AP-42 Section Number: 9.5.2

Reference Number: 6

Title: Written correspondence from D. Sellers, Wisconsin Department of Natural Resources, to Wisconsin Department of Natural Resources Files

Sellers, D.

Wisconsin Department of Natural Resources

June 1994

CORRESPONDENCE/MEMORANDUM

AP-42 Section 9.5.2
Reference Report Sect. 6
Reference 4
Reference 4

State of Wisconsin

DATE: June 17, 1994

FILE CODE: 4530-5
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TO: Files

Received; 4/4/94

FROM: David Sellers - SD/Madison DS

SUBJECT: Stack Test Review - Oscar Mayer Smokehouses, 2/15/94 - 2/17/94
Smokehouses: [redacted]

6 ↑

1. Summary

Oscar Mayer followed up smoke house testing performed in December 1993 with additonal testing February 15-17, 1994. The December 1993 testing included particulate and volatile organic compound testing of [redacted] three continuous smokehouses and [redacted] batch smokehouse. The December 1993 results showed [redacted] in violation of the 0.4 lb/1000 lbs exhaust gas particulate limit in ch. NR 415, Wis. Adm. Code, and [redacted] subject to and in violation of the 85% organic compound control requirement in ch. NR 424, Wis. Adm. Code.

The February 1994 testing of [redacted] three continuous smokehouses confirmed that [redacted] particulate emissions exceeded the 0.4 lb/1000 lb exhaust gas limit, and so did [redacted] emissions. [redacted] VOC testing results showed that ch. NR 424 limits applied, 85% control of organic compounds.

2. Test Methods

Test Firm - Clean Air Engineering, Palatine, Illinois
Particulate Matter Method - Method 5 with Wisconsin Back Half
Volatile Organic Compound Method - Method 25A

Organic compound results were reported as propane. I converted the results to carbon. Clean Air Engineering's particulate sampling train used a long teflon tube to connect the heated particulate filter box to the impinger box. Due to the cold ambient temperatures there was noticeable particulate condensation in the teflon tubing. I asked Clean Air to rinse the line with acetone to insure collection of the condensible particulate in the tubing.

Process #3
The [redacted] Continuous Smokehouse was tested with the thermal oxidizer off. Results represent uncontrolled emissions for this process.

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3. Results

Process #1

[redacted] Continous Smokehouse Producing Beef Franks - 2/15/94

Run	1	2	3	Avg
Production Data				
sawdust (lbs/hr)	109	106	108	108
Emission Data				
particulate (lbs/hr)	8.13	8.51	8.90	8.51
particulate (lbs/1000 lbs gas)	0.61	0.63	0.62	0.62
organic compounds (lbs/hr)	2.48	1.01	0.77	1.42
organic compounds (ppmdv)	458	184	134	259
stack flow (acfm)	3612	3679	[redacted]	3725
stack temp (F)	150	151	152	151
stack moisture (%)	[redacted] 4.3	5.1	5.8	5.1
Emission Factors			[redacted]	
particulate (lb/ton wood)	149	161	165	158
organic compounds (lb/ton wood)	46	19	14	26

Process #2

[redacted] Continous Smokehouse Producing Pork Wieners - 2/16/94

Run	1	2	3	Avg
Production Data				
sawdust (lbs/hr)	96	100	104	100
Emission Data				
particulate (lbs/hr)	10.5	8.0	9.0	9.2
particulate (lbs/1000 lbs gas)	0.61	0.63	0.62	0.62
organic compounds (lbs/hr)	1.9	0.74	0.61	~~1.42~~ 1.08
organic compounds (ppmdv)	410	153	131	232
stack flow (acfm)	3238	3061	3227	3725
stack temp (F)	120	132	140	151
stack moisture (%)	7.6	7.8	6.6	7.3
Emission Factors				
particulate (lb/ton wood)	219	160	173	184
organic compounds (lb/ton wood)	40	15	12	22

Process #3 Continuous

[redacted] Smokehouse Producing Turkey Wieners - 2/17-18/94

The thermal oxidizer was turned off for the stack test. Results below represent uncontrolled emissions.

Run	1	2	3	Avg
Production Data				
sawdust (lbs/hr)	35	32	33	33
Emission Data				
particulate (lbs/hr)	2.0	2.7	3.7	2.8
particulate (lbs/1000 lbs gas)	0.13	0.21	0.31	0.34
organic compounds (lbs/hr)	0.99	0.56	0.28	0.61
organic compounds (ppmdv)	408	160	68	232
stack flow (acfm)	1514	2192	2477	2061
stack temp (F)	117	110	95	107
stack moisture (%)	3.4	4.0	3.9	7.3
Emission Factors				
particulate (lb/ton wood)	114	169	224	169
organic compounds (lb/ton wood)	57	35	17	36

Attach.
cc: Joe Perez - AM7
US EPA Region V

PROJECT OVERVIEW

Oscar Mayer Foods Corporation contracted Clean Air Engineering to perform emissions testing at their facility in Madison, Wisconsin to demonstrate compliance with Wisconsin Department of Natural Resources regulations.

The test parameters included the following pollutants:

- Total suspended particulate, including condensibles (TSP);
- Total hydrocarbons as propane (THC).

The testing took place at the stack locations for the following processes:

Process #3 Continuous [redacted] Smokehouse ;
Process #1 Continuous [redacted] Smokehouse [redacted]
Process #2 Continuous [redacted] Smokehouse [redacted]

A summary of test results is shown in Table 1-1 below.

