	0.40	0.632	1.60	105	94	91	103.9
548.96	0.40	0.632	1.60	104	95	91	103.7
550.77	0.41	0.640	1.64	105	95	92	103.6
552.60	0.44	0.663	1.76	105	95	92	102.7
554.480	0.32	0.566	1.28	105	95	92	104.3
556.11	0.35	0.592	1.40	106	95	92	104.2
557.81	0.38	0.616	1.52	106	95	92	102.9
559.56	0.39	0.624	1.56	105	96	92	103.7
561.35	0.40	0.632	1.60	106	96	92	104.3
563.17	0.46	0.678	1.84	106	96	93	102.5
565.09	0.24	0.490	0.96	106	95	93	102.6
566.48	0.26	0.510	1.04	107	95	93	105.1
567.96	0.26	0.510	1.04	107	95	92	104.5
569.43	0.32	0.566	1.28	106	95	92	103.1
571.04	0.37	0.608	1.48	106	95	92	104.9
572.80	0.41	0.640	1.64	105	95	93	102.7

574.617 Final

AVERAGES

41.463	0.605	1.48
	105	93
	565 oR	553 oR
		103.5

Particulate Emission Test Calculations

Company: Wayne Farms	Source: Cooler Exhaust	Test No: 1
Date: September 2, 1992	Test Team: Bruce Lawrie / Scott Wilson	
Nozzle Diameter: 0.210 in.	Nozzle Area (Sq.Ft.): 0.000241	
Console No.: 2	Meter Calibration: 1.018	Km: 0.71
Stack Diameter: 44 in.	Stack Area: 10.56 Sq.Ft.	
Stack Moisture: 6.3%	Stack Static Pressure: -7.0 " w.c.	
Stack Temperature: 109 oF	Meter Temperature: 89 oF	
Pressures:	Barometric: 29.90 in. Hg.	Stack: 29.39 in. Hg.
Probe No.: 5' #2	Filter/Impinger Box No.: 1	Cp = 0.84
Orsat/Fyrite:	% CO2 = 0.0	%O2 = 21.0 %N2 = 79.0
Molecular Weight of Gas:	Dry: 28.84	Wet: 28.16
K Factor: 1.8	Minutes/Point: 5.0	Number of Points: 12
MIs: 55.0		

Vm	^P	Sqrt ^P	^H	Ts	Tm	Tm	I*
575.015	0.68	0.825	1.36	111	86	86	108.6
578.34	0.62	0.787	1.24	116	86	85	108.6
581.50	0.57	0.755	1.14	117	87	86	109.2
584.55	0.50	0.707	1.00	118	90	87	108.6
587.40	0.45	0.671	0.90	119	90	87	109.7
590.13	0.47	0.686	0.94	118	92	88	110.3
592.946	0.71	0.843	1.42	117	91	89	109.2
596.37	0.90	0.949	1.80	98	91	88	104.9
600.13	1.00	1.000	2.00	97	90	88	107.0
604.17	0.80	0.894	1.60	97	90	89	106.4
607.77	0.71	0.843	1.42	99	90	89	104.6
611.10	0.75	0.866	1.50	98	90	89	105.1
614.541	Final						

AVERAGES

39.526	0.819	1.36	109	89	107.7
			569 oR	549 oR	

Particulate Emission Test Calculations

Company: Wayne Farms	Source: Cooler Exhaust	Test No: 3
Date: September 2, 1992	Test Team: Bruce Lawrie / Scott Wilson	
Nozzle Diameter: 0.210 in.	Nozzle Area (Sq.Ft.): 0.000241	
Console No.: 2	Meter Calibration: 1.018	Km: 0.71
Stack Diameter: 44 in.	Stack Area: 10.56 Sq.Ft.	
Stack Moisture: 6.0%	Stack Static Pressure: -7.0 " w.c.	
Stack Temperature: 108 oF	Meter Temperature: 97 oF	
Pressures:	Barometric: 29.90 in. Hg.	Stack: 29.39 in. Hg.
Probe No.: 5' #2	Filter/Impinger Box No.: 1	Cp = 0.84
Orsat/Fyrite:	% CO2 = 0.0	% O2 = 21.0 % N2 = 79.0
Molecular Weight of Gas:	Dry: 28.84	Wet: 28.19
K Factor: 1.9	Minutes/Point: 5.0	Number of Points: 12
Mls: 58.0		

