

AP42 Section:	9.10.1.2
Title:	Emission Factor Documentation for AP-42 Section 9.10.1.2, March 1997 WITH APPENDICES The report is available electronically but not with the appendices (test reports).

Emission Factor Documentation for AP-42
Section 9.10.1.2

SUGARBEET PROCESSING

Final Report

Appendices Only

For U. S. Environmental Protection Agency
Office of Air Quality Planning and Standards
Emission Factor and Inventory Group
Research Triangle Park, NC 27711

Attn: Mr. Dallas Safriet (MD-14)
Emission Factor and Inventory Group

EPA Contract 68-D2-0159
Work Assignment No. 2-03 and 4-04

MRI Project No. 4602-03 and 4604-04

March 1997

NOTICE

The information in this document has been funded wholly or in part by the United States Environmental Protection Agency under Contract No. 68-D2-0159 to Midwest Research Institute. It has been reviewed by the Office of Air Quality Planning and Standards, U. S. Environmental Protection Agency, and has been approved for publication. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

Abberqes only

APPENDIX A

REPORT EXCERPTS FROM REFERENCE 1

(Southern Minnesota Beet Sugar Cooperative, January 21, 1988)

#290

MMT Environmental, Inc.
4643 North Chatsworth Street
St. Paul, MN 55112

RESULTS OF A SOURCE
EMISSION COMPLIANCE TEST AT
SOUTHERN MINNESOTA BEET SUGAR
COOPERATIVE
RENVILLE, MINNESOTA 56284

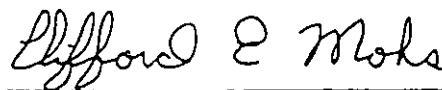
January 21, 1988

Submitted to:

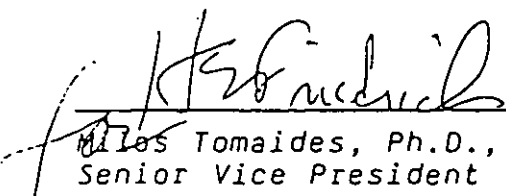
Southern Minnesota Beet Sugar
Cooperative
P.O. Box 500
Renville, Minnesota 56248

Attention: Mr. W.D. DeBelly

Prepared by:


Clifford E. Mohs
Manager, Technical Services

Approved by:


Milos Tomaides, Ph.D., P.E.
Senior Vice President

PARTICULATE EMISSION TEST CALCULATIONS

PROJECT NUMBER: 8014	COMPANY: SOUTHERN MN. BEET SUGAR
TEST NUMBER: 1	SOURCE: CYCLONE 'A-2'
RUN NUMBER: 1	TIME: 1/21/88 1128-1231

TEST DATA

GAS METER COEFFICIENT	1.0335 Y	VOLUME OF LIQUID COLLECTED, ML	515.5 V1
PITOT TUBE COEFFICIENT	0.848 Cp	GAS COMPOSITION, % V/V DRY:	
NOZZLE DIMENSIONS:		CARBON DIOXIDE	5.50 CD
DIAMETER, IN	0.375 Dn	OXYGEN	14.20 OX
AREA, SF	0.00767 An	CARBON MONOXIDE	0.00 CM
STACK DIMENSIONS:		NITROGEN (BY DIFFERENCE)	80.33 NI
DIAMETER/LENGTH, IN	47.50 S1	AVE. TRAVERSE POINT DATA:	
WIDTH, IN	0.00 Sw	STACK TEMP., DEG F	288 Ts
AREA, SF	12.306 As	METER TEMP., DEG F	68 Tm
BAROMETRIC PRESSURE, IN HG	29.30 Pb	ORIFICE PRESSURE, IN WC	1.450 Po
STACK PRESSURES:		SQRT VELOCITY P., IN WC	0.421 Pv
STATIC, IN WC	0.00 Ps	MASS OF PARTICULATE MATTER COLLECTED, G:	
ABSOLUTE, IN HG	29.30 Pa	FRONT CATCH (94.8%)	0.4046 Wf
SAMPLING TIME, MIN	60.00 Ti	BACK CATCH (5.2%)	0.0234 Wb
VOLUME OF GAS SAMPLED AT METER, DCF	40.427 Vm	TOTAL CATCH	0.4480 Wt

CALCULATED RESULTS

VOLUME OF GAS SAMPLED AT METER, DSCF	39.872 Vas	GAS MOLECULAR WEIGHT:	
EQUIVALENT VOLUME OF WATER VAPOR COLLECTED, SCF	24.265 Vw	DRY BASIS, LB/LB-MOLE	29.45 Mg
GAS MOISTURE CONTENT:		WET BASIS, LB/LB-MOLE	25.12 Ms
VOLUME FRACTION	0.3783 Zws	AVERAGE GAS VELOCITY, FPS	30.52 Vs
PERCENT BY VOLUME	37.83 Zwp	GAS VOLUMETRIC FLOW RATE:	
		ACTUAL, ACFM	22532 Qa
		STANDARD, SCFM	15567 Qs
		DRY STANDARD, DSCFM	9678 Qsd
		ISOKINETIC VARIATION, %	110.24 I

PARTICULATE EMISSION PARAMETER	FRONT CATCH	BACK CATCH	TOTAL CATCH
PARTICULATE CONCENTRATION			
ACTUAL, GR/ACF	0.0705 Caf	0.0039 Cab	0.0744 Cat
STANDARD, GR/SCF	0.1021 Cwf	0.0056 Cwb	0.1077 Cwt
DRY STANDARD, GR/DSCF	0.1642 Csf	0.0090 Csb	0.1733 Cst
PARTICULATE EMISSION RATE, LB/HR			
CLASSICAL METHOD	13.63 Rcf	0.75 Rcb	14.38 Rct
RATIO OF AREAS METHOD	15.02 R-f	0.83 R-b	15.85 R-t

STANDARD CONDITIONS: 68 DEG F, 29.92 IN HG * NON-APPLICABLE DATA

PARTICULATE EMISSION TEST CALCULATIONS

PROJECT NUMBER: 8014	COMPANY: SOUTHERN MN. BEET SUGAR
TEST NUMBER: 1	SOURCE: CYCLONE "A-2"
RUN NUMBER: 2	TIME: 1/21/88 1248-1352

TEST DATA

GAS METER COEFFICIENT	1.0035 Y	VOLUME OF LIQUID COLLECTED, ML	460.0 V1
PITOT TUBE COEFFICIENT	0.840 Cp	GAS COMPOSITION, % V/V DRY:	
NOZZLE DIMENSIONS:		CARBON DIOXIDE	4.60 C0
DIAMETER, IN	0.375 Dn	OXYGEN	15.60 OX
AREA, SF	0.200767 An	CARBON MONOXIDE	0.00 CM
		NITROGEN (BY DIFFERENCE)	79.80 NI
STACK DIMENSIONS:		AVE. TRAVERSE POINT DATA:	
DIAMETER/LENGTH, IN	47.50 S1	STACK TEMP., DEG F	292 Ts
WIDTH, IN	0.00 Sw	METER TEMP., DEG F	63 Tm
AREA, SF	12.306 As	ORIFICE PRESSURE, IN WC	1.385 Po
BAROMETRIC PRESSURE, IN HG	29.30 Pb	SQRT VELOCITY P., IN WC	0.422 Pv
STACK PRESSURES:		MASS OF PARTICULATE MATTER COLLECTED, G:	
STATIC, IN WC	2.00 Pg	FRONT CATCH (96.0%)	0.4116 Wf
ABSOLUTE, IN HG	29.30 Ps	BACK CATCH (4.0%)	0.0170 Wb
SAMPLING TIME, MIN	60.00 T:	TOTAL CATCH	0.4286 Wt
VOLUME OF GAS SAMPLED AT METER, DCF	38.299 Vm		

CALCULATED RESULTS

VOLUME OF GAS SAMPLED AT METER, DSCF	37.767 Vms	GAS MOLECULAR WEIGHT:	
		DRY BASIS, LB/LB-MOLE	29.36 Md
		WET BASIS, LB/LB-MOLE	25.22 Mw
EQUIVALENT VOLUME OF WATER VAPOR COLLECTED, SCF	21.652 Vw	AVERAGE GAS VELOCITY, FPS	30.60 Vs
GAS MOISTURE CONTENT:		GAS VOLUMETRIC FLOW RATE:	
VOLUME FRACTION	0.3644 Bws	ACTUAL, ACFM	22593 Qa
PERCENT BY VOLUME	36.44 Bvp	STANDARD, SCFM	15535 Qs
		DRY STANDARD, DSCFM	9974 Qsd
		ISOKINETIC VARIATION, %	102.34 I

PARTICULATE EMISSION PARAMETER	FRONT CATCH	BACK CATCH	TOTAL CATCH
PARTICULATE CONCENTRATION:			
ACTUAL, GR/ACF	0.3734 Caf	0.0030 Cab	0.3765 Cat
STANDARD, GR/SCF	0.1368 Csf	0.0044 Csb	0.1412 Cst
DRY STANDARD, GR/DSCF	0.1681 Csf	0.0059 Csb	0.1740 Cst
PARTICULATE EMISSION RATE, LB/HR			
CLASSICAL METHOD	14.23 Rcf	0.59 Rcb	14.82 Rct
RATIO OF AREAS METHOD	14.56 Rrf	0.60 Rrb	15.16 Rrt

STANDARD CONDITIONS: 68 DEG F, 29.92 IN HG	* NON-APPLICABLE DATA

PARTICULATE EMISSION TEST CALCULATIONS

PROJECT NUMBER: 8014 COMPANY: SOUTHERN MN. BEET SUGAR
 TEST NUMBER: 1 SOURCE: CYCLONE "A-2"
 RUN NUMBER: 3 TIME: 1/21/88 1430-1533

TEST DATA

GAS METER COEFFICIENT	1.0035 Y	VOLUME OF LIQUID COLLECTED, ML	614.1 V1
PITOT TUBE COEFFICIENT	0.840 Cp	GAS COMPOSITION, % V/V DRY:	
NOZZLE DIMENSIONS:		CARBON DIOXIDE	6.30 CD
DIAMETER, IN	0.375 Dn	OXYGEN	13.10 OX
AREA, SF	2.020767 An	CARBON MONOXIDE	2.20 CM
		NITROGEN (BY DIFFERENCE)	82.90 NI
STACK DIMENSIONS:		AVE. TRAVERSE POINT DATA:	
DIAMETER/LENGTH, IN	47.50 S1	STACK TEMP., DEG F	292 Ts
WIDTH, IN	0.82 Sw	METER TEMP., DEG F	68 Tm
AREA, SF	12.326 As	ORIFICE PRESSURE, IN WC	1.555 Po
BAROMETRIC PRESSURE, IN HG	29.30 Pb	SOOT VELOCITY P., IN WC	0.446 Pv
STACK PRESSURES:		MASS OF PARTICULATE MATTER COLLECTED, G:	
STATIC, IN WC	0.20 Pg	FRONT CATCH (95.8%)	2.4170 Wf
ABSOLUTE, IN HG	29.30 Ps	BACK CATCH (4.2%)	0.0164 Wb
SAMPLING TIME, MIN	60.00 Ti	TOTAL CATCH	2.4334 Wt
VOLUME OF GAS SAMPLED AT METER, DCF	41.600 Vm		

CALCULATED RESULTS

VOLUME OF GAS SAMPLED AT METER, DSCF	42.448 Vms	GAS MOLECULAR WEIGHT:	
		DRY BASIS, LB/LB-MOLE	29.46 Md
		WET BASIS, LB/LB-MOLE	24.70 Ms
EQUIVALENT VOLUME OF WATER VAPOR COLLECTED, SCF	28.906 Vw	AVERAGE GAS VELOCITY, FPS	32.65 Vs
GAS MOISTURE CONTENT:		GAS VOLUMETRIC FLOW RATE:	
VOLUME FRACTION	0.4168 Bws	ACTUAL, ACFM	24108 Qa
PERCENT BY VOLUME	41.68 Bwp	STANDARD, SCFM	16566 Qs
		DRY STANDARD, DSCFM	9662 Qsd
		ISOKINETIC VARIATION, %	112.02 I

PARTICULATE EMISSION PARAMETER	FRONT CATCH	BACK CATCH	TOTAL CATCH
PARTICULATE CONCENTRATION			
ACTUAL, GR/ACF	0.2637 Caf	0.0028 Cab	0.2665 Cat
STANDARD, GR/SCF	0.0927 Cwf	0.0041 Cwb	0.0968 Cwt
DRY STANDARD, GR/DSCF	0.1590 Csf	0.0070 Csb	0.1660 Cst
PARTICULATE EMISSION RATE, LB/HR			
CLASSICAL METHOD	13.18 Rcf	0.58 Rcb	13.76 Rct
RATIO OF AREAS METHOD	14.75 Rrf	0.65 Rrb	15.40 Rrt

STANDARD CONDITIONS: 68 DEG F, 29.92 IN HG

• NON-APPLICABLE DATA

SUMMARY OF PARTICULATE EMISSION TEST LABORATORY DATA

PROJECT NUMBER: 8314
TEST NUMBER: 1

COMPANY: SOUTHERN MN. BEET SUGAR
SOURCE: CYCLONE "A-2"

MASS OF PARTICULATE MATTER COLLECTED, GRAMS								
RUN NUMBER	FRONT CATCH				BACK CATCH			TOTAL PARTICULATE MASS COLLECTED
	FRONT WASH	CYCLONE CATCH	FILTER CATCH	FRONT TOTAL	IMPINGER CATCH **	IMPINGER WASH	BACK TOTAL	
1	0.1632	2.0020	0.2616	0.4246	0.0112	0.0122	0.0234	0.4480
2	0.1766	2.0020	0.2356	0.4116	0.0087	0.0083	0.0170	0.4286
3	0.1611	0.0020	0.2559	0.4170	0.0122	0.0062	0.0184	0.4354

* NOT APPLICABLE

** CHLOROFORM/ETHYL ETHER EXTRACTION

(4) JAN 26 1988

DIFFUSER REPORT

SIGNATURES

DAY ENDING 8 A.M. 1-21-88

OPER.

BEET END 4M.

SHIFT 1 AcidlySHIFT 2 HandSHIFT 3 Julie

5%

	A.M.				P.M.								A.M.											
	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	
BEETS SLICED TONS	3.2	3.0	3.0	3.0	3.2	3.0	3.0	3.2	0	3.0	3.0	3.0	3.0	3.0	3.0	3.2	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
COSSETTE SCALE	8 A.M. 21945								4 P.M. 24316								12 Mid. 26431							
SLICERS IN SERVICE	4	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	
CONDITION OF COSSETTES	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
TEMPS:																								
SCALDING TEMP. ENT. DIFF. °F	77	83	79	84	82	83	81	81	76	84	85	82	82	83	84	84	84	82	83	80	76	76	76	
RAW JUICE LVG. DIFF.	51	51	56	56	61	68	10	65	65	62	64	60	61	62	63	63	66	64	65	64	62	61	61	
DIFFUSER SUPPLY	67	67	67	68	67	68	68	67	69	67	67	67	66	67	67	68	68	69	68	68	69	69	69	
RAW JUICE TO CARBS.	71	80	78	-	79	82	86	85	84	84	83	82	82	82	83	84	85	85	85	85	85	85	83	
Cossette	55	65	51	50	36	62	64	57	58	57	59	53	55	56	58	58	60	58	58	58	59	59	59	
WATER FLOW TO DIFF. (TON/HR)	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5		
DIFF. SCREENS CLEANED																								
RAW JUICE FLOW %	66	66	70	70	70	70	70	70	66	66	70	70	70	70	70	66	70	70	66	66	66	66	66	
DELAY TO SLICE (BELOW 250 TON/HR)																								

FORMALDEHYDE GALS.

SHIFT 1 12:45pm 7.00

SHIFT 2

SHIFT 3 8:00am 5:00am

FOAM OIL GALS.

SHIFT 1 7'8 1/2"SHIFT 2 7'8 1/2" - 7'6"SHIFT 3 7'6" - 7'5"

DIFFUSER TEMP.

CELL 2	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71
CELL 9	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71
CELL 13	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71
CELL 17	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71
CELL 22	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71
CELL 25	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71	71

REASON FOR DELAY:

SHUTTING @ 3:30 P.M. LIME KILN @ 5:00 P.M.

COMMENTS: Flushed Flume @ 10:20 A.M. Flushed Flume @ 5:15 P.M.

IFROZE "B" SLICER - SLICING AGAIN 11:50 -

B-SLICER MOTOR SHUT OFF 3 TIMES - IMMEDIATELY

Filename: BEET1.WQ1

Date: 02-Dec-94

Facility: Southern Minnesota Beet Sugar Cooperative, Renville, Minnesota

Source: Fuel oil-fired drum pulp dryer (assumed south dryer)

Test date: Jan. 21, 1988

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	288	292	292	
	Pressure	in. HG	29.3	29.3	29.3	
	Moisture	%	37.83	36.44	41.68	
	Oxygen	%	14.2	15.6	13.1	
	Volumetric flow, actual	acfm	22532	22593	24108	
	Volumetric flow, standard*	dscfm	9683	9874	9667	
	Isokinetic variation	%	110.2	102.3	112	
Wet pulp feed rate (Assumed South Dryer)		TPH	45.0	41.0	42.5	
Pollutant concentrations:						
	Filterable PM	G/dscf	0.1642	0.1681	0.159	
	Condensable PM	G/dscf	0.0090	0.0069	0.007	
	CO2	% dv	5.5	4.6	6.0	
	Condensable organic PM	% of CPM	47.9%	51.2%	66.3%	
	Condensable inorganic PM	% of CPM	52.1%	48.8%	33.7%	
Multiply all conc. by 4 because only one of four stacks was tested.						
Pollutant mass flux rates:						
	Filterable PM	lb/hr	54.5	56.9	52.7	
	Condensable PM	lb/hr	2.99	2.34	2.32	
	CO2	lb/hr	14600	12451	15901	
	Condensable organic PM	lb/hr	1.43	1.20	1.54	
	Condensable inorganic PM	lb/hr	1.56	1.14	0.782	
Emission factors (ENGLISH UNITS):						AVERAGE
	Filterable PM	lb/ton	1.21	1.39	1.24	1.28
	Condensable PM	lb/ton	0.0664	0.0570	0.0546	0.0593
	CO2	lb/ton	324	304	374	334
	Condensable organic PM	lb/ton	0.0318	0.0292	0.0362	0.0322
	Condensable inorganic PM	lb/ton	0.0346	0.0278	0.0184	0.0269
Emission factors (METRIC UNITS):						AVERAGE
	Filterable PM	kg/Mg	0.606	0.694	0.620	0.64
	Condensable PM	kg/Mg	0.0332	0.0285	0.0273	0.0297
	CO2	kg/Mg	162	152	187	16
	Condensable organic PM	kg/Mg	0.0159	0.0146	0.0181	0.016
	Condensable inorganic PM	kg/Mg	0.0173	0.0139	0.00920	0.0135

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

APPENDIX B

REPORT EXCERPTS FROM REFERENCE 2

(Southern Minnesota Beet Sugar Cooperative, December 14, 1988)

Rec'd 11/9/88
22

Minnesota
Department of Natural Resources
MMT Environmental Services, Inc.
4643 North Chatsworth Street
St. Paul, MN 55112

RESULTS OF AN EMISSION
COMPLIANCE TEST ON THE NORTH
DRYER #2 AT SOUTHERN MINNESOTA
BEET SUGAR COOPERATIVE
RENVILLE, MINNESOTA 56284

December 11, 1988

Submitted to:

Southern Minnesota Beet Sugar
Cooperative
P. O. Box 500
Renville, Minnesota 56284

Attention: Mr. W. D. DeBelly

Prepared by:

Clifford E. Mohs
Clifford E. Mohs
Manager, Technical Services

Approved by:

Milos Tomaides
for Milos Tomaides, Ph.D., P.E.

Report Number 8722
Project Number 8202

TABLE 2.1 SUMMARY OF PARTICULATE EMISSION TEST RESULTS

PROJECT NUMBER: 8282 COMPANY: SOUTHERN MN SUGAR BEET COOP
 TEST NUMBER: 1 SOURCE: NORTH CYCLONE DRYER #2

TEST PARAMETER	RUN 1	RUN 2	RUN 3
TEST DATE	12/14/88	12/14/88	12/14/88
TIME OF TEST, HR:			
START	0928	1044	1204
FINISH	1029	1147	1310
EFFLUENT TEMPERATURE, °DEGREES F	292	279	259
EFFLUENT MOISTURE CONTENT, % V/V	29.8	30.6	30.5
EFFLUENT COMPOSITION, % V/V DRY:			
CARBON DIOXIDE	5.2	5.2	5.2
OXYGEN	14.9	14.9	14.9
CARBON MONOXIDE	0.0	0.0	0.0
EFFLUENT VOLUMETRIC FLOW RATE:			
ACTUAL CONDITIONS, ACFM	20741	20481	20739
STANDARD CONDITIONS, SCFM	14831	14825	14657
DRY STANDARD CONDITIONS, DSCFM	9847	9733	10183
ISOKINETIC VARIATION, %	96.6	99.4	95.0
EFFLUENT PARTICULATE CONCENTRATION:			
ACTUAL CONDITIONS, GR/ACF	0.0424	0.0400	0.0462
STANDARD CONDITIONS, GR/SCF	0.0627	0.0582	0.0654
DRY STANDARD CONDITIONS, GR/DSCF	0.0894	0.0839	0.0941
SOURCE PARTICULATE EMISSION RATE:			
CLASSICAL METHOD, LB/HR	7.55	7.01	8.22
RATIO OF AREAS METHOD, LB/HR	7.29	6.96	7.88

9.721

0.0891

1 - sample

7.59
7.33

PARTICULATE CONCENTRATION AND EMISSION RATES BASED ON ANALYSIS OF
 THE SAMPLING TRAIN FRONT AND BACK CATCHES.

STANDARD CONDITIONS: 68 DEGREES FAHRENHEIT, 29.92 INCHES OF MERCURY.

700 ± .0520 - 2.00 - 0.0892

SUMMARY OF PARTICULATE EMISSION TEST LABORATORY DATA

PROJECT NUMBER: 8282
TEST NUMBER: 1

COMPANY: SOUTHERN MN SUGAR BEET COOP
SOURCE: NORTH CYCLONE DRYER #2

MASS OF PARTICULATE MATTER COLLECTED, GRAMS								
RUN NUMBER	FRONT CATCH				BACK CATCH			TOTAL PARTICULATE MASS COLLECTED
	FRONT WASH	CYCLONE CATCH	FILTER CATCH	FRONT TOTAL	IMPINGER CATCH **	IMPINGER WASH	BACK TOTAL	
1	0.0429	0.0000	0.1237	0.1666	0.0235	0.0139	0.0374	0.2040
2	0.0225	0.0000	0.1326	0.1551	0.0221	0.0175	0.0396	0.1947
3	0.0465	0.0000	0.1400	0.1865	0.0103	0.0214	0.0317	0.2182

* NOT APPLICABLE

** CHLOROFORM/ETHYL ETHER EXTRACTION

Filename: BEET2.WQ1
 Date: 02-Dec-94
 Facility: Southern Minnesota Beet Sugar Cooperative
 Location: Renville, Minnesota
 Source: Fuel oil-fired drum pulp dryer (North dryer)
 Test date: Dec. 14, 1988

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	292	279	259	
	Pressure	in. HG	28.82	28.8	28.8	
	Moisture	%	29.82	30.6	30.52	
	Oxygen	%	14.9	14.9	14.9	
	Volumetric flow, actual	acfm	20741	20401	20739	
	Volumetric flow, standard*	dscfm	9844	9737	10186	
	Isokinetic variation	%	96.63	99.41	94.95	
	Wet pulp feed rate North Dryer	TPH	37.5	25.3	20	
	Pollutant concentrations:					
	Filterable PM	G/dscf	0.073	0.0668	0.159	
	Condensable PM	G/dscf	0.0164	0.0171	0.007	
	CO2	% dv	5.2	5.2	5.2	
	Condensable organic PM	% of CPM	62.8%	55.8%	32.5%	
	Condensable inorganic PM	% of CPM	37.2%	44.2%	67.5%	
	Multiply all conc. by 4 because only one of four stacks was tested.					
	Pollutant mass flux rates:					
	Filterable PM	lb/hr	24.6	22.3	55.5	
	Condensable PM	lb/hr	5.54	5.71	2.44	
	CO2	lb/hr	14033	13880	14519	
	Condensable organic PM	lb/hr	3.48	3.19	0.79	
	Condensable inorganic PM	lb/hr	2.06	2.52	1.65	
	Emission factors (ENGLISH UNITS):					
	Filterable PM	lb/ton	0.657	0.880	2.78	AVERAGE 1.44
	Condensable PM	lb/ton	0.148	0.225	0.122	0.165
	CO2	lb/ton	374	548	726	549
	Condensable organic PM	lb/ton	0.0927	0.126	0.0397	0.0861
	Condensable inorganic PM	lb/ton	0.0549	0.0996	0.0825	0.0790
	Emission factors (METRIC UNITS):					
	Filterable PM	kg/Mg	0.329	0.440	1.39	AVERAGE 0.719
	Condensable PM	kg/Mg	0.0738	0.113	0.0611	0.0825
	CO2	kg/Mg	187	274	363	275
	Condensable organic PM	kg/Mg	0.0464	0.0629	0.0199	0.0430
	Condensable inorganic PM	kg/Mg	0.0274	0.0498	0.0413	0.0395

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

APPENDIX C

REPORT EXCERPTS FROM REFERENCE 3

(Southern Minnesota Beet Sugar Cooperative, December 8, 1986)

RECEIVED DEC 15 1986

Interpoll Inc.
4500 Ball Road N.E.
Circle Pines, Minnesota 55014

Telephone (612) 786-6020

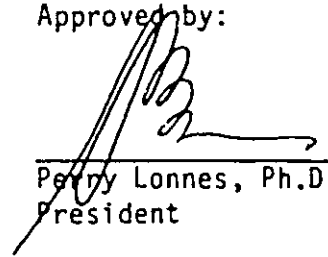
RESULTS OF THE NOVEMBER 18, 1986,
PARTICULATE EMISSION COMPLIANCE
TEST ON THE COMBINED DISCHARGE STACK
OF THE SUGAR DRYER AND SUGAR COOLER
AT THE SOUTHERN MINNESOTA SUGAR COOPERATIVE
PLANT IN RENVILLE, MINNESOTA

Submitted to:

SOUTHERN MINNESOTA SUGAR COOPERATIVE
P. O. Box 500
Renville, Minnesota 56284

Attention: Dean DeBelly

Approved by:



Perry Lonnes, Ph.D.
President

Report Number 6-2305
December 8, 1986

1 INTRODUCTION

On November 18, 1986, Interpoll Inc. personnel conducted a particulate emission compliance test on the combined discharge from the Sugar Dryer and Sugar Cooler scrubbers at the Southern Minnesota Sugar Cooperative (SMSC) Plant located in Renville, Minnesota. On-site testing was performed by J. Buresh and C. Mosser. Coordination between testing activities and plant operation was provided by Dean DeBelly of SMSC. The test was witnessed by Carolina Schutt of the Minnesota Pollution Control Agency (MPCA).

The Sugar Dryer and Cooler are rotary drum indirectly heated units manufactured by Stearns-Roger. Particulate emissions from the dryer and cooler are controlled by identical American Air Filter, Type W, Size 24 wet scrubbers. The scrubbers have a nominal air flow of 13,000 ACFM and a scrubber water flow rate of 6 GPM.

Particulate determinations were performed in accordance with EPA Methods 1-5 and 9, CFR Title 40, Part 60, Appendix A (revised July 1, 1986). A preliminary determination of the gas linear velocity profile was made before the first particulate run to allow selection of the appropriate nozzle diameter required for isokinetic sample withdrawal. An Interpoll sampling train which meets or exceeds specifications in the above-cited reference was used to extract particulate samples by means of a heated glass-lined probe.

Testing was conducted from two test ports oriented at 90 degrees on the common stack. These test ports are located 30 feet downstream and 20 feet upstream of the nearest flow disturbance. A 12-point traverse was used to extract representative particulate samples. Each traverse point was sampled five minutes to give a total sampling time of 60 minutes per run. Visible emission determinations could not be performed due to a steam plume from an adjacent source.

TABLE 1. Results of the November 18, 1986, Particulate Emission Compliance Test on the Combined Sugar Cooler/Dryer Stack at the Southern Minnesota Sugar Cooperative in Renville, Minnesota.

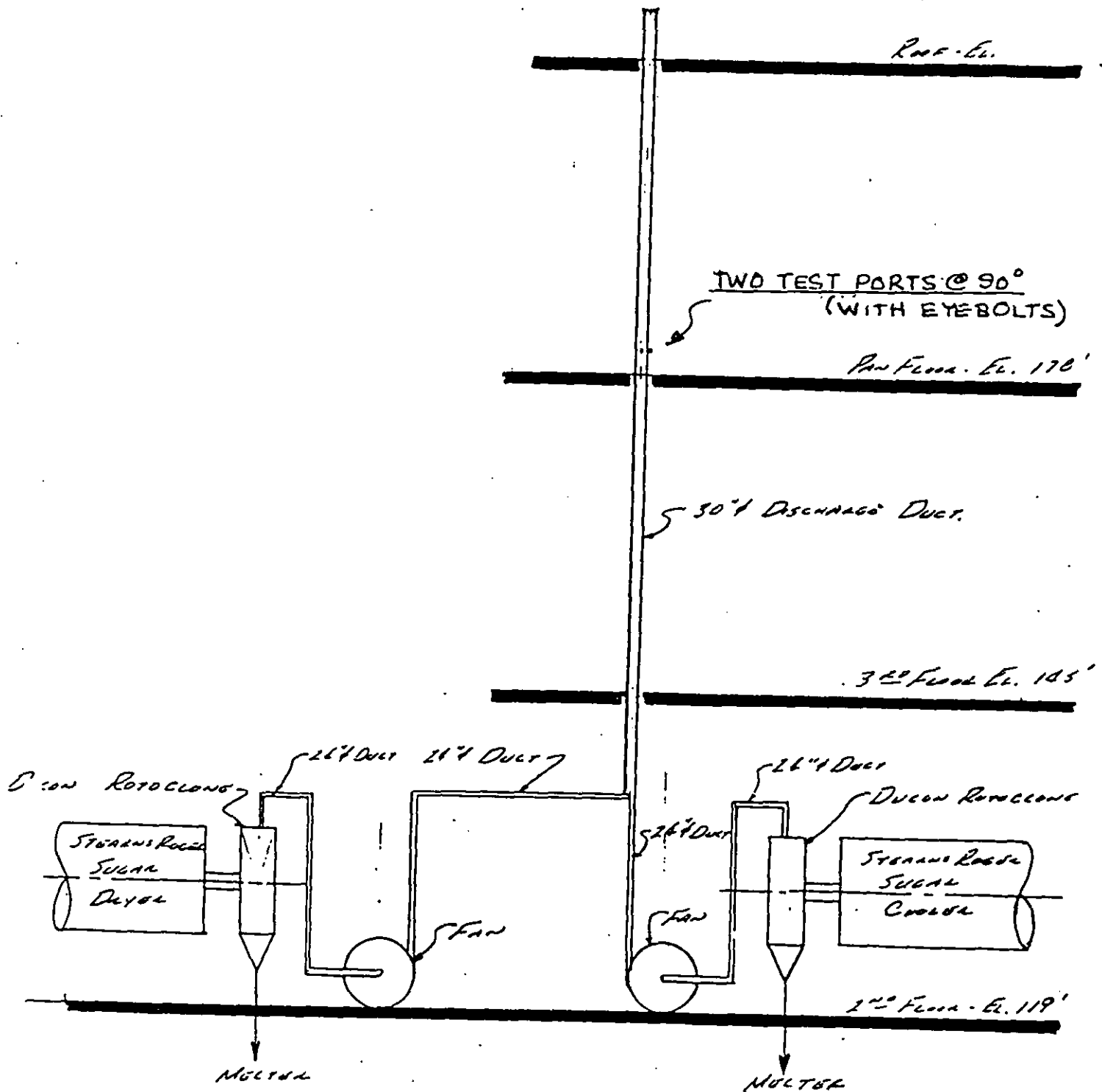
ITEM	Run 1	Run 2	Run 3
Date of test	11-18-86	11-18-86	11-18-86
Time runs were done (HRS)	800/ 901	926/1027	1038/1139
Process rate (KLB/HR)	87.9	87.9	87.9
Volumetric flow actual (ACFM)	18779	19029	18666
standard (DSCFM)	15935	15952	15830
Gas temperature (DEG-F)	108	108	107
Moisture content (%V/V)	5.72	6.86	5.87
Gas composition (%V/V, dry)			
carbon dioxide	0.03	0.03	0.03
oxygen	20.90	20.90	20.90
carbon monoxide	0.00	0.00	0.00
nitrogen	79.07	79.07	79.07
Isokinetic variation (%)	101.3	101.1	100.6
Particulate concentration			
actual (GR/ACF)	0.01054	0.00792	0.01039
standard (GR/DSCF)	0.01243	0.00945	0.01226
Part. emission rate (LB/HR)	1.70	1.29	1.66

15,906

1.53

* Dry catch only

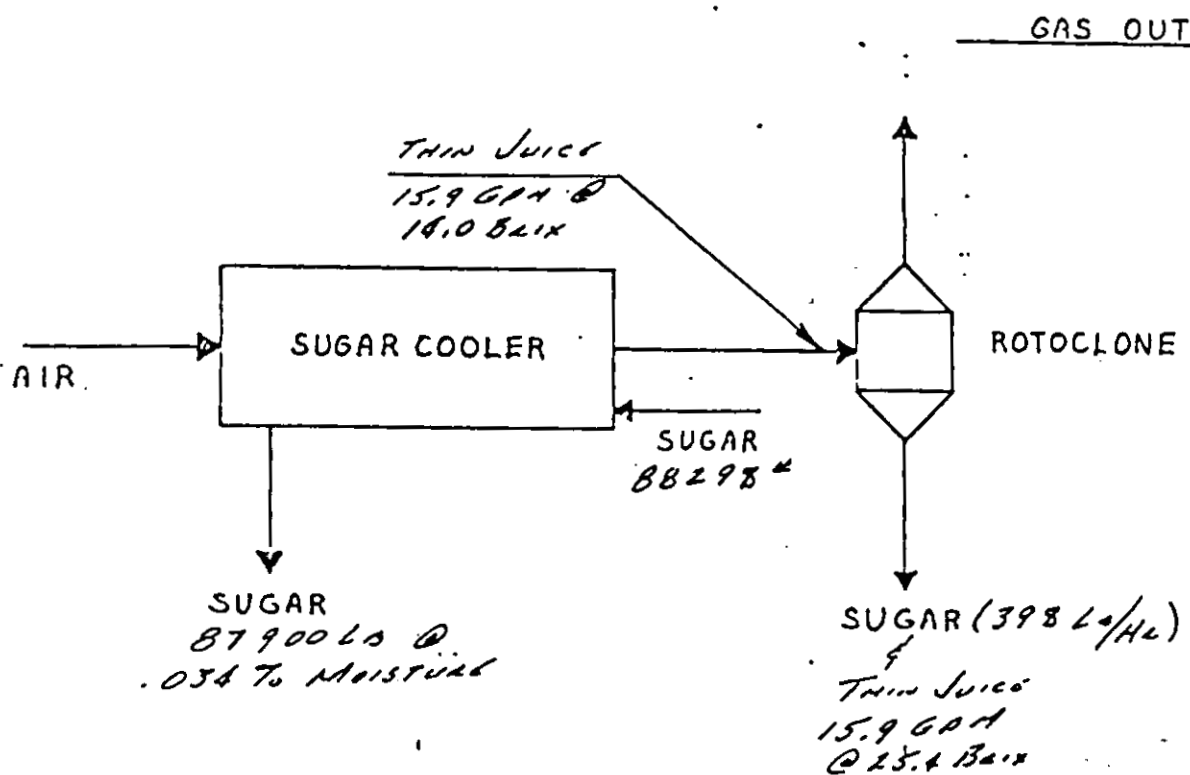
SO. MINNESOTA SUGAR COOP.



FIRST FLOOR

1st Floor - El. 100'

SUGAR COOLER & DRYER STACK ELEV.
M.H.D.
10/30/86



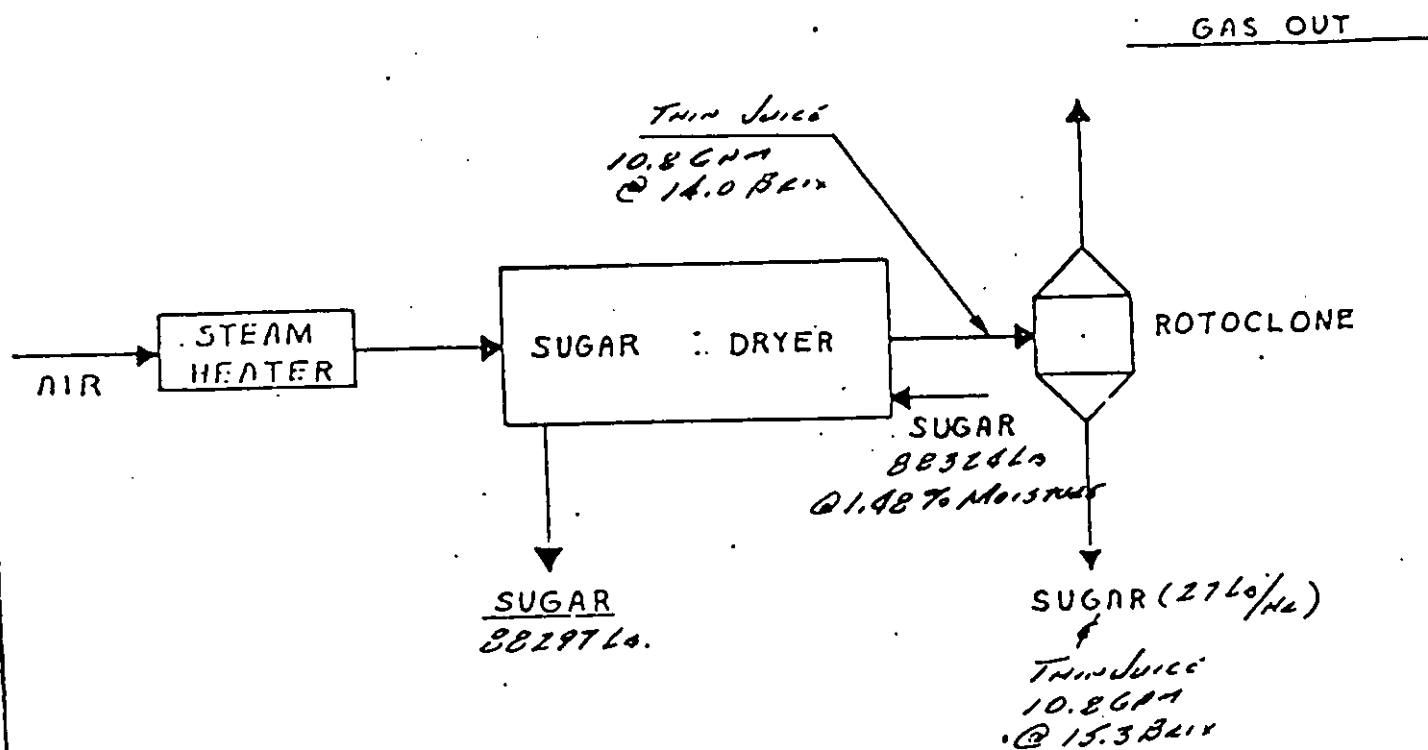
SUGAR COOLER

SUGAR IS COOLED FROM 130°F TO 100°F.

$$\begin{aligned}
 &\text{SUGAR INCREASE IN THIN JUICE} \\
 &= (\text{FLOW}) (\text{SP. GR. OUT} - \text{SP. GR. IN}) \\
 &= (15.9)(500)(1.107 - 1.057) \\
 &= 398 \text{ LB/Hr}
 \end{aligned}$$

WPD 11/19/86

 H·K·FERGUSON THE ENGINEERING & CONSTRUCTION COMPANY		
SUGAR COOLER		
DESIGNED BY E.P.L.	APPROVED BY	LOCATION & NUMBER
CHECKED BY	DATE 11/19/86	2738



SUGAR DRYER

SUGAR IS DRIED AND COOLED FROM
140°F TO 130°F.

$$\begin{aligned}
 \text{SUGAR INCREASE IN THIN JUICE} &= (\text{FLOW})(\text{Sp. Gr.}_{\text{out}} - \text{Sp. Gr.}_{\text{in}}) \\
 &= (10.8)(500)(1.062 - 1.057) \\
 &= 27 \text{ LBS/Hr}
 \end{aligned}$$

M.O.P. 11/19/86

 H·K·FLAGGSON			
ONE ENGINEER PLANT • LITTLE ROCK, ARK • PHONE 673			
SUGAR DRYER			
DESIGNED BY T. P. DUFFY	APPROVED BY [Signature]	LOFT/BLT NUMBER 2738	DATE 11/19/86

Filename: BEET3.WQ1

Date: 02-Dec-94

Facility: Southern Minnesota Beet Sugar Cooperative

Location: Renville, Minnesota

Source: Sugar dryer & cooler w/wet scrubbers--combined stack after identical controls

Test date: Nov. 18, 1986

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	108	108	107	
	Pressure	in. HG	29.0	29.0	29.0	
	Moisture	%	5.72	6.86	5.87	
	Oxygen	%	20.9	20.9	20.9	
	Volumetric flow, actual	acfm	18779	19029	18666	
	Volumetric flow, standard*	dscfm	15935	15952	15831	
	Isokinetic variation	%	101.3	101.1	100.6	
	Process rate	TPH	43.95	43.95	43.95	
Sugar produced--cooler output						
	Pollutant concentrations:					
	Filterable PM	G/dscf	0.01243	0.00945	0.01226	
	CO2	% dv	0.03	0.03	0.03	
	Pollutant mass flux rates:					
	Filterable PM	lb/hr	1.70	1.29	1.66	
	CO2	lb/hr	32.8	32.8	32.5	
	Emission factors (ENGLISH UNITS):					
						AVERAGE
	Filterable PM	lb/ton	0.0386	0.0294	0.0379	0.035
	CO2	lb/ton	0.745	0.746	0.741	neglig 0.74
	Emission factors (METRIC UNITS):					
						AVERAGE
	Filterable PM	kg/Mg	0.0193	0.0147	0.0189	0.0176
	CO2	kg/Mg	0.373	0.373	0.370	neglig 0.372

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

APPENDIX D

REPORT EXCERPTS FROM REFERENCE 4

(Minn-Dak Farmers Cooperative, November 1, 1983)

Rec'd 10/25/94
72

MMT Environmental, Inc.
4643 N. Chatsworth Street
St. Paul, MN 55112

RESULTS OF A SOURCE
EMISSION COMPLIANCE TEST AT
MINN-DAK FARMERS COOPERATIVE
WAHPETON, NORTH DAKOTA
OCTOBER, 1983

18
iv. H. g. h. k.

Submitted to:

Minn-Dak Farmers Cooperative
Post Office Box 10
Wahpeton, ND 58075

Attention: Mr. John E. Groneman

Prepared by:

for Alan L. Trowbridge
Alan L. Trowbridge
Manager of Technical Services

Approved by:

Milos Tomaides
Milos Tomaides, Ph.D., P.E.
President

Report Number 3531
Project Number 3915

November 1, 1983

RESULTS OF A SOURCE
EMISSION COMPLIANCE TEST AT
MINN-DAK FARMERS COOPERATIVE
WAHPETON, NORTH DAKOTA
OCTOBER, 1983

Report Number 3531
Project Number 3915

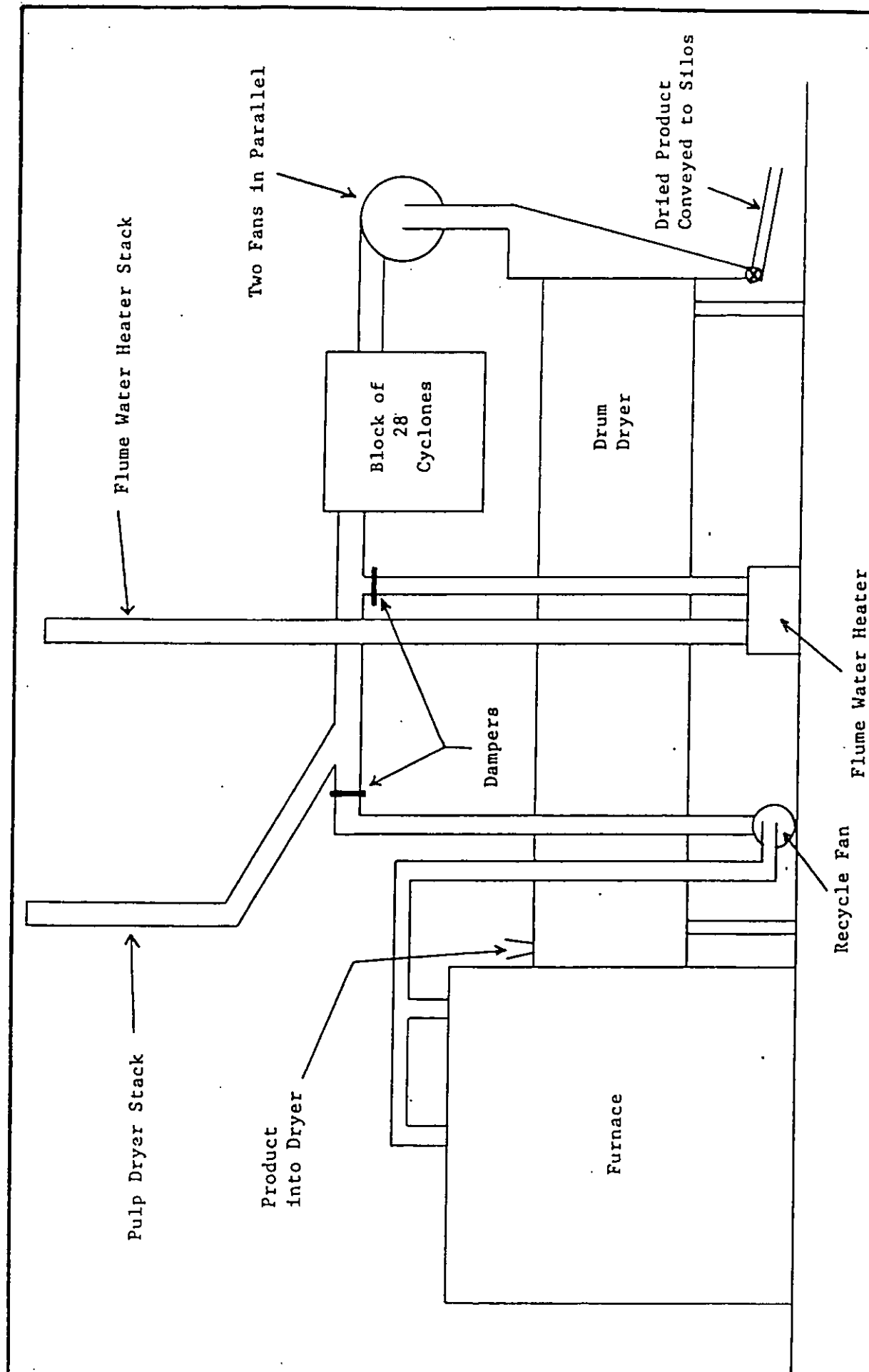
1 INTRODUCTION

On October 18, 1983, MMT Environmental, Inc. performed a series of source emission tests at Minn-Dak Farmers Cooperative, Wahpeton, North Dakota. The tests were performed at the request of Mr. John Groneman of Minn-Dak Farmers Cooperative.

The cooperative processes sugar beets. Pressed beet pulp (80% moisture) is dried to less than 10% moisture in a rotary drum dryer. The heat source for the dryer is a spreader stoker, lignite coal fired furnace which can also burn waste gas from an anaerobic waste water treatment plant. The combustion gases come into direct contact with the beet pulp and then pass through an array of 28 cyclones. Prior to entering the discharge stack, a portion of the exhaust gas can be recycled to the furnace and another portion can be removed as a heat source for the flume water heater. A schematic of the process is presented in Figure 1.1.

Three replicate EPA Method 5 particulate and EPA Method 6 sulfur dioxide emission tests were performed simultaneously on the pulp dryer stack and on the flume water heater stack. The results generated by the test program are presented in this report.

The MMT sampling team consisted of Messrs. Alan Trowbridge, Robert Laska and Timothy Puffer. Mr. John Hauges represented Minn-Dak Farmers Cooperative. Messrs. Chuck McDonald and Joe Selnekovic of the North Dakota State Department of Health witnessed the on-site testing.



mini environmental, Inc. 81 P.O. Box 10512			
Project #	AT	Rev	11-3-81
Drawn by	None	Checked by	None
TINN-DAX PROCESS SCHEMATIC			

Figure 1.1 Process Schematic

TABLE 2.2 SUMMARY OF PARTICULATE EMISSION TEST RESULTS

PROJECT NUMBER: 3915
TEST NUMBER: 1COMPANY: MINN-DAK FARMERS COOPERATIVE
SOURCE: PULP DRYER

TEST PARAMETER	RUN 1	RUN 2	RUN 3
TEST DATE	10/18/83	10/18/83	10/18/83
TIME OF TEST, HR;			
START	1019	1311	1606
FINISH	1157	1441	1741
EFFLUENT TEMPERATURE, DEGREES F	257	241	247
EFFLUENT MOISTURE CONTENT, % V/V	35.1	33.1	34.7
EFFLUENT COMPOSITION, % V/V DRY;			
CARBON DIOXIDE	5.1	5.6	5.3
OXYGEN	15.1	14.6	14.9
EFFLUENT VOLUMETRIC FLOW RATE;			
ACTUAL CONDITIONS, ACFM	148865	140178	140673
STANDARD CONDITIONS, SCFM	106967	103078	102478
DRY STANDARD CONDITIONS, DSCFM	69443	68937	66883
ISOKINETIC VARIATION, %	92.0	93.6	95.0
EFFLUENT PARTICULATE CONCENTRATION;			
ACTUAL CONDITIONS, GR/ACF	0.0625	0.0566	0.0513
STANDARD CONDITIONS, GR/SCF	0.0869	0.0770	0.0704
DRY STANDARD CONDITIONS, GR/DSCF	0.1339	0.1151	0.1078
SOURCE PARTICULATE EMISSION RATE;			
CLASSICAL METHOD, LB/HR	79.76	68.05	61.86
RATIO OF AREAS METHOD, LB/HR	73.31	63.69	58.72

PARTICULATE CONCENTRATION AND EMISSION RATES BASED ON ANALYSIS OF THE SAMPLING TRAIN FRONT CATCH ONLY.

STANDARD CONDITIONS: 68 DEGREES FAHRENHEIT, 29.92 INCHES OF MERCURY.

C5 70
74

TABLE 2.3 SUMMARY OF SULFUR DIOXIDE EMISSION TEST RESULTS

PROJECT NUMBER: 3915
TEST NUMBER: 1

COMPANY: MINN-DAK FARMERS COOPERATIVE
SOURCE: PULP DRYER

PARAMETER	RUN 1	RUN 2	RUN 3
SULFUR DIOXIDE CONCENTRATION;			
LB/DSCF	0.00002292	0.00002171	0.00002171
mg/DSCM	367	348	351
PPM	138	131	133
SULFUR DIOXIDE MASS EMISSION RATE;			
CLASSICAL METHOD, LB/HR	95.51	89.78	89.9
RATIO OF AREAS METHOD, LB/HR	87.78	84.01	85.7

TABLE 2.4 SUMMARY OF PARTICULATE EMISSION TEST RESULTS

PROJECT NUMBER: 3915
TEST NUMBER: 2

COMPANY: MINN-DAK FARMERS COOPERATIVE
SOURCE: FLUME WATER HEATER

TEST PARAMETER	RUN 1	RUN 2	RUN 3
TEST DATE	10/18/83	10/18/83	10/18/83
TIME OF TEST, HR:			
START	1018	1311	1605
FINISH	1154	1442	1741
EFFLUENT TEMPERATURE, DEGREES F	118	121	124
EFFLUENT MOISTURE CONTENT, % V/V	11.9	13.9	16.1
EFFLUENT COMPOSITION, % V/V DRY:			
CARBON DIOXIDE	5.1	5.6	5.3
OXYGEN	15.1	14.6	14.9
EFFLUENT VOLUMETRIC FLOW RATE:			
ACTUAL CONDITIONS, ACFM	22809	23424	22050
STANDARD CONDITIONS, SCFM	20363	20809	19484
DRY STANDARD CONDITIONS, DSCFM	17948	17925	16343
ISOKINETIC VARIATION, %	105.1	100.7	105.7
EFFLUENT PARTICULATE CONCENTRATION:			
ACTUAL CONDITIONS, GR/ACF	0.0480	0.1020	0.0297
STANDARD CONDITIONS, GR/SCF	0.0538	0.1148	0.0336
DRY STANDARD CONDITIONS, GR/DSCF	0.0610	0.1333	0.0401
SOURCE PARTICULATE EMISSION RATE:			
CLASSICAL METHOD, LB/HR	9.39	20.49	5.62
RATIO OF AREAS METHOD, LB/HR	9.87	20.62	5.94

PARTICULATE CONCENTRATION AND EMISSION RATES BASED ON ANALYSIS OF THE SAMPLING TRAIN FRONT CATCH ONLY.

STANDARD CONDITIONS: 68 DEGREES FAHRENHEIT, 29.92 INCHES OF MERCURY.

TABLE 2.5 SUMMARY OF SULFUR DIOXIDE EMISSION TEST RESULTS

PROJECT NUMBER: 3915
TEST NUMBER: 2

COMPANY: MINN-DAK FARMERS COOPERATIVE
SOURCE: FLUME WATER HEATER

PARAMETER	RUN 1	RUN 2	RUN
SULFUR DIOXIDE CONCENTRATION;			
LB/DSCF	0.00000155	0.00000149	0.00000
mg/DSCM	25	24	
PPM	9	9	
SULFUR DIOXIDE MASS EMISSION RATE;			
CLASSICAL METHOD, LB/HR	1.67	1.60	1
RATIO OF AREAS METHOD, LB/HR	1.75	1.61	1

Table 2.6 PROCESS DATA*

Test Number	Average Dryer Temperature, °F		Average Product Moisture Content, %		Average Dryer Through-Put, LB/HR	
	Inlet	Outlet	Inlet	Outlet	Inlet	Outlet
1	1722	259	81.6	3.6	140000	26722
2	1675	258	82.4	3.6	133714	24413
3	1718	253	81.9	9.7	139625	27987
Average	1705	257	82.0	5.6	137780	26374

Note: Average coal feed rate: 14414 lb/hr (124.0 MBTU/HR)
Average gas feed rate: 3000 cf/hr (1.5 MBTU/HR)
Average furnace heat input rate: 125.5 MBTU/HR
Average process weight rate (beet pulp and coal): 76.1 tons/hr

* Data furnished by Mr. Hohn Hauges of Minn-Dak Farmers Cooperative

Filename: BEET4.WQ1

Date: 02-Dec-94

Facility: MINN-DAK Farmers Cooperative

Location: Wahpeton, North Dakota

Source: Coal- and supplemental waste gas- (1% of fuel) fired rotary drum beet pulp dryer
Controlled by a bank of 28 cyclones, then exhaust goes to two separate stacks.