Table 1-1
Summary of Test Results

Source Constituent	Sampling Method	Average Emission
Process #3 Continuous [redacted] Smokehouse		
Particulate (lb/hr)	EPA M5	2.80
Particulate (lb/ 1,000 lb of stack gas)	EPA M5	0.338
THC (lb/hr)	EPA M25A	0.746 as propane 0.61 as carbon
[redacted] Smokehouse Process #1		
Particulate (lb/hr)	EPA M5	8.51
Particulate (lb/ 1,000 lb of stack gas)	EPA M5	0.620
THC (lb/hr)	EPA M25A	1.73 as Propane 1.42 as carbon
[redacted] Smokehouse Process #2		
Particulate (lb/hr)	EPA M5	9.17
Particulate (lb/ 1,000 lb of stack gas)	EPA M5	0.755
THC (lb/hr)	EPA M25A	1.32 as propane 1.08 as carbon

The testing was performed on February 15 through 18, 1994. Coordinating the field testing were:

D. Love - Oscar Mayer Foods Corporation
J. Bojan - Clean Air Engineering

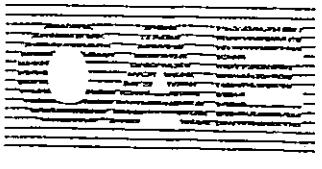
TEST RESULTS

Process #1

Table 2-2

Continuous [redacted] Smokehouse - Particulate and Total Hydrocarbons

Run No.		1	2	3	Average
Date (1994)		February 15	February 15	February 15	
Start Time (approx.)		08:00	10:07	12:15	
Stop Time (approx.)		09:07	11:12	13:30	
Operating Data					
	Sawdust used (lb/hr)	109.09	106.51	108.82	108.14
	Meat processed (lb/hr) - 100% Utilization				[redacted]
	Meat processed (lb/hr) - Typical Utilization				
Gas Conditions					
T_s	Temperature (°F)	150	151	152	151
B_{wo}	Moisture (volume %)	4.33	5.09	5.84	5.09
O_2	Oxygen (dry volume %)	20.2	20.2	20.1	20.2
CO_2	Carbon dioxide (dry volume %)	0.6	0.6	0.7	0.6
Volumetric Flow Rate					
Q_a	Actual conditions (acfm)	3,612	3,679	3,884	3,725
Q_{std}	Standard conditions (dscfm)	2,891	2,916	3,049	2,952
Particulate Results					
Front Half					
C	Concentration (gr/dscf)	0.176	0.200	0.187	0.187
E	Emission rate (lb/hr)	4.35	5.00	4.87	4.74
E	Emission rate (lb/1,000 lb stack gas)	0.325	0.369	0.342	0.345
Back Half Organic					
C	Concentration (gr/dscf)	0.0660	0.0687	0.0724	0.0690
E	Emission rate (lb/hr)	1.63	1.72	1.89	1.75
E	Emission rate (lb/1,000 lb stack gas)	0.122	0.127	0.133	0.127
Back Half Inorganic					
C	Concentration (gr/dscf)	0.0811	0.0696	0.0758	0.0755
E	Emission rate (lb/hr)	2.01	1.74	1.98	1.91
E	Emission rate (lb/1,000 lb stack gas)	0.150	0.128	0.139	0.139
Back Half Acetone					
C	Concentration (gr/dscf)	0.00536	0.00200	0.00573	0.00436
E	Emission rate (lb/hr)	0.133	0.0499	0.150	0.111
E	Emission rate (lb/1,000 lb stack gas)	0.00992	0.00366	0.0105	0.00804
Back Half Total					
C	Concentration (gr/dscf)	0.152	0.140	0.154	0.149
E	Emission rate (lb/hr)	3.78	3.51	4.02	3.77
E	Emission rate (lb/1,000 lb stack gas)	0.282	0.259	0.282	0.274
Total					
C	Concentration (gr/dscf)	0.328	0.340	0.340	0.336
E	Emission rate (lb/hr)	8.13	8.51	8.90	8.51
E	Emission rate (lb/1,000 lb stack gas)	0.607	0.627	0.624	0.620
Total Hydrocarbons Results					
C_{gas}	Concentration (ppmdv)	152.7	61.4	44.7	86.3
E	Emission rate (lb/hr)	3.03	1.23	0.936	1.73



