

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.

AP42 Section:	9.10.1.2
Background Chapter	4
Reference:	12
Title:	Report on Compliance Testing Performed at Western Sugar Company Pulp Dryer, Scottsbluff, NE, Clean Air Engineering, Palatine, IL, January 12, 1990.

APPENDIX L

REPORT EXCERPTS FROM REFERENCE 12

(Western Sugar Company, January 12, 1990)

Clean Air Engineering

January 12, 1990

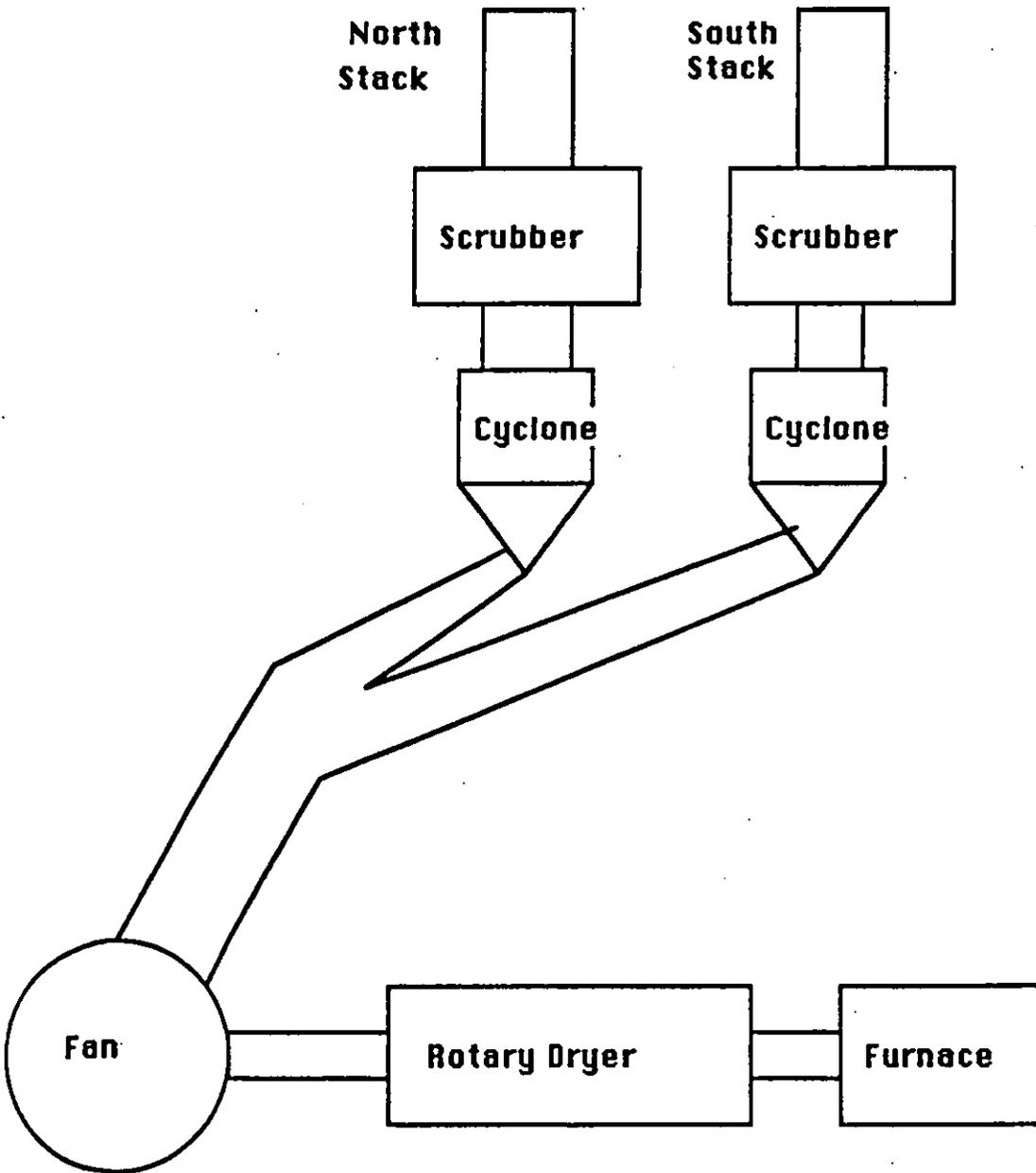
Note that this pulp
dryer has been
modified since this
testing, but this
data may still
be useful for emissions
from a micronized-coal-
fired dryer.

