AP-42 Section Number: 9.10.1.2

Reference Number: 13

Title: Report on Compliance Testing Performed at Western Sugar Company Pulp Dryer, Scottsbluff, NE

Clean Air Engineering

Clean Air Engineering

January 1990

AP-42 Section 9.10.1.2
Reference 13
Report Sect.
Reference

207 Woodwork Ln. • Palatine, IL 60067 • 708/991-3300

Clean Air Engineering

January 12, 1990

Note that this pulp dryer has been modified since this testing, but this data may still be useful for emissions from a micronized-coal fired dryer.

REPORT ON COMPLIANCE TESTING

Performed at:
WESTERN SUGAR COMPANY
PULP DRYER
SCOTTSBLUFF, NE
CAE Project No: 5119

WESTERN SUGAR COMPANY
CAE Project No: 5119

CONTENTS

SUMMARY

INTRODUCTION

Western Sugar Company contracted Clean Air Engineering to perform compliance testing at their facility in Scottsbluff, Nebraska.

Simultaneously testing took place at the North and South Stacks to the Pulp Dryer on December 12 and 13, 1989. The following coordinated the field sampling:

M. Hohl - Western Sugar Company
D. Meier Henry - Nebraska Dept. of Environ. Control
G. Pavlovics - Clean Air Engineering
D. Klassen - Clean Air Engineering

SUMMARY OF TEST RESULTS

Particulate

The weighted average of the overall particulate concentration for the combined North and South Stacks was 0.0906 gr/dscf. This corresponds to a straight average emission rate of 23.1 lb/hr or 0.649 lb/ton of process weight.

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

Respectfully submitted,

CLEAN AIR ENGINEERING

Georg Pavlovics
Manager Western Region

Elizabeth Williams
Manager Technical Communications

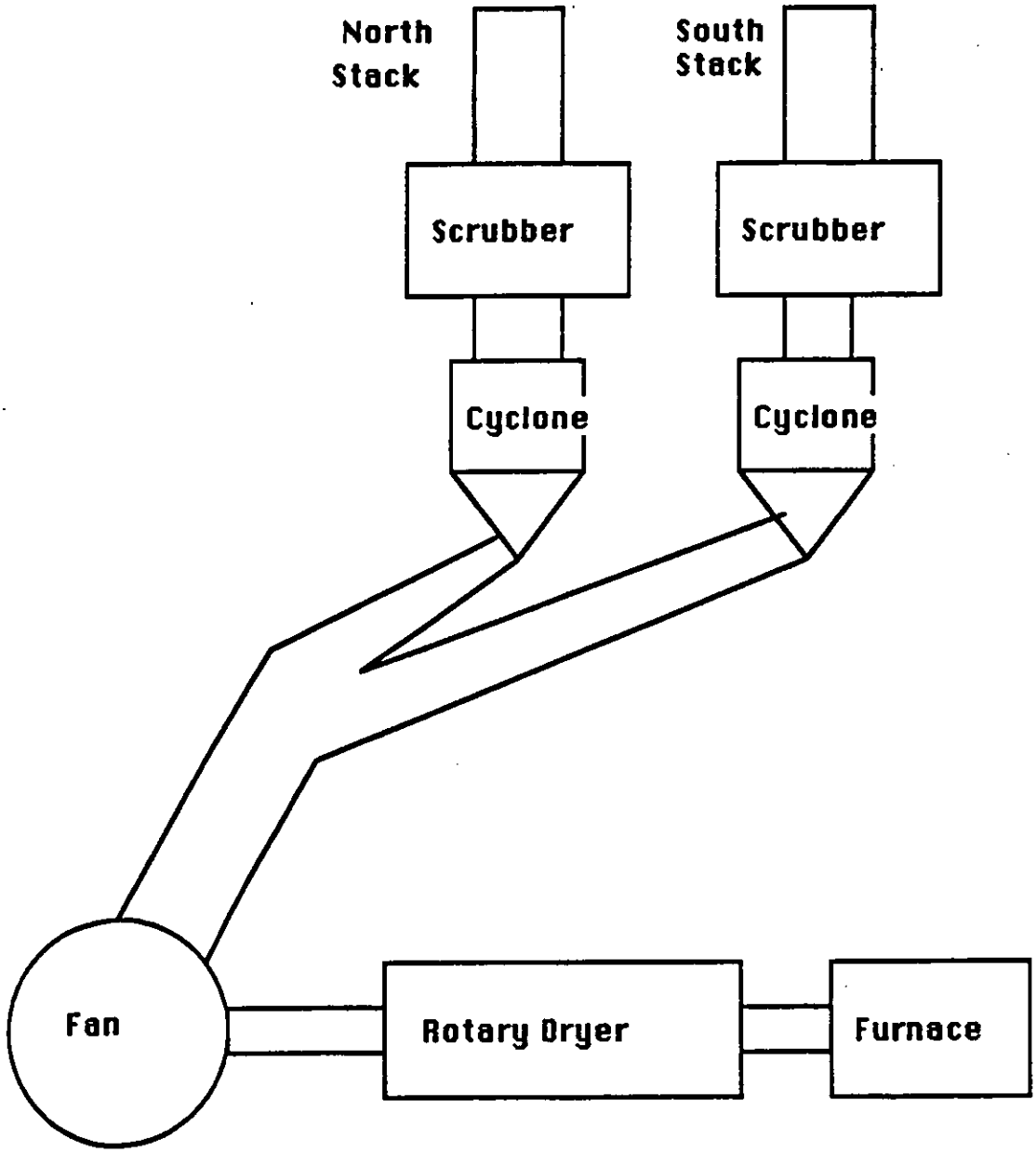
DESCRIPTION OF INSTALLATION

The Western Sugar Company manufactures sugar. After the sugar is produced the remaining pulp is made into feed pellets. The sugar beet pulp drying process is based on a slice rate and is powered by coal. The hot air flowing through the rotary dryer is furnished by a furnace. The sugar beets enter the cylindrical rotary dryer at one end and exit the other end as a pulp.

The air flow through the dryer is regulated by the dryer outlet pressure. The gas exits the dryer outlet and enters the fan inlet, where the gas is forced into two different cyclones. After the gas exits the cyclones, it enters two separate spray dryers or scrubbers. The gas then exits two separate stacks. A schematic of the process is shown in Figure 1 on page 2-2.

FIGURE 1

A schematic of the process is shown.



SAMPLING PROCEDURES

The sampling followed procedures detailed in U.S. Environmental Protection Agency (EPA) Methods 1, 2, 3, 4, and 5. 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 Carbon Dioxide, Oxygen, Excess Air and Dry Molecular Weight;"
- Method 4--"Determination of Moisture Content in Stack Gases;"
- Method 5--"Determination of Particulate Emissions from Stationary Sources."

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

The sampling apparatus is shown in Figure 2 on page 3-2. The sampling equipment was designed and manufactured by the Research Appliance Co. and Clean Air Engineering to meet U.S. EPA standards. All equipment was calibrated at the Clean Air Engineering laboratory prior to shipment to the job site.

Sampling Locations

The Pulp Dryer has two identical stacks, each having two ports. 12 points were sampled per port. For the North Stack, the sampling time per point was 3 minutes for a total sampling time of 72 minutes. For the South Stack, the sampling time per point was 3.5 minutes for a total sampling time of 84 minutes. The stack sampling point locations are shown in Figure 3 on page 3-3.

FIGURE 2

The EPA Method 5 (Misco) sampling apparatus is shown.

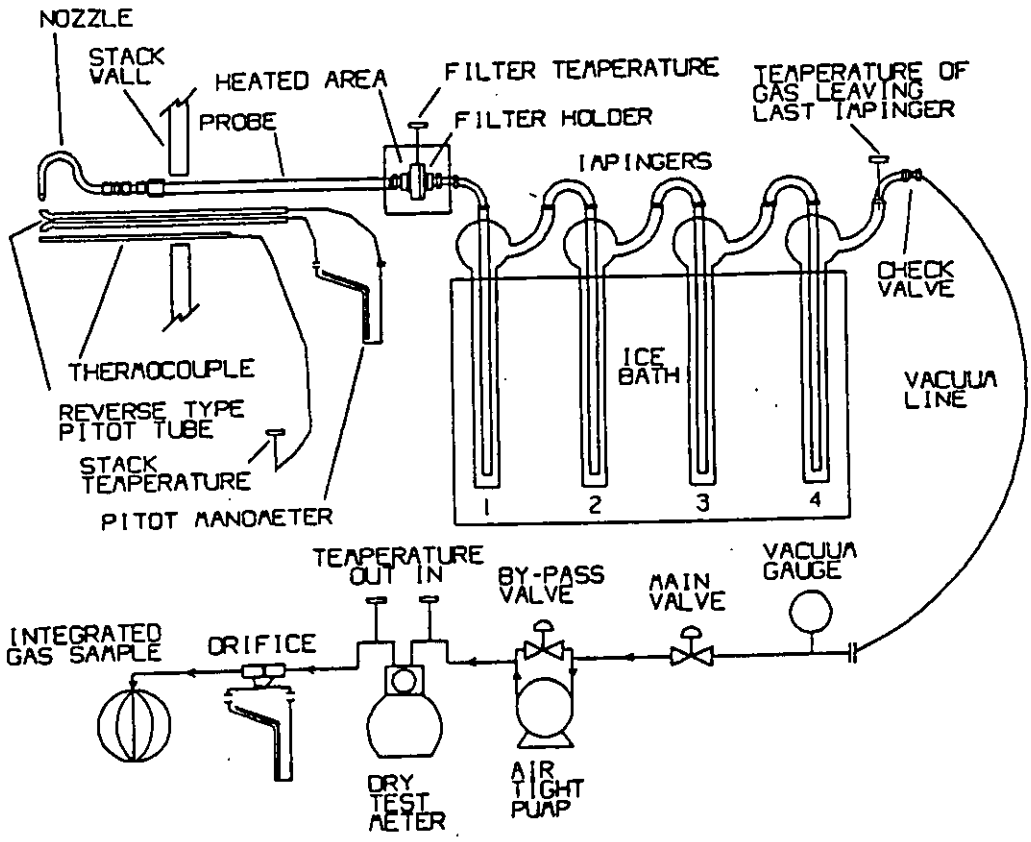
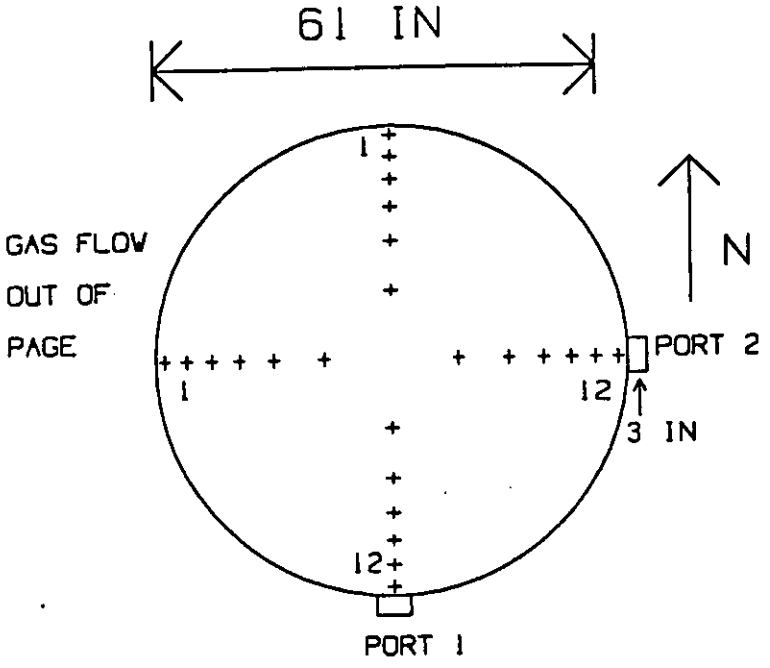


FIGURE 3

The cross section of the stack shows sampling point locations.

One of Two Identical Locations



TRAVERSE POINT	PORT TO POINT DISTANCE (IN)
1	62.7
2	59.9
3	56.8
4	53.2
5	48.7
6	42.2
7	24.7
8	18.2
9	13.8
10	10.2
11	7.0
12	4.2

SUMMARY OF PROCEDURES (Continued)

ANALYTICAL PROCEDURES

Particulate

The particulate emission rate was determined following procedures detailed in EPA Method 5. Particulate samples collected on Whatman 934 AH glass fiber filters were analyzed gravimetrically. The probe and nozzles were washed with acetone. The wash was transferred to tared beakers and evaporated to dryness. These weight differentials were combined to determine total particulate matter.

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 documented in "Quality Assurance Manuals for Air Pollution Measurement Systems," Vol 3, "Stationary Source Specific Methods" (EPA-600/4-77-027b).

RESULTS

The results of analysis for combined particulate tests are presented in Table 1 on page 4-2.