OSCAR MAYER FOODS CORPORATION
CAE Project No: 6940
[redacted] Smokehouse #1

PARTICULATE PARAMETERS

Run No.		1	2	3
Date (1994)		February 15	February 15	February 15
Start Time (approx.)		08:00	10:07	12:15
Stop Time (approx.)		09:07	11:12	13:30
Sampling Conditions				
Y_d	Dry gas meter correction factor	1.0054	1.0054	1.0054
C_p	Pitot tube coefficient	0.84	0.84	0.84
	Static pressure (in. H_2O)	0.0	0.0	0.0
A_s	Sample location area (ft^2)	3.06	3.06	3.06
P_b	Barometric pressure (in. Hg)	28.91	28.91	28.91
D_n	Nozzle diameter (in.)	0.375	0.375	0.375
O_2	Oxygen (dry volume %)	20.2	20.2	20.1
CO_2	Carbon dioxide (dry volume %)	0.6	0.6	0.7
V_{lc}	Liquid collected (ml)	39.2	48.8	59.8
V_m	Volume metered, meter conditions (ft^3)	40.52	43.37	46.20
T_m	Dry gas meter temperature (°F)	52	61	65
T_s	Stack temperature (°F)	150	151	152
ΔH	Meter box orifice pressure drop (in. H_2O)	1.6	1.8	2.0
Θ	Total sampling time (min)	60	60	60
Flow Results				
V_{wstd}	Volume of water collected (ft^3)	1.85	2.30	2.81
V_{mstd}	Volume metered, standard (ft^3)	40.75	42.86	45.37
P_s	Sample gas pressure, absolute (in. Hg)	28.91	28.91	28.91
P_v	Vapor pressure, actual (in. Hg)	7.48	7.68	7.89
B_{wo}	Moisture in sample (% by volume)	4.33	5.09	5.84
B_{ws}	Saturated moisture (% by volume)	25.87	26.58	27.29
$\sqrt{\Delta P}$	Velocity head ($\sqrt{}$in. H_2O)	0.318	0.323	0.341
M_d	MW of sample gas, dry (lb/lb-mole)	28.90	28.90	28.92
M_s	MW of sample gas, wet (lb/lb-mole)	28.43	28.35	28.28
V_s	Velocity of sample (ft/sec)	19.7	20.0	21.2
%I	Isokinetic sampling (%)	93.7	97.7	99.0
Q_a	Volumetric flow rate, actual (acfm)	3,612	3,679	3,884
Q_{std}	Volumetric flow rate, standard (dscfm)	2,891	2,916	3,049
	Gas density (lb/ft^3)	0.0617	0.0614	0.0612
	Gas mass flow rate (1,000 lb/hr)	13.38	13.56	14.26

OSCAR MAYER FOODS CORPORATION
CAE Project No: 6940
[redacted] Smokehouse #1
February 15, 1994

RUN 1

Time	THC (ppmwv)
08:41	126.4
08:42	126.4
08:43	126.3
08:44	126.3
08:45	126.3
08:46	126.3
08:47	126.2
08:48	126.2
08:49	126.2
08:50	126.2
08:51	126.2
08:52	126.2
08:53	126.2
08:54	126.2
08:55	126.2
08:56	126.2
08:57	126.2

Data Acquisition

C	Effluent gas concentration	146.7

Calibration Gases

C_{oi}	Calibration bias check, initial zero gas	-0.3
C_{mi}	Calibration bias check, initial upscale gas	546.6
C_{of}	Calibration bias check, final zero gas	2.6
C_{mf}	Calibration bias check, final upscale gas	546.0
C_{ma}	Actual concentration of upscale gas	547.5

Sampling Conditions[1]

B_{wo}	Moisture in sample (% by volume)	4.33
Q_{std}	Volumetric flow rate, standard (dscfm)	2,891

Calculated Results

C_{gas}	Concentration drift corrected	146.1
C_{gas}	Concentration moisture corrected	152.7
E	Emission rate (lb/hr)	3.03

[1] Sampling conditions taken from Particulate Run 1.

OSCAR MAYER FOODS CORPORATION
CAE Project No: 6940
[redacted] Smokehouse #1
February 15, 1994

RUN 2

Time	THC (ppmwv)
10:46	76.5
10:47	76.4
10:48	76.4
10:49	76.4
10:50	76.4
10:51	76.4
10:52	76.4
10:53	76.4
10:54	76.4
10:55	76.3
10:56	76.3
10:57	76.3
10:58	76.2
10:59	76.2
11:00	76.2
11:01	76.2
11:02	76.2

Data Acquisition		
C	Effluent gas concentration	71.3
Calibration Gases		
C_{oi}	Calibration bias check, initial zero gas	2.6
C_{mi}	Calibration bias check, initial upscale gas	546.0
C_{of}	Calibration bias check, final zero gas	26.9
C_{mf}	Calibration bias check, final upscale gas	546.8
C_{ma}	Actual concentration of upscale gas	547.5
Sampling Conditions[1]		
B_{wo}	Moisture in sample (% by volume)	5.09
Q_{std}	Volumetric flow rate, standard (dscfm)	2,916
Calculated Results		
C_{gas}	Concentration drift corrected	58.3
C_{gas}	Concentration moisture corrected	61.4
E	Emission rate (lb/hr)	1.23

[1] Sampling conditions taken from Particulate Run 2.

OSCAR MAYER FOODS CORPORATION
CAE Project No: 6940
[redacted] Smokehouse #1 (continuous)
February 15, 1994

RUN 3

Time	THC (ppmwv)
12:57	37.9
12:58	37.7
12:59	63.9
13:00	68.8
13:01	70.2
13:02	73.0
13:03	74.4
13:04	75.7
13:05	76.5
13:06	79.1
13:07	81.4
13:08	78.9
13:09	83.0
13:10	77.8
13:11	78.6
13:12	79.8
13:13	80.0

Data Acquisition		
C	Effluent gas concentration	50.9
Calibration Gases		
C_{oi}	Calibration bias check, initial zero gas	26.9
C_{mi}	Calibration bias check, initial upscale gas	546.8
C_{of}	Calibration bias check, final zero gas	-6.7
C_{mf}	Calibration bias check, final upscale gas	534.0
C_{ma}	Actual concentration of upscale gas	547.5
Sampling Conditions[1]		
B_{wo}	Moisture in sample (% by volume)	5.84
Q_{sld}	Volumetric flow rate, standard (dscfm)	3,049
Calculated Results		
C_{gas}	Concentration drift corrected	42.1
C_{gas}	Concentration moisture corrected	44.7
E	Emission rate (lb/hr)	0.936

[1] Sampling conditions taken from Particulate Run 3.