Test date: Oct. 18, 1983

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	257	241	247	
STACK 1	Pressure	in. HG	29.2	29.2	29.2	
	Moisture	%	35.1	33.1	34.7	
	Oxygen	%	15.1	14.6	14.9	
	Volumetric flow, actual	acfm	148865	140178	140673	
	Volumetric flow, standard*	dscfm	69443	68936	66883	
	Isokinetic variation	%	92	93.6	95	
Process rate:		TPH	70.00	66.86	69.81	
Beet pulp feed to dryer						
Pollutant concentrations:						
	Filterable PM	G/dscf	0.1339	0.1151	0.1078	
	SO2	lb/dscf	2.292E-05	2.171E-05	2.242E-05	
	CO2	% dv	5.1	5.6	5.30	
Pollutant mass flux rates:						
	Filterable PM	lb/hr	79.70	68.01	61.80	
	SO2	lb/hr	95.5	89.8	90.0	
	CO2	lb/hr	24272	26457	24294	
Emission factors (ENGLISH UNITS):						AVERAGE
	Filterable PM	lb/ton	1.14	1.02	0.89	1.01
	SO2	lb/ton	1.36	1.34	1.29	1.33
	CO2	lb/ton	347	396	348	363
Emission factors (METRIC UNITS):						AVERAGE
	Filterable PM	kg/Mg	0.569	0.509	0.443	0.507
	SO2	kg/Mg	0.682	0.672	0.644	0.666
	CO2	kg/Mg	173	198	174	182

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

TOTAL EMISSION FACTORS FOR BOTH STACKS

Emission factors (ENGLISH UNITS):						AVERAGE
	Filterable PM	lb/ton	1.27	1.32	0.966	1.19
	SO2	lb/ton	1.39	1.37	1.31	1.36
	CO2	lb/ton	436	499	433	456
Emission factors (METRIC UNITS):						AVERAGE
	Filterable PM	kg/Mg	0.636	0.662	0.483	0.594
	SO2	kg/Mg	0.694	0.684	0.656	0.678
	CO2	kg/Mg	218	249	217	228

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
2	Stack temperature	Deg F	118	121	124	
STACK 2	Pressure	in. HG				
	Moisture	%	11.9	13.9	16.1	
	Oxygen	%	15.1	14.6	14.9	
	Volumetric flow, actual	acfm	22809	23424	22050	
	Volumetric flow, standard*	dscfm	17948	17925	16343	
	Isokinetic variation	%	105.1	100.7	105.7	
Process rate:		TPH	70.00	66.86	69.81	
Beet pulp feed to dryer						
Pollutant concentrations:						
	Filterable PM	G/dscf	0.061	0.1333	0.0401	
	SO2	lb/dscf	1.55E-06	1.49E-06	1.66E-06	
	CO2	% dv	5.1	5.6	5.30	
Pollutant mass flux rates:						
	Filterable PM	lb/hr	9.38	20.48	5.62	
	SO2	lb/hr	1.67	1.60	1.63	
	CO2	lb/hr	6273	6879	5936	
Emission factors (ENGLISH UNITS):						AVERAGE
	Filterable PM	lb/ton	0.134	0.306	0.0805	0.174
	SO2	lb/ton	0.0238	0.0240	0.0233	0.0237
	CO2	lb/ton	89.6	103	85.0	92.5
Emission factors (METRIC UNITS):						AVERAGE
	Filterable PM	kg/Mg	0.0670	0.153	0.0402	0.0868
	SO2	kg/Mg	0.0119	0.0120	0.0117	0.0119
	CO2	kg/Mg	44.8	51.4	42.5	46.3

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

APPENDIX E

REPORT EXCERPTS FROM REFERENCE 5

(The Amalgamated Sugar Company, May 14, 1993)

*PARTICULATE, ALDEHYDE, AND SEMI-VOLATILE ORGANIC
COMPOUND (SVOC) TESTING REPORT FOR THE PULP DRYER STACKS,
1st AND 2nd CARBONATION TANK VENTS, AND THE EVAPORATOR
HEATER VENTS*

THE AMALGAMATED SUGAR COMPANY

Nampa, Idaho

May 14, 1993

Prepared by:

DEAN C. DeLOREY, Corporate Environmental Engineer

DENNIS STEGENGA, P.E., Nampa Plant Engineer



THE AMALGAMATED SUGAR COMPANY

P.O. BOX 87 • NAMPA, IDAHO 83653 • PHONE (208) 466-3541

September 7, 1994

Mr. Tom Lapp
MRI, Suite 350
401 Harrison Oaks Blvd.
Cary, NC 27513

RE: Particulate, Aldehyde, and Semi-Volatile Organic Compound (SVOC)
Emission Testing Results

Dear Mr. Lapp:

In response to your request, attached is a summary of the report entitled "Particulate, Aldehyde, and Semi-Volatile Organic Compound (SVOC) Testing Report for the Pulp Dryer Stacks, 1st and 2nd Carbonation Tank Vents, and the Evaporator Heater Vents". The stack tests were approved by the Idaho Division of Environmental Quality. The stack tests were conducted during the 1992 beet processing campaign at The Amalgamated Sugar Company facility in Nampa, Idaho.

The stack testing results indicate that particulate emission concentrations varied from each pulp dryer. According to the stack testing results, the two scrubbers on the south pulp dryer had the lowest emissions, the two scrubbers on the center pulp dryer had the second lowest emissions, and the north pulp dryer had the highest emissions. One of the primary factors effecting particulate emissions is the design of the impingement type scrubbers. During the testing, the following were the differences in the design of the pulp dryer scrubbers:

- 1) South Pulp Dryer Scrubbers - Water spray system; highest impingement velocities of gases entering the scrubber; level controls on the scrubber water tub; pressure drop ~ 4 in. H₂O.
- 2) Center Pulp Dryer Scrubbers - No water sprays; lower impingement velocities than south pulp dryer scrubbers; level controls on the scrubber water tub; pressure drop ~ 4 in. H₂O.

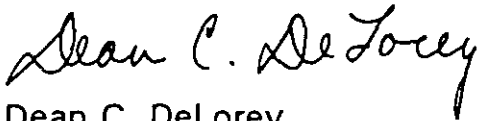
Mr. Tom Lapp
September 7, 1994
Page 2

3) North Pulp Dryer Scrubber - Water sprays; lower impingement velocities than south pulp dryer scrubbers; no automatic level controls; pressure drop ~ 2 in. H₂O.

Since completing these tests in 1992, the North Pulp Dryer Scrubber has been rebuilt and provides performance comparable to the South Pulp Dryer Scrubbers.

If you have any questions, feel free to contact either Edward G. Bulgin, Corporate Chief Engineer, or me at 208-466-3541.

Sincerely,



Dean C. DeLorey
Corporate Environmental Engineer

Attachment

DCD:ce

cc: George Hobbs
John Lemke
Ed Bulgin

SECTION 1.0 INTRODUCTION

Particulate, aldehyde, and semi-volatile organic compound (SVOC) sampling was conducted on a variety of stack and vents at the Nampa facility to satisfy the requirements of the August 12, 1993, Consent Order between the Idaho Department of Health and Welfare and The Amalgamated Sugar Company (TASCO). As part of the Consent Order, on September 11, 1992, the Department and TASCO agreed to a stack sampling protocol.

The stack tests were completed during the 1992 beet processing campaign (i.e. October 1992 through January 1993). Emission sources which were tested included a selected number of the pulp dryer stacks, carbonation tank vents, and heater vents on 1st evaporator vapors. A summary of the emissions testing is shown in Table 1.0.

The objectives of the testing were to: 1) determine the aldehyde and SVOC emissions from the pulp drying process, carbonation process and evaporation process; 2) using the testing data, provided in this report and 1991 campaign testing data, estimate aldehyde and SVOC emissions from all vents associated with the pulp drying process, carbonation process, and evaporation process and; 3) determine the compliance status of the particulate emissions from the pulp dryer stacks.

The stack sampling methods employed were: EPA Method 1 - Sampling Point Determination; EPA Method 2 - Stack Gas Flow and Velocity; EPA Method 3 - Stack Gas Composition and Molecular Weight; EPA Method 4 - Stack Gas Moisture; Alignment Approach - Cyclonic Flows; EPA Method 5 - Particulates; SW846 Method 0010 - SVOC's; and Modified EPA Method TO5 (midget and standard impingers) - Aldehydes.

TASCO's stack testing crew consisted of Dean C. DeLorey, Glenn Jones, Matt Bunn, Ray Reno, Dennis Stegenga, and Homer Martinez. Jeff Kunstling of Entropy Environmentalist oversaw the initial particulate, aldehyde, and SVOC tests conducted on the north pulp dryer. Ron Hill of the Idaho Department of Health and Welfare was present during the 2nd SVOC test run conducted on the B-side evaporator heater vent.

All aldehyde and SVOC samples were extracted and analyzed by Triangle Laboratories.

SECTION 2.0 SUMMARY OF RESULTS

This section includes as summary of the particulate, aldehyde, and SVOC testing at the Nampa facility. The following information is provided: 1) stack emissions and exhaust data; 2) estimated aldehyde and SVOC emissions from all vents associated with the pulp drying process, carbonation process, and evaporation process; and 3) sampling and analytical problems encountered during the testing. All supporting information is included in Appendix A through Appendix F.

Particulate emissions are expressed as grains per dry standard cubic foot (gr/dscf) and pounds per hour (lbs/h). Aldehyde and SVOC emissions are expressed as micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) and pounds per hour. In addition to the emission rates, emission factors are also provided. These factors were calculated by dividing the hourly emission rates (lbs/hour) by the hourly production rates.

2.1 Pulp Dryer Stacks

Particulate, aldehyde and SVOC stack testing results for the pulp dryer stacks are included in Tables 2.1.1 through 2.1.9. A summary of the particulate, aldehyde and SVOC hourly emission rates for all pulp dryer stacks is included in Tables 2.1.10 and 2.1.11. Results of the SVOC and aldehyde testing blanks (i.e. field blank, proof blanks, and resin blanks) are provided in Section A.1 of Appendix A.

Due to the design of the pulp dryer emissions control equipment, cyclonic flows exist within each pulp dryer stack. Cyclonic flow angles (yaw angles) for each test conducted on the pulp dryer stacks were greater than 20° . Particulate and SVOC testing methods (EPA Method 5 and SW846 Method 0010) were modified according to the alignment approach to account for the cyclonic flow (see Appendix F).

All particulate, aldehyde, and SVOC testing was conducted while the dryers were fired on pulverized coal, except for one test run. The second particulate test run (part 2) on the center dryer east stack was conducted while the dryer was fired by natural gas.

As shown, particulate emissions from each pulp dryer stack are below the 0.1 grains per dry standard cubic foot (gr/dscf) permit limit. However, particulate emissions from the north pulp dryer stack were initially above 0.1 gr/dscf. On December 16, 1993, the north pulp dryer scrubber was repaired. As shown, except for the testing conducted December 28, 1992, particulate emissions were in compliance with the permit limit. The December 28, 1993, particulate testing results were not representative of normal operation, due to a fire which occurred in the pulp dryer building. Water flow to the scrubber was below normal because filters which screen scrubbing water were not cleaned as scheduled. Personnel responsible for cleaning the screens were extinguishing the fire.

The last 2 particulate test runs (Run No.'s Part 4 and Part 5) for the south pulp dryer east stack were conducted to determine the relationship between particulate emissions and the pressure drop across the scrubber.

The Department requested aldehyde and SVOC testing on the dryer stack with the highest amount of condensible particulates as determined by the back half catch of EPA Method 5 and Method 202. The Department required this testing to occur during late campaign. The north pulp dryer had the highest amount of condensible particulate. Therefore, the north pulp dryer was sampled for aldehydes and SVOC during the middle part of January.

In addition, the north pulp dryer stack was tested for aldehydes and SVOC's during the early part of campaign (i.e. October). Aldehyde testing was also conducted on the center pulp dryer west stack.

Particulate, aldehyde, and SVOC maximum hourly emission rates for all the pulp dryer stacks are given in Table 2.1.10 and 2.1.11. These emission rates were calculated using average emission factors and the maximum hourly production rates.

2.2 Carbonation Tank Vents

SVOC and aldehyde stack testing results for the B Side 1st carbonation tank and 2nd carbonation tank vents are given in Tables 2.2.1 through 2.2.3. A summary of the SVOC and aldehyde emissions for all carbonation tank vents are given in Tables 2.2.4 and 2.2.5. SVOC and aldehyde blank information is given in Section A.5 and A.6 of Appendix A.

2.3 Heater Vents on 1st Evaporator Vapors

The heater vents on 1st evaporator vapors were sampled by installing a temporary 4 inch diameter stack onto the heater vent pipes. Table 2.3.1 includes the aldehyde testing results for the A-side #2 thin juice evaporator heater vent. Aldehyde and SVOC testing results for the B-side 2nd carbonation evaporator heater vent are provided in Tables 2.3.2 through 2.3.5. SVOC and aldehyde testing blank information is provided in Sections A.7 and A.8 of Appendix A. A summary of the aldehyde and SVOC emissions from the evaporator heater vents are included in Table 2.3.6 and 2.3.7.

2.4 Sampling and Analytical Problems

This section discusses the sampling and analytical problems which occurred during the stack testing. Some of the problems required modification of the stack sampling equipment. Other problems required modification of the sampling procedures. TASCOT notified the Department by phone and in writing anytime the pre-agreed upon Stack Sampling Protocol had to be modified. Appendix F provides a detailed discussion of the testing problems and how they were resolved.

2.4.1 Pulp Dryers

Initial particulate test runs, conducted on the north pulp dryer stack were aborted due to incompatible equipment within the sampling train. The sockets on the cyclone bypasses cracked due to the expansion of the ball joints on the stainless steel probes. It was discovered that the stainless steel probes purchased from NuTech were not compatible with Ace Glass cyclone bypasses. To correct the problem, the ball joints on the NuTech probes were removed and

replaced with Ace Glass ball joints.

The particulate sample collection methods had to be slightly modified for some of the pulp dryer test runs. Acetone rinsing and brushing did not adequately remove particulates from the probe and nozzle. In order to remove all particulates, the probe and probe nozzle were additionally rinsed with hot deionized water followed by brushing. The acetone and DI rinses were kept separate for analysis in the laboratory.

Prior to analysis by the GC/MS system, Triangle Laboratories indicated that the SVOC samples collected from the north pulp dryer stack, had to be diluted due to precipitation occurring during the extraction. Final extract volumes were brought to a final volume of 5 ml. This resulted in a 1 to 5 dilution of the final sample.

The 6th SVOC test run on the north pulp dryer had to be stopped prior to collecting 60 dscf. Due to extremely cold weather conditions and moderate winds, the sampling train froze during the sampling in the last port. Prior to stopping the test, 51 dscf had been collected. The Department and TASCO agreed that this sample volume was adequate.

During the SVOC test runs, teflon tape was wrapped around the edges of the ball joints of the condenser and XAD II traps to prevent leakage into the sampling train. Again, XAD II traps and condensers which were purchased from NuTech were not compatible with Ace Glass glassware. Teflon tape was selected because of its inertness. Teflon tape was also applied to the XAD resin and condensers during the B side 1st carbonation and heater vent testing.

2.4.2 Carbonation Tank Vent

During the SVOC testing of the 1st carbonation tank vent, the temperature of the gases exiting the XAD II resin trap occasionally exceeded 20°C. Salt and dry ice was added to the impinger ice bath to maintain the gases below 20°C. The analytical results did not appear to be affected by this occurrence.

SVOC sample extracts from the B-Side 1st carbonation tank vent were also diluted. Firstly, the samples were diluted by a factor of 2 because the samples would not concentrate below 2 mls. Secondly, the samples were diluted by a factor of 2 due to high levels of target and non-target analyses. Finally, the sample for Run SVOC 2 was additionally diluted to bring benzaldehyde concentrations within the calibration range.

2.4.3 Evaporator Heater Vents

Evaporator heater vent sampling was very difficult due to the combination of the extremely high exhaust temperatures (greater than 200°F), high moisture content of the exhaust gas (greater than 98% H₂O), and presence of ammonia in the exhaust gas. In addition, heaters with vapors from the 2nd evaporator could not be sampled due to extremely low flows. For a complete discussion of the problems associated with heater vent sampling and solutions, see Sections F.6, F.8, F.10, F.12 and F.13 of Appendix F.

The high temperatures and moisture contents of the heater vent exhaust caused the

following problems:

- Midget impingers could not be used for aldehyde sampling (Modified Method TO5). Condensed moisture would quickly overflow the midget impingers.
- During the 1st aldehyde test run on the A side heater vent, isooctane from the first 2 impingers volatilized and condensed into the third impinger.
- Sampling times and volumes for the aldehyde and SVOC testing had to be drastically reduced due to the excessive amounts of moisture which condensed within the impingers.
- During the first 2 SVOC test runs on the B side heater vent, the temperatures of the gases exiting the XAD II resin regularly exceeded 20°C (68°F).

To correct the above problems, the following modifications to the testing equipment and methods were employed:

- An EPA Method 5 sampling train with standard impingers (approx. 600 mil capacity) was employed for the evaporator heater vent aldehyde sampling (see Section 4.0).
- During the aldehyde testing, a water cooled condenser was inserted prior to the 1st impinger. In addition, the probe heater and box heaters were shut off. Also, the sampling times were drastically reduced.
- To prevent degradation of the XAD II resin due to the high volume of condensed water, the sample volume was reduced to 1 dscf for the SVOC testing. This sample volume was employed for test runs no.'s 3 and 4. Approximately 2500 mls of condensed water was collected in the knockout impingers during each of these test runs.
- An additional condenser was inserted into the SVOC sampling train to ensure gases exiting the resin trap were below 68°F. In addition, the sampling flow rate was significantly reduced.

During the initial sampling, ammonia from the evaporator heater vents eroded the copper tubing within the console and caused the dry gas meter to operate erratically. To correct the problem, a 1% sulfuric solution was added to the last impinger.

TABLE 2.1.1 NORTH PULP DRYER STACK PARTICULATE EMISSION TESTING RESULTS
NAMPA IDAHO FACILITY - 1992 CAMPAIGN

DATE	SCRUBBER	RUN NO.	DRYER INPUT RATE (T/HR)	STACK GAS PARAMETERS					PARTICULATE EMISSIONS						SCRUBBER OPERATION		
				TEMP. (DEG. F)	H2O (%)	VELOCITY (FPM)	CYCLE ANGLE (DEG.)	ACTUAL FLOW (ACFM)	STD. FLOW (DSCFM)	FRONT HALF			BACK HALF		DELTA P (IN H2O)	H2O FLOW (GPM)	
										GR/DSCF	LB/HR	LBS/TON	GR/DSCF	LB/HR			
10/14/92	N	5	17.5	187	41.6	668	58	33325	14548	32.4	1.85	0.2599			0.079	9.8	184
10/15/92	N	7	19.6	185	41.7	758	55	37835	16663.2	32	1.63	0.2243			0.12	16.9	198
10/21/92	N	8	20.8	171	40.8	744	47	37101	16810	23.2	1.12	0.1609			0.11	15.4	213
10/23/92	N	9	23.7	175	41.5	732	55	36520	16520	21.4	0.9	0.1512			0.13	18.3	240
11/6/92	N	10	20.4	180	35.9	585	58	29173	14279	24	1.18	0.1965			0.1586	19.4	235
11/30/92	N	11	15.7	210	37.6	612	54	30513	13967	32.4	2.06	0.2706			0.1031	12.3	94
12/3/92	N	13	17.3	214	36.8	472	56	23543	10685	31.3	1.82	0.3419			0.1169	10.7	172
AVG			19.3	189	39.4	653	55	32573	14782	28.1	1.51	0.2293			0.1168	14.7	191
12/22/92	N	14	17.2	156	28.9	593	41	16936	16648	10.7	0.62	0.0747			0.0681	9.7	247
12/28/92	N	15	21.9	187	41	957	42	47743	20819	42.1	1.92	0.2362			0.1179	21	115
1/4/93	N	16	19.8	160	32.4	654	46	32607	17261	13	0.66	0.0882			0.1115	16.5	196
1/5/93	N	17	18.6	160	30.9	639	46	31880	17266	11.2	0.60	0.0805			0.0764	11.3	246
AVG			18.5	159	30.7	629	44	27141	17058	11.6	0.63	0.0811			0.0853	12.5	230

^a AVERAGE ONLY INCLUDES DATA FOR 12/22/92, 1/4/93 AND 1/5/93. PARTICULATE RESULTS FOR 12/28/92 ARE NOT REPRESENTATIVE. ON 12/28/92, A FIRE OCCURRED IN THE PULP DRYER BUILDING. PERSONNEL RESPONSIBLE FOR CLEANING SCREENS WHICH FILTER SCRUBBING WATER, WERE INVOLVED IN PUTTING THE FIRE OUT. THEREFORE, WATER FLOW WAS BELOW NORMAL.

TABLE 2.1.3 SUMMARY OF THE NORTH PULP DRYER STACK ALDEHYDE EMISSION TESTING RESULTS (WINTER 1993) - RUN NOS. ALD 6-8

SOURCE	DATE	TEST RUN NO.	FORMALDEHYDE			ACETALDEHYDE			ACROLEIN			CROTONALDEHYDE		
			(lbs/hr)	(ug/m3)	(lbs/ton)	(lbs/hr)	(ug/m3)	(lbs/ton)	(lbs/hr)	(ug/m3)	(lbs/ton)	(lbs/hr)	(ug/m3)	(lbs/ton)
N	1/11/93	ALD6	2.69E-02	463.0	1.63E-03	7.51E-02	1293.6	4.55E-03	6.76E-02	1163.0	4.09E-03	1.75E-02	301.4	1.06E-03
N	1/11/93	ALD7	4.79E-01	8248.1	2.99E-02	5.24E-01	9026.7	3.28E-02	1.32E-01	2276.2	8.26E-03	2.87E-02	494.3	1.79E-03
N	1/11/93	ALD8	2.40E-01	4134.0	1.50E-02	4.63E-01	7977.4	2.90E-02	1.71E-01	2947.5	1.07E-02	3.49E-02	601.3	2.18E-03
		AVG	2.49E-01	4281.7	1.55E-02	3.54E-01	6099.2	2.21E-02	1.24E-01	2128.9	7.69E-03	2.71E-02	465.6	1.68E-03

TABLE 2.1.5 SUMMARY OF THE NORTH PULP DRYER STACK SVOC EMISSION TESTING RESULTS (WINTER 1993) - RUN NO'S. SVOC6-SVOC8

RUN NO'S.	SVOC6			SVOC7			SVOC8		AVERAGE	
	COMPOUND	CONC. (ug/m3)	EMISSION RATE (lbs/hr)	COMPOUND	CONC. (ug/m3)	EMISSION RATE (lbs/hr)	COMPOUND	CONC. (ug/m3)	EMISSION RATE (lbs/hr)	
	BENZOIC ACID	855.83	4.31E-02	BENZOIC ACID	683.90	4.73E-02	BENZOIC ACID	721.15	5.05E-02	753.63 4.70E-02
	BIS(2-ETHYLHEXYL)PHTHALATE	1056.42	5.32E-02	BIS(2-ETHYLHEXYL)PHTHALATE	751.54	5.20E-02	BIS(2-ETHYLHEXYL)PHTHALATE	248.64	1.74E-02	685.53 4.09E-02
	BENZALDEHYDE	440.78	2.22E-02	BENZALDEHYDE	422.50	2.92E-02	BENZALDEHYDE	431.52	3.02E-02	431.60 2.72E-02
	PHENOL	190.24	9.58E-03							63.41 3.19E-03
	4-METHYLPHENOL	44.69	2.25E-03	4-METHYLPHENOL	18.85	1.30E-03	4-METHYLPHENOL	25.95	1.82E-03	29.83 1.79E-03
	NAPHTHALENE	23.81	1.20E-03	NAPHTHALENE	20.97	1.45E-03	NAPHTHALENE	18.60	1.30E-03	21.13 1.32E-03
				4-NITROPHENOL	29.41	2.03E-03	4-NITROPHENOL	23.04	1.61E-03	17.48 1.22E-03
	2-NITROPHENOL	25.90	1.30E-03	2-NITROPHENOL	24.44	1.89E-03				16.78 9.98E-04
	BENZYL ALCOHOL	27.42	1.38E-03				BENZYL ALCOHOL	19.97	1.40E-03	15.80 9.27E-04
	2-METHYLPHENOL	9.86	4.96E-04	2-METHYLPHENOL	4.29	2.97E-04	2-METHYLPHENOL	6.19	4.34E-04	6.78 4.09E-04
	2-METHYLNAPHTHALENE	5.75	2.89E-04	2-METHYLNAPHTHALENE	4.07	2.82E-04	2-METHYLNAPHTHALENE	3.74	2.62E-04	4.52 2.78E-04
	NITROBENZENE	16.43	8.27E-04							5.48 2.76E-04
	2,4-DIMETHYLPHENOL	15.95	8.03E-04							5.32 2.68E-04
	PHENANTHRENE	7.87	3.96E-04				PHENANTHRENE	2.04	1.43E-04	3.30 1.80E-04
	DIN-BUTYLPHTHALATE	10.33	5.20E-04							3.44 1.73E-04
	BUTYLBENZYLPHTHALATE	10.29	5.18E-04							3.43 1.73E-04
	DIBENZOFURAN	5.09	2.56E-04	DIBENZOFURAN	2.20	1.52E-04				2.43 1.36E-04
	FLUORANTHRENE	5.73	2.88E-04							1.91 9.61E-05
	ACENAPHTHYLENE	2.45	1.23E-04	ACENAPHTHYLENE	1.85	1.28E-04				1.43 8.37E-05
	ANTHRACENE	4.76	2.40E-04							1.59 7.98E-05
TENTATIVELY IDENTIFIED COMPOUNDS										
	2-FURANCARBOXALDEHYDE	1441.32	7.26E-02	2-FURANCARBOXALDEHYDE	1335.25	9.24E-02	2-FURANCARBOXALDEHYDE	1060.98	7.43E-02	
	UNKNOWN	632.38	3.18E-02	UNKNOWN	581.53	4.02E-02	UNKNOWN	263.96	1.85E-02	
	2-FURANCARBOXALDEHYDE	246.38	1.24E-02	2-FURANCARBOXALDEHYDE	213.43	1.48E-02	PYRAZINE	231.48	1.62E-02	
	PYRAZINE	191.63	9.65E-03	UNKNOWN	203.12	1.41E-02	2-FURANCARBOXALDEHYDE	186.63	1.31E-02	
	SUBSTITUTED HYDROCARBON	181.36	9.13E-03	PYRAZINE	146.93	1.02E-02	UNKNOWN	153.63	1.08E-02	
	PYRAZINE	140.98	7.10E-03	PYRAZINE	122.18	8.45E-03	PYRAZINE	134.56	9.43E-03	
	SUBSTITUTED HYDROCARBON	132.09	6.65E-03	SUBSTITUTED HYDROCARBON	112.39	7.78E-03	SUBSTITUTED HYDROCARBON	118.57	8.31E-03	
	SUBSTITUTED HYDROCARBON	112.24	5.65E-03	SUBSTITUTED HYDROCARBON	109.87	7.60E-03	SUBSTITUTED HYDROCARBON	102.81	7.69E-03	
	SUBSTITUTED HYDROCARBON	107.45	5.41E-03	SUBSTITUTED HYDROCARBON	105.09	7.31E-03	DIMETHYL SULFONE	108.78	7.62E-03	
	UNKNOWN	103.34	5.20E-03	UNKNOWN	79.91	5.53E-03	SUBSTITUTED HYDROCARBON	99.5	6.97E-03	

TABLE 2.1.6 CENTER PULP DRYER EAST STACK PARTICULATE EMISSION TESTING RESULTS
NAMPA IDAHO FACILITY - 1992 CAMPAIGN

DATE	SCRUBBER	RUN NO.	DRYER INPUT RATE (T/HR)	STACK GAS PARAMETERS						PARTICULATE EMISSIONS						SCRUBBER OPERATION	
				TEMP. (DEG. F)	H2O (%)	VELOCITY (FPM)	CYCLE ANGLE (DEG.)	ACTUAL FLOW (ACFM)	STD. FLOW (DSCFM)	FRONT HALF			BACK HALF			DELTA P (IN H2O)	H2O FLOW (GPM)
										GR/DSCF	LB/HR	LB5/TON	GR/DSCF	LB/HR	LB5/TON		
10/28/92	CE	1	50.2	173	47.4	1011	49	38894	15674	0.0939	12.6	0.25	0.19	24.9	3.5	119.5	
10/29/92	CE	a	47.4	171	44.3	1081	53	41616	17613	0.0668	10.1	0.21	0.05	6.9	3.9	167	
10/30/92	CE	3	55.2	170	44.6	1146	52	44102	18534	0.0601	9.5	0.17	0.06	9.9	3.6	170	
11/2/92	CE	4	49.7	175	48.7	1050	54	40393	16480	0.0873	12.3	0.25	0.0614	8.7	3.1	166	
AVG			50.6	172.25	45.75	1072	52	41251.3	17075	0.077025	11.1	0.22	0.090	12.6	3.5	156	

^a DRYER FIRED BY NATURAL GAS

TABLE 2.1.7 CENTER PULP DRYER WEST STACK PARTICULATE EMISSION TESTING RESULTS
 NAMPA IDAHO FACILITY - 1992 CAMPAIGN

DATE	SCRUBBER	RUN NO.	DRYER INPUT RATE (T/HR)	STACK GAS PARAMETERS					PARTICULATE EMISSIONS						SCRUBBER OPERATION	
				TEMP. (DEQ. F)	H2O (%)	VELOCITY (FPM)	CYCLE ANGLE (DEQ.)	ACTUAL FLOW (ACFM)	STD. FLOW (DSCFM)	FRONT HALF			BACK HALF		DELTA P (IN H2O)	H2O FLOW (GPM)
										GR/DSCF	LB/HR	LBS/TON	GR/DSCF	LB/HR		
11/3/92	CW	1	55.3	173	42.6	994	48	37491	16691	0.0805	11.6	0.21	0.0652	9.4	3.7	165
11/4/92	CW	2	55.8	171	42.2	1015	47	39063	17538	0.0706	10.6	0.19	0.0695	10.4	4	164
11/5/92	CW	3	55.7	169	43.2	971	49	37381	16515	0.0684	9.7	0.17	0.0773	10.9	4.4	156
AVG			55.6	171	42.7	993	48	37978	16915	0.0732	10.6	0.19	0.0707	10.2	4.0	162

TABLE 2.1.8 SUMMARY OF THE CENTER PULP DRYER WEST STACK ALDEHYDE TESTING RESULTS(WINTER 1993) - RUN NO'S. ALD 1-3

SOURCE	DATE	TEST RUN NO.	FORMALDEHYDE			ACETALDEHYDE			ACROLEIN			CROTONALDEHYDE		
			(lbs/hr)	(ug/m3)	(lbs/ton)	(lbs/hr)	(ug/m3)	(lbs/ton)	(lbs/hr)	(ug/m3)	(lbs/ton)	(lbs/hr)	(ug/m3)	(lbs/ton)
CW	1/25/93	ALD1	1.08E-01	1815.0	2.61E-03	4.25E-01	7124.1	1.03E-02	4.25E-01	7135.6	1.03E-02	7.11E-02	1192.5	1.72E-03
CW	1/25/93	ALD2	1.57E-01	2638.9	3.80E-03	5.42E-01	9091.8	1.31E-02	4.99E-01	8367.3	1.20E-02	7.65E-02	1284.3	1.85E-03
CW	1/25/93	ALD3	4.83E-01	8107.2	1.12E-02	1.09E+00	18355.4	2.53E-02	2.28E-01	3827.4	5.27E-03	5.20E-02	872.4	1.20E-03
		AVG	2.50E-01	4187.0	5.86E-03	6.87E-01	11523.8	1.62E-02	3.84E-01	6443.4	9.20E-03	6.65E-02	1116.4	1.59E-03

TABLE 2.1.9 SOUTH PULP DRYER EAST STACK PARTICULATE EMISSION TESTING RESULTS

NAMPA IDAHO FACILITY - 1992 CAMPAIGN

DATE	SCRUBBER	RUN NO.	DRYER INPUT RATE (T/HR)	STACK GAS PARAMETERS				PARTICULATE EMISSIONS						SCRUBBER OPERATION	
				TEMP. (DEG. F)	H2O (%)	VELOCITY (FPM)	CYCLE ANGLE (DEG.)	ACTUAL FLOW (ACFM)	STD. FLOW (DSCFM)	FRONT HALF			BACK HALF	DELTA P (IN H2O)	H2O FLOW (GPM)
										GR/DSCF	LB/HR	LBS/TON	GR/DSCF	LB/HR	
11/23/92	SE	1	47.1	165	39.2	891	24	34287	16192	0.0619	8.6	0.18	0.0387	5.4	137
11/24/92	SE	2	47.1	165	37.5	816	29	31421	15319	0.0497	6.5	0.14	0.0402	5.3	145
11/25/92	SE	3	47.2	165	37.9	724	40	27870	13630	0.0467	5.5	0.12	0.0763	8.9	131
12/29/92	SE	4	38.9	156	36.8	609	41	23435	11484	0.0922	9.1	0.23	0.0992	9.8	136
12/30/92	SE	5	39.8	160	37.1	478	59	18387	8995	0.1082	8.3	0.21	0.078	6	104
AVG ^a			47.1	165	38.2	810	31	31193	15047	0.0528	6.9	0.15	0.0517	6.5	138

^a AVERAGE CALCULATED FOR RUN NO.'S 1 THROUGH 3 ONLY. RUNS 4 AND 5 WERE CONDUCTED TO DETERMINE THE IMPACT OF EMISSIONS VS. PRESSURE DROP

TABLE 2.2.1 SUMMARY OF THE 1ST CARBONATION TANK VENT SVOC EMISSION TESTING RESULTS • RUN NO'S. SVOC1-SVOC3

RUN NO'S.	SVOC1		SVOC2		COMPOUND	SVOC3		AVERAGE	
	CONC. (ug/m3)	EMISSION RATE (lbs/hr)	CONC. (ug/m3)	EMISSION RATE (lbs/hr)		CONC. (ug/m3)	EMISSION RATE (lbs/hr)	(ug/m3)	(lbs/hr)
BENZALDEHYDE	1341.88	7.312E-03	1635.15	9.044E-03	BENZALDEHYDE	1400.87	8.073E-03	1459.30	8.14E-03
BIS(2-ETHYLHEXYL)PHTHALATE	252.09	1.374E-03	133.42	7.380E-04	BIS(2-ETHYLHEXYL)PHTHALATE	127.69	7.359E-04	171.07	9.49E-04
BENZOIC ACID	171.13	9.324E-04	85.43	4.725E-04	BENZOIC ACID	91.79	5.290E-04	116.12	6.45E-04
BENZYL ALCOHOL	66.52	3.624E-04	66.18	3.661E-04	BENZYL ALCOHOL	71.99	4.149E-04	68.23	3.81E-04
NAPHTHALENE	21.62	1.178E-04	33.28	1.841E-04	2,4-DINITROPHENOL	141.55	8.155E-04	47.18	2.72E-04
PHENANTHRENE	17.91	9.760E-05	19.62	1.085E-04	NAPHTHALENE	27.48	1.583E-04	27.46	1.53E-04
PHENOL	20.27	1.105E-04	19.48	1.078E-04	PHENANTHRENE	18.78	1.082E-04	18.77	1.05E-04
4-METHYLPHENOL	12.22	6.660E-05	8.14	4.504E-05	PHENOL	14.28	8.228E-05	18.01	1.00E-04
2-METHYLNAPHTHALENE	3.98	2.168E-05	8.90	4.922E-05	4-METHYLPHENOL	6.94	3.999E-05	9.10	5.05E-05
					2-METHYLNAPHTHALENE	8.18	4.713E-05	7.02	3.93E-05
					ACENAPHTHRENE	19.29	1.112E-04	6.43	3.71E-05
TENTATIVELY IDENTIFIED COMPOUNDS									
SATURATED HYDROCARBON	1632.20	8.894E-03	1735.40	9.599E-03	SATURATED HYDROCARBON	1737.68	1.001E-02		
DIMETHYL PYRAZINE	1227.86	6.690E-03	1337.91	7.400E-03	DIMETHYL PYRAZINE	862.19	4.969E-03		
SATURATED HYDROCARBON	956.85	5.214E-03	1058.17	5.853E-03	ACID ESTER	726.05	4.184E-03		
TRIMETHYL PYRAZINE	783.94	4.272E-03	902.88	4.994E-03	UNKNOWN HYDROCARBON	638.45	3.668E-03		
SATURATED HYDROCARBON	777.12	4.234E-03	644.30	3.564E-03	SATURATED HYDROCARBON	579.13	3.338E-03		
SUBSTITUTED HYDROCARBON	653.67	3.562E-03	612.21	3.386E-03	SATURATED HYDROCARBON	477.74	2.753E-03		
UNKNOWN HYDROCARBON	586.00	3.193E-03	588.58	3.256E-03	TRIMETHYL PYRAZINE	476.12	2.744E-03		
SATURATED HYDROCARBON	553.46	3.016E-03	532.48	2.945E-03	SATURATED HYDROCARBON	405.03	2.334E-03		
BRANCHED HYDROCARBON	526.56	2.869E-03	417.80	2.311E-03	SATURATED HYDROCARBON	394.2	2.272E-03		
ALCOHOL	371.16	2.022E-03	279.26	1.545E-03	SATURATED HYDROCARBON	362.78	2.091E-03		

TABLE 2.2.2 B-SIDE 2ND CARBONATION TANK VENT ALDEHYDE TESTING RESULTS - RUN NO. ALD1

STACK SAMPLING DATA									
DATE:	11/13/92	SAMPLE FLOW(ml/min):	180	ACTUAL STACK FLOW(ACFM) :	1167				
TEST & RUN NO.:	NA1392 ALD1	SAMPLE TIME(min):	60	MOISTURE (% H2O):	77.3				
SOURCE THRPT (GAL/HR):	71700	STACK TEMP(DEG F):	194	DRY STD STACK FLOW(DSCFM):	200				
		LAB TEMP(DEG F):	62.5	LAB PRESSURE (in hg)	27.8				
		SAMPLE VOLUME(ACM):	0.0135						
		SAMPLE VOLUME(ACF):	0.4774						
COMPOUND	MDL (ug/ml)	MASS			CONCENTRATION (ug/m3)	EMISSION RATE (lbs/hr)	EMISSION FACTOR (lbs/gal)		
		BLANK (ug)	IMP 1 & 2 (ug)	IMP 3 (ug)				TOTAL (ug)	
FORMALDEHYDE	0.0079	1.62	5.15	1.54	271.81	1.592E-08	1.115E-03	1.555E-08	
ACETALDEHYDE	0.0131	2.77	945.57	11.34	74955.48	4.390E-06	3.074E-01	4.287E-06	
ACROLEIN	0.0046	2.13	52.99	3.42	4108.74	2.406E-07	1.685E-02	2.350E-07	
CROTONALDEHYDE	0.0295	0.83	7.38	0.83	516.05	3.022E-08	2.116E-03	2.951E-08	

TABLE 2.2.3 CARBONATION TANK VENT EXHAUST DATA

NAMPA IDAHO FACILITY - 1992 CAMPAIGN

DATE	CARB TANK VENT	RUN NO.	STACK GAS PARAMETERS				
			TEMP (DEG. F)	H2O (%)	VEL (FPM)	ACTUAL FLOW (ACFM)	DRY FLOW (DSCFM)
11/13/92	B SIDE 2ND	ALD 1	194	77.3	563	1167	200
11/17/92	B SIDE 1ST	SVOC 1	188	66.9	3305	5841	1456
11/18/92	B SIDE 1ST	SVOC 2	188	67.6	3430	5061	1478
11/19/92	B SIDE 1ST	SVOC 3	186	67.0	3517	6215	1540

TABLE 2.3.1 SUMMARY OF THE A-SIDE #2 THIN JUICE HEATER VENT ALDEHYDE EMISSION TESTING RESULTS - RUN NO'S. ALD1 - ALD3

SOURCE	DATE	TEST RUN NO.	FORMALDEHYDE			ACETALDEHYDE			ACROLEIN			CROTONALDEHYDE		
			(lbs/hr)	(ug/m3)	(lbs/gal)	(lbs/hr)	(ug/m3)	(lbs/gal)	(lbs/hr)	(ug/m3)	(lbs/gal)	(lbs/hr)	(ug/m3)	(lbs/gal)
A HTR	1/13/93	ALD1	2.11E-04	26866	2.83E-09	1.06E-02	1352228	1.42E-07	1.93E-05	2455	2.58E-10	2.21E-05	2812	2.96E-10
A HTR	1/13/93	ALD2	5.79E-05	7369	7.88E-10	8.64E-03	1099809	1.18E-07	8.94E-06	1137	1.22E-10	1.29E-05	1638	1.75E-10
A HTR	1/13/93	ALD3	1.87E-05	2374	2.53E-10	4.55E-03	579289	6.17E-08	4.76E-06	605	6.45E-11	7.22E-06	918	9.78E-11
		AVG	9.59E-05	12203	1.29E-09	7.94E-03	1010442	1.07E-07	1.10E-05	1399	1.48E-10	1.41E-05	1789	1.90E-10

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TABLE 2.3.2 SUMMARY OF THE B - SIDE 2ND CARBONATION HEATER VENT ALDEHYDE EMISSION TESTING RESULTS - RUN NO'S. ALD1-ALD3

SOURCE	DATE	TEST RUN NO.	FORMALDEHYDE			ACETALDEHYDE			ACROLEIN			CROTONALDEHYDE		
			(lbs/hr)	(ug/m3)	(lbs/gal)	(lbs/hr)	(ug/m3)	(lbs/gal)	(lbs/hr)	(ug/m3)	(lbs/gal)	(lbs/hr)	(ug/m3)	(lbs/gal)
BHTR	1/21/93	ALD1	1.07E-05	4745	1.45E-10	2.43E-03	1081023	3.31E-08	5.80E-05	25835	7.91E-10	7.17E-06	3193	9.77E-11
BHTR	1/21/93	ALD2	7.12E-06	3170	9.65E-11	1.68E-03	749815	2.28E-08	4.98E-05	22168	6.75E-10	5.10E-06	2273	6.92E-11
BHTR	1/21/93	ALD3	5.07E-06	2260	6.94E-11	1.08E-03	481552	1.48E-08	4.10E-05	18245	5.61E-10	8.72E-06	3885	1.19E-10
		AVG	7.61E-06	3391	1.04E-10	1.73E-03	770797	2.36E-08	4.96E-05	22083	6.75E-10	7.00E-06	3117	9.54E-11

Prod. Rates - Backcalculated 12/5/94 (MRI)

$$\text{Run 1 } (73793 + 73414 + 73325 + 73388) = 73480 \pm 73500$$

$$\text{Run 2 } (73782 + 73684 + 73771 + 73699) \pm 73700$$

$$\text{Run 3 } (73055 + 73305 + 73481 + 73375) \pm 73300$$

TABLE 2.3.3 SUMMARY OF THE B SIDE 2ND CARBONATION HEATER VENT SVOC EMISSION TESTING RESULTS (XAD & RINSES) - RUN NO'S. SVOC1 - 4

RUN NO'S.	SVOC1			SVOC2			SVOC3			SVOC4		
	CONC. [ug/m3]	EMISSION RATE [lbs/hr]	COMPOUND	CONC. [ug/m3]	EMISSION RATE [lbs/hr]	COMPOUND	CONC. [ug/m3]	EMISSION RATE [lbs/hr]	COMPOUND	CONC. [ug/m3]	EMISSION RATE [lbs/hr]	AVERAGE [ug/m3]
BENZALDEHYDE	80517.0	2.65E-04	BENZALDEHYDE	48269.9	1.66E-04	BENZALDEHYDE	49757.4	8.98E-05	BENZALDEHYDE	74726.8	1.81E-04	83588.2
BIS(2-ETHYLOXY)PHTHALATE	1801.9	5.93E-08	BIS(2-ETHYLOXY)PHTHALATE	6803.1	2.28E-05	BIS(2-ETHYLOXY)PHTHALATE	44883.2	8.30E-05	BIS(2-ETHYLOXY)PHTHALATE	8245.8	1.77E-05	15434.0
BENZYL ALCOHOL	2510.8	8.27E-08	BENZYL ALCOHOL	1288.9	4.28E-08				BENZYL ALCOHOL	2726.8	5.87E-08	1827.8
NAPHTHALENE	748.3	2.47E-08	NAPHTHALENE	354.7	1.10E-08				NAPHTHALENE	1844.3	3.97E-08	1827.8
4-METHYLPHENOL	2214.8	7.28E-08										737.1
PHENANTHRENE	320.9	1.08E-08	PHENANTHRENE	285.3	8.81E-07	PHENANTHRENE	357.3	5.01E-07	PHENANTHRENE	1073.5	2.31E-08	553.7
			ISOPHORONE	1304.1	4.38E-08							508.3
			BENZOIC ACID	1133.43	3.82E-08							328.0
			PHENOL	352.2	1.18E-08							283.4
			PYRIDINE	528.1	1.78E-08				DIETHYLPHTHALATE	1640.4	3.53E-08	544.3
									PYRIDINE	784.2	1.88E-08	410.1
												328.1
												23.8
TENTATIVELY IDENTIFIED COMPOUNDS												
TRIMETHYL PYRAZINE	284248.3	9.88E-04	UNKNOWN AROMATIC HC	30868.2	1.04E-04	ALKYL PYRAZINE	14550.7	2.04E-05	TRIMETHYL PYRAZINE (SAT)	83838.1	1.81E-04	
UNKNOWN AROMATIC HC	147878.5	4.88E-04	DIMETHYL PYRAZINE	18181.9	5.44E-05	UNKNOWN AROMATIC HC	11041.8	1.55E-05	DIMETHYL PYRAZINE (SAT)	65828.8	1.42E-04	
DIMETHYL PYRAZINE	27789.3	9.15E-05	DIMETHYL PYRAZINE	15288.5	5.13E-05	UNKNOWN AROMATIC HC (SAT)	11041.8	1.55E-05	UNKNOWN AROMATIC HC	34784.8	7.48E-05	
METHYL PYRAZINE	11853.5	3.80E-05	UNKNOWN AROMATIC HC	10027.0	3.38E-05	UNKNOWN AROMATIC HC	8080.2	1.13E-05	ALKYL PYRAZINE	20607.7	4.43E-05	
UNKNOWN AROMATIC HC	10884.4	3.58E-05	UNKNOWN AROMATIC HC	8783.8	2.28E-05	ALKYL PYRAZINE	7583.1	1.08E-05	METHYL PYRAZINE	4800.0	1.03E-05	
ALKYL PYRAZINE	3864.3	1.21E-05	TETRAMETHYL PYRAZINE	4003.8	1.35E-05	TRIMETHYL PYRAZINE (SAT)	5311.7	7.45E-06	UNKNOWN AROMATIC HC	4178.7	8.88E-06	
ALKYL PYRAZINE	2705.2	8.91E-06	ALKYL PYRAZINE	3840.5	1.23E-05	DIMETHYL PYRAZINE (SAT)	4281.5	8.01E-06	UNKNOWN CYCLIC HC	3085.7	8.84E-06	
ALKYL PYRAZINE	2410.0	7.84E-06	UNKNOWN AROMATIC HC	2131.2	7.18E-06	SUBSTITUTED PYRAZINE (SAT)	2983.8	4.20E-06	DIMETHYL SULFOXIDE	2805.2	8.04E-06	
UNKNOWN AROMATIC HC	1898.9	5.58E-06	UNKNOWN AROMATIC HC	1725.8	5.81E-06	ALKYL PYRAZINE	1223.3	1.72E-06	UNKNOWN AROMATIC HC	2244.2	4.83E-06	
UNKNOWN AROMATIC HC	1573.9	5.18E-06	ALKYL PYRAZINE	1387.5	4.71E-06	UNKNOWN AROMATIC HC	811.7	8.58E-07	ALKYL PYRAZINE	2181.8	4.69E-06	

TABLE 2.3.4 SUMMARY OF THE B-SIDE 2ND CARBONATION HEATER VENT SVOC EMISSION TESTING RESULTS (KNOCKOUT IMPINGER WATER) - RUN NO'S. SVOC1-SVOC4

RUN NO'S.	SVOC1		SVOC2		SVOC3		SVOC4		AVERAGE	
	CONC. [ug/m3]	EMISSION RATE [lb/hr]	COMPOUND	CONC. [ug/m3]	EMISSION RATE [lb/hr]	COMPOUND	CONC. [ug/m3]	EMISSION RATE [lb/hr]	[ug/m3]	[lb/hr]
BENZYL ALCOHOL	2741.5	9.03E-06	BENZYL ALCOHOL	4336.5	1.48E-05	BENZYL ALCOHOL	3484.4	4.90E-06	3837.2	8.52E-06
BENZALDEHYDE	240.0	7.80E-07	BENZALDEHYDE	5059.3	1.70E-05	BENZALDEHYDE	1202.0	1.69E-06	1287.3	2.73E-06
PYRIDINE	889.4	2.30E-06	PYRIDINE	528.1	1.78E-06	PYRIDINE	783.2	1.10E-06	784.2	1.88E-06
BIS(2-ETHYLHEXYL)PHTHALATE	72.8	2.38E-07	BIS(2-ETHYLHEXYL)PHTHALATE	80.8	2.72E-07	BIS(2-ETHYLHEXYL)PHTHALATE	95.0	1.33E-07	1321.8	2.84E-06
DI-N-BUTYL PHTHALATE	34.9	1.15E-07	DI-N-BUTYL PHTHALATE			DI-N-BUTYL PHTHALATE	71.8	1.01E-07		
TENTATIVELY IDENTIFIED COMPOUNDS										
SUBSTITUTED PYRIMIDINE (SAT.)	13272.4	4.37E-04	SUBSTITUTED PYRIMIDINE (SAT.)	127597.5	4.30E-04	SUBSTITUTED PYRIMIDINE (SAT.)	245289.8	3.44E-04	308074.4	8.83E-04
SUBSTITUTED PYRAZINE (SAT.)	43828.7	1.44E-04	SUBSTITUTED PYRAZINE (SAT.)	81181.0	2.08E-04	SUBSTITUTED PYRAZINE (SAT.)	157031.9	2.20E-04	184034.7	3.54E-04
SUBSTITUTED PYRAZINE (SAT.)	43184.0	1.42E-04	SUBSTITUTED PYRAZINE	60323.1	2.04E-04	SUBSTITUTED PYRAZINE (SAT.)	68928.9	9.38E-05	108340.9	2.35E-04
UNKNOWN	35142.3	1.18E-04	SUBSTITUTED PYRAZINE (SAT.)	28417.9	9.57E-05	UNKNOWN AROMATIC	40754.9	5.72E-05	94442.1	2.03E-04
UNKNOWN	34578.7	1.14E-04	SUBSTITUTED HYDROCARBON	12507.5	4.21E-05	SUBSTITUTED AROMATIC	35121.3	4.83E-05	35314.5	7.80E-05
SUBSTITUTED PYRAZINE (SAT.)	18528.0	5.44E-05	SUBSTITUTED HYDROCARBON	10821.4	3.88E-05	SUBSTITUTED HYDROCARBON	28429.5	3.71E-05	34130.1	7.34E-05
UNKNOWN	13943.8	4.58E-05	UNKNOWN AROMATIC	7188.1	2.41E-05	SUBSTITUTED PYRAZINE	25208.2	3.54E-05	18838.5	4.23E-05
SUBSTITUTED HYDROCARBON	10820.8	3.58E-05	SUBSTITUTED BENZALDEHYDE	8831.8	2.33E-05	SUBSTITUTED HYDROCARBON	24240.5	3.40E-05	18838.5	4.23E-05
SUBSTITUTED HYDROCARBON	10181.2	3.35E-05	SUBST. CYCLIC HYDROCARBON	5887.4	1.89E-05	UNKNOWN AROMATIC	18894.8	2.78E-05	18044.3	4.10E-05
SUBSTITUTED PYRAZINE	5582.4	1.84E-05	SUBSTITUTED PYRAZINE	9247.8	1.77E-05	SUBST. CYCLIC HC	18830.2	2.78E-05	17810.5	3.78E-05

TABLE 2.3.5 EXHAUST DATA FOR THE EVAPORATOR HEATER VENTS

NAMPA IDAHO FACILITY - 1992 CAMPAIGN

DATE	HEATER VENT	RUN NO.	STACK GAS PARAMETERS				
			TEMP (DEG. F)	H2O (%)	VEL (FPM)	ACTUAL FLOW (ACFM)	DRY FLOW (DSCFM)
1/14/93	A SIDE #2 THIN JUICE	ALD 1-3	207	98.6	2426	212	2.1
1/18/93	B SIDE 2ND CARB	SVOC 1	206	98.5	957	83.5	0.9
11/19/92	B SIDE 2ND CARB	SVOC 2	207	98.4	891	77.8	0.9
1/21/93	B SIDE 1ST 2ND CARB	ALD 1-3	211	98.9	830	72.5	0.6
1/22/93	B SIDE 2ND CARB	SVOC 3	207	99.1	678	59.2	0.4
1/27/93	B SIDE 2ND CARB	SVOC 4	207	99.0	903	78.8	0.6

SECTION 3.0 PROCESS DESCRIPTION AND OPERATION

A general flow diagram of the beet sugar production process is shown in Figure 3.0. The process can be divided into 2 operations; the beet end and the sugar end. The "beet end" involves the production of thick sugar juice and includes all process equipment from the beet flumes (where beets enter the factory) through the evaporators. The Nampa facility operates 2 parallel beet end production lines, referred to as the A and B sides. The "sugar end" (A side only) involves the production of granulated sugar and molasses, and includes all process equipment after the evaporators. The tank farm (B side only) stores thick juice for processing after all the sugar beets are processed.

Stack testing was conducted on the pulp drying, carbonation and evaporation processes. The following sections briefly discuss these processes and the operation of the process equipment during the testing.

3.1 Pulp Drying

The purpose of the pulp drying process is to dry pressed pulp. Dried pulp is a highly desirable livestock feed.

The Nampa facility operates 3 pulp dryers: the north pulp dryer; the center pulp dryer; and the south pulp dryer. Each pulp dryer consists of a rotating drum and a furnace. The dryers are direct fired by pulverized coal. The dryers can also be fired by natural gas. Temperature sensors are located in the furnace, throat and the discharge end of the dryer.