The results of analysis for the particulate tests performed at the North and South Stacks are presented in Tables 2 and 3 on pages 4-3 and 4-4, respectively.

WESTERN SUGAR COMPANY
CAE Project No: 5119

TABLE 1 - Particulate Results

EPA Method 5
Pulp Dryer North and South Stacks Combined
December 13, 1989

RUN NO.	2	3	4
Start Time (approx.)	10:17 am	2:12 pm	5:08 pm
Stop Time (approx.)	11:46 am	3:38 pm	8:21 pm
Process Data			
Coal (tons/hr)	3.20	3.39	3.48
Molasses (tons/hr)	0.57	0.57	0.83
% MARC	19.5	19.6	17.4
Pressed Pulp (tons/hr)	32.01	29.92	34.38
Process Wt. (tons/hr)	35.21	33.31	37.86
Gas Conditions			
Temperature (^{o}F)	158	159	161
Moisture (volume %)	31.5	31.6	31.6
O_2 (dry volume %)	16.1	16.0	15.8
CO_2 (dry volume %)	3.9	4.1	4.2
Volumetric Flow Rate			
acfm	57,977	57,612	59,560
dscfm	29,512	29,257	30,180
Particulate Results			
gr/dscf	0.0749	0.0896	0.1070
lb/hr	19.0	22.5	27.7
lb/ton	0.540	0.676	0.732

• See discussion

WESTERN SUGAR COMPANY
CAE Project No: 5119

TABLE 2 - Particulate Results

EPA Method 5
Pulp Dryer South Stack
December 13, 1989

RUN NO. *	2	3	4
Start Time (approx.)	10:17 am	2:12 pm	5:08 pm
Stop Time (approx.)	11:46 am	3:38 pm	8:21 pm
Process Data			
Pressure Differential			
Demister (in. H_2O)	0.2	0.2	0.2
Cyclone (in. H_2O)	2.2	1.9	2.6
Scrubber (in. H_2O)	2.2	2.6	2.2
Gas Conditions			
Temperature (^oF)	161	162	162
Moisture (volume %)	32.9	32.8	32.7
O_2 (dry volume %)	16.2	16.1	15.7
CO_2 (dry volume %)	3.9	3.9	4.2
Volumetric Flow Rate			
acfm	31,668	31,181	33,617
dscfm	15,750	15,497	16,747
Particulate Results			
gr/dscf	0.1033	0.0941	0.1081
lb/hr	14.0	12.5	15.5

* See discussion

TABLE 3 - Particulate Results

EPA Method 5
Pulp Dryer North Stack
December 13, 1989

RUN NO. *	2	3	4
Start Time (approx.)	10:17 am	2:12 pm	5:08 pm
Stop Time (approx.)	11:46 am	3:38 pm	8:21 pm
Process Data			
Pressure Differential			
Demister (in. H_2O)	.1	.2	.2
Cyclone (in. H_2O)	2.7	2.7	2.5
Scrubber (in. H_2O)	1.8	1.8	2.0
Gas Conditions			
Temperature (^oF)	155	156	159
Moisture (volume %)	30.1	30.3	30.4
O_2 (dry volume %)	16.0	15.8	15.8
CO_2 (dry volume %)	3.9	4.2	4.2
Volumetric Flow Rate			
acfm	26,309	26,431	25,943
dscfm	13,762	13,760	13,433
Particulate Results			
gr/dscf	0.0425	0.0845	0.1056
lb/hr	5.0	10.0	12.2

* See discussion

TABLE 4 - Cyclonic Flow Check

EPA Method 5
Pulp Dryer North and South Stacks
December 13, 1989

North

Port-Point	Angle from Vertical
2-1	-3
2-2	-3
2-3	+2
2-4	-5
2-5	+5
2-6	-4
2-7	+12
2-8	-5
2-9	+10
2-10	+5
2-11	+3
2-12	+3

Average Absolute Angle
5 degrees

South

Port-Point	Angle from Vertical
2-1	-9
2-2	-10
2-3	0
2-4	+5
2-5	+5
2-6	+11
2-7	0
2-8	+3
2-9	+6
2-10	+10
2-11	+15
2-12	+15

Average Absolute Angle
7 degrees

DISCUSSION

Before even beginning compliance testing on the pulp drying process, CAE personnel had performed a preliminary cyclonic flow check. The results are presented in Table 4 on page 4-5. The results were within the EPA limits, and allowed CAE to perform compliance tests without taking into account excessive swirling effects in either stack.

The first run was performed on December 12, 1989 and was not isokinetic. This was the result of stack gas moisture that was approximately 10% higher than in previous testing. This run was voided and as a result was not presented in the report.

The remaining runs were performed on December 13, 1989. The stack gas flow rates were such that a 0.302 inch instead of a 0.370 inch nozzle was used to maintain isokinetic sampling at the South Stack. Therefore, the run time was extended to 84 minutes to sample the required standard meter volume of dry gas.

The results obtained at the South Stack were consistent with the grain loading varying from 0.09 to 0.10 gr/dscf as seen in Table 2. The gas conditions and volumetric flow rate between runs were also consistent.

The results obtained at the North Stack were not consistent with the grain loading varying from 0.04 to 0.11 gr/dscf as seen in Table 3. However, the gas conditions and volumetric flow rates between runs were consistent. The more than doubling of the grain loading from runs 2 to 4 cannot be explained in light of the test procedures performed, process data collected, and consistent grain loading results acquired at the North Stack.

In comparing the results of both stacks, it was seen that runs 2, 3, and 4 at the South Stack were consistent with runs 3 and 4 at the North Stack. This was determined by comparing the velocity of the gas at both locations. The stack gas velocity at the North Stack was approximately 80% that of the South. Therefore, the grain loading at the North should have been approximately 80% that of the South. This of course does not take into account the particle size of the particulate in the gas stream.

DISCUSSION (continued)

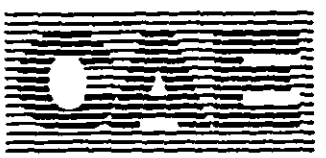
The grain loading at the North Stack was about 76% that of the South Stack. Even after taking into account the differing stack gas velocities, the grain loading for run 2 seemed low at the North Stack, and other factors may have to be considered. In observing the overall results for each run after combining both locations in Table 1, it can be seen that the particulate grain loading varied from 0.07 to 0.11 grains/dscf. Again, the low value for run 2 may be attributed to the results obtained at the North Stack. The pressure drops across the mechanical collectors seem consistent from run 2 through 4 for the North Stack. Even after looking at the process data for run 2 in Table 3, the results cannot be explained.

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 to gross calories (scf/MBtu)
GCV	-	gross calorific value of fuel (Btu/lb)
$\overline{DH}$	-	average pressure drop across the meter box orifice (in. H_2O)
$\sqrt{\overline{DP}}$	-	average of 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: $90 \le \%I \le 110\%$)
K_p	-	pitot tube constant: 85.49 (ft/sec)$\frac{\sqrt{(lb/lb-mole)(\text{in. Hg})}}{\sqrt{(^{\circ}R)(\text{in. } H_2O)}}$
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 (^oR)
T_i	-	initial absolute temperature of flask (^oR)
$\overline{T_m}$	-	average dry gas meter temperature (^oF)
$\overline{T_s}$	-	average stack temperature (^oF)
T_{std}	-	absolute temperature, standard conditions (528^oR)
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

WESTERN SUGAR COMPANY
CAE Project No: 5119

SAMPLE CALCULATIONS - South Run 2

1. Volume of water collected

$$V_{wstd} = (0.04707)(V_{lc})$$

$$= (0.04707)(343)$$

$$= 16.15 \text{ wscf}$$

2. Volume of gas metered, standard conditions

$$V_{mstd} = \frac{(17.64)(V_m)[P_b + DH_{avg}/13.6](y_d)}{(460 + T_m)}$$

$$= \frac{(17.64)(38.91)[26.1+0.57/13.6](1.0038)}{(460 + 86)}$$

$$= 32.95 \text{ dscf}$$

3. Moisture content

$$B_{wo} = \frac{V_{wstd}}{V_{mstd} + V_{wstd}}$$

$$= \frac{16.15}{32.95 + 16.15}$$

$$= 0.3289 \text{ or } 32.89\%$$

4. Molecular weight of dry gas stream

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

$$= 0.44 (3.9) + 0.32(16.2) + 0.28(79.9)$$

$$= 29.27$$

SAMPLE CALCULATIONS - Continued

5. Molecular weight of stack gas

$$Ms = Md\,(1-Bwo) + 18(Bwo)$$

$$= 29.27(1-0.3289) + 18(0.3289)$$

$$= 25.56$$

6. Velocity of stack gas

$$Vs = Kp\,Cp\,(DPavg)^{1/2}\,\frac{[Tsavg + 460]^{1/2}}{[(Ms)(Ps)]^{1/2}}$$

$$= 85.49(0.84)(0.375)\,\frac{(161 + 460)^{1/2}}{[(25.56)(26.09)]^{1/2}}$$

$$= 26.0 \text{ ft/sec}$$

7. Total flow of stack gas

$$Qa = (60)\,(As)\,(Vs)$$

$$= (60)\,(20.3)(26.0)$$

$$= 31{,}668 \text{ ACFM}$$

$$Qstd = Qa\,Ps\,(17.64)\,(1 - Bwo)$$

$$= 31{,}668(17.64)\,(1 - 0.3289)$$

$$= 15{,}750 \text{ DSCFM}$$

WESTERN SUGAR COMPANY
CAE Project No: 5119

SAMPLE CALCULATIONS - Continued

8. Percent isokinetic (point 1-1)

$$\%I = \frac{(0.09450)\,(Tsavg + 460)\,Vmstd}{Ps\ Vs\ An\ \phi\ (1 - Bwo)}$$

$$= \frac{(0.09450)\,(161 + 460)\,(32.95)}{(26.09)(26.0)(0.0005)(84)(1-0.3289)}$$

$$= 101.7$$

9. Particulate

$$gr/dscf = \frac{(15.43)\,(Mn)}{Vmstd}$$

$$= \frac{(15.43)(.2206)}{32.95}$$

$$= 0.1033$$

$$lb/hr = \frac{(gr/dscf)\,(Qstd)\,(60)}{7000}$$

$$= (0.1033)\,(15{,}750)\,(60) / (7000)$$

$$= 13.94$$

$$\text{average gr/dscf (runs 2,3,4)} = \frac{SUM\,[\,(gr/dscf)\,(dscfm)\,]}{SUM\,(dscfm)}$$

$$= \frac{4895.59}{47994.00}$$

$$= .102$$

(Run 2 North and South Combined)

$$lb/ton = \frac{emission\ rate\ (lbs/hr)}{process\ wt\ (tons/hr)}$$

$$= (19.0) / (35.21)$$

$$= 0.540$$

SAMPLE CALCULATIONS - Continued

10. Statistical computations (Run 2 South Temperature)

Std Deviation= $[\text{SUM } (Ri - Ravg)2 / (n-1)]^{1/2}$
$i = 1\text{-}24$

$= [(126)/(23)]^{1/2}$

$= 2.34$

Variance $=$ $(\text{std deviation})^2$

$= (2.34)^2$

$= 5.48$

RMS Dev. $= \frac{(\text{std dev})(100)}{(\text{avg})}$

$= (2.34)(100)/(160.5)$

$= 1.46$

R_i = The temperature for point i of a designated run
i = The point that was traversed for a designated run
R_{avg} = The average of the temperatures for all points i traversed for a run

11. Pulp dryer process data (run 2 North and South combined)

% MARC $=$ (% sugar)(.215) + (1.6)

$= (19.5)(.215) + (1.6)$

$= 5.79$

SAMPLE CALCULATIONS - Continued

$$\text{pressed pulp (tons/hr)} = \frac{(\%MARC)\,(\text{Slice Rate})\,(100 - \text{Dry Pulp Moisture})}{(100 - \text{Pressed Pulp Moisture})}$$

$$= \frac{(5.79)\,(170)\,(100 - 11.2)}{(100 - 72.7)}$$

$$= 32.01$$

$$\text{Process Wt. (tons/hr)} = \text{coal feed (tons/hr)} + \text{pressed pulp (tons/hr)}$$

$$= 3.2 + 32.01$$

$$= 32.21$$

PARAMETERS

PARAMETERS
DRYER SOUTH

RUN NO.	2	3	4
AN	0.00049	0.00049	0.00049
AS	20.3	20.3	20.3
BWO	0.3289	0.3283	0.3267
%CO2	3.9	3.9	4.2
CP	0.84	0.84	0.84
DH (AVG)	0.57	0.56	0.64
DH@	1.791	1.791	1.791
DP1/2 (AVG)	0.375	0.369	0.399
%I	101.7	103.1	101.5
MD	29.27	29.26	29.30
MN ← TOTAL PARTICULATE MATTER COLLECTED (FRONT HALF)	0.2206	0.2009	0.2459
MS	25.56	25.57	25.61
%O2	16.2	16.1	15.7
PB	26.1	26.1	26.1
PS	26.09	26.09	26.09
RUN TIME	84	84	84
TM (AVG)	86	92	87
TS (AVG)	161	162	162
VLC	343	342	362
VM	38.91	39.27	41.508
VMSTD	32.95	32.94	35.11
VS	26	25.6	27.60
VWSTD	16.15	16.10	17.04
YD	1.0038	1.0038	1.0038