**REPORT ON
COMPLIANCE TESTING**

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

FIGURE 1

A schematic of the process is shown.



SUMMARY OF PROCEDURES

3-1

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.



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
<u>Process Data</u>			
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
<u>Gas Conditions</u>			
Temperature (°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
<u>Volumetric Flow Rate</u>			
acfm	57,977	57,612	59,560
dscfm	29,512	29,257	30,180
<u>Particulate Results</u>			
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

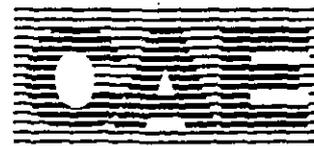


TABLE 2 - Particulate Results

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
<u>Process Data</u>			
<u>Pressure Differential</u>			
Demister (in. H ₂ O)	0.2	0.2	0.2
Cyclone (in. H ₂ O)	2.2	1.9	2.6
Scrubber (in. H ₂ O)	2.2	2.6	2.2
<u>Gas Conditions</u>			
Temperature (°F)	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
<u>Volumetric Flow Rate</u>			
acfm	31,668	31,181	33,617
dscfm	15,750	15,497	16,747
<u>Particulate Results</u>			
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
<u>Process Data</u>			
<u>Pressure Differential</u>			
Demister (in. H ₂ O)	.1	.2	.2
Cyclone (in. H ₂ O)	2.7	2.7	2.5
Scrubber (in. H ₂ O)	1.8	1.8	2.0
<u>Gas Conditions</u>			
Temperature (°F)	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
<u>Volumetric Flow Rate</u>			
acfm	26,309	26,431	25,943
dscfm	13,762	13,760	13,433
<u>Particulate Results</u>			
gr/dscf	0.0459	0.0845 ✓	0.1056 ✓
lb/hr	0.0425	10.0	12.2

