Note: This is a reference cited in *AP 42, Compilation of Air Pollutant Emission Factors, Volume I Stationary Point and Area Sources.* AP42 is located on the EPA web site at www.epa.gov/ttn/chief/ap42/

The file name refers to the reference number, the AP42 chapter and section. The file name "ref02_c01s02.pdf" would mean the reference is from AP42 chapter 1 section 2. The reference may be from a previous version of the section and no longer cited. The primary source should always be checked.

AP-42 Section Number: 9.9.4

Reference Number: 8

Title: Source Emissions Report For Gothenburg Feed Products Co., Gothenburg, NE

AirSource Technologies

AirSource Technologies

October 1993

PLANT #1

SOURCE EMISSIONS REPORT
for
GOTHENBURG FEED PRODUCTS CO.
Gothenburg, Nebraska

prepared by
AirSource Technologies

11635 W. 83rd Terrace
Lenexa, Kansas 66214

AirSource Project No. 411922

PREFACE

This report was prepared by AirSource Technologies in response to a test that was conducted at the Gothenburg Feed Products Co. in Gothenburg, Nebraska on August 31, 1993. Any questions concerning this report should be directed to Mr. Blane Wood, Project Manager, or to Mr. George Cobb, General Manager.

AirSource Technologies

Blane Wood

Blane Wood
Project Manager

Approved

George R. Cobb
General Manager

Date: October 8, 1993

SECTION 1

INTRODUCTION

A stack test was conducted by AirSource Technologies on the Gothenburg Feed Products Co. alfalfa dehydrating plant in Gothenburg, Nebraska on August 31, 1993.

The AirSource Technologies personnel who conducted the test were: Mr. Blane Wood, Project Manager and Mr. Tim Titus, Environmental Scientist.

The results of the test were used to evaluate the process' performance with regards to the particulate emission rate.

The appendices contain the following:

Appendix A:	Example Calculations
Appendix B:	Computer Forms
Appendix C:	Particulate Field Data Forms
Appendix D:	Laboratory and Analysis Forms
Appendix E:	Pretest Calibrations
Appendix F:	Posttest Calibrations
Appendix G:	Process Data

SECTION 2

SUMMARY OF RESULTS

The results of the particulate emissions are: 15.62 lb.hr, 28.46 lb/hr, and 13.2 lb/hr for Runs 1, 2 and 3 respectively.

Run 1 did not meet the ± 10% of 100% isokinetic criteria. For the purposes of this study, the data should still give an indication of particulate loading. The results are biased low.

The sampling and particulate results are shown in Table 1.

Table 1
SUMMARY OF SAMPLING AND PARTICULATE RESULTS
Gothenburg Feed Products Co.
Gothenburg, Nebraska

Parameters	Unit of Measure	Run 1	Run 2	Run 3
Particulate Emissions				
Front Half	gr/dscf	0.0746	0.1440	0.0624
Uncorrected	gr/dscf	0.3480	0.6719	0.2494
Corrected to 7% O_2	gr/dscf	0.5965	1.1518	0.4989
Emission Rate	lb/hr	15.62	28.46	13.28
Weight	grams	0.1883	0.3865	0.1828
Isokinetics	%	81.9	92.3	93.5
Stack Flow Rate				
Actual	acfm	38,559	39,350	38,248
Standard Conditions	dscfm	24,452	23,066	24,845
Velocity	ft/min.	4,008	4,090	3,975
Sampling Results				
Sampling Volume	dscf	38.891	41.343	45.142
Avg. Stack Temperature	°F	162	183	154
Avg. ΔP	inches H_2O	1.041	1.032	1.039
Avg. ΔH	inches H_2O	1.48	1.69	2.03
Avg. Meter Temperature	°F	63	75	80
Oxygen, Orsat	%	18.0	18.0	17.5
Carbon Dioxide, Orsat	%	1.5	1.5	1.5
Static Pressure	inches H_2O	0.65	0.65	0.65
Moisture Collected	ml	203.5	265.7	221.6
Moisture	% H_2O	19.8	23.2	18.8
Sampling Time	min.	60	60	60

SECTION 3

PROCESS OPERATION

The alfalfa dehydration plant is a 12 foot MEC three pass dryer. The control equipment used is a single compartment baghouse and a 12 foot diameter cyclone. The condition for each of the test runs were the same.

Table 2 summarizes the results of the process operations and Table 3 presents the process data collected during the testing.

Table 2 SUMMARY OF RESULTS Process Operation	
Historical Average Process Weight (pellets)	12,000 lb/hr
Historical Maximum Process Weight (pellets)	16,000 lb/hr
Type of Fuel Normally Burned	Natural Gas
Approximate Quantity of Fuel Burned Annually	59,500 MCF
Actual Production (pellets)	4.36 TPH
Rated Water Production	25,000 lb/hr
Actual Water Production	9,962 lb/hr
Baghouse - 1 compartment positive pressure	
Type of Cleaning	Reverse Air
Clean Cycle	2 minute
Average baghouse ΔP	3.3 in. H_2O
Fan	
Rated H.P.	25 H.P.
Operating Volts	460 Volts
Operating Amps	18 amps

Table 3 PROCESS DATA			
	Hay Moisture %	**Scale Reading**	**Pellet Moisture %**
08:45	57	255506	8.58
09:00	58	255535	6.42
09:15	60.5	255557	6.26
09:30	61.5	255577	6.04
09:45	60	255600	6.37
10:00	61.5	256627	5.88
10:15	59.5	255648	5.70
10:30	62	255668	6.37
10:45	58	255695	6.16
11:00	59	255718	<5.00
11:15	56	255745	<5.00
11:30		255768	<5.00
11:45		255791	5.68
14:15	38.5	256055	6.77
14:30	37.5	256090	5.53
14:45	37.9	256115	6.72
15:00	31.0	256143	6.90
15:15	35.6	256176	7.70

SECTION 4

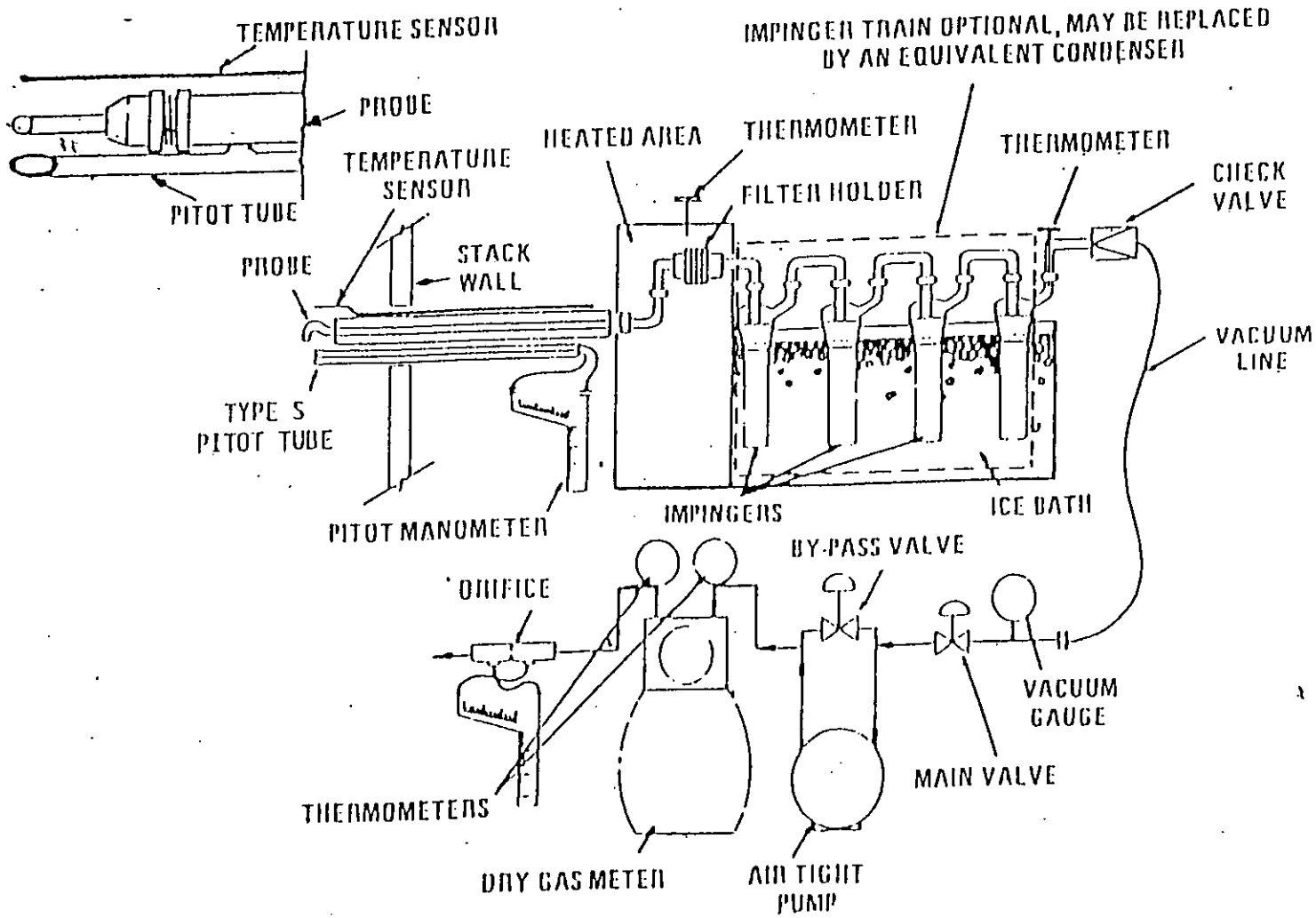
SAMPLING AND ANALYTICAL PROCEDURES

Particulates

EPA Methods 1-4 were used for the determination of traverse point locations, velocities and flows of stack gas, oxygen, carbon dioxide, and moisture. The particulate sampling and recovery of the samples were done according to EPA Method 5 recovery procedures.

Figure 1 shows a schematic of the sampling train.

Figure 2 shows a schematic of the stack and traverse locations.



Schematic of Method 5 sampling train.