Pressed pulp and varying amounts of sugar juice additives are screw conveyed into each dryer. Sugar juice additives include molasses and concentrated separator byproduct (CSB). The amount of the molasses and CSB added to the pressed pulp is dependent on customer needs. Once dried, the dried pulp is either conveyed to the pellet mills or sold in bulk.

The total amount of material added to each dryer was calculated using the total amount of dried pulp produced per hour; percent throughput to each dryer; pressed pulp moisture; dried pulp moisture; molasses characteristics; CSB characteristics; coal heating value; and coal throughput. Example calculations are provided in Appendix C.

Emissions from the north pulp dryer are controlled by a cyclone and impingement type wet scrubber in series. Both the south and center dryer emissions are controlled by a parallel pair of cyclones and impingement type scrubbers in series. When the dryer stacks were tested, the pressure drop across the scrubber and scrubbing liquid flow rate was recorded.

A summary of the process data for each dryer is shown in Table 3.1.1. The table provides the average operations for all testing. Because the north pulp dryer scrubber was modified during the testing, 2 sets of process data are provided. Appendix C includes all process data information.

3.2 Carbonation

The 1st and 2nd carbonation tanks are used to precipitate non-sugar substances from raw juice. Prior to entering the carbonation tanks, milk of lime ($\text{Ca}(\text{OH})_2$) is added to the raw juice. The limed raw juice is transferred into the 1st carbonation tank where CO_2 is added. The milk of lime combines with the CO_2 to form a precipitate of calcium carbonate (CaCO_3) and non-sugars. To ensure that all milk of lime has reacted, the juice is transferred from the 1st carbonation tank to the second (2nd) carbonation tank where CO_2 is also added.

The following operating data for the B side 1st and 2nd carbonation tanks are averages for all test runs:

Raw Juice Flow	(GPM)	1,274
	(GPH)	76,955
Juice Temperature	(°F)	191
Juice pH		9.7
Juice CaO	(%)	1.0
Milk of Lime	(%CaO)	18
$\text{Ca}(\text{OH})_2$ Feed Rate	(GPM)	0
Kiln Gas CO_2	(%)	29.1
	O_2 (%)	2.9
	CO_2 (%)	0.4

3.3 Evaporator

Sugar juices are heated at various stages of the juice purification process using heaters. Thermoenergy in the form of steam is supplied to the heaters from the evaporators.

Evaporators are used to drive off water from the beet juices. At Nampa, both the A and B sides operate 5 effect evaporator systems. Each evaporator consists of a calandria and dome. Steam from the factory boilers supply heat to 1st evaporator. Water vapor driven off from the juices in the 1st evaporator supplies the heat for the 2nd effect. This scheme is continued for each successive effect.

The pressure and temperature vary from one evaporator effect to the next. The highest pressures and temperatures occur in the 1st evaporator. The pressure and temperature decrease through each subsequent effect. The 5th effect operates under a vacuum.

Non-condensable gases (air, carbon dioxide, ammonia, and oxygen) and water vapor from the 1st three evaporators are exhausted to the heaters. Non-condensable gases must be vented to allow for efficient heating within the evaporators. Non-condensable gases and water vapor are vented through heaters to the atmosphere through pipes with 1/8" to 3/8" orifices.

The average operating data for the A side 1st evaporator and the B side 1st evaporator data is as follows:

		<u>A SIDE</u>	<u>B SIDE</u>
Thin Juice Flow	(GPM)	1,233	1,212
Thin Juice Flow	(GPH)	74,000	72,703
Evaporator Temp	(°F)	245	253
Evaporator Pressure			
♦ Chest	(PSI)	27.7	27.1
♦ Dome	(PSI)	13.8	14.2
Steam Feed Rate	(lb/hr)	5,152	7,979

3.4 Biocide Additions

Biocides are added at various points of the beet end operations to control bacterial growth. Biocides are typically added at the cossette mixer, diffusion tower, and press water from the pulp presses.

The biocides used during the 1992 campaign were formaldehyde, ammonium bisulfite, and Busan 1007. Brocide 900 was not used during 1992 campaign.

The formaldehyde biocide consists of 37% formaldehyde and 21% methanol. The usage of formaldehyde during the 1992 campaign was significantly reduced compared to previous campaigns. During the testing, only one addition occurred. On October 14, 1993, 10,500 lbs of formaldehyde was added to the A and B side mixers, towers and press water. Formaldehyde was not used for the remainder of the testing.

Both ammonium bisulfite solution and Busan 1007 were continuously added throughout the 1992 campaign. Since these biocides were continuously added at a constant rate, hourly records were not maintained during the testing. Ammonium bisulfite solution (67% NH_4HSO_3) was added to the A and B side cossette mixers and diffusion towers. The amount of ammonium bisulfite added to each side was 20.5 gallons per hour (238 lbs/hour). Busan 1007 is a FDA approved biocide consisting of 14.7% cyanodithiomido-carbonate and 23.3% potassium-N-methyldithiocarbamate. Busan 1007 was added to the diffusion towers via press water at a concentration of 20 ppm. The average amount of Busan added to each side was 2.0 gallons per hour (20.4 lbs/hour).

BET SUGAR PROCESS

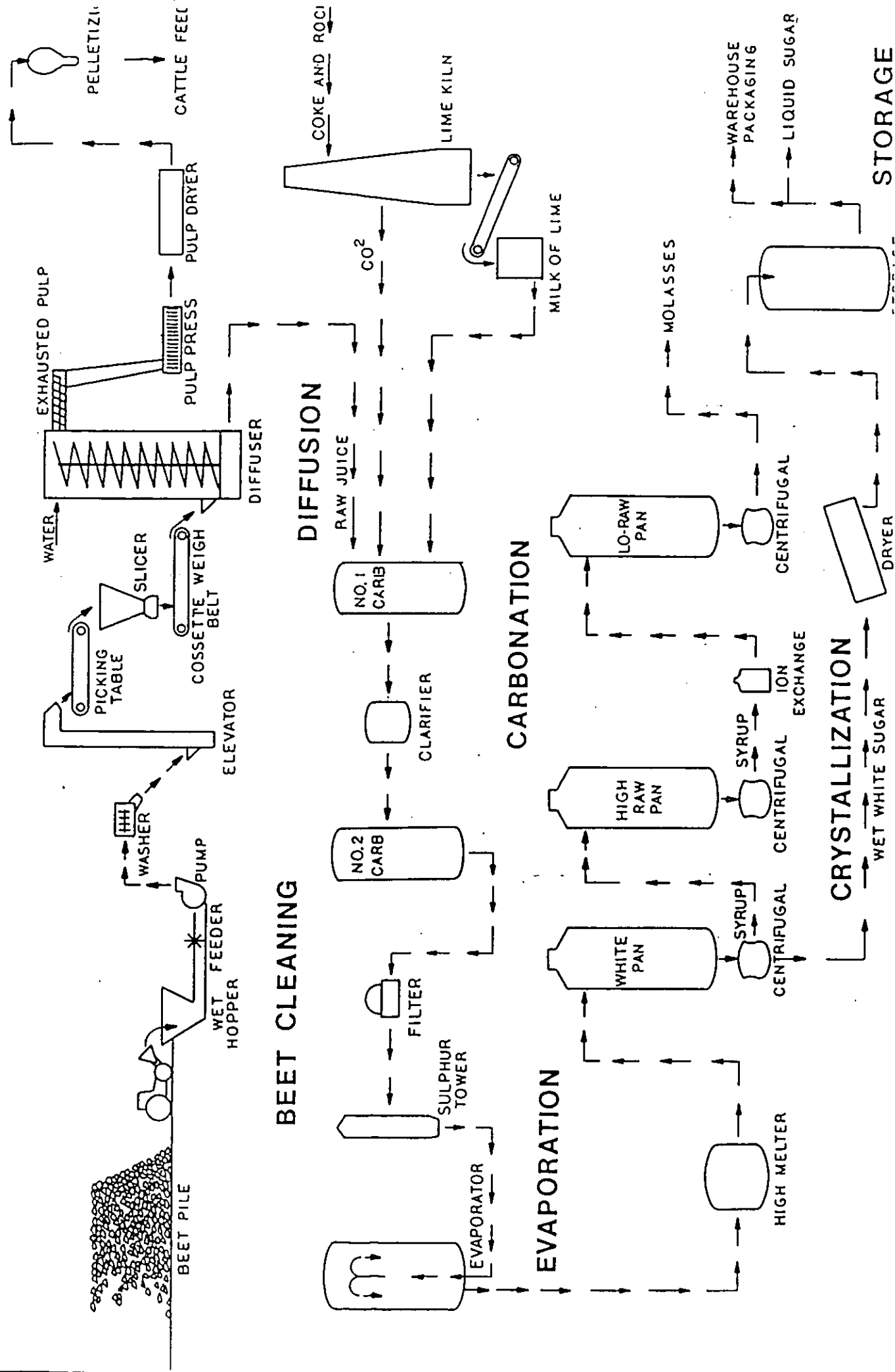


TABLE 3.1.1 SUMMARY OF THE PROCESS DATA FOR THE PULP DRYERS
NAMPA IDAHO FACILITY - 1992 CAMPAIGN

DRYER	TOTAL THROUGHPUT RATE (T/H) a	COAL b (T/H)	DRYER TEMPERATURES		SCRUBBER OPERATION	
			THROAT (DEG. F)	DISCHARGE (DEG. F)	PRES. DROP (IN H ₂ O)	WATER FLOW (GPM)
NORTH c	20.1	1.6	1,616	288	1.0	199
NORTH d	18.3	1.5	1,640	282	2.0	243
CENTER	51.4	4.6	1,769	297	4.0	162
SOUTH	44.0	5.3	1,367	253	4.4	138

- a TOTAL THROUGHPUT RATE TO EACH DRYER WAS BACK CALCULATED BASED ON: THE TOTAL AMOUNT OF DRIED PULP PRODUCED PER HOUR; PULP MOISTURES; GRAVIMETRIC ANALYSIS OF MOLASSES, CSB, DRYER HEAT INPUT AND COAL HEATING VALUE.
- b THE AVERAGE ASH AND SULFUR CONTENTS OF THE COAL WERE 5.7% AND 0.72%, RESPECTIVELY.
- c PROCESS DATA PRIOR TO THE 12-16-92 MODIFICATION TO THE INTERNAL SKIRT OF THE SCRUBBER.
- d PROCESS DATA AFTER THE 12-16-92 MODIFICATION TO THE INTERNAL SKIRT TO THE SCRUBBER.

Test date: Oct. 14-Dec. 3, 1992

VOID
DATA
- SCRUBBER NOT
OPERATING CORP

[illegible]

Filename: BEET5A.WQ1

Date: 02-Dec-94

Facility: The Amalgamated Sugar Company

Location: Nampa, Idaho

Source: CENTRAL PULP DRYER

Coal-fired rotary drum beet pulp dryer controlled with cyclones and wet impingement type scrubbers in series (two parallel stacks each w/controls)

Note: Run 2--east stack: dryer fired by natural gas

Test date: Oct. 28-Nov. 2, 1992

*North Pulp Dryer
Stack PM
Data (1992)
Not representative of
typical control systems.
Data Not used*

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2**	Run 3	Run 4
EAST STACK	Stack temperature	Deg F	173	171	170	175
	Moisture	%	47.4	44.3	44.6	46.7
	Oxygen	%	nd	nd	nd	nd
	Volumetric flow, actual	acfm	38894	41616	44102	40393
	Volumetric flow, standard*	dscfm	15674	17613	18534	16480
	Isokinetic variation	%	nd	nd	nd	nd
Process rate:		TPH	50.20	47.40	55.20	49.7
Beet pulp feed to dryer						
Pollutant concentrations:						
	Filterable PM	G/dscf	0.0939	0.0668	0.0601	0.0873
	Condensable PM	G/dscf	0.185	0.0457	0.0623	0.0614
Pollutant mass flux rates:						
	Filterable PM	lb/hr	12.6	10.1	9.55	12.3
	Condensable PM	lb/hr	24.9	6.90	9.90	8.67
Emission factors (ENGLISH UNITS):						
	Filterable PM	lb/ton	0.251	0.213	0.173	0.248
	Condensable PM	lb/ton	0.495	0.146	0.179	0.175
Emission factors (METRIC UNITS):						
	Filterable PM	kg/Mg	0.126	0.106	0.0865	0.124
	Condensable PM	kg/Mg	0.248	0.0728	0.0896	0.0873

TOTAL EMISSION FACTORS FOR BOTH STACKS (EAST RUNS 1,3,4 + WEST RUNS 1,2,3)

Emission factors (ENGLISH UNITS):					AVERAGE
	Filterable PM	lb/ton	0.460	0.363	0.422
	Condensable PM	lb/ton	0.664	0.367	0.467
Emission factors (METRIC UNITS):					AVERAGE
	Filterable PM	kg/Mg	0.230	0.182	0.211
	Condensable PM	kg/Mg	0.332	0.183	0.234

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
WEST STACK	2 Stack temperature	Deg F	173	171	169	
	Moisture	%	42.6	42.2	43.2	
	Oxygen	%	nd	nd	nd	
	Volumetric flow, actual	acfm	37491	39063	37381	
	Volumetric flow, standard*	dscfm	16691	17538	16515	
	Isokinetic variation	%	nd	nd	nd	
Process rate: Beet pulp feed to dryer		TPH	55.30	55.80	55.70	
Pollutant concentrations:						
	Filterable PM	G/dscf	0.0805	0.0706	0.0684	
	Condensable PM	G/dscf	0.0652	0.0695	0.0773	
Pollutant mass flux rates:						
	Filterable PM	lb/hr	11.5	10.6	9.7	
	Condensable PM	lb/hr	9.3	10.4	10.9	
Emission factors (ENGLISH UNITS):						AVERAGE
	Filterable PM	lb/ton	0.208	0.190	0.174	0.191
	Condensable PM	lb/ton	0.169	0.187	0.196	0.184
Emission factors (METRIC UNITS):						AVERAGE
	Filterable PM	kg/Mg	0.104	0.0951	0.0869	0.0954
	Condensable PM	kg/Mg	0.0843	0.0936	0.0982	0.0920

Filename: BEET5C.WQ1

Date: 07-Dec-94

Facility: The Amalgamated Sugar Company

Location: Nampa, Idaho

Source: SOUTH PULP DRYER--east stack

Coal-fired rotary drum beet pulp dryer controlled with cyclones and wet impingement type scrubbers in series (two parallel stacks each w/controls)

Note: Only one of the two stacks was tested; emission rates are doubled to account for both stacks.

Test date: Oct. 28-Nov. 2, 1992

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	165	165	165	156
EAST STACK	Moisture	%	39.2	37.5	37.9	36.8
	Oxygen	%	nd	nd	nd	nd
	Volumetric flow, actual	acfm	34287	31421	27870	23435
	Volumetric flow, standard*	dscfm	16192	15319	13630	11484
	Isokinetic variation	%	nd	nd	nd	nd
Process rate:		TPH	47.10	47.10	47.20	38.9
Beet pulp feed to dryer						
Pollutant concentrations:						
Filterable PM		G/dscf	0.0619	0.0497	0.0467	0.0922
Condensable PM		G/dscf	0.0387	0.0402	0.0763	0.0992
Pollutant mass flux rates:						
Filterable PM		lb/hr	8.59	6.53	5.46	9.08
Condensable PM		lb/hr	5.37	5.28	8.91	9.76
Multiply mass flux rate by number of emission points:						2
Emission factors (ENGLISH UNITS):						
Filterable PM		lb/ton	0.365	0.277	0.231	0.467
Condensable PM		lb/ton	0.228	0.224	0.378	0.502
Emission factors (METRIC UNITS):						
Filterable PM		kg/Mg	0.182	0.139	0.1156	0.233
Condensable PM		kg/Mg	0.114	0.1121	0.1889	0.2510
						AVERAGE
						0.335
						0.333
						0.167
						0.166

RUN 5 DATA ARE NOT PRESENTED BECAUSE THE PRESSURE DROP ACROSS THE SCRUBBER WAS 2.7" H2O.
RUNS 1-4 PRESSURE DROP >3" H2O.

Aldehyde and SVOC data for Amalgamated Sugar--North Pulp Dryer

Test date	No. of runs detected*	Pollutant	Concentration (ug/m ³)	Emission Rate (lb/hr)	Emission factor (lb/ton)		
ALDEHYDES						AVG. OF 2 TESTS	
10/26/92	3	Formaldehyde	190.1	0.0244	0.00102	0.0083	
	3	Acetaldehyde	585.1	0.0753	0.00315	0.013	
	3	Acrolein	814.3	0.105	0.00439	0.0060	
	3	Crotonaldehyde	568.3	0.0732	0.00306	0.0024	
01/11/93	3	Formaldehyde	4281.7	0.249	0.0155		
	3	Acetaldehyde	6099.2	0.354	0.0221		
	3	Acrolein	2128.9	0.124	0.00769		
	3	Crotonaldehyde	465.6	0.0271	0.00168		
SVOC						AVG. OF 2 TESTS	TOTAL # OF RUNS DETECTED
10/92	3	Benzoic acid	1019.37	6.43E-02	0.00269	0.0028	6
	3	Benzaldehyde	388.07	2.42E-02	0.00101	0.0014	6
	3	Bis(2-ethylhexyl)phthalate	196.45	1.23E-02	0.000515	0.0015	6
	2	Phenol	176.97	1.07E-02	0.000448	0.00032	3
	3	2-Nitrophenol	109.07	7.04E-03	0.000295	0.00018	5
	2	4-Nitrophenol	74.36	4.83E-03	0.000202	0.00014	4
	2	4-Methylphenol	61.63	3.67E-03	0.000154	0.00013	5
	3	Naphthalene	49.54	3.11E-03	0.000130	0.00011	6
	3	Di-n-butylphthalate	35.44	2.21E-03	9.25E-05	5.16E-05	4
	3	Benzyl alcohol	32.76	2.01E-03	8.41E-05	7.08E-05	5
	2	2,4-Dinitrophenol	18.7	1.21E-03	5.06E-05	5.06E-05	2
	2	2-Methylphenol	17.24	1.02E-03	4.27E-05	3.40E-05	5
	3	Nitrobenzene	14.34	8.97E-04	3.75E-05	1.88E-05	4
	3	2,4-Dimethylphenol	12.7	7.91E-04	3.31E-05	2.49E-05	4
	2	2-Methylnaphthalene	6.4	3.93E-04	1.64E-05	1.69E-05	5
	1	4,6-Dinitro-2-methylphenol	5.59	3.67E-04	1.54E-05	1.54E-05	1
	3	Dibenzofuran	5.13	3.16E-04	1.32E-05	1.08E-05	5
	3	Phenanthrene	4.94	3.06E-04	1.28E-05	1.20E-05	5
	3	Diethylphthalate	3.72	2.33E-04	9.75E-06	9.75E-06	3
	2	Acenaphthylene	1.35	8.23E-05	3.44E-06	1.72E-06	4
1/93	3	Benzoic acid	753.63	0.047	0.00292		
	3	Bis(2-ethylhexyl)phthalate	685.53	0.0409	0.00254		
	3	Benzaldehyde	431.6	0.0272	0.00169		
	1	Phenol	63.41	0.00319	0.000198		
	3	4-Methylphenol	29.83	0.00179	0.000111		
	3	Naphthalene	21.13	0.00132	8.20E-05		
	2	4-Nitrophenol	17.48	0.00122	7.58E-05		
	2	2-Nitrophenol	16.78	0.000998	6.20E-05		
	2	Benzyl alcohol	15.8	0.000927	5.76E-05		
	3	2-Methylphenol	6.78	0.000409	2.54E-05		
	3	2-Methylnaphthalene	4.52	0.000278	1.73E-05		
	1	Nitrobenzene	5.48	0.000276	1.71E-05		
	1	2,4-Dimethylphenol	5.32	0.000268	1.66E-05		
	2	Phenanthrene	3.3	0.00018	1.12E-05		
	1	Di-n-butylphthalate	3.44	0.000173	1.07E-05		
	1	Butylbenzylphthalate	3.43	0.000173	1.07E-05	1.07E-05	1
	2	Dibenzofuran	2.43	0.000136	8.45E-06		
	1	Fluoranthene	1.91	9.61E-05	5.97E-06	5.97E-06	1
	2	Acenaphthylene	1.43	8.37E-05	5.20E-06		
	1	Anthracene	1.59	7.98E-05	4.96E-06	4.96E-06	1

Aldehyde data for Amalgamated Sugar-Central Pulp Dryer

Test date	No. of runs detected*	Pollutant	Concentration (ug/m ³)	Emission Rate (lb/hr)	Emission factor (lb/ton)
ALDEHYDES					
01/25/93	3	Formaldehyde	4187	0.25	0.00586
	3	Acetaldehyde	11523.8	0.687	0.0162
	3	Acrolein	6443.4	0.384	0.0092
	3	Crotonaldehyde	1116.4	0.0665	0.00159

SVOC data for Amalgamated Sugar-B-side 1st carbonation tank vent

Test date	Run #	Pollutant	Concentration (ug/m ³)	Flow rate (dscfm)	Emission Rate (lb/hr)	Emission factor (lb/1000 gal)
SVOC			Process throughput rate (1000 gal/hr) =		76.955	
11/17/92 to 11/19/92	1	Benzaldehyde	1341.88	1456	7.32E-03	9.51E-05
	2	Benzaldehyde	1635.15	1478	9.05E-03	1.18E-04
	3	Benzaldehyde	1400.87	1540	8.08E-03	1.05E-04
	AVERAGE					1.06E-04
	1	Bis(2-ethylhexyl)phthalate	252.09	1456	1.37E-03	1.79E-05
	2	Bis(2-ethylhexyl)phthalate	133.42	1478	7.39E-04	9.60E-06
	3	Bis(2-ethylhexyl)phthalate	127.69	1540	7.37E-04	9.57E-06
	AVERAGE					1.23E-05
	1	Benzoic acid	171.13	1456	9.33E-04	1.21E-05
	2	Benzoic acid	85.43	1478	4.73E-04	6.15E-06
	3	Benzoic acid	91.79	1540	5.29E-04	6.88E-06
	AVERAGE					8.38E-06
	1	Benzyl alcohol	66.52	1456	3.63E-04	4.71E-06
	2	Benzyl alcohol	66.18	1478	3.66E-04	4.76E-06
	3	Benzyl alcohol	71.99	1540	4.15E-04	5.40E-06
	AVERAGE					4.96E-06
	1	2,4-Dinitrophenol	ND	1456	0.00E+00	ND
	2	2,4-Dinitrophenol	ND	1478	0.00E+00	ND
	3	2,4-Dinitrophenol	141.55	1540	8.16E-04	1.06E-05
	AVERAGE					ND
	1	Naphthalene	21.62	1456	1.18E-04	1.53E-06
	2	Naphthalene	33.28	1478	1.84E-04	2.39E-06
	3	Naphthalene	27.48	1540	1.59E-04	2.06E-06
	AVERAGE					2.00E-06
	1	Phenanthrene	17.91	1456	9.77E-05	1.27E-06
	2	Phenanthrene	19.62	1478	1.09E-04	1.41E-06
	3	Phenanthrene	18.78	1540	1.08E-04	1.41E-06
	AVERAGE					1.36E-06
	1	Phenol	20.27	1456	1.11E-04	1.44E-06
	2	Phenol	19.48	1478	1.08E-04	1.40E-06
	3	Phenol	14.28	1540	8.24E-05	1.07E-06
	AVERAGE					1.30E-06
	1	4-Methylphenol	12.22	1456	6.66E-05	8.66E-07
	2	4-Methylphenol	8.14	1478	4.51E-05	5.86E-07
	3	4-Methylphenol	6.94	1540	4.00E-05	5.20E-07
	AVERAGE					6.57E-07
	1	2-Methylnaphthalene	3.98	1456	2.17E-05	2.82E-07
	2	2-Methylnaphthalene	8.9	1478	4.93E-05	6.40E-07
	3	2-Methylnaphthalene	8.18	1540	4.72E-05	6.13E-07
	AVERAGE					5.12E-07
	1	Acenaphthene	ND	1456	0.00E+00	ND
	2	Acenaphthene	ND	1478	0.00E+00	ND
	3	Acenaphthene	19.29	1540	1.11E-04	1.45E-06
	AVERAGE					ND

Aldehyde data for Amalgamated Sugar-B-side 2nd carbonation tank vent

Test date	No. of test runs	Pollutant	Concentration (lb/acf)	Flow rate (acfm)	Emission Rate (lb/hr)	Emission factor (lb/1000 gal)
ALDEHYDES		Process throughput rate (1000 gal/hr) =		71.7		
11/13/92	1	Formaldehyde	1.592E-08	1167	0.00111	1.55E-05
	1	Acetaldehyde	4.39E-06	1167	0.307	0.00429
	1	Acrolein	2.406E-07	1167	0.0168	0.000235
	1	Crotonaldehyde	3.022E-08	1167	0.00212	2.95E-05

Aldehyde data for Amalgamated Sugar-A-side No.2 thin juice heater vent

Test date	Test run #	Pollutant	Concentration (ug/m ³)	Flow rate (dscfm)	Emission Rate (lb/hr)	Emission factor (lb/1000 gal)
ALDEHYDES		Process throughput rate (1000 gal/hr) =		Run 1-74.6	Run 2-73.4	Run 3-73.8
01/13/93	1	Formaldehyde	26866	2.1	2.11E-04	2.83E-06
	2	Formaldehyde	7369	2.1	5.80E-05	7.90E-07
	3	Formaldehyde	2374	2.1	1.87E-05	2.53E-07
	AVERAGE					1.29E-06
	1	Acetaldehyde	1352228	2.1	1.06E-02	1.43E-04
	2	Acetaldehyde	1099809	2.1	8.65E-03	1.18E-04
	3	Acetaldehyde	579289	2.1	4.56E-03	6.17E-05
	AVERAGE					1.07E-04
	1	Acrolein	2455	2.1	1.93E-05	2.59E-07
	2	Acrolein	1137	2.1	8.94E-06	1.22E-07
	3	Acrolein	605	2.1	4.76E-06	6.45E-08
	AVERAGE					1.48E-07
	1	Crotonaldehyde	2812	2.1	2.21E-05	2.96E-07
	2	Crotonaldehyde	1638	2.1	1.29E-05	1.76E-07
	3	Crotonaldehyde	918	2.1	7.22E-06	9.78E-08
	AVERAGE					1.90E-07

Aldehyde data for Amalgamated Sugar--B-side 2nd carbonation heater vent

Test date	Test run #	Pollutant	Concentration (ug/m ³)	Flow rate (dscfm)	Emission Rate (lb/hr)	Emission factor (lb/1000 gal)
ALDERYDES Process throughput rate (1000 gal/hr) =			Run 1--73.5	Run 2--73.7	Run 3--73.3	
01/21/93	1	Formaldehyde	4745	0.6	1.07E-05	1.45E-07
	2	Formaldehyde	3170	0.6	7.12E-06	9.67E-08
	3	Formaldehyde	2260	0.6	5.08E-06	6.93E-08
	AVERAGE					1.04E-07
	1	Acetaldehyde	1081023	0.6	2.43E-03	3.31E-05
	2	Acetaldehyde	749815	0.6	1.69E-03	2.29E-05
	3	Acetaldehyde	481552	0.6	1.08E-03	1.48E-05
	AVERAGE					2.36E-05
	1	Acrolein	25835	0.6	5.81E-05	7.90E-07
	2	Acrolein	22168	0.6	4.98E-05	6.76E-07
	3	Acrolein	18245	0.6	4.10E-05	5.59E-07
	AVERAGE					6.75E-07
	1	Crotonaldehyde	3193	0.6	7.18E-06	9.76E-08
	2	Crotonaldehyde	2273	0.6	5.11E-06	6.93E-08
	3	Crotonaldehyde	3885	0.6	8.73E-06	1.19E-07
	AVERAGE					9.54E-08

SVOC data for Amalgamated Sugar--B-side 2nd carbonation heater vent

Test date	Run #	Pollutant	Concentration (ug/m ³)	Flow rate (dscfm)	Emission Rate (lb/hr)	Emission factor (lb/1000 gal)
SVOC		Process throughput rate (1000 gal/hr) = 76.955				
01/18/93 to 01/27/93	1	Benzaldehyde	80757	0.879	2.66E-04	3.45E-06
	2	Benzaldehyde	54329.2	0.901	1.83E-04	2.38E-06
	3	Benzaldehyde	50959.4	0.375	7.15E-05	9.29E-07
	4	Benzaldehyde	75995.9	0.574	1.63E-04	2.12E-06
	AVERAGE					2.22E-06
	1	Bis(2-ethylhexyl)phthalate	1874.5	0.879	6.17E-06	8.02E-08
	2	Bis(2-ethylhexyl)phthalate	6885.7	0.901	2.32E-05	3.02E-07
	3	Bis(2-ethylhexyl)phthalate	44978.2	0.375	6.31E-05	8.20E-07
	4	Bis(2-ethylhexyl)phthalate	9567.4	0.574	2.06E-05	2.67E-07
	AVERAGE					3.67E-07
	1	Benzyl alcohol	5252.1	0.879	1.73E-05	2.25E-07
	2	Benzyl alcohol	5606.4	0.901	1.89E-05	2.46E-07
	3	Benzyl alcohol	3494.4	0.375	4.90E-06	6.37E-08
	4	Benzyl alcohol	6327	0.574	1.36E-05	1.77E-07
	AVERAGE					1.78E-07
	1	Naphthalene	749.3	0.879	2.47E-06	3.21E-08
	2	Naphthalene	354.7	0.901	1.20E-06	1.56E-08
	3	Naphthalene	ND	0.375	ND	ND
	4	Naphthalene	1844.3	0.574	3.96E-06	5.15E-08
	AVERAGE					2.48E-08
	1	4-Methylphenol	2214.8	0.879	7.29E-06	9.47E-08
	2	4-Methylphenol	ND	0.901	ND	ND
	3	4-Methylphenol	ND	0.375	ND	ND
	4	4-Methylphenol	ND	0.574	ND	ND
	AVERAGE					ND
	1	Phenanthrene	320.9	0.879	1.06E-06	1.37E-08
	2	Phenanthrene	285.3	0.901	9.63E-07	1.25E-08
	3	Phenanthrene	357.3	0.375	5.01E-07	6.52E-09
	4	Phenanthrene	1073.5	0.574	2.31E-06	3.00E-08
	AVERAGE					1.57E-08
	1	Isophorone	ND	0.879	ND	ND
	2	Isophorone	1304.1	0.901	4.40E-06	5.72E-08
	3	Isophorone	ND	0.375	ND	ND
	4	Isophorone	ND	0.574	ND	ND
	AVERAGE					ND
	1	Benzoic acid	ND	0.879	ND	ND
	2	Benzoic acid	1133.43	0.901	3.82E-06	4.97E-08
	3	Benzoic acid	ND	0.375	ND	ND
	4	Benzoic acid	ND	0.574	ND	ND
	AVERAGE					ND
	1	Phenol	ND	0.879	ND	ND
	2	Phenol	352.2	0.901	1.19E-06	1.54E-08
	3	Phenol	1825	0.375	2.56E-06	3.33E-08
	4	Phenol	ND	0.574	ND	ND
	AVERAGE					1.22E-08
	1	Diethylphthalate	ND	0.879	ND	ND
	2	Diethylphthalate	ND	0.901	ND	ND
	3	Diethylphthalate	ND	0.375	ND	ND
	4	Diethylphthalate	1640.4	0.574	3.52E-06	4.58E-08
	AVERAGE					ND
	1	Pyridine	699.4	0.879	2.30E-06	2.99E-08
	2	Pyridine	1056.2	0.901	3.56E-06	4.63E-08
	3	Pyridine	783.2	0.375	1.10E-06	1.43E-08
	4	Pyridine	1568.4	0.574	3.37E-06	4.38E-08
	AVERAGE					3.36E-08
	1	Dibenzofuran	ND	0.879	ND	ND
	2	Dibenzofuran	ND	0.901	ND	ND
	3	Dibenzofuran	95.3	0.375	1.34E-07	1.74E-09
	4	Dibenzofuran	ND	0.574	ND	ND
	AVERAGE					ND
	1	Di-n-butylphthalate	34.9	0.879	1.15E-07	1.49E-09
	2	Di-n-butylphthalate	ND	0.901	ND	ND
	3	Di-n-butylphthalate	167.1	0.375	2.35E-07	3.05E-09
	4	Di-n-butylphthalate	ND	0.574	ND	ND
	AVERAGE					1.14E-09

APPENDIX F

REPORT EXCERPTS FROM REFERENCE 6

(Monitor Bay Sugar Company, October 12, 1992)

Report of...

Particulate Emission Testing

performed for...



Monitor Sugar Company
Bay City, Michigan

on the

Pulp Dryer 3 Exhaust

October 12, 1992

022.06

Network Environmental, Inc.
Grand Rapids, MI

Network Environmental, Inc.

SUMMARY OF PARTICULATE EMISSIONS

COMPANY NAME: MONITOR SUGAR COMPANY
COMPANY LOCATION: BAY CITY, MICHIGAN
SOURCE NAME: PULP DRYER #3 NORTH
SAMPLING STAFF: BYRD/CARGILL

TEST DATE: 10/12/92

SAMPLE NUMBER	1	2	3
STANDARD ANALYSIS			
E1. TOTAL WEIGHT COLLECTED, grams	0.096	0.095	0.103
E2. LBS. PARTICULATE/1000 LBS. GAS, ACTUAL(1)	0.051	0.050	0.049
E3. LBS. PARTICULATE/1000 LBS. GAS, DRY(2)	0.051	0.050	0.049
E6. GRAINS/DSCF(4)	0.037	0.034	0.034
E7. LBS./HOUR	10.64	10.21	11.00

1. 'ACTUAL' MEANS AT THE CONDITIONS FOUND AT THE SAMPLING LOCATION.
2. 'DRY' INCLUDES ONLY THE NATURAL MOISTURE THAT WOULD BE EMITTED FROM THE PROCESS. MOISTURE ADDED OR SUBTRACTED BY THE COLLECTOR IS NOT INCLUDED.
3. 'WET' INCLUDES THE MOISTURE AS MEASURED AT THE SAMPLING LOCATION.
4. 'DSCF' IS UNDER TOTALLY DRY CONDITIONS, ALL MOISTURE REMOVED.

Network Environmental, Inc.

SUMMARY OF EXHAUST GAS PARAMETERS

COMPANY NAME: MONITOR SUGAR COMPANY

TEST DATE: 10/12/92

COMPANY LOCATION: BAY CITY, MICHIGAN

SOURCE NAME: PULP DRYER #3 NORTH

SAMPLING STAFF: BYRD/CARGILL

SAMPLE NUMBER	1	2	3
G1. STACK RADIUS, inches	33.0	33.0	33.0
G2. AREA OF STACK, sq. ft.	23.76	23.76	23.76
G3. BAROMETRIC PRESSURE, in. HG.	28.75	28.75	28.75
G4. STATIC PRESSURE IN STACK, in. H ₂ O	0.51-	0.51-	0.51-
G5. STACK GAS TEMPERATURE, deg. F	168	165	164
G6. AVG. SQRT VELOCITY PRESSURE OF POINTS SAMPLED	0.675	0.657	0.721
G7. PERCENT MOISTURE AT TEST LOCATION	37.29	33.04	33.90
G8. PERCENT MOISTURE BEFORE COLLECTOR	37.29	33.04	33.90
G9. DRY GAS COMPOSITION: % OXYGEN	16.00	16.40	16.20
% CARBON DIOXIDE	2.93	2.73	2.13
% CARBON MONOXIDE	0.00	0.00	0.00
% NITROGEN	81.07	80.87	81.67
G10. PERCENT EXCESS AIR AT TEST LOCATION			
DENSITY AND MOLECULAR WEIGHT OF STACK GAS:			
G11. DRY, @ STP, lbs./cu.ft.	0.0753	0.0752	0.0749
G12. WET, @ STP, lbs./cu.ft.	0.0645	0.0657	0.0653
G13. WET, @ STACK CONDITIONS, lbs./cu.ft.	0.0522	0.0535	0.0533
G14. MOLECULAR WEIGHT, DRY, @ STP, lbs./mole	29.12	29.10	29.00
G15. AVERAGE GAS VELOCITY, feet/min.	2783	2678	2946
STACK GAS FLOW RATE:			
G16. STACK CONDITIONS, ACFM	66,117	63,616	69,994
G17. STANDARD CONDITIONS, SCFM	53,512	51,804	57,097
G18. STANDARD CONDITIONS, DRY SCFM	33,556	34,688	37,739

STANDARD TEMPERATURE AND PRESSURE (STP) = 29.92 inches Hg, 70 deg. F

Network Environmental, Inc.

SUMMARY OF PARTICULATE TRAIN PARAMETERS

COMPANY NAME: MONITOR SUGAR COMPANY
 COMPANY LOCATION: BAY CITY, MICHIGAN
 SOURCE NAME: PULP DRYER #3 NORTH
 SAMPLING STAFF: BYRD/CARGILL

TEST DATE: 10/12/92

SAMPLE NUMBER	1	2	3
P1. NUMBER OF POINTS SAMPLED	12	12	12
P2. DURATION OF SAMPLE, minutes	60.00	60.00	60.00
P3. NOZZLE DIAMETER, inches	0.309	0.309	0.309
P4. NOZZLE AREA, sq. ft.	0.00052	0.00052	0.00052
P5. PITOT CALIBRATION FACTOR	0.860	0.860	0.860
P6. METER CALIBRATION FACTOR	0.982	0.982	0.982
P7. AVERAGE FILTER TEMPERATURE, deg. F	0	0	0
P8. AVERAGE METER TEMPERATURE, deg. F	69.5	70.9	71.5
P9. AVERAGE METER PRESSURE, inches of water	1.570	1.835	2.193
P10. METER VOLUME, ACTUAL READING, cu.ft.	42.13	45.09	49.35
P11. METER VOLUME, @ STP, cu.ft.	39.93	42.65	46.67
P12. LIQUID VOLUME OF WATER CONDENSED, mls.	501.0	444.0	505.0
P13. VAPOR VOLUME OF WATER CONDENSED, @ STP, cu.ft.	23.75	21.05	23.94
P14. TOTAL GAS SAMPLED, @ STP, cu.ft.	63.68	63.70	70.60
P15. WEIGHT OF GAS SAMPLED, DRY, lbs.	3.01	3.21	3.50
P16. WEIGHT OF GAS SAMPLED, WET, lbs.	4.11	4.19	4.61
P17. PERCENT ISOKINETICS	90.3	93.3	93.8

CONCENTRATION CONVERSION FACTORS:

P18. 50 % EXCESS AIR, AFTER COLLECTOR			
P19. 50 % EXCESS AIR, BEFORE COLLECTOR			
P20. MOISTURE CONDITIONS BEFORE COLLECTOR	1.00	1.00	1.00

STANDARD TEMPERATURE AND PRESSURE (STP) = 29.92 inches Hg, 70 deg. F

Network Environmental, Inc.

SUMMARY OF PARTICULATE EMISSIONS

COMPANY NAME: MONITOR SUGAR COMPANY
COMPANY LOCATION: BAY CITY, MICHIGAN
SOURCE NAME: PULP DRYER #3 SOUTH
SAMPLING STAFF: ENGELHARDT/SMITH

TEST DATE: 10/12/92

SAMPLE NUMBER	1	2	3
STANDARD ANALYSIS			
E1. TOTAL WEIGHT COLLECTED, grams	0.102	0.117	0.111
E2. LBS. PARTICULATE/1000 LBS. GAS, ACTUAL(1)	0.053	0.052	0.051
E3. LBS. PARTICULATE/1000 LBS. GAS, DRY(2)	0.053	0.052	0.051
E6. GRAINS/DSCF(4)	0.036	0.036	0.035
E7. LBS./HOUR	9.99	10.46	9.72

1. 'ACTUAL' MEANS AT THE CONDITIONS FOUND AT THE SAMPLING LOCATION.
2. 'DRY' INCLUDES ONLY THE NATURAL MOISTURE THAT WOULD BE EMITTED FROM THE PROCESS. MOISTURE ADDED OR SUBTRACTED BY THE COLLECTOR IS NOT INCLUDED.
3. 'WET' INCLUDES THE MOISTURE AS MEASURED AT THE SAMPLING LOCATION.
4. 'DSCF' IS UNDER TOTALLY DRY CONDITIONS, ALL MOISTURE REMOVED.

Network Environmental, Inc.

SUMMARY OF EXHAUST GAS PARAMETERS

COMPANY NAME: MONITOR SUGAR COMPANY
 COMPANY LOCATION: BAY CITY, MICHIGAN
 SOURCE NAME: PULP DRYER #3 SOUTH
 SAMPLING STAFF: ENGELHARDT/SMITH

TEST DATE: 10/12/92

SAMPLE NUMBER	1	2	3
G1. STACK RADIUS, inches	33.0	33.0	33.0
G2. AREA OF STACK, sq. ft.	23.76	23.76	23.76
G3. BAROMETRIC PRESSURE, in. HG.	28.75	28.75	28.75
G4. STATIC PRESSURE IN STACK, in. H2O	0.28-	0.28-	0.28-
G5. STACK GAS TEMPERATURE, deg. F	176	174	174
G6. AVG. SQRT VELOCITY PRESSURE OF POINTS SAMPLED	0.637	0.672	0.649
G7. PERCENT MOISTURE AT TEST LOCATION	33.19	33.72	34.79
G8. PERCENT MOISTURE BEFORE COLLECTOR	33.19	33.72	34.79
G9. DRY GAS COMPOSITION: % OXYGEN	16.80	17.60	17.33
% CARBON DIOXIDE	1.80	1.27	1.20
% CARBON MONOXIDE	0.00	0.00	0.00
% NITROGEN	81.40	81.13	81.47
G10. PERCENT EXCESS AIR AT TEST LOCATION			
DENSITY AND MOLECULAR WEIGHT OF STACK GAS:			
G11. DRY, @ STP, lbs./cu.ft.	0.0749	0.0747	0.0747
G12. WET, @ STP, lbs./cu.ft.	0.0655	0.0652	0.0649
G13. WET, @ STACK CONDITIONS, lbs./cu.ft.	0.0524	0.0524	0.0521
G14. MOLECULAR WEIGHT, DRY, @ STP, lbs./mole	28.97	28.92	28.89
G15. AVERAGE GAS VELOCITY, feet/min.	2530	2670	2588
STACK GAS FLOW RATE:			
G16. STACK CONDITIONS, ACFM	60,105	63,439	61,475
G17. STANDARD CONDITIONS, SCFM	48,120	50,943	49,359
G18. STANDARD CONDITIONS, DRY SCFM	32,147	33,763	32,189

STANDARD TEMPERATURE AND PRESSURE (STP) - 29.92 inches HG, 70 deg. F

Network Environmental, Inc.

SUMMARY OF PARTICULATE TRAIN PARAMETERS

COMPANY NAME: MONITOR SUGAR COMPANY
 COMPANY LOCATION: BAY CITY, MICHIGAN
 SOURCE NAME: PULP DRYER #3 SOUTH
 SAMPLING STAFF: ENGELHARDT/SMITH

TEST DATE: 10/12/92

SAMPLE NUMBER	1	2	3
P1. NUMBER OF POINTS SAMPLED	12	12	12
P2. DURATION OF SAMPLE, minutes	60.00	60.00	60.00
P3. NOZZLE DIAMETER, inches	0.322	0.322	0.322
P4. NOZZLE AREA, sq. ft.	0.00057	0.00057	0.00057
P5. PITOT CALIBRATION FACTOR	0.830	0.830	0.830
P6. METER CALIBRATION FACTOR	0.998	0.998	0.998
P7. AVERAGE FILTER TEMPERATURE, deg. F	0	0	0
P8. AVERAGE METER TEMPERATURE, deg. F	69.8	71.0	72.5
P9. AVERAGE METER PRESSURE, inches of water	1.903	2.583	2.408
P10. METER VOLUME, ACTUAL READING, cu.ft.	44.95	51.94	50.44
P11. METER VOLUME, @ STP, cu.ft.	43.31	50.03	48.43
P12. LIQUID VOLUME OF WATER CONDENSED, mls.	454.0	537.0	545.0
P13. VAPOR VOLUME OF WATER CONDENSED, @ STP, cu.ft.	21.52	25.45	25.83
P14. TOTAL GAS SAMPLED, @ STP, cu.ft.	64.83	75.48	74.26
P15. WEIGHT OF GAS SAMPLED, DRY, lbs.	3.24	3.74	3.62
P16. WEIGHT OF GAS SAMPLED, WET, lbs.	4.24	4.92	4.82
P17. PERCENT ISOKINETICS	94.3	103.7	105.3

CONCENTRATION CONVERSION FACTORS:

P18. 50 % EXCESS AIR, AFTER COLLECTOR			
P19. 50 % EXCESS AIR, BEFORE COLLECTOR			
P20. MOISTURE CONDITIONS BEFORE COLLECTOR	1.00	1.00	1.00

STANDARD TEMPERATURE AND PRESSURE (STP) = 29.92 inches HG, 70 deg. F

DISCUSSION OF RESULTS

The resulting combined exhaust particulate emission concentrations for the three samples were 0.052 Lbs/1000 Lbs for sample one, 0.051 Lbs/1000 Lbs for sample two, and 0.050 Lbs/1000 Lbs for sample three. The average exhaust particulate concentration was 0.051 Lbs/1000 Lbs.

The combined particulate mass emission rates were 20.63 Lbs/Hr for sample one, 20.67 Lbs/Hr for sample two, and 20.72 Lbs/Hr for sample three. The average mass emission rate was 20.68 Lbs/Hr.

SOURCE DESCRIPTION

The source tested was the number three beet pulp dryer. The rotary dryer is fired by natural gas and dries the pulp with direct contact. The pulp is fed into the dryer at the beginning of the rotary section. The pulp is passed through the rotary dryer where most of the moisture is removed. The particulate laden exhaust is then passed through a multiclone collector and then a scrubber for particulate removal before it is exhausted to the atmosphere through the twin exhaust stacks. Each exhaust stack is equipped with a scrubber.

Process operating information for the day of the sampling can be found in Appendix C.

SAMPLING AND ANALYTICAL PROTOCOL

The sampling locations were on the twin 66 inch I.D. exhaust stacks at a distance that meets the eight duct diameter downstream two duct diameter upstream requirement of U.S. EPA Reference Method 1.

Particulate

The particulate sampling and analysis were performed in accordance with MDNR Reference Method 5B, and the methods referenced therein. Three (3) samples, each sixty (60) minutes in duration, were collected simultaneously from the north and south exhausts. All the quality control and quality assurance requirements specified in the methods were incorporated in the sampling and analysis. No alterations were incorporated in the testing or analysis. Figure 1 shows a schematic of the particulate sampling train.

3
TACXS TEST #1 11:05A.M - 12:10P.M.
TEST #2 12:35-P.M - 1:40P.M.
TEST #3 2:00P.M - 3:30

MONITOR SUGAR COMPANY

Operating Log
Pulp Drivers Station

29,5230

Day Ending: 10-12-92
Campaing Day: 19

Time	Inlet Temp.			Outlet Temp.			Moist. Plain			Moist. Pellets	Collectors Press. Drop				Belt Scale Wet Pulp Ton/Hr.	Feed Conv. R.P.M.			Loading Scrolls		
	#1	#2	#3	#1	#2	#3	#1	#2	#3		#1	#2	#3	#4		#1	#2	#3	#1	#2	#3
7	780	950	820	168	145	125	10.1	10.1	10.1	9.9	4	4	4	4	68	235	220	100	60	41	50
8	720	970	870	168	145	125	10.6	13.6	12.4	10.2	4	4	4	4	70	235	220	100	58	41	52
9	710	940	810	168	145	125	15.0	12.6	11.0	10.1	4	4	4	4	67	210	195	100	58	42	52
10	820	940	830	168	145	125	14.1	13.5	14.3	10.3	4	4	4	4	72	235	210	100	58	41	52
11	700	940	830	168	145	125	10.6	13.6	11.8	10.3	4	4	4	4	79	235	212	100	60	41	50
12	660	930	820	168	145	125	11.0	12.8	11.0	10.1	4	4	4	4	17	235	210	100	60	41	50
1	680	920	810	168	145	125	11.0	10.6	10.8	10.1	4	4	4	4	63	235	210	100	60	41	50
2	620	920	880	168	145	125	9.2	13.6	11.8	9.9	4	4	4	4	63	235	210	100	58	41	58
3	600	900	800	170	145	125	9.6	11.3	11.3	10.6	4	4	4	4	63	235	210	100	56	40	58
4	680	900	820	170	145	125	11.1	12.8	12.1	10.0	4	4	4	4	65	235	210	100	58	42	50
5	700	900	840	170	145	125	10.2	12.8	11.6	10.2	4	4	4	4	79	235	210	100	58	42	52
6	700	880	840	170	145	125	9.3	13.7	12.8	9.8	4	4	4	4	79	235	210	100	60	42	52
7	700	900	840	170	145	125	10.2	11.1	9.6	10.3	4	4	4	4	64	235	210	100	58	40	52
8	700	900	840	170	145	125	8.7	9.8	7.2	10.6	4	4	4	4	50	235	210	100	58	41	54
9	700	900	840	170	145	125	9.6	10.0	10.2	9.8	4	4	4	4	51	235	210	100	58	42	48
10	680	920	820	170	145	125	7.0	9.6	9.8	10.5	4	4	4	4	63	235	210	100	58	42	52
11	720	920	860	170	145	125	8.5	11.0	10.5	9.2	4	4	4	4	64	235	210	98	58	42	50
12	620	920	880	165	145	125	11.1	9.6	8.9	8.9	4	4	4	4	60	235	210	98	56	40	52
1	900	880	880	145	145	125	8.2	9.5	9.5	9.2	4	4	4	4	51	210	198	98	40	40	52
2	620	920	860	165	145	125	8.0	11.0	9.5	9.5	4	4	4	4	40	240	170	80	50	40	58
3	600	980	920	165	145	125	10.5	11.6	10.3	9.5	4	4	4	4	62	240	210	98	48	40	58
4	340	540	540	165	145	125	8.0	11.1	10.3	9.2	4	4	4	4	72	240	180	98	48	40	57
5	1000	800	800	145	145	125	10.5	12.1	12.1	9.5	4	4	4	4	46	200	200	98	42	42	56
6	260	1020	880	165	145	125	13.0	12.8	13.0	9.2	4	4	4	4	49	240	200	98	60	42	50

Filename: BEET6.WQ1

Date: 07-Dec-94

Facility: Monitor Sugar Company

Location: Bay City, Michigan

Source: Pulp dryer 3

Natural gas-fired rotary drum beet pulp dryer controlled with a multiclone and wet scrubber in series (two parallel stacks following controls)

Test date: Oct. 12, 1992

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	168	165	164	
NORTH STACK	Pressure	in. HG	28.75	28.75	28.75	
	Moisture	%	37.29	33.04	33.9	
	Oxygen	%	16	16.4	16.2	
	Volumetric flow, actual	acfm	66117	63616	69994	
	Volumetric flow, standard*	dscfm	33623	34710	37760	
	Isokinetic variation	%	90.3	93.3	93.8	
Circle: Production or feed rate		TPH	77.15	64.54	67.00	
Capacity:						
Pollutant concentrations:						
	Filterable PM	G/dscf	0.037	0.034	0.034	
	CO2	% vol	2.93	2.73	2.13	
Pollutant mass flux rates:						
	Filterable PM	lb/hr	10.66	10.12	11.00	
	CO2	lb/hr	6750	6493	5511	
Emission factors (ENGLISH UNITS):						AVERAGE
	Filterable PM	lb/ton	0.138	0.157	0.164	0.153
	CO2	lb/ton	87.5	101	82.3	90.1
Emission factors (METRIC UNITS):						AVERAGE
	Filterable PM	kg/Mg	0.0691	0.0784	0.0821	0.0765
	CO2	kg/Mg	43.7	50.3	41.1	45.1

*DSCFM BASED ON A STANDARD TEMPERATURE OF 70 DEGREES FAHRENHEIT

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
2	Stack temperature	Deg F	176	174	174	
SOUTH STACK	Pressure	in. HG	28.75	28.75	28.75	
	Moisture	%	33.19	33.72	34.79	
	Oxygen	%	16.8	17.6	17.33	
	Volumetric flow, actual	acfm	60105	63439	61475	
	Volumetric flow, standard*	dscfm	32155	33775	32201	
	Isokinetic variation	%	94.3	103.7	105.3	
Circle: Production or feed rate		TPH	77.15	64.54	67.00	
Capacity:						
Pollutant concentrations:						
	Filterable PM	G/dscf	0.036	0.036	0.035	
	CO2	% vol	1.8	1.27	1.2	
Pollutant mass flux rates:						
	Filterable PM	lb/hr	9.92	10.42	9.66	
	CO2	lb/hr	3966	2939	2648	
Emission factors (ENGLISH UNITS):						AVERAGE
	Filterable PM	lb/ton	0.129	0.161	0.144	0.145
	CO2	lb/ton	51.4	46	39.5	45.5
Emission factors (METRIC UNITS):						AVERAGE
	Filterable PM	kg/Mg	0.0643	0.0807	0.0721	0.0724
	CO2	kg/Mg	25.7	22.8	19.8	22.7

*DSCFM BASED ON A STANDARD TEMPERATURE OF 70 DEGREES FAHRENHEIT

TOTAL EMISSION FACTORS FOR BOTH STACKS	Emission factors (ENGLISH UNITS):					AVERAGE
	Filterable PM	lb/ton	0.267	0.318	0.308	0.298
	CO2	lb/ton	139	146	122	136
	Emission factors (METRIC UNITS):					AVERAGE
	Filterable PM	kg/Mg	0.133	0.159	0.154	0.149
	CO2	kg/Mg	69.4	73.1	60.9	67.8

APPENDIX G

REPORT EXCERPTS FROM REFERENCE 7

(Monitor Bay Sugar Company, October 13, 1992)

Report of...

Particulate Emission Testing

performed for...



Monitor Sugar Company
Bay City, Michigan

on the

Pulp Dryer 2 Exhaust

October 13, 1992

022.06

Network Environmental, Inc.
Grand Rapids, MI

Network Environmental, Inc.

SUMMARY OF PARTICULATE EMISSIONS

COMPANY NAME: MONITOR SUGAR COMPANY
COMPANY LOCATION: BAY CITY, MICHIGAN
SOURCE NAME: PULP DRYER #2
SAMPLING STAFF: CARGILL/SMITH

TEST DATE: 10/13/92

SAMPLE NUMBER	1	2	3
STANDARD ANALYSIS			
E1. TOTAL WEIGHT COLLECTED, grams	0.125	0.125	0.126
E2. LBS. PARTICULATE/1000 LBS. GAS, ACTUAL(1)	0.061	0.063	0.060
E3. LBS. PARTICULATE/1000 LBS. GAS, DRY(2)	0.061	0.063	0.060
E6. GRAINS/DSCF(4)	0.044	0.047	0.045
E7. LBS./HOUR	12.68	13.34	13.24

1. 'ACTUAL' MEANS AT THE CONDITIONS FOUND AT THE SAMPLING LOCATION.
2. 'DRY' INCLUDES ONLY THE NATURAL MOISTURE THAT WOULD BE EMITTED FROM THE PROCESS. MOISTURE ADDED OR SUBTRACTED BY THE COLLECTOR IS NOT INCLUDED.
3. 'WET' INCLUDES THE MOISTURE AS MEASURED AT THE SAMPLING LOCATION.
4. 'DSCF' IS UNDER TOTALLY DRY CONDITIONS, ALL MOISTURE REMOVED.