5.0
 5.42 ↑
 Grains
 dry @
 stack
 conditions
 reported
 here BLS
 3/13/95

* See discussion



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

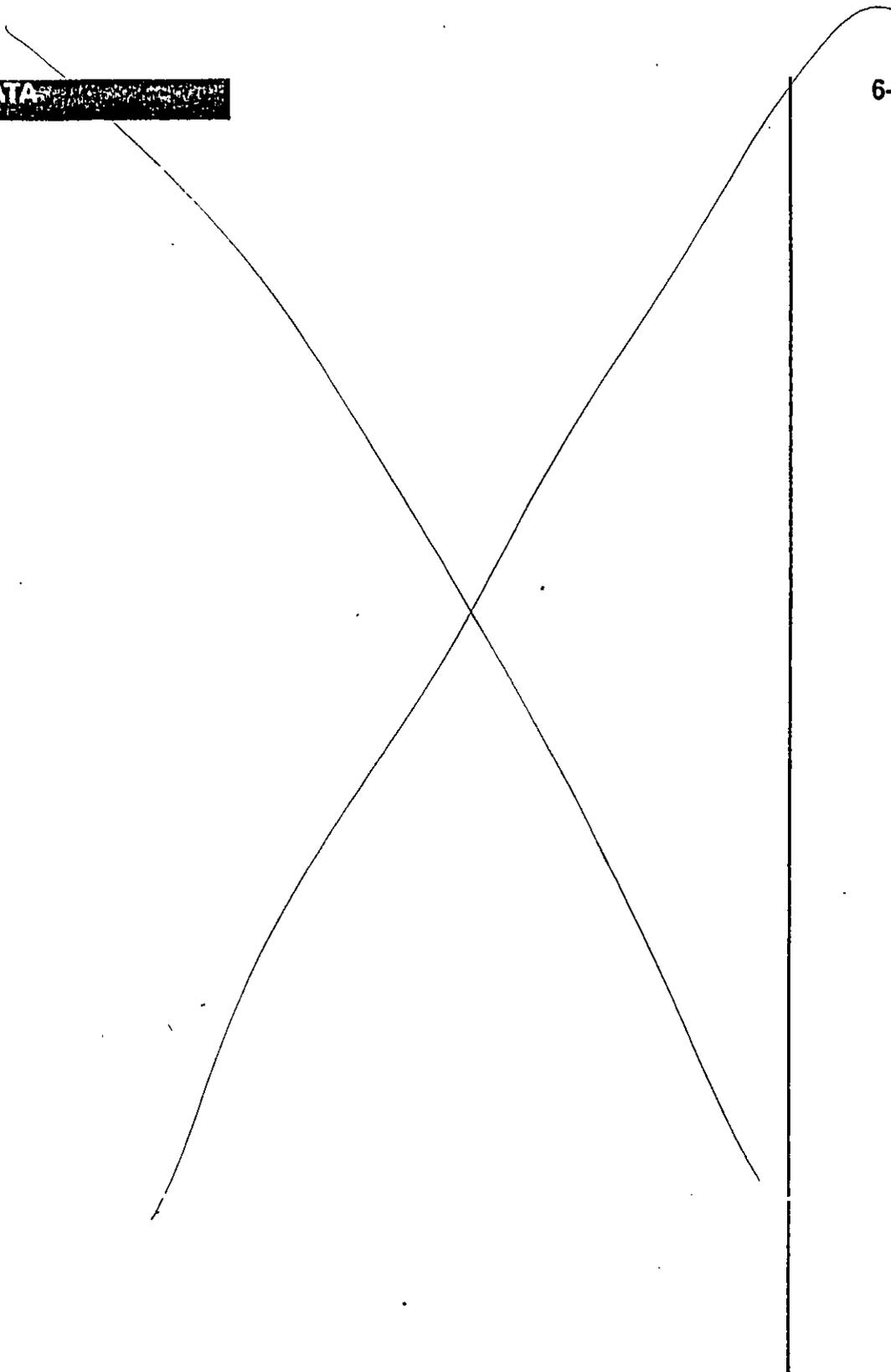
% SUGAR	19.5	19.6	17.4
% MARC	0.0579	0.0581	0.0534
SLICE RATE (tons/hr)	170	170	170
% DRY PULP MOISTURE	11.2	9.2	13.7
% PRESSED PULP MOISTURE	72.7	73.9	73.8
COAL FEED RATE (tons/hr)	3.20	3.39	3.48

CALCULATIONS

PRESSED PULP (tons/hr)	32.01	29.92	34.38
PROCESS WEIGHT (tons/hr)	35.21	33.31	37.86

PROCESS DATA

6-8



Filename: BEET12.WQ1

Date: 08-Dec-94

Facility: Western Sugar Company

Location: Scottsbluff, Nebraska

Source: Pulp Dryer

Pulverized coal-fired rotary drum beet pulp dryer controlled with two sets of cyclones and wet scrubbers in parallel (two stacks) (about 2" pressure drop)