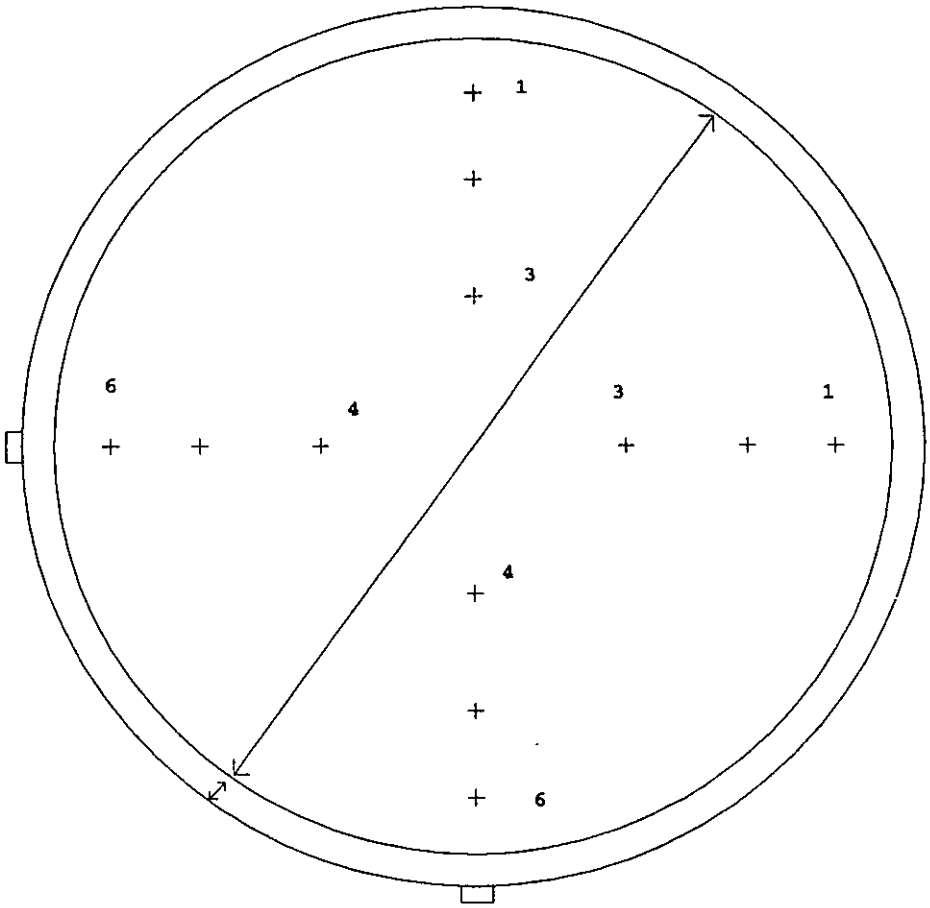
Figure 1

Stack dimensions - Gothenburg Feed Products Co.

Inside diameter 42"
Port length 3"

Sampling Port Location

8 Diameters upstream from disturbance
2 Diameters downstream from disturbance



Traverse Point Locations
(Excluding Port Length)

1.	1.8"	4.	29.5"
2.	6.1"	5.	35.9"
3.	12.4"	6.	40.2"

Figure 2

APPENDIX A

EXAMPLE CALCULATIONS

NOMENCLATURE

Equation No.	Symbol	Description	Units
1	Vi	Initial meter reading	dcf
	Vf	Final meter reading	dcf
	Vm	Volume meter, actual	dcf
2	Pb	Barometric pressure	in. Hg
	ΔH_{avg}	Average orfice pressure drop	in. H_2O
	Tm_{avg}	Average meter temperature	°F
	Vm_{std}	Volume meter, standard conditions	dscf
3	Vlc	Total moisture collected	grams
	Vw_{std}	Volume of water vapor collected, standard conditions	ft^3
	% H_2O	Percent moisture by volume	-
4	Mf	Mole fraction of dry gas	-
5	% CO_2	Percent carbon dioxide by volume, dry	-
	% O_2	Percent oxygen by volume, dry	-
	% CO	Percent carbon monoxide by volume, dry	-
	% N_2	Percent nitrogen by volume, dry	-
6	Md	Molecular weight, dry stack gas	lb/lb-mole
7	Ms	Molecular weight, stack gas	lb/lb-mole
8	Θi	Sampling time interval	minutes
	Dn	Diameter of nozzle	inches
	ΔPs	Velocity head of S pitot	in. H_2O
	Ts	Temperature of stack gas	°F
	Vm_i	Volume of meter per sampling interval	ft^3
9	Ps	Stack pressure, absolute	in. Hg
	Pg	Stack gas pressure	in. H_20
10	ΔPs_{avg}	Average velocity head of S pitot	in. H_2O
	Ts_{avg}	Average temperature of stack gas	°F
	Vs	Average stack gas velocity	fpm
11	Θ	Total time of test	minutes
	% I	Percent isokinetic	-
12	ID	Inside diameter of stack	inches
	As	Area of stack	in^2
13	Qs	Stack flow rate, dry standard conditions	dscfm
14	m_n	Total particulate matter collected	mg
	Cs_{std}	Concentration of particulate collected, dry basis, standard conditions	gr/dscf

15	Cs_{std}(corr 7% O_2)	Concentration of particulate collected, dry basis standard conditions	gr/dscf (corr to 7% O_2)
16	Cs_{std}(corr 12% CO_2)	Concentration of particulate collected, dry basis standard condition	gr/dscf (corr to 12% CO_2)
17	Cs_{std}	Concentration of particulate collected, actual conditions	gr/acf
18	Ep	Particulate emission rate	lb/hr

PARTICULATE CALCULATION EQUATIONS

1. $V_m = V_f - V_i$

2. $$V_{m(std)} = \frac{17.64\ (V_m)\ Y \left(P_b + \frac{\Delta H_{avg}}{13.6}\right)}{T_{m(avg)} + 460}$$

3. $V_{wc(std)} = 0.0471(V_{lc})$

$$\%\ H_2O = \frac{100(V_{wc(std)})}{V_{m(std)} + V_{wc(std)}}$$

4. $$M_f = \frac{100 - \%H_2O}{100}$$

5. $\%\ N_2 = 100 - (\%CO_2 + \%O_2 + \%CO)$

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

7. $M_s = (M_d \times M_f) + 18(1 - M_f)$

8. $$V_{mi} = \frac{5.168(T_m + 460)(C_p)(\theta_i)(M_f)(D_n^2)}{\sqrt{P_b}} \times \sqrt{\frac{\Delta P_s}{T_S + 460}}$$

9. $$P_s = P_b + \frac{P_g}{13.6}$$

10. $$V_s = 5128.8 \times C_P \times \left(\sqrt{\Delta P_{s(avg)}}\right) \times \sqrt{\frac{T_{s(avg)} + 460}{P_s \times M_s}}$$

11. $$\%\ I = \frac{1039(T_{s(avg)} + 460)(V_{m(std)})}{V_s(\theta)(P_s)(M_f)(D_n^2)}$$

12. $A_s = \pi \left(\frac{ID}{2}\right)^2$

13. $Q_s = \frac{0.122(V_s)(A_s)(M_p)(P_s)}{T_{s(avg)} + 460}$

14. $C_{s(std)} = 0.0154\left(\frac{M_n}{V_{m(std)}}\right)$

15. $C_{s(act)} = \frac{17.64(C_{s(std)})(P_s)(M_p)}{T_{s(avg)} + 460}$

16. $E_p = 0.00857(C_{S(std)})(Q_s)$

APPENDIX B

COMPUTER FORMS

FILE NAME - GOTHENBURG.R1
RUN # - GOTHENBURG RUN 1
LOCATION - DRYER STACK
DATE - AUGUST 31, 1993
PROJECT # - 411922

PROG.=VER 06/27/89
09-29-1993 10:52:26

Initial Meter Volume (Cubic Feet)=	605.520
Final Meter Volume (Cubic Feet)=	646.069
Meter Factor=	1.019
Final Leak Rate (cu ft/min)=	0.013
Net Meter Volume (Cubic Feet)=	41.319
Gas Volume (Dry Standard Cubic Feet)=	38.891
Barometric Pressure (in Hg)=	27.79
Static Pressure (Inches H20)=	0.65
Percent Oxygen=	18.0
Percent Carbon Dioxide=	1.5
Moisture Collected (ml)=	203.5
Percent Water=	19.8
Average Meter Temperature (F)=	63
Average Delta H (in H20)=	1.48
Average Delta P (in H20)=	1.041
Average Stack Temperature (F)=	162
Dry Molecular Weight=	28.96
Wet Molecular Weight=	26.79
Average Square Root of Delta P (in H20)=	1.0191
% Isokinetic=	81.9
Pitot Coefficient=	0.84
Sampling Time (Minutes)=	60.0
Nozzle Diameter (Inches)=	0.239
Stack Axis #1 (Inches)=	42.0
Stack Axis #2 (Inches)=	42.0
Circular Stack	
Stack Area (Square Feet)=	9.62
Stack Velocity (Actual, Feet/min)=	4,008
Flow Rate (Actual, Cubic ft/min)=	38,559
Flow rate (Standard, Wet, Cubic ft/min)=	30,478
Flow Rate (Standard, Dry, Cubic ft/min)=	24,452

Particulate Loading - Front Half

		Corr. to 7% O2	& 12% CO2
Particulate Weight (g)=	0.1883		
Particulate Loading, Dry Std. (gr/scf)=	0.0746	0.3480	0.5965
Particulate Loading, Actual (gr/cu ft)=	0.0473		
Emission Rate (lb/hr)=	15.62		

Particulate Loading - Total Catch Including Impingers

Particulate Weight (g)=	0.2506		
Particulate Loading, Dry Std. (gr/scf)=	0.0992	0.4631	0.7939
Particulate Loading, Actual (gr/cu ft)=	0.0629		
Emission Rate (lb/hr)=	20.80		
Percent Impinger Catch=	24.9		

* * METRIC UNITS * *

FILE NAME - GOTHENBURG.R1
RUN # - GOTHENBURG RUN 1
LOCATION - DRYER STACK
DATE - AUGUST 31, 1993
PROJECT # - 411922

PROG.=VER 06/27/89
09-29-1993 10:52:27

Initial Meter Volume (Cubic Meters)=	17.146
Final Meter Volume (Cubic Meters)=	18.294
Meter Factor=	1.019
Final Leak Rate (cu m/min)=	0.0004
Net Meter Volume (Cubic Meters)=	1.170
Gas Volume (Dry Standard Cubic Meters)=	1.101
Barometric Pressure (mm Hg)=	706
Static Pressure (mm H20)=	17
Percent Oxygen=	18.0
Percent Carbon Dioxide=	1.5
Moisture Collected (ml)=	203.5
Percent Water=	19.8
Average Meter Temperature (C)=	17
Average Delta H (mm H20)=	37.7
Average Delta P (mm H20)=	26.4
Average Stack Temperature (C)=	72
Dry Molecular Weight=	28.96
Wet Molecular Weight=	26.79
Average Square Root of Delta P (mm H20)=	5.1360
% Isokinetic=	81.9
Pitot Coefficient=	0.84
Sampling Time (Minutes)=	60.0
Nozzle Diameter (mm)=	6.07
Stack Axis #1 (Meters)=	1.067
Stack Axis #2 (Meters)=	1.067
Circular Stack	
Stack Area (Square Meters)=	0.894
Stack Velocity (Actual, m/min)=	1,222
Flow rate (Actual, Cubic m/min)=	1,092
Flow rate (Standard, Wet, Cubic m/min)=	863
Flow rate (Standard, Dry, Cubic m/min)=	692