Vm	^P	Sqrt ^P	^H	Ts	Tm	Tm	I*
657.735	1.20	1.095	2.40	100	97	97	104.2
662.10	1.10	1.049	2.20	101	94	95	106.0
666.33	1.00	1.000	2.00	106	96	96	104.7
670.31	0.82	0.906	1.64	109	98	97	104.5
673.91	0.74	0.860	1.48	111	99	97	105.5
677.36	0.86	0.927	1.72	110	100	98	104.3
681.044	0.90	0.949	1.80	111	99	99	102.9
684.76	0.93	0.964	1.86	118	98	97	108.3
688.70	1.00	1.000	2.00	105	96	98	107.1
692.78	0.66	0.812	1.32	107	96	97	105.7
696.05	0.50	0.707	1.00	108	96	97	105.5
698.89	0.48	0.693	0.96	108	98	97	106.5

701.705 Final

AVERAGES

43.970	0.914	1.70	108	97	105.4
			568 oR	557 oR	

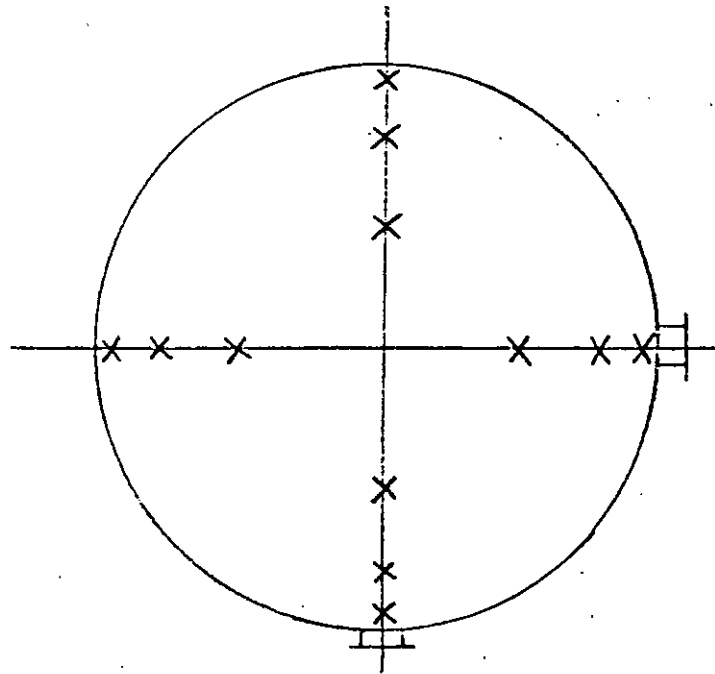
NOMENCLATURE

A_s	Cross-sectional area of stack, feet ²
A_n	Cross-sectional area of nozzle, feet ²
ACFM	Actual cubic feet of stack gas per minute at stack conditions
B_{ws}	Proportion by volume of water vapor in stack gas
c_s	Particulate concentration in stack gas, gr/dscf
c_{sl}	Particulate concentration in stack gas, gr/ACF
C_p	Pitot tube coefficient
delta H	Pressure drop across orifice, inches H ₂ O
d_p	Nozzle diameter, inches
delta P	Velocity pressure of stack gas, inches H ₂ O
dscf	Cubic feet of stack gas @ standard conditions
E	Particulate emission rate, pounds per hour
K_p	Constant (85.49)
Mg.	Total particulate matter collected, milligrams
I	Percent of isokinetic sampling
P_{bar}	Barometric pressure, inches mercury
P_m	Barometric pressure of dry gas meter inches mercury
P_s	Absolute stack gas pressure, inches mercury
P_{std}	Barometric pressure, standard conditions (29.92" Mercury)

Q_a	Volumetric flow rate, actual conditions, ACF/minute
Q_s	Volumetric flow rate, dry standard conditions, dscf/minute
T_m	Absolute average dry gas meter temperature, °R
T_s	Absolute average stack gas temperature, °R
T_{std}	Absolute temperature at standard conditions, °R
V_{lc}	Total volume collected in impingers and silica gel, milliliters
V_m	Volume of stack gas sampled through gas meter
V_{mstd}	Volume of stack gas sampled through gas meter, standard ft ³
V_s	Average stack gas velocity, feet per second
V_{wstd}	Volume of water vapor in gas sampled, standard ft ³
Y	Dry gas meter calibration factor