Test date: Dec. 12-13, 1989

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	155	156	159	
NORTH STACK	Pressure	in. HG	26.1	26.1	26.1	
	Moisture	%	30.10	30.32	30.36	
	Oxygen	%	16	15.8	15.8	
	Volumetric flow, actual	acfm	26309	26431	25943	
	Volumetric flow, standard*	dscfm	13773	13771	13443	
	Isokinetic variation	%	98.1	99.9	102.5	
Circle: Production or feed rate	TPH		32.01	29.92	34.38	
Feed to dryer and west drum						
Pollutant concentrations:			mistake in report run 1 G/dscf calc. as G/dcf			
	Filterable PM	G/dscf	0.0459	0.08450	0.1056	
	Condensable inorganic PM	G/dscf	0.00494	0.00654	0.00554	
	CO2	% vol	3.9	4.2	4.2	
Pollutant mass flux rates:						
	Filterable PM	lb/hr	5.42	9.97	12.2	
	Condensable inorganic PM	lb/hr	0.583	0.772	0.638	
	CO2	lb/hr	3680	3963	3869	
Emission factors (ENGLISH UNITS):						AVERAGE
	Filterable PM	lb/ton	0.169	0.333	0.354	0.286
	Condensable inorganic PM	lb/ton	0.0182	0.0258	0.0186	0.0209
	CO2	lb/ton	115	132	113	120
Emission factors (METRIC UNITS):						AVERAGE
	Filterable PM	kg/Mg	0.0846	0.167	0.177	0.143
	Condensable inorganic PM	kg/Mg	0.00910	0.0129	0.00928	0.01043
	CO2	kg/Mg	57.5	66.2	56.3	60.0

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
2	Stack temperature	Deg F	161	162	162	
SOUTH STACK	Pressure	in. HG	26.1	26.1	26.1	
	Moisture	%	32.89	32.83	32.67	
	Oxygen	%	16.2	16.1	15.7	
	Volumetric flow, actual	acfm	31668	31181	33617	
	Volumetric flow, standard*	dscfm	15763	15509	16761	
	Isokinetic variation	%	101.7	103.1	101.5	
Circle: Production or feed rate	TPH		32.01	29.92	34.38	
Feed to dryer and west drum						
Pollutant concentrations:						
	Filterable PM	G/dscf	0.1033	0.09412	0.1081	
	Condensable inorganic PM	G/dscf	0.00918	0.00529	0.00585	
	CO2	% vol	3.9	3.9	4.2	
Pollutant mass flux rates:						
	Filterable PM	lb/hr	14.0	12.5	15.5	
	Condensable inorganic PM	lb/hr	1.24	0.704	0.840	
	CO2	lb/hr	4212	4144	4823	
Emission factors (ENGLISH UNITS):						AVERAGE
	Filterable PM	lb/ton	0.436	0.418	0.452	0.435
	Condensable inorganic PM	lb/ton	0.0387	0.0235	0.0244	0.0289
	CO2	lb/ton	132	139	140	137
Emission factors (METRIC UNITS):						AVERAGE
	Filterable PM	kg/Mg	0.218	0.209	0.226	0.218
	Condensable inorganic PM	kg/Mg	0.0194	0.0118	0.0122	0.0144
	CO2	kg/Mg	65.8	69.3	70.1	68.4

TOTAL EMISSION FACTORS FOR BOTH STACKS	Emission factors (ENGLISH UNITS):					AVERAGE	
		Filterable PM	lb/ton	0.605	0.752	0.806	0.721
	Condensable inorganic PM	lb/ton	0.0570	0.0493	0.0430	0.0498	
	CO2	lb/ton	247	271	253	257	
TOTAL EMISSION FACTORS FOR BOTH STACKS	Emission factors (METRIC UNITS):					AVERAGE	
		Filterable PM	kg/Mg	0.303	0.376	0.403	0.360
		Condensable inorganic PM	kg/Mg	0.0285	0.0247	0.0215	0.0249
		CO2	kg/Mg	123	135	126	128

SUMMARY

1-1

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

2-1

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.



DISCUSSION

5-1

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)

5-2

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.