PARAMETERS
DRYER NORTH

UN NO.	2	3	4
N	0.00074	0.00074	0.00074
.S	20.3	20.3	20.3
;WO	0.3010	0.3032	0.3036
;CO2	3.9	4.2	4.2
:P	0.84	0.84	0.84
)H (AVG)	0.87	0.88	0.86
)H@	1.692	1.692	1.692
)P1/2 (AVG)	0.315	0.316	0.310
%I	98.1	99.9	102.5
MD	29.26	29.30	29.30
MN	0.1061	0.1990	0.2497
MS	25.87	25.88	25.87
%O2	16.0	15.8	15.8
PB	26.1	26.1	26.1
PS	26.09	26.09	26.09
RUN TIME	72	72	72
TM (AVG)	39	55	48
TS (AVG)	155	156	159
VLC	326	336	338
VM	38.48	40.38	40.12
VMSTD	35.64	36.34	36.49
VS	21.6	21.7	21.30
VWSTD	15.34	15.82	15.91
YD	1.0034	1.0034	1.0034

BACK-HALF CONDENSIBLES

	2	3	4
SOUTH STACK (MN)	0.0196	0.0113	0.0133
NORTH STACK (MN)	0.0114	0.0154	0.0131

CALIBRATION DATA

Date: 12-11-89 Pitot Number: D-10

TYPE S PITOT TUBE INSPECTION DATA

Pitot tube assembly level? X yes ____ no

Pitot tube openings damaged? ____ yes (explain below) P no

α_1 = 2° (<10°), α_2 = 3° (<10°), β_1 = 1° (<5°)

β_2 = 1° (<5°)

Y = 3°, θ = 2°, A = .548 ~~cm~~ (in.)

Z = A sin Y = .029 ~~cm~~ (in.); < ~~0.32 cm~~ (< 1/8 in.), .125"

W = A sin θ = .019 ~~cm~~ (in.); < ~~0.08 cm~~ (< 1/32 in.) .03125

P_a .273 ~~cm~~ (in.) P_b .275 cm (in.)

D_t = .25 cm (in.) $\frac{P}{D_t} = \frac{1.10}{P_a - P_b = P}$ (≥1.05 and≤1.50)

COMMENTS: Pitot Tube Assemby is geometrically correct

USED SOUTH STACK - WESTERN SUGAR - 12-13-89

Calibration required? ____ yes X no

Calibrated by: Daniel Klassen

Clean Air Engineering, Inc.

Date: 12-11-89 Pitot Number: D-64

TYPE S PITOT TUBE INSPECTION DATA

Pitot tube assembly level? X yes _____ no

Pitot tube openings damaged? ____ yes (explain below) X no

α_1 = 0° (<10°), α_2 = 2° (<10°), β_1 = 1° (<5°)

β_2 = 3° (<5°)

Y = 2°, θ = 2°, A = .560 ~~cm~~ (in.)

Z = A sin Y = .020 ~~cm~~ (in.); < ~~0.32 cm~~ (< 1/8 in.), .125"

W = A sin θ = .020 ~~cm~~ (in.); < ~~0.08~~ cm (< 1/32 in.) .0312 5

P_a 0.265 ~~cm~~ (in.) P_b 0.295 ~~cm~~ (in.)

D_t = 0.25 cm (in.) $\frac{P}{D_t} = \frac{1.12}{P_a = P_b = P}$ (≥1.05 and≤1.50)

COMMENTS: Pitot Tube Assembly is Geometrically Correct

USED N. STACK - WESTERN SUGAR - 12-13-89

Calibration required? ____ yes X no

Calibrated by: Michael Kullgren

Clean Air Engineering, Inc.

Date: April 18, 1989

Operator: C.T. FULTON

Meter Box No.: LSI - 01	Meter Box ΔH@: 1.791	Meter Box Yd: 1.0038	Barometric Press.: 25.19

				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 θ	Yd	ΔH@
.3238	0.5	-9.8	1.00	0	9.0190	9.0190	31.5260	41.4320	9.9060	78	78	78	158	133	141	23.005	0.9857	1.973
.3337	0.5	-9.8	1.00	9.0190	18.3160	9.2970	41.4320	51.3920	9.9600	78	78	78	143	114	128	23.009	0.9898	1.897
.5899	1.5	-12.2	1.00	0	10.7170	10.7170	54.9180	66.1260	11.2080	78	78	78	145	120	132	15.006	1.0107	1.809
.5823	1.5	-12.2	1.00	10.7170	21.2950	10.5780	66.1260	77.4590	11.3330	78	78	78	153	127	140	15.004	0.9989	1.833
.8618	3.0	-24.7	1.00	0	10.5120	10.5120	79.8160	90.6240	10.8080	78	78	78	175	133	154	10.005	1.0206	1.613
.8624	3.0	-23.2	1.00	10.5120	20.9550	10.4430	90.6240	101.5440	10.9200	78	78	78	181	138	159	10.002	1.0169	1.619

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

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

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

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

POST TEST CALIBRATION CHECK

Client/Owner: Western Sugar, Ft. Morgan, Co.

Operator: C.T. Fulton

Project Number: 4627

Date: 02-02-89

Meter Box No.:	LSID-1	Meter Box Vacuum:	6	Meter Box Yd:	1.0038	Barometric Press.:	24.93

				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 θ	Yd	ΔH@
.4961	1.0	-7.0	1.0000	0.000	5.896	5.896	527.625	533.660	6.035	72	66	69	119.5	84.5	102	10:00 30	1.0135	1.821
	1.0	-7.0	1.0000	5.896	11.760	5.864	533.660	539.793	6.133	72	66	69	133.8	93	113.4	10:00 10	1.0120	1.805
	1.0	-7.0	1.0000	11.760	17.542	5.782	539.793	545.927	6.134	72	66	69	144.5	102.5	123.5	10:00 30	1.0153	1.824

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

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

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

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

CLEAN AIR ENGINEERING, INC.
6830 N. Broadway Suite I
DENVER, COLORADO 80221
(303) 650-9745

VACUUM GAUGE CALIBRATION SHEET

METER LSI D-1 DATE 02-20-89

STANDARD (HG)	VACUUM GAUGE
5" Hg	5" Hg
7" Hg	7" Hg
10" Hg	10" Hg
12" Hg	12" Hg
15" Hg	15" Hg
17" Hg	17" Hg

Clean Air
Engineering, Inc.

207 N. Woodwork Lane Palatine, Illinois 60067 312-991-3300

THERMOMETER CALIBRATION

DATE 02-20-89 METER LSID-1 OPERATOR C.T. FULTON

STANDARD	INLET	OUTLET
Room Temp 76°	76°	76°
Boiling Water 200°	200°	200°
Ice Water 32°	32°	32°

Meter Box No.: C	Meter Box ΔH@: 1.751	Meter Box Yd: .9839	Barometric Press.: 25.05

				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 θ	Yd	ΔH@
.3672	.50	-2.6	1.0000	0.000	10.432	10.432	101.263	112.040	10.777	66	60	63	87.5	76.5	82	24.0	.9940	1.690
.3655	.50	-2.6	1.0000	10.432	20.813	10.381	112.040	122.996	10.956	66	60	63	94.5	84	89.25	24.0	.9860	1.684
.6249	1.5	-5.6	1.0000	0.000	11.094	11.094	124.237	135.947	11.71	66	60	63	97.3	88	92.65	15.0	.9803	1.718
.6216	1.5	-5.6	1.0000	11.094	22.129	11.035	135.947	147.662	11.715	66	60	63	102	90	96	15.0	.9806	1.725
.8482	3.0	-10.0	1.0000	0.000	10.039	10.039	150.830	161.364	10.534	66	60	63	106	93.5	99.75	10.0	.9814	1.841
.8456	3.0	-10.0	1.0000	10.039	20.047	10.008	161.364	171.908	10.544	66	60	63	108.5	95	101.75	10.0	.9809	1.846

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

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

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

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

POST TEST CALIBRATION CHECK

Client/Owner: Western Sugar

Project Number: UNIC

Operator: C. T. Fulton

Date: 11-14-89

Meter Box No.:	Meter Box Vacuum:	Meter Box Yd:	Barometric Press.:
C	11	1.0034	24.78

				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 θ	Yd	ΔH@
.5882	1.4	-6.0	1.0000	0.000	7.105	7.105	881.233	888.594	7.361	70	66	68	102	94	98	10.0	.9978	1.773
.5912	1.4	-6.0	1.0000	7.105	14.246	7.141	888.594	896.032	7.438	70	66	68	104	96	100	10.0	.9960	1.748
.5918	1.4	-6.0	1.0000	14.246	21.395	7.149	896.032	903.509	7.477	70	66	68	104	96	100	10.0	.9919	1.745

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

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

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

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

Clean Air
Engineering, Inc.

207 N. Woodwork Lane Palatine, Illinois 60067 312-991-3300

THERMOMETER CALIBRATION

DATE 04-17-89 METER C OPERATOR C. Fulton

STANDARD	INLET	OUTLET
34	34	35
76	77	77
100	100	101
120	121	119

CAE

CLEAN AIR ENGINEERING, INC.
6830 N. Broadway Suite I
DENVER, COLORADO 80221
(303) 650-9745

VACUUM GAUGE CALIBRATION SHEET

METER C

DATE 02-17-89

STANDARD (HG)	VACUUM GAUGE
5" Hg	5" Hg
7" Hg	7" Hg
9.6" Hg	10" Hg
11.4" Hg	12" Hg
14.2" Hg	15" Hg
17.8" Hg	18" Hg

WEIGHT SHEETS

WESTERN SUGAR
CAE Project No: 5119

ALL WEIGHTS SORTED BY RDS

RDS	RUN	SH #	WT #	IDENTIFIER	FB T	WASH ML	CORR	GROSS	TARE	NET
		2	9	BLANK	B	150	0.0000	59.3853	59.3848	0.0005
		3	8	BLANK	B	500	0.0000	60.3490	60.3481	0.0009
1	2S	2	3	358	B	170	0.0006	66.3249	66.2781	0.0462
1	2S	1	9	48432	F	-----	------	0.6801	0.5057	0.1744
1	2S	3	4	43	B	343	0.0006	61.7126	61.6924	0.0196
2	3S	2	5	312	B	130	0.0004	67.6524	67.6231	0.0289
2	3S	1	5	48438	F	-----	------	0.6752	0.5032	0.1720
2	3S	3	5	63	B	342	0.0006	60.6012	60.5893	0.0113
3	4S	2	7	322	B	190	0.0006	68.2758	68.2293	0.0459
3	4S	1	4	48437	F	-----	------	0.7047	0.5047	0.2000
3	4S	3	6	78	B	362	0.0007	60.7084	60.6944	0.0133
4	2N	2	4	370	B	170	0.0006	67.7911	67.7809	0.0096
4	2N	1	7	48429	F	-----	------	0.6002	0.5037	0.0965
4	2N	3	7	81	B	326	0.0006	50.5788	50.5668	0.0114
5	3N	2	6	330	B	175	0.0006	67.8372	67.8228	0.0138
5	3N	1	8	48431	F	-----	------	0.6951	0.5099	0.1852
5	3N	3	2	36	B	336	0.0006	49.1353	49.1193	0.0154
6	4N	2	8	69	B	200	0.0007	67.7538	67.6993	0.0538
6	4N	1	6	48439	F	-----	------	0.7019	0.506	0.1959
6	4N	3	2	36	B	338	0.0006	59.9354	59.9217	0.0131

SH # 1 = filter particulate
2 = probe wash particulate
3 = back half condensible

WESTERN SUGAR
CAE Project No: 5119

WEIGHT SHEET # 1

RD S	RU N	SH #	WT #	IDENTIFIER	FB T	WASH ML	CORR	GROSS	TARE	NET
				BLANK	B	-----	------	-------	-------	------
1	2S	1	9	48432	F	-----	------	0.6801	0.5057	0.1744
2	3S	1	5	48438	F	-----	------	0.6752	0.5032	0.1720
3	4S	1	4	48437	F	-----	------	0.7047	0.5047	0.2000
4	2N	1	7	48429	F	-----	------	0.6002	0.5037	0.0965
5	3N	1	8	48431	F	-----	------	0.6951	0.5099	0.1852
6	4N	1	6	48439	F	-----	------	0.7019	0.5060	0.1959