APPENDIX C
SAMPLE POINT LOCATIONS

**SAMPLING POINT LOCATION
FOR
COOLER EXHAUST**



44 inch Diameter Stack

<u>Sampling Point</u>	<u>Distance From Stack Wall (Inches)</u>
1	1.9
2	6.4
3	13.0
4	31.0
5	37.6
6	42.1

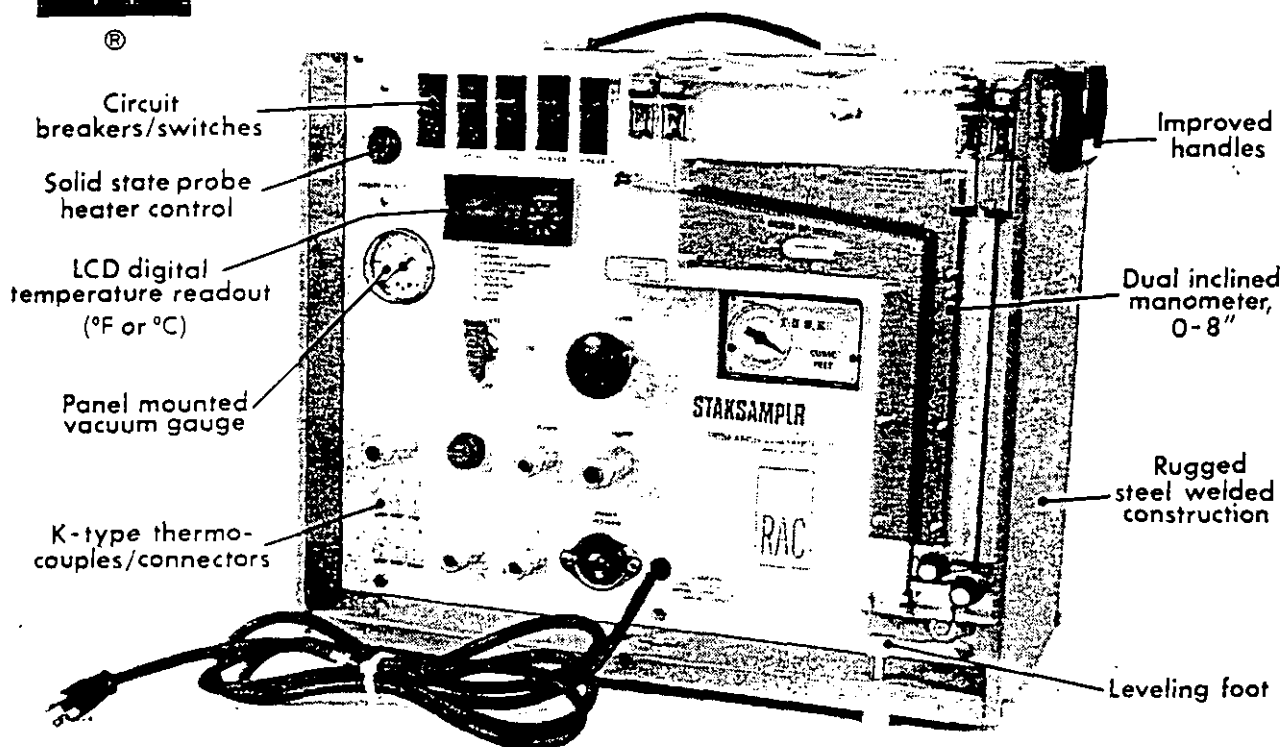
APPENDIX D
TEST EQUIPMENT & CALIBRATION DATA



STAKSAMPLR LCD™

From the leader in the field of air pollution monitors

BULLETIN RF 823-1



LIGHTWEIGHT

Staksamplr LCD™ is transportable by one person, with the meter control console weighing less than 50 pounds. This weight reduction was achieved without sacrificing the durability and reliability standard on RAC samplers.

COMPACT

Staksamplr LCD™ encased in a rugged steel welded enclosure, is compact, yet offers ease in component serviceability. By simply removing the screws holding the rear portion of the case, the user is able to service all internal components without restriction.

A separate, external high capacity rotary vane pump adds to the compactness of the meter control case while reducing noise and vibration during sampling periods.

