Background Report Reference

AP-42 Section Number: 9.5.2

Background Chapter: 4

Reference Number: 1

Title: Report on Compliance Testing

Hillshire Farms & Kahn's

February 1993

Section 4 Reference 1
AP-42 Reference ___

Emission Test Report Review Checklist--Short Form

Reviewer: BRIAN SHRAGER
Review Date: 7/5/94

A. Background Information

1. Facility name: HILLSHIRE FARM® & KAHN'S
   Location: NEW LONDON, WISCONSIN
2. Source category: MEAT SMOKEHOUSES
3. Test date: Jan. 21, 1993
4. Test sponsor: HILLSHIRE FARM & KAHN'S
5. Testing contractor: CLEAN AIR ENGINEERING
6. Purpose of test: Compliance test (Formaldehyde & hydrocarbons)
7. Pollutants measured (include test method and indicate if valid): FORMALDEHYDE → BIF Method 0011 → REFERENCE METHOD ✓
   HYDROCARBONS → EPA Method 25A → REFERENCE METHOD ✓
8. Process overview: Attach a process description and a block diagram. Identify processes tested with letters from the beginning of the alphabet (A, B, C, etc...) and APC systems with letters from the end of the alphabet (V, W, X, etc...). Also identify test locations with Arabic numerals (1,2,3, ...). Using the ID symbols from the diagram, complete the table below.

Test ID	Process	Process ID	Emissions tested		APCD (controlled emissions only)
			Uncontrolled	Controlled	
1	CONTINUOUS SMOKEHOUSE	A	✓		ID: Type: Model #:
2	CONTINUOUS SMOKEHOUSE	A		✓	ID: Z Type: Vortex wet Scrubber and in-stack demister Model #: Sonic Environmental
					ID: Type: Model #:
					ID: Type: Model #:

B. Process Information

1. Provide a brief narrative description of the process and attach process flow diagram. (Note: If the process description provided in the test report is adequate, attach a copy here.)

DESCRIPTION OF INSTALLATION

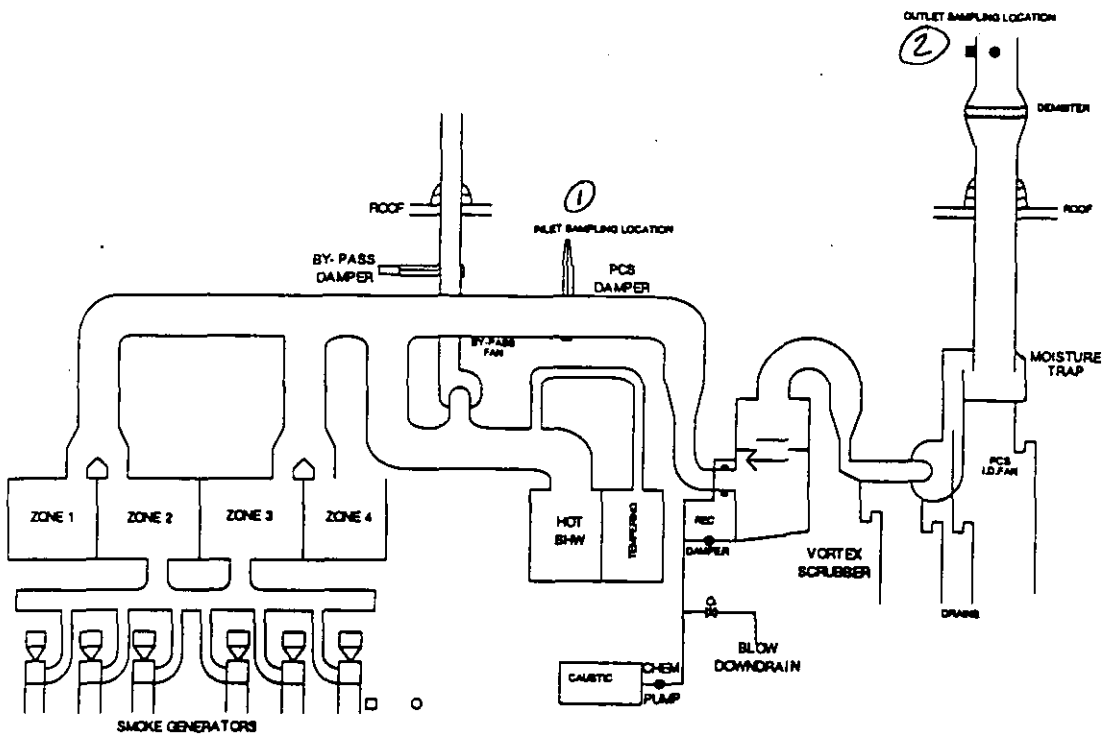
Hillshire Farms & Kahn's located in New London, Wisconsin operates the KSI-2 Smokehouse (Unit 3335) which is used to smoke sausages and other meats. The process runs continuously for 20 hours each day.

Emissions are controlled by a Sonic Environmental Vortex Scrubber. The volumetric flow rate through the scrubber is approximately 7,000 acfm.

The testing reported in this document was performed at the Smokehouse Scrubber Inlet and Smokehouse Stack.

A schematic of the process is shown below.

* OPERATING @ 8,000 lbs of meat out/hr = 4 tons/hr produced



* PER 2/22/93 MEMO FROM ANDY SEEBER, STATE OF WISCONSIN, TO FILES.

C. 1. List any APCD parameters (supplied in the test report) below.

APCD ID	Parameter	Units	Readings			
			Run 1	Run 2	Run 3	Run 4
2	NO PARAMETERS DOCUMENTED.					
Type of APCD: VORTEX WET SCRUBBER W/INSTACK DEMISTER						
Type of APCD:						
Type of APCD:						

2. Include any additional information (such as capture techniques for fugitive systems) and descriptions of the air pollution control systems (use a separate page if necessary).

TEST DATA FROM HILLSHIRE FARMS 1/21/93 EMISSION TEST
FILENAME: F:\PRIVATE\BRI\AP42\SMOKEHSE\REF1DATA.WQ1

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported				
			Run 1	Run 2	Run 3	Run 4	
1	Stack temperature	Deg F	116	115	115	115	
KSI-2	Moisture	%	10.5	5.7	8.8	7.3	
SMOKEHOUS	Oxygen	%	20.9	20.9	20.9	20.9	
SCRUBBER	Volumetric flow, actual	acfm	7800	8051	7227	7639	
INLET	Volumetric flow, standard	dscfm	6213	6772	5873	6323	
	Isokinetic variation	%	NA	NA	NA	NA	
Circle: Production or feed rate Capacity:		TPH	4	4	4	4	
	Pollutant concentrations:						
	TVOC as propane	ppm	void	98	99	87	
	Formaldehyde	lb/dscf	5.29E-08	5.49E-08	4.72E-08	ND	
	Pollutant mass flux rates:						
	TVOC as propane	lb/hr	void	4.55	3.98	3.77	
	Formaldehyde	lb/hr	0.0197	0.0223	0.0166	ND	
	Emission factors:						AVERAGE
	TVOC as propane	lb/ton	void	1.14	1.00	0.942	1.03
	Formaldehyde	lb/ton	0.00493	0.00558	0.00416	ND	0.00489

TEST 1 EMISSION FACTORS--METRIC UNITS					AVERAGE
kg/Mg	void	0.568	0.498	0.471	0.513
kg/Mg	0.00247	0.00279	0.00208	ND	0.00244

Test ID	Parameter	Units	Values reported				
			Run 1	Run 2	Run 3	Run 4	
2	Stack temperature	Deg F	119	119	117	118	
KSI-2	Moisture	%	9.3	8.7	9.2	9	
SMOKEHOUS	Oxygen	%	20.9	20.9	20.9	20.9	
SCRUBBER	Volumetric flow, actual	acfm	6691	6670	6749	6710	
INLET	Volumetric flow, standard	dscfm	5407	5428	5470	5449	
(STACK)	Isokinetic variation	%	NA	NA	NA	NA	
Circle: Production or feed rate Capacity:		TPH	4	4	4	4	
	Pollutant concentrations:						
	TVOC as propane	ppm	void	43	48	56	
	Formaldehyde	lb/dscf	2.69E-08	2.98E-08	3.72E-08	ND	
	Pollutant mass flux rates:						
	TVOC as propane	lb/hr	void	1.60	1.80	2.09	
	Formaldehyde	lb/hr	0.00873	0.00971	0.0122	ND	
	Emission factors:						AVERAGE
	TVOC as propane	lb/ton	void	0.400	0.450	0.523	0.457
	Formaldehyde	lb/ton	0.00218	0.00243	0.00305	ND	0.00255

TEST 2 EMISSION FACTORS--METRIC UNITS					AVERAGE
kg/Mg	void	0.200	0.225	0.261	0.229
kg/Mg	0.00109	0.00121	0.00153	ND	0.00128

Hillshire Farm

AP-42 Section Reference 9.5.2
Report Sect. Reference 4 1

CAE
Clean Air Engineering

[illegible] W. Wood St. • Palatine, IL 60067 • 708-991-3300

New London, WI

Smokehouse
KSI-2
Jan 21, 1993

REPORT ON
COMPLIANCE TESTING

Conducted at:
HILLSHIRE FARM & KAHN'S
NEW LONDON, WISCONSIN

CAE Project No: 6508-1
February 9, 1993

Received: 2/17/93
Reviewed: 2/23/93

CONTENTS

SUMMARY

INTRODUCTION

Clean Air Engineering was contracted by Hillshire Farm & Kahn's to determine the levels of formaldehyde and hydrocarbon emissions at their facility located in New London, Wisconsin for compliance purposes.

The testing took place at the KSI-2 Smokehouse Scrubber on January 21, 1993. Coordinating the field testing were:

G. Ehrle - Hillshire Farm & Kahn's
R. Wulk - State of Wisconsin
J. Bojan - Clean Air Engineering

SUMMARY OF TEST RESULTS

The test conditions and results of analysis are presented in Tables 1 and 2 on pages 1-2 and 1-3.

To the best of our knowledge, the data presented in this report are accurate and complete.

Respectfully submitted,

CLEAN AIR ENGINEERING

William Ansell
Project Manager

David Perkins
Manager, Technical Communications

TABLE 1 - Summary of Test Results

EPA Method 25A
Hydrocarbons
Smokehouse Scrubber Inlet and Smokehouse Stack

Run No.	2	3	4*	Average
Date (1993)	January 21	January 21	January 21	
Start Time (approx.)	11:53	14:19	15:30	
Stop Time (approx.)	12:53	15:19	16:30	
SMOKEHOUSE SCRUBBER INLET				
Gas Conditions				
Temperature (° F)	115	115	115	115
Moisture (volume %)	5.7	8.8	7.3	7.3
O_2(dry volume %)	20.9	20.9	20.9	20.9
CO_2(dry volume %)	0.0	0.0	0.0	0.0
Volumetric Flow Rate				
acfm	8,051	7,227	7,639	7,639
dscfm	6,772	5,873	6,323	6,323
Total Hydrocarbons as Propane				
ppm_{dv}	98	99	87	95
lb/hr	4.55	3.98	3.76	4.10
SMOKEHOUSE STACK				
Gas Conditions				
Temperature (° F)	119	117	118	118
Moisture (volume %)	8.7	9.2	9.0	9.0
O_2(dry volume %)	20.9	20.9	20.9	20.9
CO_2(dry volume %)	0.0	0.0	0.0	0.0
Volumetric Flow Rate				
acfm	6,670	6,749	6,710	6,710
dscfm	5,428	5,470	5,449	5,449
Total Hydrocarbons as Propane				
ppm_{dv}	43	48	56	49
lb/hr	1.59	1.80	2.09	1.83
REMOVAL EFFICIENCY				
Based on lb/hr (%)	64.96	54.66	44.46	54.69

*See Comments on page 4-1.

TABLE 2 - Summary of Test Results

BIF Method 0011
Formaldehyde
Smokehouse Scrubber Inlet and Smokehouse Stack

Run No.	1	2	3	Average
Date (1993)	January 21	January 21	January 21	
Start Time (approx.)	9:05	11:35	14:00	
Stop Time (approx.)	10:35	12:45	15:19	
SMOKEHOUSE SCRUBBER INLET				
Gas Conditions				
Temperature (° F)	116	115	115	**115**
Moisture (volume %)	10.5	5.7	8.8	**8.3**
O_2 (dry volume %)	20.9	20.9	20.9	**20.9**
CO_2 (dry volume %)	0.0	0.0	0.0	**0.0**
Volumetric Flow Rate				
acfm	7,800	8,051	7,227	**7,693**
dscfm	6,213	6,772	5,873	**6,286**
Formaldehyde				
lb/dscf	5.29E-08	5.49E-08	4.72E-08	**5.16E-08**
mg/dscm	0.85	0.88	0.76	**0.83**
lb/hr	0.020	0.022	0.017	**0.020**
SMOKEHOUSE STACK				
Gas Conditions				
Temperature (° F)	119	119	117	**118**
Moisture (volume %)	9.3	8.7	9.2	**9.1**
O_2 (dry volume %)	20.9	20.9	20.9	**20.9**
CO_2 (dry volume %)	0.0	0.0	0.0	**0.0**
Volumetric Flow Rate				
acfm	6,691	6,670	6,749	**6,703**
dscfm	5,407	5,428	5,470	**5,435**
Formaldehyde				
lb/dscf	2.69E-08	2.98E-08	3.72E-08	**3.13E-08**
mg/dscm	0.43	0.48	0.60	**0.50**
lb/hr	0.009	0.010	0.012	**0.010**
COLLECTION EFFICIENCY				
Based on lb/hr (%)	55.7	56.4	26.6	**46.2**

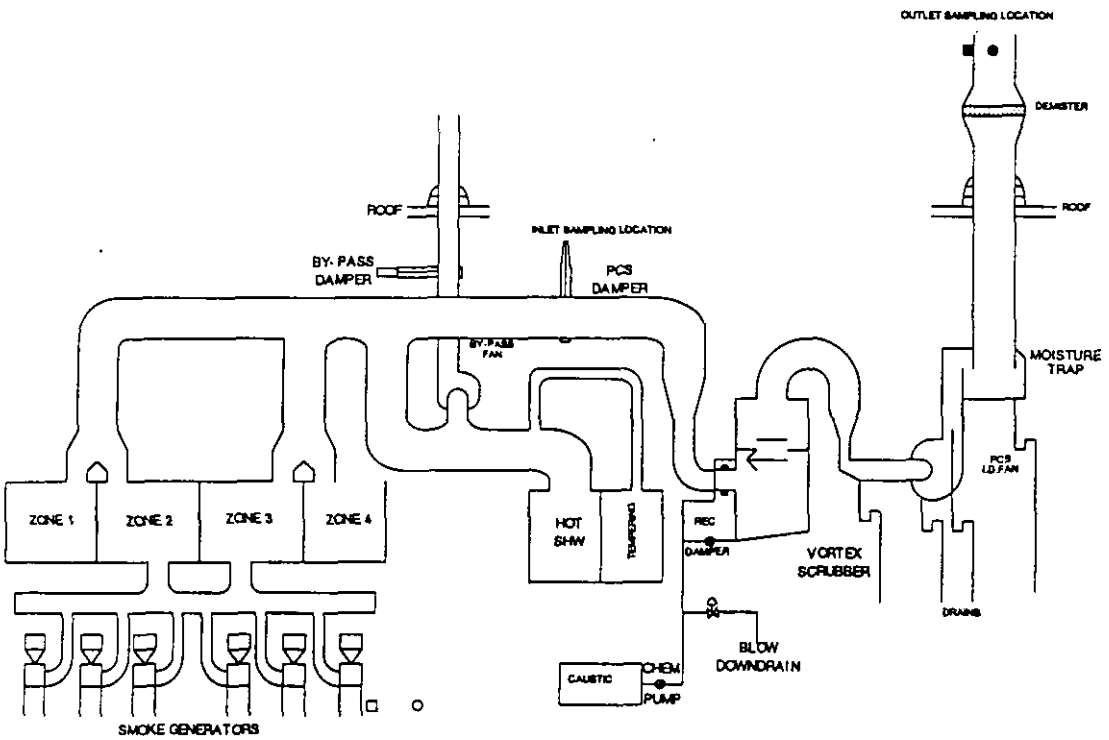
DESCRIPTION OF INSTALLATION

Hillshire Farms & Kahn's located in New London, Wisconsin operates the KSI-2 Smokehouse (Unit 3335) which is used to smoke sausages and other meats. The process runs continuously for 20 hours each day.

Emissions are controlled by a Sonic Environmental Vortex Scrubber. The volumetric flow rate through the scrubber is approximately 7,000 acfm.

The testing reported in this document was performed at the Smokehouse Scrubber Inlet and Smokehouse Stack.

A schematic of the process is shown below.