WEIGHT SHEET # 2

RD S	RU N	SH #	WT #	IDENTIFIER	FB T	WASH ML	CORR	GROSS	TARE	NET
		2	9	BLANK	B	150	0.0000	59.3853	59.3848	0.0005
1	2S	2	3	358	B	170	0.0006	66.3249	66.2781	0.0462
2	3S	2	5	312	B	130	0.0004	67.6524	67.6231	0.0289
3	4S	2	7	322	B	190	0.0006	68.2758	68.2293	0.0459
4	2N	2	4	370	B	170	0.0006	67.7911	67.7809	0.0096
5	3N	2	6	330	B	175	0.0006	67.8372	67.8228	0.0138
6	4N	2	8	69	B	200	0.0007	67.7538	67.6993	0.0538

WEIGHT SHEET # 3

RD S	RU N	SH #	WT #	IDENTIFIER	FB T	WASH ML	CORR	GROSS	TARE	NET
		2	8	BLANK	B	500	0.0000	60.3490	60.3481	0.0009
1	2S	2	4	43	B	343	0.0006	61.7126	61.6924	0.0196
2	3S	2	5	63	B	342	0.0006	60.6012	60.5893	0.0113
3	4S	2	6	78	B	362	0.0007	60.7084	60.6944	0.0133
4	2N	2	7	81	B	326	0.0006	50.5788	50.5668	0.0114
5	3N	2	2	36	B	336	0.0006	49.1353	49.1193	0.0154
6	4N	2	3	41	B	338	0.0006	59.9354	59.9217	0.0131

Particulate Testing
Weight Sheet

Client Western Sugar	Project Number 5119	Analyst D. Amaya / D. Klassen
Plant Scottsbluff	Unit	Balance Sartorius
Test Date 12-13-89	10 CM	

Description	No.	I.D. and Sample Description[1]	Sample volume (ml)[2]	Date/ Time	Gross Weight (g)	Tare Weight (g)	Date/ Time	Net Weight (g)
Type	1	48434				.5053	12.6 AM	
Run						.5056	12.8 PM	
Location			T (F) B					
Type	2	48435				.5055		
Run						.5054		
Location			T (F) B					
Type	3	48436				.5048		
Run						.5045		
Location			T (F) B					
Type Western Sugar	4	48437		12-15-89	0.7046	.5045		
Run 4				12-18-89	0.7048	.5048		.2000
Location South Stack			T (F) B		.7047	.5047		~~.2001~~
Type	5	48438			.6752	.5032		
Run 3				12-15-89	0.6759	.5033		
Location South Stack				12-18-89	0.6747	.5030		.1720
			T (F) B	12-18-89 PM	0.6749			~~.1717~~
Type	6	48439						
Run 4				12-15-89	0.7020	.5058		
Location N. Stack				12-18-89	0.7017	.5061		.1959
			T (F) B		.7019	.5060		~~.1958~~
Type	7							
Run								
Location			T F B					
Type	8							
Run								
Location			T F B					
Type	9							
Run								
Location			T F B					
Type	10							
Run								
Location			T F B					

[1] Note appearance of particulate
[2] Two volumes (e.g. 500/100) indicate an aliquot was taken.
Indicate (T)himble, (F)ilter, or (B)eaker in box below.

Particulate Testing
Weight Sheet

Client Western Sugar	Project Number 4575	Analyst DAT
Plant Scottsbluff	Unit Cyclone Inlet, Stack	Balance Sartorius
Test Date 11/6 & 11/7/89	10 cm Filters	

Description	Wt. No.	I.D. and Sample Description[1]	Sample volume (ml)[2]	Date/ Time	Gross Weight (g)	Tare Weight (g)	Date/ Time	Net Weight (g)
Type West. Sugar	1	48424	T (F) B	11/11/89 - PM	.5396	.5065	10/31 AM	.0329
Run VOID				11/12 - AM	.5393	.5067	10/31 PM	
Location								
Type West. Sugar #4979	2	48425	T (F) B	11/11 - PM	.7403	.5093		.2312
Run 5 11/7/89				11/12 - AM	.7403	.5089		
Location Stack								
Type West. Sugar	3	48426	T (F) B	11/11 - PM	1.7573	.5076		1.2354
Run 5 11/7				11/12 - AM	1.7425	.5071		
Location Cyc. Inlet				11/13 - AM	1.7430			
Type West. Sugar	4	48427	T (F) B	11/11 - PM	.7314	.5100		.2212
Run 6 11/7				11/12 - AM	.7310	.5100		
Location Stack								
Type West. Sugar	5	48428	T (F) B	11/11 - PM	1.0116	.5055		.5008
Run 6 11/7				11/12 - AM	1.0062	.5058		
Location Cyc. Inlet				11/13 - AM	1.0067			
Type WESTERN SUGAR- SCOTTSBLUFF- TESTING 12-13-89	6	48429 # 5119	T (F) B	12-15-89	0.6002	.5039		.0965
Run 2				12-18-89	0.6002	.5035		~~.0967~~
Location North Stack	7				.6002	.5037		
Type		48430	T (F) B			.5100		
Run						.5097		
Location								
Type West. Sugar	8	Test Date - 12-13-89 Job # 5119 48431	T (F) B	12-15-89	.6949	.5100		.1852
Run 3 Scottsbluff				12-18-89	.6953	.5098		~~0.1851~~
Location N. Stack					.6951	.5099		
Type West. Sugar	9	Test Date 12-13-89 48432	T (F) B	12-15-89	0.6805	.5059		0.1744
Run 2 Scottsbluff				12-18-89	0.6799	.5055		
Location S. Stack				12-18-89 PM	0.6799			
					.6801	.5057		
Type	10	48433	T (F) B			.5069		
Run						.5065	X	
Location								

Note appearance of particulate
[2] Two volumes (e.g. 500/100) indicate an aliquot was taken.
Indicate (T)himble, (F)ilter, or (B)eaker in box below.

CONDENSABLES

~~Particulate~~ Testing
Weight Sheet

Client WESTERN SUGAR | Project Number 5119 | Analyst D. Klassen

Plant SCOTTSBLUFF | Unit Pellet Dryer Stacks | Balance Sartorius

Test Date 12-13-89

Description	Wt. No.	I.D. and Sample Description[1]	Sample volume (ml)[2]	Date/ Time	Gross Weight (g)	Tare Weight (g)	Date/ Time	Net Weight (g)
Type	1	#33				51.8543	12-11-89	
Run 2		Broke Beaker				51.8539	12-14-89	
Location North St			TF(B)					
Type	2	#36		12-22-89	49.1355	49.1193	12-11-89	
Run 3			336	1-2-90	49.1351	49.1193	12-14-89	0.0158
Location N. STACK			TF(B)					
Type	3	#41			59.9355	59.9216	12-14-89	
Run 4			338		59.9353	59.9218	12-14-89	0.0137
Location N. Stack			TF(B)					
Type	4	#43			61.7126	61.6922	12-11-89	
Run 2			343		61.7123	61.6925	12-14-89	0.0203
Location South Stack			TF(B)					
Type	5	~~#00~~ 63			60.6013	60.5892	12-11-89	
Run 3			342		60.6010	60.5893	12-14-89	0.0118
Location S Stack			TF(B)					
Type	6	#78			60.7086	60.6942	12-11-89	
Run 4			362		60.7081	60.6946	12-14-89	0.0139
Location S. Stack			TF(B)					
Type	7	#81			50.5789	50.5672	12-11-89	
Run 2			326		50.5787	50.5664	12-14-89	
Location N. Stack			TF(B)			50.5667	12-15-89	0.0123
Type	8	#66			60.3489	60.3482	12-11-89	
Run Blank			500		60.3490	60.3480	12-14-89	0.0009
Location			TFB					
Type	9							
Run			TFB					
Location								
Type	10							
Run			TFB					
Location								

[1] Note appearance of particulate

[2] Two volumes (e.g. 500/100) indicate an aliquot was taken.
Indicate (T)himble, (F)ilter, or (B)eaker in box below.

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Particulate Testing Weight Sheet

Client Western Sugar	Project Number 5119	Analyst Dan Klassen
Plant Scottsbluff	Unit	Balance Sartorius
Test Date 12-13-89		

Description	Wt. No.	I.D. and Sample Description[1]	Sample volume (ml)[2]	Date/ Time	Gross Weight (g)	Tare Weight (g)	Date/ Time	Net Weight (g)
Type Beaker	1	# 352	125	12-15-89 1400	68.5662	69.0977		
Run 1				12-15-89 2000	68.5663	68.5399	12-11-89	.0266
Location South Stack			T F (B)			68.5395	12-14-89	
					68.5663	68.5397		0.0263
Type Beaker	2	# 60	160	12-15-1400	59.1399	59.1132	12-11-89	
Run 1				12-15-2000	59.1396	59.1133	12-14-89	.0265
Location North Stack			T F (B)		59.1398	59.1133		0.0264
Type Beaker	3	# 358	170		66.3250	66.2779	12-11-89	
Run 2					66.3248	66.2782	12-14-89	
Location S. Stack			T F (B)		66.3249	66.2781		.0469
Type Beaker	4	# 370	170		67.7909	67.7810	12-11-89	
Run 2					67.7913	67.7808	12-14-89	.0102
Location N. Stack			T F (B)		67.7911	67.7809		0.0101
Type Beaker	5	# 312	130		67.6522	67.6231	12-11-89	
Run 3					67.6526	67.6231	12-14-89	.0293
Location S. Stack			T F (B)		67.6524	67.6231		0.0291
Type Beaker	6	# 330	175		67.8373	67.8229	12-11-89	
Run 3					67.8370	67.8226	12-14-89	
Location N. Stack			T F (B)		67.8372	67.8228		0.0144
Type Beaker	7	# 322	190		68.2755	68.2294	12-11-89	
Run 4					68.2761	68.2291	12-14-89	.0460
Location S. Stack			T F (B)		68.2758	68.2293		0.0464
Type Beaker	8	# 69	200		67.7537	67.6991	12-11-89	
Run 4					67.7539	67.6995	12-14-89	.0545
Location N. Stack			T F (B)		67.7538	67.6993		0.0546
Type Beaker	9	# 75	150	✓	59.3853	59.3846	12-11-89	
Run Blank					59.3852	59.3849	12-14-89	.0005
Location			T F (B)		59.3853	59.3848		0.0007
Type	10							
Run								
Location			T F B					

[1] Note appearance of particulate
[2] Two volumes (e.g. 500/100) indicate an aliquot was taken.
Indicate (T)himble, (F)ilter, or (B)eaker in box below.

FIELD DATA

Orsat Readings

Client Western Sugar	Project Number 5119
Plant Scottsbluff	Unit STACKS
Date 12-12-89	Fuel Type
Orsat ID	Leak Check? ✓

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

F_o = 1.083 to 1.230 (for bituminous coal)

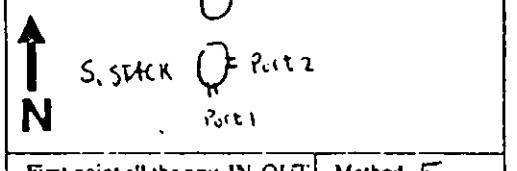
Run Number	Location	Bag ID	Trial	Percent CO_2	Percent $CO_2 + O_2$	Percent O_2	F_o	Sample Time	Analysis Time	Analyst
1	N. STACK		1							
			2							
			3							
			Avg.							
1	S. STACK		1							
			2							
			3							
			Avg.							
2	North Stack		1	3.9	20.0	16.1				
			2	3.9	19.9	16.0				
			3	3.9	19.8	15.9				
			Avg.	3.9		16.0				
2	South Stack		1	3.8	20.0	16.2				
			2	3.9	20.0	16.1				
			3	3.9	20.2	16.3				
			Avg.	3.87		16.2				
3	North Stack		1	4.2	20.0	15.8				
			2	4.2	19.9	15.7				
			3	4.2	19.9	15.7				
			Avg.	4.2		15.76				
3	South Stack		1	4.0	20.1	16.1				
			2	3.8	19.8	16.0				
			3	4.0	20.0	16.0				
			Avg.	3.93		16.07				
4	North Stack		1	4.1	19.9	15.8				
			2	4.2	20.0	15.8				
			3	4.2	20.0	15.8				
			Avg.	4.17		15.8				
4	South Stack		1	4.2	19.8	15.6				
			2	4.2	19.9	15.7				
			3	4.2	19.9	15.7				
			Avg.	4.2						

Location: S. Stack Run: 2

Particulate Testing Field Data Sheet

Client	Western Sugar	Project Number	5119
Plant	Scottsbluff	Unit	
Date	12/13/91	Inlet/outlet/(duct)	So. Stack
Meter Operator	DK		
Probe Operator	DK		

Schematic of Testing Location



Ambient Temp. (°F)	25	Bar. Press. (in. Hg)	26.16
Assumed Moisture (%)	3.2		

Heater Box Setting	248 ± 25	Probe Heater Setting	248 ± 25
Probe Length	7'	Probe Number	D-27
Probe Material	Stainless St.	Acetone Number	
Nozzle Diameter (in.)	0.302	Nozzle Number	