Network Environmental, Inc.

SUMMARY OF EXHAUST GAS PARAMETERS

COMPANY NAME: MONITOR SUGAR COMPANY
 COMPANY LOCATION: BAY CITY, MICHIGAN
 SOURCE NAME: PULP DRYER #2
 SAMPLING STAFF: CARGILL/SMITH

TEST DATE: 10/13/92

SAMPLE NUMBER	1	2	3
G1. STACK RADIUS, inches	33.0	33.0	33.0
G2. AREA OF STACK, sq. ft.	23.76	23.76	23.76
G3. BAROMETRIC PRESSURE, in. HG.	28.80	28.80	28.80
G4. STATIC PRESSURE IN STACK, in. H2O	0.98-	0.98-	0.98-
G5. STACK GAS TEMPERATURE, deg. F	171	180	182
G6. AVG. SQRT VELOCITY PRESSURE OF POINTS SAMPLED	0.685	0.698	0.726
G7. PERCENT MOISTURE AT TEST LOCATION	38.54	39.55	39.63
G8. PERCENT MOISTURE BEFORE COLLECTOR	38.54	39.55	39.63
G9. DRY GAS COMPOSITION: % OXYGEN,	16.40	16.60	16.00
% CARBON DIOXIDE	2.20	2.47	2.93
% CARBON MONOXIDE	0.00	0.00	0.00
% NITROGEN	81.40	80.93	81.07
G10. PERCENT EXCESS AIR AT TEST LOCATION			
DENSITY AND MOLECULAR WEIGHT OF STACK GAS:			
G11. DRY, @ STP, lbs./cu.ft.	0.0750	0.0751	0.0753
G12. WET, @ STP, lbs./cu.ft.	0.0640	0.0638	0.0639
G13. WET, @ STACK CONDITIONS, lbs./cu.ft.	0.0516	0.0507	0.0506
G14. MOLECULAR WEIGHT, DRY, @ STP, lbs./mole	29.02	29.07	29.12
G15. AVERAGE GAS VELOCITY, feet/min.	2842	2922	3040
STACK GAS FLOW RATE:			
G16. STACK CONDITIONS, ACFM	67,529	69,415	72,232
G17. STANDARD CONDITIONS, SCFM	54,467	55,208	57,255
G18. STANDARD CONDITIONS, DRY SCFM	33,475	33,376	34,565

STANDARD TEMPERATURE AND PRESSURE (STP) - 29.92 inches HG, 70 deg. F

Network Environmental, Inc.

SUMMARY OF PARTICULATE TRAIN PARAMETERS

COMPANY NAME: MONITOR SUGAR COMPANY
 COMPANY LOCATION: BAY CITY, MICHIGAN
 SOURCE NAME: PULP DRYER #2
 SAMPLING STAFF: CARGILL/SMITH

TEST DATE: 10/13/92

SAMPLE NUMBER	1	2	3
P1. NUMBER OF POINTS SAMPLED	12	12	12
P2. DURATION OF SAMPLE, minutes	60.00	60.00	60.00
P3. NOZZLE DIAMETER, inches	0.313	0.313	0.313
P4. NOZZLE AREA, sq. ft.	0.00053	0.00053	0.00053
P5. PITOT CALIBRATION FACTOR	0.860	0.860	0.860
P6. METER CALIBRATION FACTOR	0.998	0.998	0.998
P7. AVERAGE FILTER TEMPERATURE, deg. F	0	0	0
P8. AVERAGE METER TEMPERATURE, deg. F	69.7	70.6	71.1
P9. AVERAGE METER PRESSURE, inches of water	1.963	1.871	2.001
P10. METER VOLUME, ACTUAL READING, cu.ft.	45.09	42.78	44.98
P11. METER VOLUME, @ STP, cu.ft.	43.54	41.23	43.32
P12. LIQUID VOLUME OF WATER CONDENSED, mls.	576.0	569.0	600.0
P13. VAPOR VOLUME OF WATER CONDENSED, @ STP, cu.ft.	27.30	26.97	28.44
P14. TOTAL GAS SAMPLED, @ STP, cu.ft.	70.84	68.20	71.76
P15. WEIGHT OF GAS SAMPLED, DRY, lbs.	3.27	3.10	3.26
P16. WEIGHT OF GAS SAMPLED, WET, lbs.	4.53	4.35	4.58
P17. PERCENT ISOKINETICS	96.7	91.8	93.2

CONCENTRATION CONVERSION FACTORS:

P18. 50 % EXCESS AIR, AFTER COLLECTOR			
P19. 50 % EXCESS AIR, BEFORE COLLECTOR			
P20. MOISTURE CONDITIONS BEFORE COLLECTOR	1.00	1.00	1.00

STANDARD TEMPERATURE AND PRESSURE (STP) - 29.92 inches HG, 70 deg. F

DISCUSSION OF RESULTS

The particulate emission concentrations for the three samples were 0.061 Lbs/1000 Lbs for sample one, 0.063 Lbs/1000 Lbs for sample two, and 0.060 Lbs/1000 Lbs for sample three. The average exhaust particulate concentration was 0.0614 Lbs/1000 Lbs.

The particulate mass emission rates were 12.68 Lbs/Hr for sample one, 13.34 Lbs/Hr for sample two, and 13.24 Lbs/Hr for sample three. The average mass emission rate was 13.09 Lbs/Hr.

SOURCE DESCRIPTION

The source tested was the number two beet pulp dryer. The rotary dryer is fired by natural gas and dries the pulp with direct contact. The pulp is fed into the dryer at the beginning of the rotary section. The pulp is passed through the rotary dryer where most of the moisture is removed. The particulate laden exhaust is then passed through a multiclone collector and then a scrubber for particulate removal before it is exhausted to the atmosphere.

Process operating information for the day of the sampling can be found in Appendix A.

SAMPLING AND ANALYTICAL PROTOCOL

The sampling location was on the 66 inch I.D. exhaust stack at a distance that meets the eight duct diameter downstream two duct diameter upstream requirement of U.S. EPA Reference Method 1.

Particulate

The particulate sampling and analysis were performed in accordance with MDNR Reference Method 5B, and the methods referenced therein. Three (3) samples, each sixty (60) minutes in duration, were collected from the exhaust stack. All the quality control and quality assurance requirements specified in the methods were incorporated in the sampling and analysis. No alterations were incorporated in the testing or analysis. Figure 1 shows a schematic of the particulate sampling train:

11.25 - 12.35

12.51 - 13.55

14.07 - 15.09

MONITOR SUGAR COMPANY

Operating Log

Pulp Drivers Station

Day Ending:

Campaign Day:

10-13-92

Time	Inlet Temp.			Outlet Temp.			Moist. Plain			Moist. Pellets	Collectors Press. Drop				Belt Scale Net Pulp Ton/Hr.	Feed Conv. R.P.M.			Loading Scrolls		
	#1	#2	#3	#1	#2	#3	#1	#2	#3		#1	#2	#3	#4		#1	#2	#3	#1	#2	#3
7	720	860	920	170	145	125	9.5	9.4	10.1	10.3	4	4	4	4	80	140	145	145	60	41	53
8	780	920	920	170	145	125	9.5	11.0	8.6	10.1	4	4	4	4	63	140	145	145	60	41	53
9	460	1040	820	170	145	125	15.0	10.8	10.8	10.1	4	4	4	4	70	140	145	145	60	41	53
10	—	620	1100	—	145	125	12.6	11.3	7.8	9.9	4	4	4	4	40	140	145	145	60	41	53
11	880	1000	880	170	145	125	11.8	12.3	8.6	10.3	4	4	4	4	55	140	145	145	60	41	53
12	820	920	860	170	145	125	11.8	12.3	8.6	10.3	4	4	4	4	85	140	145	145	60	41	53
1	800	910	180	170	145	125	12.2	11.3	10.6	9.9	4	4	4	4	85	140	145	145	60	41	53
2	260	930	900	170	145	125	12.0	13.2	13.5	10.0	4	4	4	4	97	140	145	145	60	41	53
3	580	920	900	170	145	125	10.5	10.6	11.0	10.8	4	4	4	3	70	140	145	145	60	41	53
4	680	900	800	170	145	125	10.8	11.0	9.6	9.5	4	4	4	3	61	140	145	145	60	41	53
5	780	800	800	170	145	125	10.2	11.8	10.0	9.2	4	4	4	3	69	140	145	145	60	41	53
6	700	880	820	170	145	125	9.8	12.4	10.2	9.2	4	4	4	3	67	140	145	145	60	41	53
7	720	940	840	170	145	125	8.5	10.8	11.8	9.5	4	4	4	3	71	140	145	145	60	41	53
8	700	920	880	170	145	125	7.6	10.3	8.2	9.7	4	4	4	3	73	140	145	145	60	41	53
9	720	900	840	170	145	125	11.0	11.4	10.8	9.2	4	4	4	3	67	140	145	145	60	41	53
10	800	940	900	170	145	125	8.9	11.0	11.3	9.9	4	4	4	3	53	140	145	145	60	41	53
11	780	920	860	170	145	125	10.0	9.8	9.6	10.1	4	4	4	3.5	71	140	145	145	60	41	53
12	720	940	880	170	145	125	10.6	12.2	9.8	9.9	4	4	4	3.5	65	140	145	145	60	41	53
1	780	900	880	170	145	125	11.9	11.6	11.3	10.2	4	4	4	3.5	81	140	145	145	60	41	53
2	800	920	880	170	145	125	11.3	9.8	10.6	10.1	4	4	4	3.5	76	140	145	145	60	41	53
3	820	920	880	170	145	125	10.3	10.1	9.9	9.5	4	4	4	3.5	79	140	145	145	60	41	53
4	820	960	860	170	145	125	10.2	9.8	11.0	9.5	4	4	4	3.5	83	140	145	145	60	41	53
5	820	960	860	170	145	125	9.5	10.1	8.6	9.7	4	4	4	3.5	69	140	145	145	60	41	53
6	800	960	860	170	145	125	10.0	11.1	9.8	10.3	4	4	4	3.5	67	140	145	145	60	41	53

Filename: BEET7.WQ1

Date: 07-Dec-94

Facility: Monitor Sugar Company

Location: Bay City, Michigan

Source: Pulp dryer 2

Natural gas-fired rotary drum beet pulp dryer controlled with a multiclone and wet scrubber in series

Test date: Oct. 13, 1992

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	171	180	182	
	Pressure	in. HG	28.80	28.80	28.80	
	Moisture	%	38.54	39.55	39.63	
	Oxygen	%	16.4	16.6	16	
	Volumetric flow, actual	acfm	67529	69415	72232	
	Volumetric flow, standard*	dscfm	33555	33448	34652	
	Isokinetic variation	%	96.7	91.8	93.2	
Circle: Production or <u>feed</u> rate Capacity:		TPH	70.00	85.00	85.39	
Pollutant concentrations:						
	Filterable PM	G/dscf	0.044	0.047	0.045	
	CO2	% vol	2.2	2.47	2.93	
Pollutant mass flux rates:						
	Filterable PM	lb/hr	12.68	13.36	13.25	
	CO2	lb/hr	5058	5661	6957	
Emission factors (ENGLISH UNITS):						AVERAGE
	Filterable PM	lb/ton	0.181	0.157	0.155	0.16
	CO2	lb/ton	72.3	67	81.5	73.1
Emission factors (METRIC UNITS):						AVERAGE
	Filterable PM	kg/Mg	0.0906	0.0786	0.0776	0.082
	CO2	kg/Mg	36.1	33.3	40.7	36.7

*DSCFM BASED ON A STANDARD TEMPERATURE OF 70 DEGREES FAHRENHEIT

APPENDIX H

REPORT EXCERPTS FROM REFERENCE 8

(Monitor Bay Sugar Company, October 14, 1992)

Report of...

Particulate Emission Testing

performed for...



Monitor Sugar Company
Bay City, Michigan

on the

Pulp Dryer 1 Exhaust

October 14, 1992

022.06

Network Environmental, Inc.
Grand Rapids, MI

Network Environmental, Inc.

SUMMARY OF PARTICULATE EMISSIONS

COMPANY NAME: MONITOR SUGAR COMPANY
COMPANY LOCATION: BAY CITY, MICHIGAN
SOURCE NAME: PULP DRYER #1
SAMPLING STAFF: CARGILL/SMITH

TEST DATE: 10/14/92

SAMPLE NUMBER	1	2	3
STANDARD ANALYSIS			
E1. TOTAL WEIGHT COLLECTED, grams	0.135	0.129	0.124
E2. LBS. PARTICULATE/1000 LBS. GAS, ACTUAL(1)	0.064	0.063	0.058
E3. LBS. PARTICULATE/1000 LBS. GAS, DRY(2)	0.064	0.063	0.058
E6. GRAINS/DSCF(4)	0.046	0.044	0.043
E7. LBS./HOUR	13.98	13.97	12.59

1. 'ACTUAL' MEANS AT THE CONDITIONS FOUND AT THE SAMPLING LOCATION.
2. 'DRY' INCLUDES ONLY THE NATURAL MOISTURE THAT WOULD BE EMITTED FROM THE PROCESS. MOISTURE ADDED OR SUBTRACTED BY THE COLLECTOR IS NOT INCLUDED.
3. 'WET' INCLUDES THE MOISTURE AS MEASURED AT THE SAMPLING LOCATION.
4. 'DSCF' IS UNDER TOTALLY DRY CONDITIONS, ALL MOISTURE REMOVED.

Network Environmental, Inc.

SUMMARY OF EXHAUST GAS PARAMETERS

COMPANY NAME: MONITOR SUGAR COMPANY
 COMPANY LOCATION: BAY CITY, MICHIGAN
 SOURCE NAME: PULP DRYER #1
 SAMPLING STAFF: CARGILL/SMITH

TEST DATE: 10/14/92

SAMPLE NUMBER	1	2	3
G1. STACK RADIUS, inches	33.0	33.0	33.0
G2. AREA OF STACK, sq. ft.	23.76	23.76	23.76
G3. BAROMETRIC PRESSURE, in. HG.	28.86	28.86	28.86
G4. STATIC PRESSURE IN STACK, in. H ₂ O	1.05-	1.05-	1.05-
G5. STACK GAS TEMPERATURE, deg. F	178	177	178
G6. AVG. SQRT VELOCITY PRESSURE OF POINTS SAMPLED	0.711	0.718	0.715
G7. PERCENT MOISTURE AT TEST LOCATION	37.08	34.48	39.92
G8. PERCENT MOISTURE BEFORE COLLECTOR	37.08	34.48	39.92
G9. DRY GAS COMPOSITION: % OXYGEN	15.33	16.07	15.93
% CARBON DIOXIDE	3.60	2.93	3.00
% CARBON MONOXIDE	0.00	0.00	0.00
% NITROGEN	81.07	81.00	81.07
G10. PERCENT EXCESS AIR AT TEST LOCATION			
DENSITY AND MOLECULAR WEIGHT OF STACK GAS:			
G11. DRY, @ STP, lbs./cu.ft.	0.0755	0.0753	0.0753
G12. WET, @ STP, lbs./cu.ft.	0.0647	0.0653	0.0638
G13. WET, @ STACK CONDITIONS, lbs./cu.ft.	0.0517	0.0523	0.0510
G14. MOLECULAR WEIGHT, DRY, @ STP, lbs./mole	29.20	29.12	29.13
G15. AVERAGE GAS VELOCITY, feet/min.	2947	2962	2985
STACK GAS FLOW RATE:			
G16. STACK CONDITIONS, ACFM	70,027	70,367	70,925
G17. STANDARD CONDITIONS, SCFM	55,969	56,285	56,680
G18. STANDARD CONDITIONS, DRY SCFM	35,214	36,876	34,051

STANDARD TEMPERATURE AND PRESSURE (STP) = 29.92 inches Hg, 70 deg. F

Network Environmental, Inc.

SUMMARY OF PARTICULATE TRAIN PARAMETERS

COMPANY NAME: MONITOR SUGAR COMPANY
 COMPANY LOCATION: BAY CITY, MICHIGAN
 SOURCE NAME: PULP DRYER #1
 SAMPLING STAFF: CARGILL/SMITH

TEST DATE: 10/14/92

SAMPLE NUMBER	1	2	3
P1. NUMBER OF POINTS SAMPLED	12	12	12
P2. DURATION OF SAMPLE, minutes	60.00	60.00	60.00
P3. NOZZLE DIAMETER, inches	0.313	0.313	0.313
P4. NOZZLE AREA, sq. ft.	0.00053	0.00053	0.00053
P5. PITOT CALIBRATION FACTOR	0.860	0.860	0.860
P6. METER CALIBRATION FACTOR	0.998	0.998	0.998
P7. AVERAGE FILTER TEMPERATURE, deg. F	0	0	0
P8. AVERAGE METER TEMPERATURE, deg. F	84.7	81.9	90.2
P9. AVERAGE METER PRESSURE, inches of water	2.083	2.097	2.079
P10. METER VOLUME, ACTUAL READING, cu.ft.	47.59	47.50	47.53
P11. METER VOLUME, @ STP, cu.ft.	44.79	44.94	44.29
P12. LIQUID VOLUME OF WATER CONDENSED, mls.	557.0	499.0	621.0
P13. VAPOR VOLUME OF WATER CONDENSED, @ STP, cu.ft.	26.40	23.65	29.44
P14. TOTAL GAS SAMPLED, @ STP, cu.ft.	71.20	68.59	73.73
P15. WEIGHT OF GAS SAMPLED, DRY, lbs.	3.38	3.38	3.33
P16. WEIGHT OF GAS SAMPLED, WET, lbs.	4.61	4.48	4.70
P17. PERCENT ISOKINETICS	94.6	90.6	96.7

CONCENTRATION CONVERSION FACTORS:

P18. 50 % EXCESS AIR, AFTER COLLECTOR			
P19. 50 % EXCESS AIR, BEFORE COLLECTOR			
P20. MOISTURE CONDITIONS BEFORE COLLECTOR	1.00	1.00	1.00

STANDARD TEMPERATURE AND PRESSURE (STP) = 29.92 inches HG, 70 deg. F

DISCUSSION OF RESULTS

The particulate emission concentrations for the three samples were 0.064 Lbs/1000 Lbs for sample one, 0.063 Lbs/1000 Lbs for sample two, and 0.058 Lbs/1000 Lbs for sample three. The average exhaust particulate concentration was 0.0619 Lbs/1000 Lbs.

The particulate mass emission rates were 13.98 Lbs/Hr for sample one, 13.97 Lbs/Hr for sample two, and 12.59 Lbs/Hr for sample three. The average mass emission rate was 13.51 Lbs/Hr.

SOURCE DESCRIPTION

The source tested was the number one beet pulp dryer. The rotary dryer is fired by natural gas and dries the pulp with direct contact. The pulp is fed into the dryer at the beginning of the rotary section. The pulp is passed through the rotary dryer where most of the moisture is removed. The particulate laden exhaust is then passed through a multiclone collector and then a scrubber for particulate removal before it is exhausted to the atmosphere.

Process operating information for the day of the sampling can be found in Appendix A.

SAMPLING AND ANALYTICAL PROTOCOL

The sampling location was on the 66 inch I.D. exhaust stack at a distance that meets the eight duct diameter downstream two duct diameter upstream requirement of U.S. EPA Reference Method 1.

Particulate

The particulate sampling and analysis were performed in accordance with MDNR Reference Method 5B, and the methods referenced therein. Three (3) samples, each sixty (60) minutes in duration, were collected from the exhaust stack. All the quality control and quality assurance requirements specified in the methods were incorporated in the sampling and analysis. No alterations were incorporated in the testing or analysis. Figure 1 shows a schematic of the particulate sampling train.

MONITOR SUGAR COMPANY

Operating Log
Pulp Driers Station

Day Ending:
Campaign Day:

10-14-92

Time	Inlet Temp.			Outlet Temp.			Moist. Plain			Moist. Pellets	Collectors Press. Drop				Belt Scale Wet Pulp Ton/Hr.	Feed Conv. R.P.M.			Loading Scrolls		
	#1	#2	#3	#1	#2	#3	#1	#2	#3		#1	#2	#3	#4		#1	#2	#3	#1	#2	#3
7	850	900	830	170	145	125	13.2	10.1	10.6	10.6	7	4	4	4	69	240	180	100	61	41	52
8	320	1040	850	120	145	125	10.3	9.6	9.7	10.4	4	4	4	4	87	240	210	100	60	41	52
9	870	1010	830	150	145	125	14.0	11.6	10.1	10.4	4	4	4	4	74	240	210	100	60	41	50
10	860	960	860	170	145	125	12.8	12.4	13.1	10.1	4	4	4	4	95	240	205	100	60	41	55
11	970	1040	880	120	145	125	12.4	11.0	12.6	9.9	4	4	4	4	90	240	195	100	60	41	45
12	860	1020	880	170	145	125	13.1	11.8	13.5	10.1	4	4	4	4	90	240	175	100	60	41	50
1	680	1000	860	120	145	125	10.1	10.1	11.8	10.3	4	4	4	4	85	240	195	100	58	41	50
2	830	1020	800	150	145	125	15.5	11.0	11.8	10.1	4	4	4	4	62	240	195	100	60	41	55
3	600	900	880	170	145	125	7.2	10.0	11.4	10.5	4	4	3	4	57	240	200	100	60	40	50
4	720	920	880	170	145	125	11.6	12.1	13.1	9.5	4	4	3	4	71	240	200	100	60	40	50
5	740	980	880	170	145	125	13.7	11.0	11.0	8.9	4	4	3	4	64	240	220	100	60	44	52
6	780	940	880	175	145	125	9.3	9.3	11.0	9.7	4	4	3	4	79	240	220	100	60	44	50
7	820	1000	840	175	145	125	10.0	10.2	9.5	9.5	4	4	3	4	75	240	220	100	60	44	50
8	760	940	880	175	145	125	8.5	11.4	11.0	9.2	4	4	3	4	78	240	220	100	60	44	50
9	740	980	800	175	145	125	8.7	9.3	10.8	9.2	4	4	3	4	82	240	220	100	60	44	50
10	760	940	840	175	145	125	8.7	9.5	11.0	9.9	4	4	3	4	71	240	220	100	60	44	50
11	600	940	820	165	145	125	8.7	9.1	11.0	10.1	4	4	4	4	75	240	220	100	60	44	50
12	560	820	900	165	145	125	10.2	11.1	12.1	10.3	4	4	4	4	62	240	220	100	60	44	52
1	700	820	840	165	145	125	10.0	10.3	11.0	9.9	4	4	4	4	52	240	220	100	60	44	52
2	800	940	820	165	145	125	8.9	10.8	10.3	9.8	4	4	4	4	77	240	200	100	60	42	50
3	780	920	800	165	145	125	9.2	10.8	9.8	10.0	4	4	4	4	76	240	200	100	60	42	52
4	780	920	840	165	145	125	10.1	11.0	9.6	10.1	4	4	4	4	88	240	200	100	60	42	52
5	740	900	820	165	145	125	9.9	11.3	10.2	9.6	4	4	4	4	85	240	200	100	60	42	52
6	760	920	840	165	145	125	10.4	11.2	10.2	9.9	4	4	4	4	75	240	200	100	60	42	52

Filename: BEET8.WQ1

Date: 07-Dec-94

Facility: Monitor Sugar Company

Location: Bay City, Michigan

Source: Pulp dryer 1

Natural gas-fired rotary drum beet pulp dryer controlled with a multiclone and wet scrubber in series

Test date: Oct. 14, 1992

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	178	177	178	
	Pressure	in. HG	28.86	28.86	28.86	
	Moisture	%	37.08	34.48	39.92	
	Oxygen	%	15.33	16.07	15.93	
	Volumetric flow, actual	acfm	70027	70367	70925	
	Volumetric flow, standard*	dscfm	35306	37001	34144	
	Isokinetic variation	%	94.6	90.6	96.7	
Circle: Production or feed rate		TPH	77.20	93.98	90.00	
Capacity:						
Pollutant concentrations:						
	Filterable PM	G/dscf	0.046	0.044	0.043	
	CO2	% vol	3.60	2.93	3.00	
Pollutant mass flux rates:						
	Filterable PM	lb/hr	13.92	13.95	12.58	
	CO2	lb/hr	8709	7428	7019	
Emission factors (ENGLISH UNITS):						AVERAGE
	Filterable PM	lb/ton	0.180	0.148	0.140	0.15
	CO2	lb/ton	113	79.0	78.0	89.5
Emission factors (METRIC UNITS):						AVERAGE
	Filterable PM	kg/Mg	0.0902	0.0742	0.0699	0.078
	CO2	kg/Mg	56.4	39.5	39.0	45.0

*DSCFM BASED ON A STANDARD TEMPERATURE OF 70 DEGREES FAHRENHEIT

APPENDIX I

REPORT EXCERPTS FROM REFERENCE 9

(Western Sugar Company, December 1988)



1988-89

"EMISSIONS SURVEY CONDUCTED AT
WESTERN SUGAR COMPANY'S BILLINGS, MONTANA
PRODUCTION FACILITY"

American Environmental Testing Company Inc.

801-266-7111

TABLE I-B

(Data Summary - Pulp Dryer)

I. <u>North Dryer Method</u>		Test 1	Test 2	Test 2	Ave.
5 Particulate Emissions					
a)	Sample Volume collected (DSCF)	61.698	47.350	47.713	52.2
b)	Particulate matter collected (mg)	131.1	135.0	145.1	137.1
c)	Emission rate (lbs/hr)	5.59	7.35	7.74	6.8
	1. lbs/dscf x 10^{-6}	4.685	6.286	6.704	5.8
	2. grains/dscf	0.0328	0.0440	0.0469	0.0
II. <u>South Dryer Method</u>					
5 Particulate Emissions					
a)	Sample Volume collected (dscf)	48.783	46.022	45.157	46.6
b)	Particulate matter collected (mg)	80.0	139.5	80.2	99.9
c)	Emission rate (lbs/hr)	4.47	7.27	4.25	5.3
	1. lbs/dscf x 10^{-6}	3.615	6.683	3.915	4.7
	2. grains/dscf	0.0253	0.0468	0.0274	0.0
III. <u>Total Emissions</u>					
a)	lbs/hr.	10.06	14.63	11.99	12.2
b)	% of allowable	9.17	13.34	10.93	11.1

Table IV a).

FIELD AND LABORATORY DATA.

Plant or Job Description: Western Sugar - Billings, Montana
East Dryer - North and South Stacks
 Bank

RUN NO. Compl. #5

DATE 12-8-88

<u>SYMBOL</u>	<u>DESCRIPTION</u>	<u>UNITS</u>	N#1	S#1	N
			<u>1</u>	<u>2</u>	
V_m	volume dry gas sampled @ meter conditions	ft ³	61.145	47.330	45.
P_b	barometric pressure	"Hg abs	26.52	26.33	26.
ΔH	average pressure drop across the orifice meter	in H ₂ O	1.788	2.04	1.
T_m	average gas meter temperature	°F	57.4	42.9	40.
Y_i	meter coefficient		1.116	1.116	1.
V_w	total H ₂ O collected, impingers & silica gel	ml	539.8	398.1	385.
CO ₂		%	3.6	2.3	3.
O ₂		%	11.4	10.8	11.
N ₂ + CO		%	85.0	86.9	85.4
R_n	nozzle dia.	in.	0.492	0.492	0.4
T_s	stack temperature	°F	168.5	162.7	167.1
$\sqrt{\Delta P}$	velocity head of stack gas	in. H ₂ O	0.2253	0.2284	0.2
C_p	pilot tube coefficient		0.8955	0.8955	0.8
P_s	static pressure	in H ₂ O	+0.02	+0.02	+0.0
A_s	area stack	ft. ²	38.028	38.028	38.0
T_t	net time of test	min.	96.0	72.0	72.0
Mg _p	Total particulates	mg	131.1	80.0	135.0

Table IV b)

FIELD AND LABORATORY DATA.

Plant or Job Description: Western Sugar Company - Billings, Montana
East Bank of Pulp Dryers

RUN NO. Part. Compliance

DATE 12-9-88

<u>SYMBOL</u>	<u>DESCRIPTION</u>	<u>UNITS</u>	#2 S	#3 N	#3 S
			<u>1</u>	<u>2</u>	<u>3</u>
V_m	volume dry gas sampled @ meter conditions	ft ³	45.681	47.496	44.68
P_b	barometric pressure	"Hg abs	26.33	26.28	26.33
ΔH	average pressure drop across the orifice meter	in H ₂ O	1.755	1.931	1.75
T_m	average gas meter temperature	°F	54.5	55.0	50.0
Y_i	meter coefficient		1.116	1.116	1.11
V_w	total H ₂ O collected, impingers & silica gel	ml	428.0	422.8	413.6
CO ₂		%	2.6	3.4	2.0
O ₂		%	10.7	11.0	10.0
N ₂ + CO		%	86.7	85.6	86.6
R_n	nozzle dia.	in.	0.492	0.492	0.49
T_s	stack temperature	°F	170.2	173.1	170.8
$\sqrt{\Delta P}$	velocity head of stack gas	in. H ₂ O	0.2091	0.2203	0.20
C_p	pitot tube coefficient		0.8955	0.8955	0.89
P_s	static pressure	in H ₂ O	26.332 +0.02	26.282 +0.02	26.33 +0.02
A_s	area stack	ft. ²	38.028	38.028	38.02
T_t	net time of test	min.	72.0	72.0	72.0
M_{g_p}	Total particulates	mg	139.5	145.1	80.2

DATA SUMMARY.

Table V a)

Plant or Job Description: Western Sugar - Billings, Montana
East Dryer Bank - North and South Stack

Date 12-8-88

			N #1	S #1	N #2
<u>SYMBOL</u>	<u>DESCRIPTION</u>	<u>UNITS</u>	<u>1</u>	<u>2</u>	<u>3</u>
$V_{m \text{ std}}$	volume dry gas sampled @ standard conditions*	scf	61.698	48.783	47.350
$V_{w \text{ gas}}$	volume water vapor collected @ standard conditions*	scf	25.408	18.739	18.150
B_{wp}	proportion by volume of water vapor in gas stream dimensionless		0.2917	0.2775	0.2771
H_d	dry molecular weight	lb/lb mole	29.032	28.80	28.980
H_s	wet molecular weight	lb/lb. mole	25.814	25.803	25.937
V_s	stack gas velocity	ft/sec	16.526	16.739	15.965
Q_s	volumetric flow rate dry basis, standard conditions*	ft^3/hr	1.1933403 $\times 10^6$	1.2344225 $\times 10^6$	1.169438 $\times 10^6$
I_{so}	isokinetic variation	I	93.45	95.21	97.6
C_s	conc. particulate matter in stack gas, dry basis	lb/scf	4.6844495 $\times 10^{-6}$	3.615334 $\times 10^{-6}$	6.285513 $\times 10^{-6}$
Em_4	emission rate	lb/hr gr/dacf	5.59 0.0328	4.47 0.0253	7.35 0.0440
			Comb.		Comb.
			10.06 #/hr.		14.62 #,

DATA SUMMARY.

Table V b)

Plant or Job Description: Western Sugar Company - Billings, Montana
East Dryer Bank

Date 12-9-88

<u>SYMBOL</u>	<u>DESCRIPTION</u>	<u>UNITS</u>	S #2 <u>1</u>	N #3 <u>2</u>	S #3 <u>3</u>
$V_{m\ std}$	volume dry gas sampled @ standard conditions*	dscf	46.022	47.713	45.157
$V_{w\ gas}$	volume water vapor collected @ standard conditions*	scf	20.146	19.901	19.468
B_{vp}	proportion by volume of water vapor in gas stream dimensionless		0.3045	0.2943	0.3013
H_d	dry molecular weight	lb/lb mole	28.844	28.984	28.848
H_s	wet molecular weight	lb/lb. mole	25.542	25.751	25.580
V_s	stack gas velocity	ft/sec	15.496	16.312	15.457
Q_s	volumetric flow rate dry basis, standard conditions*	$ft^3/hr \times 10^6$	1.08792859 $\times 10^6$	1.1544942 $\times 10^6$	1.084577 $\times 10^6$
Iso	isokinetic variation	I	101.93	99.63	100.31
C_s	conc. particulate matter in stack gas, dry basis	lb/scf $\times 10^{-6}$	6.682449 $\times 10^{-6}$	6.704364551 $\times 10^{-6}$	3.915470 $\times 10^{-6}$
Em_4	emission rate	lb/hr gr/dscf	7.27 0.0468	7.74 0.0469	4.25 0.0274

American Environmental Testing Co.
565 South Birch Drive
Spanish Fork, Utah 84660
(801) 266-7111

JOB Western Sugar Co., Billing, Mont
SHEET NO. _____ OF _____
CALCULATED BY _____ DATE _____
CHECKED BY _____ DATE _____
SCALE _____

East Dayer Production Rates.

#1

12/8-88

Tons/Hr. @ = 135 Tons.

24/Hr = 3240 Tons.

#2

12/9-88

Tons/Hr. @ = 135 Tons.

24/Hr = 3240 Tons.

received from Joe Moore on 12/11-88.

J.B.

Filename: BEET9.WQ1
 Date: 07-Dec-94
 Facility: Western Sugar Company
 Location: Billings, Montana
 Source: East Pulp Dryer
 Natural gas-fired rotary drum beet pulp dryer controlled with a wet scrubber
 Test date: Dec. 8-9, 1988

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
NORTH STACK	1 Stack temperature	Deg F	168.5	167.1	173.1	
	Pressure	in. HG	26.52	26.3	26.28	
	Moisture	%	29.17	27.71	29.43	
	Oxygen	%	10.8	11.3	11	
	Volumetric flow, actual	acfm	ND	ND	ND	
	Volumetric flow, standard*	dscfm	19889	19491	19242	
	Isokinetic variation	%	93.45	97.6	99.63	
Circle: Production of feed rate		TPH	135.00	135.00	135.00	
Capacity: Feed to dryers						
Pollutant concentrations:						
	Filterable PM	G/dscf	0.0285	0.0401	0.0430	
	Condensable inorganic PM	G/dscf	0.00425	0.00391	0.00388	
	CO2	% vol	2.3	3.3	3.4	
Pollutant mass flux rates:						
	Filterable PM	lb/hr	4.87	6.70	7.10	
	Condensable inorganic PM	lb/hr	0.725	0.653	0.640	
	CO2	lb/hr	3134	4407	4483	
	Total PM	lb/hr	5.59	7.35	7.74	
Emission factors (ENGLISH UNITS):						AVERAGE
	Filterable PM	lb/ton	0.0360	0.0496	0.0526	0.0461
	Condensable inorganic PM	lb/ton	0.00537	0.00484	0.00474	0.00498
	CO2	lb/ton	23.2	32.6	33.2	29.7
Emission factors (METRIC UNITS):						AVERAGE
	Filterable PM	kg/Mg	0.0180	0.0248	0.0263	0.0230
	Condensable inorganic PM	kg/Mg	0.00269	0.00242	0.00237	0.00249
	CO2	kg/Mg	11.6	16.3	16.6	14.8

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
SOUTH STACK	2 Stack temperature	Deg F	162.7	170.2	170.8	
	Pressure	in. HG	26.33	26.33	26.22	
	Moisture	%	27.75	30.45	30.13	
	Oxygen	%	11.4	10.7	10.8	
	Volumetric flow, actual	acfm	ND	ND	ND	
	Volumetric flow, standard*	dscfm	20574	18132	18077	
	Isokinetic variation	%	95.21	101.93	100.31	
Circle: Production or feed rate		TPH	135.00	135.00	135.00	
Capacity:						
Pollutant concentrations:						
	Filterable PM	G/dscf	0.0180	0.0377	0.0175	
	Condensable inorganic PM	G/dscf	0.00727	0.00906	0.00991	
	CO2	% vol	3.6	2.6	2.6	
Pollutant mass flux rates:						
	Filterable PM	lb/hr	3.18	5.87	2.71	
	Condensable inorganic PM	lb/hr	1.28	1.41	1.54	
	CO2	lb/hr	5075	3230	3220	
	Total PM	lb/hr	4.46	7.27	4.25	
Emission factors (ENGLISH UNITS):						AVERAGE
	Filterable PM	lb/ton	0.0235	0.0435	0.0201	0.0290
	Condensable inorganic PM	lb/ton	0.00950	0.0104	0.0114	0.0104
	CO2	lb/ton	37.6	23.9	23.9	28.5
Emission factors (METRIC UNITS):						AVERAGE
	Filterable PM	kg/Mg	0.0118	0.0217	0.0100	0.0145
	Condensable inorganic PM	kg/Mg	0.00475	0.00521	0.00569	0.00522
	CO2	kg/Mg	18.8	12.0	11.9	14.2

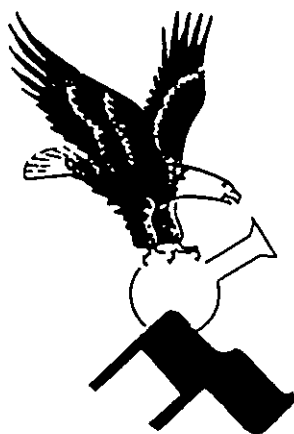
Condensable
 Condensable inorganic

TOTAL EMISSION FACTORS FOR BOTH STACKS	Emission factors (ENGLISH UNITS):					AVERAGE
	Filterable PM	lb/ton	0.0596	0.0931	0.0726	0.0751
	Condensable inorganic PM	lb/ton	0.0149	0.0153	0.0161	0.0154
	CO2	lb/ton	60.8	56.6	57.1	58.1
	Emission factors (METRIC UNITS):					AVERAGE
	Filterable PM	kg/Mg	0.0298	0.0465	0.0363	0.0375
	Condensable inorganic PM	kg/Mg	0.00744	0.00763	0.00805	0.00771
	CO2	kg/Mg	30.4	28.3	28.5	29.1

APPENDIX J

REPORT EXCERPTS FROM REFERENCE 10

(Western Sugar Company, January 1990)



1989-90

"EPA METHOD 5 PARTICULATE EMISSIONS TESTS CONDUCTED
ON WESTERN SUGAR'S BOILER AND PULP DRYER
STACKS LOCATED IN BILLINGS, MONTANA"

American Environmental Testing Company Inc.

801-266-7111

AMERICAN ENVIRONMENTAL TESTING, INCORPORATED

565 So. Birch Drive 801-266-7111

Spanish Fork, Utah 84660

FIELD AND LABORATORY DATA

TABLE IVa

Plant or Job Description : Western Sugar Company - Located In Billings, Montana

Wet Scrubber On Pulp Dryer

Type : Compliance EPA #5

Date : 1/23-24/90

<u>Symbol</u>	<u>Description</u>	<u>Units</u>	<u>1 South</u>	<u>2 North</u>	<u>3 South</u>
Vm	Volume dry gas sampled @ meter conditions	Ft3	66.554	64.264	65.52
Pb	Barometric Pres	"Hg abs	26.38	26.42	26.79
ΔH	Average Pres drop across the orifice meter	"H2O	3.8189	3.57	3.7701
Tm	Average gas meter temp	"R "F	536.71 76.71	535.38 75.38	531.58 71.58
Yi	Meter Coefficient		1.07	1.07	1.07
Vw	Total H2O collected, impingers & silica gel	ml	268	249	229.1
CO2		%	2.6	2.4	2.73
O2		%	10.8	10.93	11.2
N2 + CO		%	86.6	86.67	86.07
Rn	Nozzle Dia.	in.	0.5037	0.5037	0.503
Ts	Stack Temp	"R "F	582.58 122.58	584.54 124.54	589.42 129.42
Sqr rt ΔP	Velocity head of stack gas	"H2O	0.242	0.2413	0.2509
Cp	Pitot Tube Coefficient		0.8484	0.8484	0.8484
Ps	Static Pres	"H2O	0.03	0.03	0.03
Pabs	Absolute Pres	"Hg	26.38	26.42	26.79
As	Area stack	Ft2	33.183	33.183	33.183
Tt	Net time of test	min.	72	72	72
Mgp	Total Particulate	mg	33.7	49.2	50.2

AMERICAN ENVIRONMENTAL TESTING, INCORPORATED

565 So. Birch Drive 801-266-7111

Spanish Fork, Utah 84660

FIELD AND LABORATORY DATA

TABLE IVb

Plant or Job Description : Western Sugar Company - Located In Billings, Montana

Wet Scrubber On Pulp Dryer

Type : Compliance EPA #5

Date : 1/23-24/90

Symbol	Description	Units	4 North	5 South	6 North
Vm	Volume dry gas sampled @ meter conditions	Fl3	67.27	62.806	61.523
Pb	Barometric Pres	"Hg abs	26.79	26.79	26.78
ΔH	Average Pres drop across the orifice meter	"H2O	3.9678	3.4535	3.3218
Tm	Average gas meter temp	"R "F	534.42 74.42	536.9 76.9	533.33 73.33
Yi	Meter Coefficient		1.07	1.07	1.07
Vw	Total H2O collected, impingers & silica gel	ml	271.2	302.2	295.1
CO2		%	1.96	2.2	2.37
O2		%	12.13	12.1	11.87
N2 + CO		%	85.91	85.7	85.76
Rn	Nozzle Dia.	in.	0.503	0.503	0.503
Ts	Stack Temp	"R "F	597.29 137.29	595.5 135.5	605.71 145.71
Sqr rt ΔP	Velocity head of stack gas	"H2O	0.2531	0.2354	0.2335
Cp	Pitot Tube Coefficient		0.8484	0.8484	0.8484
Ps	Static Pres	"H2O	0.03	0.03	0.03
Pabs	Absolute Pres	"Hg	26.79	26.79	26.78
As	Area stack	Fl2	33.183	33.183	33.183
Tl	Net time of test	min.	72	72	72
Mgp	Total Particulate	mg	53.9	85.2	63.6

AMERICAN ENVIRONMENTAL TESTING, INCORPORATED

565 So. Birch Drive 801-266-7111

Spanish Fork, Utah 84660

DATA SUMMARY

TABLE Va

Plant : Western Sugar Company - Located In Billings, Montana

Wet Scrubber On Plup Dryer

Type : Compliance EPA #5

Date : 1/23-24/90

SYMBOL	DESCRIPTION	UNITS	1 South	2 North	3 South
Vm std	Volume dry gas	dscfm	0.8747	0.8453	0.8742
	sampled @ standard Conditions	dscf	62.9784	60.861	62.9451
Vw gas	Volume water vapor collected @ standard conditions	scf	12.6148	11.7204	10.7837
Bws	Proportion by volume of water vapor in gas stream	ddimensionless	0.1669	0.1615	0.1463
Md	Dry molecular weight	lb/lb mole	28.848	28.8212	28.8848
Ms	Wet molecular weight	lb/lb mole	27.0377	27.0738	27.2928
Vs	Stack gas velocity	ft/sec	15.8635	15.818	16.3412
Qs	Volumetric flow rate dry basis standard conditions	ft ³ /hr	1.2617 X 10 ⁶	1.2639 X 10 ⁶	1.3369 X 10 ⁶
Iso	Isokinetic variation	%	99.3405	95.7276	94.4232
Cs	Conc. particulate matter in stack gas, dry basis	lb/scf	5.351 X 10 ⁻⁴	8.084 X 10 ⁻⁴	7.9752 X 10 ⁻⁴
Emr	Emission rate	lbs/dscf	1.1797 X 10 ⁻⁶	1.7822 X 10 ⁻⁶	1.7582 X 10 ⁻⁶
		gr/dscf	0.0083	0.0125	0.0123
		lbs/hr	1.4884	2.2525	2.3505

AMERICAN ENVIRONMENTAL TESTING, INCORPORATED

565 So. Birch Drive 801-266-7111

Spanish Fork, Utah 84660

DATA SUMMARY

TABLE Yb

Plant : Western Sugar Company - Located in Billings, Montana

Wet Scrubber On Plup Dryer

Type : Compliance EPA #5

Date : 1/23-24/90

SYMBOL	DESCRIPTION	UNITS	4 North	5 South	6 North
Vm std	Volume dry gas	dscfm	0.8981	0.8373	0.8196
	sampled @ standard	dscf	64.661	60.2859	59.0114
	Conditions				
Vw gas	Volume water	scf	12.7654	14.2246	13.8904
	vapor collected @				
	standard conditions				
Bws	Proportion by		0.1649	0.1909	0.1905
	volume of water				
	vapor in gas stream				
	ddimensionless				
Md	Dry molecular	lb/lb mole	28.7988	28.836	28.854
	weight				
Ms	Wet molecular	lb/lb mole	27.0184	26.7673	26.7859
	weight				
Vs	Stack gas	ft/sec	16.6776	15.5576	15.5646
	velocity				
Qs	Volumetric flow	ft ³ /hr	1.317	1.1939	1.1744
	rate dry basis		X 10 ⁶	X 10 ⁶	X 10 ⁶
	standard conditions				
Iso	Isokinetic	%	98.0207	100.4534	100.5011
	variation				
Cs	Conc. particulat	lb/scf	8.3358	1.4133	1.0778
	matter in stack		X 10 ⁻⁴	X 10 ⁻³	X 10 ⁻³
	gas, dry basis				
Emr	Emission rate	lbs/dscf	1.8377	3.1157	2.376
			X 10 ⁻⁶	X 10 ⁻⁶	X 10 ⁻⁶
		gr/dscf	0.0129	0.0218	0.0166
		lbs/hr	2.4203	3.7197	2.7903

DRYER STACK TESTS 1-23-90 (TEST #1)

PROCESS FEED RATE TO DRYER DURING TEST

= 42 TONS/HR.

PROCESS FEED RATE TO ~~WEST~~ WEST DRUM DURING TEST

= 21 TONS/HR

DRYER STACK TESTS 1-24-90

TEST #2 { PROCESS FEED RATE TO DRYER DURING TEST
= 32.2 TONS/HR
PROCESS FEED RATE TO WEST DRUM DURING TEST
= 16.1 TONS/HR

TEST #3 { PROCESS FEED RATE TO DRYER DURING TEST
= 37.6 TONS/HR
PROCESS FEED RATE TO WEST DRUM DURING TEST
= 18.8 TONS/HR

Filename: BEET10.WQ1

Date: 02-Feb-95

Facility: Western Sugar Company

Location: Billings, Montana

Source: West Pulp Dryer

Natural gas-fired rotary drum beet pulp dryer controlled with a wet scrubber

Test date: Jan. 23-25, 1990

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	124.54	137.29	145.71	
NORTH STACK	Pressure	in. HG	26.42	26.79	26.78	
	Moisture	%	16.15	16.49	19.05	
	Oxygen	%	10.93	12.13	11.87	
	Volumetric flow, actual	acfm	ND	ND	ND	
	Volumetric flow, standard*	dscfm	21065	21950	19573	
	Isokinetic variation	%	95.7	98.02	100.5	
Circle: Production or feed rate		TPH	42.00	32.20	37.60	
Feed to dryer						
Pollutant concentrations:						
	Filterable PM	G/dscf	0.0117	0.00972	0.0134	
	Condensable inorganic PM	G/dscf	0.000838	0.00318	0.00321	
	CO2	% vol	2.4	1.96	2.37	
Pollutant mass flux rates:						
	Filterable PM	lb/hr	2.11	1.83	2.25	
	Condensable inorganic PM	lb/hr	0.151	0.599	0.539	
	CO2	lb/hr	3464	2948	3178	
Emission factors (ENGLISH UNITS):						AVERAGE
	Filterable PM	lb/ton	0.050	0.057	0.060	0.056
	Condensable inorganic PM	lb/ton	0.0036	0.019	0.014	0.012
	CO2	lb/ton	55	61	56	57
Emission factors (METRIC UNITS):						AVERAGE
	Filterable PM	kg/Mg	0.025	0.028	0.030	0.028
	Condensable inorganic PM	kg/Mg	0.0018	0.0093	0.0072	0.0061
	CO2	kg/Mg	28	31	28	29

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
2	Stack temperature	Deg F	122.58	129.42	135.5	
SOUTH STACK	Pressure	in. HG	26.38	26.79	26.79	
	Moisture	%	16.69	14.63	19.09	
	Oxygen	%	10.8	11.2	12.1	
	Volumetric flow, actual	acfm	ND	ND	ND	
	Volumetric flow, standard*	dscfm	21028	22282	19898	
	Isokinetic variation	%	99.34	94.42	100.45	
Circle: Production or feed rate		TPH	42.00	32.20	37.60	
Feed to dryer						
Pollutant concentrations:						
	Filterable PM	G/dscf	0.00660	0.00985	0.0166	
	Condensable inorganic PM	G/dscf	0.00170	0.00245	0.00522	
	CO2	% vol	2.6	2.73	2.2	
Pollutant mass flux rates:						
	Filterable PM	lb/hr	1.19	1.88	2.83	
	Condensable inorganic PM	lb/hr	0.306	0.468	0.890	
	CO2	lb/hr	3746	4168	2999	
Emission factors (ENGLISH UNITS):						AVERAGE
	Filterable PM	lb/ton	0.028	0.058	0.075	0.054
	Condensable inorganic PM	lb/ton	0.0073	0.015	0.024	0.015
	CO2	lb/ton	89	129	80	99
Emission factors (METRIC UNITS):						AVERAGE
	Filterable PM	kg/Mg	0.014	0.029	0.038	0.027
	Condensable inorganic PM	kg/Mg	0.0036	0.0073	0.012	0.0076
	CO2	kg/Mg	45	65	40	50

TOTAL EMISSION FACTORS FOR BOTH STACKS	Emission factors (ENGLISH UNITS):					AVERAGE
	Filterable PM	lb/ton	0.078	0.12	0.13	0.11
	Condensable inorganic PM	lb/ton	0.011	0.033	0.038	0.027
	CO2	lb/ton	144	190	136	157
	Emission factors (METRIC UNITS):					AVERAGE
	Filterable PM	kg/Mg	0.039	0.058	0.067	0.055
	Condensable inorganic PM	kg/Mg	0.0054	0.017	0.019	0.014
	CO2	kg/Mg	72	95	68	78

APPENDIX K

REPORT EXCERPTS FROM REFERENCE 11

(Western Sugar Company, March 1991)

Western Sugar

Final Report

*Emissions Testing and Analysis
at Billings, Montana Refinery*

March 26, 1991

RADIAN
CORPORATION

Table 3-5.

 Results of Emissions Testing at Western Sugar's
 Billings, Montana Facility

Pulp Dryer—North Stack

Test No.	RM5-4-2N	RM5-4-3N	RM5-4-4N	
Date	01-25-91	01-25-91	01-25-91	
Test Time	1047-1237	1630-1759	1909-2053	Average
Effluent Conditions				
Gas Velocity (fps)	16.18	15.10	15.43	15.57
Flow Rate (acfm)	36,941	34,473	35,219	35544
Flow Rate (dscfm)	17,391	17,032	16,884	17102
Gas Temperature (F)	185	163	166	171
Moisture (%)	35.1	35.0	36.6	35.6
Isokinetics (%)	102.54	104.58	108.90	105.34
Sample Volume (dscf)	35.06	35.02	36.15	35.41
Analysis (mg)				
Filter	139.1	95.2	115.5	116.6
Probe Wash	24.9	14.3	25.5	21.6
Condensables	77.3	60.0	63.4	66.9
Concentration (gr/dscf)				
Filter	0.06123	0.04195	0.04931	0.05083
Probe Wash	0.01096	0.00630	0.01089	0.00938
Condensables	0.03403	0.02644	0.02706	0.02918
Emission Rate (lb/hr)				
Filter	9.13	6.12	7.14	7.46
Probe Wash	1.63	0.92	1.58	1.38
Condensables	5.07	3.86	3.92	4.28

Table 3-6.

 Results of Emissions Testing at Western Sugar's
 Billings, Montana Facility

Pulp Dryer—South Stack

Test No.	RM5-4-2S	RM5-4-3S	RM5-4-4S	
Date	01-25-91	01-25-91	01-25-91	
Test Time	1047-1237	1630-1759	1909-2053	Average
Effluent Conditions				
Gas Velocity (fps)	14.36	14.21	14.51	14.36
Flow Rate (acfm)	32,769	32,445	33,118	32777
Flow Rate (dscfm)	16,800	16,374	16,467	16547
Gas Temperature (F)	177	165	164	169
Moisture (%)	31.0	33.4	34.5	33.0
Isokinetics (%)	106.80	103.52	108.57	106.30
Sample Volume (dscf)	35.28	33.32	35.15	34.58
Analysis (mg)				
Filter	85.4	72.9	75.9	78.1
Probe Wash	8.4	12.9	25.7	15.7
Condensables	29.9	62.1	82.9	58.3
Concentration (gr/dscf)				
Filter	0.03736	0.03376	0.03332	0.03481
Probe Wash	0.00367	0.00597	0.01128	0.00698
Condensables	0.01308	0.02876	0.03640	0.02608
Emission Rate (lb/hr)				
Filter	5.38	4.74	4.70	4.94
Probe Wash	0.53	0.84	1.59	0.99
Condensables	1.88	4.04	5.14	3.69

Table 3-7.

 Results of Emissions Testing at Western Sugar's
 Billings, Montana Facility

Pellet Cooler

Test No.	RM5-5-1	RM5-5-2	RM5-5-3	
Date	01-26-91	01-26-91	01-26-91	
Test Time	1113-1230	1434-1551	1647-1806	Average
Effluent Conditions				
Gas Velocity (fps)	51.80	50.34	49.68	50.61
Flow Rate (acfm)	21,968	21,349	21,071	21,463
Flow Rate (dscfm)	17,476	16,764	16,533	16,924
Gas Temperature (F)	114	121	118	118
Moisture (%)	2.3	2.3	3.0	2.6
Isokinetics (%)	96.65	100.84	102.56	100.02
Sample Volume (dscf)	58.64	58.68	58.87	58.73
Analysis (mg)				
Filter	14.6	18.3	20.0	17.6
Probe Wash	10.9	6.0	4.8	7.2
Condensables	7.9	8.4	3.3	6.5
				31.3
Concentration (gr/dscf)				
Filter	3.84E-03	4.81E-03	5.24E-03	4.63E-03
Probe Wash	2.87E-03	1.58E-03	1.26E-03	1.90E-03
Condensables	2.08E-03	2.21E-03	8.65E-04	1.72E-03
				.00235
Emission (lb/hr)				
Filter	0.58	0.69	0.74	0.67
Probe Wash	0.43	0.23	0.18	0.28
Condensables	0.31	0.32	0.12	0.25
				1.20
Emission (gr/sec)				
Filter	0.73	0.87	0.94	0.84
Probe Wash	0.54	0.29	0.22	0.35
Condensables	0.39	0.40	0.15	0.32
				1.51

4.0 PROCESS DESCRIPTION

The following section presents a brief description of the beet processing procedures, a discussion of the stack schematics, and a description of the air pollution control equipment.