SUMMARY OF PROCEDURES

SAMPLING PROCEDURES

The sampling followed procedures as detailed in U.S. Environmental Protection Agency (EPA) Methods 1, 2, 3, 4 and 25A. These methods are titled:

- Method 1 — "Sample and Velocity Traverses for Stationary Sources;"
- Method 2 — "Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube);"
- Method 3 — "Gas Analysis for the Determination of Dry Molecular Weight;"
- Method 4 — "Determination of Moisture Content in Stack Gases;"
- Method 25A - "Determination of Total Gaseous Organic Concentrations using a Flame Ionization Analyzer (FIA)."

These methods appear in detail in Title 40 of the Code of Federal Regulations (CFR), Part 60, Appendix A.

In addition to the above methods, the following was referenced:

EPA/530-SW-91-010, "Methods for Determining Compliance with the BIF Regulations." This method is titled:

- BIF Method 0011- "Sampling for Aldehyde and Ketone Emissions from Stationary Sources."

The sampling apparatus is shown in Figures 1 and 2 on pages 3-2 and 3-3. All equipment was calibrated at the Clean Air Engineering laboratory prior to shipment to the job site.

Sampling Locations

The Smokehouse Scrubber Inlet has four ports. For formaldehyde testing, five points were tested in each port. The sampling time per point was 3.5 minutes for a total sampling time of 70 minutes.The sampling point locations are shown in Figure 3 on page 3-4. For hydrocarbon testing, a single point in the center of the duct was sampled for 60 minutes.

The Smokehouse Stack has two ports. For formaldehyde testing, 12 points were tested in each port. The sampling time per point was three minutes for a total sampling time of 72 minutes.The sampling point locations are shown in Figure 4 on page 3-5. For hydrocarbon testing, a single point in the center of the duct was sampled for 60 minutes.

FIGURE 1

The EPA Method 25A sampling apparatus is shown.

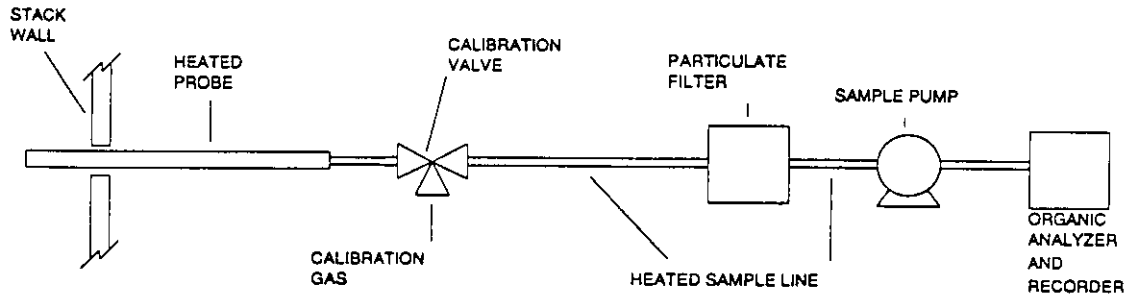
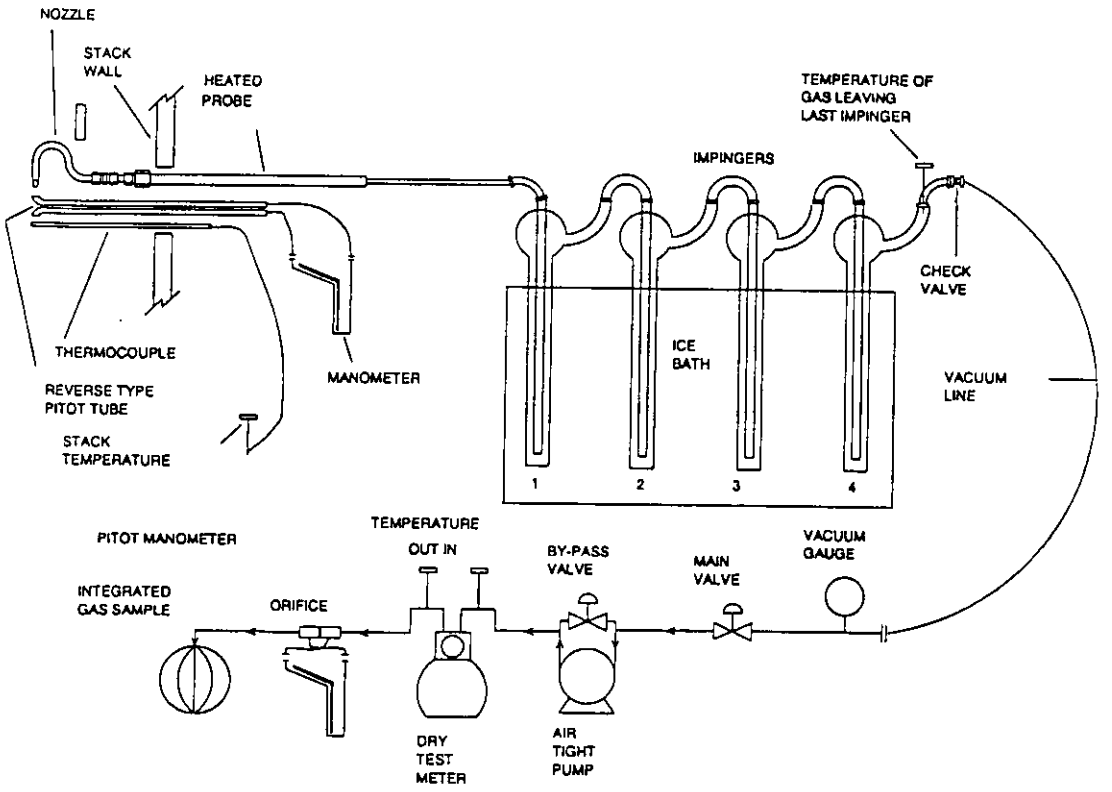


FIGURE 2

The BIF Method 0011 sampling apparatus is shown.

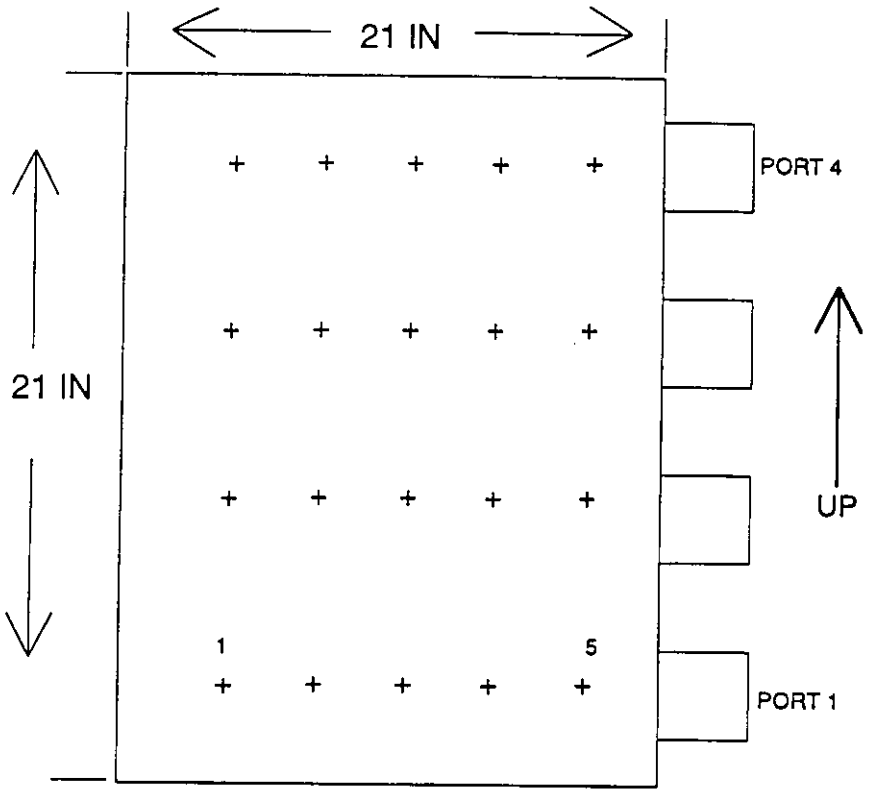


Impinger Contents

1) 100 ml 2,4-dinitrophenyl-hydrazine, (DNPH)
2) 100 ml 2,4-dinitrophenyl-hydrazine, (DNPH)
3) empty
4) 300g silica gel

FIGURE 3

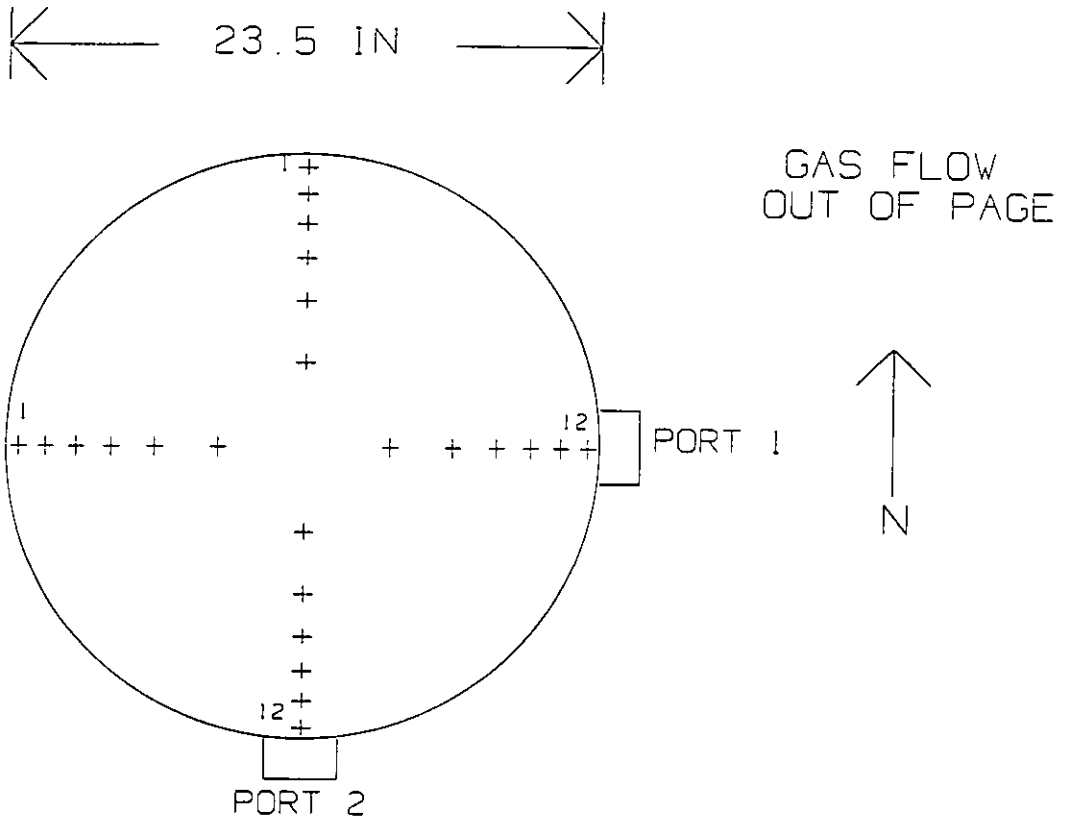
The cross section of the Smokehouse Scrubber Inlet shows sampling point locations.



SAMPLING POINT	PORT TO POINT DISTANCE (IN)
1	18.9
2	14.7
3	10.5
4	6.3
5	2.1

FIGURE 4

The cross section of the Smokehouse Stack shows traverse point locations.



TRAVERSE POINT	PORT TO POINT DISTANCE (IN)
1	23.0
2	21.9
3	20.7
4	19.3
5	17.6
6	15.1
7	8.4
8	5.9
9	4.2
10	2.8
11	1.6
12	0.5

SUMMARY OF PROCEDURES (Continued)

ANALYTICAL PROCEDURES

Formaldehyde

Gaseous emissions are drawn through a glass sampling probe in a series of two impingers in series, each impinger containing an aqueous acidic solution of 2,4-dinitrophenyl-hydrazine, (DNPH). An aldehyde reacts with the DNPH by nucleophilic addition on the carbonyl followed by 1, 2-elimination of water and the formation of 2, 4-dinitrophenylhydrazone.

After organic solvent extraction, the sample is analyzed using reverse phase HPLC with an ultraviolet (UV) absorption detector operated at 360 nm. The formaldehyd in the sample is identified and quantified by comparison of retention times and area counts of sample extracts with those of standards.

Continuous Emissions Monitoring

Total Hydrocarbons

The total hydrocarbons emission rate was determined using procedures detailed in EPA Method 25A. A sample was extracted continuously from the flue gas stream, and a portion was conveyed to a flame ionization analyzer.

Before and after each run, the monitors were zeroed and calibrated with a certified calibration gas. These calibrations were used to correct the raw data for zero and calibration drift occurring during the test runs.

QUALITY CONTROL PROCEDURES

Quality control procedures for all aspects of field sampling; sample preservation and holding time; reagent quality; analytical method; analyst training and safety; and instrument cleaning, calibration and safety were followed. These procedures are generally consistent with EPA guidelines

COMMENTS

The hydrocarbons parameter sheets show Runs 2, 3 and 4. Because of data acquisition system problems experienced during Run 1, a fourth run was performed. Gas flow and composition data for the hydrocarbon sampling was taken from the formaldehyde sampling. No formaldehyde sample run was made during the fourth hydrocarbon sample run. For this run the gas flow and composition used is the average of the data obtained during the two preceding runs.

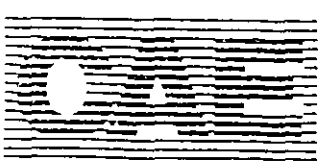
No other deviations from standard U.S. EPA testing procedures were noted.

APPENDIX

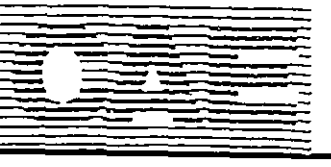
NOMENCLATURE

Nomenclature

A	-	absorbance
A_n	-	cross sectional area of nozzle (ft^2)
A_s	-	cross sectional area of stack (ft^2)
B_{wo}	-	proportion of water vapor in the gas stream by volume
B_{ws}	-	proportion of water vapor in the gas stream by volume at saturated conditions
C_p	-	pitot tube coefficient (dimensionless)
D_f	-	dilution factor
F_d	-	ratio of dry gas generated to gross calories (dscf/MBtu)
F_c	-	ratio of gas generated
GCV	-	gross calorific value of fuel (Btu/lb)
$\overline{DH}$	-	average pressure drop across meter box orifice (in. H_2O)
$\overline{\sqrt{DP}}$	-	average square roots of velocity heads of stack gas ($\sqrt{\text{in. } H_2O}$)
DH@	-	meter orifice calibration coefficient (in. H_2O)
%I	-	percent of isokinetic sampling (acceptable: $90 \leq \%I \leq 110\%$)
K_p	-	pitot tube constant: 85.49 (ft/sec) $\frac{\sqrt{(lb/lb\text{-}mole)(in.\ Hg)}}{\sqrt{(^\circ R)(in.\ H_2O)}}$
K_c	-	spectrophotometer calibration factor
M_d	-	dry molecular weight of stack gas (lb/lb-mole)
M_s	-	molecular weight of stack gas, wet basis (lb/lb-mole)
M_n	-	total amount of particulate matter collected (gm)
N	-	normality of titrant (meq/ml)
P_b	-	barometric pressure (in. Hg)
P_f	-	final absolute pressure of flask (in. Hg)
P_i	-	initial absolute pressure of flask (in. Hg)
P_s	-	absolute stack gas pressure (in. Hg)
Q_a	-	volumetric flow rate, actual conditions
Q_{std}	-	volumetric flow rate, standard conditions, dry basis
std	-	standard conditions, 29.92 in. Hg, 68 ° F
T_f	-	final absolute temperature of flask (° R)
T_i	-	initial temperature of flask (° R)
T_m	-	average dry gas meter temperature (° F)



T_s	-	average stack temperature (° F)
T_{std}	-	absolute temperature, standard conditions (528 ° R)
Θ	-	total sampling time (min)
V_a	-	volume of aliquot (ml)
V_f	-	volume of flask (ml)
V_{lc}	-	total volume of liquid collected in impingers and silica gel (ml)
V_m	-	volume of gas sample through the dry gas meter at meter conditions (ft^3)
V_{mstd}	-	volume of gas sample through the dry gas meter, standard conditions (ft^3)
V_{sc}	-	volume of flask sample, standard conditions (ml)
V_{soln}	-	total volume of solution (ml)
V_t	-	volume of titrant used to titrate aliquot (ml)
V_{tb}	-	volume of titrant used to titrate blank (ml)
V_{wstd}	-	volume of water collected, standard conditions (ft^3)
V_s	-	stack gas velocity (ft/sec)
Y_d	-	gas meter correction factor (dimensionless)