TEST RESULTS

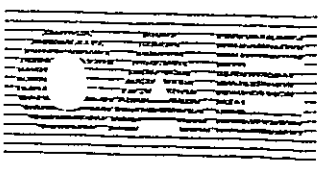
Process #2

Table 2-3

Continuous [redacted] Smokehouse - Particulate and Total Hydrocarbons

Run No.[1]		1	3	4	Average
Date (1994)		February 16	February 16	February 16	
Start Time (approx.)		08:10	12:10	14:15	
Stop Time (approx.)		09:30	13:15	15:25	
Operating Data					
	Sawdust used (lb/hr)	96.00	100.00	104.00	100.00
	Meat processed (lb/hr) - 100% Utilization				[redacted]
	Meat processed (lb/hr) - Typical Utilization				
Gas Conditions					
T_s	Temperature (°F)	120	132	140	130
B_{wo}	Moisture (volume %)	7.57	7.78	6.55	7.30
O_2	Oxygen (dry volume %)	20.3	20.4	20.4	20.4
CO_2	Carbon dioxide (dry volume %)	0.5	0.4	0.4	0.4
Volumetric Flow Rate					
Q_a	Actual conditions (acfm)	3,238	3,061	3,227	3,175
Q_{std}	Standard conditions (dscfm)	2,660	2,457	2,590	2,569
Particulate Results					
Front Half					
C	Concentration (gr/dscf)	0.214	0.206	0.196	0.205
E	Emission rate (lb/hr)	4.89	4.33	4.35	4.52
E	Emission rate (lb/1,000 lb stack gas)	0.389	0.372	0.358	0.373
Back Half Organic					
C	Concentration (gr/dscf)	0.0957	0.0792	0.0956	0.0902
E	Emission Rate (lb/hr)	2.18	1.67	2.12	1.99
E	Emission rate (lb/1,000 lb stack gas)	0.173	0.143	0.175	0.164
Back Half Inorganic					
C	Concentration (gr/dscf)	0.0794	0.0668	0.0751	0.0738
E	Emission Rate (lb/hr)	1.81	1.41	1.67	1.63
E	Emission rate (lb/1,000 lb stack gas)	0.144	0.121	0.137	0.134
Back Half Acetone					
C	Concentration (gr/dscf)	0.0724	0.0277	0.0385	0.0462
E	Emission Rate (lb/hr)	1.65	0.584	0.854	1.03
E	Emission rate (lb/1,000 lb stack gas)	0.131	0.0502	0.0702	0.0839
Back Half Total					
C	Concentration (gr/dscf)	0.247	0.174	0.209	0.210
E	Emission Rate (lb/hr)	5.64	3.66	4.64	4.65
E	Emission rate (lb/1,000 lb stack gas)	0.449	0.315	0.382	0.382
Total					
C	Concentration (gr/dscf)	0.462	0.379	0.405	0.415
E	Emission Rate (lb/hr)	10.5	7.99	9.00	9.17
E	Emission rate (lb/1,000 lb stack gas)	0.837	0.687	0.740	0.755
Total Hydrocarbons Results					
C_{gas}	Concentration (ppmdv)	136.8	51.1	43.8	77.2
E	Emission rate (lb/hr)	2.31	0.908	0.749	1.32

[1] Run 2 was aborted due to process difficulties.



OSCAR MAYER FOODS CORPORATION
CAE Project No: 6940
[redacted] Smokehouse #2

PARTICULATE PARAMETERS

Run No.		1	3[1]	4
Date (1994)		February 16	February 16	February 16
Start Time (approx.)		08:10	12:10	14:15
Stop Time (approx.)		09:30	13:15	15:25
Sampling Conditions				
Y_d	Dry gas meter correction factor	1.0054	1.0054	1.0054
C_p	Pitot tube coefficient	0.84	0.84	0.84
	Static pressure (in. H_2O)	0.0	-0.1	0.0
A_s	Sample location area (ft^2)	3.06	3.06	3.06
P_b	Barometric pressure (in. Hg)	29.20	29.20	29.20
D_n	Nozzle diameter (in.)	0.375	0.375	0.375
O_2	Oxygen (dry volume %)	20.3	20.4	20.4
CO_2	Carbon dioxide (dry volume %)	0.5	0.4	0.4
V_{lc}	Liquid collected (ml)	69.3	66.5	57.0
V_m	Volume metered, meter conditions (ft^3)	39.01	37.62	38.52
T_m	Dry gas meter temperature (°F)	49	67	63
T_s	Stack temperature (°F)	120	132	140
ΔH	Meter box orifice pressure drop (in. H_2O)	1.5	1.3	1.4
Θ	Total sampling time (min)	60	60	60
Flow Results				
V_{wstd}	Volume of water collected (ft^3)	3.26	3.13	2.68
V_{mstd}	Volume metered, standard (ft^3)	39.85	37.11	38.25
P_s	Sample gas pressure, absolute (in. Hg)	29.20	29.19	29.20
P_v	Vapor pressure, actual (in. Hg)	3.40	4.73	5.85
B_{wo}	Moisture in sample (% by volume)	7.57	7.78	6.55
B_{ws}	Saturated moisture (% by volume)	11.63	16.21	20.02
$\sqrt{\Delta P}$	Velocity head ($\sqrt{}$in. H_2O)	0.292	0.273	0.287
M_d	MW of sample gas, dry (lb/lb-mole)	28.89	28.88	28.88
M_s	MW of sample gas, wet (lb/lb-mole)	28.07	28.03	28.17
V_s	Velocity of sample (ft/sec)	17.6	16.7	17.6
%I	Isokinetic sampling (%)	99.6	100.5	98.2
Q_a	Volumetric flow rate, actual (acfm)	3,238	3,061	3,227
Q_{std}	Volumetric flow rate, standard (dscfm)	2,660	2,457	2,590
	Gas density (lb/ft^3)	0.0647	0.0633	0.0628
	Gas mass flow rate (1,000 lb/hr)	12.58	11.63	12.16

[1] Run 2 was aborted due to process difficulties.