Sample Box Number	~~ER~~	Pyrometer Number	D-01
Meter Box Number	4.5.01		
Meter ΔH@	1.791	Meter Yd	1.0038
K Factor	3.2	Pitot Cp	.84
Pitot Leak Check:	Before	V	After
Leak Rate Before	.012	CFM @ 20	"Hg
Leak Rate After	OK	CFM @	"Hg
Static Pressure (inches H_2O) (+/-)	-0.1		

First point all the way IN OUT	Method	5
Area (ft^2)	Port Len. (in.)	Gas Flow IN OUT

Filter Number	45432	
Thimble Number		
Beaker Number		

IGS Bag ID Number			
% O_2		% CO_2	
H_2O (ml)	335	Silica Gel (gm)	8
Total Vlc	343		

Start Time	10:17 AM / PM	Stop Time	11:46 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 339.642 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)	102 Probe Temp. (°F)	Notes
1-1	3.5	8	156	.12	~~3.7~~ .44	341.26	78	57	41	243	257	
2	7	9	157	.13	.48	342.53	84	56	42	245	265	
3	10.5	9	157	.14	.52	344.17	90	56	43	241	281	K = 4.1
4	14	10	158	.13	.53	345.85	92	57	44	243	275	
5	17.5	10	156	.14	.57	347.47	95	59	44	238	265	
6	21.0	10	159	.14	.57	349.07	97	61	45	241	256	
7	24.5	13	159	.16	.66	350.85	97	62	43	243	257	
8	28.	12	160	.15	.61	352.60	98	62	43	244	261	
9	31.5	11	160	.13	.53	354.24	99	63	45	231	257	
10	35	11	161	.13	.53	355.68	101	64	43	226	254	
11	38.5	11	162	.14	.57	357.30	103	66	43	224	254	
12	42	8	162	.10	.41	358.78	106	66	43	220	260	
Total												
Average												

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Particulate Testing Field Data Sheet

Location: S. Stack **Run:** 2

Client Wisconsin	Project Number 5119
Plant 3,6	Unit 3. Stack
Date 12/13/95	Inlet/outlet/(stack)
Meter Operator DK	
Probe Operator DK	

Schematic of Testing Location

N

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.) .302	Nozzle Number

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) (+/-)	

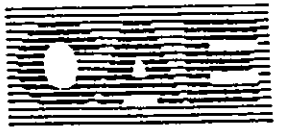
First point all the way IN OUT	Method	
Area (ft^2)	Port Len. (in.)	Gas Flow IN OUT

Filter Number		
Thimble Number		
Beaker Number		

IGS Bag ID Number	
% O_2	% CO_2
H_2O (ml) 335	Silica Gel (gm) 8
Total Vlc 342	

Start Time AM / PM Stop Time 11.46 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
2-1	45.535	10	160	.13	.53	360.34	109	73	41	221	273	
2	49 7	11	161	.14	.57	361.96	111	75	41	228	276	
3	52.510.5	12	161	.15	.61	363.73	112	76	42	231	277	
4	56 14	13	162	.15	.61	365.52	109	77	42	239	264	
5	59.517.5	13	163	.15	.61	367.25	110	78	42	242	256	
6	63 21	13	162	.16	.66	369.07	111	79	43	252	249	
7	66.52345	14	163	.17	.70	371.02	109	80	44	221	252	*
8	70 28	11	162	.15	.61	372.51	110	81	44	231	252	
9	73.535	12	163	.15	.61	374.45	110	82	45	224	250	
10	77 34	12	163	.15	.61	375.57	109	82	45	244	256	
11	80.539.5	9	163	.14	.57	377.06	114	83	45	255	256	
12	84 42	9	163	.13	.53	378.846	114	83	45	257	257	On Work
Total							84					
Average			(160.5)	(.3748)	~~.568~~ .5667	38.904	(86.5)					



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Particulate Testing Field Data Sheet

Page 1 of 2

Location: _____ **Run:** 3

Client Western Sugar	Project Number
Plant Scottsbluff NE	Unit S. Stack
Date 12-13	Inlet/outlet/stack
Meter Operator D. K	
Probe Operator D K	

Ambient Temp. (°F) 22	Bar. Press. (in. Hg) 26.10
Assumed Moisture (%) 33	

Schematic of Testing Location

Heater Box Setting 245 ± 25	Probe Heater Setting 245 ± 25
Probe Length 7'	Probe Number D-27
Probe Material Stainless	Acetone Number
Nozzle Diameter (in.) .302	Nozzle Number

Sample Box Number	Pyrometer Number D-01	
Meter Box Number LSD-1		
Meter ΔH@ 1.791	Meter Yd 1.0038	
K Factor 4	Pitot C_p 0.84	
Pitot Leak Check: Before	After	
Leak Rate Before .01	CFM @ 14	"Hg
Leak Rate After .05	CFM @ 8	"Hg
Static Pressure (inches H_2O) (+/-) -.1		

First point all the way IN OUT Method 5

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

Filter Number	48438	
Thimble Number		
Beaker Number		

IGS Bag ID Number	
% O_2	% CO_2
H_2O (ml) 335	Silica Gel (gm) 7
Total Vlc 342	

Start Time 2:12 AM / PM Stop Time 3:35 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 379.106 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	3.5	5	160	.11	.44	380.33	75	58	34	256	271	
2	7	5	161	.12	.48	381.59	86	57	35	258	280	
3	10.5	5	161	.14	.57	383.75	90	59	35	259	274	
4	14	5	161	.14	.57	385.47	94	60	36	261	271	
5	17.5	6	160	.14	.57	387.25	98	62	36	260	267	
6	21	5	160	.13	.53	389.00	103	63	36	260	261	
7	24.5	5	158	.12	.49	390.21	105	67	36	266	256	
8	28	5	157	.12	.49	391.53	104	67	36	266	254	
9	31.5	5	156	.15	.62	393.15	108	69	36	266	252	
10	35	5	158	.15	.62	394.70	113	72	36	267	246	
11	38.5	5	160	.15	.62	396.50	116	75	36	265	242	
12	42	5	160	.11	.44	398.09	118	76	36	263	239	
Total				4.35	6.44		1004	654				
Average			162.8	.37	.560	39.274	93.4					

DI (up)

Particulate Testing Field Data Sheet

Location: _____ Run: 3

Client Western Sug 91	Project Number
Plant Scottsbluf	Unit
Date 12-13-89	Inlet/outlet (stack)
Meter Operator	
Probe Operator	

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 3:35	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 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
2-1	45.5	6	162	.11	.44	399.70	118	78	37	266	245	
2	49	6	163	.11	.44	401.23	117	80	37	268	253	
3	52.6	6	165	.13	.53	402.97	117	82	38	271	257	
4	56	6	165	.15	.62	404.69	119	83	39	267	259	
5	59.5	6	165	.15	.62	406.43	121	84	40	263	261	
6	63	6	165	.16	.65	408.28	123	87	41	233	265	
7	66.5	6	165	.17	.69	410.08	124	88	42	234	263	
8	70	6	165	.16	.65	411.88	123	88	43	249	260	
9	73.5	6	165	.15	.62	413.52	125	89	44	253	253	
10	77	6	165	.15	.62	415.28	125	89	44	243	245	
11	80.5	6	165	.14	.57	416.83	126	89	44	238	243	
12	84	7	165	.13	.53	418.38	126	89	44	244	240	AM (NDEC)
Total					.600		1215	85.5				
Average												

Particulate Testing Field Data Sheet

Location: Run: 4

Page 1 of 2

Client Western Sugar	Project Number 5119
Plant Scottsbluff	Unit South Stack
Date 12-13-89	Inlet/outlet (stack)
Meter Operator D. Klassen	
Probe Operator "	

Schematic of Testing Location

N

First point all the way (IN) OUT	Method 5	
Area (ft^2)	Port Len. (in.)	Gas Flow IN (OUT)

Ambient Temp. (°F) 20	Bar. Press. (in. Hg) 26.1
Assumed Moisture (%) 32	

Heater Box Setting 248 ± 25	Probe Heater Setting 248 ± 25
Probe Length 7'	Probe Number D-27
Probe Material Stainless St	Acetone Number
Nozzle Diameter (in.) .375	Nozzle Number

Sample Box Number M5C0	Pyrometer Number D-01
Meter Box Number 251 D-1	
Meter ΔH@ 1.771	Meter Yd 1.0038
K Factor 4	Pitot Cp 0.84
Pitot Leak Check: Before	After
Leak Rate Before .005	CFM @ 16 "Hg
Leak Rate After .002	CFM @ 8 "Hg
Static Pressure (inches H_2O) (+/-) -0.1	

Filter Number	48437	
Thimble Number		
Beaker Number		

IGS Bag ID Number	
% O_2	% CO_2
H_2O (ml)	Silica Gel (gm)
Total Vlc	

Start Time 5:08 AM / PM Stop Time 8:12 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 418,616 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	3	155	.12	.48	419.82	103	78	34	248	272	
2	7	4	157	.14	.56	421.42	107	79	35	237	271	
3	10.5	5	159	.15	.60	423.09	106	73	36	233	270	
4	14	5	160	.16	.64	424.97	99	74	37	228	269	
5	17.5	5	161	.17	.68	426.67	104	74	37	221	268	
6	21	5	160	.17	.68	428.41	111	77	38	249	264	
7	24.5	5	162	.17	.68	430.23	114	78	39	257	260	
8	28	5	163	.18	.72	432.60	121	80	39	257	254	
9	32.5	7	164	.20	.80	434.70	122	81	40	262	250	
10	35	5	165	.18	.72	436.56	123	82	40	263	245	
11	38.5	5	165	.16	.64	438.41	124	83	40	266	246	
12	42	5	166	.14	.56	439.85	122	83	40	269	247	PLANT DOWN
Total				4.			2361					
Average				4.315								

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Particulate Testing Field Data Sheet

Location: South St. Run: 4

Page 2 of 2

Client Western Sugar	Project Number 5119
Plant Scottsbluff	Unit South Stack
Date 12-13-89	Inlet/outlet (stack)
Meter Operator DK	
Probe Operator DK	

Schematic of Testing Location

N

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

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) (+/-)	

First point all the way IN OUT Method 5

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

Filter Number		
Thimble Number		
Beaker Number		

IGS Bag ID Number	
% O_2	% CO_2
H_2O (ml) 355	Silica Gel (gm) 9
Total V_{lc} 362	

Start Time 9:38 AM / PM Stop Time 8:21 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
2-1	3.5	6	156	.15	.60	441.55	79	7951	33	267	257	
2	7	6	160	.16	.64	443.19	82	51	34	268	257	
3	10.5	7	161	.17	.68	444.96	88	52	35	265	259	
4	14	7	163	.17	.68	446.75	94	55	36	266	261	
5	17.5	7	163	.17	.68	448.59	95	55	37	268	259	
6	21	7	163	.17	.68	450.27	99	59	38	262	260	
7	24.5	7	163	.17	.68	452.02	101	60	39	261	257	
8	28	7	163	.16	.64	453.70	102	64	40	262	259	
9	31.5	6	163	.15	.60	455.13	105	65	41	263	257	
10	35	6	164	.15	.60	456.92	105	68	42	264	256	
11	38.5	6	164	.14	.56	458.44	108	69	42	261	256	
12	42	6	165	.13	.52	460.124	108	72	42	259	254	RM (NOAA)
Total			161	4.815 +	7.76		2301 +					
Average			162	.399	.64	41.508	89.3					

.6383

101.9 ISO

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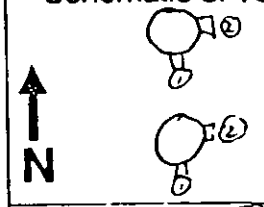
Particulate Testing Field Data Sheet

Location N. Stack Run: 2

Page 1 of 2

Client Western Sugar	Project Number 5119
Plant Scottsbluff	Unit N. Stack
Date 12/13/89	Inlet/outlet/(stack)
Meter Operator CT	
Probe Operator CT	

Schematic of Testing Location



Ambient Temp. (°F) 74	Bar. Press. (in. Hg) 26.15
Assumed Moisture (%) 30	

Sample Box Number	Pyrometer Number K-34
Meter Box Number C	
Meter ΔH@ 1.652	Meter Yd 1.0034
K Factor 8.9	Pitot Cp .84
Pitot Leak Check: Before ✓	After ✓
Leak Rate Before .01	CFM @ 10 "Hg
Leak Rate After .027	CFM @ 9 "Hg
Static Pressure (inches H_2O) (+) 0-0.1	

First point all the way (IN) OUT	Method 5	
Area (ft^2)	Port Len. (in.)	Gas Flow IN OUT

Filter Number	45729	
Thimble Number		
Beaker Number		

Heater Box Setting	Probe Heater Setting
Probe Length	Probe Number
Probe Material	Acetone Number
Nozzle Diameter (in.) .370	Nozzle Number