4.1 Beet Process Description

The following is a description of the processes used by Western Sugar at their Billings, Montana site:

Process 1 -- Power Boiler/Wet Scrubber Unit: Low-sulfur coal is fired in three separate power boilers (stoker feeders). After the useful heat has been removed from the combustion gases, the flue gases are combined and passed through two parallel (north and south) wet venturi scrubbers for particulate removal (see Figure 4-1). Maximum coal firing rate: 18 tons of coal per hour (total in the three boilers; firing rate is read once per shift).

Process 2 -- Pulp Dryer: Processed wet beet pulp is sent to a natural gas fired dryer and pelletized for stock feed. Oil is used as an emergency backup fuel for the pulp dryer. The wet pressed pulp is fed at an average rate of 34 tons per hour; however, the pulp is not routinely weighed, nor is the pellet production weighed (except for loads leaving the facility). Therefore, the only direct measure of the production rate is the natural gas feed rate. Maximum natural gas feed rate is 1600 cubic feet per minute.

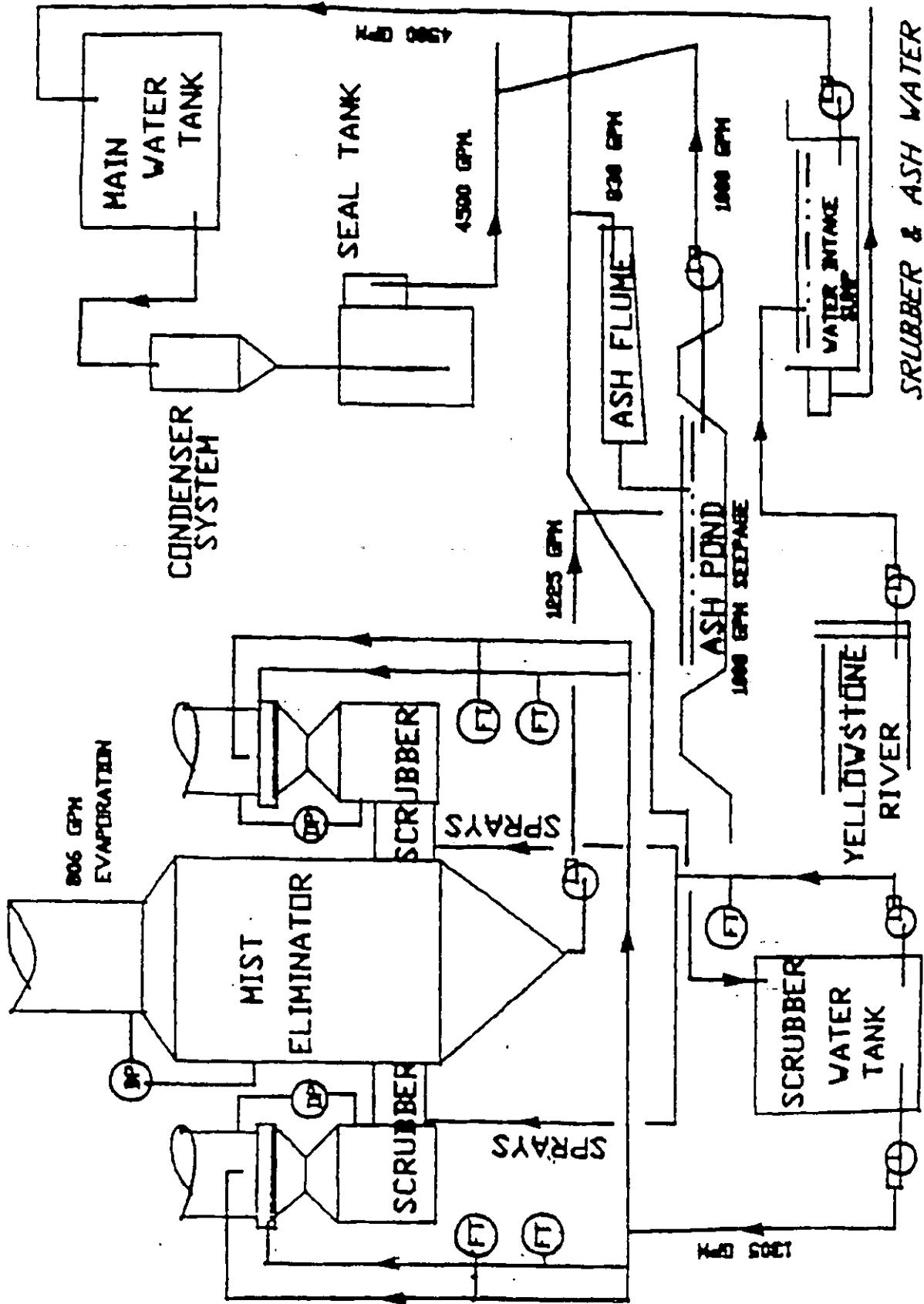


Figure 4-1

Filename: BEET 11.WQ1

Date: 08-Dec-94

Facility: Western Sugar Company

Location: Billings, Montana

Source: Pulp Dryer

Natural gas-fired rotary drum beet pulp dryer controlled with a wet scrubber

Test date: Jan. 23-25, 1991

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	185	163	166	
NORTH STACK	Pressure	in. HG	ND	ND	ND	
	Moisture	%	35.1	35	36.6	
	Oxygen	%	ND	ND	ND	
	Volumetric flow, actual	acfm	36941	34473	35219	
	Volumetric flow, standard*	dscfm	17391	17032	16884	
	Isokinetic variation	%	102.54	104.58	108.9	
Circle: Production or feed rate		TPH	34.00	34.00	34.00	
Feed to dryer ~~and wet scrub~~						
Pollutant concentrations:						
	Filterable PM	G/dscf	0.0722	0.04825	0.0602	
	Condensable inorganic PM	G/dscf	0.034030	0.02644	0.02706	
Pollutant mass flux rates:						
	Filterable PM	lb/hr	10.76	7.04	8.71	
	Condensable inorganic PM	lb/hr	5.073	3.860	3.916	
Emission factors (ENGLISH UNITS):						AVERAGE
	Filterable PM	lb/ton	0.317	0.207	0.256	0.260
	Condensable inorganic PM	lb/ton	0.149	0.114	0.115	0.126
Emission factors (METRIC UNITS):						AVERAGE
	Filterable PM	kg/Mg	0.158	0.104	0.128	0.130
	Condensable inorganic PM	kg/Mg	0.0746	0.0568	0.0576	0.0630

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
2	Stack temperature	Deg F	177	165	164	
SOUTH STACK	Pressure	in. HG	ND	ND	ND	
	Moisture	%	31	33.4	34.5	
	Oxygen	%	ND	ND	ND	
	Volumetric flow, actual	acfm	32769	32445	33118	
	Volumetric flow, standard*	dscfm	16800	16374	16467	
	Isokinetic variation	%	106.8	103.52	108.57	
Circle: Production or feed rate		TPH	34.00	34.00	34.00	
Capacity:						
Pollutant concentrations:						
	Filterable PM	G/dscf	0.04103	0.03973	0.0446	
	Condensable inorganic PM	G/dscf	0.01308	0.02876	0.03640	
Pollutant mass flux rates:						
	Filterable PM	lb/hr	5.91	5.58	6.30	
	Condensable inorganic PM	lb/hr	1.88	4.04	5.14	
Emission factors (ENGLISH UNITS):						AVERAGE
	Filterable PM	lb/ton	0.174	0.164	0.185	0.174
	Condensable inorganic PM	lb/ton	0.0554	0.119	0.151	0.108
Emission factors (METRIC UNITS):						AVERAGE
	Filterable PM	kg/Mg	0.0869	0.0820	0.0926	0.0872
	Condensable inorganic PM	kg/Mg	0.0277	0.0594	0.0756	0.0542

TOTAL EMISSION FACTORS FOR BOTH STACKS	Emission factors (ENGLISH UNITS):						AVERAGE
	Filterable PM	lb/ton	0.490	0.371	0.441		0.434
	Condensable inorganic PM	lb/ton	0.205	0.232	0.266		0.234
	Emission factors (METRIC UNITS):						AVERAGE
	Filterable PM	kg/Mg	0.245	0.186	0.221		0.217
	Condensable inorganic PM	kg/Mg	0.102	0.116	0.133		0.117

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
3	Stack temperature	Deg F	114	121	118	
PELLET COOLER	Pressure	in. HG	ND	ND	ND	
	Moisture	%	2.3	2.3	3	
	Oxygen	%	ND	ND	ND	
	Volumetric flow, actual	acfm	21968	21349	21071	
	Volumetric flow, standard*	dscfm	17476	16764	16533	
	Isokinetic variation	%	96.65	100.84	102.56	
Circle: Production or feed rate		TPH	34.00	34.00	34.00	
Wet pulp feed to dryer						
Pollutant concentrations:						
	Filterable PM	G/dscf	0.00671	0.00639	0.00650	
	Condensable inorganic PM	G/dscf	0.00208	0.00221	0.000865	
Pollutant mass flux rates:						
	Filterable PM	lb/hr	1.01	0.918	0.921	
	Condensable inorganic PM	lb/hr	0.312	0.318	0.123	
Emission factors (ENGLISH UNITS):						AVERAGE
	Filterable PM	lb/ton	0.0296	0.0270	0.0271	0.0279
	Condensable inorganic PM	lb/ton	0.00916	0.00934	0.00361	0.00737
Emission factors (METRIC UNITS):						AVERAGE
	Filterable PM	kg/Mg	0.0148	0.0135	0.0135	0.0139
	Condensable inorganic PM	kg/Mg	0.00458	0.00467	0.00180	0.00368

Emission factors based on feed rate to DRYER...may not be useful.

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

2-2

A schematic of the process is shown.

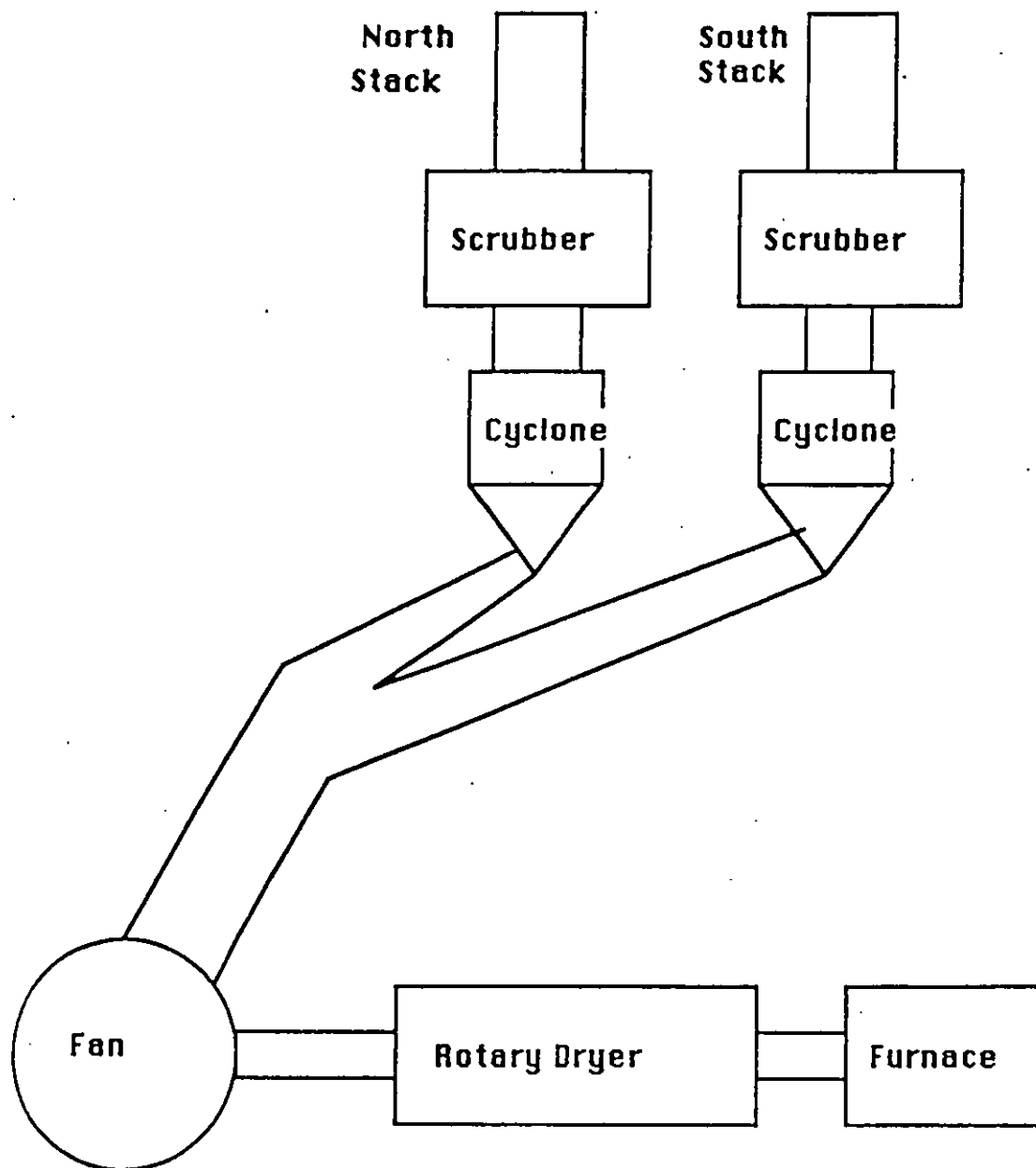


TABLE 1 - Particulate Results

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

4-3

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

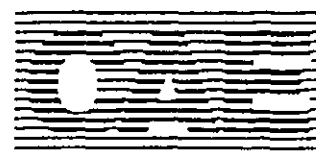


TABLE 3 - Particulate Results

EPA Method 5
Pulp Dryer North Stack
December 13, 1989

HUN 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	5.0	10.0	12.2

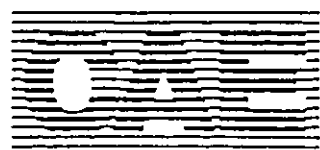
0.0425
5.0
5.42

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

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
	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

APPENDIX M

REPORT EXCERPTS FROM REFERENCE 13

(Holly Sugar Corporation, November 16, 1993)

EMISSION MEASUREMENT TEST REPORT

of

C.E. Boilers, Union Boilers & Pulp Dryers
Permit Compliance

for

SO₂, Particulate and PM10 with back-half Emission(s)

C.E. Boilers, Union Boilers, Pulp Dryers
Sidney, Montana Plant, Sidney, MT
Test Date: October 19-23, 1993

Prepared for:

Holly Sugar Corporation

Montana Division

East Holly Street
Sidney, MT 59270

Mr. Tom B. Jacobsen, Environmental Engineer
Phone: 307 532-7141, Ext.: N/A

Submitted to:

Montana State Department of Health and Environmental Sciences
Air Quality Bureau

Room A116
Cogswell Bldg.
Helena, MT 59620

Mr. Brian Hohn, Environmental Specialist
Phone: 406 444-3454

Prepared by:

THE EMISSION MEASUREMENT GROUP, INC.

P.O. Box 4953, ENGLEWOOD, CO 80155-4953
Nationwide Watts: 800-222-4187
Office Phone: 303 693-6725

Report Date: November 16, 1993

The Emission Measurement Group, Inc.

Table 3-6 (Pulp - NE)
TEST RESULTS, by Run

Pulp Dryer - Northeast Sidney, MT

CORPORATE DATA

Company Name:	Holly Sugar Corporation
Division Name:	Montana Division
Plant/Fac. Name:	Sidney, MT
Dept. Name:	Environmental
Contact Name:	Mr. Tom Jacobsen
Contact's Title:	Environmental Engineer
Process Ident./Type:	Sugar Beet Processing
Fuel Type:	#6 Fuel Oil
Fd(dscf gas/10 ⁶ BTU):	9220
Stack/Duct Identifier:	Pulp Dryer - Northeast
Equiv.Flue Dia,(ft.):	5.250
Hrs of Oper./Year:	4320

TEST CONDITIONS

Test Date, (mm/dd/yy):	10/23/93	10/23/93	10/23/93	
Test Operator, (LN,FI):	Lynn, M.	Lynn, M.	Lynn, M.	
Tech. Helper #1:	Floyd, J.	Floyd, J.	Floyd, J.	
Run ID Number, (VDRR):	8101	8102	8103	AVERAGE
Time- Start, (24hr.):	10:24	16:32	20:02	
- End, (24hr.):	12:38	18:27	22:29	
Time of Test, (t, min.):	100.0	100.0	100.0	100.0
Max. Rtd. Cap.,(TPH,Feed):	48.8	48.8	48.8	48.8
Feed Load, (TPH):	25.0	25.0	25.0	25.0
Test Cond., Feed, (%MRC):	51.25	51.25	51.25	51.25

PARTICULATE RESULTS, (RM5)

gr./dscf:	0.0609	0.0596	0.0868	0.0691
gr./acf:	0.0273	0.0268	0.0367	0.0303
lbs./hr.:	9.03	7.62	10.72	9.12
lbs./10 ⁶ BTU:	0.439	0.296	0.554	0.430
lbs./Ton of Feed:	0.361	0.305	0.429	0.365
Tons/Year:	19.50	16.46	23.16	19.71

The Emission Measurement Group, Inc.

Table 3-6 (Pulp - NE Continued)
TEST RESULTS, by Run

TEST CONDITIONS

Test Date, (mm/dd/yy):	10/23/93	10/23/93	10/23/93	
Run ID Number, (VDRR):	8101	8102	8103	AVERAGE

PM-10 RESULTS, (including backhalf)

gr./dscf:	0.0651	N/A	N/A	0.0651
gr./acf:	0.0292	N/A	N/A	0.0292
lbs./hr.:	9.65	N/A	N/A	9.65
lbs./10 ⁶ BTU:	0.470	N/A	N/A	0.470
lbs./Ton of Feed:	0.386	N/A	N/A	0.386
Tons/Year:	20.84	N/A	N/A	20.84

PARTICULATE TOTAL RESULTS (including backhalf)

gr./dscf:	0.0876	0.0680	0.1204	0.0920
gr./acf:	0.0393	0.0305	0.0510	0.0403
lbs./hr.:	12.99	8.69	14.88	12.19
lbs./10 ⁶ BTU:	0.632	0.338	0.769	0.580
lbs./Ton of Feed:	0.52	0.35	0.60	0.49
Tons/Year:	28.07	18.77	32.13	26.32

SO2 RESULTS, (RM6C)

ppm, (dry, v/v):	34.09	70.96	39.93	48.32
ppm, (wet, v/v):	20.96	43.38	22.95	29.10
lbs./hr.:	5.871	10.535	5.729	7.378
lbs./10 ⁶ BTU:	0.2857	0.4094	0.2963	0.3305
lbs./Ton of Feed:	0.23	0.42	0.23	0.30
Tons/Year:	12.68	22.76	12.37	15.94

PARAMETRIC FLUE GAS RESULTS

Pres.Vel.Del.P(in.w.g.):	0.1764	0.1318	0.1364	0.1482
Moisture, (%v/v):	38.50	38.86	42.53	39.97
CO2, Inst., (% dry,v/v):	4.08	4.88	4.26	4.41
O2, Inst., (% dry,v/v):	17.09	15.36	16.59	16.34
Temperature,Stack, (°F):	212.8	208.4	207.2	209.5
Velocity,Flue Gas,(Furl/Ftnt):	29.67	25.57	26.21	27.15
Volume Flow, (DSCFM):	17297	14912	14411	15540
Volume Flow, (ACFM):	38539	33209	34041	35263

The Emission Measurement Group, Inc.

Table 3-6 (Pulp - NW)
TEST RESULTS, by Run

Pulp Dryer - Northwest Sidney, MT

CORPORATE DATA

Company Name:	Holly Sugar Corporation
Division Name:	Montana Division
Plant/Fac. Name:	Sidney, MT
Dept. Name:	Environmental
Contact Name:	Mr. Tom Jacobsen
Contact's Title:	Environmental Engineer
Process Ident./Type:	Sugar Beet Processing
Fuel Type:	#6 Fuel Oil
Fd(dscf gas/10 ⁶ BTU):	9220
Stack/Duct Identifier:	Pulp Dryer - Northwest
Equiv.Flue Dia.(ft.):	5.250
Hrs of Oper./Year:	4320

TEST CONDITIONS

Test Date, (mm/dd/yy):	10/23/93	10/23/93	10/23/93	
Test Operator, (LN,FI):	Lynn, M.	Lynn, M.	Lynn, M.	
Tech. Helper #1:	Floyd, J.	Floyd, J.	Floyd, J.	
Run ID Number, (VDRR):	7101	7102	7103	AVERAGE
Time- Start, (24hr.):	10:26	15:18	19:18	
- End, (24hr.):	12:40	17:20	21:57	
Time of Test, (t, min.):	100.0	100.0	100.0	100.0
Max. Rtd. Cap.,(TPH,Feed):	48.8	48.8	48.8	48.8
Feed Load, (TPH):	25.0	25.0	25.0	25.0
Test Cond., Feed, (%MRC):	51.25	51.25	51.25	51.25

PARTICULATE RESULTS, (RM5)

gr./dscf:	0.0524	0.0724	0.0755	0.0668
gr./acf:	0.0250	0.0337	0.0358	0.0315
lbs./hr.:	6.73	11.55	11.89	10.06
lbs./10 ⁶ BTU:	0.276	0.368	0.439	0.361
lbs./Ton of Feed:	0.269	0.462	0.476	0.402
Tons/Year:	14.54	24.95	25.69	21.73

The Emission Measurement Group, Inc.

Table 3-6 (Pulp - NW Continued)
TEST RESULTS, by Run

TEST CONDITIONS

Test Date, (mm/dd/yy):	10/23/93	10/23/93	10/23/93	
Run ID Number, (VDRR):	7101	7102	7103	AVERAGE

PM-10 RESULTS, (including backhalf)

gr./dscf:	N/A	0.0567	0.0529	0.0548
gr./acf:	N/A	0.0264	0.0251	0.0258
lbs./hr.:	N/A	9.05	8.33	8.69
lbs./10 ⁶ BTU:	N/A	0.289	0.307	0.298
lbs./Ton of Feed:	N/A	0.362	0.333	0.348
Tons/Year:	N/A	19.55	17.99	18.77

PARTICULATE TOTAL RESULTS (including backhalf)

gr./dscf:	0.1039	0.0946	0.0908	0.0964
gr./acf:	0.0496	0.0441	0.0431	0.0456
lbs./hr.:	13.35	15.10	14.30	14.25
lbs./10 ⁶ BTU:	0.548	0.481	0.527	0.519
lbs./Ton of Feed:	0.53	0.60	0.57	0.57
Tons/Year:	28.83	32.62	30.88	30.78

SO2 RESULTS, (RM6C)

ppm, (dry, v/v):	39.10	70.56	32.44	47.37
ppm, (wet, v/v):	25.67	45.92	21.74	31.11
lbs./hr.:	5.833	13.083	5.933	8.283
lbs./10 ⁶ BTU:	0.2396	0.4171	0.2189	0.2919
lbs./Ton of Feed:	0.23	0.52	0.24	0.33
Tons/Year:	12.60	28.26	12.82	17.89

PARAMETRIC FLUE GAS RESULTS

Pres.Vel.Del.P(in.w.g.):	0.1188	0.1893	0.1767	0.1616
Moisture, (%v/v):	34.35	34.92	32.98	34.08
CO2, Inst., (% dry,v/v):	4.15	4.60	3.93	4.23
O2, Inst., (% dry,v/v):	15.68	15.49	16.16	15.78
Temperature,Stack, (°F):	216.1	225.9	234.1	225.4
Velocity,Flue Gas,(fps):	24.20	30.78	29.80	28.26
Volume Flow, (DSCFM):	14984	18623	18370	17326
Volume Flow, (ACFM):	31428	39979	38709	36705

The Emission Measurement Group, Inc.

Table 3-6 (Pulp - SE)
TEST RESULTS, by Run

Pulp Dryer - Southeast Sidney, MT

CORPORATE DATA

Company Name: Holly Sugar Corporation
Division Name: Montana Division
Plant/Fac. Name: Sidney, MT
Dept. Name: Environmental
Contact Name: Mr. Tom Jacobsen
Contact's Title: Environmental Engineer
Process Ident./Type: Sugar Beet Processing
Fuel Type: #6 Fuel Oil
Fd(dscf gas/10⁶ BTU): 9220
Stack/Duct Identifier: Pulp Dryer - Southeast
Equiv.Flue Dia.(ft.): 5.250
Hrs of Oper./Year: 4320

TEST CONDITIONS

Test Date, (mm/dd/yy):	10/21/93	10/22/93	10/22/93	10/22/93	
Test Operator, (LN,FI):	Lynn, M.	Lynn, M.	Lynn, M.	Lynn, M.	
Tech. Helper #1:	Floyd, J.	Floyd, J.	Floyd, J.	Floyd, J.	
Run ID Number, (VDRR):	6101	6102	6103	6104	AVERAGE
Time- Start, (24hr.):	20:56	9:34	15:27	19:24	
- End, (24hr.):	21:16	13:36	17:46	21:50	
Time of Test, (l, min.):	20.0	113.5	120.0	120.0	93.4
Max. Rtd. Cap.,(TPH,Feed):	48.8	48.8	48.8	48.8	48.8
Feed Load, (TPH):	24.0	25.0	25.0	25.0	24.8
Test Cond., Feed, (%MRC):	49.20	51.25	51.25	51.25	50.74

PARTICULATE RESULTS, (RM5)

	10/21/93	10/22/93	10/22/93	10/22/93	AVERAGE
gr./dscf:	0.1306	0.1281	0.0705	0.1047	0.1085
gr./acf:	0.0555	0.0582	0.0374	0.0440	0.0488
lbs./hr.:	15.99	24.34	12.61	14.33	16.82
lbs./10 ⁶ BTU:	0.535	0.518	0.278	0.393	0.431
lbs./Ton of Feed:	0.666	0.974	0.504	0.573	0.679
Tons/Year:	34.54	52.58	27.24	30.96	36.33

The Emission Measurement Group, Inc.

Table 3-6 (Pulp - SE Continued)
TEST RESULTS, by Run

TEST CONDITIONS

Test Date, (mm/dd/yy):	10/21/93	10/22/93	10/22/93	10/22/93	
Run ID Number, (VDRR):	6101	6102	6103	6104	AVERAGE

PM-10 RESULTS, (including backhalf)

gr./dscf:	0.0943	0.1494	N/A	N/A	0.1218
gr./acf:	0.0401	0.0679	N/A	N/A	0.0540
lbs./hr.:	11.54	28.40	N/A	N/A	19.97
lbs./10 ⁶ BTU:	0.386	0.605	N/A	N/A	0.495
lbs./Ton of Feed:	0.481	1.136	N/A	N/A	0.808
Tons/Year:	24.92	61.33	N/A	N/A	43.13

PARTICULATE TOTAL RESULTS (including backhalf)

gr./dscf:	0.1582	0.2133	0.1089	0.1372	0.1544
gr./acf:	0.0673	0.0970	0.0577	0.0577	0.0699
lbs./hr.:	19.36	40.55	19.48	18.79	24.54
lbs./10 ⁶ BTU:	0.647	0.863	0.429	0.515	0.614
lbs./Ton of Feed:	0.81	1.62	0.78	0.75	0.99
Tons/Year:	41.82	87.58	42.07	40.59	53.01

SO2 RESULTS, (RM6C)

ppm, (dry, v/v):	71.31	72.19	88.02	82.43	78.49
ppm, (wet, v/v):	42.00	45.29	63.96	47.45	49.67
lbs./hr.:	10.138	15.940	18.292	13.115	14.371
lbs./10 ⁶ BTU:	0.3389	0.3395	0.4030	0.3595	0.3602
lbs./Ton of Feed:	0.42	0.64	0.73	0.52	0.58
Tons/Year:	21.90	34.43	39.51	28.33	31.04

PARAMETRIC FLUE GAS RESULTS

Pres.Vel.Del.P(in.w.g.):	0.1312	0.2825	0.1940	0.1694	0.1943
Moisture, (%v/v):	41.10	37.27	27.34	42.44	37.04
CO2, Inst., (% dry,v/v):	5.32	5.20	5.57	6.18	5.57
O2, Inst., (% dry,v/v):	14.17	14.10	13.92	13.57	13.94
Temperature,Stack, (°F):	222.5	219.4	213.4	211.8	216.8
Velocity,Flue Gas,(fps):	25.86	37.54	30.32	29.26	30.74
Volume Flow, (DSCFM):	14279	22177	20872	15980	18327
Volume Flow, (ACFM):	33584	48757	39378	38003	39930

The Emission Measurement Group, Inc.

Table 3-6 (Pulp-SW)
TEST RESULTS, by Run

Pulp Dryer - Southwest Sidney, MT

CORPORATE DATA

Company Name:	Holly Sugar Corporation
Division Name:	Montana Division
Plant/Fac. Name:	Sidney, MT
Dept. Name:	Environmental
Contact Name:	Mr. Tom Jacobsen
Contact's Title:	Environmental Engineer
Process Ident./Type:	Sugar Beet Processing
Fuel Type:	#6 Fuel Oil
Fd(dscf gas/10 ⁶ BTU):	9220
Stack/Duct Identifier:	Pulp Dryer - Southwest
Equiv.Flue Dia,(ft.):	5.250
Hrs of Oper./Year:	4320

TEST CONDITIONS

Test Date, (mm/dd/yy):	10/21/93	10/22/93	10/22/93	10/22/93	
Test Operator, (LN,FI):	Lynn, M.	Lynn, M.	Lynn, M.	Lynn, M.	
Tech. Helper #1:	Floyd, J.	Floyd, J.	Floyd, J.	Floyd, J.	
Run ID Number, (VDRR):	5101	5102	5103	5104	AVERAGE
Time- Start, (24hr.):	21:08	9:43	15:24	19:27	
- End, (24hr.):	21:33	13:35	17:43	21:59	
Time of Test, (t, min.):	25.0	110.5	120.0	120.0	93.9
Max. Rtd. Cap.,(TPH,Feed):	48.8	48.8	48.8	48.8	48.8
Feed Load, (TPH):	24.0	25.0	25.0	25.0	24.8
Test Cond., Feed, (%MRC):	49.20	51.25	51.25	51.25	50.74

PARTICULATE RESULTS, (RM5)

gr./dscf:	0.0431	0.0666	0.1409	0.1179	0.0921
gr./acf:	0.0183	0.0283	0.0609	0.0552	0.0407
lbs./hr.:	4.66	9.96	22.30	20.40	14.33
lbs./10 ⁶ BTU:	0.175	0.269	0.594	0.451	0.372
lbs./Ton of Feed:	0.194	0.398	0.892	0.816	0.575
Tons/Year:	10.06	21.51	48.17	44.07	30.95

The Emission Measurement Group, Inc.

Table 3-6 (Pulp-SW Continued)
TEST RESULTS, by Run

TEST CONDITIONS

Test Date, (mm/dd/yy):	10/21/93	10/22/93	10/22/93	10/22/93	
Run ID Number, (VDRR):	5101	5102	5103	5104	AVERAGE

PM-10 RESULTS, (including backhalf)

gr./dscf:	N/A	N/A	0.1154	0.1030	0.1092
gr./acf:	N/A	N/A	0.0499	0.0482	0.0491
lbs./hr.:	N/A	N/A	18.27	17.83	18.05
lbs./10 ⁶ BTU:	N/A	N/A	0.486	0.394	0.440
lbs./Ton of Feed:	N/A	N/A	0.731	0.713	0.722
Tons/Year:	N/A	N/A	39.45	38.51	38.98

PARTICULATE TOTAL RESULTS (including backhalf)

gr./dscf:	0.1276	0.0916	0.1709	0.1585	0.1372
gr./acf:	0.0540	0.0390	0.0739	0.0742	0.0603
lbs./hr.:	13.77	13.71	27.05	27.43	20.49
lbs./10 ⁶ BTU:	0.518	0.370	0.720	0.606	0.554
lbs./Ton of Feed:	0.57	0.55	1.08	1.10	0.83
Tons/Year:	29.74	29.60	58.43	59.25	44.26

SO2 RESULTS, (RM6C)

ppm, (dry, v/v):	72.50	86.83	84.48	75.17	79.74
ppm, (wet, v/v):	44.16	52.20	51.94	49.84	49.54
lbs./hr.:	9.089	15.089	15.532	15.110	13.705
lbs./10 ⁶ BTU:	0.3419	0.4069	0.4137	0.3338	0.3741
lbs./Ton of Feed:	0.38	0.60	0.62	0.60	0.55
Tons/Year:	19.63	32.59	33.55	32.64	29.60

PARAMETRIC FLUE GAS RESULTS

Pres.Vel.Del.P(in.w.g.):	0.1000	0.1928	0.2091	0.2197	0.1804
Moisture, (%v/v):	39.08	39.88	38.51	33.70	37.80
CO2, Inst., (% dry,v/v):	5.45	5.24	5.25	6.27	5.55
O2, Inst., (% dry,v/v):	14.12	14.08	14.37	13.70	14.07
Temperature,Stack, (F):	248.7	235.9	238.4	235.4	239.6
Velocity,Flue Gas,(fps):	22.89	31.57	32.88	33.22	30.14
Volume Flow, (DSCFM):	12591	17453	18466	20189	17175
Volume Flow, (ACFM):	29735	40999	42701	43148	39146

The Emission Measurement Group, Inc.

Table 3-7 (Pulp - NE)
SAMPLING and ANALYTICAL DATA, by Run

Pulp Dryer - Northeast Sidney, MT

CORPORATE DATA

Company Name:	Holly Sugar Corporation
Division Name:	Montana Division
Plant/Fac. Name:	Sidney, MT
Dept. Name:	Environmental
Contact Name:	Mr. Tom Jacobsen
Contact's Title:	Environmental Engineer
Process Ident./Type:	Sugar Beet Processing
Fuel Type:	#6 Fuel Oil
Fd(dscf gas/10 ⁶ BTU):	9220
Stack/Duct Identifier:	Pulp Dryer - Northeast
Equiv.Flue Dia.(ft.):	5.250
Hrs of Oper./Year:	4320

TEST CONDITIONS

Test Operator (LN,FI):	Lynn, M.	Lynn, M.	Lynn, M.
Tech. Helper #1:	Floyd, J.	Floyd, J.	Floyd, J.
Test Date, (mm/dd/yy):	10/23/93	10/23/93	10/23/93
Run ID Number, (VDRR):	8101	8102	8103
Time- Start, (24hr.):	10:24	16:32	20:02
- End, (24hr.):	12:38	18:27	22:29
Time of Test, (t, min.):	100.0	100.0	100.0

PROCESS LOAD DATA

Max. Rtd. Cap., (TPH, Feed):	48.8	48.8	48.8
Feed Load, (TPH):	25.0	25.0	25.0
Test Cond., Feed, (%MRC):	51.25	51.25	51.25

SAMPLE VOLUME DATA

Reference Diluent (CO2) %:	12.0	12.0	12.0
Reference Diluent (O2) %:	15.0	15.0	15.0
Console ID #:	CC-2	CC-2	CC-2
Gas Meter ID Number:	6848398	6848398	6848398
Gas Mtr. Cal Factor, (Yo):	0.99650	0.99650	0.99650
Volume, Gas Samp. @ Std. Cond, (dscf):	46.551	38.077	37.750
Corrected for Excess Leak, (acf):	50.476	41.847	40.498
At Meter Conditions, (acf):	50.476	41.847	40.498
Temperature, @ Gas Meter, (°F):	72.10	78.80	66.60
Delta H Pres. @ Meter, (in.w.g.):	1.09	0.80	0.86
Pressure Barometric., Abs., (in.Hg.):	27.825	27.820	27.850
Leak Ck.Result, Post, Excessive, (acf):	0.000	0.000	0.000
Leak Rate Result, (cfm):	0.000	0.000	0.000
At Vacuum, (in. Hg.):	24.00	25.00	25.00
High During Run, (in. Hg.):	15.00	5.80	3.00

The Emission Measurement Group, Inc.

Table 3-7 (Pulp - NE Continued)
SAMPLING and ANALYTICAL DATA, by Run

TEST CONDITIONS

Test Date, (mm/dd/yy):	10/23/93	10/23/93	10/23/93
Run ID Number, (VDRR):	8101	8102	8103

STACK MOISTURE DATA

Press.H2O Vap.@ Saturation,(in.Hg.):	0.2411	0.2586	0.2374
Of Gas @ Silica Gel, (in. Hg.):	19.025	23.620	25.850
Temperature @ Silica Gel Imp., (°F):	39.30	41.10	38.90
Vacuum @ Silica Gel/Pump,(in.Hg.):	8.800	4.200	2.000
Volume H2O @ Silica Gel,(gm):	13.75	9.83	7.97
Condensed H2O @ Impingers,(ml.):	605.0	504.0	585.0
Total Vol. H2O Collected,(ml.):	618.75	513.83	592.97

FLUE GAS MOL. WT. & FLOWRATE DATA

Area of Flue, (sq. ft.):	21.65	21.65	21.65
Pres., Duct, Static, (in. w.g.):	0.00	0.00	0.00
Pitobe ID #:	PM-60	PM-60	PM-60
Pitot ID #:	PM-60	PM-60	PM-60
Pitot Side ID #:	A	A	A
Pitot Coef., (Cp):	0.840	0.840	0.840
Density of Flue Gas, (lb/cf):	0.0647	0.0647	0.0635
Molecular Weight, wet:	24.984	24.980	24.533

PARTICULATE SAMPLING DATA

Isokinetic Sampling Rate, Final,(%):	104.32	98.97	101.53
" Point-by-Point, (Avg., %):	104.40	96.90	94.30
" Point-by-Point, (High, %):	140.30	112.80	106.40
" Point-by-Point, (Low, %):	91.20	50.80	69.60
Filter A ID #:	7492	7490	7497
B ID #:	N/A	N/A	N/A
Nozzle ID #:	PM10-11	PM10-11	PM10-11
Nozzle Diameter, (in.):	0.32000	0.32000	0.32000
Orifice Factor, Del. Ha, (in. w.g.):	1.904	1.904	1.904
Sampling Rate Factor, (K3):	4.29	4.18	4.06

The Emission Measurement Group, Inc.

Table 3-7 (Pulp - NW)
SAMPLING and ANALYTICAL DATA, by Run

Pulp Dryer - Northwest Sidney, MT

CORPORATE DATA

Company Name:	Holly Sugar Corporation
Division Name:	Montana Division
Plant/Fac. Name:	Sidney, MT
Dept. Name:	Environmental.
Contact Name:	Mr. Tom Jacobsen
Contact's Title:	Environmental Engineer
Process Ident./Type:	Sugar Beet Processing
Fuel Type:	#6 Fuel Oil
Fd(dscf gas/10 ⁶ BTU):	9220
Stack/Duct Identifier:	Pulp Dryer - Northwest
Equiv.Flue Dia.(ft.):	5.250
Hrs of Oper./Year:	4320

TEST CONDITIONS

Test Operator (LN,FI):	Lynn, M.	Lynn, M.	Lynn, M.
Tech. Helper #1:	Floyd, J.	Floyd, J.	Floyd, J.
Test Date, (mm/dd/yy):	10/23/93	10/23/93	10/23/93
Run ID Number, (VDRR):	7101	7102	7103
Time- Start, (24hr.):	10:26	15:18	19:18
- End, (24hr.):	12:40	17:20	21:57
Time of Test, (t, min.):	100.0	100.0	100.0

PROCESS LOAD DATA

Max. Rtd. Cap., (TPH, Feed):	48.8	48.8	48.8
Feed Load, (TPH):	25.0	25.0	25.0
Test Cond., Feed, (%MRC):	51.25	51.25	51.25

SAMPLE VOLUME DATA

Reference Diluent (CO2) %:	12.0	12.0	12.0
Reference Diluent (O2) %:	15.0	15.0	15.0
Console ID #:	JC-1	JC-1	JC-1
Gas Meter ID Number:	382459	382459	382459
Gas Mtr. Cal Factor, (Yo):	0.99650	0.99650	0.99650
Volume, Gas Samp. @ Std. Cond. (dscf):	34.178	47.555	46.146
Corrected for Excess Leak, (acf):	37.149	53.029	49.506
At Meter Conditions, (acf):	37.149	53.029	49.506
Temperature, @ Gas Meter, (F):	72.20	86.20	66.00
Delta H Pres. @ Meter, (in.w.g.):	0.25	0.46	0.43
Pressure Barometric., Abs., (in.Hg.):	27.825	27.820	27.850
Leak Ck. Result, Post, Excessive, (acf):	0.000	0.000	0.000
Leak Rate Result, (cfm):	0.000	0.000	0.000
At Vacuum, (in. Hg.):	23.50	23.50	23.50
High During Run, (in. Hg.):	17.00	5.20	4.00

The Emission Measurement Group, Inc.

Table 3-7 (Pulp - NW Continued)
SAMPLING and ANALYTICAL DATA, by Run

TEST CONDITIONS

Test Date, (mm/dd/yy):	10/23/93	10/23/93	10/23/93
Run ID Number, (VDRR):	7101	7102	7103

STACK MOISTURE DATA

Press.H2O Vap.@ Saturation,(in.Hg.):	0.3586	0.3252	0.2392
Of Gas @ Silica Gel, (in. Hg.):	18.425	25.320	25.350
Temperature @ Silica Gel Imp., (°F):	49.70	47.10	39.10
Vacuum @ Silica Gel/Pump,(in.Hg.):	9.400	2.500	2.500
Volume H2O @ Silica Gel,(gm):	15.65	14.65	10.01
Condensed H2O @ Impingers,(ml.):	364.0	527.0	472.0
Total Vol. H2O Collected,(ml.):	379.65	541.65	482.01

FLUE GAS MOL. WT. & FLOWRATE DATA

Area of Flue, (sq. ft.):	21.65	21.65	21.65
Pres., Duct, Static, (in. w.g.):	0.20	0.20	0.20
Pitobe ID #:	60-1	60-2	60-2
Pitot ID #:	60-1	60-2-PM10	60-2-PM10
Pitot Side ID #:	A	A	A
Pitot Coef., (Cp):	0.840	0.840	0.840
Density of Flue Gas, (lb/cf):	0.0659	0.0658	0.0662
Molecular Weight, wet:	25.425	25.403	25.569

PARTICULATE SAMPLING DATA

Isokinetic Sampling Rate, Final,(%):	88.41	98.97	97.37
" Point-by-Point, (Avg., %):	88.70	98.90	99.20
" Point-by-Point, (High, %):	118.00	111.60	114.60
" Point-by-Point, (Low, %):	81.50	94.10	88.50
Filter A ID #:	7493	7489	7496
B ID #:	N/A	N/A	N/A
Nozzle ID #:	10-2	PM10-11	PM10-11
Nozzle Diameter, (in.):	0.32000	0.32000	0.32000
Orifice Factor, Del. Ha, (in. w.g.):	0.940	0.940	0.940
Sampling Rate Factor, (K3):	2.16	2.29	2.21

The Emission Measurement Group, Inc.

Table 3-7 (Pulp - SE)
SAMPLING and ANALYTICAL DATA, by Run

Pulp Dryer - Southeast Sidney, MT

CORPORATE DATA

Company Name: Holly Sugar Corporation
Division Name: Montana Division
Plant/Fac. Name: Sidney, MT
Dept. Name: Environmental
Contact Name: Mr. Tom Jacobsen
Contact's Title: Environmental Engineer
Process Ident./Type: Sugar Beet Processing
Fuel Type: #6 Fuel Oil
Fd(dscf gas/10⁶ BTU): 9220
Stack/Duct Identifier: Pulp Dryer - Southeast
Equiv.Flue Dia.(ft.): 5.250
Hrs of Oper./Year: 4320

TEST CONDITIONS

Test Operator (LN,FI):	Lynn, M.	Lynn, M.	Lynn, M.	Lynn, M.
Tech. Helper #1:	Floyd, J.	Floyd, J.	Floyd, J.	Floyd, J.
Test Date, (mm/dd/yy):	10/21/93	10/22/93	10/22/93	10/22/93
Run ID Number, (VDRR):	6101	6102	6103	6104
Time- Start, (24hr.):	20:56	9:34	15:27	19:24
- End, (24hr.):	21:16	13:36	17:46	21:50
Time of Test, (l, min.):	20.0	113.5	120.0	120.0

PROCESS LOAD DATA

Max. Rtd. Cap., (TPH, Feed):	48.8	48.8	48.8	48.8
Feed Load, (TPH):	24.0	25.0	25.0	25.0
Test Cond., Feed, (%MRC):	49.20	51.25	51.25	51.25

SAMPLE VOLUME DATA

Reference Diluent (CO ₂) %:	12.0	12.0	12.0	12.0
Reference Diluent (O ₂) %:	15.0	15.0	15.0	15.0
Console ID #:	CC-2	CC-2	CC-2	CC-2
Gas Meter ID Number:	6848398	6848398	6848398	6848398
Gas Mtr. Cal Factor, (Yo):	0.99650	0.99650	0.99650	0.99650
Volume, Gas Samp. @ Std. Cond, (dscf):	8.719	51.819	27.042	46.895
Corrected for Excess Leak, (acf):	9.165	54.983	29.744	50.673
At Meter Conditions, (acf):	9.165	54.983	29.744	50.673
Temperature, @ Gas Meter, (F):	57.60	62.70	79.70	69.80
Delta H Pres. @ Meter, (in.w.g.):	1.10	1.33	0.92	0.97
Pressure Barometric, Abs., (in. Hg.):	27.920	27.915	27.835	27.810
Leak Ck. Result, Post, Excessive, (acf):	0.000	0.000	0.000	0.000
Leak Rate Result, (cfm):	0.000	0.000	0.000	0.000
At Vacuum, (in. Hg.):	14.00	14.00	14.00	23.50
High During Run, (in. Hg.):	5.00	17.80	2.80	5.80

The Emission Measurement Group, Inc.

Table 3-7 (Pulp - SE)
SAMPLING and ANALYTICAL DATA, by Run

STACK MOISTURE DATA

Press.H2O Vap.@ Saturation,(in.Hg.):	0.2656	0.2430	0.2729	0.2656
Of Gas @ Silica Gel, (in. Hg.):	24.020	21.215	26.135	24.110
Temperature @ Silica Gel Imp., (F):	41.80	39.50	42.50	41.80
Vacuum @ Silica Gel/Pump,(in.Hg.):	3.900	6.700	1.700	3.700
Volume H2O @ Silica Gel,(gm):	2.18	13.52	6.66	11.98
Condensed H2O @ Impingers,(ml.):	127.0	640.0	209.3	722.0
Total Vol. H2O Collected,(ml.):	129.18	653.52	215.96	733.98

FLUE GAS MOL. WT. & FLOWRATE DATA

Area of Flue, (sq. ft.):	21.65	21.65	21.65	21.65
Pres., Duct, Static, (in. w.g.):	0.00	0.00	0.00	0.00
Pitot ID #:	PM10-60	PM10-60	60-1	60-1
Pitot ID #:	PM10-60	PM10-60	60-1	60-1
Pitot Side ID #:	A	A	A	A
Pitot Coef., (Cp):	0.840	0.840	0.840	0.840
Density of Flue Gas, (lb/cf):	0.0641	0.0652	0.0682	0.0638
Molecular Weight, wet:	24.739	25.162	26.332	24.651

PARTICULATE SAMPLING DATA

Isokinetic Sampling Rate, Final,(%):	133.75	90.19	47.30	107.13
" Point-by-Point, (Avg., %):	80.40	100.00	103.30	94.20
" Point-by-Point, (High, %):	111.20	111.40	114.60	119.00
" Point-by-Point, (Low, %):	99.90	20.20	88.10	87.80
Filter A ID #:	7480	7481	7485	7488
B ID #:	N/A	7484	N/A	N/A
Nozzle ID #:	PM10-10	PM10-10	10.2	10.2
Nozzle Diameter, (in.):	0.30100	0.30100	0.30100	0.30100
Orifice Factor, Del. Ha, (in. w.g.):	1.904	1.904	1.904	1.904
Sampling Rate Factor, (K3):	5.02	3.28	3.30	3.09

The Emission Measurement Group, Inc.

Table 3-7 (Pulp - SW)
SAMPLING and ANALYTICAL DATA, by Run

Pulp Dryer - Southwest Sidney, MT

CORPORATE DATA

Company Name:	Holly Sugar Corporation
Division Name:	Montana Division
Plant/Fac. Name:	Sidney, MT
Dept. Name:	Environmental
Contact Name:	Mr. Tom Jacobsen
Contact's Title:	Environmental Engineer
Process Ident./Type:	Sugar Beet Processing
Fuel Type:	#6 Fuel Oil
Fd(dscf gas/10 ⁶ BTU):	9220
Stack/Duct Identifier:	Pulp Dryer - Southwest
Equiv.Flue Dia.(ft.):	5.250
Hrs of Oper./Year:	4320

TEST CONDITIONS

Test Operator (LN,FI):	Lynn, M.	Lynn, M.	Lynn, M.	Lynn, M.
Tech. Helper #1:	Floyd, J.	Floyd, J.	Floyd, J.	Floyd, J.
Test Date, (mm/dd/yy):	10/21/93	10/21/93	10/21/93	10/21/93
Run ID Number, (VDRR):	5101	5102	5103	5104
Time- Start, (24hr.):	21:08	9:43	15:24	19:27
- End, (24hr.):	21:33	13:35	17:43	21:59
Time of Test, (t, min.):	25.0	110.5	120.0	120.0

PROCESS LOAD DATA

Max. Rtd. Cap., (TPH, Feed):	48.8	48.8	48.8	48.8
Feed Load, (TPH):	24.0	25.0	25.0	25.0
Test Cond., Feed, (%MRC):	49.20	51.25	51.25	51.25

SAMPLE VOLUME DATA

Reference Diluent (CO ₂) %:	12.0	12.0	12.0	12.0
Reference Diluent (O ₂) %:	15.0	15.0	15.0	15.0
Console ID #:	JC-1	JC-1	JC-1	JC-1
Gas Meter ID Number:	352648	352648	352648	352648
Gas Mtr. Cal Factor, (Yo):	0.99650	0.99650	0.99650	0.99650
Volume, Gas Samp. @ Std. Cond, (dscf):	8.704	45.704	47.334	54.085
Corrected for Excess Leak, (acf):	9.021	48.808	53.503	58.278
At Meter Conditions, (acf):	9.021	48.808	53.503	58.278
Temperature, @ Gas Meter, (°F):	49.00	64.90	93.80	67.50
Delta H Pres. @ Meter, (in.w.g.):	0.18	0.35	0.36	0.39
Pressure Barometric, Abs., (in.Hg.):	27.915	27.925	27.835	27.810
Leak Ck.Result, Post, Excessive, (acf):	0.000	0.000	0.000	0.000
Leak Rate Result, (cfm):	0.000	0.000	0.000	0.000
At Vacuum, (in. Hg.):	5.00	14.00	23.00	23.50
High During Run, (in. Hg.):	1.50	4.80	4.80	8.00

The Emission Measurement Group, Inc.

Table 3-7 (Pulp - SW Continued)
SAMPLING and ANALYTICAL DATA, by Run

TEST CONDITIONS

Test Date, (mm/dd/yy):	10/21/93	10/21/93	10/21/93	10/21/93
Run ID Number, (VDRR):	5101	5102	5103	5104

STACK MOISTURE DATA

Press.H2O Vap.@ Saturation,(in.Hg.):	0.2143	0.2365	0.3015	0.2576
Of Gas @ Silica Gel, (in. Hg.):	26.585	25.525	25.835	23.810
Temperature @ Silica Gel Imp., (°F):	36.30	38.80	45.10	41.00
Vacuum @ Silica Gel/Pump,(in.Hg.):	1.330	2.400	2.000	4.000
Volume H2O @ Silica Gel,(gm):	1.56	9.69	13.41	13.53
Condensed H2O @ Impingers,(ml.):	117.0	634.0	616.0	570.0
Total Vol. H2O Collected,(ml.):	118.56	643.69	629.41	583.53

FLUE GAS MOL. WT. & FLOWRATE DATA

Area of Flue, (sq. ft.):	21.65	21.65	21.65	21.65
Pres., Duct, Static, (in. w.g.):	0.00	0.00	0.00	0.00
Pitobe ID #:	60-1	60-1	60-1	60-1
Pitot ID #:	60-1	60-1	60-1	60-1
Pitot Side ID #:	A	A	A	A
Pitot Coef., (Cp):	0.840	0.840	0.840	0.840
Density of Flue Gas, (lb/cf):	0.0647	0.0644	0.0648	0.0665
Molecular Weight, wet:	24.980	24.868	25.032	25.672

PARTICULATE SAMPLING DATA

Isokinetic Sampling Rate, Final,(%):	139.59	103.82	93.58	97.80
" Point-by-Point, (Avg., %):	172.95	91.60	94.50	104.30
" Point-by-Point, (High, %):	240.00	181.80	127.20	118.60
" Point-by-Point, (Low, %):	105.90	42.50	34.10	94.70
Filter A ID #:	7479	7482	7486	7487
B ID #:	N/A	N/A	N/A	N/A
Nozzle ID #:	9.2	10.2	10.2	10.2
Nozzle Diameter, (in.):	0.28040	0.30100	0.30100	0.30100
Orifice Factor, Del. Ha, (in. w.g.):	0.940	0.940	0.940	0.940
Sampling Rate Factor, (K3):	1.75	1.52	1.50	1.62

HOLLY SUGAR CORPORATION
SIDNEY, MT FACTORY
OPERATING CONDITIONS

11/10/93

SUMMARY

PULP DRYERS

<u>Pulp Dryer No. 1 (South)</u>	<u>TONS WET PULP PER HOUR INPUT</u>	<u>*galbns per hour Fuel Oil Consum</u>
10-21-93 RUNS 5101 thru 6101	24	275*
10-22-93 RUNS 5102 thru 6104	25	275*
<u>Pulp Dryer No. 2 (North)</u>		
10-23-93 RUNS 7101 thru 8103	25	275*

* Data were collected of fuel oil consumed during testing by monitoring elevation changes in the fuel oil storage tank, temperature of the tank, and fuel oil deliveries. All testing was performed with only one unit (2 union boilers + 2 pulp dryers) on fuel oil in an attempt to get accurate information. But calculated fuel oil consumption was highly variable though the process ran steady. Our best estimate of fuel oil consumed is based on recent data on Dryer No. 2 (North) over a number of days of operation with no other units on fuel oil. They had been averaging approx. 275 gph at $\approx$ 225 TPH slice rate. The same method of tank measurement was employed, but over periods of days rather than hours. Testing was performed at 220 to 224 TPH slice.