Particulate Loading - Front Half

		Corr. to 7% O2	& 12% CO2
Particulate Weight (g)=	0.1883		
Particulate Loading, Dry Std. (mg/cu m)=	171.0	797.9	1367.9
Particulate Loading, Actual (mg/cu m)=	108.4		
Emission Rate (kg/hr)=	7.09		

Particulate Loading - Total Catch Including Impingers

Particulate Weight (g)=	0.3		
Particulate Loading, Dry Std. (mg/cu m)=	227.6	1062.0	1820.6
Particulate Loading, Actual (mg/cu m)=	144.3		
Emission Rate (kg/hr)=	9.44		
Percent Impinger Catch=	24.9		

FILE NAME - GOTHENBURG.R1
RUN # - GOTHENBURG RUN 1
LOCATION - DRYER STACK
DATE - AUGUST 31, 1993
PROJECT # - 411922

PROG.=VER 06/27/89
09-29-1993 10:52:28

Point #	Delta P (in. H20)	Delta H (in. H20)	Stack T (F)	Meter T In(F)	Meter T Out(F)
1	1.000	1.80	150	53	52
2	1.000	1.50	159	56	53
3	1.000	1.30	165	59	55
4	0.980	1.50	158	62	56
5	0.990	1.40	163	64	58
6	0.950	1.10	167	66	59
7	1.300	2.60	142	65	61
8	1.200	1.30	172	70	63
9	1.100	1.40	165	71	64
10	1.000	1.20	168	73	66
11	0.990	1.30	166	74	67
12	0.980	1.40	163	75	67

Fraction	Final Wt. (g)	Tare Wt. (g)	Blank Wt. (g)	Net Wt. (g)
DRY CATCH	0.0000	0.0000	0.0000	0.0000
FILTER	31.7829	31.6539	-0.0003	0.1293

Fraction	Final Wt. (g)	Tare Wt. (g)	Vol. (ml)	Net Wt. (g)
PROBE RINSE	76.3760	76.3159	140.0	0.0590
IMPINGERS	317.1218	317.0576	200.0	0.0623

Probe Rinse Blank (mg/ml)= 0.0080 High Acetone Blank - Limit .0079
Impinger Blank (mg/ml)= 0.0095

FILE NAME - GOTHENBURG.R2
RUN # - GOTHENBURG.R2
LOCATION - DRYER STACK
DATE - AUGUST 31, 1993
PROJECT # - 411922

PROG.=VER 06/27/89
09-28-1993 16:11:06

Initial Meter Volume (Cubic Feet)=	646.345
Final Meter Volume (Cubic Feet)=	690.385
Meter Factor=	1.019
Final Leak Rate (cu ft/min)=	0.009
Net Meter Volume (Cubic Feet)=	44.877
Gas Volume (Dry Standard Cubic Feet)=	41.343
Barometric Pressure (in Hg)=	27.79
Static Pressure (Inches H20)=	0.65
Percent Oxygen=	18.0
Percent Carbon Dioxide=	1.5
Moisture Collected (ml)=	265.7
Percent Water=	23.2
Average Meter Temperature (F)=	75
Average Delta H (in H20)=	1.69
Average Delta P (in H20)=	1.032
Average Stack Temperature (F)=	183
Dry Molecular Weight=	28.96
Wet Molecular Weight=	26.41
Average Square Root of Delta P (in H20)=	1.0149
% Isokinetic=	92.3
Pitot Coefficient=	0.84
Sampling Time (Minutes)=	60.0
Nozzle Diameter (Inches)=	0.239
Stack Axis #1 (Inches)=	42.0
Stack Axis #2 (Inches)=	42.0
Circular Stack	
Stack Area (Square Feet)=	9.62
Stack Velocity (Actual, Feet/min)=	4,090
Flow Rate (Actual, Cubic ft/min)=	39,350
Flow rate (Standard, Wet, Cubic ft/min)=	30,048
Flow Rate (Standard, Dry, Cubic ft/min)=	23,066

Particulate Loading - Front Half

		Corr. to 7% O2	& 12% CO2
Particulate Weight (g)=	0.3865		
Particulate Loading, Dry Std. (gr/scf)=	0.1440	0.6719	1.1518
Particulate Loading, Actual (gr/cu ft)=	0.0844		
Emission Rate (lb/hr)=	28.46		

Particulate Loading - Total Catch Including Impingers

Particulate Weight (g)=	0.5883		
Particulate Loading, Dry Std. (gr/scf)=	0.2192	1.0227	1.7532
Particulate Loading, Actual (gr/cu ft)=	0.1284		
Emission Rate (lb/hr)=	43.32		
Percent Impinger Catch=	34.3		

* * METRIC UNITS * *

FILE NAME - GOTHENBURG.R2
RUN # - GOTHENBURG.R2
LOCATION - DRYER STACK
DATE - AUGUST 31, 1993
PROJECT # - 411922

PROG.=VER 06/27/89
09-28-1993 16:11:07

Initial Meter Volume (Cubic Meters)=	18.302
Final Meter Volume (Cubic Meters)=	19.549
Meter Factor=	1.019
Final Leak Rate (cu m/min)=	0.0003
Net Meter Volume (Cubic Meters)=	1.271
Gas Volume (Dry Standard Cubic Meters)=	1.171
Barometric Pressure (mm Hg)=	706
Static Pressure (mm H20)=	17
Percent Oxygen=	18.0
Percent Carbon Dioxide=	1.5
Moisture Collected (ml)=	265.7
Percent Water=	23.2
Average Meter Temperature (C)=	24
Average Delta H (mm H20)=	43.0
Average Delta P (mm H20)=	26.2
Average Stack Temperature (C)=	84
Dry Molecular Weight=	28.96
Wet Molecular Weight=	26.41
Average Square Root of Delta P (mm H20)=	5.1151
% Isokinetic=	92.3
Pitot Coefficient=	0.84
Sampling Time (Minutes)=	60.0
Nozzle Diameter (mm)=	6.07
Stack Axis #1 (Meters)=	1.067
Stack Axis #2 (Meters)=	1.067
Circular Stack	
Stack Area (Square Meters)=	0.894
Stack Velocity (Actual, m/min)=	1,247
Flow rate (Actual, Cubic m/min)=	1,114
Flow rate (Standard, Wet, Cubic m/min)=	851
Flow rate (Standard, Dry, Cubic m/min)=	653

Particulate Loading - Front Half

		Corr. to 7% O2	& 12% CO2
Particulate Weight (g)=	0.3865		
Particulate Loading, Dry Std. (mg/cu m)=	330.2	1540.8	2641.4
Particulate Loading, Actual (mg/cu m)=	193.5		
Emission Rate (kg/hr)=	12.92		

Particulate Loading - Total Catch Including Impingers

Particulate Weight (g)=	0.6		
Particulate Loading, Dry Std. (mg/cu m)=	502.6	2345.3	4020.5
Particulate Loading, Actual (mg/cu m)=	294.5		
Emission Rate (kg/hr)=	19.67		
Percent Impinger Catch=	34.3		

FILE NAME - GOTHENBURG.R2
RUN # - GOTHENBURG.R2
LOCATION - DRYER STACK
DATE - AUGUST 31, 1993
PROJECT # - 411922

PROG.=VER 06/27/89
09-28-1993 16:11:07

Point #	Delta P (in. H20)	Delta H (in. H20)	Stack T (F)	Meter T In(F)	Meter T Out(F)
1	1.000	1.60	178	73	72
2	1.000	1.60	185	73	72
3	1.000	1.70	181	73	72
4	0.980	1.60	187	74	72
5	0.990	1.60	189	75	72
6	0.950	1.60	176	75	72
7	1.100	1.80	187	75	73
8	1.200	2.00	180	76	74
9	1.200	2.00	186	78	75
10	1.000	1.60	190	78	75
11	1.000	1.60	184	79	75
12	0.960	1.60	177	79	76

Fraction	Final Wt. (g)	Tare Wt. (g)	Blank Wt. (g)	Net Wt. (g)
DRY CATCH	0.0000	0.0000	0.0000	0.0000
FILTER	45.8222	45.5358	-0.0003	0.2867

Fraction	Final Wt. (g)	Tare Wt. (g)	Vol. (ml)	Net Wt. (g)
PROBE RINSE	68.3028	68.2018	150.0	0.0998
IMPINGERS	321.5349	321.3312	200.0	0.2018

Probe Rinse Blank (mg/ml)= 0.0080 High Acetone Blank - Limit .0079
Impinger Blank (mg/ml)= 0.0095

FILE NAME - GOTHENBURG.R3
RUN # - GOTHENBURG.R3
LOCATION - DRYER STACK
DATE - AUGUST 31, 1993
PROJECT # - 411922

PROG.=VER 06/27/89
09-28-1993 16:11:44

Initial Meter Volume (Cubic Feet)=	690.543
Final Meter Volume (Cubic Feet)=	739.070
Meter Factor=	1.019
Final Leak Rate (cu ft/min)=	0.005
Net Meter Volume (Cubic Feet)=	49.449
Gas Volume (Dry Standard Cubic Feet)=	45.142
Barometric Pressure (in Hg)=	27.79
Static Pressure (Inches H20)=	0.65
Percent Oxygen=	17.5
Percent Carbon Dioxide=	1.5
Moisture Collected (ml)=	221.6
Percent Water=	18.8
Average Meter Temperature (F)=	80
Average Delta H (in H20)=	2.03
Average Delta P (in H20)=	1.039
Average Stack Temperature (F)=	154
Dry Molecular Weight=	28.94
Wet Molecular Weight=	26.89
Average Square Root of Delta P (in H20)=	1.0186
% Isokinetic=	93.5
Pitot Coefficient=	0.84
Sampling Time (Minutes)=	60.0
Nozzle Diameter (Inches)=	0.239
Stack Axis #1 (Inches)=	42.0
Stack Axis #2 (Inches)=	42.0
Circular Stack	
Stack Area (Square Feet)=	9.62
Stack Velocity (Actual, Feet/min)=	3,975
Flow Rate (Actual, Cubic ft/min)=	38,248
Flow rate (Standard, Wet, Cubic ft/min)=	30,590
Flow Rate (Standard, Dry, Cubic ft/min)=	24,845

Particulate Loading - Front Half

		Corr. to 7% O2	& 12% CO2
Particulate Weight (g)=	0.1828		
Particulate Loading, Dry Std. (gr/scf)=	0.0624	0.2494	0.4989
Particulate Loading, Actual (gr/cu ft)=	0.0405		
Emission Rate (lb/hr)=	13.28		

Particulate Loading - Total Catch Including Impingers

Particulate Weight (g)=	0.1980		
Particulate Loading, Dry Std. (gr/scf)=	0.0675	0.2702	0.5404
Particulate Loading, Actual (gr/cu ft)=	0.0439		
Emission Rate (lb/hr)=	14.38		
Percent Impinger Catch=	7.7		