SAMPLE CALCULATIONS

HILLSHIRE FARM & KAHN'S
CAE Project No : 6508 - 1

SAMPLE CALCULATIONS - RUN #1, SMOKEHOUSE SCRUBBER INLET

(Note : results are taken from computer analysis)

1. Volume of water collected

$$V_{wstd} = (0.04707\ ft^3/ml)\ (V_{lc})$$
$$= (0.04707)\ (124.7)$$
$$= 5.87\ wscf$$

2. Volume of gas metered, standard conditions

$$V_{mstd} = \frac{(17.64\ ^\circ R/in.\ Hg)\ (V_m)\left[P_b + \frac{DH}{13.6}\right]}{(460 + T_m)}(Y_d)$$
$$= \frac{(17.64)\ (54.51)\left[29.18 + \frac{1.88}{13.6}\right]}{(460 + 101)}(0.9923)$$
$$= 49.86\ dscf$$

3. Moisture content

$$B_{wo} = \frac{V_{wstd}}{V_{mstd} + V_{wstd}}$$
$$= \frac{5.87}{49.83 + 5.87}$$
$$= 0.1054$$
$$= 10.5\ \%$$

4. Molecular weight of dry gas stream

$$M_d = 0.44(\%CO_2) + 0.32(\%O_2) + 0.28(\%CO + \%N_2)$$
$$= 0.44(0.0) + 0.32(20.9) + 0.28(79.1)$$
$$= 28.84$$

5. Molecular weight of stack gas

$$M_s = M_d\ (1 - B_{wo}) + 18(B_{wo})$$
$$= 28.84\ (1 - 0.1054) + 18(0.1054)$$
$$= 27.69$$

6. Stack pressure (in. Hg)

$$P_s = P_b + \left(\frac{STATIC\ P}{13.6}\right)$$
$$= 29.18 + \left(\frac{-1.2}{13.6}\right)$$
$$= 29.09$$

HILLSHIRE FARM & KAHN'S
CAE Project No: 6508 - 1

SAMPLE CALCULATIONS (Continued)

7. Velocity of stack gas

$$V_s = K_p C_p \overline{(DP)}^{\frac{1}{2}} \frac{[\overline{T_s} + 460]^{\frac{1}{2}}}{[(M_s)(P_s)]^{\frac{1}{2}}}$$

$$= 85.49\ (0.840)\ (0.699)\ \frac{[116+460]^{\frac{1}{2}}}{[(27.69)\ (29.09)]^{\frac{1}{2}}}$$

$$= 42.49\ \text{ft/sec}$$

8. Total flow of stack gas

$$Q_a = (60)\ (A_s)\ (V_s)$$
$$= (60)\ (3.06)\ (42.49)$$
$$= 7,800\ \text{acfm}$$

$$Q_{std} = \frac{Q_a\ P_s\ (17.64\ ^\circ R/\text{in. Hg})\ (1 - B_{wo})}{\overline{T_s} + 460}$$

$$= \frac{(7,800)\ (29.09)\ (17.64)\ (1 - 0.1054)}{116 + 460}$$

$$= 6,213\ \text{dscfm}$$

9. Percent Isokinetic

$$\%I = \frac{(0.09450)\ (\overline{T_s} + 460)\ V_{mstd}}{P_s\ V_s\ A_n\ \Theta\ (1 - B_{wo})}$$

$$= \frac{(0.09450)\ (116 + 460)\ (49.83)}{(29.09)\ (42.49)\ (0.000341)\ (70.0)\ (1 - 0.1054)}$$

$$= 102.9\ \%$$

10. Formaldehyde

$$\text{lb/dscf} = \frac{\mu g_{gross} - \mu g_{blank}}{(V_{mstd})\ (453,590)(1,000 \mu g/mg)}$$

$$= \frac{1,200 - 5.2}{(49.83)\ (453,590)(1,000)}$$

$$= 5.2 \times 10^{-8}$$

$$\text{lb/hr} = (\text{lb/dscf})\ (\text{dscfm})\ (60)$$
$$= (5.2 \times 10^{-8})(6,213)(60)$$
$$= 0.0197$$

HILLSHIRE FARM & KAHN'S
CAE Project No : 6508 - 1

SAMPLE CALCULATIONS (Continued)
RUN #2

11. Total Hydrocarbons (as propane)

$$ppm_{wet,\ drift\ calibrated} = \left(C_{avg} - C_o\right)\frac{C_{ma}}{(C_m - C_o)}$$
$$= (108.38 - 2.5)\frac{250.9}{(290 - 2.5)}$$
$$= 92$$

C_{avg} = Average gas concentration indicated by gas analyzer, wet basis, ppm.
C_o = Average of initial and final system calibration bias check responses for the zero gas, ppm.
C_m = Average of initial and final system calibration bias check responses for the upscale calibration gas, ppm.
C_{ma} = Actual concentration of the upscale calibration gas, ppm.

$$ppm_{dry} = \frac{ppm_{wet,\ drift\ calibrated}}{1 - B_{wo}}$$
$$= \frac{92}{1 - 0.0573}$$
$$= 98$$

$$lb/hr_{propane} = \left(\frac{\left(ppm_{dry}\right)(MW)}{385.3 \times 10^6\ ft^3/lb\ mole}\right)(dscfm)(60)$$
$$= \left(\frac{(98)\ (44)}{385.3 \times 10^6}\right)(6,772)(60)$$
$$= 4.55$$

PARAMETERS

HILLSHIRE FARMS & KAHN'S
CAE Project No: 6508

PARAMETERS

SMOKEHOUSE SCRUBBER INLET

Run No.	1	2	3
A_n	.000341	.000341	.000341
A_s	3.06	3.06	3.06
B_{wo}	.1054	.0573	.0885
$\%CO_2$	.0	.0	.0
C_p	.840	.840	.840
$\overline{DH}$	1.88	2.04	1.63
DH@	1.867	1.867	1.867
$\overline{(DP)^{1/2}}$	.699	.730	.651
%I	102.9	98.6	101.5
M_d	28.84	28.84	28.84
M_s	27.69	28.22	27.88
$\%O_2$	20.9	20.9	20.9
P_b	29.18	29.18	29.18
P_s	29.09	29.09	29.06
θ	70.0	70.0	70.0
$\overline{T_m}$	101	110	110
$\overline{T_s}$	116	115	115
V_{lc}	124.7	67.2	95.8
V_m	54.51	57.81	51.68
V_{mstd}	49.83	52.04	46.46
V_s	42.49	43.85	39.36
V_{wstd}	5.87	3.16	4.51
Y_d	.9923	.9923	.9923

HILLSHIRE FARMS & KAHN'S
CAE Project No: 6508

PARAMETERS

SMOKEHOUSE STACK

Run No.	1	2	3
A_n	.000341	.000341	.000341
A_s	3.01	3.01	3.01
B_{wo}	.0925	.0865	.0921
$\%CO_2$	.0	.0	.0
C_p	.840	.840	.840
$\overline{DH}$	1.36	1.34	1.38
DH@	1.758	1.758	1.758
$\overline{(DP)^{1/2}}$	.612	.610	.618
%I	97.6	97.7	97.6
M_d	28.84	28.84	28.84
M_s	27.83	27.90	27.84
$\%O_2$	20.9	20.9	20.9
P_b	29.18	29.18	29.18
P_s	29.22	29.22	29.22
Θ	72.0	72.0	72.0
$\overline{T_m}$	97	106	108
$\overline{T_s}$	119	119	117
V_{lc}	93.2	87	93.8
V_m	45.89	46.89	47.36
V_{mstd}	43.03	43.22	43.53
V_s	37.05	36.93	37.37
V_{wstd}	4.39	4.10	4.42
Y_d	1.0107	1.0107	1.0107

HILLSHIRE FARM & KAHN'S
CAE Project No: 6508-1
Smokehouse Scrubber Inlet

FORMALDEHYDE PARAMETERS

Run No.	**1**	**2**	**3**
Date (1993)	January 21	January 21	January 21
Start Time (approx.)	9:05	11:35	14:00
Stop Time (approx.)	10:21	12:45	15:13
Vmstd	49.83	52.04	46.46
dscfm	6,213	6,772	5,873
Blank(s)			
field blank, µg	5.2	5.2	5.2
Formaldehyde			
µg, gross	1,200	1,300	1,000
µg, net	1,195	1,294.8	994.8
lb/dscf	5.29E-08	5.49E-08	4.72E-08
mg/dscm	0.85	0.88	0.76
lb/hr	0.020 ✓	0.022 ✓	0.017 ✓

HILLSHIRE FARM & KAHN'S
CAE Project No: 6508-1
Smokehouse Stack

FORMALDEHYDE PARAMETERS

Run No.	**1**	**2**	**3**
Date (1993)	January 21	January 21	January 21
Start Time (approx.)	9:05	11:35	14:00
Stop Time (approx.)	10:35	12:43	15:19
Vmstd	43.03	43.22	43.53
dscfm	5,407	5,428	5,470
Blank(s)			
field blank, µg	5.2	5.2	5.2
Formaldehyde			
µg, gross	530	590	740
µg, net	524.8	584.8	734.8
lb/dscf	2.69E-08	2.98E-08	3.72E-08
mg/dscm	0.431	0.478	0.596
lb/hr	0.009	0.010	0.012

HILLSHIRE FARM & KAHN'S
CAE Project No: 6508-1
Smokehouse Scrubber Inlet

TOTAL HYDROCARBONS CONCENTRATION

ppm as propane

RUN NO.	2	3	4*
Date (1993)	January 21	January 21	January 21
Start Time (approx)	11:53	14:19	15:30
Stop Time (approx)	12:53	15:19	16:30
dscfm	6,772	5,873	6,323
Bwo	0.0573	0.0855	0.0714
ZERO I	0	5	0
CAL I	295	285	273
ZERO F	5	0	5
CAL F	285	273	271
ppm	108	102	89
CAL GAS	250.9	250.9	250.9
ppm, wet (drift calibrated)	92	90	81
ppm, dry	98	99	87
lb/dscf	1.12E-05	1.13E-05	0.99E-05
lb/hr	4.55 ✓	3.98 ✓	3.76 ✓

*See Comments on page 4-1.

HILLSHIRE FARM & KAHN'S
CAE Project No: 6508-1
Smokehouse Stack

TOTAL HYDROCARBONS CONCENTRATION

ppm as propane

RUN NO.	2	3	4*
Date (1993)	January 21	January 21	January 21
Start Time (approx)	11:53	14:19	15:30
Stop Time (approx)	12:53	15:19	16:30
dscfm	5,428	5,470	5,449
Bwo	0.0865	0.0921	0.0893
ZERO I	0	-0.9	0
CAL I	261	231	244
ZERO F	-0.9	0	1
CAL F	231	244	230
ppm	38	41	49
CAL GAS	250.9	250.9	250.9
ppm, wet (drift calibrated)	39	44	51
ppm, dry	43	48	56
lb/dscf	4.89E-06	5.50E-06	6.39E-06
lb/hr	1.59	1.80	2.09

*See Comments on page 4-1.

CALIBRATION DATA

CEM
SAMPLING SYSTEM DATA

Client: HILLSHIRE FARMS
Plant: NEW LONDON
Unit: SMOKE HOUSE
Location: INLET TO SCRUBBER & STACK

Job #: 66-6508
Operator: BOJAN / PIONTEK
Date: 1-21-93
Run #'s: 4

Instrumentation Data:

	Reference Method Instrumentation					
#	Type	Manufacturer	Serial/Asset#	Range Used	Zero Pot @	Span Pot @
	FID	JUM		1-1000		
2	FID	RATFICH		1-000		
5						

Data Aquisition by: (Strip Chart) Computer
File Names: _____

Calibration Material Data:

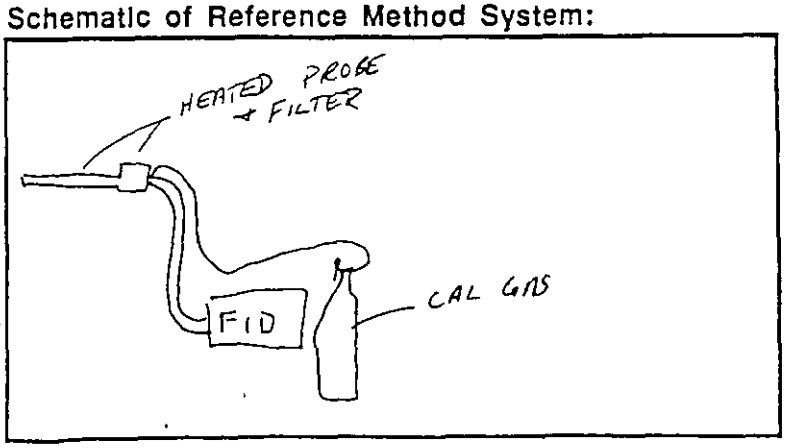
	Type	Concentration	Cylinder ID	Protocol?
1	PROPANE	853.2	AAL2 0195	(YES) / NO
2	PROP	853.2	ALM -011890	(YES) / NO
3	"	250.9	ALM 016298	(YES) / NO
4	"	250.9	ALM 023966	(YES) / NO
5	"	551.6	AAL -14232	(YES) / NO
6				YES / NO
7				YES / NO
8				YES / NO
9				YES / NO
10				YES / NO
11				YES / NO
12				YES / NO
13				YES / NO
14				YES / NO

Plant CEM System:

Manufacturer _____
Extractive/In-Situ _____
Dilution Probe? _____
Dilution Factor _____
CEM F factor _____
RATA / Cal Drift / N/A

CEM Gas	Units Reported

Schematic of Reference Method System:



Comments:

_____
_____
_____
_____
_____
_____
_____

Scott Specialty Gases

Scott Environmental Technology, Inc.

1290 COMBERMERE STREET, TROY, MICHIGAN 48084 (313) 589-2950

Our Project # : 539874

Your P.O. # : 6077-71500

Expiration Date : 1-28-94

Cylinder Number AAL20175

Cylinder Pressure 1900 psig

1 of 1 Component(s)

toner :
C A E INSTRUMENT RENTAL
246 WOODWORK LANE
PALATINE IL 60067

CERTIFICATE OF ANALYSIS - EPA PROTOCOL GASES
PERFORMED ACCORDING TO SECTION 3.0.4

Certified Per Traceability Procedure # G1
Protocol # 1

File # PO-4084

Certified Accuracy 1 % NBS Traceable

COMPONENT	CERTIFIED CONC.	REFERENCE STD: SRM # (CRM #)	REFERENCE STD: CYLINDER NUMBER	REFERENCE STD: CONC.	GAS ANALYZER: MAKE/MODEL/SERIAL #	GAS ANALYZER: LAST CALIBRATION DATE	GAS ANALYZER: ANALYTICAL PRINCIPLE
PROPANE	853.2 PPM	2646	AAL-18432	973.2 PPM	PECKMAN/409/1002059	6-16-92	FLAME IONIZATION DETECTOR
		GMIS#	A14907	250.6 PPM			

BALANCE GAS : NITROGEN

ANALYSIS DATE : 7-28-92

RUN # (S) (V)	TEST GAS (mV)	RESULTS PPM	REFERENCE GAS CONC.	REFERENCE GAS (mV)	RESULTS PPM
0	84.50	854.8	973.3 PPM	96.40	975.1
0	84.50	854.8		96.40	975.1
0	84.50	854.8		96.40	975.1

CALCULATED RESULTS 853.2
853.2
853.2

AVERAGE : 853.2 PPM

CALIBRATION CURVE 1 st DEGREE

SRM # (CRM #)	CONC. PPM	SPLIT PT (%)	DVM (mV)	FITTED VALUE	PERCENT ERROR
GMIS	1012	100	100.00	1012	0.00
2646	973.2	96	96.40	975.1	0.20
GMIS	797.8	79	79.10	800.3	0.05
GMIS	250.6	25	24.70	250.4	-0.09
GMIS	187.2	19	18.60	188.7	-0.24
	0.0000	0	-0.01	0.0000	0.00
		0		0.00	0.00
GMIS	250.6	LOW	27.60	279.7	0.00
2646	973.2	HIGH	96.40	975	0.20

GMIS - GAS MANUFACTURER'S INTERNAL STANDARD

Analyst : L Dora

Approved By : L Shapiri

Scott Specialty Gases a division of Scott Environmental Technology, Inc.
1290 COMBERMERE STREET, TROY, MICHIGAN 48084 (313) 589-2950

Our Project # : 03962

Your P.O. # : 5911-71500

Expiration Date : 1-28-94

Cylinder Number ALM-011870

Cylinder Pressure 1900 psig

1 of 1 Component(s)

stomer :
C A E INSTRUMENTAL RENTAL
246 WOODWORK LANE
PALATINE, IL. 600067

CERTIFICATE OF ANALYSIS - EPA PROTOCOL GASES
PERFORMED ACCORDING TO SECTION 3.0.4

Certified Per Traceability Procedure # G1
Protocol # 1

File # PO-4038

Certified Accuracy 1 % NBS Traceable

COMPONENT	CERTIFIED CONC.	REFERENCE STD SRM # (CRM #)	REFERENCE STD CYLINDER NUMBER	REFERENCE STD CONC.	GAS ANALYZER MAKE/MODEL/SERIAL #	GAS ANALYZER LAST CALIBRATION DATE	ANALYTICAL PRINCIPLE
OPANE	853.2 PPM	2646	AAL-18432	973.2 PPM	BECKMAN/400/1092057	6-16-92	FLAME IONIZATION DETECTOR
		GMIS*	A14907	250.6 PPM			
LANCE GAS : NITROGEN							

ANALYSIS DATE : 7-28-92

ERO AS (mV)	TEST GAS (mV)	RESULTS PPM	REFERENCE GAS CONC.	REFERENCE GAS (mV)	RESULTS PPM
00	84.50	854.8	973.3 PPM	96.40	975.1
00	84.50	854.8		96.40	975.1
00	84.50	854.8		96.40	975.1
CALCULATED RESULTS		853.2			
		853.2			
		853.2			
AVERAGE :		853.2 PPM			

CALIBRATION CURVE 1 st DEGREE

SRM # (CRM #)	CONC. PPM	SPLIT PT (%)	DVM (mV)	FITTED VALUE	PERCENT ERROR
GMIS	1012	100	100.00	1012	0.00
2646	973.2	96	96.40	975.1	0.20
GMIS	799.8	79	79.10	800.3	0.05
GMIS	250.6	25	24.70	250.4	-0.08
GMIS	189.2	19	18.80	188.7	-0.24
	0.0000	0	-0.01	0.0000	0.00
		0		0.00	0.00
GMIS	250.6	LOW	27.60	279.7	0.00
2646	973.2	HIGH	96.40	975	0.20

GMIS - GAS MANUFACTURER'S INTERNAL STANDARD

Analyst : P Dona

Approved By : C Shapiro

Scott Specialty Gases

a division of Scott Environmental Technology, Inc.