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 ₂ O)
$\sqrt{\overline{DP}}$	-	average of square roots of velocity heads of stack gas ($\sqrt{\text{in. H}_2\text{O}}$)
$DH@$	-	meter orifice calibration coefficient (in. H ₂ O)
%I	-	percent of isokinetic sampling (acceptable: $90 \leq \%I \leq 110\%$)
K_p	-	pitot tube constant: $85.49 \text{ (ft/sec)} \frac{\sqrt{(\text{lb/lb-mole})(\text{in. Hg})}}{\sqrt{(^{\circ}\text{R})(\text{in. H}_2\text{O})}}$
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 ($^{\circ}\text{R}$)
T_i	-	initial absolute temperature of flask ($^{\circ}\text{R}$)
$\overline{T_m}$	-	average dry gas meter temperature ($^{\circ}\text{F}$)
$\overline{T_s}$	-	average stack temperature ($^{\circ}\text{F}$)
T_{std}	-	absolute temperature, standard conditions (528°R)
Θ	-	total sampling time (min)
V_a	-	volume of aliquot (ml)
V_f	-	volume of flask (ml)
V_{lc}	-	total volume of liquid collected in impingers and silica gel (ml)
V_m	-	volume of gas sample through the dry gas meter at meter conditions (ft^3)
V_{mstd}	-	volume of gas sample through the dry gas meter, standard conditions (ft^3)
V_{sc}	-	volume of flask sample, standard conditions (ml)
V_{soln}	-	total volume of solution (ml)
V_t	-	volume of titrant used to titrate aliquot (ml)
V_{tb}	-	volume of titrant used to titrate blank (ml)
V_{wstd}	-	volume of water collected, standard conditions (ft^3)
V_s	-	stack gas velocity (ft/sec)
Y_d	-	gas meter correction factor (dimensionless)



SAMPLE CALCULATIONS - Continued

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

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

$$= 32.01$$

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

$$= 3.2 + 32.01$$

$$= 32.21$$

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
DHC	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	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

*TOTAL PARTICULATE
MATTER COLLECTED
(front half)*

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

ALL WEIGHTS SORTED BY RDS

R	R	S	W	F	WASH	GROSS	TARE	NET		
D	U	H	T	B	ML CORR					
S	N	#	#	IDENTIFIER	T					
		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 condensable

WESTERN SUGAR
 CAE Project No: 5119

WEIGHT SHEET # 1

R	R	S	W	F					
D	U	H	T	B	WASH				
S	N	#	#	IDENTIFIER	T	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

R	R	S	W	F					
D	U	H	T	B	WASH				
S	N	#	#	IDENTIFIER	T	ML CORR	GROSS	TARE	NET

		2	9	BLANK	B	150	0.0000	59.3853	59.3848
1	2S	2	3	358	B	170	0.0006	66.3249	66.2781
2	3S	2	5	312	B	130	0.0004	67.6524	67.6231
3	4S	2	7	322	B	190	0.0006	68.2758	68.2293
4	2N	2	4	370	B	170	0.0006	67.7911	67.7809
5	3N	2	6	330	B	175	0.0006	67.8372	67.8228
6	4N	2	8	69	B	200	0.0007	67.7538	67.6993

WEIGHT SHEET # 3

R	R	S	W	F					
D	U	H	T	B	WASH				
S	N	#	#	IDENTIFIER	T	ML CORR	GROSS	TARE	NET

		2	8	BLANK	B	500	0.0000	60.3490	60.3481
1	2S	2	4	43	B	343	0.0006	61.7126	61.6924
2	3S	2	5	63	B	342	0.0006	60.6012	60.5893
3	4S	2	6	78	B	362	0.0007	60.7084	60.6944
4	2N	2	7	81	B	326	0.0006	50.5788	50.5668
5	3N	2	2	36	B	336	0.0006	49.1353	49.1193
6	4N	2	3	41	B	338	0.0006	59.9354	59.9217

WESTERN SUGAR COMPANY
CAE Project No: 5119

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) %	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)%	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)%	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

Avg	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	Mg	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		