IGS Bag ID Number	
% O_2	% CO_2
H_2O (ml) 315	Silica Gel (gm) 11
Total V_{lc} 326	

Start Time 10:18 AM / PM Stop Time 11:33 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 91.538 / 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	2	156	.06	.53	93.18	36	38	55	270	264	Impingers and lines
2	6	2	157	.07	.62	94.30	36	38	55	274	250	lines fuzzy
3	9	4	156	.09	.80	95.76	36	38	55	286	276	~2.5 Gm catch
4	12	4	156	.09	.80	97.38	36	38	55	258	260	
5	15	4	156	.09	.80	98.21	36	38	54	258	258	
6	18	5	156	.11	.98	100.52	37	38	54	282	250	
7	21	5	155	.11	.98	102.36	37	38	54	283	245	
8	24	5	154	.12	1.1	103.88	38	38	54	281	256	
9	27	4	153	.11	.98	105.66	38	38	56	285	260	
10	30	5	155	.10	.89	107.37	38	38	56	291	270	
11	33	5	154	.10	.89	109.01	39	38	58	295	272	
12	36	5	154	.09	.80	110.54	39	38	58	298	274	pm (not)
Total												
Average			155.4	.31	.187	38.983	38.9					

38.974

.3008 .8012

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Particulate Testing Field Data Sheet

Page 2 of 2

Location: N. Stack Run: 2

Client W Dayton	Project Number
Plant	Unit
Date 12/12/89	Inlet/outlet/stack
Meter Operator	
Probe Operator	

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) 315	Silica Gel (gm)
Total Vlc 3	

Start Time	AM / PM	Stop Time	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 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	39	5	154	.09	.78	112.16	35	38	50	284	288	change K to 8.7
2	42	5	154	.09	.78	113.72	40	38	55	271	259	
3	45	4	155	.10	.87	~~113.72~~ 115.24	40	38	53	269	258	
4	48	4	152	.11	.96	116.82	40	38	53	279	272	change K to 8.6
5	51	4	155	.11	.96	118.62	42	39	52	281	290	
6	54	4	157	.12	1.0	120.65	43	39	51	288	288	
7	57	4	156	.12	1.0	122.13	44	40	51	293	285	
8	60	4	156	.12	1.0	123.96	44	40	51	283	280	
9	63	4	156	.11	.95	125.69	45	41	51	284	275	
10	66	4	156	.10	.86	127.31	46	41	51	286	271	
11	69	4	156	.09	.77	128.92	46	42	52	289	268	
12	72	4	154	.09	.77	130.521	46	42	53	284	264	AM (HDEC)
Total												
Average												

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Particulate Testing Field Data Sheet

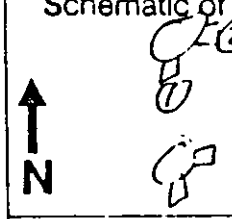
Location: N. Stack Run: 3

Page 1 of 2

Client Wisconsin Steam	Project Number 5119
Plant South Oak Creek	Unit
Date 12/16/87	Inlet/outlet (stack)
Meter Operator DA	
Probe Operator DA	

Ambient Temp. (°F) 22 (Snowing)	Bar. Press. (in. Hg) 26.10
Assumed Moisture (%) 30	

Schematic of Testing Location



Heater Box Setting	Probe Heater Setting
Probe Length	Probe Number
Probe Material	Acetone Number
Nozzle Diameter (in.) .370	Nozzle Number

First point all the way (IN) OUT	Method 5	
Area (ft^2)	Port Len. (in.)	Gas Flow IN OUT

Filter Number	98431	
Thimble Number		
Beaker Number		

Sample Box Number	Pyrometer Number K-34
Meter Box Number C	
Meter ΔH@ 1.692	Meter Yd 1.0034
K Factor 8.6	Pitot Cp .84
Pitot Leak Check: Before ✓	After
Leak Rate Before .002	CFM @ 15 "Hg
Leak Rate After .001	CFM @ 8 "Hg
Static Pressure (inches H_2O) (+) (−) −0.1	

IGS Bag ID Number	
% O_2	% CO_2
H_2O (ml) 327	Silica Gel (gm) 6.7
Total Vlc 336	

Start Time 2:16 AM (PM) Stop Time 3:36 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 140.816 / 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
1	3	2	153	.08	.69	142.48	50	50	43	288	280	
2	6	2	153	.09	.72	144.18	52	51	43	282	282	
3	9	3	152	.09	.77	145.11	54	51	46	275	270	
4	12	3	151	.10	.86	146.68	54	52	47	266	266	
5	15	4	152	.10	.86	148.16	54	53	50	240	251	
6	18	4	151	.11	.95	149.93	58	59	51	239	245	
7	21	5	153	.11	.95	151.92	59	55	52	238	230	
8	24	5	153	.11	.95	154.01	60	56	54	245	242	
9	27	5	154	.12	1.0	155.11	60	56	55	258	248	
10	30	5	155	.10	.89	157.15	60	56	56	260	255	Change-i to 8.9
11	33	5	156	.09	.77	158.93	60	56	57	262	260	
12	36	5	156	.09	.72	160.45	60	56	58	265	263	Am (pbl)
Total					.8813							
Average			155.8	.32 (.3163)	.88 (.7350)	40.382	57.4					

98.6 iso

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Location: N. Stack Run: 3

Particulate Testing Field Data Sheet

Client Pacific Gas & Electric	Project Number
Plant	Unit
Date 12/15/87	Inlet/outlet/stack
Meter Operator	
Probe Operator	

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)	Outlet T_m out (°F)	Cond. Temp. T_c (°F)	Filter Temp. T_f (°F)	Probe Temp. (°F)	Notes
2-1	39	5	158	.10	.85	162.25	58	56	56	256	283	
2	42	5	158	.10	.85	164.07	54	54	54	250	280	
3	45	5	159	.10	.89	165.77	54	55	54	248	270	
4	48	6	158	.11	.98	167.64	55	54	55	242	264	
5	51	6	158	.11	.98	169.42	55	54	53	236	258	
6	54	7	158	.12	1.1	171.22	54	54	53	232	251	
7	57	7	158	.12	1.1	172.92	53	53		248	246	
8	60	6	158	.11	.98	174.63	52	52		254	240	
9	63	6	158	.10	.89	176.38	52	51		272	238	
10	66	6	159	.09	.80	178.03	52	51		258		
11	69	5	159	.08	.71	179.65	51	50	55	263	230	
12	72	5	159	.08	.71	181.230	50	50	54	270	230	DM (VPCF)
Total												
Average												

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Particulate Testing Field Data Sheet

Location: N. Stack Run: 4

Page 1 of 2

Client	Lehigh	Project Number	
Plant	Scotts Bluff	Unit	
Date	12/13/89	Inlet/outlet/stack	
Meter Operator	DTA		
Probe Operator	CH		

Schematic of Testing Location

N

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

Ambient Temp. (°F)	20	Bar. Press. (in. Hg)	Sidney
Assumed Moisture (%)			

Heater Box Setting		Probe Heater Setting	
Probe Length		Probe Number	
Probe Material		Acetone Number	
Nozzle Diameter (in.)	.357	Nozzle Number	

Sample Box Number		Pyrometer Number	K-34
Meter Box Number	C		
Meter ΔH@	1.692	Meter Ya	1.0034
K Factor		Pitot Cp	.84
Pitot Leak Check:	Before —	After	
Leak Rate Before	.006	CFM @ 12	"Hg
Leak Rate After	.038	CFM @ 10	"Hg
Static Pressure (inches H_2O)	(+5)	−0.1	

Filter Number	115439	(115439)
Thimble Number		
Beaker Number		

IGS Bag ID Number			
% O_2		% CO_2	
H_2O (ml)	328 338	Silica Gel (gm)	10
Total Vic	7138		8.14
Start Time	5:05 AM / PM	Stop Time	5:47 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 181.368 / 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	3	155	.09	.86	183.19	40	40	45	242	266	
2	6	4	153	.09	.80	185.175	42	44				
3	9	4	160	.09	.80	186.94	44	46				
4	12	4	163	.09	.80	188.10	44	46				
5	15	5	162	.10	.89	189.89	44	46				
6	18	6	162	.11	.98	191.72	44	46				
7	21	7	163	.12	1.1	193.59	46	46	54	263	283	
8	24	6	163	.11	.98	195.62	44	46				
9	27	6	163	.11	.95	197.68	46	47				
10	30	6	165	.10	.89	199.65	48	47				
11	33	6	164	.08	.71	201.01	44	48				
12	36	6	165	.09	.80	202.[illegible]	50	48				~2hr. plant clock
Total												
Average			160.0	.30	.89	41.916	42.5		108.8	150		

159.5 .2959 .8515 65 47.7 10

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Particulate Testing Field Data Sheet

Location: N Stack Run: 4

Client W.I Sugar	Project Number
Plant	Unit
Date 12/12/87	Inlet/outlet/stack
Meter Operator	
Probe Operator	

Schematic of Testing Location

N

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

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) (+/-)	

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

Filter Number		
Thimble Number		
Beaker Number		

IGS Bag ID Number	
% O_2	% CO_2
H_2O (ml)	Silica Gel (gm)
Total Vlc	

Start Time AM / PM	Stop Time 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) (10.77)	Initial Volume / 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	39	5	155	.08	.71	204.07	46	48	43	288	264	
.2	42	5	156	.09	.80	205.77	50	48				
3	45	5	157	.09	.80	207.43	50	48				
4	48	6	157	.10	.89	209.31	50	49				
5	51	7	158	.11	.98	211.36	52	49	52	293	273	
6	54	8	157	.11	.98	212.73	52	50				
7	57	8	157	.11	.98	214.78	54	50	54	278	257	
8	60	7	157	.10	.89	216.42	52	50				
9	63	7	157	.09	.80	217.97	51	49				
10	66	6	157	.08	.71	219.59	50	49				
11	69	7	158	.09	.80	221.19	51	49		252		
12	72	7	158	.08	.71	222.7884	50	49	58	252	239	
Total												
Average												

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FIELD DATA PRINTOUTS

Western Sugar
CAE Project No: 5119

RAW DATA SET #2 SOUTH

Unit	Pulp Dryer	Dn	0.302
Date	12-DEC	An	0.0005
Run	2	O2	16.2
Cp	0.84	CO2	3.9
Loc	South	Md	29.27
Pb	26.1	Ms	25.56
Static	-0.1	Vmstd	32.95
Ps	26.09	Vlc	343
Yd	1.0038	Vwstd	16.15
Min/Pt	3.5	Bwo	0.32887
Run Time	84		

Point		Temp	DP	(DP)½	DH	Vm	Tm in	Tm out	% Iso	Vel	Vmstd
		Initial Meter Volume				339.942					
1	1	156	0.12	0.35	0.44	341.26	78	57	92.3	23.9	1.16
	2	157	0.13	0.36	0.48	342.83	84	58	105.1	24.9	1.37
	3	157	0.14	0.37	0.52	344.17	90	56	86.1	25.8	1.16
	4	158	0.13	0.36	0.53	345.85	92	57	111.8	24.9	1.45
	5	156	0.14	0.37	0.57	347.47	95	59	103.3	25.8	1.40
	6	159	0.14	0.37	0.57	349.07	97	61	101.8	25.9	1.37
	7	159	0.16	0.40	0.66	350.85	97	62	105.9	27.7	1.53
	8	160	0.15	0.39	0.61	352.60	98	62	107.5	26.8	1.50
	9	160	0.13	0.36	0.53	354.24	99	63	108.0	25.0	1.40
	10	161	0.13	0.36	0.53	355.68	101	64	94.7	25.0	1.23
	11	162	0.14	0.37	0.57	357.30	103	66	102.3	25.9	1.38
	12	162	0.10	0.32	0.41	358.78	106	68	110.1	21.9	1.25
2	1	160	0.13	0.36	0.53	360.34	109	73	100.9	25.0	1.31
	2	161	0.14	0.37	0.57	361.96	111	75	100.7	25.9	1.36
	3	161	0.15	0.39	0.61	363.73	112	76	106.1	26.8	1.48
	4	162	0.15	0.39	0.61	365.52	109	77	107.6	26.9	1.50
	5	163	0.15	0.39	0.61	367.25	110	78	103.9	26.9	1.45
	6	162	0.16	0.40	0.66	369.07	111	79	105.5	27.7	1.52
	7	163	0.17	0.41	0.70	371.02	109	80	109.9	28.6	1.63
	8	162	0.15	0.39	0.61	372.51	110	81	89.1	26.9	1.24
	9	163	0.15	0.39	0.61	374.45	110	82	116.0	26.9	1.62
	10	163	0.15	0.39	0.61	375.57	109	82	67.1	26.9	0.93
	11	163	0.14	0.37	0.57	377.06	114	83	91.8	26.0	1.23
	12	163	0.13	0.36	0.53	378.850	114	83	114.5	25.0	1.48
Avgs		161		0.375	0.57	38.908		86	101.7	26.0	32.95