1290 COMBERMERE STREET, TROY, MICHIGAN 48084 (313) 589-2950

Our Project # : 539624

Your P.O. # : 5911-71500

Expiration Date : 1-28-94

Cylinder Number : ALM-016298

Cylinder Pressure 1900 psig

1 of 1 Component(s)

stomer :
C A E INSTRUMENTS RENTAL
246 WOODWORK LANE
PALATINE, IL. 60067

**** CERTIFICATE OF ANALYSIS - EPA PROTOCOL GASES ****
PERFORMED ACCORDING TO SECTION 3.0.4

Certified For Traceability Procedure # G1
Protocol # 1

File # PO-4032

Certified Accuracy 1 % NBS Traceable

ANALYZED CYLINDER		REFERENCE STD			INSTRUMENTATION		
COMPONENT	CERTIFIED CONC.	SRM # (CRM #)	CYLINDER NUMBER	CONC.	INSTR/MODEL/SERIAL #	LAST CALIBRATION DATE	ANALYTICAL PRINCIPLE
OPANE	250.9 PPM	2645A	FF26816	498.5 PPM	BECKMAN/400/1002057	5-27-92	FLAME IONIZATION DETECTOR
		GMIS*	014707	250.6 PPM			
LANCE GAS :	NITROGEN						

ANALYSIS : DATE : 7-28-92

ERO AS mV)	TEST GAS (mV)	RESULTS PPM	REFERENCE GAS CONC.	(mV)	RESULTS PPM
00	50.40	250.9	498.5 PPM	100.00	498.5
00	50.40	250.9		100.00	498.5
00	50.40	250.9		100.00	498.5
CALCULATED RESULTS		250.9			
		250.9			
		250.9			
AVERAGE :		250.9 PPM			

CALIBRATION CURVE 1 st DEGREE

SRM # (CRM #)	CONC. PPM	SPLIT PT (%)	DVM (mV)	FITTED VALUE	PERCENT ERROR
2645A	498.5	100	100.00	498.5	-0.00
GMIS	250.6	38	50.30	250.4	-0.06
GMIS	100.0	20	20.30	100.7	0.72
2643A	99.12	20	19.90	98.72	-0.40
	0.0000	0	0.00	0.0000	0.00
		0		0.0000	0.00
		0		0.00	0.00
GMIS	189.20	LOW	38.20	190.06	0.45
2645A	498.5	HIGH	100.00	498.5	-0.00

GMIS - GAS MANUFACTURER'S INTERNAL STANDARD

Analyst : F Dora

Approved By : I Shapiro

The only liability of this Company for gas which fails to comply with this analysis shall be replacement thereof by the Company without extra cost.

Scott Specialty Gases

a division of Scott Environmental Technology, Inc.

1290 COMBERMERE STREET, TROY, MICHIGAN 48084 (313) 589-2950

Our Project # : 539624

Your P.O. # : 5911-71509

stomer :
C A E INSTRUMENTS RENTAL
246 WOODWORK LANE
PALATINE, IL. 60067

CERTIFICATE OF ANALYSIS - EPA PROTOCOL GASES

PERFORMED ACCORDING TO SECTION 3.0.4

Certified Per Traceability Protocol # 1

Procedure # G1

File # FO-4035

Certified Accuracy 1 % NBS Traceable

Expiration Date : 1-28-94

Cylinder Number : ALM-023966

Cylinder Pressure 1700 psig

1 of 1 Component(s)

ANALYZED CYLINDER		REFERENCE STD			INSTRUMENTATION		
COMPONENT	CERTIFIED CONC.	SRM # (CRM #)	CYLINDER NUMBER	CONC.	INSTR/MODEL/SERIAL #	LAST CALIBRATION DATE	ANALYTICAL PRINCIPLE
OPANE	250.9 PPM	2645A	FF26816	498.5 PPM	BECKMAN/400/1002057	5-27-92	FLAME IONIZATION DETECTOR
		GMIS#	A14707	250.6 PPM			

LANCE GAS : NITROGEN

ANALYSIS DATE : 7-28-92

ERO AS mV)	TEST GAS (mV)	RESULTS PPM	REFERENCE GAS CONC.	(mV)	RESULTS PPM
00	50.40	250.9	498.5 PPM	100.00	498.5
00	50.40	250.9		100.00	498.5
00	50.40	250.9		100.00	498.5
CALCULATED RESULTS		250.9			
		250.9			
		250.9			
AVERAGE :		250.9 PPM			

CALIBRATION CURVE 1 st DEGREE

SRM # (CRM #)	CONC. PPM	SPLIT PT (%)	DVM (mV)	FITTED VALUE	PERCENT ERROR
2645A	498.5	100	100.00	498.5	-0.00
GMIS	250.6	38	50.30	250.4	-0.06
GMIS	100.0	20	20.30	100.7	0.72
2643A	99.12	20	19.90	98.72	-0.40
	0.0000	0	0.00	0.0000	0.00
		0		0.0000	0.00
		0		0.00	0.00
GMIS	189.20	LOW	38.20	190.06	0.45
2645A	498.5	HIGH	100.00	498.5	-0.00

GMIS - GAS MANUFACTURER'S INTERNAL STANDARD

Analyst : F Dow

Approved By : L Shapiro

Scott Specialty Gases — a division of Environmental Technology, Inc.

1290 COMBERMERE STREET, TROY, MICHIGAN 48084 (313) 589-2950

Ship From Scot

Our Project # : 527476

Your P.O. # : 3114-71500

Expiration Date : 2-27-93

Cylinder Number AAL-14232

Cylinder Pressure 1900 psig

Customer :
C A E INSTRUMENT RENTAL
246 WOODWORK LANE
PALATINE, IL. 60067

CERTIFICATE OF ANALYSIS - EPA PROTOCOL GASES
PERFORMED ACCORDING TO SECTION 3.0.4

Certified Per Traceability Procedure # G1
Protocol # 1

File # PD-1149

Certified Accuracy 1 % NBS Traceable

COMPONENT	CERTIFIED CONC.
PROPANE	551.6 PPM

BALANCE GAS : NITROGEN

REFERENCE STD

SRM # (CRM #)	CYLINDER NUMBER	CONC.
2646	AAL-18432	973.2 PPM
GMIS#	XA-4258	279.7 PPM

GAS ANALYZER

MAKE/MODEL/SERIAL #	LAST CALIBRATION DATE	ANALYTICAL PRINCIPLE
BECKMAN/400/1002059	6-20-91	FLAME IONIZATION DETECTOR

ANALYSIS DATE : 8-27-91

ZERO GAS (mV)	TEST GAS (mV)	RESULTS PPM	REFERENCE GAS CONC.	REFERENCE GAS (mV)	RESULTS PPM
0.00	54.60	552.6	973.3 PPM	96.40	975.1
0.00	54.60	552.6		96.40	975.1
0.00	54.60	552.6		96.40	975.1

CALCULATED RESULTS 551.6
551.6
551.6

AVERAGE : 551.6 PPM

CALIBRATION CURVE 1 st DEGREE

SRM # (CRM #)	CONC. PPM	SPLIT PT (%)	DVM (mV)	FITTED VALUE	PERCENT ERROR
	1012	100	100.00	1012	0.00
2646	973.2	96	96.40	975.1	0.20
	799.8	79	79.10	800.3	0.05
	279.7	28	27.60	279.7	0.00
	189.2	19	18.60	188.7	-0.24
	0.0000	0	-0.01	0.0000	0.00
		0		0.00	0.00
	189.2	LOW	18.60	188.7	-0.24
2646	973.2	HIGH	96.40	975	0.20

GMIS - GAS MANUFACTURER'S INTERNAL STANDARD

The obligation of this Company for any which fails to comply with this analysis shall be replacement thereof by the Company without extra cost.

Approved J. Shapiro

METER BOX COEFFICIENT CALIBRATION

Date: 5-26-92 Operator: M. KUBERA

Meter Box No.: 2	Meter Box ΔH@: 1.7578	Meter Box Yd: 1.0107	Barometric Pressure: 29.35

				Standard Meter Gas Volume ft³			Meter Box Gas Volume ft³			Std. Meter Temperature °F			Meter Box Temperature °F					
Q	ΔH	ΔP	Yds	Initial	Final	Vds Net	Initial	Final	Vds Net	In	Out	Tds Avg	In	Out	Tds Avg	Time θ	Yd	ΔH@
.40	.5	-2.9	1.000	0	5.004	5.004	277.116	282.285	5.169	70	70	70	104	96	100	12.02	1.0141	1.5630
.40	.5	-2.9	1.000	0	5.003	5.003	282.285	287.454	5.169	70	70	70	104	96	100	12.04	1.0139	1.5688
.65	1.5	-3.4	1.000	0	10.093	10.093	307.115	317.448	10.333	70	70	70	102	94	98	15.10	1.0157	1.8254
.65	1.5	-3.4	1.000	0	10.005	10.005	317.448	327.765	10.317	70	70	70	106	96	101	14.99	1.0139	1.8209
.90	3.0	-4.1	1.000	0	10.006	10.006	251.820	262.159	10.339	70	70	70	106	94	100	10.77	1.0045	1.8529
.90	3.0	-4.1	1.000	0	10.007	10.007	262.159	272.540	10.381	70	70	70	108	94	101	10.79	1.0023	1.8862

Nomenclature

- Pb — Barometric Pressure
- Q — Flow Rate (cfm)
- ΔH — Orifice Pressure Differential ("H_2O)
- ΔP — Inlet Pressure Differential ("H_2O)
- Vd — Volume Dry Gas Meter (ft^3)
- Vds — Volume Dry Standard (ft^3)
- Yd — Meter Correction Factor (unitless)
- Yds — Standard Meter Correction Factor (unitless)
- ΔH@ — Orifice Pressure Differential that gave 0.75 cfm of air at 70°F and 29.92 "Hg ("H_2O)

Calculations

$$Yd = (Yds)\left[\frac{Vds}{Vd}\right]\left[\frac{Td + 460}{Tds + 460}\right]\left[\frac{Pb + \Delta P/13.6}{Pb + \Delta H/13.6}\right]$$

$$\Delta H@ = \frac{0.0317\,\Delta H}{Pb(Td + 460)}\left[\frac{(Tds + 460)\theta^2}{(Vds)(Yds)}\right]$$

$$Q = \frac{17.64\,(Vds)(Pb)}{(Tds + 460)\theta}$$

Vacuum Gauge Calibration

Standard (Hg)	Vacuum Gauge
5.4	5
10.4	10
15.4	15
20.4	20
—	—
24.7	MAX

Thermometer Calibration

Standard	Inlet	Outlet
40	40	40
60	60	60
85	85	85
100	100	100
120	120	120
130	130	130

POST TEST CALIBRATION CHECK

Client/Owner: Hillshire Farm & Kahn's

Project Number: 6508

Operator: M. KUBERA

Date: 01-22-93

Meter Box No.:	Meter Box Vacuum:	Meter Box Yd:	Barometric Press.:
Z	10	1.0107	29.24

				Standard Meter Gas Volume ft^3			Meter Box Gas Volume ft^3			Std. Meter Temperature °F			Meter Box Temperature °F					
Q	ΔH	ΔP	Yds	Initial	Final	Vds Net	Initial	Final	Vd Net	In	Out	Tds Avg	In	Out	Td Avg	Time 0	Yd	ΔH@
0.70	1.7	-2.9	1	0	10.004	10.004	641.074	651.358	10.284	66	66	66	106	84	95	13.88	1.0145	1.7686
0.70	1.7	-2.9	1.0000	0	10.124	10.124	651.358	661.858	10.500	66	66	66	108	88	98	14.10	1.0110	1.7725
0.70	1.7	-2.9	1.0000	0	10.253	10.253	661.858	672.565	10.707	66	66	66	110	90	100	14.30	1.0077	1.7712

Nomenclature

Pb	Barometric Pressure
Q	Flow Rate (cfm)
ΔH	Orifice Pressure Differential ("H_2O)
ΔP	Inlet Pressure Differential ("H_2O)
Vd	Volume Dry Gas Meter (ft^3)
Vds	Volume Dry Standard (ft^3)
Yd	Meter Correction Factor (unitless)
Yds	Standard Meter Correction Factor (unitless)
ΔH@	Orifice Pressure Differential that gave 0.75 cfm of air at 70° F and 29.92 "Hg ("H_2O)

Calculations

$$Yd = (Yds)\left[\frac{Vds}{Vd}\right]\left[\frac{Td + 460}{Tds + 460}\right]\left[\frac{Pb + \Delta P/13.6}{Pb + \Delta H/13.6}\right]$$

$$\Delta H@ = \frac{0.0317\,\Delta H}{Pb\,(Td + 460)}\left[\frac{(Tds + 460)\,0}{(Vds)\,(Yds)}\right]^2$$

$$Q = \frac{17.64\,(Vds)\,(Pb)}{(Tds + 460)\,0}$$

METER BOX FULL TEST CALIBRATION

Date: 3-20-92 Operator: D Rybarski

Meter Box No.: U | Meter Box ΔH@: 1.8667 | Meter Box Yd: .9923 | Barometric Pressure: 29.25

			Standard Meter Gas Volume ft³			Meter Box Gas Volume ft³			Std. Meter Temperature °F			Meter Box Temperature °F					
ΔH	ΔP	Yds	Initial	Final	Yds Net	Initial	Final	Yds Net	In	Out	Tds Avg	In	Out	Tds Avg	Time 0	Yd	ΔH@
.5	-2.4	1.0000	Ø	5.003	5.003	145.226	150.58	5.322	64	64	64	110	96	103	13.08	.9933	1.8063
.5	-2.3	1.0000	Ø	5.004	5.004	150.582	155.952	5.36	64	64	64	109	95	102	12.94	.9942	1.7703
1.5	-2.6	1.0000	Ø	10.006	10.006	160.101	170.825	10.724	64	64	64	113	95	104	15.38	.9939	1.6695
1.5	-2.5	1.0000	Ø	10.005	10.005	170.325	181.560	10.735	64	64	64	114	96	105	15.37	.9948	1.8644
3.0	-3.4	1.0000	Ø	10.002	10.002	118.709	129.482	10.773	64	64	64	118	96	107	11.13	.9590	1.9476
3.0	-3.3	1.0000	Ø	10.003	10.003	129.482	140.277	10.795	64	64	64	119	97	108	11.12	.9586	1.9423

Nomenclature

Barometric Pressure
Flow Rate (cfm)
Orifice Pressure Differential ("H_2O)
Inlet Pressure Differential ("H_2O)
Volume Dry Gas Meter (ft³)
Volume Dry Standard (ft³)
Meter Correction Factor (unitless)
Standard Meter Correction Factor (unitless)
Orifice Pressure Differential that gave 0.75 cfm of air at 70°F and 29.92 "Hg ("H_2O)