* * METRIC UNITS * *

FILE NAME - GOTHENBURG.R3
RUN # - GOTHENBURG.R3
LOCATION - DRYER STACK
DATE - AUGUST 31, 1993
PROJECT # - 411922

PROG.=VER 06/27/89
09-28-1993 16:11:44

Initial Meter Volume (Cubic Meters)=	19.553
Final Meter Volume (Cubic Meters)=	20.928
Meter Factor=	1.019
Final Leak Rate (cu m/min)=	0.0001
Net Meter Volume (Cubic Meters)=	1.400
Gas Volume (Dry Standard Cubic Meters)=	1.278
Barometric Pressure (mm Hg)=	706
Static Pressure (mm H20)=	17
Percent Oxygen=	17.5
Percent Carbon Dioxide=	1.5
Moisture Collected (ml)=	221.6
Percent Water=	18.8
Average Meter Temperature (C)=	27
Average Delta H (mm H20)=	51.6
Average Delta P (mm H20)=	26.4
Average Stack Temperature (C)=	68
Dry Molecular Weight=	28.94
Wet Molecular Weight=	26.89
Average Square Root of Delta P (mm H20)=	5.1335
% Isokinetic=	93.5
Pitot Coefficient=	0.84
Sampling Time (Minutes)=	60.0
Nozzle Diameter (mm)=	6.07
Stack Axis #1 (Meters)=	1.067
Stack Axis #2 (Meters)=	1.067
Circular Stack	
Stack Area (Square Meters)=	0.894
Stack Velocity (Actual, m/min)=	1,212
Flow rate (Actual, Cubic m/min)=	1,083
Flow rate (Standard, Wet, Cubic m/min)=	866
Flow rate (Standard, Dry, Cubic m/min)=	704

Particulate Loading - Front Half

		Corr. to 7% O2	& 12% CO2
Particulate Weight (g)=	0.1828		
Particulate Loading, Dry Std. (mg/cu m)=	143.0	572.0	1144.1
Particulate Loading, Actual (mg/cu m)=	92.9		
Emission Rate (kg/hr)=	6.03		

Particulate Loading - Total Catch Including Impingers

Particulate Weight (g)=	0.2		
Particulate Loading, Dry Std. (mg/cu m)=	154.9	619.6	1239.2
Particulate Loading, Actual (mg/cu m)=	100.6		
Emission Rate (kg/hr)=	6.53		
Percent Impinger Catch=	7.7		

FILE NAME - GOTHENBURG.R3
RUN # - GOTHENBURG.R3
LOCATION - DRYER STACK
DATE - AUGUST 31, 1993
PROJECT # - 411922

PROG.=VER 06/27/89
09-28-1993 16:11:45

Point #	Delta P (in. H20)	Delta H (in. H20)	Stack T (F)	Meter T In(F)	Meter T Out(F)
1	1.100	2.10	163	77	77
2	1.000	1.90	160	76	76
3	1.000	1.90	161	77	76
4	1.000	2.00	155	79	76
5	0.980	1.90	153	80	77
6	0.960	1.90	151	82	78
7	1.200	2.30	151	83	78
8	1.200	2.40	151	83	79
9	1.100	2.20	152	85	80
10	1.000	2.00	151	85	80
11	0.970	1.90	152	86	81
12	0.960	1.90	151	85	81

Fraction	Final Wt. (g)	Tare Wt. (g)	Blank Wt. (g)	Net Wt. (g)
DRY CATCH	0.0000	0.0000	0.0000	0.0000
FILTER	91.4028	91.2927	-0.0003	0.1104

Fraction	Final Wt. (g)	Tare Wt. (g)	Vol. (ml)	Net Wt. (g)
PROBE RINSE	76.3396	76.2661	140.0	0.0724
IMPINGERS	240.4431	240.4260	200.0	0.0152

Probe Rinse Blank (mg/ml)= 0.0080 High Acetone Blank - Limit .0079
Impinger Blank (mg/ml)= 0.0095

APPENDIX C

PARTICULATE FIELD DATA FORMS

TRAVERSE POINT LOCATIONS

PROJECT NO. 411922

PLANT Gothenburg Alfalfa

DATE 8-31-93

SAMPLING LOCATION Dryer Stack Gothenburg

INSIDE OF FAR WALL TO OUTSIDE OF NIPPLE (Distance A) 45

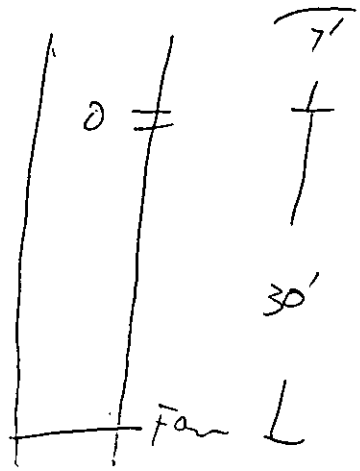
INSIDE OF NEAR WALL TO OUTSIDE OF NIPPLE (Distance B) 3

STACK I.D. (Distance A - Distance B) 42

NEAREST UPSTREAM DISTURBANCE (in.) 360 8 dia.

NEAREST DOWNSTREAM DISTURBANCE (in.) 84 2 dia.

OPERATOR B. Wood



DRAWING OF STACK

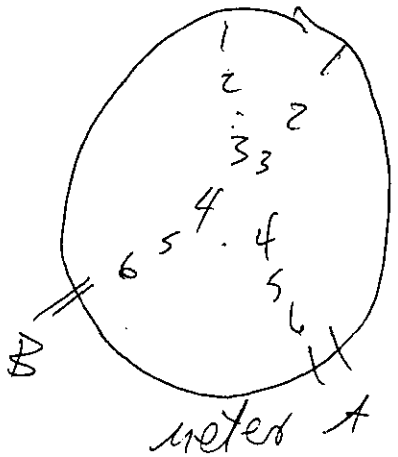
TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 2 AND 3	DISTANCE B	TRAVERSE POINT LOCATION FROM OUTSIDE OF NIPPLE (SUM OF COLUMNS 4 & 5)	
					Decimal	Fraction to nearest 1/8 in.
1	4.4	42	1.8			
2	14.6		6.1			
3	29.6		12.4			
4	70.4		29.5			
5	85.4		35.9			
6	95.6		40.2			
7						
8						
9						
10						
11						
12						

Comments:

Reviewed by: _____ Date: _____

Preliminary Velocity Traverse

Plant Gathrenburg
Project No. 41922
Date 8-31-93
Location Dryer Stack
Stack I.D. 43
Pitot Cp .84
Static Pressure in H_2O .65
Barometer Pressure in. Hg 27.979
Start Time
Stop Time
Operators B. Wood
T. Titus



SCHEMATIC OF TRAVERSE POINT LAYOUT

Final Pitot Leak Check at ≥3" H_2O (P) F

Traverse Point Number	Velocity Head ΔP in. H_2O	Stack Temp. °F	Cyclonic Flow Determination	
			ΔP at O° Reference	Angle Which Yields a Null ΔP
A1	1.0	138		
2	1.0	140		
3	1.0	141		
4	.99	143		
5	.97	143		
6	.95	144		

Traverse Point Number	Velocity Head ΔP in. H_2O	Stack Temp °F	Cyclonic Flow Determination	
			ΔP at O° Reference	Angle Which Yields a Null ΔP
B 1	1.4	148		
2	1.3	148		
3	1.1	147		
4	1.0	141		
5	1.0	140		
6	.98	141		

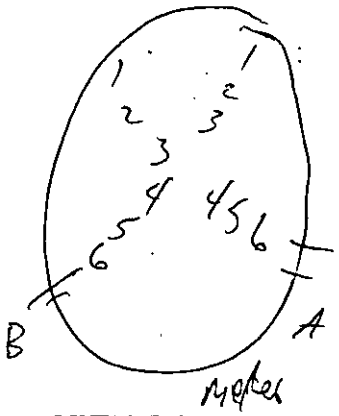
AIRSOURCE TECHNOLOGIES

11635 W 83RD TERRACE
Lenexa, Kansas 66215
(913) 492-1613
FAX: (913) 492-1012

PROJECT NO. 411922
RUN NO. 1
DATE 8/31/93
SAMPLE TYPE particulate
PLANT Alfalfa Processors Assn. - Gothenburg
SAMPLING LOCATION Dryer Stack
TOTAL SAMPLING TIME 60

PROJECT LEADER B. Wood
CONSOLE OPERATOR B. Wood
LAB PERSON T. Titus
SUPPORT PERSONNEL: T. Titus

METER NO. 4 ASSUMED MOISTURE 25 %
UMBILICAL CORD I.D. NO. 50' METER CORRECTION FACTOR 1.019
UMBILICAL/SAMPLER HOOKUP 1 METER ΔH @ 1.843
OVEN BOX NO. 1 BAROMETRIC PRESSURE 27.79 in Hg
PROBE NO. 1 STATIC PRESSURE .65 in H_2O
PROBE LENGTH & TYPE 5' Glass RECORD DATA EVERY 5 MIN
PITOT NO. PITOT COEFFICIENT .84
THERMOCOUPLE I.D. NO. 1 NOZZLE DIAMETER .239 in
NOZZLE NO. .239 CS STACK AXIS #1 42
NOZZLE TYPE SS / G / O STACK AXIS #2 42



SCHEMATIC OF TRAVERSE POINT LAYOUT

SAMPLE TRAIN LEAK CHECKS	INITIAL	FINAL
TIME (24 HRS.)	0855	1012
VACUUM, in. Hg	≥15	3"
CFM	.003	.013
PITOT LEAK CHECK ≥3" H_2O	Pass	Pass

INITIAL METER VOLUME	605.520
FINAL METER VOLUME	646.069

ORSAT/FYRITE

TRIAL	PERCENT CO_2	PERCENT CO_2 + O_2	PERCENT O_2
1	1.5		18.0
2	1.5		18.0
3			
AVG	1.5		18.0

RECOVERY DATA

	FINAL	INITIAL	DIFFERENCE
IMP. 1	223	100	123
IMP. 2	155	100	55
IMP. 3	12	0	12
IMP. 4	745.1	731.6	13.5
TOTAL:			203.5'

COMMENTS:

FILTER NO: 8-20-93-1 % BLUE 70

REVIEWED BY:

Run No. 1 Project No. 411922 Location Dryer Stack Date 8-31-93 Operator B. Wbol Page 1 of 1