OSCAR MAYER FOODS CORPORATION
CAE Project No: 6940
[redacted] Smokehouse #2
February 16, 1994

RUN 1

Time	THC (ppmwv)
12:53	149.2
12:54	96.3
12:55	97.8
12:56	92.9
12:57	95.4
12:58	99.1
12:59	101.8
13:00	102.9
13:01	104.7
13:02	101.8
13:03	99.6
13:04	96.6
13:05	95.5
13:06	95.5
13:07	92.2
13:08	89.7
13:09	88.1

Data Acquisition

C	Effluent gas concentration	129.4

Calibration Gases

C_{oi}	Calibration bias check, initial zero gas	8.9
C_{mi}	Calibration bias check, initial upscale gas	242.3
C_{of}	Calibration bias check, final zero gas	27.3
C_{mf}	Calibration bias check, final upscale gas	233.3
C_{ma}	Actual concentration of upscale gas	248.9

Sampling Conditions[1]

B_{wo}	Moisture in sample (% by volume)	7.78
Q_{std}	Volumetric flow rate, standard (dscfm)	2,457

Calculated Results

C_{gas}	Concentration drift corrected	126.1
C_{gas}	Concentration moisture corrected	136.8
E	Emission rate (lb/hr)	2.31

[1] Sampling conditions taken from Particulate Run 3.

OSCAR MAYER FOODS CORPORATION
CAE Project No: 6940
[redacted] Smokehouse #2
February 16, 1994

RUN 2

Time	THC (ppmwv)
15:09:40	65.3
15:09:55	65.8
15:10:10	67.3
15:10:25	67.5
15:10:40	67.2
15:10:55	66.9
15:11:10	67.4
15:11:25	65.5
15:11:40	65.6
15:11:55	66.8
15:12:10	66.5
15:12:25	67.9
15:12:40	66.9
15:12:55	67.1
15:13:10	66.8
15:13:25	66.1
15:13:40	67.7
15:13:55	67.5
15:14:10	66.3
15:14:25	67.2

Data Acquisition		
C	Effluent gas concentration	70.8
Calibration Gases		
C_{oi}	Calibration bias check, initial zero gas	27.3
C_{mi}	Calibration bias check, initial upscale gas	233.3
C_{of}	Calibration bias check, final zero gas	31.5
C_{mf}	Calibration bias check, final upscale gas	257.8
C_{ma}	Actual concentration of upscale gas	248.9
Sampling Conditions[1]		
B_{wo}	Moisture in sample (% by volume)	6.55
Q_{sld}	Volumetric flow rate, standard (dscfm)	2,590
Calculated Results		
C_{gas}	Concentration drift corrected	47.7
C_{gas}	Concentration moisture corrected	51.1
E	Emission rate (lb/hr)	0.908

[1] Sampling conditions taken from Particulate Run 4.

OSCAR MAYER FOODS CORPORATION
CAE Project No: 6940
[redacted] Smokehouse Process #2 (continuous)
February 16, 1994

RUN 3

	Time	THC (ppmwv)
	16:10	66.4
	16:11	66.8
	16:12	66.6
	16:13	66.5
	16:14	67.9
	16:15	68.9
	16:16	69.5
	16:17	68.6
	16:18	69.2
	16:19	68.7
	16:20	69.1
	16:21	67.9
	16:22	67.7
	16:23	66.9
	16:24	66.8
	16:25	66.9
	16:26	66.6

Data Acquisition

C	Effluent gas concentration	66.7

Calibration Gases

C_{oi}	Calibration bias check, initial zero gas	31.5
C_{mi}	Calibration bias check, initial upscale gas	257.8
C_{of}	Calibration bias check, final zero gas	29.8
C_{mf}	Calibration bias check, final upscale gas	245.3
C_{ma}	Actual concentration of upscale gas	248.9

Sampling Conditions[1]

B_{wo}	Moisture in sample (% by volume)	7.20
Q_{sd}	Volumetric flow rate, standard (dscfm)	2,492

Calculated Results

C_{gas}	Concentration drift corrected	40.6
C_{gas}	Concentration moisture corrected	43.8
E	Emission rate (lb/hr)	0.749

[1] Sampling conditions taken from Velocity and Moisture Run 1.