DIGITAL

Staksamplr LCD™ is equipped with a liquid crystal display (LCD) temperature indicator for various points in the sampling system. (Maximum readout capacity is 10 points.) The LCD readout, not to be confused with the more popular LED readouts, provides temperature readings which can be observed in direct sunlight.

CALL TOLL FREE 800-241-6898
RESEARCH APPLIANCE COMPANY

DIVISION OF ANDERSEN SAMPLERS, INC., 4801 FULTON IND. BLVD.
ATLANTA, GEORGIA 30336 • 404-691-1910

• options & accessories

Digital Temperature Display

Staksampr LCD is a complete stack sampling system which provides accurate digital temperature readouts for 6 different points in the system. Thermocouples replace dial thermometers and are used to obtain temperature readings (1) in the stack, (2) at the probe liner, (3) in sample case heated compartment, (4) at outlet of last impinger, (5) at dry gas meter inlet, and (6) at dry gas meter outlet. The meter control case is equipped with a liquid crystal display (LCD) temperature indicator and external pump and is compatible with all existing RAC Staksampr's.

Large Filter Holders

When a high volume of particulate matter is encountered, interchangeable 3" (80 mm, P/N 201012) and 4" (110mm, P/N 201013) glass units can be substituted for 2.5" (64mm, P/N 997065) particle filter in sample case heated compartment. All sizes of RAC filter holders are equipped with a fritted glass disc to support the filter media.

Water-Jacketed Pitobes

These jacketed units use circulating water to withstand stack temps over 800°F; available in 3', 5' & 10' effective lengths.

Stainless Steel Impingers-Bubblers

For applications in which breakage of glassware is a common problem, RAC offers optional stainless steel impingers (P/N 201093) & bubbler units (P/N 201092) with ball-joint connections. These unbreakable all-metal units are interchangeable with the std glassware.

Sectionalized Pitot Tube

Three modular sections provide an S-type pitot with effective lengths of 10' & 15'.

Digital Pocket Pyrometer

Pocket-sized, battery powered thermocouple pyrometer provides stable, accurate temperature readings. Type K thermocouple (supplied separately) attaches to pitotube and provides temperatures over a range of 50° to 1900°F (P/N 992726) or 10° to 1100°C (P/N 992726-1).

Slide Rule Nomograph

Performs presampling and during-sampling isokinetic calculations easily and accurately; handy, standard, slide rule body; very accurate and versatile, no assumptions are necessary; calculates nozzle diameter and isokinetic sampling rate (P/N 201014); optional slide rule

(P/N 201127) available if meter moisture content is greater than 2.5% and/or dry molecular weight is not 29 ± 1 .

Special Probe Liners

In addition to the standard Pyrex glass and Type 304 stainless steel liners furnished as standard with RAC probes, optional liners made of Teflon, Type 316 stainless steel, quartz, and Inconel also are available on special order. These liners are furnished in standard lengths of 3', 5' or 10' (except for Pyrex glass and quartz) and special lengths can be supplied to order.

Flexible Sampling Lines

For sampling operations in confined or physically restricted areas, RAC offers flexible, heated, sample-collecting lines that allow the pitotube to be separated from the sample case by distances up to 20' with no loss in sampling efficiency. Available in 5', 10', 15' & 20' lengths, these flexible lines can be used for gas streams with temps up to 300°F (max), and have std ball-joint connections at both ends. A variable voltage device controls temp range in the sample line and prevents burn-out of integral heating wires. Pitot extension lines may be required.

Stack Interface

This instrument adapts the Staksampr control console for use with the RAC Stack Gas Train sample case, which uses midget (30 ml) impingers for sampling moisture (EPA Method 4) and SO₂ (EPA Method 6) in stacks or ducts; has flowmeter to monitor the low flow rates required, drying tube & connections for sampling pitot & electrical lines (P/N 997503).

Andersen In-Stack Fractionating Sampler

Precision, multi-stage, stainless steel unit collects & automatically classifies particles into 8 sizes (ranging from +20.0 microns down to 0.36 microns dia) according to their aerodynamic characteristics; isokinetic techniques can be used for sampling in stacks with velocities from 100 to 12,000 fpm & temps to 1500°F; adapts to all RAC pitobes (P/N 201037).