Traverse Point Number	Sample Time (min)	Clock Time (24-hr)	Dry Gas Meter ft³ Initial 605.520 Desired	Dry Gas Meter ft³ Actual	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O Desired	Orifice ΔH in. H_2O Actual	Stack Temp. °F	Dry Gas Meter Temperature °F Inlet	Dry Gas Meter Temperature °F Outlet	Pump VAC in. Hg	Probe Temp. °F	Filter Temp. °F	Impinger Temp. °F	
		0904													
A 1	5	0909	609.20	609.19	1.0	1.76	1.8	150	53	52	1	254	233	56	
2	10	0914	612.56	612.51	1.0	1.47	1.5	159	56	53	1	248	244	43	
3	15	0919	615.74	615.72	1.0	1.29	1.3	165	59	55	1	244	249	47	
4	20	0924	619.16	619.13	.98	1.49	1.5	158	62	56	1	243	235	51	
5	25	0929	622.41	622.44	.99	1.34	1.4	163	64	58	1	236	245	55	
6	30	0934	625.43	625.475	.95	1.16	1.1	167	66	59	1	234	249	59	
		0940													
B 1	5	0945	629.99	629.87	1.3	2.64	2.6	142	65	61	3	252	242	58	
2	10	0950	633.14	633.16	1.2	1.25	1.3	172	70	63	1	253	247	56	
3	15	0955	636.52	636.46	1.1	1.43	1.4	165	71	64	1	247	244	56	
4	20	1000	639.61	639.55	1.0	1.20	1.2	168	73	66	1	244	251	56	
5	25	1005	642.79	642.73	.99	1.26	1.3	166	74	67	1	255	250	57	
6	30	1010	646.09	646.069	.98	1.35	1.4	163	75	67	1	252	253	57	

AIRSOURCE TECHNOLOGIES

11635 W 83RD TERRACE
Lenexa, Kansas 66215
(913) 492-1613
FAX: (913) 492-1012

PROJECT NO. 411927 PROJECT LEADER B. Wood
RUN NO. 2 CONSOLE OPERATOR B. Wood
DATE 8-31-93 LAB PERSON T. Titus
SAMPLE TYPE particulate SUPPORT PERSONNEL: T. Titus
PLANT
SAMPLING LOCATION Dryer Stack
TOTAL SAMPLING TIME 60
METER NO. 4 ASSUMED MOISTURE 30 %
UMBILICAL CORD I.D. NO. 50' METER CORRECTION FACTOR 1.019
UMBILICAL/SAMPLER HOOKUP 2 METER ΔH @ 1.843
OVEN BOX NO. 1 BAROMETRIC PRESSURE 27.79 in Hg
PROBE NO. 1 STATIC PRESSURE .65 in H_2O
PROBE LENGTH & TYPE 5' Glass RECORD DATA EVERY 5 MIN
PITOT NO. PITOT COEFFICIENT .84
THERMOCOUPLE I.D. NO. 1 NOZZLE DIAMETER .239 in
NOZZLE NO. .239 STACK AXIS #1 42
NOZZLE TYPE SS / G / O STACK AXIS #2 42

See Run 1

SCHEMATIC OF TRAVERSE POINT LAYOUT

SAMPLE TRAIN LEAK CHECKS	INITIAL	FINAL
TIME (24 HRS.)	1026	1143
VACUUM, in. Hg	≥15	10"
CFM	.003	.009
PITOT LEAK CHECK ≥3" H_2O	Pass	Pass

INITIAL METER VOLUME	646.345
FINAL METER VOLUME	690.385

ORSAT/FYRITE

TRIAL	PERCENT CO_2	PERCENT CO_2 + O_2	PERCENT O_2
1	1.5		18.0
2	1.5		18.0
3			
AVG	1.5		18.0

RECOVERY DATA

	FINAL	INITIAL	DIFFERENCE
IMP. 1	215	100	115
IMP. 2	217	100	117
IMP. 3	12	0	12
IMP. 4	698.3	~~722.8~~ 676.6	21.7
TOTAL:			265.7'

COMMENTS:

FILTER NO.: 93-~~65~~ 62 % BLUE 20

REVIEWED BY:

Run No. 2 Project No. 411922 Location Dryer Stack Date 8-31-93 Operator B. Wood Page 1 of

Traverse Point Number	Sample Time (min)	Clock Time (24-hr)	Dry Gas Meter ft³ Initial 646.345 Desired	Dry Gas Meter ft³ Actual	Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O Desired	Orifice ΔH in. H_2O Actual	Stack Temp. °F	Dry Gas Meter Temperature °F Inlet	Dry Gas Meter Temperature °F Outlet	Pump VAC. in. Hg	Probe Temp. °F	Filter Temp. °F	Impinger Temp. °F	
		1032													
A 1	5	1037	649.96	649.86	1.0	1.63	1.6	176	73	72	5	258	230	61	
2	10	1042	653.56	653.46	1.0	1.61	1.6	185	73	72	6	243	231	55	
3	15	1047	657.17	657.14	1.0	1.62	1.7	181	73	72	7	246	231	55	
4	20	1052	660.74	660.67	.98	1.58	1.6	187	74	72	7	245	240	60	
5	25	1057	664.32	664.25	.99	1.59	1.6	189	75	72	7	240	245	62	
6	30	1102	667.86	667.863	.95	1.56	1.6	176	75	72	7	242	252	66	
		1110													
B 1	5	1115	671.64	671.60	1.1	1.78	1.8	187	75	73	8	241	258	66	
2	10	1120	675.62	675.54	1.2	1.96	2.0	180	76	74	9	246	254	65	
3	15	1125	679.59	679.50	1.2	1.95	2.0	186	78	75	10	240	253	63	
4	20	1130	683.20	683.16	1.0	1.61	1.6	190	78	75	8	241	252	67	
5	25	1135	686.84	686.70	1.0	1.63	1.6	184	79	75	8	248	250	66	
6	30	1140	690.42	690.385	.96	1.58	1.6	177	79	76	8	256	247	66	

AIRSOURCE TECHNOLOGIES

11635 W 83RD TERRACE
Lenexa, Kansas 66215
(913) 492-1613
FAX: (913) 492-1012

PROJECT NO. 41922
RUN NO. 3
DATE 8-31-93
SAMPLE TYPE particulate
PLANT Gothenburg
SAMPLING LOCATION Dryer Stack
TOTAL SAMPLING TIME 60

PROJECT LEADER B. Wood
CONSOLE OPERATOR B. Wood
LAB PERSON T. Titus
SUPPORT PERSONNEL: T. Titus

METER NO. 4
UMBILICAL CORD I.D. NO. 50'
UMBILICAL/SAMPLER HOOKUP 3
OVEN BOX NO. 1
PROBE NO. 1
PROBE LENGTH & TYPE 5' Glass
PITOT NO.
THERMOCOUPLE I.D. NO.
NOZZLE NO. .239
NOZZLE TYPE SS / G10

ASSUMED MOISTURE 25 %
METER CORRECTION FACTOR 1.019
METER ΔH @ 1.843
BAROMETRIC PRESSURE 27.79 in Hg
STATIC PRESSURE .65 in H_2O
RECORD DATA EVERY 5 MIN
PITOT COEFFICIENT .84
NOZZLE DIAMETER .239 in
STACK AXIS #1 42
STACK AXIS #2 42

See Run 1

SCHEMATIC OF TRAVERSE POINT LAYOUT

SAMPLE TRAIN LEAK CHECKS	INITIAL	FINAL
TIME (24 HRS.)	1400	1528
VACUUM, in. Hg	≥15	2"
CFM	.005	.005
PITOT LEAK CHECK ≥3" H_2O	Pass	Pass

INITIAL METER VOLUME	690.543
FINAL METER VOLUME	739.070

ORSAT/FYRITE

TRIAL	PERCENT CO_2	PERCENT CO_2 + O_2	PERCENT O_2
1	1.5		17.5
2	~~1.5~~ BW		17.5
3	1.5		
AVG	~~1.5~~ BW		17.5

COMMENTS: 1.5 / 1.5

RECOVERY DATA

	FINAL	INITIAL	DIFFERENCE
IMP. 1	231	100	131
IMP. 2	170	100	70
IMP. 3	9	0	9
IMP. 4	739.4	~~676.6~~ 727.8	11.6
TOTAL:			(~~221.6~~)

FILTER NO. 57-116
% BLUE
REVIEWED BY:

Run No. 3 Project No. 41192 Location Dryer Stack Date 8-31-93 Operator B. Wood Page 1 of 1

Traverse Point Number	Sample Time (min)	Clock Time (24-hr)	Dry Gas Meter ft³ Initial 690.543		Velocity Head Δp in. H_2O	Orifice ΔH in. H_2O		Stack Temp. °F	Dry Gas Meter Temperature °F		Pump VAC in. Hg	Probe Temp. °F	Filter Temp. °F	Impinger Temp. °F	
		1419	Desired	Actual		Desired	Actual		Inlet	Outlet					
A1	5	1424	694.65	694.69	1.1	2.08	2.1	163	77	77	1	249	248	65	
2	10	1429	698.57	698.53	1.0	1.90	1.9	160	76	76	1	240	247	49	
3	15	1434	702.50	702.26	1.0	1.90	1.9	161	77	76	1	244	246	50	
4	20	1439	706.45	706.26	1.0	1.92	2.0	155	79	76	1	240	249	52	
5	25	1444	710.37	710.17	.98	1.89	1.9	153	80	77	1	251	252	53	
6	30	1449	714.28	714.217	.96	1.86	1.9	151	82	78	1	249	254	54	
		1455													
B1	5	1500	718.64	718.50	1.2	2.33	2.3	151	83	78	1	248	252	56	
2	10	1505	723.01	722.91	1.2	2.34	2.4	151	83	79	2	245	253	56	
3	15	1510	727.20	727.17	1.1	2.14	2.2	152	85	80	1	247	250	56	
4	20	1515	731.20	731.16	1.0	1.95	2.0	151	85	80	1	238	251	57	
5	25	1520	735.15	735.11	.97	1.89	1.9	152	86	81	1	245	249	57	
6	30	1525	739.07	739.070	.96	1.87	1.9	151	85	81	1	240	253	58	

APPENDIX D

LABORATORY AND ANALYSIS FORMS

AIRSOURCE TECHNOLOGIES

11635 WEST 83RD TERRACE
LENEXA KS 66214
(913) 492-1613
FAX: (913) 492-1613

Alfalfa Assn.