Std Dev	2.3402	0.0200
Variance	5.4764	0.0004
RMS Dev	1.4577	5.3445

Western Sugar
CAE Project No: 5119

RAW DATA SET #3 SOUTH

Unit	Pulp Dryer	Dn	0.302
Date	12-DEC	An	0.0005
Run	3	O2	16.1
Cp	0.84	CO2	3.9
Loc	South	Md	29.26
Pb	26.1	Ms	25.56
Static	-0.1	Vmstd	32.84
Ps	26.09	Vlc	342
Yd	1.0038	Vwstd	16.10
Min/Pt	3.5	Bwo	0.32896
Run Time	84		

Point		Temp	DP	(DP)½	DH	Vm	Tm in	Tm out	% Iso	Vel	Vmstd
		Initial Meter Volume				379.106					
1	1	160	0.11	0.33	0.44	380.33	75	58	90.0	23.0	1.08
	2	161	0.12	0.35	0.48	381.59	86	57	88.0	24.0	1.10
	3	161	0.14	0.37	0.57	383.73	90	59	137.6	25.9	1.85
	4	161	0.14	0.37	0.57	385.47	94	60	111.4	25.9	1.50
	5	160	0.14	0.37	0.57	387.25	98	62	113.2	25.9	1.53
	6	160	0.13	0.36	0.53	389.00	103	63	114.8	25.0	1.49
	7	158	0.12	0.35	0.49	390.21	105	67	82.0	23.9	1.03
	8	157	0.12	0.35	0.49	391.53	104	67	89.5	23.9	1.12
	9	156	0.15	0.39	0.62	393.15	108	69	97.7	26.7	1.37
	10	158	0.15	0.39	0.62	394.70	113	72	92.9	26.8	1.30
	11	160	0.15	0.39	0.62	396.50	116	75	107.5	26.8	1.50
	12	160	0.11	0.33	0.44	398.09	118	76	110.5	23.0	1.32
2	1	162	0.11	0.33	0.44	399.70	118	78	111.9	23.0	1.34
	2	163	0.11	0.33	0.44	401.23	117	80	106.3	23.0	1.27
	3	165	0.13	0.36	0.53	402.97	117	82	111.3	25.1	1.44
	4	165	0.15	0.39	0.62	404.69	119	83	102.1	26.9	1.42
	5	165	0.15	0.39	0.62	406.43	121	84	103.0	26.9	1.43
	6	165	0.16	0.40	0.65	408.28	123	87	105.6	27.8	1.52
	7	165	0.17	0.41	0.69	410.08	124	88	99.5	28.7	1.47
	8	165	0.16	0.40	0.65	411.88	123	88	102.7	27.8	1.47
	9	165	0.15	0.39	0.62	413.52	125	89	96.4	26.9	1.34
	10	165	0.15	0.39	0.62	415.28	125	89	103.4	26.9	1.44
	11	165	0.14	0.37	0.57	416.83	126	89	94.2	26.0	1.26
	12	165	0.13	0.36	0.53	418.380	126	89	97.7	25.1	1.26
Avgs		162		0.369	0.56	39.274		93	102.9	25.6	32.84

Std Dev	2.9997	0.0243
Variance	8.9982	0.0006
RMS Dev	1.8521	6.5725

Western Sugar
CAE Project No: 5119

RAW DATA #4 South

Unit	Pulp Dryer	Dn	0.302
Date	12-DEC	An	0.0005
Run	4	O2	15.7
Cp	0.84	CO2	4.2
Loc	South	Md	29.30
Pb	26.1	Ms	25.61
Static	-0.1	Vmstd	35.11
Ps	26.09	Vlc	362
Yd	1.0038	Vwstd	17.04
Min/Pt	3.5	Bwo	0.32672
Run Time	84		

Point		Temp	DP	(DP)½	DH	Vm	Tm in	Tm out	% Iso	Vel	Vmstd
		Initial Meter Volume				418.616					
1	1	155	0.12	0.35	0.48	419.82	103	78	80.6	23.9	1.01
	2	157	0.14	0.37	0.56	421.42	107	79	98.9	25.8	1.34
	3	159	0.15	0.39	0.60	423.09	106	73	100.5	26.8	1.41
	4	160	0.16	0.40	0.64	424.97	99	74	110.3	27.7	1.59
	5	161	0.17	0.41	0.68	426.67	104	74	96.4	28.5	1.43
	6	160	0.17	0.41	0.68	428.41	111	77	97.7	28.5	1.45
	7	160	0.17	0.41	0.68	430.25	118	78	102.6	28.5	1.53
	8	163	0.18	0.42	0.72	432.60	121	80	127.0	29.4	1.94
	9	164	0.20	0.45	0.80	434.70	122	81	107.6	31.0	1.73
	10	165	0.18	0.42	0.72	436.56	123	82	100.4	29.5	1.53
	11	165	0.16	0.40	0.64	438.41	124	83	105.7	27.8	1.52
	12	166	0.14	0.37	0.56	439.85	122	83	88.1	26.0	1.18
2	1	156	0.15	0.39	0.60	441.55	79	51	106.8	26.7	1.50
	2	160	0.16	0.40	0.64	443.19	82	51	99.8	27.7	1.44
	3	161	0.17	0.41	0.68	444.96	88	52	103.9	28.5	1.55
	4	163	0.17	0.41	0.68	446.75	94	55	104.4	28.6	1.55
	5	163	0.17	0.41	0.68	448.59	95	55	107.2	28.6	1.59
	6	163	0.17	0.41	0.68	450.27	99	59	97.2	28.6	1.44
	7	163	0.17	0.41	0.68	452.02	101	60	100.9	28.6	1.50
	8	163	0.16	0.40	0.64	453.70	102	64	99.4	27.7	1.43
	9	163	0.15	0.39	0.60	455.13	105	65	87.1	26.9	1.21
	10	164	0.15	0.39	0.60	456.92	105	68	108.8	26.9	1.52
	11	164	0.14	0.37	0.56	458.44	108	69	95.2	26.0	1.28
	12	165	0.13	0.36	0.52	460.124	108	72	109.3	25.0	1.42
Avgs		162		0.399	0.64	41.508		87	101.5	27.6	35.11

Std Dev	2.9337	0.0225
Variance	8.6069	0.0005
RMS Dev	1.8133	5.6458

Western Sugar
CAE Project No: 5119

RAW DATA SET #2 NORTH

Unit	Pulp Dryer	Dn	0.37
Date	12-DEC	An	0.0007
Run	2	O2	16.0
Cp	0.84	CO2	3.9
Loc	North	Md	29.26
Pb	26.1	Ms	25.88
Static	-0.1	Vmstd	35.68
Ps	26.09	Vlc	326
Yd	1.0034	Vwstd	15.34
Min/Pt	3	Bwo	0.30075
Run Time	72		

Point		Temp	DP	(DP)½	DH	Vm	Tm in	Tm out	% Iso	Vel	Vmstd
		Initial Meter Volume				91.538					
1	1	156	0.06	0.24	0.53	93.18	36	38	127.9	16.8	1.51
	2	157	0.07	0.26	0.62	94.30	36	38	80.9	18.2	1.03
	3	156	0.09	0.30	0.80	95.76	36	38	92.9	20.6	1.34
	4	156	0.09	0.30	0.80	97.38	36	38	103.1	20.6	1.49
	5	156	0.09	0.30	0.80	98.21	36	38	52.8	20.6	0.76
	6	156	0.11	0.33	0.98	100.52	37	38	132.9	22.7	2.12
	7	155	0.11	0.33	0.98	102.36	37	38	105.8	22.7	1.69
	8	154	0.12	0.35	1.10	103.88	38	38	83.6	23.7	1.40
	9	153	0.11	0.33	0.98	105.66	38	38	102.1	22.7	1.63
	10	155	0.10	0.32	0.89	107.37	38	38	103.0	21.7	1.57
	11	154	0.10	0.32	0.89	109.01	39	38	98.6	21.7	1.50
	12	154	0.09	0.30	0.80	110.56	39	38	98.2	20.5	1.42
2	1	154	0.09	0.30	0.78	112.16	39	38	101.4	20.5	1.47
	2	154	0.09	0.30	0.78	113.72	40	38	98.7	20.5	1.43
	3	155	0.10	0.32	0.87	115.26	40	38	92.6	21.7	1.41
	4	156	0.11	0.33	0.96	116.82	40	38	89.5	22.7	1.43
	5	155	0.11	0.33	0.95	118.62	42	39	102.9	22.7	1.64
	6	157	0.12	0.35	1.00	120.65	43	39	111.2	23.8	1.85
	7	156	0.12	0.35	1.00	122.13	44	40	80.8	23.8	1.35
	8	156	0.12	0.35	1.00	123.96	44	40	99.9	23.8	1.67
	9	156	0.11	0.33	0.95	125.69	45	41	98.5	22.7	1.57
	10	156	0.10	0.32	0.86	127.31	46	41	96.6	21.7	1.47
	11	156	0.09	0.30	0.77	128.92	46	42	101.0	20.6	1.46
	12	156	0.09	0.30	0.77	130.521	46	42	100.5	20.6	1.45
Avgs		155		0.315	0.87	38.983		39	98.1	21.6	35.68
Leak Check Correction						38.479					

Std Dev	1.0555	0.0254
Variance	1.1141	0.0006
RMS Dev	0.6793	8.0810

Western Sugar
CAE Project No: 5119

RAW DATA #3 NORTH

Unit	Pulp Dryer	Dn	0.37
Date	12-DEC	An	0.0007
Run	3	O2	15.8
Cp	0.84	CO2	4.2
Loc	NORTH	Md	29.30
Pb	26.1	Ms	25.88
Static	-0.1	Vmstd	36.34
Ps	26.09	Vlc	336
Yd	1.0034	Vwstd	15.82
Min/Pt	3	Bwo	0.30322
Run Time	72		

Point		Temp	DP	(DP)½	DH	Vm	Tm in	Tm out	% Iso	Vel	Vmstd
		Initial Meter Volume				140.848					
1	1	153	0.08	0.28	0.69	142.48	50	50	108.9	19.4	1.48
	2	153	0.09	0.30	0.77	144.18	52	51	106.6	20.5	1.54
	3	152	0.09	0.30	0.77	145.11	54	51	58.2	20.5	0.84
	4	159	0.10	0.32	0.86	146.68	56	52	93.4	21.7	1.41
	5	152	0.10	0.32	0.86	148.16	56	53	87.5	21.6	1.33
	6	151	0.11	0.33	0.95	149.93	58	59	98.9	22.7	1.58
	7	153	0.11	0.33	0.95	151.92	59	55	111.7	22.7	1.78
	8	153	0.11	0.33	0.95	154.01	60	56	117.1	22.7	1.87
	9	154	0.12	0.35	1.00	155.41	60	56	75.2	23.7	1.25
	10	155	0.10	0.32	0.89	157.15	60	56	102.4	21.7	1.56
	11	156	0.09	0.30	0.77	158.93	60	56	110.5	20.6	1.59
	12	156	0.09	0.30	0.72	160.65	60	56	106.8	20.6	1.54
2	1	158	0.10	0.32	0.89	162.25	58	56	94.6	21.7	1.43
	2	158	0.10	0.32	0.89	164.07	56	56	107.8	21.7	1.63
	3	159	0.10	0.32	0.89	165.77	56	55	100.9	21.7	1.53
	4	158	0.11	0.33	0.96	167.64	55	54	106.0	22.8	1.68
	5	158	0.11	0.33	0.98	169.42	55	54	100.9	22.8	1.60
	6	158	0.12	0.35	1.10	171.22	54	54	97.8	23.8	1.62
	7	158	0.12	0.35	1.10	172.92	53	53	92.5	23.8	1.54
	8	158	0.11	0.33	0.98	174.63	52	52	97.4	22.8	1.55
	9	158	0.10	0.32	0.89	176.38	52	51	104.6	21.7	1.58
	10	159	0.09	0.30	0.80	178.03	52	51	104.0	20.6	1.49
	11	159	0.08	0.28	0.71	179.65	51	50	108.5	19.4	1.47
	12	159	0.08	0.28	0.71	181.230	50	50	105.9	19.4	1.43
Avgs		156		0.316	0.88	40.382		55	99.9	21.7	36.34

Std Dev	2.7554	0.0196
Variance	7.5924	0.0004
RMS Dev	1.7649	6.1919

Western Sugar
CAE Project No: 5119

RAW DATA #4 NORTH

Unit	Pulp Dryer	Dn	0.37
Date	12-DEC	An	0.0007
Run	4	O2	15.8
Cp	0.84	CO2	4.2
Loc	NORTH	Md	29.30
Pb	26.1	Ms	25.88
Static	-0.1	Vmstd	36.60
Ps	26.09	Vlc	338
Yd	1.0034	Vwstd	15.91
Min/Pt	3	Bwo	0.30300
Run Time	72		