Gas Stream Hygrometer

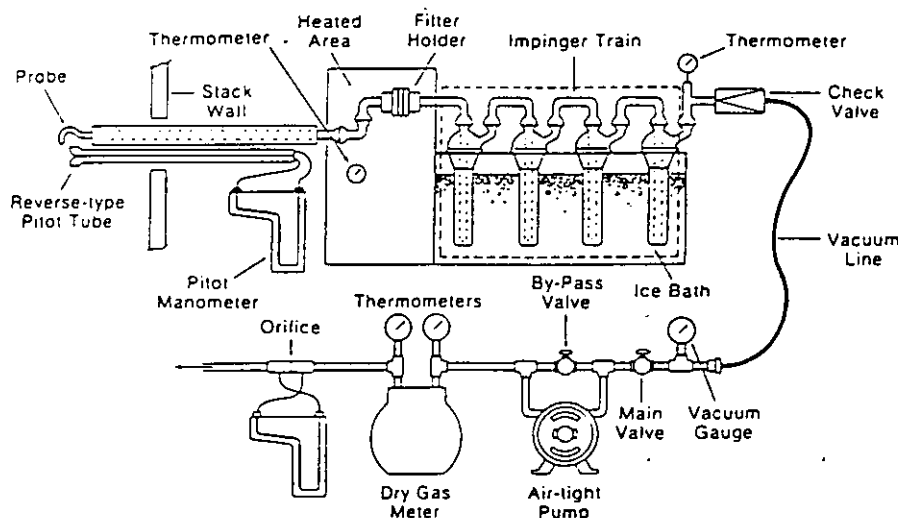
Uses matched (0–220°F) wet-bulb and dry-bulb thermometers to measure percent of water vapor in stack gas streams with temps below 212°F; stainless steel construction (P/N 997517).

Alundum Thimble Filter (in-stack)

Uses 45 x 127mm Alundum (ceramic) thimble of coarse porosity for dry collection of particles entrained in gas streams with temps to 1500°F; glass-fiber and

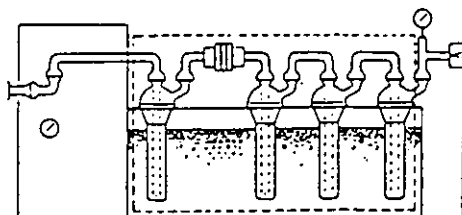
RAC Staksampr Schematic of EPA Particulate Sampling Train (Method 5)

Same basic configuration used to sample Beryllium & Mercury Vapor (Federal Register, Vol. 36, Nos. 234 [Be, Hg] & 247)



Configuration of Sample Case for sampling SO₂, SO₃, & H₂SO₄ MIST (Method 8)

Heated area is by-passed; particulate filter positioned between 1st & 2nd impingers; all other components same as for particulate sampling. (Federal Register, Vol. 36, No. 247)



AST Meter/Orifice Calibration

Console No.: 2

Calibration Date: April 6, 1992

Time (min)	^H	^cm	Gas Volume Calibration Meter		Gas Volume Dry Gas Meter		Tcm	T1	T2
			Initial	Final	Initial	Final			
18.00	0.5	0.0	941.195	948.498	198.565	205.748	65	66 72	64 65
15.00	1.0	0.0	948.498	957.053	205.748	214.222	65	71 75	65 66
20.00	2.0	0.0	957.053	973.420	214.222	230.406	65	74 77	66 69
14.00	3.0	0.0	973.420	987.178	230.406	244.012	65	76 77	69 70
18.00	4.0	0.0	987.178	1007.825	244.012	264.342	65	76 77	69 70

Pb = 29.00

H = 0.5	MCF = 1.019	Qm = 0.405	Km = 0.723
H = 1.0	MCF = 1.015	Qm = 0.569	Km = 0.719
H = 2.0	MCF = 1.019	Qm = 0.818	Km = 0.730
H = 3.0	MCF = 1.019	Qm = 0.984	Km = 0.716
H = 4.0	MCF = 1.021	Qm = 1.145	Km = 0.723
AVERAGE	MCF = 1.018	Qm = 0.784	Km = 0.723

CALCULATIONS

$$MCF = \frac{(Cm \text{ Final} - Cm \text{ Initial}) (Tdgm) (Pcm)}{(DGM \text{ Final} - DGM \text{ Initial}) (Tcm) (Pdgm)}$$

$$Qm = \frac{DGM \text{ Volume}}{Time} \times \frac{(T2 \text{ Avg.} + 460)}{(T1 + T2 \text{ Avg.} + 460)} \times (MCF)$$

$$Km = (Qm) [\text{Sqrt} (Pm * Mm / Tm / ^H)]$$

AIR SYSTEMS TESTING, INC.