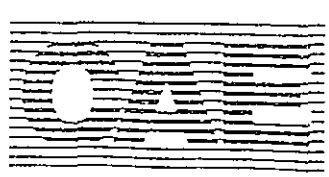
TEST RESULTS

Process #3

Table 2-1
Continuous [redacted] Smokehouse - Particulate and Total Hydrocarbons

Run No.[1]		1	4	5	Average
Date (1994)		February 17	February 18	February 18	
Start Time (approx.)		10:00	13:00	15:15	
Stop Time (approx.)		11:23	14:15	16:44	
Operating Data					
	Sawdust used (lb/hr)	34.78	32.00	33.33	33.37
	Meat processed (lb/hr) - 100% Utilization				[redacted]
	Meat processed (lb/hr) - Typical Utilization				
Gas Conditions					
T_s	Temperature (°F)	117	110	95	107
B_{wo}	Moisture (volume %)	3.39	3.97	3.89	3.75
O_2	Oxygen (dry volume %)	20.4	20.4	20.4	20.4
CO_2	Carbon dioxide (dry volume %)	0.4	0.4	0.4	0.4
Volumetric Flow Rate					
Q_a	Actual conditions (acfm)	1,514	2,192	2,477	2,061
Q_{std}	Standard conditions (dscfm)	1,293	1,885	2,190	1,789
Particulate Results					
Front Half					
C	Concentration (gr/dscf)	0.109	0.0578	0.0299	0.0656
E	Emission rate (lb/hr)	1.21	0.933	0.561	0.901
E	Emission rate (lb/1,000 lb stack gas)	0.204	0.107	0.0555	0.122
Back Half Organic					
C	Concentration (gr/dscf)	0.0288	0.0422	0.0509	0.0406
E	Emission rate (lb/hr)	0.319	0.682	0.955	0.652
E	Emission rate (lb/1,000 lb stack gas)	0.0537	0.0785	0.0946	0.0756
Back Half Inorganic					
C	Concentration (gr/dscf)	0.0163	0.0431	0.0683	0.0426
E	Emission rate (lb/hr)	0.180	0.696	1.28	0.720
E	Emission rate (lb/1,000 lb stack gas)	0.0303	0.0801	0.127	0.0791
Back Half Acetone					
C	Concentration (gr/dscf)	0.0253	0.0250	0.0480	0.0328
E	Emission rate (lb/hr)	0.280	0.403	0.902	0.528
E	Emission rate (lb/1,000 lb stack gas)	0.0472	0.0464	0.0893	0.061
Back Half Total					
C	Concentration (gr/dscf)	0.0703	0.110	0.167	0.116
E	Emission rate (lb/hr)	0.779	1.78	3.14	1.90
E	Emission rate (lb/1,000 lb stack gas)	0.131	0.205	0.311	0.216
Total					
C	Concentration (gr/dscf)	0.179	0.168	0.197	0.182
E	Emission rate (lb/hr)	1.99	2.72	3.70	2.80
E	Emission rate (lb/1,000 lb stack gas)	0.335	0.312	0.366	0.338
Total Hydrocarbons Results					
C_{gas}	Concentration (ppmdv)	136.1	53.3	22.7	70.7
E	Emission rate (lb/hr)	1.21	0.689	0.341	0.746

[1] Runs 2 and 3 were aborted due to process difficulties.



OSCAR MAYER FOODS CORPORATION
CAE Project No: 6940
Continuous [redacted] Smokehouse Process #3

PARTICULATE PARAMETERS

Run No.[1]		1	4	5
Date (1994)		February 17	February 18	February 18
Start Time (approx.)		10:00	13:00	15:15
Stop Time (approx.)		11:23	14:15	16:44
Sampling Conditions				
Y_d	Dry gas meter correction factor	1.0054	1.0054	1.0054
C_p	Pitot tube coefficient	0.84	0.84	0.84
	Static pressure (in. H_2O)	0.0	0.0	0.0
A_s	Sample location area (ft^2)	3.69	3.69	3.69
P_b	Barometric pressure (in. Hg)	28.94	28.94	28.94
D_n	Nozzle diameter (in.)	0.500	0.500	0.500
O_2	Oxygen (dry volume %)	20.4	20.4	20.4
CO_2	Carbon dioxide (dry volume %)	0.4	0.4	0.4
V_{lc}	Liquid collected (ml)	24.1	42.6	47.7
V_m	Volume metered, meter conditions (ft^3)	33.20	49.93	57.21
T_m	Dry gas meter temperature (°F)	68	70	73
T_s	Stack temperature (°F)	117	110	95
ΔH	Meter box orifice pressure drop (in. H_2O)	0.73	1.7	2.3
Θ	Total sampling time (min)	72	72	72
Flow Results				
V_{wstd}	Volume of water collected (ft^3)	1.13	2.01	2.25
V_{mstd}	Volume metered, standard (ft^3)	32.31	48.55	55.42
P_s	Sample gas pressure, absolute (in. Hg)	28.94	28.94	28.94
P_v	Vapor pressure, actual (in. Hg)	3.21	2.60	1.64
B_{wo}	Moisture in sample (% by volume)	3.39	3.97	3.89
B_{ws}	Saturated moisture (% by volume)	11.08	9.00	5.68
$\sqrt{\Delta P}$	Velocity head ($\sqrt{in.}$ H_2O)	0.114	0.166	0.190
M_d	MW of sample gas, dry (lb/lb-mole)	28.88	28.88	28.88
M_s	MW of sample gas, wet (lb/lb-mole)	28.51	28.45	28.46
V_s	Velocity of sample (ft/sec)	6.8	9.9	11.2
%I	Isokinetic sampling (%)	93.9	96.8	95.1
Q_a	Volumetric flow rate, actual (acfm)	1,514	2,192	2,477
Q_{std}	Volumetric flow rate, standard (dscfm)	1,293	1,885	2,190
	Gas density (lb/ft^3)	0.0654	0.0661	0.0680
	Gas mass flow rate (1,000 lb/hr)	5.94	8.69	10.10

[1] Runs 2 and 3 were aborted due to process difficulties.