Filename: BEET13.WQ1

Date: 23-Jan-95

Facility: Holly Sugar Corporation

Location: Sidney, Montana

Source: #6 fuel oil-fired pulp dryer with dry scrubber w/skimmer fan and cyclone

Test date: October 19-23, 1993

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	212.8	208.4	207.2	
Northeast pulp dryer	Pressure	in. HG	27.825	27.82	27.85	
	Moisture	%	38.5	38.86	42.53	
	Oxygen	%	17.09	15.36	16.59	
	Volumetric flow, actual	acfm	38539	33209	34041	
	Volumetric flow, standard*	dscfm	17298	14913	14411	0
	Isokinetic variation	%	104.32	98.97	101.53	
Wet Pulp Feed Rate To Dryer		TPH	25	25	25	
Pollutant concentrations:						
	Total PM	G/dscf	0.0876	0.068	0.1204	
	Total PM-10	G/dscf	0.0651	no data	no data	
	Filterable PM	G/dscf	0.0609	0.0596	0.0868	
	Condensable inorganic PM	G/dscf	0.0267	0.0084	0.0336	
	CO2	% dv	4.08	4.88	4.26	
	SO2	ppmdv	34.09	70.96	39.93	
Pollutant mass flux rates:						
	Total PM	lb/hr	13.0	8.69	14.9	
	Total PM-10	lb/hr	9.65	no data	no data	
	Filterable PM	lb/hr	9.03	7.62	10.72	
	Condensable inorganic PM	lb/hr	3.96	1.07	4.15	
	CO2	lb/hr	4837	4988	4207	
	SO2	lb/hr	5.88	10.56	5.74	
Emission factors (ENGLISH UNITS):						AVERAGE
	Total PM	lb/ton	0.520	0.348	0.595	0.487
	Total PM-10	lb/ton	0.386	no data	no data	
	Filterable PM	lb/ton	0.361	0.305	0.429	0.365
	Condensable inorganic PM	lb/ton	0.158	0.043	0.166	0.122
	Filterable PM-10	lb/ton	0.228	no data	no data	
	CO2	lb/ton	193	200	168	187
	SO2	lb/ton	0.235	0.422	0.230	0.296
Emission factors (METRIC UNITS):						AVERAGE
	Total PM	kg/Mg	0.260	0.174	0.297	0.244
	Total PM-10	kg/Mg	0.193	no data	no data	
	Filterable PM	kg/Mg	0.181	0.152	0.214	0.182
	Condensable inorganic PM	kg/Mg	0.0792	0.0215	0.0830	0.0612
	Filterable PM-10	kg/Mg	0.114	no data	no data	
	CO2	kg/Mg	96.7	99.8	84.1	93.5
	SO2	kg/Mg	0.118	0.211	0.115	0.148

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

TOTAL EMISSION FACTORS--NORTHEAST AND NORTHWEST STACKS

Emission factors (ENGLISH UNITS):						AVERAGE
	Total PM	lb/ton	1.1	0.95	1.2	1.1
	*Total PM-10	lb/ton	0.77	0.72	0.67	0.72
	Filterable PM	lb/ton	0.63	0.77	0.91	0.77
	Condensable inorganic PM	lb/ton	0.42	0.19	0.26	0.29
	Filterable PM-10	lb/ton	0.46	0.54	0.40	0.47
	CO2	lb/ton	363	435	366	388
	SO2	lb/ton	0.47	0.95	0.47	0.63
Emission factors (METRIC UNITS):						AVERAGE
	Total PM	kg/Mg	0.53	0.48	0.58	0.53
	*Total PM-10	kg/Mg	0.39	0.36	0.33	0.36
	Filterable PM	kg/Mg	0.32	0.38	0.45	0.38
	Condensable inorganic PM	kg/Mg	0.21	0.093	0.13	0.15
	Filterable PM-10	kg/Mg	0.23	0.27	0.20	0.23
	CO2	kg/Mg	182	218	183	194
	SO2	kg/Mg	0.23	0.47	0.23	0.31

*TOTAL PM-10 DOES NOT INCLUDE CONDENSIBLE ORGANIC PM

Filename: BEET13A.WQ1

Date: 08-Dec-94

Facility: Holly Sugar Corporation

Location: Sidney, Montana

Source: #6 fuel oil-fired pulp dryer with dry scrubber w/skimmer fan and cyclone

Test date: October 19-23, 1993

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	216.1	225.9	234.1	
Northwest pulp dryer	Pressure	in. HG	27.825	27.82	27.85	
	Moisture	%	34.35	34.92	32.98	
	Oxygen	%	15.68	15.49	16.16	
	Volumetric flow, actual	acfm	31428	39979	38709	
	Volumetric flow, standard*	dscfm	14985	18623	18369	0
	Isokinetic variation	%	88.41	98.97	97.37	
Wet Pulp Feed Rate To Dryer		TPH	25	25	25	
Pollutant concentrations:						
	Total PM	G/dscf	0.1039	0.0946	0.0908	
	Total PM-10	G/dscf	ND	0.0567	0.0529	
	Filterable PM	G/dscf	0.0524	0.0724	0.0755	
	Condensable inorganic PM	G/dscf	0.0515	0.0222	0.0153	
	Filterable PM-10	G/dscf	ND	0.0345	0.0376	
	CO2	% dv	4.15	4.6	3.93	
	SO2	ppmdv	39.1	70.56	32.44	
Pollutant mass flux rates:						
	Total PM	lb/hr	13.3	15.10	14.3	
	Total PM-10	lb/hr	ND	9.05	8.33	
	Filterable PM	lb/hr	6.73	11.56	11.89	
	Condensable inorganic PM	lb/hr	6.61	3.54	2.41	
	Filterable PM-10	lb/hr	ND	5.51	5.92	
	CO2	lb/hr	4262	5871	4948	
	SO2	lb/hr	5.84	13.11	5.94	
Emission factors (ENGLISH UNITS):						AVERAGE
	Total PM	lb/ton	0.534	0.604	0.572	0.570
	Total PM-10	lb/ton	ND	0.362	0.333	0.348
	Filterable PM	lb/ton	0.269	0.462	0.476	0.402
	Condensable inorganic PM	lb/ton	0.265	0.142	0.096	0.168
	Filterable PM-10	lb/ton	ND	0.220	0.237	0.229
	CO2	lb/ton	170	235	198	201
	SO2	lb/ton	0.234	0.524	0.238	0.332
Emission factors (METRIC UNITS):						AVERAGE
	Total PM	kg/Mg	0.267	0.302	0.286	0.285
	Total PM-10	kg/Mg	ND	0.181	0.167	0.174
	Filterable PM	kg/Mg	0.135	0.231	0.238	0.201
	Condensable inorganic PM	kg/Mg	0.1323	0.0709	0.0482	0.0838
	Filterable PM-10	kg/Mg	ND	0.110	0.118	0.114
	CO2	kg/Mg	85.2	117.4	99.0	100.5
	SO2	kg/Mg	0.117	0.262	0.119	0.166

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

Filename: BEET13B.WQ1
 Date: 01-Feb-95
 Facility: Holly Sugar Corporation
 Location: Sidney, Montana
 Source: #6 fuel oil-fired pulp dryer with dry scrubber w/skimmer fan and cyclone
 Test date: October 19-23, 1993

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	222.5	219.4	213.4	211.8
Southeast pulp dryer	Pressure	in. HG	27.92	27.915	27.835	27.81
	Moisture	%	41.1	37.27	27.34	42.44
	Oxygen	%	14.17	14.1	13.92	13.57
	Volumetric flow, actual	acfm	33584	48757	39378	38003
	Volumetric flow, standard*	dscfm	14280	22177	20871	15980
	Isokinetic variation	%	133.75	90.19	47.3	107.13
Wet Pulp Feed Rate To Dryer		TPH	24	25	25	25
Pollutant concentrations:						
	Total PM	G/dscf	0.1582	0.2133	0.1089	0.1372
	Total PM-10	G/dscf	0.0943	0.1494	ND	ND
	Filterable PM	G/dscf	0.1306	0.1281	0.0705	0.1047
	Condensable inorganic PM	G/dscf	0.0276	0.0852	0.0384	0.0325
	Filterable PM-10	G/dscf	0.0667	0.0642	ND	ND
	CO2	% dv	5.32	5.2	5.57	6.18
	SO2	ppmdv	71.31	72.19	88.02	82.43
Pollutant mass flux rates:						
	Total PM	lb/hr	19.4	40.55	19.5	18.8
	Total PM-10	lb/hr	11.54	28.40	ND	ND
	Filterable PM	lb/hr	15.99	24.35	12.61	14.34
	Condensable inorganic PM	lb/hr	3.38	16.20	6.87	4.45
	Filterable PM-10	lb/hr	8.16	12.20	ND	ND
	CO2	lb/hr	5207	7903	7967	6768
	SO2	lb/hr	10.16	15.97	18.33	13.14
Emission factors (ENGLISH UNITS):						AVERAGE
	Total PM	lb/ton	void	1.62	void	0.752
	Total PM-10	lb/ton	void	1.136	void	ND
	Filterable PM	lb/ton	void	0.974	void	0.574
	Condensable inorganic PM	lb/ton	void	0.648	void	0.178
	Filterable PM-10	lb/ton	void	0.488	void	ND
	CO2	lb/ton	void	316	void	271
	SO2	lb/ton	void	0.639	void	0.526
Emission factors (METRIC UNITS):						AVERAGE
	Total PM	kg/Mg	void	0.811	void	0.376
	Total PM-10	kg/Mg	void	0.568	void	ND
	Filterable PM	kg/Mg	void	0.487	void	0.287
	Condensable inorganic PM	kg/Mg	void	0.324	void	0.0890
	Filterable PM-10	kg/Mg	void	0.244	void	ND
	CO2	kg/Mg	void	158	void	135
	SO2	kg/Mg	void	0.319	void	0.263

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

Run 1 and 3 PM measurements are void because of isokinetics.

TOTAL EMISSION FACTORS FOR SOUTHEAST AND SOUTHWEST STACKS

Emission factors (ENGLISH UNITS):						AVERAGE
	Total PM	lb/ton	void	2.2	2.2	1.8
	*Total PM-10	lb/ton	void	2.3	1.5	1.4
	Filterable PM	lb/ton	void	1.4	1.8	1.4
	Condensable inorganic PM	lb/ton	void	0.80	0.38	0.46
	Filterable PM-10	lb/ton	void	1.5	1.1	0.97
	CO2	lb/ton	void	567	532	618
	SO2	lb/ton	void	1.2	1.2	1.1
Emission factors (METRIC UNITS):						AVERAGE
	Total PM	kg/Mg	void	1.1	1.1	0.92
	*Total PM-10	kg/Mg	void	1.1	0.73	0.71
	Filterable PM	kg/Mg	void	0.69	0.89	0.69
	Condensable inorganic PM	kg/Mg	void	0.40	0.19	0.23
	Filterable PM-10	kg/Mg	void	0.74	0.54	0.48
	CO2	kg/Mg	void	283	266	309
	SO2	kg/Mg	void	0.62	0.62	0.57

*TOTAL PM-10 DOES NOT INCLUDE CONDENSABLE ORGANIC PM IN THIS TEST

Filename: BEET13C.WQ1

Date: 01-Feb-95

Facility: Holly Sugar Corporation

Location: Sidney, Montana

Source: #6 fuel oil-fired pulp dryer with dry scrubber w/skimmer fan and cyclone

Test date: October 19-23, 1993

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported				
			Run 1	Run 2	Run 3	Run 4	
1	Stack temperature	Deg F	248.7	235.9	238.4	235.4	
Southwest pulp dryer	Pressure	in. HG	27.915	27.925	27.835	27.81	
	Moisture	%	39.08	39.88	38.51	33.7	
	Oxygen	%	14.12	14.08	14.37	13.7	
	Volumetric flow, actual	acfm	29735	40999	42701	43148	
	Volumetric flow, standard*	dscfm	12591	17455	18467	20189	
	Isokinetic variation	%	139.59	103.82	93.58	97.8	
Wet Pulp Feed Rate To Dryer		TPH	24	25	25	25	
Pollutant concentrations:							
	Total PM	G/dscf	0.1276	0.0916	0.1709	0.1585	
	Total PM-10	G/dscf	ND	ND	0.1154	0.103	
	Filterable PM	G/dscf	0.0431	0.0666	0.1409	0.1179	
	Condensible inorganic PM	G/dscf	0.0845	0.0250	0.0300	0.0406	
	Filterable PM-10	G/dscf	ND	ND	0.0854	0.0624	
	CO2	% dv	5.45	5.24	5.25	6.27	
	SO2	ppmdv	72.5	86.83	84.48	75.17	
Pollutant mass flux rates:-							
	Total PM	lb/hr	void	13.70	27.1	27.4	
	Total PM-10	lb/hr	void	ND	18.3	17.8	
	Filterable PM	lb/hr	void	9.96	22.3	20.4	
	Condensible inorganic PM	lb/hr	void	3.74	4.75	7.03	
	Filterable PM-10	lb/hr	void	ND	13.5	10.8	
	CO2	lb/hr	void	6268	6645	8675	
	SO2	lb/hr	void	15.1	15.6	15.1	
Emission factors (ENGLISH UNITS):						AVERAGE	
	Total PM	lb/ton	void	0.548	1.082	1.097	0.909
	Total PM-10	lb/ton	void	ND	0.731	0.713	0.722
	Filterable PM	lb/ton	void	0.399	0.892	0.816	0.702
	Condensible inorganic PM	lb/ton	void	0.150	0.190	0.281	0.207
	Filterable PM-10	lb/ton	void	ND	0.541	0.432	0.486
	CO2	lb/ton	void	251	266	347	288
	SO2	lb/ton	void	0.605	0.623	0.606	0.611
Emission factors (METRIC UNITS):						AVERAGE	
	Total PM	kg/Mg	void	0.274	0.541	0.549	0.455
	Total PM-10	kg/Mg	void	ND	0.365	0.356	0.361
	Filterable PM	kg/Mg	void	0.199	0.446	0.408	0.351
	Condensible inorganic PM	kg/Mg	void	0.0748	0.0950	0.141	0.103
	Filterable PM-10	kg/Mg	void	ND	0.270	0.216	0.243
	CO2	kg/Mg	void	125	133	174	144
	SO2	kg/Mg	void	0.302	0.311	0.303	0.305

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT
Run 1 PM measurements are void because of isokinetics.

APPENDIX N

REPORT EXCERPTS FROM REFERENCE 14

(Holly Sugar Corporation, June 1991)

**EMISSION PERFORMANCE TESTING
OF FOUR BOILERS,
THREE DRYERS AND ONE COOLER**

Book 1 of 2

SITE: HOLLY SUGAR CORPORATION
Santa Maria, California

DATE: JUNE 1991

Prepared For:

HOLLY SUGAR CORPORATION
2820 W. Betteravia Road
Santa Maria, California 93455

Contact: Ralph Medema
(805) 925-8633

Prepared By:

THOMAS ROONEY
(213) 540-4676

WESTERN ENVIRONMENTAL SERVICES
1010 South Pacific Coast Highway
Redondo Beach, California 90277

TABLE 2.14 CONTINUOUS MONITORING DATA

SITE: HOLLY SUGAR

UNIT: DRYER #1

DATE: JUNE 13, 1991

TIME	FUNCTION	NOx ppm	O(2) %	CO ppm	CO(2) %	SO(2) ppm	NOx (1) ppm	CO (1) ppm
825	System Check	Vacuum Check						
828	Zero	0	0.04	1	0.36	0		
	Mid	94.7	5.20	233	4.36	19		
	High	222	15	495	10	51.1		
1021	Test #1							
1119	Average 58 min	88	14.00	360	4.90	0	227.36	930
1124	Zero	1	0.03	1	0.39	0.6		
	Mid	93.4	5.21	226.8	4.59	19.3		
	High	220	14.62	496	10.32	50.9		
1348	Test #2							
1428	Average 40 min	70	15.77	126	4.50	0	241.66	436
1433	Zero	-1	0.06	-1	0.41	0.5		
	Mid	93	5.12	228	4.66	20.1		
	High	219.2	14	496.3	10	51.2		
1521	Test #3							
1627	Average 66 min	75	15.30	160	4.80	0	238.07	509
1642	Zero	-2	0.04	-2	0.40	0.1		
	Mid	93.6	5.09	231.4	5.14	18.9		
	High	219	14.32	501	10.10	50.2		
1718	System - -	Vacuum Check						
Span Gases								
NOx, ppm		220.7, 94.3						
CO, ppm		230.7, 500						
O(2), %		14.51, 5.11						
CO(2), %		10.34, 4.40						
SO(2), ppm		19.54, 51.7						

* NOx (1) and CO (1) - values corrected to 3% oxygen.

TABLE 2.14a HYDROCARBON TEST DATA

SITE: Dryer #3

DATE: June 11, 1991

DATE ANALYZED: June 13, 1991

DRYER #1
June 13, 1991?

Standards	RT	Area	ppm
C1	0.8	31963	21.5
C2	1.277	51659	21.4
C3	2.32	79668	21.4
C4	5.08	106031	21.6
C5	11.93	122802	20.9
C6	15.8	6789	21.0

Test #1	Area	Concentration	Test #2	Area	Concentration
C1	26978	18.15	C1	11877	7.99
C2	28395	11.76	C2	29504	12.22
C3	9399	2.52	C3	3613	0.97
C4	0	0.00	C4	0	0.00
C5	0	0.00	C5	0	0.00
C6	0	0.00	C6	0	0.00

Test #3	Area	Concentration	Average	Concentration
C1	7949	5.35	C1	10.49
C2	25294	10.48	C2	11.49
C3	12838	3.45	C3	2.31
C4	0	0.00	C4	0.00
C5	0	0.00	C5	0.00
C6	0	0.00	C6	0.00

TABLE 2.15 PARTICULATE SAMPLING

SITE: Holly Sugar Dryer #1

DATE: June 13, 1991

STACK PARAMETERS	TEST 1	TEST 2	TEST 3	AVERAGE
Barometric Pressure °Hg	29.95	29.95	29.95	29.95
Static Pressure °H2O	-0.70	-0.70	-0.70	-0.70
CO2 %	4.90	4.50	4.80	4.73
O2 %	14.00	15.77	15.30	15.02
N2 %	81.1	79.73	79.9	80.24
CO ppm	360	126	160	215.33
Stack Diameter "	39.5	39.5	39.5	39.50
Stack Temperature F	242	219	218	226.33
Stack Pressure °Hg	29.90	29.90	29.90	29.90
TEST CONDITIONS	TEST 1	TEST 2	TEST 3	AVERAGE
Sample Volume Ft3	40.899	40.595	38.904	40.13
Meter F	72	81	74	75.67
Nozzle Dia "	0.245	0.245	0.245	0.25
Time Min	60	60	60	60.00
Points	24	24	24	24.00
Pitot Tube Factor cp	0.84	0.84	0.84	0.84
Orifice Press °H2O	1.74	1.69	1.57	1.67
Condensate mls	483	388	368	413.00
Velocity Pressure °H2O	1.015	0.938	0.88	0.94
Meter Calibration	1.02	1.02	1.02	1.02
TEST CALCULATIONS	TEST 1	TEST 2	TEST 3	AVERAGE
Water Vapor SDCF	22.411	18.003	17.075	19.16
Gas Sampled SDCF	40.992	40.006	38.830	39.94
Moisture %	35.35	31.04	30.54	32.31
Molecular Weight Dry	29.34	29.35	29.38	29.36
Molecular Weight Wet	25.33	25.83	25.90	25.69
Gas Velocity F/Sec	69.65	65.22	63.03	65.97
Flow Rate ACFM	35562	33299	32182	33681
Flow Rate DSCFM	17019	17574	17131	17242
Isokinetics %	102.8	97.2	96.8	98.92

TABLE 2.15a PARTICULATE ANALYSIS

SITE: Holly Sugar Dryer #1

DATE: June 13, 1991

ANALYTICAL DATA	TEST 1	TEST 2	TEST 3	AVERAGE
FRONT HALF				
Probe mg	343.3	541.8	258.0	381.03
Filter mg	72.4	47.2	54.7	58.10
Blanks mg	0.5	0.5	0.5	0.50
Subtotal mg	415.2	588.5	312.2	438.63
BACK HALF				
Impingers Inorg mg	137.9	56.8	32.1	75.60
Impingers Org mg	94.1	1.3	0.0	31.80
Blank mg	0.5	0.5	0.5	0.50
Subtotal mg	231.5	57.6	31.6	106.90
Total Weight Gain mg	646.7	646.1	343.8	545.53
EMISSION DATA	TEST 1	TEST 2	TEST 3	AVERAGE
FRONT HALF				
Grs/SDCF	0.1563	0.2270	0.1241	0.1691
Lbs/Hr	22.782	34.167	18.203	25.051
BACK HALF				
Grs/SDCF	0.0871	0.0222	0.0126	0.0406
Lbs/Hr	12.702	3.344	1.842	5.963
TOTAL EMISSIONS	TEST 1	TEST 2	TEST 3	AVERAGE
Grs/SDCF	0.2434	0.2492	0.1366	0.2097
Lbs/Hrs	35.484	37.511	20.046	31.014

TABLE 2.16 O2 TRAVERSE

SITE: Holly Sugar
 UNIT: Dryer #1
 DATE: June 13, 1991

LOCATION		NOx	O(2)	CO	CO(2)	SO(2)
POINT	TIME	ppm	%	ppm	%	ppm
SE PORT						
1	1522	70.0	15.25	160	4.50	0
2	1527	70.0	15.00	180	5.10	0
3	1532	70.0	15.75	150	4.65	0
4	1538	72.5	15.25	150	4.80	0
5	1545	73.0	15.75	120	4.50	0
6	1553	72.5	15.50	140	4.70	0
SW PORT						
1	1556	72.5	14.75	150	5.30	0
2	1601	75.0	15.25	150	4.50	0
3	1606	70.0	14.80	200	5.10	0
4	1611	72.5	15.00	180	5.00	0
5	1617	71.0	15.25	160	4.95	0
6	1625	69.5	15.50	150	4.65	0
AVERAGE		71.5	15.3	157.5	4.8	0.0
Span Gases						
NOx, ppm		197.6, 896				
CO, ppm		230.7, 946				
O(2), %		14.51, 7.44				
CO(2), %		10.34, 8.40				
SO(2), ppm		51.7, 89				

TABLE 2.17 CONTINUOUS MONITORING DATA

SITE: HOLLY SUGAR

UNIT: DRYER #2

DATE: JUNE 12, 1991

TIME	FUNCTION	NOx ppm	O(2) %	CO ppm	CO(2) %	SO(2) ppm	NOx (1) ppm	CO (1) ppm
820	System Check	Vacuum Check						
825	Zero	0	0.06	1	0.40	-0.1		
	Mid	94.4	5.14	229	5.21	19.2		
	High	198	14	948	10	50.9		
1019	Test #1							
1120	Average 61 min	50	16.03	200	4.20	0	182.53	730
1122	Zero	1	0.05	-1	0.38	0.1		
	Mid	93.8	5.06	223.7	4.68	20.3		
	High	194	14.16	947	10.32	51.4		
1214	Test #2							
1312	Average 58 min	46	16.81	205	2.31	0	197.42	889
1315	Zero	1	0.06	-2	0.39	0.1		
	Mid	96	5.07	225	4.54	19.5		
	High	219.9	14	510.3	11	52.7		
1604	Test #3							
1650	Average 46 min	51	15.79	200	4.63	0	175.77	696
1655	Zero	2	0.06	-1	0.40	0.1		
	Mid	94.4	5.14	223.7	4.41	19.2		
	High	219	14.36	500	9.65	51.2		
1716	System	Vacuum Check						
Span Gases								
NOx, ppm		220.7, 94.3, 197.6						
CO, ppm		230.7, 500, 946						
O(2), %		14.51, 5.11						
CO(2), %		10.34, 4.40						
SO(2), ppm		51.7, 19.54						

* NOx (1) and CO (1) - values corrected to 3% oxygen.

TABLE 2.17a HYDROCARBON TEST DATA

SITE: Dryer #2

DATE: June 12, 1991

DATE ANALYZED: June 13, 1991

Standards	RT	Area	ppm
C1	0.695	8573	21.5
C2	1.11	33018	21.4
C3	2.04	57788	21.4
C4	4.45	68045	21.6
C5	10.47	80451	20.9
C6	14.97	6578	21.0

Test #1	Area	Concentration	Test #2	Area	Concentration
C1	12107	30.36	C1	3878	9.73
C2	6096	3.95	C2	12913	8.37
C3	16566	6.13	C3	21096	7.81
C4	8802	2.79	C4	15591	4.95
C5	0	0.00	C5	0	0.00
C6	0	0.00	C6	0	0.00

Test #3	Area	Concentration	Average	Concentration
C1	2581	6.47	C1	15.52
C2	9476	6.14	C2	6.15
C3	27316	10.12	C3	8.02
C4	14288	4.54	C4	4.09
C5	0	0.00	C5	0.00
C6	0	0.00	C6	0.00

TABLE 2.18 PARTICULATE SAMPLING

SITE: Holly Sugar Dryer #2

DATE: June 12, 1991

STACK PARAMETERS	TEST 1	TEST 2	TEST 3	AVERAGE
Barometric Pressure "Hg	29.95	29.95	29.95	29.95
Static Pressure "H2O	-0.65	-0.65	-0.65	-0.65
CO2 %	4.20	2.31	4.63	3.71
O2 %	16.03	16.81	15.79	16.21
N2 %	79.77	80.88	79.58	80.08
CO ppm	200	205	200	201.67
Stack Diameter "	39.5	39.5	39.5	39.50
Stack Temperature F	245	246	245	245.33
Stack Pressure "Hg	29.90	29.90	29.90	29.90
TEST CONDITIONS	TEST 1	TEST 2	TEST 3	AVERAGE
Sample Volume Ft3	36.765	36.051	36.476	36.43
Meter F	71	73	74	72.67
Nozzle Dia "	0.245	0.245	0.245	0.25
Time Min	60	60	60	60.00
Points	24	24	24	24.00
Pitot Tube Factor cp	0.84	0.84	0.84	0.84
Orifice Press "H2O	1.42	1.36	1.44	1.41
Condensate mls	312	288	289	296.33
Velocity Pressure "H2O	0.773	0.806	0.825	0.80
Meter Calibration	1.02	1.02	1.02	1.02
TEST CALCULATIONS	TEST 1	TEST 2	TEST 3	AVERAGE
Water Vapor SDCF	14.864	13.720	13.768	14.12
Gas Sampled SDCF	36.889	36.032	36.395	36.44
Moisture %	28.72	27.58	27.45	27.91
Molecular Weight Dry	29.31	29.04	29.37	29.24
Molecular Weight Wet	26.06	26.00	26.25	26.10
Gas Velocity F/Sec	60.05	61.44	61.81	61.10
Flow Rate ACFM	30661	31371	31562	31198
Flow Rate DSCFM	16110	16724	16880	16571
Isokinetics %	97.8	92.0	92.0	93.93

TABLE 2.18a PARTICULATE ANALYSIS

SITE: Holly Sugar Dryer #2

DATE: June 12, 1991

ANALYTICAL DATA	TEST 1	TEST 2	TEST 3	AVERAGE
FRONT HALF				
Probe mg	162.6	193.1	153.8	169.83
Filter mg	55.3	43.4	9.9	36.20
Blanks mg	0.5	0.5	0.5	0.50
Subtotal mg	217.4	236.0	163.2	205.53
BACK HALF				
Impingers Inorg mg	91.2	65.1	27.4	61.23
Impingers Org mg	2.0	1.0	1.6	1.53
Blank mg	0.5	0.5	0.5	0.50
Subtotal mg	92.7	65.6	28.5	62.27
Total Weight Gain mg	310.1	301.6	191.7	267.80
EMISSION DATA	TEST 1	TEST 2	TEST 3	AVERAGE
FRONT HALF				
Grs/SDCF	0.0909	0.1011	0.0692	0.0871
Lbs/Hr	12.548	14.476	10.003	12.342
BACK HALF				
Grs/SDCF	0.0388	0.0281	0.0121	0.0263
Lbs/Hr	5.350	4.024	1.747	3.707
TOTAL EMISSIONS	TEST 1	TEST 2	TEST 3	AVERAGE
Grs/SDCF	0.1297	0.1292	0.0813	0.1134
Lbs/Hrs	17.898	18.500	11.750	16.050

TABLE 2.19 O2 TRAVERSE

SITE: Holly Sugar
 UNIT: Dryer #2
 DATE: June 12, 1991

LOCATION POINT	TIME	NOx ppm	O(2) %	CO ppm	CO(2) %	SO(2) ppm
SW PORT						
1	1020	60.0	15.00	190	4.35	0
2	1023	50.5	14.00	290	4.50	0
3	1025	50.7	14.20	270	4.80	0
4	1027	50.7	14.20	270	4.65	0
5	1030	60.0	14.10	280	4.95	0
6	1033	50.5	14.50	260	4.80	0
SE PORT						
1	1036	45.0	15.00	250	4.00	0
2	1045	50.0	15.00	140	4.00	0
3	1054	34.0	15.25	200	3.80	0
4	1103	50.0	15.10	120	3.80	0
5	1110	47.0	15.50	200	3.00	0
6	1119	35.0	15.75	250	3.20	0
AVERAGE		48.6	14.8	226.7	4.2	0.0
Span Gases						
NOx, ppm		197.6, 896				
CO, ppm		230.7, 946				
O(2), %		14.51, 7.44				
CO(2), %		10.34, 8.40				
SO(2), ppm		51.7, 99				

TABLE 2.20 CONTINUOUS MONITORING DATA

SITE: HOLLY SUGAR

UNIT: DRYER #3

DATE: JUNE 11, 1991

TIME	FUNCTION	NOx ppm	O(2) %	CO ppm	CO(2) %	SO(2) ppm	NOx (1) ppm	CO (1) ppm
750	System Check	Vacuum Check						
755	Zero	0.00	0.06	0	0.52	0.4		
	Mid	96.20	5.11	227	4.68	20.6		
	High	197	14.37	940	11	51.4		
1052	Test #1							
1158	Average 66 min	61	13.90	230	4.10	0	155.62	586
1202	Zero	-3	0.09	-2	0.42	0		
	Mid	95.8	5.07	224.6	4.88	52.4		
	High	197	14.21	947	10.80	98.5		
1308	Test #2							
1404	Average 56 min	61	13.90	230	4.10	0	155.62	586
1406	Zero	-3	0.04	0	0.42	-0.4		
	Mid	96	5.11	229	4.92	51.2		
	High	199.9	14	947.1	11	93.7		
1544	Test #3							
1655	Average 71 min	69	13.97	250	6.10	0	177.50	643
1657	Zero	-2	0.09	-1	0.45	-0.2		
	Mid	92.3	5.05	227.6	5.5	51.4		
	High	197	14.17	947	10.15	96		
1725	System	Vacuum Check						
Span Gases								
NOx, ppm		94.3, 197.6						
CO, ppm		230.7, 946						
O(2), %		14.51, 5.11						
CO(2), %		10.34, 4.40						
SO(2), ppm		51.7, 99						

* NOx (1) and CO (1) - values corrected to 3% oxygen.

TABLE 2.20a HYDROCARBON TEST DATA

SITE: Dryer #3

DATE: June 11, 1991

DATE ANALYZED: June 13, 1991

Standards	RT	Area	ppm
C1	0.695	8573	21.5
C2	1.11	33018	21.4
C3	2.04	57788	21.4
C4	4.45	68045	21.6
C5	10.47	80451	20.9
C6	14.97	6578	21.0

Test #1	Area	Concentration	Test #2	Area	Concentration
C1	4618	11.58	C1	7599	19.06
C2	21866	14.17	C2	22772	14.76
C3	13135	4.86	C3	11236	4.16
C4	28332	8.99	C4	13400	4.25
C5	0	0.00	C5	0	0.00
C6	0	0.00	C6	0	0.00

Test #3	Area	Concentration	Average	Concentration
C1	6474	16.24	C1	15.62
C2	22739	14.74	C2	14.56
C3	16886	6.25	C3	5.09
C4	15257	4.84	C4	6.03
C5	0	0.00	C5	0.00
C6	0	0.00	C6	0.00

TABLE 2.21 PARTICULATE SAMPLING

SITE: Holly Sugar Dryer #3

DATE: June 11, 1991

STACK PARAMETERS	TEST 1	TEST 2	TEST 3	AVERAGE
Barometric Pressure "Hg	28.90	28.90	28.90	28.90
Static Pressure "H2O	-0.07	-0.07	-0.07	-0.07
CO2 %	4.10	4.10	6.10	4.77
O2 %	13.90	13.90	13.97	13.92
N2 %	82	82	79.93	81.31
CO ppm	230	230	250	236.67
Stack Diameter "	39.5	39.5	39.5	39.50
Stack Temperature F	225	216	212	217.67
Stack Pressure "Hg	28.89	28.89	28.89	28.89
TEST CONDITIONS	TEST 1	TEST 2	TEST 3	AVERAGE
Sample Volume Ft3	26.700	32.951	33.485	31.05
Meter F	85	91	83	86.33
Nozzle Dia "	0.2	0.245	0.245	0.23
Time Min	60	60	60	60.00
Points	24	24	24	24.00
Pitot Tube Factor cp	0.84	0.84	0.84	0.84
Orifice Press "H2O	0.66	1.08	1.17	0.97
Condensate mls	193	223	316	244.00
Velocity Pressure "H2O	0.595	0.507	0.544	0.55
Meter Calibration	1.02	1.02	1.02	1.02
TEST CALCULATIONS	TEST 1	TEST 2	TEST 3	AVERAGE
Water Vapor SDCF	8.955	10.347	14.662	11.32
Gas Sampled SDCF	25.142	30.722	31.688	29.18
Moisture %	26.26	25.19	31.63	27.70
Molecular Weight Dry	29.21	29.21	29.53	29.32
Molecular Weight Wet	26.27	26.39	25.89	26.18
Gas Velocity Ft/Sec	52.62	48.15	50.20	50.32
Flow Rate ACFM	26869	24583	25634	25695
Flow Rate DSCFM	14525	13661	13096	13761
Isokinetics %	110.9	96.0	103.3	103.40

TABLE 2.21a PARTICULATE ANALYSIS

SITE: Holly Sugar Dryer #3

DATE: June 11, 1991

ANALYTICAL DATA	TEST 1	TEST 2	TEST 3	AVERAGE
FRONT HALF				
Probe mg	292.9	286.0	258.9	279.27
Filter mg	22.5	41.4	68.0	43.97
Blanks mg	0.5	0.5	0.5	0.50
Subtotal mg	314.9	326.9	326.4	322.73
BACK HALF				
Impingers Inorg mg	12.0	11.8	17.7	13.83
Impingers Org mg	2.0	1.9	1.3	1.73
Blank mg	0.5	0.5	0.5	0.50
Subtotal mg	13.5	13.2	18.5	15.07
Total Weight Gain mg	328.4	340.1	344.9	337.80
EMISSION DATA	TEST 1	TEST 2	TEST 3	AVERAGE
FRONT HALF				
Grs/SDCF	0.1933	0.1642	0.1589	0.1721
Lbs/Hr	24.043	19.211	17.828	20.360
BACK HALF				
Grs/SDCF	0.0083	0.0066	0.0090	0.0080
Lbs/Hr	1.031	0.776	1.010	0.939
TOTAL EMISSIONS	TEST 1	TEST 2	TEST 3	AVERAGE
Grs/SDCF	0.2015	0.1708	0.1679	0.1801
Lbs/Hrs	25.073	19.986	18.838	21.299

TABLE 2.22 O2 TRAVERSE

SITE: Holly Sugar
 UNIT: Dryer #3
 DATE: June 11, 1991

LOCATION POINT	TIME	NOx ppm	O(2) %	CO ppm	CO(2) %	SO(2) ppm
SW PORT						
1	1053	94.0	14.30	190	4.65	0
2	1059	89.0	14.30	180	4.45	0
3	1105	84.0	14.30	185	4.35	0
4	1111	70.0	14.30	170	3.70	0
5	1117	64.0	14.90	120	3.30	0
6	1123	64.0	14.95	120	3.20	0
NE PORT						
1	1127	62.5	15.20	120	3.00	0
2	1132	62.5	15.25	98	3.00	0
3	1137	62.5	15.50	95	2.90	0
4	1142	63.0	15.75	90	2.80	0
5	1149	63.0	15.90	70	2.80	0
6	1157	63.0	16.00	60	2.70	0
AVERAGE		70.1	15.1	124.8	3.4	0.0
Span Gases						
NOx, ppm		197.6, 896				
CO, ppm		230.7, 946				
O(2), %		14.51, 7.44				
CO(2), %		10.34, 8.40				
SO(2), ppm		51.7, 99				

TABLE 2.23 PARTICULATE SAMPLING

SITE: Holly Sugar Cooler Stack

DATE: June 10, 1991

STACK PARAMETERS	TEST 1	TEST 2	TEST 3	AVERAGE
Barometric Pressure "Hg	29.80	29.80	29.80	29.80
Static Pressure "H2O	-0.50	-0.50	-0.50	-0.50
CO2 %	0.00	0.00	0.00	0.00
O2 %	20.90	20.90	20.90	20.90
N2 %	79.1	79.1	79.1	79.10
CO ppm	0	0	0	0.00
Stack Diameter "	61.5	61.5	61.5	61.50
Stack Temperature F	70	70	70	70.00
Stack Pressure "Hg	29.76	29.76	29.76	29.76
TEST CONDITIONS	TEST 1	TEST 2	TEST 3	AVERAGE
Sample Volume Ft3	36.88	35.279	35.149	35.77
Meter F	78	81	74	77.67
Nozzle Dia "	0.5	0.5	0.5	0.50
Time Min	60	60	60	60.00
Points	24	24	24	24.00
Pitot Tube Factor cp	0.84	0.84	0.84	0.84
Orifice Press "H2O	1.34	1.21	1.22	1.26
Condensate mls	20	19	18	19.00
Velocity Pressure "H2O	0.533	0.478	0.49	0.50
Meter Calibration	1.02	1.02	1.02	1.02
TEST CALCULATIONS	TEST 1	TEST 2	TEST 3	AVERAGE
Water Vapor SDCF	0.928	0.882	0.835	0.88
Gas Sampled SDCF	36.313	34.533	34.857	35.23
Moisture %	2.49	2.49	2.34	2.44
Molecular Weight Dry	28.84	28.84	28.84	28.84
Molecular Weight Wet	28.57	28.57	28.58	28.57
Gas Velocity Ft/Sec	41.39	39.20	39.68	40.09
Flow Rate ACFM	51234	48519	49110	49621
Flow Rate DSCFM	48758	46175	46809	47248
Isokinetics %	18.5	18.6	18.5	18.53

TABLE 2.23a PARTICULATE ANALYSIS

SITE: Holly Sugar Cooler Stack

DATE: June 10, 1991

ANALYTICAL DATA	TEST 1	TEST 2	TEST 3	AVERAGE
FRONT HALF				
Probe mg	261.3	72.6	65.9	133.27
Filter mg	3.1	8.2	7.7	6.33
Blanks mg	0.5	0.5	0.5	0.50
Subtotal mg	263.9	80.3	73.1	139.10
BACK HALF				
Impingers Inorg mg	2.6	1.5	1.2	1.77
Impingers Org mg	0.0	0.0	0.5	0.17
Blank mg	0.5	0.5	0.5	0.50
Subtotal mg	2.1	1.0	1.2	1.43
Total Weight Gain mg	266.0	81.3	74.3	140.53
EMISSION DATA	TEST 1	TEST 2	TEST 3	AVERAGE
FRONT HALF				
Grs/SDCF	0.1121	0.0359	0.0324	0.0601
Lbs/Hr	46.830	14.190	12.973	24.665
BACK HALF				
Grs/SDCF	0.0009	0.0004	0.0005	0.0006
Lbs/Hr	0.373	0.177	0.213	0.254
TOTAL EMISSIONS	TEST 1	TEST 2	TEST 3	AVERAGE
Grs/SDCF	0.1130	0.0363	0.0329	0.0607
Lbs/Hrs	47.203	14.367	13.186	24.919

BETTERAVIA BYPRODUCTS 24 HOUR SHIFT REPORT

DAY #49-Mon. DATE JUN 10 1991

20.0	PRESSED				PRESS		MOLASSES ON PULP	MOLASSES INVENTORY	
	BULK TOTAL	SMALL WHSE	LARGE WHSE	PELLET WHSE	PULP DUMPED	BY-PASS DRY SCALE		WATER OVERFLOW	PLANT TANK READINGS
STOP 8 AM	63005070	38528	374209	091122	0109517	19272.3	00776.0	15 FT 9 1/2 IN	77.0
MIDNIGHT	64987415	23625	374209	091122	0109517	19272.3	00776.0	15 FT 1 1/2 IN	80.0
4 PM	62977494	07868	374208	091122	0109517	19272.4	00776.0	15 FT 2 IN	80.0
8 AM	62958540	04387	374208	091122	0109448	19271.7	00776.0	13 FT 2 IN	69.0
TOTAL	469325	TONS PRODUCED					TOTAL USED		

NATURAL GAS METERS		SUGAR PLANT		BLOCK	
LARGE	SMALL	MAIN	WELLS	5	6
093953	898570	1935	8402	1689	0000
093953	898562	1796	8401	1689	0000
093953	898565	1796	8401	1689	0000
093953	898560	1776	8400	1689	0000

MOLASSES INVENTORY		STORAGE TANK READINGS		TONS	
6 FT	1/2 IN	6 FT	1/2 IN	6 FT	1/2 IN
6	7	6	7	6	7
6	7	6	7	6	7
6	7	6	7	6	7
6	7	6	7	6	7

MOLASSES INVENTORY		STORAGE TANK READINGS		TONS	
6 FT	1/2 IN	6 FT	1/2 IN	6 FT	1/2 IN
6	7	6	7	6	7
6	7	6	7	6	7
6	7	6	7	6	7
6	7	6	7	6	7

TIME	COMMENTS
	7 buckets from 2nd
	950 load
	4.025 TONS
12:10	1 load of Alumina 2' 4"
1:25	Alum Trench out 7' 7"
3:20	Chlorine hook on Auto

TRUCK #	TONS
940-13	25.10
920-059	28.51
920-055	28.19

TRUCK #	TONS
940-13	25.10
920-059	28.51
920-055	28.19

OIL TEMPERATURE 148.66°
 PRESSED PULP MOISTURE 75.3375%
 DRY BULK MOISTURE 10.158%

ALUMINUM SULFATE @ \$0.077/LB 8,812.5 LBS

BULK	TONS
274.14	
LIME	TONS
113.70	

000027

BETTERAVIA BYPRODUCTS 24 HOUR SHIFT REPORT

DAY #51-Wed. DATE: JUN 12 1991

MOLASSES ON PULP	MOLASSES INVENTORY PLANT TANK READINGS	TONS
491.8910	14 FT 10 1/4 IN	63.0
433.2485	13 FT 1 IN	58.0
374.4157	14 FT 1 IN	62.5
316.0898	14 FT 11 1/2 IN	65.0
175.8012	TOTAL USED	

MOLASSES INVENTORY STORAGE TANK READINGS	TONS
5 FT 2 IN	32.2
5 FT 5 1/2 IN	34.0
5 FT 0 IN	31.0
5 FT 2 1/2 IN	32.5

BY-PASS DRY SCALE	PRESS WATER OVERFLOW	PULSAIRE
19272.7	00776.0	05167.8
19271.5	00776.0	05160.6
19272.5	00776.0	05152.6
19272.5	00776.0	05144.8

PG&E MAIN	SUGAR PLANT MAIN	BLOCK #
1928	8405	1689
1930	8405	1689
1918	8404	1689
1917	8403	1689

NATURAL GAS METERS	TONS
094507	89859.1
094180	8985.49
093653	898583
093853	898580

#1 DRIER	#2 DRIER	#3 DRIER
1860870	162729.3	079064.3
186019.1	162729.3	079064.3
185954.7	162716.0	079064.3
185896.2	162664.7	079064.3

FR CAR OR TRUCK #	TONS
920-058	28.22
920-059	28.16

OIL TEMPERATURE	%
148.66	
PRESSED PULP MOISTURE	%
73.7	
DRY BULK MOISTURE	%
10.721	

ALUMINUM SULFATE @ \$0.077/LB 10,312.5 LBS

BULK	TONS
335.16	
LIME	TONS
47.30	

TOTAL USED -	TONS
4,717	
12-0	32.30 LBS
4-12	3118 LBS
8-4	3,146 LBS

TIME	COMMENTS
9:30	CHLORINE SYSTEM OFF,
	NEED NEW PARTS
9:30	SC162-SYSTEM ON
10:10	INCREASE EXCHANGER 40
3:15	DECREASED EXCHANGER TO 140
	MIDDEADON OIL H2O ON GAS
2:35	10 950 buckets thru Tank
	Screw 5,175 TONS

200	BULK TOTAL
STOP 8 AM	63103.184
MIDNIGHT	63088020
4 PM	63071397
8 AM	63054850
TOTAL	489.13

4 438
5.75

STOP 8 AM	TONS
MIDNIGHT	
4 PM	
8 AM	

000000

DAY #52-THRS. DATE: JUN 13 1991

Stove

GRAVEYARD
OPERATOR

[illegible][illegible][illegible][illegible]

JUNE 11, 1991

BETTERAVIA BYPRODUCTS 24 HOUR SHIFT REPORT

divided by 2 = For ¹/₂ shift

SCALE FACTOR	20.0	BULK PRODUCTION			PRESSED	BY-PASS DRY SCALE	PRESS WATER	
		SMALL WHSE	LARGE WHSE	PELLET WHSE	PULP DUMPED		OVERFLOW	
STOP 8 AM		63054850	75695	374219	091122	01095.7	19272.5	00776.0
MIDNIGHT		63037517	59464	374213	091122	01095.7	19272.5	00776.0
4 PM		63020617	42745	374212	091122	01095.7	19272.5	00776.0
8 AM		63005070	38525	374209	091122	01095.7	19272.5	00776.0
TOTAL		507.575	TONS PRODUCED					

TONS
477.8
= 9.775

Wed

	OIL CONSUMPTION			NATURAL GAS METERS		PG&E	SUGAR
	#1 DRIER	#2 DRIER	#3 DRIER	LARGE	SMALL	MAIN	MAIN
STOP 8 AM	185896.2	162664.7	079064.3	093953	898580	1897	8403
MIDNIGHT	185830.2	162609.5	079058.6	093953	898575	1875	8403
4 PM	185763.0	162609.5	079010.8	093953	898572	1856	8402
8 AM	185699.8	162609.5	078965.7	093953	898570	1835	8402

Tue
Thurs

Barrels
42.0 gal/1 Barrel

INFORMATION REQUIRED BY SUGAR FACTORY

24 HOUR AVERAGES	
OIL TEMPERATURE	150°
PRESSED PULP MOISTURE	73.733 %
DRY BULK MOISTURE	10.8103 %

ALUMINUM SULFATE
@ \$0.077/LB 10,875 LBS

SALES	
BULK	150.31 TONS
LIME	114.89 TONS

MOLASSES SHIPPED	
PER CAR OR TRUCK #	
940-14	
920-056	
940-15	
*920-57	

LIME APPLIED TO PULP		
TOTAL USED = 4,420.5 TONS		
12-8	3130	LBS
4-12	3322	LBS
8-4	3,189	LBS

Filename: BEET14.WQ1
 Date: 16-Dec-94
 Facility: Holly Sugar Corporation
 Location: Santa Maria, California
 Source: Fuel oil-fired pulp dryer with two cyclones in series
 and an air recycling (recirculation) system
 Test date: June 1991

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
Dryer #1	Stack temperature	Deg F	242	219	218	
	Pressure	in. HG	29.9	29.9	29.9	
	Moisture	%	35.35	31.04	30.54	
	Oxygen	%	14	15.77	15.3	
	Volumetric flow, actual	acfm	35562	33299	32182	
	Volumetric flow, standard*	dscfm	17281	17844	17396	0
	Isokinetic variation	%	102.8	97.2	96.8	
Wet Pulp Feed Rate To Dryer		TPH	32.6	32.2	32.1	
Pollutant concentrations:						
	Filterable PM	G/dscf	0.1563	0.227	0.1241	
	Condensable inorganic PM	G/dscf	0.0518	0.0217	0.0126	
	Condensable organic PM	G/dscf	0.0353	0.0004967	0	
	CO2	% dv	4.9	4.5	4.8	
	SO2	ppmdv	0	0	0	
	CO	ppmdv	360	126	160	
	NOx	ppmdv	88	70	75	
	THC	ppmdv	49.23	35.34	36.66	
	Methane	ppmdv	18.15	7.99	5.35	
Pollutant mass flux rates:						
NUMBER OF EMISSION POINTS			2	2	2	
	Filterable PM	lb/hr	46.3	69.44	37.0	
	Condensable inorganic PM	lb/hr	15.34	6.64	3.76	
	Condensable organic PM	lb/hr	10.47	0.15	0.00	
	CO2	lb/hr	11606	11006	11445	
	SO2	lb/hr	0.00	0.00	0.00	
	CO	lb/hr	54.27	19.61	24.28	
	NOx	lb/hr	21.79	17.90	18.69	
	THC as methane	lb/hr	4.25	3.15	3.19	
	Methane	lb/hr	1.57	0.71	0.47	
Emission factors (ENGLISH UNITS):						AVERAGE
	Filterable PM	lb/ton	1.42	2.2	1.15	1.58
	Condensable inorganic PM	lb/ton	0.47	0.21	0.117	0.26
	Condensable organic PM	lb/ton	0.32	0.0047	0	0.109
	CO2	lb/ton	356	342	357	351
	SO2	lb/ton	ND	ND	ND	ND
	CO	lb/ton	1.66	0.61	0.76	1.01
	NOx	lb/ton	0.67	0.56	0.58	0.60
	THC as methane	lb/ton	0.13	0.098	0.099	0.11
	Methane	lb/ton	0.048	0.022	0.014	0.028
Emission factors (METRIC UNITS):						AVERAGE
	Filterable PM	kg/Mg	0.71	1.08	0.58	0.79
	Condensable inorganic PM	kg/Mg	0.24	0.103	0.059	0.132
	Condensable organic PM	kg/Mg	0.16	0.0024	0	0.054
	CO2	kg/Mg	178	171	178	176
	SO2	kg/Mg	ND	ND	ND	ND
	CO	kg/Mg	0.83	0.30	0.38	0.51
	NOx	kg/Mg	0.33	0.28	0.29	0.30
	THC as methane	kg/Mg	0.065	0.049	0.050	0.055
	Methane	kg/Mg	0.024	0.011	0.007	0.014

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

**FLOW RATES DISAGREE WITH RATES SHOWN IN REPORT.

***THC CONCENTRATIONS DISAGREE WITH CONC. SHOWN IN REPORT

Filename: BEET14A.WQ1

Date: 26-Jan-95

Facility: Holly Sugar Corporation

Location: Santa Maria, California

Source: Fuel oil-fired pulp dryer with two cyclones in series
and an air recycling (recirculation) system

Test date: June 1991

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	245	246	245	
Dryer #2	Pressure	in. HG	29.9	29.9	29.9	
	Moisture	%	28.72	27.58	27.45	
	Oxygen	%	16.03	16.81	15.79	
	Volumetric flow, actual	acfm	30661	31371	31562	
	Volumetric flow, standard*	dscfm	16357	16980	17138	0
	Isokinetic variation	%	97.8	92	92	
Wet Pulp Feed Rate To Dryer		TPH	32.3	32.3	32.3	
Pollutant concentrations:						
	Filterable PM	G/dscf	0.0909	0.1011	0.0692	
	Condensable inorganic PM	G/dscf	0.0380	0.0277	0.0114	
	Condensable organic PM	G/dscf	0.000833	0.0004251	0.0006676	
	CO2	% dv	4.2	2.31	4.63	
	SO2	ppmdv	0	0	0	
	CO	ppmdv	200	205	200	
	NOx	ppmdv	50	46	51	
	THC	ppmdv	67.81	69.7	67.27	
	Methane	ppmdv	30.36	9.73	6.47	
Pollutant mass flux rates:						
NUMBER OF EMISSION POINTS			2	2	2	
	Filterable PM	lb/hr	25.5	29.43	20.3	
	Condensable inorganic PM	lb/hr	10.65	8.06	3.36	
	Condensable organic PM	lb/hr	0.23	0.12	0.20	
	CO2	lb/hr	9416	5376	10876	
	SO2	lb/hr	0.00	0.00	0.00	
	CO	lb/hr	28.54	30.37	29.90	
	NOx	lb/hr	11.72	11.19	12.52	
	THC as methane	lb/hr	5.54	5.91	5.76	
	Methane	lb/hr	2.48	0.83	0.55	
Emission factors (ENGLISH UNITS):						AVERAGE
	Filterable PM	lb/ton	0.79	0.91	0.63	0.78
	Condensable inorganic PM	lb/ton	0.33	0.25	0.10	0.23
	Condensable organic PM	lb/ton	0.0072	0.0038	0.0061	0.0057
	CO2	lb/ton	292	166	337	265
	SO2	lb/ton	ND	ND	ND	ND
	CO	lb/ton	0.88	0.94	0.93	0.92
	NOx	lb/ton	0.36	0.35	0.39	0.37
	THC as methane	lb/ton	0.17	0.18	0.18	0.18
	Methane	lb/ton	0.077	0.026	0.017	0.040
Emission factors (METRIC UNITS):						AVERAGE
	Filterable PM	kg/Mg	0.39	0.46	0.31	0.39
	Condensable inorganic PM	kg/Mg	0.16	0.12	0.052	0.11
	Condensable organic PM	kg/Mg	0.0036	0.0019	0.0030	0.0029
	CO2	kg/Mg	146	83	168	132
	SO2	kg/Mg	ND	ND	ND	ND
	CO	kg/Mg	0.44	0.47	0.46	0.46
	NOx	kg/Mg	0.18	0.17	0.19	0.18
	THC as methane	kg/Mg	0.086	0.092	0.089	0.089
	Methane	kg/Mg	0.038	0.013	0.009	0.020

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

**FLOW RATES DISAGREE WITH RATES SHOWN IN REPORT.

***THC CONCENTRATIONS DISAGREE WITH CONC. SHOWN IN REPORT

Filename: BEET14B.WQ1

Date: 26-Jan-95

Facility: Holly Sugar Corporation

Location: Santa Maria, California

Source: Fuel oil-fired pulp dryer with two cyclones in series
and an air recycling (recirculation) system

Test date: June 11, 1991

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
Dryer #3	Stack temperature	Deg F	225	216	212	
	Pressure	in. HG	28.89	28.89	28.89	
	Moisture	%	26.26	25.19	31.63	
	Oxygen	%	13.9	13.9	13.97	
	Volumetric flow, actual	acfm	26869	24583	25634	
	Volumetric flow, standard*	dscfm	14746	13870	13296	0
	Isokinetic variation	%	110.9	96	103.3	
Wet Pulp Feed Rate To Dryer		TPH	32.3	32.3	32.3	
Pollutant concentrations:						
	Filterable PM	G/dscf	0.1933	0.1642	0.1589	
	Condensable inorganic PM	G/dscf	0.00711	0.00568	0.00838	
	Condensable organic PM	G/dscf	0.00119	0.0009153	0.0006158	
	CO2	% dv	4.1	4.1	6.1	
	SO2	ppmdv	0	0	0	
	CO	ppmdv	230	230	250	
	NOx	ppmdv	61	61	69	
	THC	ppmdv	90.46	78.06	83.83	
	Methane	ppmdv	11.58	19.06	16.24	
Pollutant mass flux rates:						
NUMBER OF EMISSION POINTS			2	2	2	
	Filterable PM	lb/hr	48.9	39.04	36.2	
	Condensable inorganic PM	lb/hr	1.80	1.35	1.91	
	Condensable organic PM	lb/hr	0.300	0.218	0.140	
	CO2	lb/hr	8287	7794	11117	
	SO2	lb/hr	0.00	0.00	0.00	
	CO	lb/hr	29.6	27.8	29.0	
	NOx	lb/hr	12.9	12.1	13.1	
	THC as methane	lb/hr	6.66	5.41	5.57	
	Methane	lb/hr	0.853	1.32	1.08	
Emission factors (ENGLISH UNITS):						AVERAGE
	Filterable PM	lb/ton	1.5	1.2	1.1	1.3
	Condensable inorganic PM	lb/ton	0.056	0.042	0.059	0.052
	Condensable organic PM	lb/ton	0.0093	0.0067	0.0043	0.0068
	CO2	lb/ton	257	241	344	281
	SO2	lb/ton	ND	ND	ND	ND
	CO	lb/ton	0.92	0.86	0.90	0.89
	NOx	lb/ton	0.40	0.38	0.41	0.39
	THC as methane	lb/ton	0.21	0.17	0.17	0.18
	Methane	lb/ton	0.026	0.041	0.033	0.034
Emission factors (METRIC UNITS):						AVERAGE
	Filterable PM	kg/Mg	0.76	0.60	0.56	0.64
	Condensable inorganic PM	kg/Mg	0.028	0.021	0.030	0.026
	Condensable organic PM	kg/Mg	0.0046	0.0034	0.0022	0.0034
	CO2	kg/Mg	128	121	172	140
	SO2	kg/Mg	ND	ND	ND	ND
	CO	kg/Mg	0.46	0.43	0.45	0.45
	NOx	kg/Mg	0.20	0.19	0.20	0.20
	THC as methane	kg/Mg	0.10	0.084	0.086	0.091
	Methane	kg/Mg	0.013	0.020	0.017	0.017

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

**FLOW RATES DISAGREE WITH RATES SHOWN IN REPORT.

***THC CONCENTRATIONS DISAGREE WITH CONC. SHOWN IN REPORT

Filename: BEET14c.WQ1

Date: 26-Jan-95

Facility: Holly Sugar Corporation

Location: Santa Maria, California

Source: Cooler--test void due to isokinetics

Test date: June 10, 1991

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	70	70	70	
Cooler	Pressure	in. HG	29.76	29.76	29.76	
	Moisture	%	2.49	2.49	2.34	
	Oxygen	%	20.9	20.9	20.9	
	Volumetric flow, actual	acfm	51234	48519	49110	
	Volumetric flow, standard*	dscfm	49504	46880	47524	0
	Isokinetic variation	%	18.5	18.6	18.5	
Dried pulp produced (to cooler)		TPH	10.0	10.0	10.0	
Pollutant concentrations:						
	Filterable PM	G/dscf	0.1121	0.0359	0.0324	
	Condensable inorganic PM	G/dscf	0.00090	0.00040	0.00035	
	Condensable organic PM	G/dscf	0	0	0.0001471	
	CO2	% dv	0	0	0	
Pollutant mass flux rates:						
	Filterable PM	lb/hr	47.6	14.4	13.2	
	Condensable inorganic PM	lb/hr	0.382	0.161	0.144	
	Condensable organic PM	lb/hr	ND	ND	0.0599	
Emission factors (ENGLISH UNITS):						AVERAGE
	Filterable PM	lb/ton	4.8	1.4	1.3	2.5
	Condensable inorganic PM	lb/ton	0.038	0.016	0.014	0.023
	Condensable organic PM	lb/ton	ND	ND	0.0060	ND
Emission factors (METRIC UNITS):						AVERAGE
	Filterable PM	kg/Mg	2.4	0.72	0.66	1.3
	Condensable inorganic PM	kg/Mg	0.019	0.0080	0.0072	0.011
	Condensable organic PM	kg/Mg	ND	ND	0.0030	ND

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

**FLOW RATES DISAGREE WITH RATES SHOWN IN REPORT.

MIDWEST RESEARCH INSTITUTE

Project/Acct. No. 4602-03-03 Date/Time 12/14/94

Project Title Sugar Beet Processing AP-42

Phone Contact ☐

Meeting Notes ☐

Work Sheet ☒

Signature Rina Senger Verified by _____
(signature/date)

Page ____ of ____

HOLLY SUGAR, SANTA MARIA, CA

TEST DATES: JUNE 11-13, 1991

<u>DRYER #1</u>	<u>TIME</u>	<u>DATE</u>	<u>SLICE RATE (TPH)</u>	<u>PRESSED PULP MOISTURE (%)</u>	<u>DRIED PULP MOISTURE (%)</u>
<u>RUN 1</u>	<u>10:21-11:19</u>	<u>6/13</u>	<u>255</u>	<u>72.4</u>	<u>10.2</u>
<u>RUN 2</u>	<u>13:48-14:28</u>	<u>6/13</u>	<u>255</u>	<u>71.8</u>	<u>9.3</u>
<u>RUN 3</u>	<u>15:21-16:27</u>	<u>6/13</u>	<u>255</u>	<u>72.0</u>	<u>10.0</u>

$$\% \text{ SOLIDS} = \frac{\text{DRY PULP PRODUCED} - \text{DRY PULP MOISTURE} \times \text{DRY PULP PRODUCED}}{\text{BEET SLICE RATE}}$$

$$\text{DRY PULP PRODUCTION RATE} = 10.0125 \text{ TPH}$$

$$\text{RUN 1: } \% \text{ SOLIDS} = \frac{10.0125 - 0.102 \times 10.0125}{255} = 3.53 \%$$

$$\text{RUN 2: } \% \text{ SOLIDS} = \frac{10.0125 - 0.093 \times 10.0125}{255} = 3.56 \%$$

$$\text{RUN 3: } \% \text{ SOLIDS} = \frac{10.0125 - 0.10 \times 10.0125}{255} = 3.53 \%$$

$$\text{WET PULP FEED TO DRYER (TPH)} = \frac{\text{BEET SLICE RATE} \times \% \text{ SOLIDS}}{1 - \left(\frac{\text{WET PULP MOISTURE}}{100} \right)}$$

$$\text{RUN 1: PROCESS RATE} = \frac{255 \times 0.0353}{1 - \left(\frac{72.4}{100} \right)} = 32.6 \text{ TPH}$$

$$\text{RUN 2: PROCESS RATE} = \frac{255 \times 0.0356}{1 - \left(\frac{71.8}{100} \right)} = 32.2 \text{ TPH}$$

$$\text{RUN 3: PROCESS RATE} = \frac{255 \times 0.0353}{1 - \left(\frac{72}{100} \right)} = 32.1 \text{ TPH}$$

FOR DRYERS 2 AND 3, WET PULP FEED (TPH) = AVG. OF DRYER 1 = 32.3 TPH $\Rightarrow$ ASSUMED

APPENDIX O

REPORT EXCERPTS FROM REFERENCE 15

(Great Lakes Sugar Company, December 8, 1992)



Affiliated Environmental services, inc.