Post Test Meter Calibration

Console #2

ΔH	Δcm	V1cm	V2cm	V1dgm	V2dgm	Tcm	T1	T2
1.5	0.0	605.912	612.983	415.638	422.640	74	81 84	77 77
1.5	0.0	612.983	629.111	422.640	438.631	74	83 85	77 78
1.5	0.0	629.111	636.866	438.631	446.342	74	83 85	78 79

Pb = 29.20

MCF = 1.017

MCF = 1.017

MCF = 1.016

Average MCF = 1.017

Calibrated by: JBL

Date: 2/15/92

AIR SYSTEMS TESTING, INC.

Thermocouple Calibration

Console #2 Meter Inlet

Thermocouple (oF)

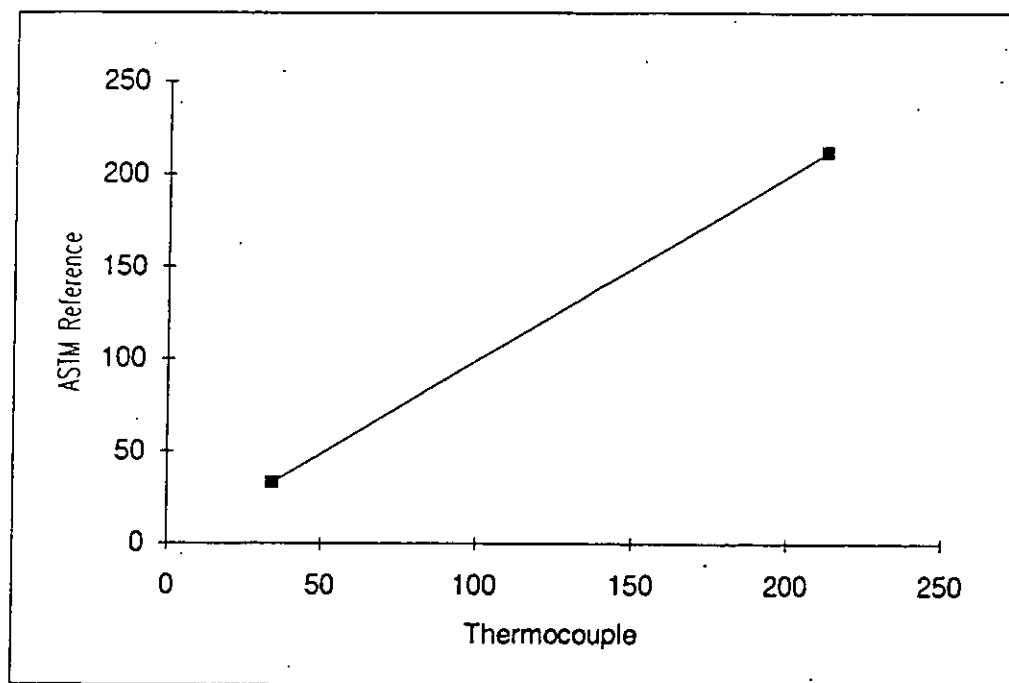
ASTM Reference (oF)

34

33

212

212



Calibration Date: April 8, 1992

AIR SYSTEMS TESTING, INC.