Calculations

$$Yd = (Yds)\left[\frac{Vds}{Vd}\right]\left[\frac{Td + 460}{Tds + 460}\right]\left[\frac{Pb + \Delta P/13.6}{Pb + \Delta H/13.6}\right]$$

$$\Delta H@ = \frac{0.0317\,\Delta H}{Pb(Td + 460)}\left[\frac{(Tds + 460)0^{2}}{(Vds)(Yds)}\right]$$

$$Q = \frac{17.64\,(Vds)(Pb)}{(Tds + 460)0}$$

Vacuum Gauge Calibration

Standard (Hg)	Vacuum Gauge
5.2	5.0
10.2	10.0
15.4	15.0
20.3	20.0
25.6	25.0
MAX	25.9

Thermometer Calibration

Standard	Inlet	Outlet
40	40	40
60	60	60
80	80	80
100	100	100
120	120	120
140	140	140

POST TEST CALIBRATION CHECK

Client/Owner: Hillshire Farm & Kahn's

Project Number: 6508

Operator: K. Peterson

Date: 1-25-93

Meter Box No.:	Meter Box Vacuum:	Meter Box Yd:	Barometric Press.:
U	8	.9923	29.66

				Standard Meter Gas Volume ft^3			Meter Box Gas Volume ft^3			Std. Meter Temperature °F			Meter Box Temperature °F					
Q	ΔH	ΔP	Yds	Initial	Final	Vds Net	Initial	Final	Vd Net	In	Out	Tds Avg	In	Out	Td Avg	Time 0	Yd	ΔH@
68	1.8	-3.1	1.0000	0	10.504	10.504	591.321	602.216	10.895	66	66	66	109	76	95	15:15	1.0049	1.9950
70	1.8	-3.1	1.0000	0	10.002	10.002	602.216	612.765	10.549	66	66	66	114	84	101	14.09	.9990	1.8828
71	1.8	-3.1	1.0000	0	12.001	12.001	612.765	623.525	12.81	66	66	66	118	90	105	16.71	.9941	1.8264

Nomenclature

Pb	Barometric Pressure
Q	Flow Rate (cfm)
ΔH	Orifice Pressure Differential ("H_2O)
ΔP	Inlet Pressure Differential ("H_2O)
Vd	Volume Dry Gas Meter (ft^3)
Vds	Volume Dry Standard (ft^3)
Yd	Meter Correction Factor (unitless)
Yds	Standard Meter Correction Factor (unitless)
ΔH@	Orifice Pressure Differential that gave 0.75 cfm of air at 70° F and 29.92 "Hg ("H_2O)

Calculations

$$Yd = (Yds)\left[\frac{Vds}{Vd}\right]\left[\frac{Td + 460}{Tds + 460}\right]\left[\frac{Pb + \Delta P/13.6}{Pb + \Delta H/13.6}\right]$$

$$\Delta H@ = \frac{0.0317\,\Delta H}{Pb\,(Td + 460)}\left[\frac{(Tds + 460)\,0}{(Vds)\,(Yds)}\right]^2$$

$$Q = \frac{17.64\,(Vds)\,(Pb)}{(Tds + 460)\,0}$$

Pyrometer Calibration Data Sheet

Pyrometer #: 66C-6 Office: PALATINE

Calibrated By: EL Date: 09-05-12

Recalibration Due: 09-5-13 Battery Replaced: ~~Yes~~ ~~No~~

Calibration Reference Setting	Pyrometer Reading
50°F	50°
100°F	100°
150°F	151°
200°F	200°
250°F	250°
300°F	299°
350°F	350°
400°F	398°
450°F	~~358~~ 449°
500°F	499°
550°F	550°
600°F	600°

Calibration Reference Information (from calibration seal on reference)

Reference Used: (Digimite/Other: _____

Serial Number: 029129

Calibrated By: EL Date Calibrated: 3-12

Calibration Report Number: 350554

H.C.B. # 96-C4 Office: PALATINE

Calibrated By: DEVIN Date: 11/6/92

Recalibration Due: 3/93 Battery Replaced: ~~Yes~~ (No)

Reference Temperature	Pyrometer Reading
50°F	50°F
100°F	100°F
150°F	150°F
200°F	200°F
250°F	250°F
300°F	300°F
350°F	349°F
400°F	398°F
450°F	446°F
500°F	496°F
550°F	447°F
600°F	598°F

Calibration Reference Information (from calibration seal on reference)

Reference Used: (Digimite) Other: _____

Serial Number: _____

Calibrated By: DEVIN Date Calibrated: 11/6/92

Calibration Report Number: _____

NOZZLE CALIBRATION DATA

CLIENT HILLSHIRE FARMS	DATE 1-21-93
PLANT NEW LONDON	CALIBRATED BY BOJAN
UNIT NUMBER SMOKE HOUSE	
RUNS 1, 2, 3	

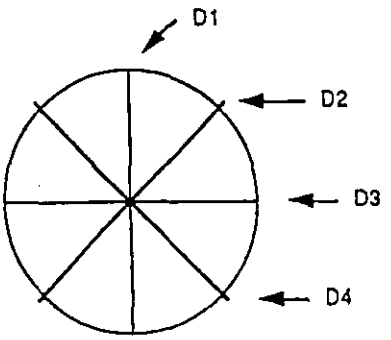
NOZZLE Identification	D1 (inches)	D2 (inches)	D3 (inches)	D4 (inches)	ΔD (inches)	ΔDavg (inches)
.250	.250	.248	.250	.252	.004	.250
.250	.249	.249	.252	.250	.003	.250

Where:

D1, D2, D3, D4 = four nozzle diameter measurements

ΔD = maximum difference between any two diameters ΔD≤0.004 inches

ΔDavg =average of D1, D2, D3, D4



FIELD DATA

Orsat Readings

Client HILLSHIRE FARMS	Project Number 6508
Plant NEW LONDON	Unit SMOKE HOUSE
Date 1-21-93	Fuel Type WOOD CHIP
Orsat ID 3	Leak Check? OK

$F_o = \frac{20.9 - \%O_2}{\%CO_2}$

F_o = 1.083 to 1.230 (for bituminous coal)

Run Number	Location	Bag ID	Trial	Percent CO_2	Percent $CO_2 + O_2$	Percent O_2	F_o	Sample Time	Analysis Time	Analyst
1	INLET	R1-IN	1	0.0	20.9	20.9		~~1:20~~	1:20 PM	JB
			2	0.0	20.9	20.9				
			3	0.0	20.9	20.9				
			Avg.	(0.0)		(20.9)				
1	STACK	R1-S	1	0.0	20.9	20.9			1:25 PM	JB
			2	0.0	20.9	20.9				
			3	0.0	20.9	20.9				
			Avg.	(0.0)		(20.9)				
2	INLET	R2-IN	1	0.0	20.9	20.9			1:30 PM	JB
			2	0.0	20.9	20.9				
			3	0.0	20.9	20.9				
			Avg.	(0.0)		(20.9)				
2	STACK	R2-ST	1	0.0	20.9	20.9			1:35 PM	JB
			2	0.0	20.9	20.9				
			3	0.0	20.9	20.9				
			Avg.	(0.0)		(20.9)				
3	INLET	R3-IN	1	0.0	20.9	20.9		2:00 PM	3:30 PM	JB
			2	0.0	20.9	20.9				
			3	0.0	20.9	20.9				
			Avg.	(0.0)		(20.9)				
3	STACK	R3-ST	1	0.0	20.9	20.9		2:00 PM	3:35 PM	JB
			2	0.0	20.9	20.9				
			3	0.0	20.9	20.9				
			Avg.	(0.0)		(20.9)				
			1							
			2							
			3							
			Avg.							
			1							
			2							
			3							
			Avg.							

Particulate Testing Field Data Sheet

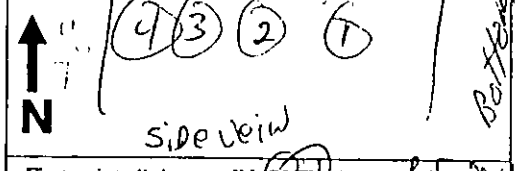
Page 1 of 2

Location: Inlet **Run:** 1

Client Hillshire Farms	Project Number 6508
Plant New London W1	Unit 3335
Date 1/21/93	(inlet)/outlet/stack
Meter Operator JAR	
Probe Operator TA	

Sample Box Number N/A	Pyrometer Number 66-(2)
Meter Box Number 4	
Meter ΔH@ 1.8667	Meter Yd .9923
K Factor 3.8	Pitot Cp .84
Pitot Leak Check: (Before)	(After)
Leak Rate Before .001	CFM @ 23 "Hg
Leak Rate After .001	CFM @ 24 "Hg
Static Pressure (inches H2O) (+) (-) 1.2	

Schematic of Testing Location



First point all the way IN (OUT) Method BI-001		
Area (ft^2) 3.06	Port Len. (in.) 2	Gas Flow IN (OUT)

Filter Number	N/A
Thimble Number	
Beaker Number	

Ambient Temp. (°F) 70	Bar. Press. (in. Hg) 29.16
Assumed Moisture (%) 5	

Heater Box Setting 250	Probe Heater Setting 250
Probe Length 4'	Probe Number 04-01
Probe Material glass	Acetone Number N/A
Nozzle Diameter (in.) .25	Nozzle Number N/A

IGS Bag ID Number Inlet 1	
% O2 20.7 wb	% CO2 0.0 DG
H2O (ml) 80	Silica Gel (gm) 44.7
Total Vlc 12-5 134.7 DG	

Start Time 9:05 (AM) / PM Stop Time 10:21 (AM) / PM

Traverse Point Number	Min/pt 3.5 / Clock time	Pump Vacuum (in. Hg)	Stack Temp. Ts (°F)	Velocity Head ΔPs	Orifice Setting ΔH (in.H2O)	Initial Volume 402.2 / Gas Sample Volume Vm (ft^3)	Gas Sample Temperature at Dry Gas Meter: Inlet Tm in (°F)	Outlet Tm out (°F)	Cond. Temp. Tc (°F)	Filter Temp. Tf (°F)	Probe Temp. (°F)	Notes
1 - 1	3.5	5	116	.49	1.86	404.83	80	77	43	250	250	
2	7	5	120	.45	1.71	407.45	96	78	44	251	249	
3	10.5	4	120	.42	1.59	409.98	102	79	43	250	249	
4	14	3	120	.29	1.1	412.14	105	80	43	250	249	
5	17.5	3	115	.32	1.216	414.34	107	81	44	250	250	
2 - 1	21	7	119	.57	2.16	417.25	103	84	44	250	249	
2	24.5	8	120	.63	2.39	420.32	112	86	44	250	250	
3	28	8	120	.58	2.2	423.31	111	87	44	249	250	
4	31.5	7	117	.44	1.67	425.97	115	88	44	250	250	
5	35	5	114	.37	1.4	428.415	120	90	45	250	250	No Color Change w
3 - 1	38.5	8	114	.63	2.39	431.37	115	91	45	250	250	second impinger
2	42	8	119	.64	2.43	434.36	119	92	45	250	250	
Total			1414	13.9892	37.636	54.51		4057				
Average			116.4	.6994	1.8818		101.425					

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Particulate Testing Field Data Sheet

Location: Inlet Run: 1

Page 2 of 3

Client Hillshire Farms	Project Number 6508
Plant New London WI	Unit 3335
Date 1/21/93	Inlet/outlet/stack
Meter Operator JAP	
Probe Operator TA	

Sample Box Number	Pyrometer Number
Meter Box Number	
Meter ΔH@	Meter Yd
K Factor	Pitot C_p
Pitot Leak Check: Before	After
Leak Rate Before	CFM @ "Hg
Leak Rate After	CFM @ "Hg
Static Pressure (inches H_2O) (+/-)	

Schematic of Testing Location

N

First point all the way IN OUT	Method	
Area (ft^2)	Port Len. (in.)	Gas Flow IN OUT

Filter Number		
Thimble Number		
Beaker Number		

Ambient Temp. (°F)	Bar. Press. (in. Hg)
Assumed Moisture (%)	

Heater Box Setting	Probe Heater Setting
Probe Length	Probe Number
Probe Material	Acetone Number
Nozzle Diameter (in.)	Nozzle Number

IGS Bag ID Number	
% O_2	% CO_2
H_2O (ml)	Silica Gel (gm)
Total V_{lc}	

Start Time 905 (AM) / PM Stop Time 1021 AM / PM

Traverse Point Number	Min/pt 3.5 / Clock time	Pump Vacuum (in. Hg)	Stack Temp. T_s (°F)	Velocity Head ΔP_s	Orifice Setting ΔH ($in.H_2O$)	Initial Volume: Gas Sample Volume V_m (ft^3)	Gas Sample Temperature at Dry Gas Meter: Inlet T_m in (°F)	Outlet T_m out (°F)	Cond. Temp. T_c (°F)	Filter Temp. T_f (°F)	Probe Temp. (°F)	Notes
3-3	45.5	7	120	.58	2.2	437,41	122	93	46	249	249	
4	49	5	120	.42	1.59	440,07	123	94	45	250	251	JP
5	52.5	4	116	.33	1.25	442,485	123	95	46	250	249	~~Stop~~
4-1	56	7	113	.6	2.28	445,44	119	96	47	250	250	
2	59.5	7	117	.63	2.39	448,51	123	96	46	250	250	
3	63	7	117	.6	2.28	451,6	124	97	47	250	250	
4	66.5	4	112	.49	1.86	454,09	125	98	48	250	250	
5	70	5	99	.44	1.67	456,71	124	98	48	250	250	1ST IMPINGER DARKER THAN 2ND
Total			2328									
Average			116,4									

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Particulate Testing Field Data Sheet

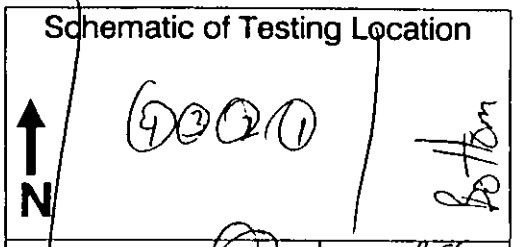
Location: Inlet Run: 2

Page 1 of 2

Client Hillshire Farms	Project Number 6808
Plant DeLand WI	Unit 3335
Date 1/21/93	Inlet/outlet/stack
Meter Operator JRP	
Probe Operator TA	

Sample Box Number N/A		Pyrometer Number 66-64	
Meter Box Number 4			
Meter ΔH@ 1.8667		Meter Yd .9923	
K Factor 3.8		Pitot Cp .84	
Pitot Leak Check:	Before		After
Leak Rate Before .002	CFM @ 24	"Hg	
Leak Rate After .002	CFM @ 20	"Hg	
Static Pressure (inches H2O) (+/-) 1.82			

Schematic of Testing Location



First point all the way	IN OUT	Method Bi-Cool
Area (ft²) 3.0625	Port Len. (in.) 2	Gas Flow IN OUT

Filter Number	N/A	
Thimble Number		
Beaker Number		

Ambient Temp. (°F) 70	Bar. Press. (in. Hg) 29.16
Assumed Moisture (%) 5	

Heater Box Setting 250	Probe Heater Setting 250
Probe Length 4'	Probe Number 04-01
Probe Material glass	Acetone Number 1/2
Nozzle Diameter (in.) .25	Nozzle Number N/A

IGS Bag ID Number Inlet 2	
% O2 20.7 BG	% CO2 0.0 BG
H2O (ml) 27	Silica Gel (gm) 340.2
Total Vlc 67.2 BG	

Start Time 11:35 AM PM Stop Time 12:35 45 AM PM

Traverse Point Number	Min/pt 3.5 Clock time	Pump Vacuum (in. Hg)	Stack Temp. Ts (°F)	Velocity Head ΔPs	Orifice Setting ΔH (in.H2O)	Initial Volume 458.9 Gas Sample Volume Vm (ft³)	Gas Sample Temperature at Dry Gas Meter: Inlet Tm in (°F)	Gas Sample Temperature at Dry Gas Meter: Outlet Tm out (°F)	Cond. Temp. Tc (°F)	Filter Temp. Tf (°F)	Probe Temp. (°F)	Notes
1- 1	3.5	3	115	.5	1.9	461.6	108	96	40	249	250	
2	7	3	121	.51	1.9	464.37	116	96	40	251	249	
3	10.5	3	122	.44	1.67	466.99	118	97	41	250	250	
4	14	2	118	.31	1.178	469.22	122	98	40	250	248	
5	17.5	2	103	.32	1.216	471.47	121	98	41	250	247	
2- 1	21	5	115	.63	2.39	474.56	120	98	40	250	248	
2	24.5	5	120	.66	2.5	477.74	122	99	40	250	250	
3	28	5	121	.63	2.39	480.89	124	99	41	250	250	
4	31.5	3	111	.44	1.67	483.59	126	99	40	250	249	
5	35	3	107	.42	1.59	486.35	125	99	41	250	249	NO COLOR CHANGE IN 2ND IMPINGER
3- 1	38.5	4	118	.59	2.24	489.37	116	98	40	250	250	
2	42	5	119	.64	2.43	492.52	124	100	41	250	250	
Total			2303	14.5902	40.817	57.81		4415				
Average			115.15	.729510	2.0408			110.375				