Point		Temp	DP	(DP)½	DH	Vm	Tm in	Tm out	% Iso	Vel	Vmstd
		Initial Meter Volume				181.368					
1	1	155	0.09	0.30	0.80	183.19	40	40	113.6	20.6	1.64
	2	158	0.09	0.30	0.80	184.75	42	44	96.4	20.6	1.39
	3	160	0.09	0.30	0.80	186.44	44	46	104.5	20.6	1.50
	4	163	0.09	0.30	0.80	188.10	44	46	102.8	20.7	1.47
	5	162	0.10	0.32	0.89	189.89	44	46	105.4	21.8	1.59
	6	162	0.11	0.33	0.98	191.72	44	46	102.8	22.9	1.63
	7	163	0.12	0.35	1.10	193.59	46	46	100.6	23.9	1.66
	8	163	0.11	0.33	0.98	195.62	46	46	114.3	22.9	1.81
	9	163	0.11	0.33	0.98	197.68	48	47	115.7	22.9	1.83
	10	165	0.10	0.32	0.89	199.65	48	47	116.0	21.8	1.75
	11	164	0.08	0.28	0.71	201.01	49	48	88.1	19.5	1.19
	12	165	0.09	0.30	0.80	202.58	50	48	96.5	20.7	1.38
2	1	155	0.08	0.28	0.71	204.07	46	48	96.5	19.4	1.31
	2	156	0.09	0.30	0.80	205.77	50	48	104.0	20.6	1.50
	3	157	0.09	0.30	0.80	207.43	50	48	101.5	20.6	1.46
	4	157	0.10	0.32	0.89	209.31	50	49	109.4	21.7	1.66
	5	158	0.11	0.33	0.98	211.36	52	49	113.9	22.8	1.81
	6	157	0.11	0.33	0.98	212.73	52	50	75.0	22.8	1.19
	7	157	0.11	0.33	0.98	214.78	54	50	113.5	22.8	1.81
	8	157	0.10	0.32	0.89	216.42	52	50	94.8	21.7	1.44
	9	157	0.09	0.30	0.80	217.97	51	49	94.4	20.6	1.36
	10	157	0.08	0.28	0.71	219.59	50	49	104.9	19.4	1.42
	11	158	0.09	0.30	0.80	221.19	51	49	97.6	20.6	1.40
	12	158	0.08	0.28	0.71	222.784	50	49	103.2	19.4	1.40
Avgs		159		0.310	0.86	41.416		48	102.7	21.3	36.60
Leak Check Correction						40.120					
Std Dev		3.2834		0.0188							
Variance		10.781		0.0004							
RMS Dev		2.0591		6.0761							

PROCESS DATA

WESTERN SUGAR COMPANY
CAE Project No: 5119

PULP PROCESS DATA
NORTH AND SOUTH STACKS COMBINED

RUN NO.	2	3	4
DATE	12/13/89	12/13/89	12/13/89
START TIME	10:17 AM	2:12 PM	5:08 PM
STOP TIME	11:46 AM	3:38 PM	8:21 PM
DATA			
% SUGAR	19.5	19.6	17.4
% MARC	0.0579	0.0581	0.0534
SLICE RATE (tons/hr)	170	170	170
% DRY PULP MOISTURE	11.2	9.2	13.7
% PRESSED PULP MOISTURE	72.7	73.9	73.8
COAL FEED RATE (tons/hr)	3.20	3.39	3.48
CALCULATIONS			
PRESSED PULP (tons/hr)	32.01	29.92	34.38
PROCESS WEIGHT (tons/hr)	35.21	33.31	37.86

SHIFT (CIRCLE ONE): 8-4, 4-12, 12-8 — RUN NO. 1 — STACK NO. 1&2 — FOREMAN ROGER SCHMIDT — SIGNATURE

TIME	1015	1030	1045	1100	1115	1130	1145	END		
DRUM ΔP	1.45	1.45	1.45	1.45	1.43	1.45	1.45	1.47		
COAL RATE (Tons/hr)	2.03	2.03	2.04	2.10	2.15	2.15	2.17	2.19	3.2	Tons
COAL MILL (Amps)	102	102	104	103	105	107	107			
ID FAN (Amps)	150	151	150	150	151	151	150			
RECYCLE FAN (Amps)	51	52	52	51	51	51	51		.5	
PRIMARY AIR FAN (Amps)	35	35	35	35	35	35	35			
SCRUBBER PUMP (Amps)	47	49	47	47	47	47	47			
COAL MILL PRESS ("W.G.)	21	21	21	21	21	21	21			
SLICE RATE (Tons/hr)	170	170	170	170	170	170	170			
EXHAUST STACK TEMP (°F)	131	132	128	128	129	131	132	PULP	32.01	
COAL BIN LEVEL (%)	72%	70%	72%	53%	69%	72%	73%	COAL	3.20	
TAIL TEMP (°F)	187	190	191	194	194	196	179	MOLASSES	.57	
DRUM DISCH PRESS ("W.G.)	+1.17	+1.17	+1.12	+1.16	+1.12	+1.21	+1.12	PROCESS	35.78	+-1
FURNACE TEMP (°F)	1782	1773	1757	1776	1331	1256	1123	FLOW		Lbs
FUEL RATE (%)	52.0	47.0	50.5	54.0	56.0	54.5	57.5			
RECYCLE DAMPER POS (%)	56.0	56.0	55.0	56.0	55.5	55.5	56.5			
THROAT TEMP (°F)	1533	1530	1570	1591	1493	1544	1487		NOTE	
AIR HTR OUTLET TEMP (°F)	706	704	703	707	710	716	715		10:45	
COAL MILL OUTLET TEMP	133	134	134	134	135	134	135			
FURNACE PRESS ("W.G.)	-1.16	-1.16	-1.09	-1.09	-1.13	-1.07	-1.10	AVE		
PRESSED PULP TONS/hr.	33.66	32.63	31.53	32.28	30.43	30.29	33.17	32.01		
PRESSES IN	5	5	5	5	5	5	5			
DRY PULP MOISTURE	11.0	10.4	10.2	10.7	11.9	12.2	12.8			+12.7.0
PRESSED PULP MOISTURE	74.0	73.4	72.0	72.3	71.5	71.5	70.0			
DEMISTER ΔP #1	.1	.1	.1	.1	.1	.1	.1		1052	+4724.3
#2	.2	.1	.1	.1	.2	.2	.1		1113	4529.7
CYCLONE ΔP #1	2.7	2.7	2.7	2.7	2.3	2.7	2.7		1170	4333.5
#2	2.5	2.5	2.5	2.4	2.1	1.9	2.7			172%
SCRUBBER ΔP #1	1.8	1.8	1.8	1.8	1.8	1.8	1.8			
#2	2.0	1.2	2.0	2.2	2.4	0.5	2.9		1145	173%
ID FAN ΔP	6.1	6.0	6.0	6.1	6.2	6.1	6.1			5345.2

DATE: 12-13-87 — PULP DRYER LOG — FOREMAN Roger Schmitt

SHIFT (CIRCLE ONE): (8-4) 4-12, 12-8 — RUN NO. 2 — STACK NO. 1&2 — SIGNATURE

TIME	1412	1425	1440	1455	1510	1525	1533			
DRUM ΔP	1.60	1.55	1.50	1.50	1.50	1.55	1.60		9.39	7.54
COAL RATE (Tons/hr)	2.00	2.00	2.00	2.00	1.95	2.00	1.90			
COAL MILL (Amps)	100	100	100	101	100	100	100			
ID FAN (Amps)	150	150	150	152	154	150	152			
RECYCLE FAN (Amps)	52	52	52	51	52	52	52		1.6	1.45
PRIMARY AIR FAN (Amps)	36	36	35	36	36	36	36			
SCRUBBER PUMP (Amps)	49	49	49	49	49	49	49			
COAL MILL PRESS ("W.G.)	12+	12+	12+	12+	12+	12+	12+		1.1	1.1
SLICE RATE (Tons/hr)	170	170	170	170	170	170	170			
EXHAUST STACK TEMP (°F)	192	196	197	198	196	194	195			
COAL BIN LEVEL (%)	66	65	64	60	58	58	55	Pulp	29.92	
TAIL TEMP (°F)	211	209	204	204	197	197	200	Coal	3.39	
DRUM DISCH PRESS ("W.G.)	+1.20	+1.25	+1.18	+1.20	+1.20	+2.13	+1.25	Molasses	1.57	
FURNACE TEMP (°F)	1834	1796	1692	1760	1709	1881	1827	PROCESS FLOW	33.88	
FUEL RATE (%)	42	47	45	40	43	46	42			
RECYCLE DAMPER POS (%)	57	57	57	56	56.5	56.5	57			
THROAT TEMP (°F)	1529	1509	1485	1609	1723	1698	1632			
AIR HTR OUTLET TEMP (°F)	742	740	723	723	734	737	735			
COAL MILL OUTLET TEMP	133	138	135	134	133	132	132			
FURNACE PRESS ("W.G.)	+1.12	+1.12	+1.19	+1.16	+1.14	+1.16	+1.11	AVE.		
PRESSED PULP TONS/hr	29.73	30.54	31.62	31.80	29.32	27.86	29.39	29.92		
PRESSES IN	5	5	5	5	5	5	5			
DRY PULP MOISTURE	13.7	12.6	9.5	9.0	16.1	17.2	17.5			
PRESSED PULP MOISTURE	78.8	77.0	74.5	74.0	74.0	73.0	73.8			
DEMISTER ΔP #1	2	2	2	2	2	2	2			
#2	2	2	2	2	2	2	2			
CYCLONE ΔP #1	2.6	2.7	2.5	2.7	2.9	2.9	3.0			
#2	1.5	1.7	1.6	1.8	2.1	2.1	2.3			
SCRUBBER ΔP #1	1.8	1.6	1.7	1.9	1.9	2.0	1.7			
#2	2.7	2.6	2.4	2.5	2.8	2.6	2.2			
ID FAN ΔP	6.1	6.0	5.9	6	6.6	6.4	6.4			

DATE: 12-13-81 PULP DRYER LOG FOREMAN Julian Polanco

SHIFT (CIRCLE ONE): 8-4, 4-12, 12-8 RUN NO. 3 STACK NO. 142 SIGNATURE

TIME	1705	1725	1740	1752	1937	1950	2005	2020		
DRUM ΔP	40	46	45		40	45	40	42		
COAL RATE (Tons/hr)	19	21	21		20	20	20	21	3.49	
COAL MILL (Amps)	100	105	105		100	100	100	101		
ID FAN (Amps)	150	155	160		160	160	160	162		
RECYCLE FAN (Amps)	50	52	54		50	50	50	50	1.56	
PRIMARY AIR FAN (Amps)	35	35	35		35	35	35	35		
SCRUBBER PUMP (Amps)	49	49	49		49	49	49	49	MO	
COAL MILL PRESS ("W.G.)	14	14	14		14	14	14	14		
SLICE RATE (Tons/hr)	170	170	170		170	170	170	170		
EXHAUST STACK TEMP (°F)	194	190	192		192	196	196	198	Pulp	34 38
COAL BIN LEVEL (%)	100	100	100		100	100	100	100	Coal	3.48
TAIL TEMP (°F)	200	196	197		200	200	200	200	(Adjusted)	3.83
DRUM DISCH PRESS ("W.G.)	+1.64	+1.65	+1.64		+1.72	+1.64	+1.72	+1.72	PRESS	
FURNACE TEMP (°F)	1676	1708	1676		1700	1676	1676	1676	FLOW	32.49
FUEL RATE (%)	40	40	40		40	50	50	50		
RECYCLE DAMPER POSITION	60	50	50		50	50	50	50		
THROAT TEMP (°F)	1470	1575	1669		1669	1665	1675	1676		
AIR HTR OUTLET TEMP (°F)	835	887	884		883	872	875	882		
COAL MILL OUTLET TEMP	198	198	197		200	200	197	197		
FURNACE PRESS ("W.G.)	-1.17	-1.11	-1.10		-1.12	-1.12	-1.14	-1.12	AVE:	
PRESSED PULP TONS/hr	32.78	34.19	33.67		35.57	35.21	35.72	33.52	34.38	
PRESSES IN	6	5	6		5	6	5	6		
DRY PULP MOISTURE	8.6	8.9	10.3		8.2	8.0	7.4	7.6		
PRESSED PULP MOISTURE	79.0	74.8	74.2		74.4	74.0	74.3	74.3		
DEMISTER ΔP #1	2	2	2		2	2	2	2		
#2	2	2	2		2	2	2	2		
CYCLONE ΔP #1	2.3	2.5	2.6		2.5	2.5	2.6	2.3		
#2	2.6	2.7	2.8		2.8	2.8	2.8	2.7		
SCRUBBER ΔP #1	1.8	2.0	1.8		1.8	1.8	1.8	1.7		
#2	1.5	1.8	1.8		1.7	1.8	1.5	1.7		
ID FAN ΔP	5.7	6.1	6.5		6.5	6.2	6.3	5.9		