Thermocouple Calibration

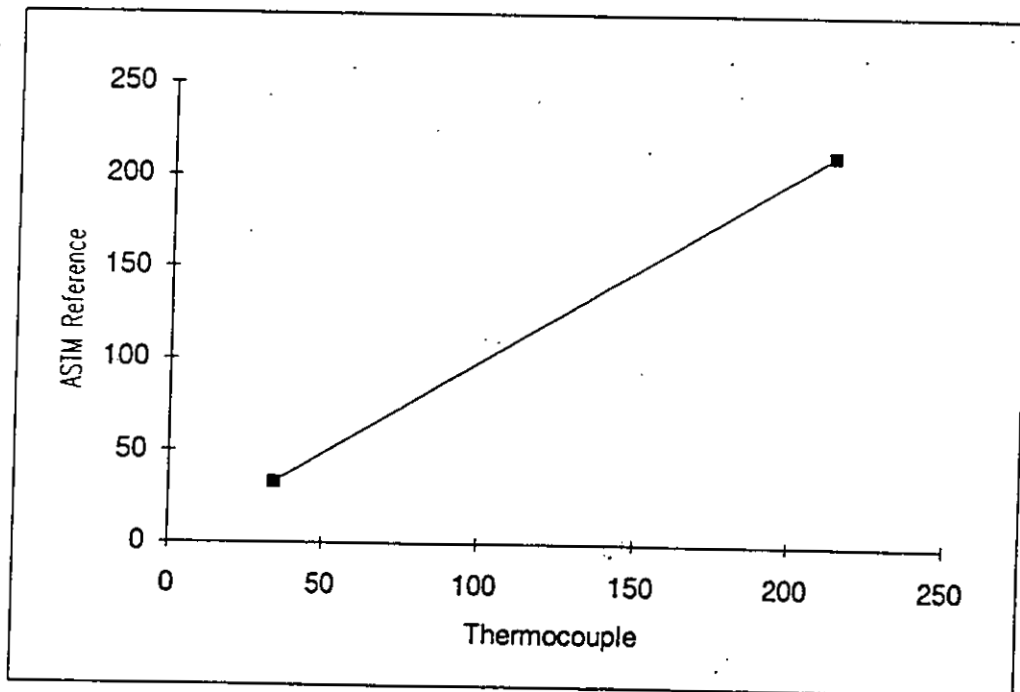
Console #2 Meter Outlet

Thermocouple (oF)

34
213

ASTM Reference (oF)

33
212



Calibration Date: April 8, 1992

AIR SYSTEMS TESTING, INC.

Thermocouple Calibration

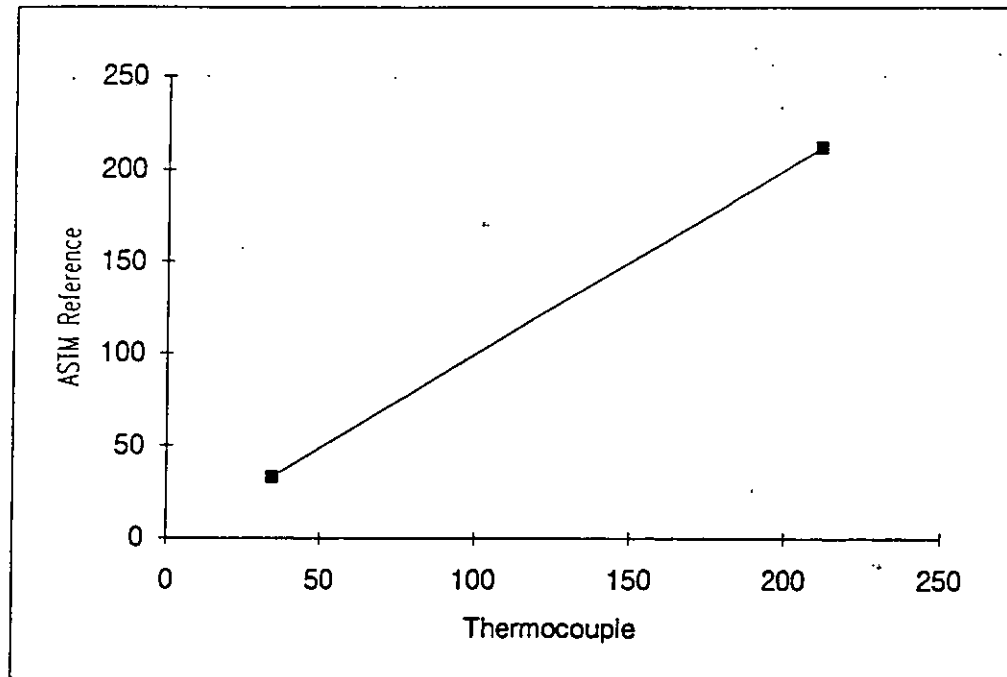
5' Probe #2 Stack T/C

Thermocouple (oF)

ASTM Reference (oF)

34
211

33
212



Calibration Date: April 8, 1992