Particulate Testing Field Data Sheet

Location: Inlet Run: 2

Page 2 of 2

Client Hillshire Farms	Project Number 6508
Plant NOJ London W 1	Unit 3335
Date 1/21/93	(Inlet)/outlet/stack
Meter Operator SDP	
Probe Operator TH	

Sample Box Number	Pyrometer Number	
Meter Box Number		
Meter ΔH@	Meter Yd	
K Factor	Pitot C_p	
Pitot Leak Check: Before	After	
Leak Rate Before	CFM @	"Hg
Leak Rate After	CFM @	"Hg
Static Pressure (inches H_2O) (+/-)		

Schematic of Testing Location

N

First point all the way IN OUT	Method	
Area (ft^2)	Port Len. (in.)	Gas Flow IN OUT

Filter Number		
Thimble Number		
Beaker Number		

Ambient Temp. (°F)	Bar. Press. (in. Hg)
Assumed Moisture (%)	

Heater Box Setting	Probe Heater Setting
Probe Length	Probe Number
Probe Material	Acetone Number
Nozzle Diameter (in.)	Nozzle Number

IGS Bag ID Number	
% O_2	% CO_2
H_2O (ml)	Silica Gel (gm)
Total V_{lc}	

Start Time AM / PM	Stop Time AM / PM

Traverse Point Number	Min/pt 3,5 Clock time	Pump Vacuum (in. Hg)	Stack Temp. T_s (°F)	Velocity Head ΔP_s	Orifice Setting ΔH ($in.H_2O$)	Initial Volume Gas Sample Volume V_m (ft^3)	Gas Sample Temperature at Dry Gas Meter Inlet T_m in (°F)	Gas Sample Temperature at Dry Gas Meter Outlet T_m out (°F)	Cond. Temp. T_c (°F)	Filter Temp. T_f (°F)	Probe Temp. (°F)	Notes
3-3	45.5	5	120	.65	2.47	495.71	125	100	41	250	250	
4	49	4	117	.55	2.09	498.65	126	100	41	250	250	
5	52.5	4	101	.47	1.786	501.365	126	101	42	250	250	
4.1	56	5	115	.59	2.242	504.44	120	99	42	250	250	
2	59.5	5	118	.65	2.47	507.62	123	100	42	250	250	
3	63	5	118	.65	2.47	510.81	124	100	43	250	250	
4	66.5	5	111	.57	2.16	513.81	126	100	42	250	250	
5	70	4	113	.54	2.052	516.71	126	100	43	250	250	1ST IMPINGER DARKER THAN 2ND
Total												
Average												

~~Particulate~~ Testing Field Data Sheet

Location: Inlet **Run:** 3

Page 1 of 2

Client Hillshire Farms	Project Number 6508
Plant New London #1	Unit 3335
Date 1/21/93	(Inlet)/outlet/stack
Meter Operator JAD	
Probe Operator TA	

Schematic of Testing Location

N ↑ | (4)(3)(2)(1) | Bottom

Ambient Temp. (°F) 70	Bar. Press. (in. Hg) 27.18
Assumed Moisture (%) 5	

Heater Box Setting 250	Probe Heater Setting 250
Probe Length 4'	Probe Number 04-01
Probe Material glass	Acetone Number N/A
Nozzle Diameter (in.) .25	Nozzle Number N/A

Sample Box Number N/A	Pyrometer Number 66-CH
Meter Box Number 4	
Meter ΔH@ 1.8667	Meter Yd .9923
K Factor 3.8	Pitot C_p .84
Pitot Leak Check: (Before)	(After)
Leak Rate Before .002	CFM @ 24 "Hg
Leak Rate After .002	CFM @ 23 "Hg
Static Pressure (inches H_2O) (+/-) 1.6	

First point all the way IN (OUT) Method BF0011

Area (ft^2)	Port Len. (in.)	Gas Flow IN (OUT)
3.0625	2	

Filter Number	N/A	
Thimble Number		
Beaker Number		

IGS Bag ID Number	Inlet Run 3
% O_2 20.9	% CO_2 0
H_2O (ml) 50ML	Silica Gel (gm) 45.8
Total Vlc 96	95.8 DG

Start Time 2 AM (PM) Stop Time 3/3 AM (PM)

Traverse Point Number	Min/pt 3.5 Clock time	Pump Vacuum (in. Hg)	Stack Temp. Ts (°F)	Velocity Head ΔPs	Orifice Setting ΔH (in.H_2O)	Initial Volume 519.5 Gas Sample Volume Vm (ft^3)	Gas Sample Temperature at Dry Gas Meter. Inlet Tm In (°F)	Outlet Tm out (°F)	Cond. Temp. Tc (°F)	Filter Temp. Tf (°F)	Probe Temp. (°F)	Notes
1 - 1	3.5	4	119	.42	1.596	521,84	111	98	40	250	250	
2	7	4	121	.42	1.596	524,35	113	98	40	250	250	
3	10.5	4	122	.40	1.52	526,84	117	99	41	250	249	
4	14	3	122	.29	1.1	529,18	120	98	42	250	248	
5	17.5	3	101	.26	.988	531,14	120	99	41	250	249	
2 - 1	21	5	117	.52	1.976	533.92	119	98	42	250	250	
2	24.5	6	121	.58	2.2	536.9	120	99	42	250	249	
3	28	5	121	.48	1.8	539,68	123	99	43	250	250	
4	31.5	3	121	.29	1.1	541.91	124	100	42	250	249	
5	35	3	117	.24	.91	543,99	123	100	43	250	250	NO COLOR CHANGE IN 2ND IMPINGER
3 - 1	38.5	6	116	.52	1.976	546,69	120	100	43	250	250	
2	42	6	118	.55	2.09	549,575	122	100	42	250	249	
Total			2301	13.011623	22.598	52.3		4415				
Average			115,05	.650581	1.6299			110,375				

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Particulate Testing Field Data Sheet

Location: Inlet **Run:** 3

Client Hillshire Farms	Project Number 6508
Plant New London WI	Unit 3335
Date 1/21/93	(Inlet)/outlet/stack
Meter Operator JAR	
Probe Operator TA	

Sample Box Number N	Pyrometer Number
Meter Box Number	
Meter ΔH@	Meter Yd
K Factor	Pitot Cp
Pitot Leak Check: Before	After
Leak Rate Before	CFM @ "Hg
Leak Rate After	CFM @ "Hg
Static Pressure (inches H_2O) (+/-)	

Schematic of Testing Location

N

First point all the way IN OUT	Method	
Area (ft^2)	Port Len. (in.)	Gas Flow IN OUT

Filter Number		
Thimble Number		
Beaker Number		

Ambient Temp. (°F)	Bar. Press. (in. Hg)
Assumed Moisture (%)	

Heater Box Setting	Probe Heater Setting
Probe Length	Probe Number
Probe Material	Acetone Number
Nozzle Diameter (in.)	Nozzle Number

IGS Bag ID Number	
% O_2	% CO_2
H_2O (ml)	Silica Gel (gm)
Total V_{lc}	

Start Time	AM / PM	Stop Time	AM / PM

Traverse Point Number	Min/pt 3.5 Clock time	Pump Vacuum (in. Hg)	Stack Temp. T_s (°F)	Velocity Head ΔP_s	Orifice Setting ΔH (in.H_2O)	Initial Volume Gas Sample Volume V_m (ft^3)	Gas Sample Temperature at Dry Gas Meter Inlet $T_{m\,in}$ (°F)	Gas Sample Temperature at Dry Gas Meter Outlet $T_{m\,out}$ (°F)	Cond. Temp. T_c (°F)	Filter Temp. T_f (°F)	Probe Temp. (°F)	Notes
3-3	45.5	6	120	.52	1.976	552.41	124	101	44	250	249	
4	49	5	113	.38	1.4	554.96	124	100	44	250	250	
5	52.5	4	102	.34	1.29	557.34	125	101	44	250	250	
4-1	56	6	115	.55	2.09	560.22	120	100	46	250	249	
2	59.5	6	118	.55	2.09	563.00 3.14	123	100	46	250	249	
3	63	6	117	.5	1.9	566.0	125	101	47	250	249	
4	66.5	5	105	.4	1.52	568.57	126	101	47	250	250	
5	70	5	95	.39	1.48	571.18	126	102	47	250	250	1ST IMPINGER DARKER THAN 2ND
Total												
Average												

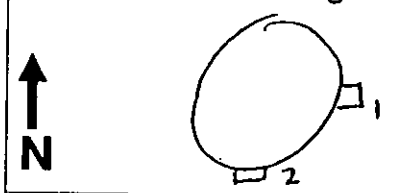
(4)

Location: SMOKE HOUSE **Run:** 1

Particulate Testing Field Data Sheet

Client HILLSHIRE FARMS	Project Number 6508
Plant NEW LONDON	Unit SMOKE HOUSE
Date 1-21-92	Inlet/outlet (stack)
Meter Operator BOJAN	
Probe Operator B. F	

Schematic of Testing Location



First point all the way (IN) OUT	Method BIFF II	
Area (ft^2) 3.01	Port Len. (in.) 2	Gas Flow IN (OUT)

Ambient Temp. (°F) 36	Bar. Press. (in. Hg) 29.19
Assumed Moisture (%) 5	

Heater Box Setting 250	Probe Heater Setting 250
Probe Length 4'	Probe Number 03-04
Probe Material GLASS	Acetone Number —
Nozzle Diameter (in.) .250	Nozzle Number .250

Sample Box Number A	Pyrometer Number 66-66	
Meter Box Number 2		
Meter ΔH@ 1.7578	Meter Yd 1.0107	
K Factor 3.6	Pitot C_p .84	
Pitot Leak Check: ✓Before	✓After	
Leak Rate Before .005	CFM @ 20 "Hg	
Leak Rate After .005	CFM @ 11 "Hg	
Static Pressure (inches H_2O) (+/-) .5		

Filter Number	—	
Thimble Number	—	
Beaker Number		

IGS Bag ID Number	
% O_2 20.7 DG	% CO_2 0.0 DG
H_2O (ml) 55	Silica Gel (gm) 38.2
Total Vlc 93.2 DG	

Start Time 9:05 (AM)/PM Stop Time 10:35 AM/(PM)

Traverse Point Number	Min/pt Clock time	Pump Vacuum (in. Hg)	Stack Temp. T_s (°F)	Velocity Head ΔP_s	Orifice Setting ΔH (in.H_2O)	Initial Volume 458.16 / Gas Sample Volume V_m (ft^3)	Gas Sample Temperature at Dry Gas Meter: Inlet $T_{m\,in}$ (°F)	Outlet $T_{m\,out}$ (°F)	Cond. Temp. T_c (°F)	Filter Temp. T_f (°F)	Probe Temp. (°F)	Notes
1-1	3	6	119	0.40	1.45	460.12	86	77	38	244	250	
2	6	5	118	0.38	1.35	461.99	88	78	38	248	250	
3	9	6	118	0.43	1.55	463.96	92	78	38	247	250	
4	12	7	119	0.48	1.70	466.05	96	79	38	246	250	
5	15	8	119	0.51	1.85	468.23	100	80	40	249	250	
6	18	8	120	0.50	1.80	470.40	102	81	40	248	250	
7	21	7	118	0.47	1.70	472.55	104	82	40	251	250	
8	24	7	119	0.45	1.60	474.62	106	84	40	251	250	
9	27	6	118	0.38	1.35	476.52	106	86	40	250	249	
10	30	6	118	0.36	1.30	478.41	106	88	40	250	250	
11	33	5	118	0.29	1.05	480.12	106	88	40	250	250	IMPINGERS
12	36	5	118	0.28	1.00	481.76	106	88	40	250	249	SHOW LITTLE COLOR CHANGE
Total						45.89						
Average			119	.6115	1.36		95					

Particulate Testing Field Data Sheet

Location: SMOKE HOUSE **Run:** 1

Client HILLSHIRE FARMS	Project Number 6508
Plant NEW LONDON	Unit SMOKE HOUSE
Date 1-21-92	Inlet/outlet/stack
Meter Operator BOJAN	
Probe Operator BF	

Sample Box Number	Pyrometer Number	
Meter Box Number		
Meter ΔH@	Meter Yd	
K Factor	Pitot C_p	
Pitot Leak Check: Before	After	
Leak Rate Before	CFM @	"Hg
Leak Rate After	CFM @	"Hg
Static Pressure (inches H_2O) (+/-)		

Schematic of Testing Location

N

First point all the way IN OUT	Method	
Area (ft^2)	Port Len. (in.)	Gas Flow IN OUT

Filter Number		
Thimble Number		
Beaker Number		

Ambient Temp. (°F)	Bar. Press. (in. Hg)
Assumed Moisture (%)	

Heater Box Setting	Probe Heater Setting
Probe Length	Probe Number
Probe Material	Acetone Number
Nozzle Diameter (in.)	Nozzle Number

IGS Bag ID Number	
% O_2	% CO_2
H_2O (ml)	Silica Gel (gm)
Total V_{lc}	

Start Time	AM / PM	Stop Time	AM / PM

Traverse Point Number	Min/pt Clock time	Pump Vacuum (in. Hg)	Stack Temp. T_s (°F)	Velocity Head ΔP_s	Orifice Setting ΔH (in.H_2O)	Initial Volume Gas Sample Volume V_m (ft^3)	Gas Sample Temperature at Dry Gas Meter Inlet T_m in (°F)	Gas Sample Temperature at Dry Gas Meter Outlet T_m out (°F)	Cond. Temp. T_c (°F)	Filter Temp. T_f (°F)	Probe Temp. (°F)	Notes
2-1	3	5	119	0.33	1.20	483.66	100	94	38	250	251	
2	6	6	118	0.35	1.25	485.50	104	94	38	252	247	
3	9	6	119	0.37	1.35	487.42	107	94	38	249	250	
4	12	6	117	0.37	1.35	489.40	108	94	38	249	250	
5	15	6	119	0.39	1.40	491.41	110	94	38	249	250	
6	18	6	120	0.46	1.65	493.16	112	96	38	253	251	
7	21	6	119	0.40	1.45	495.23	114	96	40	253	251	
8	24	5	119	0.33	1.20	497.31	112	96	40	250	250	
9	27	5	119	0.30	1.10	498.88	112	96	40	251	250	
10	30	5	121	0.29	1.05	500.63	111	96	40	250	250	
11	33	5	119	0.27	1.00	502.32	111	96	40	250	251	
12	36	5	121	0.27	1.00	504.05	111	96	40	250	249	1ST IMPINGER DARKER THAN 2ND
Total												
Average												

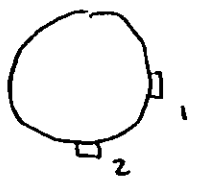
Particulate Testing Field Data Sheet

Location: SMOKE HOUSE **Run:** 2

Client HILLSHIRE FARMS	Project Number 6508
Plant ~~1-21-92~~ NEW LONDON	Unit SMOKE HOUSE
Date 1-21-92	Inlet/outlet (stack)
Meter Operator BOJAN	
Probe Operator BF	

Sample Box Number A	Pyrometer Number 66-66
Meter Box Number 2	
Meter ΔH@ 1.7578	Meter Yd 1.0107
K Factor 3.6	Pitot C_p 0.84
Pitot Leak Check: ✓Before	✓After
Leak Rate Before 0.005	CFM @ 15 "Hg
Leak Rate After 0.005	CFM @ 10 "Hg
Static Pressure (inches H_2O) (+/-) 0.5	

Schematic of Testing Location



First point all the way (IN) OUT	Method BIFFII	
Area (ft^2) 3.01	Port Len. (in.) 2	Gas Flow IN (OUT)

Filter Number	—	
Thimble Number	—	
Beaker Number		

Ambient Temp. (°F) 36	Bar. Press. (in. Hg) 29.18
Assumed Moisture (%) 10	

Heater Box Setting 250	Probe Heater Setting 250
Probe Length 4'	Probe Number 03-04
Probe Material GLASS	Acetone Number —
Nozzle Diameter (in.) .250	Nozzle Number .250

IGS Bag ID Number		
% O_2 20.9 DG	% CO_2 0.0 DG	
H_2O (ml) 45	Silica Gel (gm) 42	
Total V_{lc} 87		

Start Time 11:35 (AM) / PM Stop Time 12:43 AM / (PM)