OSCAR MAYER FOODS CORPORATION
CAE Project No: 6940
Continuous [redacted] Smokehouse Process #3
February 17, 1994

RUN 1

Time	THC (ppmwv)
11:50	150.3
11:51	146.3
11:52	150.4
11:53	154.1
11:54	157.9
11:55	156.7
11:56	159.5
11:57	160.1
11:58	149.7
11:59	116.2
12:00	114.6
12:01	108.9
12:02	97.6
12:03	84.8
12:04	74.9
12:05	68.1
12:06	62.1

Data Acquisition

C	Effluent gas concentration	140.8

Calibration Gases

C_{oi}	Calibration bias check, initial zero gas	4.6
C_{mi}	Calibration bias check, initial upscale gas	267.6
C_{of}	Calibration bias check, final zero gas	17.8
C_{mf}	Calibration bias check, final upscale gas	245.5
C_{ma}	Actual concentration of upscale gas	248.9

Sampling Conditions[1]

B_{wo}	Moisture in sample (% by volume)	3.39
Q_{std}	Volumetric flow rate, standard (dscfm)	1,293

Calculated Results

C_{gas}	Concentration drift corrected	131.4
C_{gas}	Concentration moisture corrected	136.1
E	Emission rate (lb/hr)	1.21

[1] Sampling conditions taken from Particulate Run 1.

OSCAR MAYER FOODS CORPORATION
CAE Project No: 6940
Continuous [redacted] Smokehouse Process #3
February 18, 1994

RUN 4

Time	THC (ppmwv)
13:43	41.0
13:44	37.5
13:45	35.3
13:46	32.6
13:47	29.4
13:48	26.4
13:49	26.4
13:50	26.6
13:51	26.4
13:52	24.6
13:53	22.2
13:54	21.2
13:55	19.3
13:56	17.4
13:57	17.7
13:58	16.8
13:59	16.0

Data Acquisition

C	Effluent gas concentration	62.2

Calibration Gases

C_{oi}	Calibration bias check, initial zero gas	19.4
C_{mi}	Calibration bias check, initial upscale gas	247.7
C_{of}	Calibration bias check, final zero gas	10.0
C_{mf}	Calibration bias check, final upscale gas	244.5
C_{ma}	Actual concentration of upscale gas	248.9

Sampling Conditions[1]

B_{wo}	Moisture in sample (% by volume)	3.97
Q_{std}	Volumetric flow rate, standard (dscfm)	1,885

Calculated Results

C_{gas}	Concentration drift corrected	51.1
C_{gas}	Concentration moisture corrected	53.3
E	Emission rate (lb/hr)	0.689

[1] Sampling conditions taken from Particulate Run 4.

OSCAR MAYER FOODS CORPORATION
CAE Project No: 6940
Continuous [redacted] Smokehouse Process #3
February 18, 1994

RUN 5

Time	THC (ppmwv)
15:58	23.9
15:59	22.5
16:00	21.8
16:01	21.3
16:02	21.4
16:03	20.5
16:04	20.4
16:05	20.3
16:06	20.1
16:07	19.9
16:08	18.6
16:09	12.7
16:10	17.7
16:11	18.1
16:12	18.0
16:13	17.2
16:14	17.1

Data Acquisition

C	Effluent gas concentration	29.5

Calibration Gases

C_{oi}	Calibration bias check, initial zero gas	10.0
C_{mi}	Calibration bias check, initial upscale gas	244.5
C_{of}	Calibration bias check, final zero gas	8.0
C_{mf}	Calibration bias check, final upscale gas	242.9
C_{ma}	Actual concentration of upscale gas	248.9

Sampling Conditions[1]

B_{wo}	Moisture in sample (% by volume)	3.89
Q_{std}	Volumetric flow rate, standard (dscfm)	2,190

Calculated Results

C_{gas}	Concentration drift corrected	21.8
C_{gas}	Concentration moisture corrected	22.7
E	Emission rate (lb/hr)	0.341

[1] Sampling conditions taken from Particulate Run 5.

DESCRIPTION OF INSTALLATION

Oscar Mayer Corporation's headquarters and one of its main production facilities is located in Madison, Wisconsin. The plant produces a variety of products including hotdogs, lunchmeats, sausage, bacon and lunchables. Smokehouses of various types are used in the production process.

[redacted]

The [redacted] smokehouses are all continuous processes where the wieners are conveyed through the smokehouse on a mechanized line. Smoke is first generated by burning sawdust or woodchips and then conveyed via ducting into the smokehouse.

A summary of the operating data for both processes is contained in Appendix I.

A schematic of the [redacted] smokehouse process is shown in Figure 3-1.