PROBE RINSE BLANK 0.008 mg/ml

FILTER BLANK -0.0003 g

STACK ID	RUN NO.		FIL/BEAKER NO.	FINAL WEIGHT	TARE WEIGHT	ml	COMMENTS
Rotheberg	1	F	8-20-93-1	31.7829	31.6539		
		PR	8-23-23	76.3760	76.3159	140	
	2	F	93-82	45.8222	45.5358		
		PR	8-23-25	68.3028	68.2018	150	
	3	F	57-116	91.4028	91.2927		
		PR	8-23-26	76.3396	76.2661	140	
Hanson	1	F	8-20-93-3	33.5650	33.5089		
		PR	8-23-28	63.5033	63.2907	130	
	2	F	8-20-93-13	33.5988	33.5561		
		PR	8-23-29	65.4422	65.2706	140	
	3	F	8-20-93-2	34.0298	33.9864		
		PR	8-23-32	65.8865	65.7502	150	
	Rl	F	8-20-93-15	33.9739	33.9742		
	Rl	PR	8-23-33	74.9297	74.9289	100	
		F					
		PR					
		F					
		PR					
		F					
		PR					
		F					
		PR					
		F					
		PR					
		F					
		PR					
		F					
		PR					
		F					

FINAL FILTER WEIGHING

Project No.: 411992 HY	Analyst: CAH
Filter Type and Size: 85 mm fiberglass	Weight Unit: grams

Filter Treatment:

X Desiccate 24 hours/6 hours between weighings

____ Oven Treated

____ Other

Balance Check:				
Weight Value(g)	~~9~~ 35	35	35	
Initial Check(g)	35.0000	35.0003	35.0001	
Final Check(g)	35.0001	35.0002	35.0000	
Date:	9-10-93	9-11-93	9-12-93	
Time (24 hr):	1225	1845	1050	
Filter No.	Weigh No. 1	Weigh No. 2	Weigh No. 3	Average
8-20-93-2	34.0291	34.0300	34.0295	34.0298
-3	33.5640	33.5652	33.5647	33.5650
-13	33.5986	33.5989		33.5988
-15	33.9737	33.9740		33.9739
93-82	45.8220	45.8224		45.8222
5-7-116	91.4044	91.4024	91.4024	91.4024
8-20-93-1	31.7826	31.7831		31.7829

INITIAL FILTER WEIGHING

Analyst: B. Wood	
Filter Type and Size: 85 cm Glass	**Weight Unit:** .000 / grams

Filter Treatment:

- ✓ Desiccate 24 hours/6 hours between weighings
- ____ Oven Treated
- ____ Other

Balance Check:				
Weight Value(g)	40	40		
Initial Check(g)	39.9998	39.9994		
Final Check(g)	39.9998	39.9993		
Date:	5-14-93	5-20-93		
Time (24 hr):	0900	1000		
Filter No.	**Weigh No.** 1	**Weigh No.** 2	**Weigh No.** ____	**Average**
93-77	30.4365	30.4364		30.4365
93-78	33.8330	33.8332		33.8331
93-79	48.0524	48.0521		48.0523
93-80	31.7925	31.7926		31.7926
93-81	34.3537	34.3539		34.3538
93-82	45.5360	45.5355		45.5358
93-83	33.8608	33.8603		33.8606
93-84	30.1321	30.1319		30.1320
93-85	33.4342	33.4342		33.4342
93-86	32.4576	32.4573		32.4575
93-87	48.9913	48.9910		48.9912
93-88	37.6707	37.6707		37.6707
93-89	31.6480	31.6476		31.6478
93-90	40.6104	40.6102		40.6103
93-91	32.2392	32.2387		32.2389
93-92	50.2469	50.2466		50.2468
93-93	32.9079	32.9076		32.9078

INITIAL FILTER WEIGHING

Analyst: Cobb	bottom only
Filter Type and Size: 85 mm [illegible]	**Weight Unit:** grams

Filter Treatment:

X Desiccate 24 hours/6 hours between weighings
____ Oven Treated
____ Other

Balance Check:				
Weight Value(g)	30	30		
Initial Check(g)	30.0001	30.0002		
Final Check(g)	30.0002	30.0001		
Date:	8-21-93	8-22-93		
Time (24 hr):	1300	1230		
Filter No.	**Weigh No.** 1	**Weigh No.** 2	**Weigh No.** ____	**Average**
F-20-93- 1	31.6537	31.6540		31.6539
- 2	33.9863	33.9864		33.9864
- 3	33.5089	33.5088		33.5089
- 4	44.7618	44.7619		44.7619
- 5	32.8210	32.8212		32.8211
- 6	37.6922	37.6926		37.6924
- 7	33.48384	33.4384		33.4384
- 8	50.2424	50.2426		50.2425
- 9	31.5228	31.5229		31.5229
-10	36.9209	36.9209		36.9209
-11	31.8142	31.8144		31.8143
-12	33.8494	33.8495		33.8495
-13	33.5561	33.5561		33.5561
-14	42.2211	42.2214		42.2213
-15	33.9741	33.9742		33.9742
-16	31.0860	31.0861		31.0861
-17	32.2630	32.2628		32.2629

INITIAL FILTER WEIGHING

Analyst: Cobb	
Filter Type and Size: 84 mm fiberglass	**Weight Unit:** grams

Filter Treatment:

X Desiccate 24 hours/6 hours between weighings
____ Oven Treated
____ Other

Balance Check:				
Weight Value(g)	100	100	100	
Initial Check(g)	99.9998	99.9997	99.9997	
Final Check(g)	99.9997	99.9995	99.9995	
Date:	5-22-93	5-24-93	5-24-93	
Time (24 hr):	1400	1100	1845	
Filter No.	**Weigh No.** 4	**Weigh No.** 5	**Weigh No.** 6	**Average**
5-7-113	92.8897			92.8895
5-7-114	90.7490			90.7489
5-7-115	76.30326			76.3034
5-7-116	91.2927			91.2927
5-7-117	169.6932			169.6930
5-7-118	94.9720			94.9719
5-7-119	84.0713	84.0716		84.0715
5-7-120	90.8149	90.8137	90.8137	90.8137
5-7-121	91.3553			91.3551
5-7-122	82.6449	82.6424	82.6429	82.6427

FINAL BEAKER WEIGHING

Project No.: 411992	Analyst: [illegible]
Beaker Size: 150 ml	Weight Unit: grams

Beaker Treatment:

X Desiccate 24 hours/6 hours between weighings

___ Other

Balance Check:					
Weight Value(g)	70	70	70		
Initial Check(g)	70.0000	69.9998	69.9997		
Final Check(g)	70.0002	69.9999	69.9998		
Date:	9-10-93	9-11-93			
Time (24 hr):	1405	1710			
Beaker No.	Weigh No. 1	Weigh No. 2	Weigh No. 3	Average	ml.
8-23-23	76.3760	76.3760		76.3760	140
-25	68.3027	68.3028		68.3028	150
-26	76.3394	76.3397		76.3396	140
8-23-28	63.5061	63.5030	63.5035	63.5033	130
29	65.4437	65.4423	65.4420	65.4422	140
32	65.8865	65.8864		65.8865	150
8-23-33	74.9297	74.9297		74.9297	100

INITIAL BEAKER WEIGHING

Analyst: Cobb	
Beaker Size: 150 ml	Weight Unit: grams

Beaker Treatment:
X Desiccate 24 hours/6 hours between weighings
___ Other

Balance Check:				
Weight Value(g)	70	70	70	
Initial Check(g)	69.9999	69.9998	69.9998	
Final Check(g)	69.9997	70.0000	69.9998	

Date:	8-23-93	8-24-93	8-24-93	
Time (24 hr):	1700	0820	1825	
Beaker No.	Weigh No. 1	Weigh No. 2	Weigh No. 3	Average
8-23-18	68.3417	68.3450	68.3422	→
-19	75.2457	75.2502	75.2472	→
-20	68.9971	69.0013	68.9991	→
-21	67.5494	67.5536	67.5508	→
-22	67.7590	67.7629	67.7614	→
-23	76.3139	76.3189	76.3159	→
-24	67.6512	67.6554	67.6531	→
-25	68.2014	68.2045	68.2028	→
8-23-26	76.2650	76.2688	76.2670	→
-27	69.7655	69.7691	69.7675	→
-28	63.2897	63.2934	63.2916	→
-29	65.2695	65.2725	65.2714	→
-30	70.9722	70.9754	70.9737	→
-31	68.2015	68.2052	68.2027	→
-32	65.7497	65.7540	65.7515	→
-33	74.9287	74.9315	74.9299	→
8-23-34	69.0180	69.0204	69.0195	→

INITIAL BEAKER WEIGHING

Analyst: Cobb	
Beaker Size: 150	Weight Unit: grams
Beaker Treatment: X Desiccate 24 hours/6 hours between weighings ____ Other	

Balance Check:				
Weight Value(g)	70	70	70	
Initial Check(g)	69.9997	69.9999	69.9997	
Final Check(g)	69.9996	69.9998	69.9997	
Date:	8-25-93	8-25-93	8-26-93	
Time (24 hr):	0920	1530	0930	
Beaker No.	Weigh No. 4	Weigh No. 5	Weigh No. 6	Average
8-23-18	68.3420	68.3418		68.3419
-19	75.2464	75.2461		75.2463
-20	68.9968	68.9978	68.9974	68.9976
-21	67.5497	67.5497		67.5497
-22	67.7601	67.7601		67.7601
-23	76.3148	76.3161	76.3156	76.3159
-24	67.6525	67.6523		67.6524
-25	68.2013	68.2020	68.2016	68.2018
8-23-26	76.2655	76.2663	76.2659	76.2661
-27	69.7662	69.7666		69.7664
-28	63.2900	63.2907	63.2907	63.2907
-29	65.2700	65.2707	65.2705	65.2706
-30	70.9722	70.9725		70.9724
-31	68.2022	68.2021		68.2022
-32	65.7503	65.7501		65.7502
-33	74.9288	74.9289		74.9289
8-23-34	69.0180	69.0181		69.0181

APPENDIX E

PRETEST CALIBRATIONS

BAROMETER CALIBRATION SHEET

Date	8-15-93
Barometer Number	#1
Ambient Temperature	74°
Calibrator	Ryder

Barometer Reading	28.85
Reference Barometer Reading	28.80
Difference	.05

Acceptance Criteria: Difference ≤ 0.1 inch

CONSOLE WORKSHEET

NAME Rigdon K FACTOR .5312 PROJECT # _____

DATE 8/16/93 TRAIN ID #4 PREVIOUS Y FACTOR 1.026

ORIFICE # 2 PYROMETER # _____

	RUN NUMBER 1	RUN NUMBER 2
DGM		
FINAL READING	178.24	181.84
INITIAL READING	174.80	178.40
INLET & OUTLET TEMPERATURES		
INITIAL	80 / 79	82 / 80
FINAL	82 / 80	83 / 80
TIME Sec	300	300
ORIFICE RDG. "H	1.50	1.50
BAR. PRESSURE	28.85	28.85
ROOM TEMP.	75 / 75	75 / 75
PUMP VACUUM Hg"	15"	15"
	.09	.65

CONSOLE CALIBRATION

Project	411775	Orifice number	2
Date	AUG 16 93	Orifice K factor	.5312
Operator	RIGDON	Previous Y factor	1.026
Console Number	4		

	Run 1	Run 2
Final DGM Volume	178.240	181.840
Inital DGM Volume	174.800	178.400
Net DGM Volume (Vm)	3.440	3.440