Traverse Point Number	Min/pt / Clock time	Pump Vacuum (in. Hg)	Stack Temp. T_s (°F)	Velocity Head ΔP_s	Orifice Setting ΔH (in.H_2O)	Initial Volume 506.60 / Gas Sample Volume V_m (ft^3)	Gas Sample Temperature at Dry Gas Meter: Inlet $T_{m\,in}$ (°F)	Outlet $T_{m\,out}$ (°F)	Cond. Temp. T_c (°F)	Filter Temp. T_f (°F)	Probe Temp. (°F)	Notes
1 - 1	3	5	118	0.39	1.40	508.59	104	98	38	251	250	
2	6	5	120	0.39	1.40	510.55	106	100	38	248	250	
3	9	6	119	0.42	1.50	512.60	114	98	38	248	250	
4	12	7	119	0.46	1.65	514.65	116	100	38	247	250	
5	15	7	118	0.49	1.75	516.92	115	100	38	242	250	
6	18	7	119	0.47	1.70	519.12	116	100	40	247	250	
7	21	7	119	0.46	1.65	521.30	116	99	40	247	250	
8	24	7	119	0.43	1.55	523.39	117	99	40	248	250	
9	27	6	119	0.39	1.40	525.40	117	100	40	244	250	
10	30	5	118	0.32	1.15	527.23	115	100	40	251	250	
11	33	5	117	0.30	1.10	529.00	114	100	40	251	250	
12	36	5	119	0.29	1.05	530.75	114	100	40	249	251	NO COLOR CHANGE IN 2ND IMPINGER
Total						46.89						
Average				.6105	1.34		104					

Particulate Testing Field Data Sheet

Location: Smoke House **Run:** 2

Client Hillshire Farms	Project Number 6508
Plant New London	Unit Smoke House
Date 1-21-92	Inlet/outlet/(stack)
Meter Operator Bosan	
Probe Operator BF	

Sample Box Number	Pyrometer Number
Meter Box Number	
Meter ΔH@	Meter Yd
K Factor	Pitot Cp
Pitot Leak Check: Before	After
Leak Rate Before	CFM @ "Hg
Leak Rate After	CFM @ "Hg
Static Pressure (inches H_2O) (+/-)	

Schematic of Testing Location

N

First point all the way IN OUT	Method	
Area (ft^2)	Port Len. (in.)	Gas Flow IN OUT

Filter Number		
Thimble Number		
Beaker Number		

Ambient Temp. (°F)	Bar. Press. (in. Hg)
Assumed Moisture (%)	

Heater Box Setting	Probe Heater Setting
Probe Length	Probe Number
Probe Material	Acetone Number
Nozzle Diameter (in.)	Nozzle Number

IGS Bag ID Number	
% O_2	% CO_2
H_2O (ml)	Silica Gel (gm)
Total V_{lc}	

Start Time AM / PM	Stop Time AM / PM

Traverse Point Number	Min/pt 3 / Clock time	Pump Vacuum (in. Hg)	Stack Temp. T_s (°F)	Velocity Head ΔP_s	Orifice Setting ΔH (in.H_2O)	Initial Volume: Gas Sample Volume V_m (ft^3)	Gas Sample Temperature at Dry Gas Meter: Inlet $T_{m\,in}$ (°F)	Gas Sample Temperature at Dry Gas Meter: Outlet $T_{m\,out}$ (°F)	Cond. Temp. T_c (°F)	Filter Temp. T_f (°F)	Probe Temp. (°F)	Notes
2 - 1	39	5	118	0.32	1.15	532.60	108	99	36	249	251	
2	42	5	118	0.32	1.15	534.43	110	99	36	249	251	
3	45	5	118	0.36	1.30	536.24	110	100	36	252	250	
4	48	6	119	0.38	1.35	538.22	112	100	38	251	250	
5	51	8	119	0.44	1.60	540.36	113	100	38	249	250	
6	54	8	119	0.44	1.60	542.18	114	99	38	249	252	
7	57	7	118	0.41	1.45	544.36	115	99	38	250	249	
8	60	6	119	0.32	1.15	546.43	114	100	38	247	251	
9	63	5	118	0.30	1.00	548.22	114	100	38	248	249	
10	66	5	119	.32	1.15	550.05	114	99	40	251	249	
11	69	5	118	0.30	1.00	551.65	114	100	40	247	251	
12	72	5	117	.29	1.00	553.49	112	100	40	250	248	1ST IMPINGER DARKER THAN 2ND
Total												
Average												

Particulate Testing Field Data Sheet

Location: SMOKE HOUSE **Run:** 3

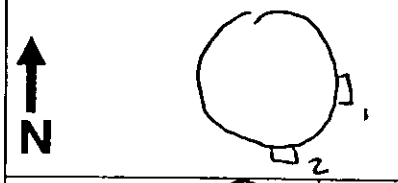
(6)

Page 1 of 2

Client HILLSHIRE FARMS	Project Number 6508
Plant NEW LONDON	Unit SMOKE HOUSE
Date 1-21-93	Inlet/outlet/(stack)
Meter Operator BOJAN	
Probe Operator BF	

Sample Box Number A	Pyrometer Number 66-C6
Meter Box Number Z	
Meter ΔH@ 1.7578	Meter Yd 1.0107
K Factor 3.6	Pitot Cp 0.84
Pitot Leak Check: ✓Before	✓After
Leak Rate Before 0.005 CFM @ 15 "Hg	
Leak Rate After 0.005 CFM @ 15 "Hg	
Static Pressure (inches H_2O) (+/-) +0.5	

Schematic of Testing Location



First point all the way (IN) OUT Method BIFF II

Area (ft^2)	Port Len. (in.)	Gas Flow IN (OUT)
3.01	2	

Filter Number	—	
Thimble Number	—	
Beaker Number		

Ambient Temp. (°F) 36	Bar. Press. (in. Hg) 29.18
Assumed Moisture (%) 10	

Heater Box Setting 250	Probe Heater Setting 250
Probe Length 4'	Probe Number 03-04
Probe Material GLASS	Acetone Number —
Nozzle Diameter (in.) .250	Nozzle Number .250

IGS Bag ID Number R3-ST	
% O_2 20.9	% CO_2 0.0
H_2O (ml) 55	Silica Gel (gm) 38.8
Total Vlc 94 - 92.8	

Start Time 2:00 AM /(PM) Stop Time 3:19 AM /(PM)

Traverse Point Number	Min/pt 3 / Clock time	Pump Vacuum (in. Hg)	Stack Temp. Ts (°F)	Velocity Head ΔPs	Orifice Setting ΔH (in.H_2O)	Initial Volume 559.00 / Gas Sample Volume Vm (ft^3)	Gas Sample Temperature at Dry Gas Meter: Inlet Tm in (°F)	Gas Sample Temperature at Dry Gas Meter: Outlet Tm out (°F)	Cond. Temp. Tc (°F)	Filter Temp. Tf (°F)	Probe Temp. (°F)	Notes
1 - 1	3	6	119	0.39	1.40	561.00	116	100	36	249	253	
2	6	6	119	0.40	1.45	563.04	110	100	36	248	250	
3	9	6	119	0.42	1.50	565.10	112	100	36	245	249	
4	12	7	118	0.46	1.65	567.23	114	100	38	247	251	
5	15	7	118	0.47	1.70	569.42	115	100	38	249	250	
6	18	8	118	0.46	1.65	571.58	116	100	38	250	250	
7	21	8	118	0.48	1.70	573.76	116	101	38	251	251	
8	24	8	117	0.44	1.60	575.92	117	101	38	250	250	
9	27	7	117	0.36	1.30	577.92	118	101	40	253	249	
10	30	6	116	0.33	1.20	579.81	116	102	40	248	250	
11	33	5	117	0.28	1.00	581.54	116	102	40	252	251	
12	36	5	116	0.29	1.00	583.30	116	102	40	249	251	NO COLOR CHANGE IN 2ND IMPINGER
Total						47.36						
Average				.6176	1.379		108					

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Particulate Testing Field Data Sheet

Location: SMOKE HOUSE **Run:** 3

Client HILLSHIRE FARMS	Project Number 6508
Plant NEW LONDON	Unit SMOKE HOUSE
Date 1-23-93	Inlet/outlet (stack)
Meter Operator BOSAN	
Probe Operator BF	

Sample Box Number	Pyrometer Number
Meter Box Number	
Meter ΔH@	Meter Yd
K Factor	Pitot Cp
Pitot Leak Check: Before	After
Leak Rate Before	CFM @ "Hg
Leak Rate After	CFM @ "Hg
Static Pressure (inches H_2O) (+/-)	

Schematic of Testing Location

N

First point all the way IN OUT	Method	
Area (ft^2)	Port Len. (in.)	Gas Flow IN OUT

Filter Number		
Thimble Number		
Beaker Number		

Ambient Temp. (°F)	Bar. Press. (in. Hg)
Assumed Moisture (%)	

Heater Box Setting	Probe Heater Setting
Probe Length	Probe Number
Probe Material	Acetone Number
Nozzle Diameter (in.)	Nozzle Number

IGS Bag ID Number	
% O_2	% CO_2
H_2O (ml)	Silica Gel (gm)
Total V_{lc}	

Start Time	AM / PM	Stop Time	AM / PM

Traverse Point Number	Min/pt Clock time	Pump Vacuum (in. Hg)	Stack Temp. T_s (°F)	Velocity Head ΔP_s	Orifice Setting ΔH (in.H_2O)	Initial Volume Gas Sample Volume V_m (ft^3)	Gas Sample Temperature at Dry Gas Meter Inlet T_m in (°F)	Gas Sample Temperature at Dry Gas Meter Outlet T_m out (°F)	Cond. Temp. T_c (°F)	Filter Temp. T_f (°F)	Probe Temp. (°F)	Notes
2 - 1	3	6	116	.35	1.25	585.22	108	102	36	252	250	
2	6	6	117	.34	1.20	587.11	110	101	36	251	249	
3	9	7	118	0.39	1.40	589.11	113	102	36	247	251	
4	12	10	119	0.48	1.75	519.32	114	102	36	249	251	
5	15	10	118	0.49	1.75	593.54	114	102	38	250	248	
6	18	9	116	0.45	1.60	595.68	116	102	38	250	243	
7	21	8	117	0.40	1.40	597.74	116	102	38	248	250	
8	24	7	117	0.34	1.20	599.65	116	102	38	250	250	
9	27	7	117	0.32	1.15	601.54	117	102	40	251	250	
10	30	7	117	0.30	1.10	603.33	116	102	40	250	251	
11	33	7	117	0.30	1.10	605.14	116	102	40	250	250	
12	36	7	116	0.29	1.05	606.36	116	102	40	250	249	1ST IMPINGER DARKER THAN 2ND
Total												
Average												

FIELD DATA PRINTOUTS

RAW DATA SET # 1

1) Plant	NEW LONDON, WI.	17) Heater Box Setting		
2) Location	SMOKEHOUSE INLET	18) Probe Length',' Ft.		
3) Operator	J. PIONTEK	19) Nozzle Diameter','In.		0.250
4) Date	1/21/93	20) Probe Heater Setting		
5) Run No.	1	21) % O2		20.9
6) Sample Box No.		22) % CO2		0.0
7) Meter Box No.	U	23) Ml. H2O		80.0
8) Meter H@	1.8667	24) GM. Silica Gel		44.7
9) K Factor	3.80	25) Total		124.7
10) Pitot Factor	0.84	26) Start Time		9:05 AM
11) Leak Rate Before	0.001@23	27) Finish Time		10:21 AM
12) Leak Rate After	0.001@24	28) Yd.		0.9923
13) Static Pres., in H2O	-1.20	29) Stack Area		3.06
14) Ambient Temperature	70	30) Sampling Time (MIN/PT)		3.5
15) Barometric Pressure	29.18	31) Initial Volume		402.20
16) Assumed Moisture, %		32) FILTER & BEAKER #'S		

Pt. #	0	Vac.	Ts	DPs	DH	Vm	Tm in	Tmout	Tc	Tb	%I
0 - 0						402.20					J. PIONTEK
1 - 1	3.5	5	116	0.49	1.86	404.83	80	77	43	250	102.2
1 - 2	3.5	5	120	0.45	1.71	407.45	96	78	44	251	104.9
1 - 3	3.5	4	120	0.42	1.59	409.98	102	79	43	250	104.1
1 - 4	3.5	3	120	0.29	1.10	412.14	105	80	43	250	106.5
1 - 5	3.5	3	115	0.32	1.22	414.34	107	81	44	250	102.5
2 - 1	3.5	7	119	0.57	2.16	417.25	103	84	44	250	102.3
2 - 2	3.5	8	120	0.63	2.39	420.32	112	86	44	250	101.8
2 - 3	3.5	8	120	0.58	2.20	423.31	117	87	44	249	102.7
2 - 4	3.5	7	117	0.44	1.67	425.97	118	88	44	250	104.3
2 - 5	3.5	5	114	0.37	1.40	428.42	120	90	45	250	104.1
3 - 1	3.5	8	114	0.63	2.39	431.37	115	91	45	250	96.6
3 - 2	3.5	8	119	0.64	2.43	434.38	119	92	45	250	97.8
3 - 3	3.5	7	120	0.58	2.20	437.41	122	93	46	249	103.1
3 - 4	3.5	5	120	0.42	1.59	440.07	123	94	45	250	106.0
3 - 5	3.5	4	116	0.33	1.25	442.49	123	95	46	250	108.2

4 - 1	3.5	7	113	0.60	2.28	445.44	119	96	47	250	98.1
4 - 2	3.5	7	117	0.63	2.39	448.51	123	96	46	250	99.7
4 - 3	3.5	7	117	0.60	2.28	451.60	124	97	47	250	102.6
4 - 4	3.5	4	112	0.49	1.86	454.09	125	98	48	250	90.8
4 - 5	3.5	5	99	0.44	1.67	456.71	124	98	48	250	99.7

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70	116	.699	1.88	54.51	101
Total	Avg.	Root	Avg.	Volume	Avg.

RAW DATA SET # 2

1) Plant	NEW LONDON, WI.	17) Heater Box Setting	
2) Location	SMOKEHOUSE INLET	18) Probe Length',' Ft.	
3) Operator	J. PIONTEK	19) Nozzle Diameter','In.	0.250
4) Date	1/21/93	20) Probe Heater Setting	
5) Run No.	2	21) % O2	20.9
6) Sample Box No.		22) % CO2	0.0
7) Meter Box No.	U	23) Ml. H2O	27.0
8) Meter H@	1.8667	24) GM. Silica Gel	40.2
9) K Factor	3.80	25) Total	67.2
10) Pitot Factor	0.84	26) Start Time	11:35 AM
11) Leak Rate Before	0.002@24	27) Finish Time	12:45 PM
12) Leak Rate After	0.002@20	28) Yd.	0.9923
13) Static Pres., in H2O	-1.20	29) Stack Area	3.06
14) Ambient Temperature	70	30) Sampling Time (MIN/PT)	3.5
15) Barometric Pressure	29.18	31) Initial Volume	458.90
16) Assumed Moisture, %		32) FILTER & BEAKER #'S	

Pt. #	0	Vac.	Ts	DPs	DH	Vm	Tm in	Tmout	Tc	Tb	%I
0 - 0						458.90					J. PIONTEK
1 - 1	3.5	3	115	0.50	1.90	461.60	108	96	40	249	95.5
1 - 2	3.5	3	121	0.51	1.90	464.37	116	96	40	251	96.8
1 - 3	3.5	3	122	0.44	1.67	466.99	118	97	41	250	98.3
1 - 4	3.5	2	118	0.31	1.18	469.22	122	98	40	250	98.8
1 - 5	3.5	2	103	0.32	1.22	471.47	121	98	41	250	97.0
2 - 1	3.5	5	115	0.63	2.39	474.56	120	98	40	250	96.3
2 - 2	3.5	5	120	0.66	2.50	477.74	122	99	40	250	97.0
2 - 3	3.5	5	121	0.63	2.39	480.89	124	99	41	250	98.2
2 - 4	3.5	3	111	0.44	1.67	483.59	126	99	40	250	99.5
2 - 5	3.5	3	107	0.42	1.59	486.35	125	99	41	250	103.8
3 - 1	3.5	4	118	0.59	2.24	489.37	116	98	40	250	97.8
3 - 2	3.5	5	119	0.64	2.43	492.52	124	100	41	250	97.2
3 - 3	3.5	5	120	0.65	2.47	495.71	125	100	41	250	97.7
3 - 4	3.5	4	117	0.55	2.09	498.65	126	100	41	250	97.4
3 - 5	3.5	4	101	0.47	1.79	501.37	126	101	42	250	96.0
4 - 1	3.5	5	115	0.59	2.24	504.44	120	99	42	250	98.7

4 - 2	3.5	5	118	0.65	2.47	507.62	123	100	42	250	97.4
4 - 3	3.5	5	118	0.65	2.47	510.81	124	100	43	250	97.6
4 - 4	3.5	5	111	0.57	2.16	513.81	126	100	42	250	97.2
4 - 5	3.5	4	113	0.54	2.05	516.71	126	100	43	250	96.7

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70	115	.73	2.04	57.81	110
Total	Avg.	Root	Avg.	Volume	Avg.