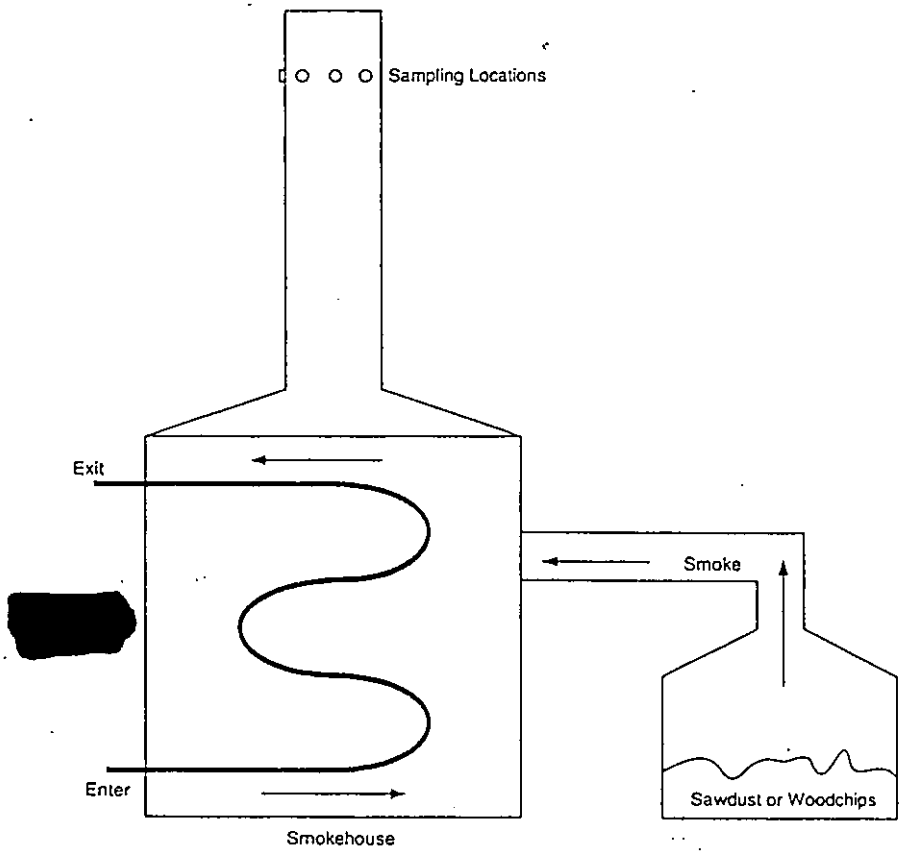


Figure 3-1: [redacted] #1 Process Schematic

DESCRIPTION OF INSTALLATION

A schematic of the [redacted] smokehouse process is shown in Figure 3-2.

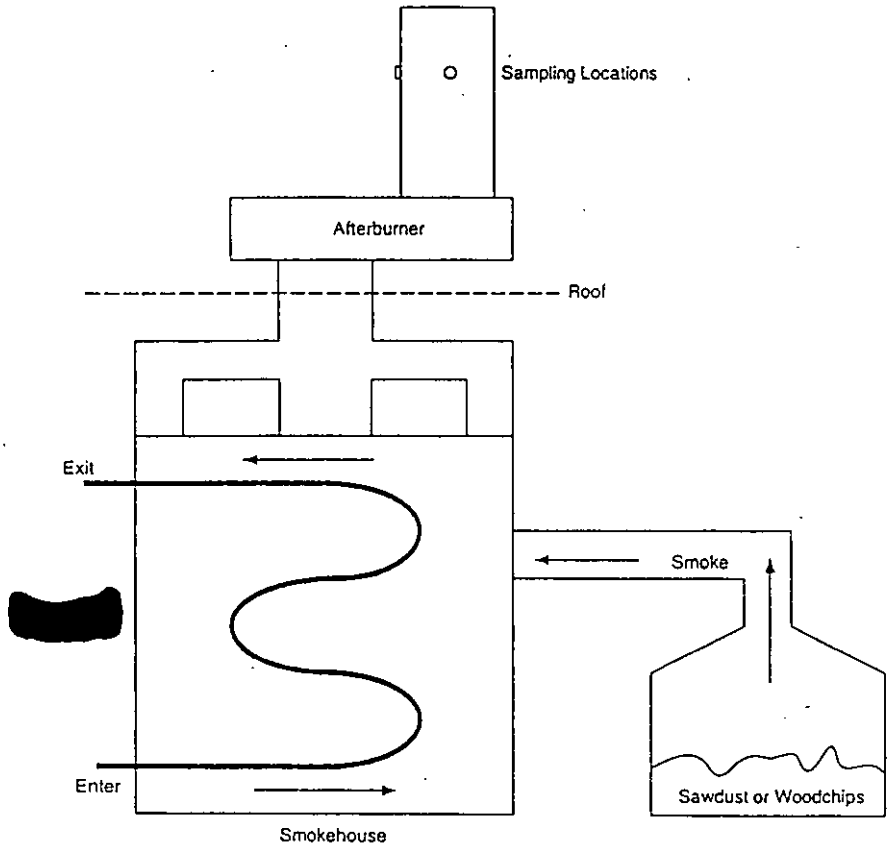


Figure 3-2: [redacted] #3 Process Schematic

OSCAR MAYER FOODS CORPORATION

March 21, 1994

Mr. Bill Ansell
Clean Air Engineering
500 W. Wood St.
Palatine, IL 60067

Dear Bill,

The following is a listing of sawdust usage during the stack tests conducted at Oscar Mayer between February 15th and 19th of this year.

Process	Test	Sawdust Usage Rate
[redacted] #1	1	109.09 lbs/hr
	2	106.51 lbs/hr
	3	108.82 lbs/hr
[redacted] #2	1	96.00 lbs/hr
	2	Test aborted
	3	100.00 lbs/hr
	4	104.00 lbs/hr
#3 [redacted]	1	34.78 lbs/hr
	2	Test aborted
	3	Test aborted
	4	32.00 lbs/hr
	5	33.33 lbs/hr

[redacted]

If you have any questions regarding this data, please give me a call at (608) 241-3311, Ext 3460.

Sincerely,

David M. Love

David M. Love,
Engineering Supervisor

stack2/dml