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	Run 1	Run 2
In/Out DGM Temp.		
Inlet Deg. F		
initial	80.0	82.0
final	82.0	83.0
Outlet Deg. F		
initial	79.0	80.0
final	80.0	80.0
Avg. DGM Temp Deg. F	80.3	81.3
Time, sec.	300.0	300.0
Orifice DH, in. H2O	1.50	1.50
Baro. Press., in. Hg	28.85	28.85
Room temp., Deg. F		
initial	75.0	75.0
final	75.0	75.0
Avg.Room Temp.	75.0	75.0
Pump Vacuum, in. Hg	15	15

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	Run 1	Run 2
Vcr (std)	3.313	3.313
Vm (std)	3.253	3.247
Y Factor	1.018	1.020
Delta H@	1.845	1.841

Average Y	1.019
Average Delta H@	1.843

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+/- 2% criteria	
Percent of Avg Y	.09
	PASS
+/- 5% criteria	
Percent of final Y	.65
	PASS

BRACKETING WORKSHEET

NAME Rigdon K.FACTOR 1. 3199 2. 6405

PROJECT # _____ DATE 8/16/93 TRAIN I.D. #4

ORIFICE # 1. 4 2. 7

DGM	1	2
Final Reading	184.15	189.17
Initial reading	182.10	186.00
Difference		

INLET & OUTLET TEMP.		
Initial	83 / 80	85 / 81
Final	85 / 81	89 / 84
Avg. Temp.		
Time	300	300
Orifice rdg. ^H	.55	2.25
Bar. Pressure	28.85	28.85
Room Temp.	75 / 75	75 / 75
Pump Vacuum	16"	15

ORFICE BRACKETING

Project	962002	Bracket Orfices:	
Date	AUG 16 93	Orifice No. 1	4.
Operator	RIGDON	Orifice N0.1 K factor	.
Orfice Number	4	Orifice No. 2	7.
Orfice Y factor	1.019	Orifice N0.2 K factor	.

	Orfice #1	Orfice #2
Final DGM Volume	184.150	189.170
Inital DGM Volume	182.100	185.000
Net DGM Volume (Vm)	2.050	4.170
In/Out DGM Temp.		
Inlet		
initial	83.0	85.0
final	85.0	89.0
Outlet		
initial	80.0	81.0
final	81.0	82.0
Avg. DGM Temp	82.3	84.3
Time, sec.	300.0	300.0
Orifice DH, in. H2O	.55	2.25
Baro. Press., in. Hg	28.85	28.85
Room temp., Deg. F		
initial	75.0	75.0
final	75.0	75.0
Avg. Room Temp.	75.0	75.0
Pump Vacuum, in. Hg	16	15
Vcr (std)	1.995	3.994
Vm (std)	1.927	3.922
Y Factor (brackets)	1.035	1.019
+/- 2% criteria		
Percent of Y	1.62	.04
	PASS	PASS

DRY GAS METER THERMOCOUPLE CALIBRATION SHEET

Date 8/16/93		Thermocouple Number	# 4
Calibrator Bigelow		Reference Mercury-in-glass	Astm
		Other	

Thermocouple	Source	Reference Thermometer Temperature (°F)	Thermocouple Potentiometer Temperature (°F)	Temperature Difference* (°F)
Inlet	Ambient Air	76°	76	0°
	Hot Water Bath	132°	132	0°
Outlet	Ambient Air	76°	77	+1°
	Hot Water Bath	132°	131°	-1°

* Reference Temperature -- Thermocouple Temperature ≤ ± 5.4 °F

TYPE S PITOT TUBE
CALIBRATION

PITOT # 7

Calibrator: R. Wood	Project no.:
Date: 6-15-93	Probe no.: 1

Pitot Tube Assembly Level? (Y) / N

Pitot Tube Openings Damaged? Y / (N) (If yes explain below)

α^1 1 ° (<10°) β^1 0 ° (<5°)

α^2 0 ° (<10°) β^2 0 ° (<5°)

Y = 1 O = 0 A = .971 in.

Z = A sin Y .015 in. (<1/8 in.)

W = A sin O _____ in. (<1/32 in.)

P^{-} .485 in. P^{+} .486 in.

DT = .381 in.

Calibration Required? Y / (N) (If yes explain below)

Comments:

STACK THERMOCOUPLE CALIBRATION SHEET

Date 8-15-93 Thermocouple Number ~~[illegible]~~ 5-1

Ambient Temp. _____ F Barometric Pressure 28.80 in. Hg

Calibrator Rigalosa Reference: mercury-in-glass Astm

Other _____

Reference Point Number[a]	Source[b] (Specify)	Reference Thermometer Temperature F	Thermocouple Potentiometer Temperature F	Temperature Difference[c] %
1	Ambient	74°	75°	+1°
2	Tube oven	248°	249	+1°

[a] Every 50°F for each reference point

[b] Type of calibration system used

[c] $\left[\frac{(\text{ref temp, °F} + 460) - (\text{test thermom temp, °F} + 460)}{\text{ref temp, °F} + 460}\right] 100 \leq 1.5\%.$

Oven THERMOCOUPLE CALIBRATION SHEET

Date 6/25/93 Thermocouple Number 1

Ambient Temp. _____ F Barometric Pressure 29.10 in. Hg

Calibrator Bigdon Reference: mercury-in-glass Astm

other _____

Reference Point Number[a]	Source[b] (Specify)	Reference Thermometer Temperature F	Thermocouple Potentiometer Temperature F	Temperature Difference[c] %
1	Ambient	70°	71°	+1°
2	Self Heat	252°	253°	+1°

a Every 50°F for each reference point

b Type of calibration system used

c $\frac{(\text{ref temp, °F} + 460) - (\text{test thermom temp, °F} + 460)}{\text{ref temp, °F} + 460} \times 100 \leq 1.5\%.$

UMBILICAL HOOKUP THERMOCOUPLE CALIBRATION SHEET

Date 9-22-93		Thermocouple Number	1
Calibrator B. Word		Reference:mercury-in-glass	
		Other	

Source	Reference Thermometer Temperature F	Thermocouple Potentiometer Temperature F	Temperature Difference[a] F
Ambient Air	90	91	1
Ice Bath	38	39	1

[a]ReferenceTemperature - Thermocouple Temperature ≤ ± 2°F

UMBILICAL HOOKUP THERMOCOUPLE CALIBRATION SHEET

Date	8-22-93	Thermocouple Number	2
Calibrator	B. Wood	Reference:mercury-in-glass	
		Other	

Source	Reference Thermometer Temperature F	Thermocouple Potentiometer Temperature F	Temperature Difference[a] F
Ambient Air	90	91	1
Ice Bath	39	39	0

[a]ReferenceTemperature - Thermocouple Temperature ≤ ± 2°F

UMBILICAL HOOKUP THERMOCOUPLE CALIBRATION SHEET

Date	8-22-93	Thermocouple Number	3
Calibrator	B. Wood	Reference:mercury-in-glass	
		Other	

Source	Reference Thermometer Temperature F	Thermocouple Potentiometer Temperature F	Temperature Difference[a] F
Ambient Air	91	91	0
Ice Bath	40	40	0

[a]ReferenceTemperature - Thermocouple Temperature ≤ ± 2°F

APPENDIX F

POSTTEST CALIBRATIONS

BAROMETER CALIBRATION SHEET

Date	9-15-93
Barometer Number	##
Ambient Temperature	72°
Calibrator	Bigdon

Barometer Reading	29.00
Reference Barometer Reading	29.05
Difference	.05

Acceptance Criteria: Difference ≤ 0.1 inch

CONSOLE WORKSHEET

NAME Rigdon K FACTOR 5312 PROJECT # _____

DATE 9/7/93 TRAIN ID #4 PREVIOUS Y FACTOR 1.019

ORIFICE # _____ PYROMETER # _____

	RUN NUMBER 1	RUN NUMBER 2
DGM		
FINAL READING	866.93	870.62
INITIAL READING	863.50	867.20
INLET & OUTLET TEMPERATURES		
INITIAL	64 / 64	68 / 64
FINAL	68 / 64	70 / 65
TIME Sec	300	300
ORIFICE RDG. "H	1.55	1.55
BAR. PRESSURE	29.20	29.20
ROOM TEMP.	63 / 63	63 / 63
PUMP VACUUM Hg"	15	15

CONSOLE CALIBRATION

Project	411775	Orifice number	2
Date	SEP 7 93	Orifice K factor	.5312
Operator	RIGDON	Previous Y factor	1.019
Console Number	4		

	Run 1	Run 2
Final DGM Volume	866.930	870.620
Inital DGM Volume	863.500	867.200
Net DGM Volume (Vm)	3.430	3.420

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	Run 1	Run 2
In/Out DGM Temp.		
Inlet Deg. F		
initial	64.0	68.0
final	68.0	70.0
Outlet Deg. F		
initial	64.0	64.0
final	64.0	65.0
Avg. DGM Temp Deg. F	65.0	66.8
Time, sec.	300.0	300.0
Orifice DH, in. H2O	1.55	1.55
Baro. Press., in. Hg	29.20	29.20
Room temp., Deg. F		
initial	63.0	63.0
final	63.0	63.0
Avg.Room Temp.	63.0	63.0
Pump Vacuum, in. Hg	15	15

ÉÉ

	Run 1	Run 2
Vcr (std)	3.391	3.391
Vm (std)	3.378	3.357
Y Factor	1.004	1.010
Delta H@	1.863	1.868

Average Y	1.007
Average Delta H@	1.865

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+/- 2% criteria	
Percent of Avg Y	.31
	PASS
+/- 5% criteria	
Percent of final Y	1.20
	PASS

GRC 6/8/90

CONSOLE CALIBRATION

Project	411775	Orifice number	2
Date	SEP 7 93	Orifice K factor	.5312
Operator	RIGDON	Previous Y factor	1.019
Console Number	4		

	Run 1	Run 2

BRACKETING WORKSHEET

NAME Bigdon K.FACTOR 1. 3199 2. .6405

PROJECT # _____ DATE 9/7/93 TRAIN I.D. 4#

ORIFICE # 1. 4 2. 5

DGM	1	2
Final Reading	873.61	878.32
Initial reading	871.50	874.20
Difference		

INLET & OUTLET TEMP.		
Initial	70 / 65	71 / 66
Final	71 / 66	71 / 66
Avg. Temp.		
Time	300	300
Orifice rdg. ^H	.56	2.25
Bar. Pressure	29.20	29.20
Room Temp.	64 / 64	64 / 64
Pump Vacuum	17"	16"

ORFICE BRACKETING

Project	962002	Bracket Orfices:	
Date	SEP 7 93	Orifice No. 1	4.
Operator	RIGDON	Orifice NO.1 K factor	.
Orfice Number	5	Orifice No. 2	7.
Orfice Y factor	1.008	Orifice NO.2 K factor	.