Great Lakes Sugar Co.
Attn: Mr. Joe Flynn
3rd Floor Plaza North
P.O. Box 1348
Saginaw, MI 48605

REPORT TO GREAT LAKES SUGAR CO.

ON

STACK PARTICULATE SAMPLES
COLLECTED ON THE PULP DRIER AT
FREMONT, OH

SUBMITTED BY

AFFILIATED ENVIRONMENTAL SERVICES, INC.
3606 VENICE RD.
SANDUSKY, OH 44870

DATE OF TESTING: 12-2-92

DATE OF REPORT: 12-8-92

Joe Gillingham
FIELD TEST SUPERVISOR

Don Dauch
MANAGER, AIR SAMPLING DIVISION



AFFILIATED ENVIRONMENTAL SERVICES, INC.
3606 VENICE RD.
SANDUSKY, OHIO 44870

PLANT NAME: Great Lakes Sugar Pulp Dryer
DATE OF TEST: 12-2-92

STACK SAMPLING PARAMETERS

TEST RUN NUMBER 1

MINUTES OF TEST	60
VOLUME OF GAS COLLECTED cubic feet	44.646
METER CALIBRATION FACTOR Y	.93
BAROMETRIC PRESSURE	30.12
PRESSURE DIFFERENTIAL ACROSS ORIFICE DELTA H	1.48
METER TEMPERATURE (+460)	559
STACK STATIC PRESSURE (HG)	.0029
STACK TEMPERATURE (+460)	727
AVERAGE SQUARE ROOT OF VELOCITY HEAD	.855
VOLUME OF IMPINGER WATER COLLECTED ml	455
WEIGHT OF SILICA COLLECTED gms	10
AREA OF SAMPLING NOZZLE square feet	.0003436
PITOT TUBE COEFFICIENT	.84
AREA OF STACK square feet	28.27
CARBON DIOXIDE (DRY FRACTION)	5.5
CARBON MONOXIDE (DRY FRACTION)	0
OXYGEN (DRY FRACTION)	15.5
NITROGEN (DRY FRACTION)	79

STACK PARTICULATE DATA

GAS VOLUME STANDARD CONDITIONS DSCF	39.607
VOLUME OF WATER VAPOR cubic feet	21.902
PERCENT MOISTURE IN STACK GAS	35.6
DRY GAS MOLECULAR WEIGHT	29.5
STACK GAS MOLECULAR WEIGHT	25.406
VELOCITY OF STACK GAS feet per second	59.836
FLOW RATE OF STACK GAS DSCFH	2867553
FLOW RATE OF STACK GAS DSCFM	47793
ISOKINICITY %	113.7
WEIGHT GAIN OF IMPINGERS mg	0
WEIGHT GAIN OF FILTER mg	71.1
WEIGHT GAIN OF PROBE WASH mg	58.8
PARTICULATES COLLECTED POUNDS/HOUR	20.71
PARTICULATES COLLECTED GRAINS/DSCF	.0504
PARTICULATES COLLECTED POUNDS/DSCF	7.2234E-06



AFFILIATED ENVIRONMENTAL SERVICES, INC.
3606 VENICE RD.
SANDUSKY, OHIO 44870

PLANT NAME: Great Lakes Sugar

DATE OF TEST: 12-2-92

STACK SAMPLING PARAMETERS

TEST RUN NUMBER 2

MINUTES OF TEST	60
VOLUME OF GAS COLLECTED cubic feet	43.251
METER CALIBRATION FACTOR Y	.93
BAROMETRIC PRESSURE	30.12
PRESSURE DIFFERENTIAL ACROSS ORIFICE DELTA H	1.41
METER TEMPERATURE (+460)	563
STACK STATIC PRESSURE (HG)	.0029
STACK TEMPERATURE (+460)	733
AVERAGE SQUARE ROOT OF VELOCITY HEAD	.864
VOLUME OF IMPINGER WATER COLLECTED ml	430
WEIGHT OF SILICA COLLECTED gms	10
AREA OF SAMPLING NOZZLE square feet	.0003409
PITOT TUBE COEFFICIENT	.84
AREA OF STACK square feet	28.27
CARBON DIOXIDE (DRY FRACTION)	5.5
CARBON MONOXIDE (DRY FRACTION)	0
OXYGEN (DRY FRACTION)	15.5
NITROGEN (DRY FRACTION)	79

STACK PARTICULATE DATA

GAS VOLUME STANDARD CONDITIONS DSCF	38.09
VOLUME OF WATER VAPOR cubic feet	20.724
PERCENT MOISTURE IN STACK GAS	35.2
DRY GAS MOLECULAR WEIGHT	29.5
STACK GAS MOLECULAR WEIGHT	25.452
VELOCITY OF STACK GAS feet per second	60.66
FLOW RATE OF STACK GAS DSCFH	2901155
FLOW RATE OF STACK GAS DSCFM	48353
ISOKINICITY %	109
WEIGHT GAIN OF IMPINGERS mg	0
WEIGHT GAIN OF FILTER mg	98.1
WEIGHT GAIN OF PROBE WASH mg	65.6
PARTICULATES COLLECTED POUNDS/HOUR	27.47
PARTICULATES COLLECTED GRAINS/DSCF	.0661
PARTICULATES COLLECTED POUNDS/DSCF	9.4678E-06



AFFILIATED ENVIRONMENTAL SERVICES, INC.
3606 VENICE RD.
SANDUSKY, OHIO 44870

PLANT NAME: Great Lakes Sugar

DATE OF TEST: 12-2-92

STACK SAMPLING PARAMETERS

TEST RUN NUMBER 3

MINUTES OF TEST	60
VOLUME OF GAS COLLECTED cubic feet	39.961
METER CALIBRATION FACTOR Y	.93
BAROMETRIC PRESSURE	30.12
PRESSURE DIFFERENTIAL ACROSS ORIFICE DELTA H	1.12
METER TEMPERATURE (+460)	565
STACK STATIC PRESSURE (HG)	.0029
STACK TEMPERATURE (+460)	741
AVERAGE SQUARE ROOT OF VELOCITY HEAD	.856
VOLUME OF IMPINGER WATER COLLECTED ml	412
WEIGHT OF SILICA COLLECTED gms	13
AREA OF SAMPLING NOZZLE square feet	.0003409
PITOT TUBE COEFFICIENT	.84
AREA OF STACK square feet	28.27
CARBON DIOXIDE (DRY FRACTION)	6.5
CARBON MONOXIDE (DRY FRACTION)	0
OXYGEN (DRY FRACTION)	13.5
NITROGEN (DRY FRACTION)	80

STACK PARTICULATE DATA

GAS VOLUME STANDARD CONDITIONS DSCF	35.044
VOLUME OF WATER VAPOR cubic feet	20.018
PERCENT MOISTURE IN STACK GAS	36.4
DRY GAS MOLECULAR WEIGHT	29.58
STACK GAS MOLECULAR WEIGHT	25.365
VELOCITY OF STACK GAS feet per second	60.529
FLOW RATE OF STACK GAS DSCFH	2810605
FLOW RATE OF STACK GAS DSCFM	46843
ISOKINICITY %	103.4
WEIGHT GAIN OF IMPINGERS mg	0
WEIGHT GAIN OF FILTER mg	72.5
WEIGHT GAIN OF PROBE WASH mg	51.9
PARTICULATES COLLECTED POUNDS/HOUR	21.97
PARTICULATES COLLECTED GRAINS/DSCF	.0546
PARTICULATES COLLECTED POUNDS/DSCF	7.8179E-06

Don Dauch

A.E.S.

Post-It™ brand fax transmittal memo 7671

of pages >

To: Don Dauch	From: Joe Flynn
Co:	Co:
Dept:	Phone #
Fax #	Fax #

ref: Fremont stock test

Don:

pulp DRIER STANDARD FORMULAS:

wet pulp to DRIER (tons/hr) =
(process weight rate)

tons Beet sliced (tons/hr) x % solids in beets

$$1 - \left(\frac{\text{wet pulp moisture (\%)}}{100} \right)$$

process weight DATA

tons beets sliced 171 tons/hr

wet pulp moisture 77.2% moisture

% solids 6%

$$\text{process weight RATE} = \frac{171 \text{ tons/hr} \times 0.06}{1 - \left(\frac{77.2}{100} \right)}$$

45 tons/hr

Allowable discharge tons/hr =

Ohio EPA formula

$$SS(45) - 40 = 43.60 \text{ lbs/hr}$$

$$SS(PWR) - 40$$

if you have any questions give
me a call (512) 797-7300
Joe

DATE	DIFFUSER #1			DIFFUSER #2			---BEETS SLICED---			SUGAR IN COSSETES			STEAM ON BEETS			PRODUCT		
	---SHIFTS---			---SHIFTS---			TOTAL TONS			SUGAR			TEMP C			DAY		
	1ST	2ND	3RD	1ST	2ND	3RD	1ST	2ND	3RD	DAY	TODATE	DAY	1ST	2ND	3RD	1ST	2ND	3RD
11/29	57.62	701	652	633	701	689	4103	222714	3865	15.52	16.94	636.79	37733.57	5	21	2.73	2.13	112.0
11/30	58.62	678	718	527	618	686	3886	226600	3866	14.84	16.91	576.68	38310.25	6	24	3.07	2.15	119.3
12/01	59.62	688	661	656	662	619	3860	230460	3865	14.90	16.87	575.14	38885.39	7	25	3.07	2.16	118.5
12/02	60.62	636	678	687	683	632	3696	234156	3863	15.35	16.85	567.34	39452.73	7	24	2.90	2.17	107.2
12/03	61.62	662	679	570	637	657	3628	237784	3859	14.69	16.82	532.95	39985.68	5	24	3.24	2.19	117.5
12/04	62.62	670	686	668	576	668	3930	241714	3860	15.95	16.80	626.84	40612.52	2	20	3.07	2.20	120.7
12/05	63.62	680	638	615	576	618	3740	245454	3858	15.46	16.78	578.20	41190.72	3	15	2.05	2.20	76.7
WK 9							26843		3835	15.25		4093.94						5402.0
TD								245454	3858		16.78		41190.72				2.20	
12/06	64.62	690	602	663	602	637	3579	249033	3854	15.68	16.77	561.19	41751.91	3	20	2.90	2.21	103.8
12/07	65.62	694	653	615	616	616	3707	252740	3852	16.03	16.75	594.23	42346.14	6	22	2.73	2.22	101.2
12/08	66.62	670	645	641	653	629	3879	256619	3852	15.86	16.74	615.21	42961.35	8	22	2.90	2.23	112.5
12/09	67.62	649	632	698	344	241	2753	259356	3835	16.00	16.73	440.48	43399.15	7	24	2.90	2.24	79.8
12/10	68.62	616	699	640	488	555	3232	262588	3827	16.39	16.73	529.72	43928.87	7	25	3.07	2.25	99.2
12/11	69.62	644	639	652	536	407	3455	266043	3821	16.62	16.73	574.22	44503.09	7	26	3.24	2.26	111.9
12/12	70.62	568	655	653	468	602	3461	269504	3816	16.69	16.73	577.64	45080.73	7	26	3.24	2.27	112.1
WK 10							24066		3438	16.18		3892.69						6122.5
TD								269504	3816		16.73		45080.73				2.27	
12/13	71.62	612	661	683	449	316	3383	272887	3810	16.98	16.73	574.43	45655.16	7	28	3.58	2.29	121.1
12/14	72.62	671	634	665	608	608	3869	276756	3811	16.87	16.73	652.70	46307.86	7	24	2.90	2.30	112.2
12/15	73.62	675	649	648	651	290	3354	280110	3805	17.22	16.74	577.56	46885.42	5	22	2.90	2.30	97.3
12/16	74.62	700	581	307	314	332	2554	282647	3788	16.66	16.74	425.50	47308.07	5	22	2.90	2.31	74.1
12/17	75.62	667	586	643	506	322	3247	285894	3781	16.83	16.74	546.47	47854.54	4	25	3.58	2.32	116.2
12/18	76.62	657	585	590	580	580	3363	289257	3775	17.09	16.74	574.74	48429.28	1	24	3.92	2.34	131.8
12/19	77.62	598	632	643	560	661	3716	292973	3774	16.35	16.74	607.57	49036.85	1	24	3.92	2.36	145.7
WK 11							23486		3355	16.86		3958.97						6920.9
TD								292973	3774		16.74		49036.85				2.36	
12/20	78.62	655	655	653	566	588	3726	296699	3774	16.11	16.73	600.26	49637.11	2	25	3.92	2.38	146.1
12/21	79.62	603	655	655	486	660	3706	300405	3773	16.42	16.73	608.53	50245.64	3	25	3.75	2.40	139.0
12/22	80.62	673	669	651	663	645	3956	304361	3775	16.38	16.72	647.99	50893.63	3	24	3.24	2.41	128.2
12/23	81.62	670	607	632	513	584	3447	307808	3771	16.45	16.72	567.03	51460.66	4	26	3.75	2.42	129.3
12/24	82.62	637	653	656	647	442	3697	311505	3770	16.38	16.71	605.57	52066.23	4	25	3.58	2.44	132.4
12/25	83.62	633	305	649	636	218	3102	314607	3762	16.45	16.71	510.28	52576.51	4	26	3.75	2.45	116.3
12/26	84.62	547	584	643	583	581	3575	318182	3760	16.25	16.71	580.94	53157.45	6	25	3.24	2.46	115.8
WK 12							25209		3601	16.35		4120.60						7828.0
TD								318182	3760		16.71		53157.45				2.46	

PULP PRODUCED				PRESSED PULP				DRY PULP				PELLET PULP				SUGAR IN PRESSED PULP			
DATE		TONS		Z ON BEETS		PRESSED PULP		DRY PULP		PELLET PULP		SUGAR IN PRESSED PULP		Z SUGAR		TONS			
DAY	DAY	DAY	TD	DAY	TD	DAY	TD	DAY	TD	DAY	TD	DAY	TD	DAY	TD	DAY	TD	DAY	TD
1/29	58	234	13189	5.70	5.92	227	227	73.05	4271.37	73.64	12.19	660.00	11.38	10.49	611.72	10.55	.35	14.77	785.00
1/30	59	216	13405	5.56	5.92	227	227	73.47	4344.84	73.64	11.30	671.30	11.38	10.95	622.67	10.55	.35	14.77	801.00
2/01	60	215	13620	5.57	5.91	227	227	73.55	4418.39	73.64	12.34	683.64	11.39	11.06	633.73	10.56	.35	11.97	813.60
2/02	61	210	13830	5.68	5.91	227	227	74.83	4493.22	73.66	11.06	694.70	11.39	10.31	644.04	10.56	.35	14.41	828.07
2/03	62	201	14031	5.54	5.90	226	226	72.47	4565.69	73.64	9.78	704.48	11.36	10.34	654.38	10.55	.35	12.70	840.77
2/04	63	229	14260	5.83	5.90	226	226	73.08	4638.77	73.63	10.67	715.15	11.35	10.70	665.08	10.56	.35	11.40	852.17
2/05	64	214	14474	5.72	5.90	226	226	74.57	4713.34	73.65	11.14	726.29	11.35	10.85	675.93	10.56	.35	13.84	866.01
K 9	1519			5.66				73.57			11.21			10.67			.35	93.86	
D			14474	5.90					73.65		11.35				10.56		.35	866.01	
2/06	65	206	14680	5.76	5.89	226	226	71.77	4785.11	73.62	12.79	739.08	11.37	11.14	687.07	10.57	.35	13.60	879.61
2/07	66	217	14897	5.85	5.89	226	226	74.15	4859.26	73.63	10.90	749.98	11.36	10.88	697.95	10.58	.35	17.42	897.03
2/08	67	225	15122	5.80	5.89	226	226	76.77	4936.03	73.67	11.60	761.58	11.37	9.87	707.82	10.56	.36	17.07	914.10
2/09	68	161	15283	5.85	5.89	225	225	73.78	5009.81	73.67	10.93	772.51	11.36	10.85	718.67	10.57	.44	12.39	926.49
2/10	69	192	15475	5.94	5.89	224	224	73.60	5083.41	73.67	9.78	782.29	11.34	10.24	728.91	10.56	.41	13.25	939.74
2/11	70	207	15682	5.99	5.89	224	224	75.58	5158.99	73.70	10.98	793.27	11.33	10.57	739.48	10.56	.45	15.55	955.29
2/12	71	208	15890	6.01	5.90	224	224	73.55	5232.54	73.70	12.16	805.43	11.34	10.73	750.21	10.57	.45	15.57	970.86
K 10	1416			5.88				74.17			11.31			10.61			.44	104.85	
D			15890	5.90					73.70		11.34				10.57		.36	970.86	
2/13	72	206	16096	6.09	5.90	224	224	73.68	5306.22	73.70	11.53	816.96	11.35	10.25	760.46	10.56	.40	13.53	984.39
2/14	73	234	16330	6.05	5.90	224	224	73.72	5379.94	73.72	10.73	827.69	11.34	10.27	770.73	10.56	.38	14.70	999.09
2/15	74	206	16536	6.14	5.90	223	223	74.98	5454.92	73.72	10.66	838.35	11.33	9.53	780.26	10.54	.41	13.75	1012.84
2/16	75	153	16689	5.99	5.90	223	223	77.28	5532.20	73.76	11.75	850.10	11.33	10.05	790.31	10.54	.40	10.22	1023.06
2/17	76	196	16885	6.04	5.91	222	222	72.30	5604.50	73.74	11.25	861.35	11.33	10.74	801.05	10.54	.31	10.07	1033.13
2/18	77	205	17090	6.10	5.91	222	222	73.80	5678.30	73.74	12.70	874.05	11.35	10.83	811.88	10.54	.35	11.77	1044.90
2/19	78	220	17310	5.92	5.91	222	222	74.35	5752.65	73.75	12.21	886.26	11.36	10.99	822.87	10.55	.41	15.24	1060.14
K 11	1420			6.05				74.30			11.55			10.38			.38	89.28	
D			17310	5.91					73.75		11.36				10.55		.36	1060.14	
2/20	79	219	17529	5.88	5.91	222	222	74.38	5827.03	73.76	13.35	899.61	11.39	11.34	834.21	10.56	.29	10.81	1070.95
2/21	80	220	17749	5.94	5.91	222	222	74.42	5907.77	73.77	12.90	912.51	11.41	10.95	845.16	10.56	.38	14.08	1085.03
2/22	81	235	17984	5.94	5.91	222	222	76.32	5971.45	73.80	11.46	923.97	11.41	11.09	856.25	10.57	.46	18.20	1101.23
2/23	82	205	18189	5.95	5.91	222	222	73.72	6051.49	73.80	11.12	935.09	11.40	10.24	866.49	10.57	.36	12.41	1113.64
2/24	83	219	18408	5.92	5.91	221	221	74.05	6125.54	73.80	10.20	945.29	11.38	10.70	877.19	10.57	.32	11.83	1127.47
2/25	84	185	18593	5.96	5.91	221	221	73.73	6199.27	73.80	10.43	955.72	11.38	10.90	888.09	10.57	.29	11.36	1136.47
2/26	85	211	18804	5.90	5.91	221	221	71.82	6271.09	73.78	12.64	968.36	11.39	10.08	898.17	10.57	.40	14.30	1150.77
K 12	1494			5.93				74.06			11.73			10.76			.36	90.63	
D			18804	5.91					73.78		11.39				10.57		.36	1150.77	

Filename: BEET15.WQ1

Date: 26-Jan-95

Facility: Great Lakes Sugar Cooperative

Location: Fremont, Ohio

Source: Fuel oil-fired rotary drum beet pulp dryer with cyclones

Test date: December 2, 1992

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	267	273	281	
	Pressure	in. HG	30.12	30.12	30.12	
	Moisture	%	35.6	35.2	36.4	
	Oxygen	%	15.5	15.5	15.5	
	Volumetric flow, actual	acfm	101493.82	102891.49	102669.29	
	Volumetric flow, standard*	dscfm	47788	48348	46839	
	Isokinetic variation	%	113.7	109	103.4	
Wet pulp feed to dryer		TPH	45.00	45.00	45.00	
Pollutant concentrations:						
	Filterable PM	G/dscf	0.0504	0.0661	0.0546	
	CO2	% dv	5.5	5.5	6.50	
	SO2	lb/dscf	1.934E-05	2.002E-05	2.065E-05	
Pollutant mass flux rates:						
	Filterable PM	lb/hr	20.6	27.4	21.9	
	CO2	lb/hr	18013	18224	20865	
	SO2	lb/hr	55.5	58.1	58.0	
Emission factors (ENGLISH UNITS):			run 1 void			AVERAGE
	Filterable PM	lb/ton		0.61	0.49	0.55
	CO2	lb/ton		405	464	434
	SO2	lb/ton		1.3	1.3	1.3
Emission factors (METRIC UNITS):						AVERAGE
	Filterable PM	kg/Mg		0.30	0.24	0.27
	CO2	kg/Mg		202	232	217
	SO2	kg/Mg		0.65	0.64	0.65

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

APPENDIX P

REPORT EXCERPTS FROM REFERENCE 16

(American Crystal Sugar Company, March 21, 1994)

Interpoll Laboratories, Inc.
4500 Ball Road N.E.
Circle Pines, Minnesota 55014-1819

TEL: (612) 786-6020
FAX: (612) 786-7854

RESULTS OF THE FEBRUARY 22 - 24, 1994
AIR EMISSION COMPLIANCE TESTING
OF PROCESS SOURCES
AT THE AMERICAN CRYSTAL SUGAR
EAST GRAND FORKS PLANT

Submitted to:

AMERICAN CRYSTAL SUGAR COMPANY
Business Highway 220
P.O. Box 357
East Grand Forks, Minnesota 56721

Attention:

Bruce Keifenheim

Approved by:



Daniel Despen
Manager
Stationary Source Testing Department

Report Number 4-2326
March 21, 1994
SP/slp

Table 1a. Summary of the Results of the February 24, 1994 Particulate Emission Compliance Test on the A Pulp Dryer Stack at the American Crystal Sugar Plant Located in East Grand Forks, Minnesota.

ITEM	Run 1	Run 2	Run 3
Date of test	02-24-94	02-24-94	02-24-94
Time runs were done (HRS)	930/1134	1200/1405	1425/1625
* Process rate			
Volumetric flow actual (ACFM)	44409	43415	43154
standard (DSCFM)	23522	23490	23462
Gas temperature (DEG-F)	208	204	203
Moisture content (%V/V)	31.36	30.37	30.12
Gas composition (%V/V, dry)			
carbon dioxide	4.40	4.30	4.30
oxygen	15.90	16.00	16.00
nitrogen	79.70	79.70	79.70
Isokinetic variation (%)	99.3	98.2	99.2
Particulate concentration			
actual (GR/ACF)	.0292	.0251	.0269
standard (GR/DSCF)	.0552	.0465	.0495
Part. emission rate (LB/HR)	11.13	9.35	9.96

Note: Dry + Organic Wet Catch

* For process information - see Appendix E.

Table 1b. Summary of the Results of the February 24, 1994 Particulate Emission Compliance Test on the A Pulp Dryer Stack at the American Crystal Sugar Plant Located in East Grand Forks, Minnesota.

ITEM	Run 1	Run 2	Run 3
Date of test	02-24-94	02-24-94	02-24-94
Time runs were done (HRS)	930/1134	1200/1405	1425/1625
* Process rate			
Volumetric flow actual (ACFM)	44409	43415	43154
standard (DSCFM)	23522	23490	23462
Gas temperature (DEG-F)	208	204	203
Moisture content (%V/V)	31.36	30.37	30.12
Gas composition (%V/V, dry)			
carbon dioxide	4.40	4.30	4.30
oxygen	15.90	16.00	16.00
nitrogen	79.70	79.70	79.70
Isokinetic variation (%)	99.3	98.2	99.2
Particulate concentration			
actual (GR/ACF)	.0264	.0220	.0238
standard (GR/DSCF)	.0498	.0407	.0438
Part. emission rate (LB/HR)	10.04	8.19	8.81

Note: Dry Catch Only

* For process information - see Appendix E.

Table 2a. Summary of the Results of the February 23, 1994 Particulate Emission Compliance Test on the B Pulp Dryer Stack at the American Crystal Sugar Plant Located in East Grand Forks, Minnesota.

ITEM	Run 1	Run 2	Run 3
Date of test	02-23-94	02-23-94	02-23-94
Time runs were done (HRS)	1021/1225	1300/1503	1543/1744
* Process rate			
Volumetric flow actual (ACFM)	68268	68024	68536
standard (DSCFM)	36779	36865	37205
Gas temperature (DEG-F)	239	237	236
Moisture content (%V/V)	27.37	27.13	27.14
Gas composition (%V/V, dry)			
carbon dioxide	3.90	3.90	3.90
oxygen	16.50	16.50	16.50
nitrogen	79.60	79.60	79.60
Isokinetic variation (%)	91.3	96.3	98.6
Particulate concentration			
actual (GR/ACF)	.0306	.0289	.0279
standard (GR/DSCF)	.0569	.0533	.0515
Part. emission rate (LB/HR)	17.93	16.84	16.41

Note: Dry + Organic Wet Catch

* For process information - see Appendix E.

Table 2b. Summary of the Results of the February 23, 1994 Particulate Emission Compliance Test on the B Pulp Dryer Stack at the American Crystal Sugar Plant Located in East Grand Forks, Minnesota.

ITEM	Run 1	Run 2	Run 3
Date of test	02-23-94	02-23-94	02-23-94
Time runs were done (HRS)	1021/1225	1300/1503	1543/1744
* Process rate			
Volumetric flow actual (ACFM)	68268	68024	68536
standard (DSCFM)	36779	36865	37205
Gas temperature (DEG-F)	239	237	236
Moisture content (%V/V)	27.37	27.13	27.14
Gas composition (%V/V, dry)			
carbon dioxide	3.90	3.90	3.90
oxygen	16.50	16.50	16.50
nitrogen	79.60	79.60	79.60
Isokinetic variation (%)	91.3	96.3	98.6
Particulate concentration			
actual (GR/ACF)	.0290	.0273	.0266
standard (GR/DSCF)	.0539	.0504	.0491
Part. emission rate (LB/HR)	16.99	15.93	15.64

Note: Dry Catch Only

Table 3a. Summary of the Results of the February 22, 1994 Particulate Emission Compliance Test on the C Pulp Dryer Stack at the American Crystal Sugar Plant Located in East Grand Forks, Minnesota.

ITEM	Run 1	Run 2	Run 3
Date of test	02-22-94	02-22-94	02-22-94
Time runs were done (HRS)	1418/1622	1705/1911	1940/2146
* Process rate			
Volumetric flow actual (ACFM)	46487	47360	47936
standard (DSCFM)	24316	24619	25136
Gas temperature (DEG-F)	212	213	215
Moisture content (%V/V)	33.27	33.65	32.89
Gas composition (%V/V, dry)			
carbon dioxide	4.80	5.20	4.80
oxygen	15.50	15.00	15.40
nitrogen	79.70	79.80	79.80
Isokinetic variation (%)	102.2	100.9	99.7
Particulate concentration			
actual (GR/ACF)	.0322	.0367	.0276
standard (GR/DSCF)	.0616	.0706	.0526
Part. emission rate (LB/HR)	12.84	14.91	11.34

Note: Dry + Organic Wet Catch

* For process information - see Appendix E.

Table 3b. Summary of the Results of the February 22, 1994 Particulate Emission Compliance Test on the C Pulp Dryer Stack at the American Crystal Sugar Plant Located in East Grand Forks, Minnesota.

ITEM	Run 1	Run 2	Run 3
Date of test	02-22-94	02-22-94	02-22-94
Time runs were done (HRS)	1418/1622	1705/1911	1940/2146
*Process rate			
Volumetric flow actual (ACFM)	46487	47360	47936
standard (DSCFM)	24316	24619	25136
Gas temperature (DEG-F)	212	213	215
Moisture content (%V/V)	33.27	33.65	32.89
Gas composition (%V/V, dry)			
carbon dioxide	4.80	5.20	4.80
oxygen	15.50	15.00	15.40
nitrogen	79.70	79.80	79.80
Isokinetic variation (%)	102.2	100.9	99.7
Particulate concentration			
actual (GR/ACF)	.0301	.0348	.0255
standard (GR/DSCF)	.0575	.0669	.0487
Part. emission rate (LB/HR)	11.99	14.13	10.49

Note: Dry Catch Only

* For process information - see Appendix E.

Test No. 1
 C Pulp Dryer Stack

Results of Volumetric Flow Rate Determination-----Method 2

Date of Determination.....	02-22-94
Time of Determination.....(HRS)	1250
Barometric pressure.....(IN.HG)	29.94
Pitot tube coefficient.....	.84
Number of sampling ports.....	2
Total number of points.....	24
Shape of duct.....	Round
Stack diameter.....(IN)	48
Duct area.....(SQ.FT)	12.57
Direction of flow.....	UP
Static pressure.....(IN.WC)	-.95
Avg. gas temp.....(DEG-F)	210
Moisture content.....(% V/V)	33.27
Avg. linear velocity.....(FT/SEC)	61.4
Gas density.....(LB/ACF)	.05230
Molecular weight.....(LB/LBMOLE)	29.39
Mass flow of gas.....(LB/HR)	145175
Volumetric flow rate.....	
actual.....(ACFM)	46262
dry standard.....(DSCFM)	24288

Test No. 1
C Pulp Dryer Stack

Results of Particulate Loading Determinations-----Method 5

	Run 1 02-22-94	Run 2 02-22-94	Run 3 02-22-94
Date of run			
Time run start/end.....(HRS)	1418/1622	1705/1911	1940/2146
Static pressure.....(IN.WC)	-0.95	-0.95	-0.95
Cross sectional area (SQ.FT)	12.57	12.57	12.57
Pitot tube coefficient.....	.840	.840	.840
Water in sample gas			
condenser.....(ML)	0.0	0.0	0.0
impingers.....(GRAMS)	452.0	461.0	454.0
desiccant.....(GRAMS)	11.0	10.0	5.0
total.....(GRAMS)	463.0	471.0	459.0
Total particulate material..			
.....collected(grams)	0.1748	0.2005	0.1507
Gas meter coefficient.....	0.9976	0.9976	0.9976
Barometric pressure..(IN.HG)	29.94	29.94	29.94
Avg. orif.pres.drop..(IN.WC)	0.47	0.47	0.48
Avg. gas meter temp..(DEF-F)	85.0	85.0	84.6
Volume through gas meter....			
at meter conditions...(CF)	45.24	45.25	45.60
standard conditions.(DSCF)	43.79	43.80	44.17
Total sampling time....(MIN)	120.00	120.00	120.00
Nozzle diameter.....(IN)	.184	.184	.184
Avg.stack gas temp ..(DEG-F)	212	213	215
Volumetric flow rate.....			
actual.....(ACFM)	46487	47360	47936
dry standard.....(DSCFM)	24316	24619	25136
Isokinetic variation.....(%)	102.2	100.9	99.7
Particulate concentration...			
actual.....(GR/ACF)	0.03221	0.03671	0.02760
dry standard.....(GR/DSCF)	0.06160	0.07064	0.05265
Particle mass rate...(LB/HR)	12.839	14.907	11.343

Test No. 2
B Pulp Dryer Stack

Results of Particulate Loading Determinations-----Method 5

	Run 1 02-23-94	Run 2 02-23-94	Run 3 02-23-94
Date of run			
Time run start/end.....(HRS)	1021/1225	1300/1503	1543/1744
Static pressure.....(IN.WC)	-0.79	-0.79	-0.79
Cross sectional area (SQ.FT)	18.99	18.99	18.99
Pitot tube coefficient.....	.840	.840	.840
Water in sample gas			
condenser.....(ML)	0.0	0.0	0.0
impingers.....(GRAMS)	305.0	322.0	331.0
desiccant.....(GRAMS)	8.0	5.0	7.0
total.....(GRAMS)	313.0	327.0	338.0
Total particulate material..			
.....collected(grams)	0.1444	0.1430	0.1427
Gas meter coefficient.....	0.9976	0.9976	0.9976
Barometric pressure..(IN.HG)	29.43	29.43	29.43
Avg. orif.pres.drop..(IN.WC)	0.43	0.43	0.46
Avg. gas meter temp..(DEF-F)	85.3	85.3	84.3
Volume through gas meter....			
at meter conditions...(CF)	41.20	43.55	44.91
standard conditions.(DSCF)	39.17	41.41	42.78
Total sampling time....(MIN)	120.00	120.00	120.00
Nozzle diameter.....(IN)	.184	.184	.184
Avg.stack gas temp ..(DEG-F)	239	237	236
Volumetric flow rate.....			
actual.....(ACFM)	68268	68024	68536
dry standard.....(DSCFM)	36779	36865	37205
Isokinetic variation.....(%)	91.3	96.3	98.6
Particulate concentration...			
actual.....(GR/ACF)	0.03063	0.02887	0.02793
dry standard.....(GR/DSCF)	0.05688	0.05329	0.05147
Particle mass rate...(LB/HR)	17.931	16.839	16.413

Test No. 4
 A Pulp Dryer Stack

Results of Particulate Loading Determinations-----Method

Date of run	Run 1 02-24-94	Run 2 02-24-94	Run 02-24-94
Time run start/end.....(HRS)	930/1134	1200/1405	1425/162
Static pressure.....(IN.WC)	-0.78	-0.78	-0.78
Cross sectional area (SQ.FT)	12.05	12.05	12.0
Pitot tube coefficient.....	.840	.840	.84
Water in sample gas			
condenser.....(ML)	0.0	0.0	0.0
impingers.....(GRAMS)	403.0	380.0	380.0
desiccant.....(GRAMS)	13.0	12.0	11.0
total.....(GRAMS)	416.0	392.0	391.0
Total particulate material.. collected(grams)	0.1536	0.1276	0.1372
Gas meter coefficient.....	1.0027	1.0027	1.0027
Barometric pressure..(IN.HG)	29.28	29.28	29.28
Avg. orif.pres.drop..(IN.WC)	0.41	0.41	0.42
Avg. gas meter temp..(DEF-F)	69.7	73.8	74.4
Volume through gas meter....			
at meter conditions...(CF)	43.86	43.64	44.08
standard conditions.(DSCF)	42.93	42.38	42.76
Total sampling time....(MIN)	120.00	120.00	120.00
Nozzle diameter.....(IN)	.184	.184	.184
Avg.stack gas temp ..(DEG-F)	208	204	203
Volumetric flow rate.....			
actual.....(ACFM)	44409	43415	43154
dry standard.....(DSCFM)	23522	23490	23462
Isokinetic variation.....(%)	99.3	98.2	99.2
Particulate concentration...			
actual.....(GR/ACF)	0.02923	0.02512	0.02690
dry standard.....(GR/DSCF)	0.05521	0.04645	0.04950
Particle mass rate...(LB/HR)	11.132	9.353	9.956

Test No. 3

Results of the Particle Size Distribution Determination

Sample Identification: B Pulp Dyrer Stack - February 23, 1994
Cascade Impactor Sampling

Assigned Density: 1.00 g/cc

Stage	Run 1	
	um	% ≥
Preimpactor	10.0	10.9
1	6.1	18.0
2	4.0	23.0
3	2.5	29.8
4	1.5	33.2
5	0.98	36.0
6	0.61	39.5
7	0.35	45.6

um
% ≥

Aerodynamic equivalent diameter in microns
Relative cumulative frequency - percent by mass of aerosol with
diameters greater than stated size

Test No. 3
B Pulp Dryer Stack
(CASCACE IMPACTOR)

Results of Particulate Loading Determinations-----Method 5

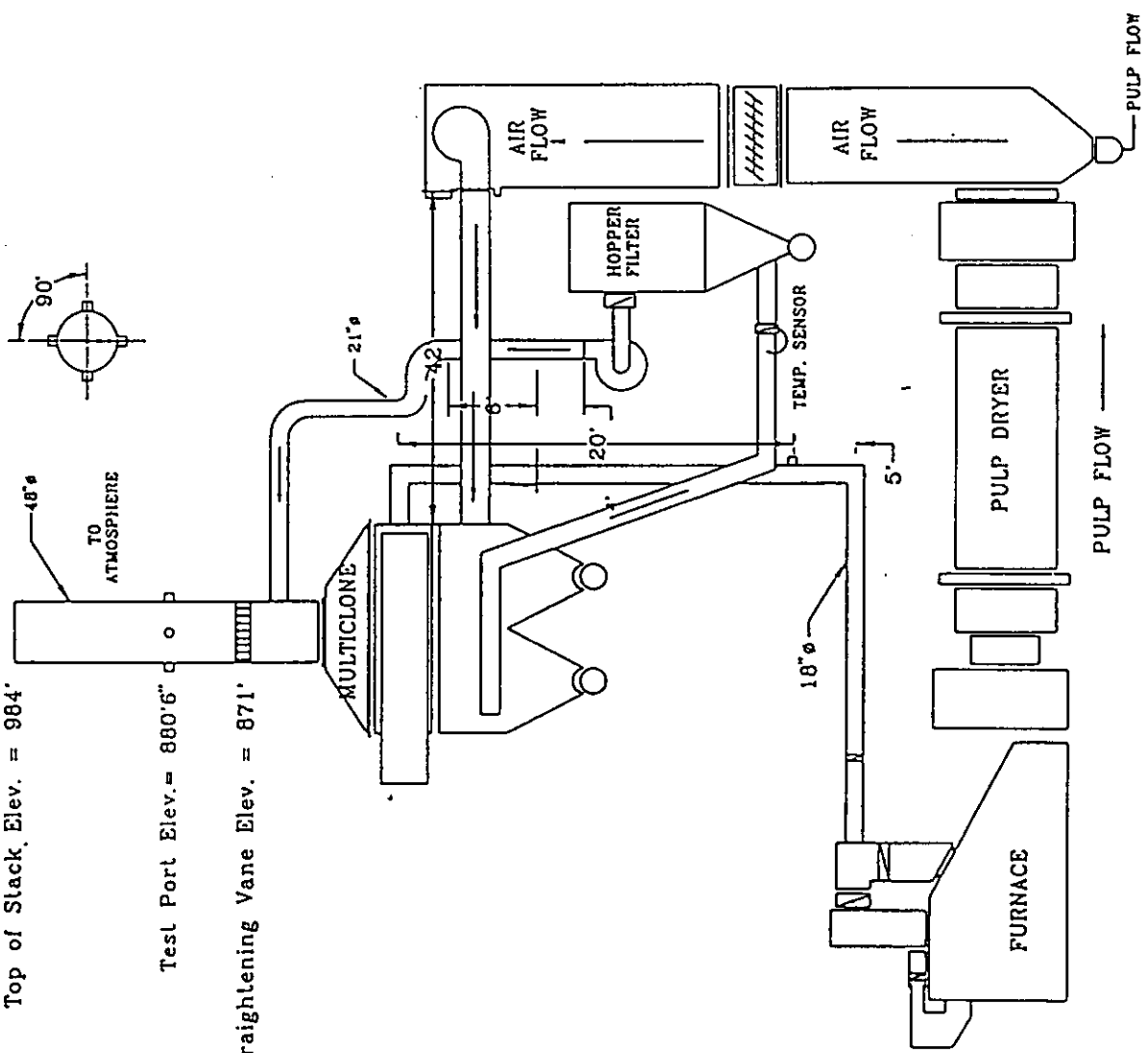
	Run 1
Date of run	02-23-94
Time run start/end.....(HRS)	1833/1940
Static pressure.....(IN.WC)	-0.79
Cross sectional area (SQ.FT)	18.99
Pitot tube coefficient.....	.840
Water in sample gas	
condenser.....(ML)	0.0
impingers.....(GRAMS)	201.0
desiccant.....(GRAMS)	5.0
total.....(GRAMS)	206.0
Total particulate material..	
.....collected(grams)	0.0697
Gas meter coefficient.....	0.9976
Barometric pressure..(IN.HG)	29.43
Avg. orif.pres.drop..(IN.WC)	0.71
Avg. gas meter temp..(DEF-F)	82.0
Volume through gas meter....	
at meter conditions...(CF)	28.05
standard conditions.(DSCF)	26.85
Total sampling time....(MIN)	60.00
Nozzle diameter.....(IN)	.206
Avg.stack gas temp ..(DEG-F)	236
Volumetric flow rate.....	
actual.....(ACFM)	68604
dry standard.....(DSCFM)	37510
Isokinetic variation.....(%)	97.9
Particulate concentration...	
actual.....(GR/ACF)	0.02189
dry standard.....(GR/DSCF)	0.04004
Particle mass rate...(LB/HR)	12.87

COB00103

Top of Stack Elev. = 984'

Test Port Elev. = 880'6"

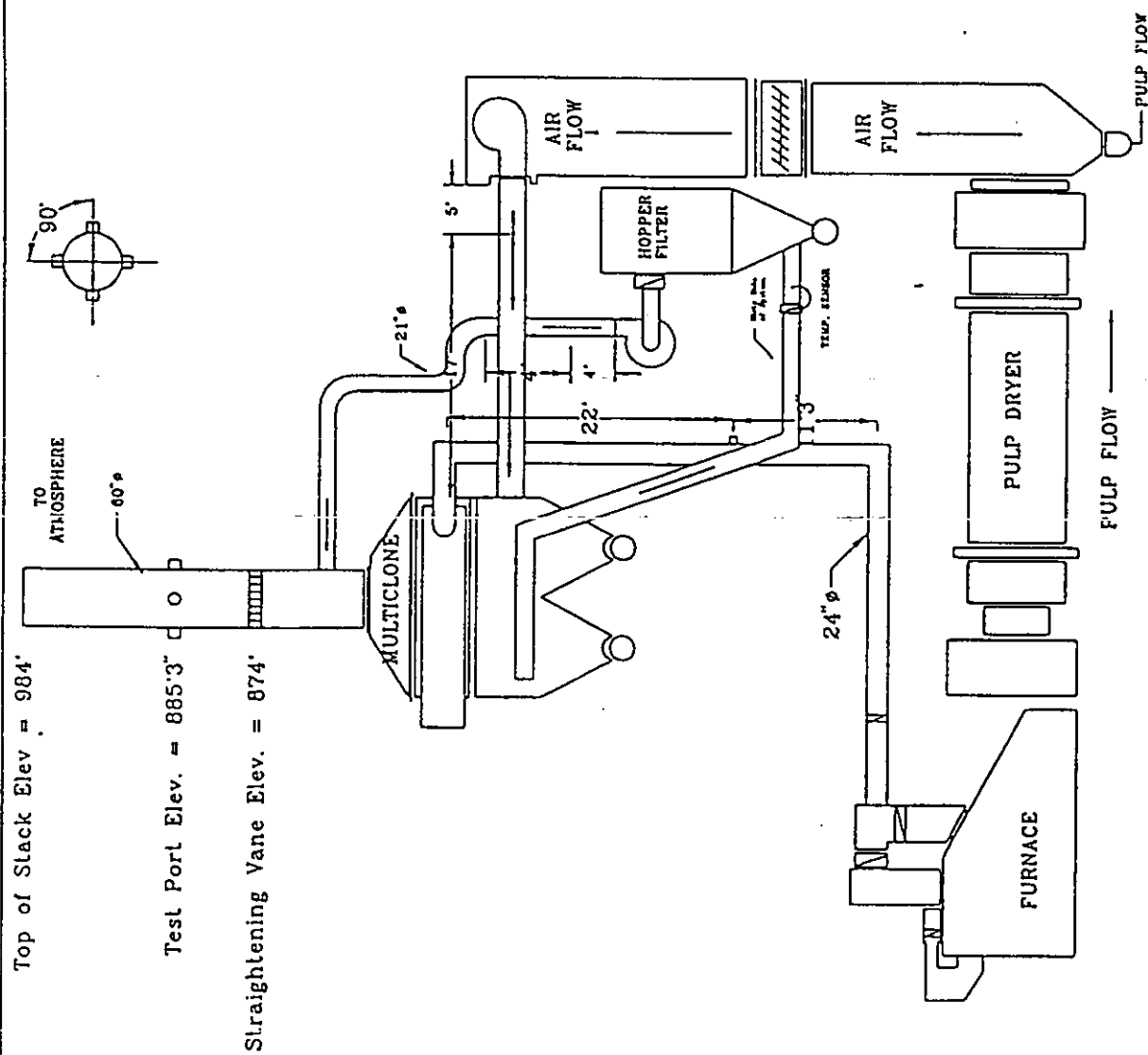
Straightening Vane Elev. = 871'

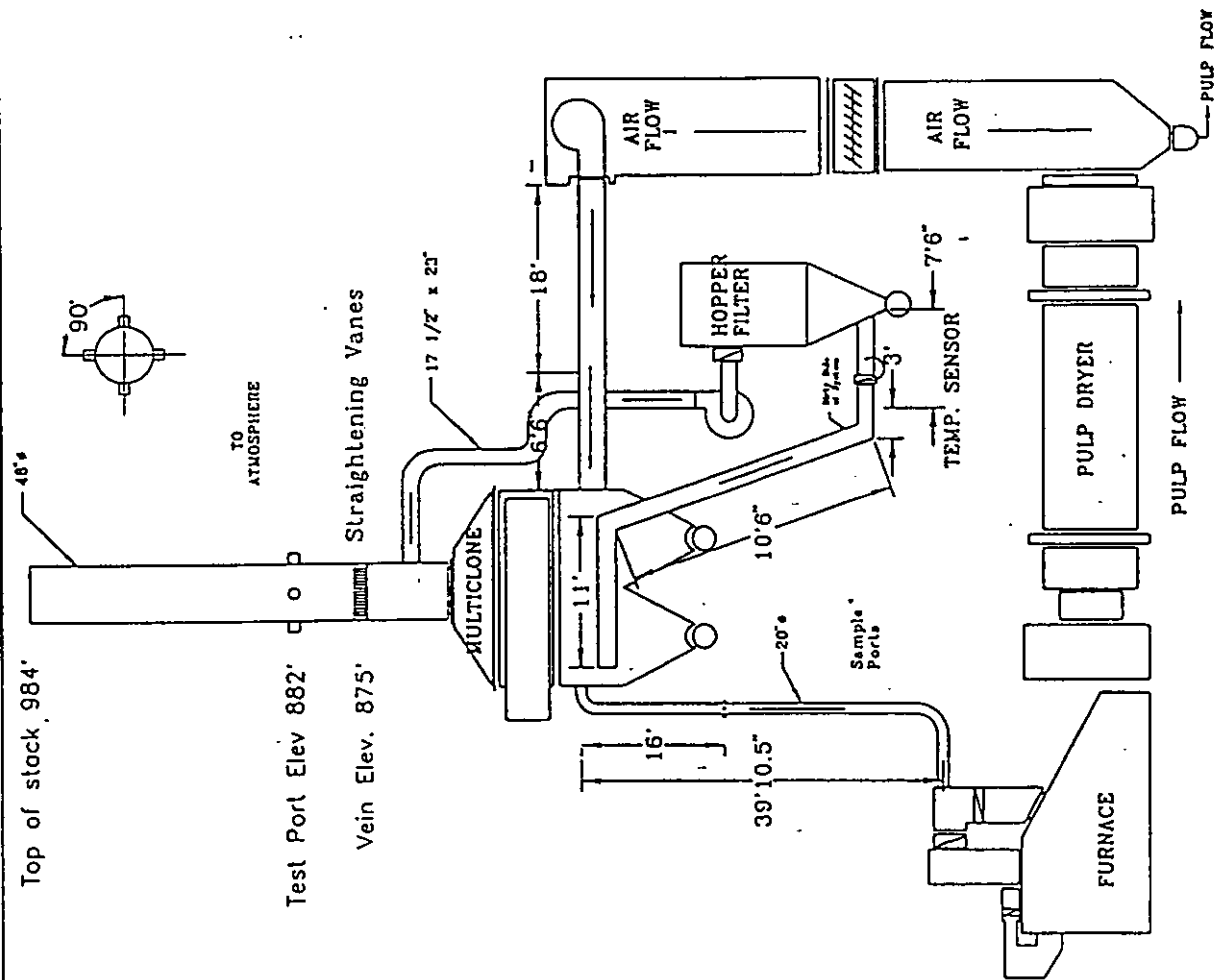


BASE ELEV. = 834'0"



'A' Pulp Drier Pollution Control
Equipment Flow Diagram.
Scale: 1/4" = 1'-0"





Bose Elev. = 834'



'C' Pulp Drier Pollution Control
Equipment Flow Diagram.