RAW DATA SET # 3

1) Plant	NEW LONDON, WI.	17) Heater Box Setting		
2) Location	SMOKEHOUSE INLET	18) Probe Length',' Ft.		
3) Operator	J. PIONTEK	19) Nozzle Diameter','In.	0.250	
4) Date	1/21/93	20) Probe Heater Setting		
5) Run No.	3	21) % O2	20.9	
6) Sample Box No.		22) % CO2	0.0	
7) Meter Box No.	U	23) Ml. H2O	50.0	
8) Meter H@	1.8667	24) GM. Silica Gel	45.8	
9) K Factor	3.80	25) Total	95.8	
10) Pitot Factor	0.84	26) Start Time	2:00 PM	
11) Leak Rate Before	0.002@24	27) Finish Time	3:13 PM	
12) Leak Rate After	0.002@23	28) Yd.	0.9923	
13) Static Pres., in H2O	-1.60	29) Stack Area	3.06	
14) Ambient Temperature	70	30) Sampling Time (MIN/PT)	3.5	
15) Barometric Pressure	29.18	31) Initial Volume	519.50	
16) Assumed Moisture, %		32) FILTER & BEAKER #'S		

Pt. #	0	Vac.	Ts	DPs	DH	Vm	Tm in	Tmout	Tc	Tb	%I
0 - 0						519.50					J. PIONTEK
1 - 1	3.5	4	119	0.42	1.60	521.84	111	98	40	250	92.5
1 - 2	3.5	4	121	0.42	1.60	524.35	113	98	40	250	99.2
1 - 3	3.5	4	122	0.40	1.52	526.84	117	99	41	250	100.4
1 - 4	3.5	3	122	0.29	1.10	529.18	120	98	42	250	110.5
1 - 5	3.5	3	101	0.26	0.99	531.14	120	99	41	250	95.9
2 - 1	3.5	5	117	0.52	1.98	533.92	119	98	42	250	97.9
2 - 2	3.5	6	121	0.58	2.20	536.90	120	99	42	250	99.6
2 - 3	3.5	5	121	0.48	1.80	539.68	123	99	43	250	101.8
2 - 4	3.5	3	121	0.29	1.10	541.91	124	100	42	250	104.7
2 - 5	3.5	3	117	0.24	0.91	543.99	123	100	43	250	107.0
3 - 1	3.5	6	116	0.52	1.98	546.69	120	100	43	250	94.8
3 - 2	3.5	6	118	0.55	2.09	549.58	122	100	42	250	98.7
3 - 3	3.5	6	120	0.52	1.98	552.41	124	101	44	250	99.3
3 - 4	3.5	5	113	0.38	1.40	554.96	124	100	44	250	103.9
3 - 5	3.5	4	102	0.34	1.29	557.34	125	101	44	250	101.4
4 - 1	3.5	6	115	0.55	2.09	560.22	120	100	46	250	98.3
4 - 2	3.5	6	118	0.55	2.09	563.14	123	100	46	250	99.6

4 - 3	3.5	6	117	0.50	1.90	566.00	125	101	47	250	101.9
4 - 4	3.5	5	105	0.40	1.52	568.57	126	101	47	250	101.2
4 - 5	3.5	5	95	0.39	1.48	571.18	126	102	47	250	103.0

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70	115	.651	1.63	51.68	110
Total	Avg.	Root	Avg.	Volume	Avg.

RAW DATA SET # 4

1) Plant	NEW LONDON, WI.	17) Heater Box Setting		
2) Location	SMOKEHOUSE STACK	18) Probe Length',' Ft.		
3) Operator	J. BOJAN	19) Nozzle Diameter','In.		0.250
4) Date	1/21/93	20) Probe Heater Setting		
5) Run No.	1	21) % O2		20.9
6) Sample Box No.	A	22) % CO2		0.0
7) Meter Box No.	Z	23) Ml. H2O		55.0
8) Meter H@	1.7578	24) GM. Silica Gel		38.2
9) K Factor	3.60	25) Total		93.2
10) Pitot Factor	0.84	26) Start Time		9:05 AM
11) Leak Rate Before	0.005@20	27) Finish Time		10:35 AM
12) Leak Rate After	0.005@11	28) Yd.		1.0107
13) Static Pres., in H2O	0.50	29) Stack Area		3.01
14) Ambient Temperature	36	30) Sampling Time (MIN/PT)		3
15) Barometric Pressure	29.18	31) Initial Volume		458.16
16) Assumed Moisture, %		32) FILTER & BEAKER #'S		

Pt. #	0	Vac.	Ts	DPs	DH	Vm	Tm in	Tout	Tc	Tb	%I
0 - 0						458.16					J. BOJAN
1 - 1	3	6	119	0.40	1.45	460.12	86	77	38	244	98.6
1 - 2	3	5	118	0.38	1.35	461.99	88	78	38	248	96.2
1 - 3	3	6	118	0.43	1.55	463.96	92	78	38	247	94.9
1 - 4	3	7	119	0.48	1.70	466.05	96	79	38	246	95.0
1 - 5	3	8	119	0.51	1.85	468.23	100	80	40	249	95.7
1 - 6	3	8	120	0.50	1.80	470.40	102	81	40	248	96.1
1 - 7	3	7	118	0.47	1.70	472.55	104	82	40	251	97.7
1 - 8	3	7	119	0.45	1.60	474.62	106	84	40	251	95.8
1 - 9	3	6	118	0.38	1.35	476.52	106	86	40	250	95.4
1 - 10	3	6	118	0.36	1.30	478.41	106	88	40	250	97.3
1 - 11	3	5	118	0.29	1.05	480.12	106	88	40	250	98.1
1 - 12	3	5	118	0.28	1.00	481.76	106	88	40	250	95.7
2 - 1	3	5	119	0.33	1.20	483.66	100	94	38	250	102.3
2 - 2	3	6	118	0.35	1.25	485.50	104	94	38	252	95.7
2 - 3	3	6	119	0.37	1.35	487.42	107	94	38	249	97.0
2 - 4	3	6	117	0.37	1.35	489.40	108	94	38	249	99.8

2 - 5	3	6	119	0.39	1.40	491.41	110	94	38	249	98.7	
2 - 6	3	6	120	0.46	1.65	493.16	112	96	38	253	78.9	*
2 - 7	3	6	119	0.40	1.45	495.23	114	96	40	253	99.8	
2 - 8	3	5	119	0.33	1.20	497.31	112	96	40	250	110.6	*
2 - 9	3	5	119	0.30	1.10	498.88	112	96	40	251	87.5	*
2 - 10	3	5	121	0.29	1.05	500.63	111	96	40	250	99.4	
2 - 11	3	5	119	0.27	1.00	502.32	111	96	40	250	99.3	
2 - 12	3	5	121	0.27	1.00	504.05	111	96	40	250	101.9	

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72	119	.612	1.36	45.89	97
Total	Avg.	Root	Avg.	Volume	Avg.

RAW DATA SET # 5

1) Plant	NEW LONDON, WI.	17) Heater Box Setting	
2) Location	SMOKEHOUSE STACK	18) Probe Length',' Ft.	
3) Operator	J. BOJAN	19) Nozzle Diameter','In.	0.250
4) Date	1/21/93	20) Probe Heater Setting	
5) Run No.	2	21) % O2	20.9
6) Sample Box No.	A	22) % CO2	0.0
7) Meter Box No.	Z	23) Ml. H2O	45
8) Meter H@	1.7578	24) GM. Silica Gel	42
9) K Factor	3.60	25) Total	87
10) Pitot Factor	0.84	26) Start Time	11:35 AM
11) Leak Rate Before	0.005@15	27) Finish Time	12:43 PM
12) Leak Rate After	0.005@10	28) Yd.	1.0107
13) Static Pres., in H2O	0.50	29) Stack Area	3.01
14) Ambient Temperature	36	30) Sampling Time (MIN/PT)	3
15) Barometric Pressure	29.18	31) Initial Volume	506.60
16) Assumed Moisture, %		32) FILTER & BEAKER #'S	

Pt. #	0	Vac.	Ts	DPs	DH	Vm	Tm in	Tmout	Tc	Tb	%I
0 - 0						506.60					J. BOJAN
1 - 1	3	5	118	0.39	1.40	508.59	104	98	38	251	97.2
1 - 2	3	5	120	0.39	1.40	510.55	106	100	38	248	95.5
1 - 3	3	6	119	0.42	1.50	512.60	114	98	38	248	95.7
1 - 4	3	7	119	0.46	1.65	514.65	116	100	38	247	91.2
1 - 5	3	7	118	0.49	1.75	516.92	115	100	38	242	97.8
1 - 6	3	7	119	0.47	1.70	519.12	116	100	40	247	96.8
1 - 7	3	7	119	0.46	1.65	521.30	116	99	40	247	97.0
1 - 8	3	7	119	0.43	1.55	523.39	117	99	40	248	96.1
1 - 9	3	6	119	0.39	1.40	525.40	117	100	40	244	96.9
1 - 10	3	5	118	0.32	1.15	527.23	115	100	40	251	97.5
1 - 11	3	5	117	0.30	1.10	529.00	114	100	40	251	97.3
1 - 12	3	5	119	0.29	1.05	530.75	114	100	40	249	98.1
2 - 1	3	5	118	0.32	1.15	532.60	108	99	36	249	99.2
2 - 2	3	5	118	0.32	1.15	534.43	110	99	36	249	98.0
2 - 3	3	5	118	0.36	1.30	536.24	110	100	36	252	91.3
2 - 4	3	6	119	0.38	1.35	538.22	112	100	38	251	97.2

2 - 5	3	8	119	0.44	1.60	540.36	113	100	38	249	97.6
2 - 6	3	8	119	0.44	1.60	542.18	114	99	38	249	83.0 *
2 - 7	3	7	118	0.41	1.45	544.36	115	99	38	250	102.7
2 - 8	3	6	119	0.32	1.15	546.47	114	100	38	247	112.6 *
2 - 9	3	5	118	0.30	1.00	548.22	114	100	38	248	96.3
2 - 10	3	5	119	0.32	1.15	550.05	114	99	40	251	97.7
2 - 11	3	5	118	0.30	1.00	551.65	114	100	40	247	88.0 *
2 - 12	3	5	117	0.29	1.00	553.49	112	100	40	250	103.1

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72	119	.61	1.34	46.89	106
Total	Avg.	Root	Avg.	Volume	Avg.

RAW DATA SET # 6

1) Plant	NEW LONDON, WI.	17) Heater Box Setting		
2) Location	SMOKEHOUSE STACK	18) Probe Length',' Ft.		
3) Operator	J. BOJAN	19) Nozzle Diameter','In.		0.250
4) Date	1/21/93	20) Probe Heater Setting		
5) Run No.	3	21) % O2		20.9
6) Sample Box No.	A	22) % CO2		0.0
7) Meter Box No.	Z	23) Ml. H2O		55.0
8) Meter H@	1.7578	24) GM. Silica Gel		38.8
9) K Factor	3.60	25) Total		93.8
10) Pitot Factor	0.84	26) Start Time		2:00 PM
11) Leak Rate Before	0.005@15	27) Finish Time		3:19 PM
12) Leak Rate After	0.005@15	28) Yd.		1.0107
13) Static Pres., in H2O	0.50	29) Stack Area		3.01
14) Ambient Temperature	36	30) Sampling Time (MIN/PT)		3
15) Barometric Pressure	29.18	31) Initial Volume		559.00
16) Assumed Moisture, %		32) FILTER & BEAKER #'S		

Pt. #	0	Vac.	Ts	DPs	DH	Vm	Tm in	Tmout	Tc	Tb	%I
0 - 0						559.00					J. BOJAN
1 - 1	3	6	119	0.39	1.40	561.00	116	100	36	249	97.0
1 - 2	3	6	119	0.40	1.45	563.04	110	100	36	248	98.2
1 - 3	3	6	119	0.42	1.50	565.10	112	100	36	245	96.6
1 - 4	3	7	118	0.46	1.65	567.23	114	100	38	247	95.2
1 - 5	3	7	118	0.47	1.70	569.42	115	100	38	249	96.8
1 - 6	3	8	118	0.46	1.65	571.58	116	100	38	250	96.4
1 - 7	3	8	118	0.48	1.70	573.76	116	101	38	251	95.2
1 - 8	3	8	117	0.44	1.60	575.92	117	101	38	250	98.3
1 - 9	3	7	117	0.36	1.30	577.92	118	101	40	253	100.5
1 - 10	3	6	116	0.33	1.20	579.81	116	102	40	248	99.1
1 - 11	3	5	117	0.28	1.00	581.54	116	102	40	252	98.6
1 - 12	3	5	116	0.29	1.00	583.30	116	102	40	249	98.4
2 - 1	3	6	116	0.35	1.25	585.22	108	102	36	252	98.5
2 - 2	3	6	117	0.34	1.20	587.11	110	101	36	251	98.4
2 - 3	3	7	118	0.39	1.40	589.11	113	102	36	247	97.0
2 - 4	3	10	119	0.48	1.75	591.32	114	102	36	249	96.7
2 - 5	3	10	118	0.49	1.75	593.54	114	102	38	250	96.0

2 - 6	3	9	116	0.45	1.60	595.68	116	102	38	250	96.2
2 - 7	3	8	117	0.40	1.40	597.74	116	102	38	248	98.3
2 - 8	3	7	117	0.34	1.20	599.65	116	102	38	250	98.8
2 - 9	3	7	117	0.32	1.15	601.54	117	102	40	251	100.7
2 - 10	3	7	117	0.30	1.10	603.33	116	102	40	250	98.5
2 - 11	3	7	117	0.30	1.10	605.14	116	102	40	250	99.6
2 - 12	3	7	116	0.29	1.05	606.36	116	102	40	250	68.2 *

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72	117	.618	1.38	47.36	108
Total	Avg.	Root	Avg.	Volume	Avg.

LABORATORY DATA

AIR TOXICS LTD.

Stationary Source Test Method - Aldehydes

(CARB Method 430)

High Pressure Liquid Chromatography

Field Sample I.D.	Lab Sample I.D.	File Name	Sample Date	Analyzed For	Total Volume (mL)	Dilution Factor	MDL (uG)	Amount (uG)
Run 1 Inlet	9301113-01A	4012503	1/21/93	Formaldehyde	72	41	21	1200
Run 1 Inlet Duplicate	9301113-01AA	4012504	1/21/93	Formaldehyde	72	41	21	1100
Run 2 Inlet	9301113-01B	4012505	1/21/93	Formaldehyde	56	41	21	1300
Run 3 Inlet	9301113-01C	4012507	1/21/93	Formaldehyde	79	41	21	1000
Run 1 Stack	9301113-02A	4012603	1/21/93	Formaldehyde	127	51	26	530
Run 2 Stack	9301113-02B	4012509	1/21/93	Formaldehyde	83	41	21	590
Run 3 Stack	9301113-02C	4012510	1/21/93	Formaldehyde	110	41	21	740
Blank	9301113-03A	4012511	1/21/93	Formaldehyde	10.0	1.0	0.50	5.2
Methylene Chloride Blank	9301113-04A	4012512	1/21/93	Formaldehyde	10.0	1.0	0.50	Not Detected
H2O Blank	9301113-05A	4012515	1/21/93	Formaldehyde	10.0	1.0	0.50	Not Detected
Pretest Probe Wash #04-01	9301113-06A	4012516	1/21/93	Formaldehyde	10.0	1.0	0.50	1.4
Pretest Probe Wash #03-04	9301113-07A	4012517	1/21/93	Formaldehyde	10.0	1.0	0.50	1.8
Trip Blank	9301113-08A	4012518	NA	Formaldehyde	10.0	1.0	0.50	Not Detected
Lab Blank	9301113-10A	4012520	NA	Formaldehyde	10.0	1.0	0.50	Not Detected
Spiked Samples								% Recovery
Run 2 Inlet Matrix Spike	9301113-01B-MS	4012508	1/21/93	Formaldehyde	58	41	21	Not Recovered
Trip Spike	9301113-09A	4012519	NA	Formaldehyde	11.0	1.0	0.50	68 Q
Lab Spike	9301113-11A	4012521	NA	Formaldehyde	11.0	1.0	0.50	83

Extraction Date: 1/22/93

Analysis Date: 1/25/93

COMMENTS: NA=Not Applicable

Q = Exceeds Quality Control limits of +/- 30%.

STATISTICAL ANALYSIS