	Orfice #1	Orfice #2
Final DGM Volume	873.610	878.320
Inital DGM Volume	871.500	874.200
Net DGM Volume (Vm)	2.110	4.120

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	Orfice #1	Orfice #2
In/Out DGM Temp.		
Inlet		
initial	70.0	71.0
final	71.0	71.0
Outlet		
initial	65.0	66.0
final	66.0	66.0
Avg. DGM Temp	68.0	68.5
Time, sec.	300.0	300.0
Orifice DH, in. H2O	.55	2.25
Baro. Press., in. Hg	29.20	29.20
Room temp., Deg. F		
initial	64.0	64.0
final	64.0	64.0
Avg. Room Temp.	64.0	64.0
Pump Vacuum, in. Hg	17	16

ÉÉÉ

0

	Orfice #1	Orfice #2
Vcr (std)	2.040	4.085
Vm (std)	2.061	4.038
Y Factor (brackets)	.990	1.012

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	Orfice #1	Orfice #2
+/- 2% criteria		
Percent of Y	1.80	.36
	PASS	PASS

GRC 6/11/90

ORFICE BRACKETING

Project	962002	Bracket Orfices:	
Date	SEP 7 93	Orifice No. 1	4.
Operator	RIGDON	Orifice NO.1 K factor	.
Orfice Number	5	Orifice No. 2	7.
Orfice Y factor	1.008	Orifice NO.2 K factor	.

	Orfice #1	Orfice #2
Final DGM Volume	873.610	878.320
Inital DGM Volume	871.500	874.200
Net DGM Volume (Vm)	2.110	4.120

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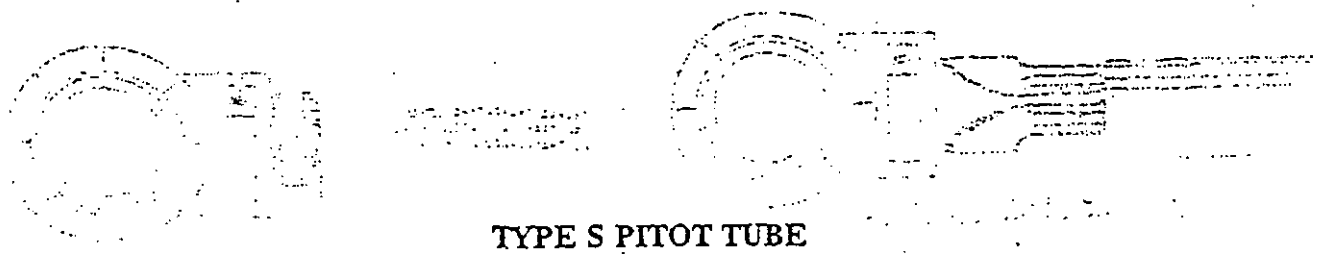
DRY GAS METER THERMOCOUPLE CALIBRATION SHEET

Date	9/7/93	Thermocouple Number	#4
Calibrator	Rigdon	Reference Mercury-in-glass	
		Other	

Thermocouple	Source	Reference Thermometer Temperature (°F)	Thermocouple Potentiometer Temperature (°F)	Temperature Difference* (°F)
Inlet	Ambient Air	64°	64°	0°
	Hot Water Bath	134°	133°	-1°
Outlet	Ambient Air	64°	65°	+1°
	Hot Water Bath	134°	135°	+1°

* Reference Temperature -- Thermocouple Temperature ≤ ± 5.4 °F



TYPE S PITOT TUBE CALIBRATION

PITOT # 7

Calibrator: Rigdon	Project no.:
Date: 9-15-93	Probe no.: 1

Pitot Tube Assembly Level? (Y) / N

Pitot Tube Openings Damaged? Y / (N) (If yes explain below)

α^1 1 ° (<10°) β^1 0 ° (<5°)

α^2 0 ° (<10°) β^2 0 ° (<5°)

Y = 1 O = 0 A = .971 in.

Z = A sin Y .015 in. (<1/8 in.)

W = A sin O _____ in. (<1/32 in.)

P^{α} .485 in. P^{β} .486 in.

DT = .381 in.

Calibration Required? Y / (N) (If yes explain below)

Comments:

STACK THERMOCOUPLE CALIBRATION SHEET

Date 9-15-93 Thermocouple Number 5-1

Ambient Temp. F Barometric Pressure 29.05 in. Hg

Calibrator Rigalos Reference: mercury-in-glass Astm

Other

Reference Point Number[a]	Source[b] (Specify)	Reference Thermometer Temperature F	Thermocouple Potentiometer Temperature F	Temperature Difference[c] %
1	Ambient	72°	72°	0°
2	Tube oven	238°	239°	0° +1°

a Every 50°F for each reference point

b Type of calibration system used

c $\frac{(\text{ref temp, °F} + 460) - (\text{test thermom temp, °F} + 460)}{\text{ref temp, °F} + 460} \times 100 \leq 1.5\%.$

Oven THERMOCOUPLE CALIBRATION SHEET

Date 10-5-93 Thermocouple Number 1

Ambient Temp. _____ F Barometric Pressure 29.25 in. Hg

Calibrator Rigalon Reference: mercury-in-glass Astm

Other _____

Reference Point Number[a]	Source[b] (Specify)	Reference Thermometer Temperature F	Thermocouple Potentiometer Temperature F	Temperature Difference[c] %
1	~~Tape~~ oven Heater	262	260	2°

[a] Every 50°F for each reference point

[b] Type of calibration system used

[c] $\left[\frac{(\text{ref temp, °F} + 460) - (\text{test thermom temp, °F} + 460)}{\text{ref temp, °F} + 460}\right] 100 \leq 1.5\%.$

UMBILICAL HOOKUP THERMOCOUPLE CALIBRATION SHEET

Date 9/15/93		Thermocouple Number	1
Calibrator Rigdon		Reference:mercury-in-glass	Aston
		Other	

Source	Reference Thermometer Temperature F	Thermocouple Potentiometer Temperature F	Temperature Difference[a] F
Ambient Air	72°	73°	+1°
Ice Bath	33°	34°	+1°

[a]ReferenceTemperature - Thermocouple Temperature ≤ ± 2°F

UMBILICAL HOOKUP THERMOCOUPLE CALIBRATION SHEET

Date	9/15/93	Thermocouple Number	2
Calibrator	Rigola	Reference:mercury-in-glass	Astm
		Other	

Source	Reference Thermometer Temperature F	Thermocouple Potentiometer Temperature F	Temperature Difference[a] F
Ambient Air	72°	72°	0°
Ice Bath	33°	33°	0°

[a]ReferenceTemperature - Thermocouple Temperature ≤ ± 2°F

UMBILICAL HOOKUP THERMOCOUPLE CALIBRATION SHEET

Date	9/15/93	Thermocouple Number	3
Calibrator	Rigdon	Reference:mercury-in-glass	Astra
		Other	

Source	Reference Thermometer Temperature F	Thermocouple Potentiometer Temperature F	Temperature Difference[a] F
Ambient Air	72°	72°	0°
Ice Bath	33°	32°	-1°

[a]Reference Temperature - Thermocouple Temperature ≤ ± 2°F

APPENDIX G

PROCESS DATA

PARTICULATE EMISSION TEST
_____ OPERATING DATA
(Type of Source)

Owner	Gothenburg Feed	**Run No.**	1
Source I.D.	Main stack	**Date**	8-31-93

	lbs/hr
Maximum Continuous Process Weight (Manufacturer's Rating)	
Historical Average Process Weight	12,000 pellets
Historical Maximum Process Weight	16,000 pellets

Type and Sources of Fuels Normally Burned	Natural Gas
Approximate Quantities of Each of Above Fuels Burned Annually	59,500 MCF

	Yes	No
Recycling Capability		X

Process Data During Run (Averaged)		
Process Weight (dry)	lbs/hr	
Percent Moisture	%	
Process Weight (wet)	lbs/hr	
How Process Weight Determined	Autoscale - on pellets	

Type of Fuel Burned During Run	Natural Gas

	Yes	No
Recycling in Progress		X

Person Responsible for Data: John Holm

Signature: John Holm

Title/Position: Mgr.

• Averages of operating data taken during actual test run, unless requested otherwise.

Pellets - 4.36 TPH / 13.1 ton pellets

PROCESS DATA

Plant	Gothenburg Feed	Location	Goth
Source Type	12' MEC 3 pass Dryer	Rated Production	25,000 # H_2O/hour
Date: 8-31-93	Time: 9:00-10	Actual Production	9,962 # H_2O/hour
Air Flow Data		Run No.	1+2

Mechanical Collector

Tube Diameter (in.)		No. of Tubes	1	Design ΔP _____ in. H_2O @ Gas Temp. _____ °F	
Observed ΔP _____ in. H_2O				Design cfm/tube @ Observed ΔP _____ @ _____ °F	
Fan Rated H.P.		Operating Volts		Operating Amps	

Electrostatic Precipitator

Field No.	Primary Voltage (volts)	Primary Current (amps)	Secondary Voltage (kV)	Secondary Current (ma)	Spark Rate (per min.)

Scrubber

Type		ΔP (across scrubber) _____ in. H_2O			
Fan Rated H.P.		Operating Volts		Operating Amps	
Liquid Circulation Rate (gal/min)		% Make-up		Blowdown (gpm)	
Scrubbing Water Change Interval					
Settling Tank Cleaning Interval					

Baghouse

Pressure-Positive	Positive	Negative		No. Compartments	1
Type Cleaning	Reverse Air	Clean Cycle (min.)	2/min		
Average Baghouse ΔP 3.3 in. H_2O		ΔP Range _____ in. H_2O			
Fan Rated H.P.	25	Operating Volts	460	Operating Amps	18

Cyclone

Type	Neg	ΔP 8.476 in. H_2O		Diameter	12' scroll inlet
Fan Rated H.P.	200	Operating Volts	460	Operating Amps	88

Person Responsible for Data: John Holm

Signature: John R Holm

Title/Position: V Plant Mgr

*Average of operating data taken during actual test run, unless requested otherwise.

	14-24 3/4	10 3/4	Downstream 10 3/4	upstream 17-22 5	Cyclone = 3.75 x .82 = 4.92"
					Manometer
	Hay Moisture	scale	Pellet Moisture		cyclone Baghouse 17 1/2-4 22 5
8:45	57	255509	5.59		4 x .827 = 3.3
9:00	58	255535	6.42		74154
9:15	60.5	255559	6.26		
9:30	61.5	255577	6.04		
9:45	60.5	255600	6.37		
10:00	61.5	255627	5.[illegible]		
10:15	59.5	255648	5.70		
10:30	62	255668	6.37		
10:45	58	255695	6.16		
11:00	59	255718	5.00		
11:15	56	255745	" "		
11:30		255768	" "		
11:45		255791	5.69		
12:00		255			

	Hay moisture	Scale	Pellet moisture %
2:00	47.5		
2:15	38.5	256055	6.77%
2:30	37.5	256090	5.53%
2:45	37.9	256115	6.72 %
3:00	31.0	256143	6.90 %
3:15	35.6	256176	7.70 %
3:30			
3:45			
4:00			
4:15			
4:30			

alfalfa
Sec. #4
Ref. #5