Interpoll Laboratories
(512) 786-6020

EPA Method 5 Data Reporting Sheet
Impinger Catch/Minnesota Protocol

Job ACS/EGF Source C dryer
Team Leader DWH Test Site static
Date Submitted 2-25-94 Date of Test 2-22-94
Test No. 1 No. of Runs Completed 3
Date of Analysis 3-6-94 Technician R. EIDEM

0	Test <u>1</u> Run <u>0</u> Field Blank Log Number <u>2326-05I</u> Comments _____	Dish No. <u>12</u> Dish Tare Wt. <u>48.1490</u> g Dish+Sample Wt. <u>48.1494</u> g Sample Wt. <u>0.0004</u> g
1	Test <u>1</u> Run <u>1</u> - <u>06 I</u> Log Number _____ Comments _____	Dish No. <u>19</u> Dish Tare Wt. <u>48.9561</u> g Dish+Sample Wt. <u>48.9681</u> g Sample Wt. <u>0.0120</u> g
2	Test <u>1</u> Run <u>2</u> - <u>07 I</u> Log Number _____ Comments _____	Dish No. <u>20</u> Dish Tare Wt. <u>48.8128</u> g Dish+Sample Wt. <u>48.8237</u> g Sample Wt. <u>0.0109</u> g
3	Test <u>1</u> Run <u>3</u> - <u>08 I</u> Log Number _____ Comments _____	Dish No. <u>21</u> Dish Tare Wt. <u>47.5271</u> g Dish+Sample Wt. <u>47.5388</u> g Sample Wt. <u>0.0117</u> g
4	Test _____ Run _____ Log Number _____ Comments _____	Dish No. _____ Dish Tare Wt. _____ g Dish+Sample Wt. _____ g Sample Wt. _____ g
5	Test _____ Run _____ Log Number _____ Comments _____	Dish No. _____ Dish Tare Wt. _____ g Dish+Sample Wt. _____ g Sample Wt. _____ g

Blank Solvent Wt. 0.0004g

Results:

Field Blk. Run 1 Run 2 Run 3 Run 4 Run 5

	0.0116	0.0105	0.0113	0-12	

LS000

Interpoll Laboratories
(312) 796-6020

EPA Method 5 Data Reporting Sheet
Probe/Cyclone Wash

Job ACS - EGF Source C Oxyer
Team Leader DVH Test Site Stack
Date Submitted 2-25-94 Date of Test 1
Test No. 1 No. of Runs Completed 3
Date of Analysis 3-3-94 Technician R. EIDEM
Transport Leakage ☐ None ☒ ml Solvent acetone

0	Test <u>1</u> Run <u>0</u> Field Blank Log Number <u>2326 - 05P</u> Vol. of Solvent <u>100</u> ml *Solvent Residue <u>3.00</u> ug/ml	Dish No. <u>502</u> Dish Tare Wt. <u>46.9039</u> Dish+Sample Wt. <u>46.9039</u> Sample Wt. <u>0.0003</u>	g g g
1	Test <u>1</u> Run <u>1</u> Vol. of Solvent <u>225</u> ml Log Number <u>-06P</u> Comments _____	Dish No. <u>504</u> Dish Tare Wt. <u>50.0215</u> Dish+Sample Wt. <u>50.0644</u> Sample Wt. <u>0.0429</u>	g g g
2	Test <u>1</u> Run <u>2</u> Vol. of Solvent <u>190</u> ml Log Number <u>-07P</u> Comments _____	Dish No. <u>522</u> Dish Tare Wt. <u>47.0022</u> Dish+Sample Wt. <u>47.0816</u> Sample Wt. <u>0.0794</u>	g g g
3	Test <u>1</u> Run <u>3</u> Vol. of Solvent <u>150</u> ml Log Number <u>-08P</u> Comments _____	Dish No. <u>609</u> Dish Tare Wt. <u>45.5609</u> Dish+Sample Wt. <u>45.5828</u> Sample Wt. <u>0.0219</u>	g g g
4	Test _____ Run _____ Vol. of Solvent _____ ml Log Number _____ Comments _____	Dish No. _____ Dish Tare Wt. _____ Dish+Sample Wt. _____ Sample Wt. _____	g g g
5	Test _____ Run _____ Vol. of Solvent _____ ml Log Number _____ Comments _____	Dish No. _____ Dish Tare Wt. _____ Dish+Sample Wt. _____ Sample Wt. _____	g g g

*Solvent Residue 3.0 ug/ml = [(Sample Wt. 0.0003g) (10⁶)] / Vol. of Sol. 100 ml
EPA-M5 Acetone Residue Blank Spec. 7.3 ug/ml

Results:

Field Blk. Run 1 Run 2 Run 3 Run 4 Run 5

	0.0423	0.0788	0.0214 D-13		

LSC-01

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EPA Method 5 Data Reporting Sheet
Filter Gravimetrics

Job AGS/EGF Source C Dryer
Team Leader DVA Test Site Stack
Date Submitted 2-25-94 Date of Test 2-22-94
Test No. 1 No. of Runs Completed 3
Date of Analysis 3-3-94 Technician C. Helgeson

0	Test <u>1</u> Run <u>0</u> Field Blank Log Number <u>2326-05F</u> Comments _____	Filter No. <u>6263</u> Filter Type <u>4"GF</u> Filter Tare Wt. <u>.8703</u> Filter+Sample Wt. <u>.8703</u> Sample Wt. _____
1	Test <u>1</u> Run <u>1</u> Log Number <u>-06F</u> Comments _____	Filter No. <u>6139</u> Filter Type <u>4"GF</u> Filter Tare Wt. <u>.8880</u> Filter+Sample Wt. <u>1.0089</u> Sample Wt. <u>0.1209</u>
2	Test <u>1</u> Run <u>2</u> Log Number <u>-07F</u> Comments _____	Filter No. <u>6141</u> Filter Type <u>4"GF</u> Filter Tare Wt. <u>.8786</u> Filter+Sample Wt. <u>.9948</u> Sample Wt. <u>0.1112</u>
3	Test <u>1</u> Run <u>3</u> Log Number <u>-08F</u> Comments _____	Filter No. <u>6258</u> Filter Type <u>4"GF</u> Filter Tare Wt. <u>.8741</u> Filter+Sample Wt. <u>.9971</u> Sample Wt. <u>0.1180</u>
4	Test _____ Run _____ Log Number _____ Comments _____	Filter No. _____ Filter Type _____ Filter Tare Wt. _____ Filter+Sample Wt. _____ Sample Wt. _____
5	Test _____ Run _____ Log Number _____ Comments _____	Filter No. _____ Filter Type _____ Filter Tare Wt. _____ Filter+Sample Wt. _____ Sample Wt. _____

Results:

Field Blk. Run 1 Run 2 Run 3 Run 4 Run 5

	0.1209	0.1112	0.1180		

Field Blk. Run 1 Run 2 Run 3 Run 4 Run 5

	0.1748	0.2005	0.1507		

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EPA Method 5 Data Reporting Sheet
Impinger Catch/Minnesota Protocol

Job ACS/EGF Source R dryer
Team Leader DUH Test Site Stack
Date Submitted 2-25-94 Date of Test 2-27-94
Test No. 2 No. of Runs Completed 3
Date of Analysis 3-6-94 Technician R. EIDEM

0	Test <u>2</u> Run <u>0</u> Field Blank Log Number <u>2326-12I</u> Comments _____	Dish No. <u>2</u> Dish Tare Wt. <u>46.2267</u> g Dish+Sample Wt. <u>46.2271</u> g Sample Wt. <u>0.0004</u> g
1	Test <u>2</u> Run <u>1</u> Log Number <u>-13I</u> Comments _____	Dish No. <u>3</u> Dish Tare Wt. <u>52.1230</u> g Dish+Sample Wt. <u>52.1310</u> g Sample Wt. <u>0.0080</u> g
2	Test <u>2</u> Run <u>2</u> Log Number <u>-14I</u> Comments _____	Dish No. <u>11</u> Dish Tare Wt. <u>47.7595</u> g Dish+Sample Wt. <u>47.7676</u> g Sample Wt. <u>0.0081</u> g
3	Test <u>2</u> Run <u>3</u> Log Number <u>-15I</u> Comments _____	Dish No. <u>17</u> Dish Tare Wt. <u>48.3931</u> g Dish+Sample Wt. <u>48.4002</u> g Sample Wt. <u>0.0071</u> g
4	Test _____ Run _____ Log Number _____ Comments _____	Dish No. _____ Dish Tare Wt. _____ g Dish+Sample Wt. _____ g Sample Wt. _____ g
5	Test _____ Run _____ Log Number _____ Comments _____	Dish No. _____ Dish Tare Wt. _____ g Dish+Sample Wt. _____ g Sample Wt. _____ g

Blank Solvent Wt. 0.004g

Results:

Field Blk. Run 1 Run 2 Run 3 Run 4 Run 5

	0.0076	0.0077	0.0067	D-18	

LSC-0

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EPA Method 5 Data Reporting Sheet
Probe/Cyclone Wash

Job ACS-EGF Source B Over
Team Leader DUT Test Site Stack
Date Submitted 2-25-94 Date of Test 2-23-94
Test No. 2 No. of Runs Completed 3
Date of Analysis 3-3-94 Technician R. EIDEM
Transport Leakage ☐ None ☒ ml Solvent acetone

0	Test <u>2</u> Run <u>0</u> Field Blank Log Number <u>2326-12P</u> Vol. of Solvent <u>100</u> ml *Solvent Residue <u>3.00</u> ug/ml	Dish No. <u>40</u> Dish Tare Wt. <u>47.6433</u> g Dish+Sample Wt. <u>47.6437</u> g Sample Wt. <u>0.0003</u> g
1	Test <u>2</u> Run <u>1</u> Vol. of Solvent <u>150</u> ml Log Number <u>-13P</u> Comments _____	Dish No. <u>47</u> Dish Tare Wt. <u>48.4658</u> g Dish+Sample Wt. <u>48.4968</u> g Sample Wt. <u>0.0310</u> g
2	Test <u>2</u> Run <u>2</u> Vol. of Solvent <u>160</u> ml Log Number <u>-14P</u> Comments _____	Dish No. <u>64</u> Dish Tare Wt. <u>43.1473</u> g Dish+Sample Wt. <u>43.1756</u> g Sample Wt. <u>0.0283</u> g
3	Test <u>2</u> Run <u>3</u> Vol. of Solvent <u>125</u> ml Log Number <u>-15P</u> Comments _____	Dish No. <u>69</u> Dish Tare Wt. <u>47.9924</u> g Dish+Sample Wt. <u>48.0209</u> g Sample Wt. <u>0.0285</u> g
4	Test _____ Run _____ Vol. of Solvent _____ ml Log Number _____ Comments _____	Dish No. _____ Dish Tare Wt. _____ g Dish+Sample Wt. _____ g Sample Wt. _____ g
5	Test _____ Run _____ Vol. of Solvent _____ ml Log Number _____ Comments _____	Dish No. _____ Dish Tare Wt. _____ g Dish+Sample Wt. _____ g Sample Wt. _____ g

*Solvent Residue 3.0 ug/ml = [(Sample Wt. 0.0003g) (10⁶)] / Vol. of Sol. 100 ml
EPA-M5 Acetone Residue Blank Spec. 7.3 ug/ml

Results:

Field Blk. Run 1 Run 2 Run 3 Run 4 Run 5

	0.0305	0.0278	0.0281	0-19	

LSC-0

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EPA Method 5 Data Reporting Sheet
Filter Gravimetrics

Job ACS/EGF Source B Dryer
Team Leader DVH Test Site Stack
Date Submitted 2-25-94 Date of Test 2-23-94
Test No. 2 No. of Runs Completed 3
Date of Analysis 3-3-94 Technician B. J. Burke

0	Test <u>2</u> Run <u>0</u> Field Blank Log Number <u>2326-12F</u> Comments _____	Filter No. <u>6262</u> Filter Type <u>4" GF</u> Filter Tare Wt. <u>.8607</u> Filter+Sample Wt. <u>.8608</u> Sample Wt. <u>0.0001</u>	g g g g
1	Test <u>2</u> Run <u>1</u> Log Number <u>-13F</u> Comments _____	Filter No. <u>6257</u> Filter Type <u>4" GF</u> Filter Tare Wt. <u>.8697</u> Filter+Sample Wt. <u>.9760</u> Sample Wt. <u>0.1063</u>	g g g g
2	Test <u>2</u> Run <u>2</u> Log Number <u>-14F</u> Comments _____	Filter No. <u>6261</u> Filter Type <u>4" GF</u> Filter Tare Wt. <u>.8723</u> Filter+Sample Wt. <u>.9798</u> Sample Wt. <u>0.1075</u>	g g g g
3	Test <u>2</u> Run <u>3</u> Log Number <u>-15F</u> Comments _____	Filter No. <u>6142</u> Filter Type <u>4" GF</u> Filter Tare Wt. <u>.8724</u> Filter+Sample Wt. <u>.9803</u> Sample Wt. <u>0.1079</u>	g g g g
4	Test _____ Run _____ Log Number _____ Comments _____	Filter No. _____ Filter Type _____ Filter Tare Wt. _____ Filter+Sample Wt. _____ Sample Wt. _____	g g g g
5	Test _____ Run _____ Log Number _____ Comments _____	Filter No. _____ Filter Type _____ Filter Tare Wt. _____ Filter+Sample Wt. _____ Sample Wt. _____	g g g g

Results:

Field Blk. Run 1 Run 2 Run 3 Run 4 Run 5

	0.1063	0.1075	0.1079		

Field Blk. Run 1 Run 2 Run 3 Run 4 Run 5

	0.1444	0.1430	0.1427		

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EPA Method 5 Data Reporting Sheet
Impinger Catch/Minnesota Protocol

Job ACS/EGF Source A Dryer
Team Leader DUIT Test Site Stack
Date Submitted _____ Date of Test 2-27-94
Test No. 4 No. of Runs Completed 3
Date of Analysis 3-9-94 Technician C. Helgeson

0	Test <u>Run 0</u> Field Blank Log Number _____ Comments _____	Dish No. _____ Dish Tare Wt. _____ g Dish+Sample Wt. _____ g Sample Wt. _____ g
1	Test <u>4</u> Run <u>1</u> Log Number <u>2326-16T</u> Comments _____	Dish No. <u>328</u> Dish Tare Wt. <u>41.9654</u> g Dish+Sample Wt. <u>41.9809</u> g Sample Wt. <u>0.0155</u> g
2	Test <u>4</u> Run <u>2</u> Log Number <u>-17F</u> Comments _____	Dish No. <u>340</u> Dish Tare Wt. <u>47.9136</u> g Dish+Sample Wt. <u>47.9299</u> g Sample Wt. <u>0.0163</u> g
3	Test <u>4</u> Run <u>3</u> Log Number <u>-18F</u> Comments _____	Dish No. <u>341</u> Dish Tare Wt. <u>47.6589</u> g Dish+Sample Wt. <u>47.6751</u> g Sample Wt. <u>0.0162</u> g
4	Test _____ Run _____ Log Number _____ Comments _____	Dish No. _____ Dish Tare Wt. _____ g Dish+Sample Wt. _____ g Sample Wt. _____ g
5	Test _____ Run _____ Log Number _____ Comments _____	Dish No. _____ Dish Tare Wt. _____ g Dish+Sample Wt. _____ g Sample Wt. _____ g

Blank Solvent Wt. 1.0004 g

Results:

Field Blk. Run 1 Run 2 Run 3 Run 4 Run 5

	0.0151	0.0159	0.0158	0.21	

LSOC

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EPA Method 5 Data Reporting Sheet
Probe/Cyclone Wash

Job ACS-EGF Source A Dryer
Team Leader DVH Test Site Stalk
Date Submitted 2-25-94 Date of Test 2-24-94
Test No. 4 No. of Runs Completed 3
Date of Analysis 3-3-94 Technician REIDEM
Transport Leakage ☐ None ☒ ml Solvent acetone

0	Test <u> </u> Run <u>0</u> Field Blank Log Number <u> </u> Vol. of Solvent <u> </u> ml *Solvent Residue <u>3.0</u> ug/ml	Dish No. <u> </u> Dish Tare Wt. <u> </u> g Dish+Sample Wt. <u> </u> g Sample Wt. <u> </u> g
1	Test <u>4</u> Run <u>1</u> Vol. of Solvent <u>125</u> ml Log Number <u>2326-16 P</u> Comments <u> </u>	Dish No. <u>16</u> Dish Tare Wt. <u>49.1384</u> g Dish+Sample Wt. <u>49.1860</u> g Sample Wt. <u>0.0476</u> g
2	Test <u>4</u> Run <u>2</u> Vol. of Solvent <u>190</u> ml Log Number <u>-17 P</u> Comments <u> </u>	Dish No. <u>175</u> Dish Tare Wt. <u>53.0301</u> g Dish+Sample Wt. <u>53.0600</u> g Sample Wt. <u>0.0299</u> g
3	Test <u>4</u> Run <u>3</u> Vol. of Solvent <u>150</u> ml Log Number <u>-18 P</u> Comments <u> </u>	Dish No. <u>509</u> Dish Tare Wt. <u>47.6214</u> g Dish+Sample Wt. <u>47.6500</u> g Sample Wt. <u>0.0286</u> g
4	Test <u> </u> Run <u> </u> Vol. of Solvent <u> </u> ml Log Number <u> </u> Comments <u> </u>	Dish No. <u> </u> Dish Tare Wt. <u> </u> g Dish+Sample Wt. <u> </u> g Sample Wt. <u> </u> g
5	Test <u> </u> Run <u> </u> Vol. of Solvent <u> </u> ml Log Number <u> </u> Comments <u> </u>	Dish No. <u> </u> Dish Tare Wt. <u> </u> g Dish+Sample Wt. <u> </u> g Sample Wt. <u> </u> g

*Solvent Residue ug/ml = [(Sample Wt. g) (100)] / Vol. of Sol. ml
EPA-MS Acetone Residue Blank Spec. (7.3 ug/ml)

Results:

Field Blk. Run 1 Run 2 Run 3 Run 4 Run 5

	0.0467	0.0293	0.0281	0.22	-	LSC-0

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(612) 786-6020

EPA Method 5 Data Reporting Sheet
Filter Gravimetrics

Job ACS ECGF Source A Dryer
Team Leader DUH Test Site stack
Date Submitted 2-25-94 Date of Test 2-24-94
Test No. 4 No. of Runs Completed 3
Date of Analysis 3-3-94 Technician B.D

0	Test <u>Run 0</u> Field Blank Log Number _____ Comments _____	Filter No. _____ Filter Type _____ Filter Tare Wt. _____ g Filter+Sample Wt. _____ g Sample Wt. _____ g
1	Test <u>4</u> Run <u>1</u> Log Number <u>2326-16F</u> Comments _____	Filter No. <u>6271</u> Filter Type <u>4"6F</u> Filter Tare Wt. <u>.8667</u> g Filter+Sample Wt. <u>.9583</u> g Sample Wt. <u>0.0916</u> g
2	Test <u>4</u> Run <u>2</u> Log Number <u>-17F</u> Comments _____	Filter No. <u>6272</u> Filter Type <u>4"6F</u> Filter Tare Wt. <u>.8611</u> g Filter+Sample Wt. <u>.9435</u> g Sample Wt. <u>.0824</u> g
3	Test <u>4</u> Run <u>3</u> Log Number <u>-18F</u> Comments _____	Filter No. <u>6273</u> Filter Type <u>4"6F</u> Filter Tare Wt. <u>.8641</u> g Filter+Sample Wt. <u>.9574</u> g Sample Wt. <u>.0933</u> g
4	Test <u>Run</u> Log Number _____ Comments _____	Filter No. _____ Filter Type _____ Filter Tare Wt. _____ g Filter+Sample Wt. _____ g Sample Wt. _____ g
5	Test <u>Run</u> Log Number _____ Comments _____	Filter No. _____ Filter Type _____ Filter Tare Wt. _____ g Filter+Sample Wt. _____ g Sample Wt. _____ g

Results:

Field Blk. Run 1 Run 2 Run 3 Run 4 Run 5

	0.0916	0.0824	0.0933		

Field Blk. Run 1 Run 2 Run 3 Run 4 Run 5

	0.1536	0.1276	0.1372		

LSC-02PR

Test No. 4
A Pulp Dryer Stack

Results of Oxides of Nitrogen (NOx) Determinations-----Method 7

	Run 1A	Run 1B	Run 1C	Run 1D
Date of run.....	02-24-94	02-24-94	02-24-94	02-24-94
Time of run.....(HRS)	930	945	1000	1015
Flask number.....	61	62	63	64
Volume of flask.....(ML)	2100	2079	2067	2087
Data: time of sampling				
flask temperature...(DEG-F)	60.00	60.00	60.00	60.00
bar. press.....(IN.HG)	29.28	29.28	29.28	29.28
flask vacuum.....(IN.HG)	26.55	26.60	26.60	26.55
flask abs. press...(IN.HG)	2.73	2.68	2.68	2.73
Data: Time of Flask Opening				
flask temperature...(DEG-F)	70.00	70.00	70.00	70.00
lab. bar. press....(IN.HG)	29.10	29.10	29.10	29.10
flask static press.(IN.HG)	-0.25	-0.10	-0.70	0.90
flask abs. press....(IN.HG)	28.85	29.00	28.40	30.00
Volume gas sampled....(DSML)	1800	1796	1745	1868
Moisture content.....(%V/V)	30.55	30.55	30.55	30.55
Nitrate in gas sample...(JG)	284.0	273.0	318.0	350.0
NO2 in gas sample.....(JG)	210.7	202.6	235.9	259.7
<u>NOx Concentration</u>				
(GR/DSCF).....	0.0512	0.0493	0.0591	0.0608
(MG/DSCM).....	117	113	135	139
(PPM-DRY).....	61	59	71	73
(PPM-WET).....	43	41	49	50
NOX Emission rate....(LB/HR)	10.30	9.93	11.91	12.24

Test No. 4
A Pulp Dryer Stack

Results of Oxides of Nitrogen (NOx) Determinations-----Method 7

	Run 2A	Run 2B	Run 2C	Run 2D
Date of run.....	02-24-94	02-24-94	02-24-94	02-24-94
Time of run.....(HRS)	1030	1045	1100	1115
Flask number.....	65	66	19	20
Volume of flask.....(ML)	2068	2096	2069	2060

Data: time of sampling

flask temperature..(DEG-F)	60.00	60.00	60.00	60.00
bar. press.....(IN.HG)	29.28	29.28	29.28	29.28
flask vacuum.....(IN.HG)	26.65	26.65	26.65	26.60
flask abs. press...(IN.HG)	2.63	2.63	2.63	2.68

Data: Time of Flask Opening

flask temperature..(DEG-F)	70.00	70.00	70.00	70.00
lab. bar. press....(IN.HG)	29.10	29.10	29.10	29.10
flask static press.(IN.HG)	-0.30	-0.90	0.70	-1.00
flask abs. press...(IN.HG)	28.80	28.20	29.80	28.10
Volume gas sampled....(DSML)	1776	1759	1845	1718
Moisture content.....(%V/V)	30.55	30.55	30.55	30.55
Nitrate in gas sample...(JG)	324.0	274.0	251.0	261.0
NO2 in gas sample.....(JG)	240.4	203.3	186.2	193.7

NOx Concentration

(GR/DSCF).....	0.0592	0.0505	0.0441	0.0493
(MG/DSCM).....	135	116	101	113
(PPM-DRY).....	71	60	53	59
(PPM-WET).....	49	42	37	41
NOX Emission rate....(LB/HR)	11.91	10.17	8.89	9.92

Test No. 4
A Pulp Dryer Stack

Results of Oxides of Nitrogen (NOx) Determinations-----Method 7

	Run 3A	Run 3B	Run 3C	Run 3D
Date of run.....	02-24-94	02-24-94	02-24-94	02-24-94
Time of run.....(HRS)	1200	1215	1230	1245
Flask number.....	21	22	23	24
Volume of flask.....(ML)	2068	2031	2056	2031
Data: time of sampling				
flask temperature...(DEG-F)	60.00	60.00	60.00	60.00
bar. press.....(IN.HG)	29.28	29.28	29.28	29.28
flask vacuum.....(IN.HG)	26.70	26.70	26.70	26.70
flask abs. press...(IN.HG)	2.58	2.58	2.58	2.58
Data: Time of Flask Opening				
flask temperature...(DEG-F)	70.00	70.00	70.00	70.00
lab. bar. press.....(IN.HG)	29.10	29.10	29.10	29.10
flask static press.(IN.HG)	-1.90	-0.30	-1.25	1.70
flask abs. press...(IN.HG)	27.20	28.80	27.85	30.80
Volume gas sampled....(DSML)	1671	1747	1705	1881
Moisture content.....(%V/V)	30.55	30.55	30.55	30.55
Nitrate in gas sample...(JG)	368.0	335.0	342.0	349.0
NO2 in gas sample.....(JG)	273.0	248.6	253.8	259.0
<u>NOx Concentration</u>				
(GR/DSCF).....	0.0714	0.0622	0.0650	0.0602
(MG/DSCM).....	163	142	149	138
(PPM-DRY).....	85	74	78	72
(PPM-WET).....	59	52	54	50
NOX Emission rate....(LB/HR)	14.39	12.52	13.10	12.12

Test No. 2
B Pulp Dryer Stack

Results of Oxides of Nitrogen (NOx) Determinations-----Method 7

	Run 1A	Run 1B	Run 1C	Run 1D
Date of run.....	02-23-94	02-23-94	02-23-94	02-23-94
Time of run.....(HRS)	1645	1700	1715	1730
Flask number.....	43	44	46	45
Volume of flask.....(ML)	2088	2090	2090	2086

Data: time of sampling

flask temperature..(DEG-F)	60.00	60.00	60.00	60.00
bar. press.....(IN.HG)	29.43	29.43	29.43	29.43
flask vacuum.....(IN.HG)	26.80	26.80	26.85	26.90
flask abs. press...(IN.HG)	2.63	2.63	2.58	2.53

Data: Time of Flask Opening

flask temperature..(DEG-F)	70.00	70.00	70.00	70.00
lab. bar. press...(IN.HG)	29.11	29.11	29.11	29.11
flask static press.(IN.HG)	-5.65	0.70	-6.00	-5.00
flask abs. press...(IN.HG)	23.46	29.81	23.11	24.11

Volume gas sampled....(DSML)	1427	1864	1407	1477

Moisture content.....(%V/V)	27.68	27.68	27.68	27.68

Nitrate in gas sample...(JG)

NO2 in gas sample.....(JG)

NOx Concentration

(GR/DSCF).....
(MG/DSCM).....
(PPM-DRY).....
(PPM-WET).....

NOX Emission rate....(LB/HR)

Test No. 2
B Pulp Dryer Stack

Results of Oxides of Nitrogen (NOx) Determinations-----Method 7

	Run 2A	Run 2B	Run 2C	Run 2D
Date of run.....	02-23-94	02-23-94	02-23-94	02-23-94
Time of run.....(HRS)	1745	1835	1850	1910
Flask number.....	47	48	67	68
Volume of flask.....(ML)	2074	2102	2073	2101

Data: time of sampling

flask temperature...(DEG-F)	60.00	60.00	60.00	60.00
bar. press.....(IN.HG)	29.43	29.43	29.43	29.43
flask vacuum.....(IN.HG)	26.95	26.85	26.95	27.00
flask abs. press...(IN.HG)	2.48	2.58	2.48	2.43

Data: Time of Flask Opening

flask temperature...(DEG-F)	70.00	70.00	70.00	70.00
lab. bar. press...(IN.HG)	29.11	29.11	29.11	29.11
flask static press.(IN.HG)	0.50	-3.35	0.60	0.50
flask abs. press...(IN.HG)	29.61	25.76	29.71	29.61

Volume gas sampled....(DSML)	1847	1599	1853	1875

Moisture content.....(%V/V)	27.68	27.68	27.68	27.68

Nitrate in gas sample...(JG)		259.0	243.0
NO2 in gas sample.....(JG)		192.2	180.3

NOx Concentration

(GR/DSCF).....	0.0453	0.0420
(MG/DSCM).....	104	96
(PPM-DRY).....	54	50
(PPM-WET).....	39	36

NOX Emission rate....(LB/HR)	14.53	13.47

Test No. 2
B Pulp Dryer Stack

Results of Oxides of Nitrogen (NOx) Determinations-----Method 7

	Run 3A	Run 3B	Run 3C	Run 3D
Date of run.....	02-23-94	02-23-94	02-23-94	02-23-94
Time of run.....(HRS)	1945	2013	2029	2040
Flask number.....	69	70	71	72
Volume of flask.....(ML)	2069	2071	2038	2092
Data: time of sampling				
flask temperature..(DEG-F)	60.00	60.00	60.00	60.00
bar. press.....(IN.HG)	29.43	29.43	29.43	29.43
flask vacuum.....(IN.HG)	26.85	26.80	26.80	26.80
flask abs. press...(IN.HG)	2.58	2.63	2.63	2.63
Data: Time of Flask Opening				
flask temperature..(DEG-F)	70.00	70.00	70.00	70.00
lab. bar. press...(IN.HG)	29.11	29.11	29.11	29.11
flask static press.(IN.HG)	0.10	-0.10	-6.50	-4.30
flask abs. press...(IN.HG)	29.21	29.01	22.61	24.81
Volume gas sampled....(DSML)	1808	1793	1335	1522
Moisture content.....(%V/V)	27.68	27.68	27.68	27.68
Nitrate in gas sample...(JG)	276.0	307.0	253.0	270.0
NO2 in gas sample.....(JG)	204.8	227.8	187.7	200.3
<u>NOx Concentration</u>				
(GR/DSCF).....	0.0495	0.0555	0.0614	0.0575
(MG/DSCM).....	113	127	141	132
(PPM-DRY).....	59	66	74	69
(PPM-WET).....	43	48	53	50
NOX Emission rate....(LB/HR)	15.87	17.80	19.70	18.44

Test No. 5
C Pulp Dryer Stack

Results of Oxides of Nitrogen (NOx) Determinations-----Method 7

	Run 1A	Run 1B	Run 1C	Run 1D
Date of run.....	02-24-94	02-24-94	02-24-94	02-24-94
Time of run.....(HRS)	832	847	914	929
Flask number.....	13	14	15	16
Volume of flask.....(ML)	2060	2048	2045	2067
Data: time of sampling				
flask temperature...(DEG-F)	50.00	50.00	50.00	50.00
bar. press.....(IN.HG)	29.24	29.24	29.24	29.24
flask vacuum.....(IN.HG)	26.70	26.90	26.80	26.85
flask abs. press...(IN.HG)	2.54	2.34	2.44	2.39
Data: Time of Flask Opening				
flask temperature...(DEG-F)	70.00	70.00	70.00	70.00
lab. bar. press...(IN.HG)	29.10	29.10	29.10	29.10
flask static press.(IN.HG)	1.10	6.35	5.75	-0.40
flask abs. press...(IN.HG)	30.20	35.45	34.85	28.70
Volume gas sampled....(DSML)	1867	2223	2173	1782
Moisture content.....(%V/V)	28.69	28.69	28.69	28.69
Nitrate in gas sample...(JG)	525.0	454.0	436.0	438.0
NO2 in gas sample.....(JG)	389.5	336.9	323.5	325.0
<u>NOx Concentration</u>				
(GR/DSCF).....	0.0912	0.0662	0.0651	0.0797
(MG/DSCM).....	209	152	149	182
(PPM-DRY).....	109	79	78	95
(PPM-WET).....	78	56	56	68
NOX Emission rate....(LB/HR)	19.62	14.25	14.00	17.15

Test No. 5
C Pulp Dryer Stack

Results of Oxides of Nitrogen (NOx) Determinations-----Method 7

	Run 2A	Run 2B	Run 2C	Run 2D
Date of run.....	02-24-94	02-24-94	02-24-94	02-24-94
Time of run.....(HRS)	945	958	1014	1030
Flask number.....	17	18	43	44
Volume of flask.....(ML)	2054	2045	2088	2090

Data: time of sampling

flask temperature..(DEG-F)	45.00	40.00	40.00	40.00
bar. press.....(IN.HG)	29.24	29.24	29.24	29.24
flask vacuum.....(IN.HG)	26.90	26.60	27.10	27.10
flask abs. press...(IN.HG)	2.34	2.64	2.14	2.14

Data: Time of Flask Opening

flask temperature..(DEG-F)	70.00	70.00	70.00	70.00
lab. bar. press....(IN.HG)	29.10	29.10	29.10	29.10
flask static press.(IN.HG)	1.60	-5.00	-5.65	0.70
flask abs. press....(IN.HG)	30.70	24.10	23.45	29.80

Volume gas sampled....(DSML)	1907	1432	1454	1892

Moisture content.....(%V/V)	28.69	28.69	28.69	28.69

Nitrate in gas sample...(JG)	333.0	327.0
NO2 in gas sample.....(JG)	247.1	242.6

NOx Concentration

(GR/DSCF).....	0.0566	0.0740
(MG/DSCM).....	130	169
(PPM-DRY).....	68	89
(PPM-WET).....	48	63

NOX Emission rate....(LB/HR)	12.18	15.93

Test No. 5
C Pulp Dryer Stack

Results of Oxides of Nitrogen (NOx) Determinations-----Method 7

	Run 3A	Run 3B	Run 3C	Run 3D
Date of run.....	02-24-94	02-24-94	02-24-94	02-24-94
Time of run.....(HRS)	1048	1108	1120	1135
Flask number.....	45	46	47	48
Volume of flask.....(ML)	2086	2090	2074	2102

Data: time of sampling

flask temperature..(DEG-F)	40.00	40.00	35.00	36.00
bar. press.....(IN.HG)	29.24	29.24	29.24	29.24
flask vacuum.....(IN.HG)	27.10	26.90	27.40	27.80
flask abs. press...(IN.HG)	2.14	2.34	1.84	1.44

Data: Time of Flask Opening

flask temperature..(DEG-F)	70.00	70.00	70.00	70.00
lab. bar. press....(IN.HG)	29.10	29.10	29.10	29.10
flask static press.(IN.HG)	5.00	6.00	0.50	-3.35
flask abs. press...(IN.HG)	34.10	35.10	29.60	25.75
Volume gas sampled....(DSML)	2184	2242	1884	1674
Moisture content.....(%V/V)	28.69	28.69	28.69	28.69
Nitrate in gas sample...(JG)				
NO2 in gas sample.....(JG)				

NOx Concentration

(GR/DSCF).....
(MG/DSCM).....
(PPM-DRY).....
(PPM-WET).....

NOX Emission rate....(LB/HR)

Filename: BEET16.WQ1

Date: 16-Dec-94

Facility: American Crystal Sugar

Location: East Grand Forks, Minnesota

Source: Pulp dryer with multiple cyclones

Test date: 02/24/94

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	208	204	203	
"A" pulp dryer (coal-fired)	Pressure	in. HG	29.28	29.28	29.28	
	Moisture	%	31.36	30.37	30.12	
	Oxygen	%	15.9	16	16	
	Volumetric flow, actual	acfm	44409	43415	43154	
	Volumetric flow, standard*	dscfm	23578	23524	23502	
	Isokinetic variation	%	99.3	98.2	99.2	
Wet Pulp Feed Rate To Dryer		TPH	20.35	19.55	21.4	
Pollutant concentrations:						
	Filterable PM	G/dscf	0.0498	0.0407	0.0438	
	Condensable organic?? PM	G/dscf	0.0054	0.0058	0.0057	
	CO2	% dv	4.4	4.3	4.3	
Pollutant mass flux rates:						
	Filterable PM	lb/hr	10.1	8.21	8.82	
	Condensable organic?? PM	lb/hr	1.09	1.17	1.15	
	CO2	lb/hr	7110	6932	6926	
	NOx--4 samples per run	lb/hr	11.1	10.2	13	
	NOx test feed rates	TPH	20.2	20.5	19.7	
Emission factors (ENGLISH UNITS):						AVERAGE
	Filterable PM	lb/ton	0.49	0.42	0.41	0.44
	Condensable organic?? PM	lb/ton	0.054	0.060	0.054	0.056
	CO2	lb/ton	349	355	324	343
	NOx	lb/ton	0.55	0.50	0.66	0.57
Emission factors (METRIC UNITS):						AVERAGE
	Filterable PM	kg/Mg	0.25	0.21	0.21	0.22
	Condensable organic?? PM	kg/Mg	0.027	0.030	0.027	0.028
	CO2	kg/Mg	175	177	162	171
	NOx	kg/Mg	0.27	0.25	0.33	0.28

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

Filename: BEET16^A.WQ1
 Date: 16-Dec-94
 Facility: American Crystal Sugar
 Location: East Grand Forks, Minnesota
 Source: Pulp dryer with multiple cyclones
 Test date: 02/23/94

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	239.4	237	236	
"B" pulp dryer (coal-fired)	Pressure	in. HG	29.43	29.43	29.43	
	Moisture	%	27.37	27.13	27.14	
	Oxygen	%	16.5	16.5	16.5	
	Volumetric flow, actual	acfm	68268	68024	68536	
	Volumetric flow, standard*	dscfm	36819	36935	37262	0
	Isokinetic variation	%	91.3	96.3	98.6	
Wet Pulp Feed Rate To Dryer		TPH	17.72	24.01	23.98	
Pollutant concentrations:						
	Filterable PM	G/dscf	0.0539	0.0504	0.0491	
	Condensable organic?? PM	G/dscf	0.00300	0.00290	0.00240	
	CO2	% dv	3.9	3.9	3.9	
Pollutant mass flux rates:						
	Filterable PM	lb/hr	17.0	16.0	15.7	
	Condensable organic?? PM	lb/hr	0.947	0.918	0.767	
	CO2	lb/hr	9841	9872	9959	
NOx DATA ARE VOID--ONLY ONE VALID TEST RUN WAS COMPLETED						
Emission factors (ENGLISH UNITS):						AVERAGE
	Filterable PM	lb/ton	0.96	0.66	0.65	0.76
	Condensable organic?? PM	lb/ton	0.053	0.038	0.032	0.041
	CO2	lb/ton	555	411	415	461
	NOx	lb/ton				VOID
Emission factors (METRIC UNITS):						AVERAGE
	Filterable PM	kg/Mg	0.48	0.33	0.33	0.38
	Condensable organic?? PM	kg/Mg	0.027	0.019	0.016	0.021
	CO2	kg/Mg	278	206	208	230
	NOx	kg/Mg				VOID

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

Filename: BEET16B.WQ1
 Date: 16-Dec-94
 Facility: American Crystal Sugar
 Location: East Grand Forks, Minnesota
 Source: Pulp dryer with multiple cyclones
 Test date: 02/23/94

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	212	213	215	
"C" pulp dryer (coal-fired)	Pressure	in. HG	29.94	29.94	29.94	
	Moisture	%	33.27	33.65	32.89	
	Oxygen	%	15.5	15	15.4	
	Volumetric flow, actual	acfm	46487	47360	47936	
	Volumetric flow, standard*	dscfm	24390	24670	25181	0
	Isokinetic variation	%	102.2	100.9	99.7	
Wet Pulp Feed Rate To Dryer		TPH	22.86	21.12	20.46	
Pollutant concentrations:						
	Filterable PM	G/dscf	0.0575	0.0669	0.0487	
	Condensable organic?? PM	G/dscf	0.00410	0.00370	0.00390	
	CO2	% dv	4.8	5.2	4.8	
Pollutant mass flux rates:						
	Filterable PM	lb/hr	12.0	14.1	10.5	
	Condensable organic?? PM	lb/hr	0.857	0.782	0.842	
	CO2	lb/hr	8023	8792	8283	
NOx DATA ARE VOID--ONLY ONE VALID TEST RUN WAS COMPLETED						
Emission factors (ENGLISH UNITS):						AVERAGE
	Filterable PM	lb/ton	0.53	0.67	0.51	0.57
	Condensable organic?? PM	lb/ton	0.038	0.037	0.041	0.039
	CO2	lb/ton	351	416	405	391
	NOx	lb/ton				VOID
Emission factors (METRIC UNITS):						AVERAGE
	Filterable PM	kg/Mg	0.26	0.33	0.26	0.28
	Condensable organic?? PM	kg/Mg	0.019	0.019	0.021	0.019
	CO2	kg/Mg	176	208	202	195
	NOx	kg/Mg				VOID

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

APPENDIX Q

REPORT EXCERPTS FROM REFERENCE 17

(American Crystal Sugar Company, March 26, 1992)

RESULTS OF THE
JANUARY 28 - 31, 1992
PARTICULATE EMISSION TESTS
SOUTH PULP DRYER

AMERICAN CRYSTAL SUGAR COMPANY
MOORHEAD, MINNESOTA

Submitted to:

David Walden
American Crystal Sugar Co.

Prepared by

Bay West, Inc.



Roger Martin, CHMM
Department Manager
Air and Waste Management

March 26, 1992

AMERICAN CRYSTAL SUGAR
MOORHEAD, MINNESOTA

Bay West

TEST NO. 1
SOURCE/SITE: SOUTH DRYER STACK

RESULTS OF PARTICULATE LOADING DETERMINATIONS - METHOD 5

	RUN 1	RUN 2	RUN 3
DATE OF RUN	21-Jan-92	21-Jan-92	21-Jan-92
RUN START TIME	1315	1600	1815
RUN END TIME	1519	1745	2013
STACK STATIC PRESSURE (in. H2O)	-0.84	-0.84	-0.84
CROSS SECTIONAL AREA (sq. ft.)	19.308	19.308	19.308
PITOT TUBE COEFFICIENT	0.840	0.840	0.840
SAMPLE GAS MOISTURE ANALYSES			
CONDENSER (ml.)	0.00	0.00	0.00
IMPINGER (ml.)	696.00	676.00	740.00
DESSICCANT (grams)	300.00	302.00	174.00
TOTAL (grams)	996.00	978.00	914.00
SAMPLE GAS MOISTURE CONTENT (%)	32.39	33.09	32.16
TOTAL PARTICULATE COLLECTED (g)	0.4594	0.4335	0.4454
DRY GAS METER COEFFICIENT	1.001	1.001	1.001
BAROMETRIC PRESSURE (in. Hg)	28.85	28.85	28.85
AVG. ORIFICE PRESSURE DROP (in. H2O)	3.65	3.32	3.16
AVG. GAS METER TEMP. (degrees F)	113.3	118.7	117.6
VOLUME THROUGH GAS METER			
AT METER CONDITIONS (cf)	109.20	104.93	102.16
STANDARD CONDITIONS (dscf)	97.93	93.16	90.82
TOTAL SAMPLING TIME (min.)	96	96	96
NOZZLE DIAMETER (in.)	0.312	0.312	0.312
AVG. STACK GAS TEMP. (degrees F)	233.3	232.8	228.8
AVG. STACK GAS VELOCITY (ft/sec)	58.99	59.33	58.89
VOLUMETRIC FLOWRATE			
ACTUAL (acfm)	68336	68733	68225
DRY STANDARD (dscfm)	33856	33725	34139
ISOKINETIC VARIATION (%)	109.64	104.70	100.84
PARTICULATE CONCENTRATION			
ACTUAL (gr/acf)	0.0359	0.0352	0.0379
DRY STANDARD (gr/dscf)	0.0724	0.0718	0.0757
PARTICLE MASS RATE (lb/hr)	20.985	20.736	22.121

AMERICAN CRYSTAL SUGAR
MOORHEAD, MINNESOTA

TEST NO.
SOURCE/SITE:

2
SOUTH DRYER STACK

RESULTS OF PARTICULATE LOADING DETERMINATIONS - METHOD 5

	RUN 1	RUN 2	RUN 3
DATE OF RUN	22-Jan-92	22-Jan-92	22-Jan-92
RUN START TIME	1020	1250	1515
RUN END TIME	1212	1430	1652
STACK STATIC PRESSURE (in. H2O)	-0.43	-0.43	-0.43
CROSS SECTIONAL AREA (sq. ft.)	19.308	19.308	19.308
PITOT TUBE COEFFICIENT	0.840	0.840	0.840
SAMPLE GAS MOISTURE ANALYSES			
CONDENSER (ml.)	0.00	0.00	0.00
IMPINGER (ml.)	984.00	1074.00	1018.00
DESSICCANT (grams)	341.00	86.00	189.00
TOTAL (grams)	1325.00	1160.00	1207.00
SAMPLE GAS MOISTURE CONTENT (%)	42.65	42.44	44.09
TOTAL PARTICULATE COLLECTED (g)	0.5441	0.4578	0.5965
DRY GAS METER COEFFICIENT	1.001	1.001	1.001
BAROMETRIC PRESSURE (in. Hg)	28.70	28.70	28.70
AVG. ORIFICE PRESSURE DROP (in. H2O)	2.75	2.14	2.04
AVG. GAS METER TEMP. (degrees F)	122.4	123.5	128.6
VOLUME THROUGH GAS METER			
AT METER CONDITIONS (cf)	95.77	84.86	83.29
STANDARD CONDITIONS (dscf)	83.91	74.11	72.09
TOTAL SAMPLING TIME (min.)	96	96	96
NOZZLE DIAMETER (in.)	0.312	0.312	0.312
AVG. STACK GAS TEMP. (degrees F)	227.8	218.4	219.8
AVG. STACK GAS VELOCITY (ft/sec)	54.50	54.01	54.35
VOLUMETRIC FLOWRATE			
ACTUAL (acfm)	63134	62566	62962
DRY STANDARD (dscfm)	26632	26857	26199
ISOKINETIC VARIATION (%)	109.19	104.60	104.29
PARTICULATE CONCENTRATION			
ACTUAL (gr/acf)	0.0422	0.0409	0.0531
DRY STANDARD (gr/dscf)	0.1001	0.0953	0.1277
PARTICLE MASS RATE (lb/hr)	22.816	21.920	28.644

AMERICAN CRYSTAL SUGAR
MOORHEAD, MINNESOTA

TEST NO.

3

SOURCE/SITE:

SOUTH DRYER STACK

RESULTS OF PARTICULATE LOADING DETERMINATIONS - METHOD 5

	RUN 1	RUN 2	RUN 3
DATE OF RUN	23-Jan-92	23-Jan-92	23-Jan-92
RUN START TIME	1005	1220	1445
RUN END TIME	1145	1355	1630
STACK STATIC PRESSURE (in. H ₂ O)	-0.45	-0.45	-0.45
CROSS SECTIONAL AREA (sq. ft.)	19.308	19.308	19.308
PITOT TUBE COEFFICIENT	0.840	0.840	0.840
SAMPLE GAS MOISTURE ANALYSES			
CONDENSER (ml.)	0.00	0.00	0.00
IMPINGER (ml.)	1135.00	1135.00	1036.00
DESSICCANT (grams)	89.00	89.00	23.00
TOTAL (grams)	1224.00	1224.00	1059.00
SAMPLE GAS MOISTURE CONTENT (%)	46.02	46.74	43.70
TOTAL PARTICULATE COLLECTED (g)	0.4289	0.4762	~~0.4544~~ 0.5052
DRY GAS METER COEFFICIENT	1.001	1.001	1.001
BAROMETRIC PRESSURE (in. Hg)	28.68	28.68	28.68
AVG. ORIFICE PRESSURE DROP (in. H ₂ O)	1.74	1.64	1.58
AVG. GAS METER TEMP. (degrees F)	107.5	107.8	109.7
VOLUME THROUGH GAS METER			
AT METER CONDITIONS (cf)	75.44	73.35	72.00
STANDARD CONDITIONS (dscf)	67.63	65.70	64.26
TOTAL SAMPLING TIME (min.)	96	96	96
NOZZLE DIAMETER (in.)	0.312	0.312	0.312
AVG. STACK GAS TEMP. (degrees F)	217.1	213.1	203.3
AVG. STACK GAS VELOCITY (ft/sec)	49.30	49.33	48.71
VOLUMETRIC FLOWRATE			
ACTUAL (acfm)	57117	57148	56430
DRY STANDARD (dscfm)	23021	22860	24213
ISOKINETIC VARIATION (%)	109.02	108.94	100.60
PARTICULATE CONCENTRATION			
ACTUAL (gr/acf)	0.0877	0.1002	0.1083
DRY STANDARD (gr/dscf)	0.0979	0.1119	0.1213
PARTICLE MASS RATE (lb/hr)	19.291	21.893	22.621

These are wrong! BLS 3/95

25.174

AMERICAN CRYSTAL SUGAR
MOORHEAD, MINNESOTA

TEST NO.

4

SOURCE/SITE:

SOUTH DRYER STACK

RESULTS OF PARTICULATE LOADING DETERMINATIONS - METHOD 5

	RUN 1	RUN 2	RUN 3
DATE OF RUN	24-Jan-92	24-Jan-92	24-Jan-92
RUN START TIME	1015	1245	1505
RUN END TIME	1210	1420	1655
STACK STATIC PRESSURE (in. H2O)	-0.55	-0.55	-0.55
CROSS SECTIONAL AREA (sq. ft.)	19.308	19.308	19.308
PITOT TUBE COEFFICIENT	0.840	0.840	0.840
SAMPLE GAS MOISTURE ANALYSES			
CONDENSER (ml.)	0.00	0.00	0.00
IMPINGER (ml.)	1109.00	1190.00	1242.00
DESSICCANT (grams)	122.00	24.00	15.00
TOTAL (grams)	1231.00	1214.00	1257.00
SAMPLE GAS MOISTURE CONTENT (%)	43.35	44.73	45.34
TOTAL PARTICULATE COLLECTED (g)	0.6358	0.5193	0.4688
DRY GAS METER COEFFICIENT	1.001	1.001	1.001
BAROMETRIC PRESSURE (in. Hg)	28.83	28.83	28.83
AVG. ORIFICE PRESSURE DROP (in. H2O)	2.17	1.90	1.98
AVG. GAS METER TEMP. (degrees F)	107.8	115.3	126.5
VOLUME THROUGH GAS METER			
AT METER CONDITIONS (cf)	84.02	79.47	81.83
STANDARD CONDITIONS (dscf)	75.75	70.66	71.38
TOTAL SAMPLING TIME (min.)	96	96	96
NOZZLE DIAMETER (in.)	0.312	0.312	0.312
AVG. STACK GAS TEMP. (degrees F)	209.5	201.5	190.8
AVG. STACK GAS VELOCITY (ft/sec)	50.80	50.17	50.24
VOLUMETRIC FLOWRATE			
ACTUAL (acfm)	58851	58123	58206
DRY STANDARD (dscfm)	25297	24675	24840
ISOKINETIC VARIATION (%)	108.32	108.55	108.92
PARTICULATE CONCENTRATION			
ACTUAL (gr/acf)	0.0557	0.0482	0.0433
DRY STANDARD (gr/dscf)	0.1295	0.1134	0.1014
PARTICLE MASS RATE (lb/hr)	28.053	23.961	21.555

AMERICAN CRYSTAL SUGAR
MOORHEAD, MINNESOTA

TEST NO.

1

SOURCE/SITE:

SOUTH DRYER MULTI-CLONE INLET

RESULTS OF PARTICULATE LOADING DETERMINATIONS - METHOD 5

	RUN 1	RUN 2	RUN 3
DATE OF RUN	21-Jan-92	21-Jan-92	21-Jan-92
RUN START TIME	1315	1600	1825
RUN END TIME	1500	1742	2002
STACK STATIC PRESSURE (in. H2O)	2.80	2.80	2.80
CROSS SECTIONAL AREA (sq. ft.)	53.472	53.472	53.472
PITOT TUBE COEFFICIENT	0.840	0.840	0.840
SAMPLE GAS MOISTURE ANALYSES			
CONDENSER (ml.)	374.00	342.00	0.00
IMPINGER (ml.)	0.00	0.00	0.00
DESSICCANT (grams)	34.00	46.00	34.00
TOTAL (grams)	408.00	388.00	34.00
SAMPLE GAS MOISTURE CONTENT (%)	31.09	31.76	31.18
TOTAL PARTICULATE COLLECTED (g)	0.9751	1.0606	0.8696
DRY GAS METER COEFFICIENT	1.000	1.000	1.000
BAROMETRIC PRESSURE (in. Hg)	28.85	28.85	28.85
AVG. ORIFICE PRESSURE DROP (in. H2O)	0.84	0.73	0.72
AVG. GAS METER TEMP. (degrees F)	127.0	124.5	126.6
VOLUME THROUGH GAS METER			
AT METER CONDITIONS (cf)	49.03	45.02	45.22
STANDARD CONDITIONS (dscf)	42.60	39.27	39.30
TOTAL SAMPLING TIME (min.)	96	96	96
NOZZLE DIAMETER (in.)	0.313	0.313	0.313
AVG. STACK GAS TEMP. (degrees F)	248.8	247.2	244.4
AVG. STACK GAS VELOCITY (ft/sec)	25.39	25.10	25.26
VOLUMETRIC FLOWRATE			
ACTUAL (acfm)	81456	80531	81030
DRY STANDARD (dscfm)	40605	39847	40596
ISOKINETIC VARIATION (%)	109.42	102.80	100.98
PARTICULATE CONCENTRATION			
ACTUAL (gr/acf)	0.1761	0.2062	0.2388
DRY STANDARD (gr/dscf)	0.3533	0.4167	0.3414
PARTICLE MASS RATE (lb/hr)	122.817	142.180	118.679

AMERICAN CRYSTAL SUGAR
MOORHEAD, MINNESOTA

TEST NO.

2

SOURCE/SITE:

SOUTH DRYER MULTI-CLONE INLET

RESULTS OF PARTICULATE LOADING DETERMINATIONS - METHOD 5

	RUN 1	RUN 2	RUN 3
DATE OF RUN	22-Jan-92	22-Jan-92	22-Jan-92
RUN START TIME	1020	1250	1515
RUN END TIME	1200	1430	1655
STACK STATIC PRESSURE (in. H ₂ O)	2.80	2.80	2.80
CROSS SECTIONAL AREA (sq. ft.)	53.472	53.472	53.472
PITOT TUBE COEFFICIENT	0.840	0.840	0.840
SAMPLE GAS MOISTURE ANALYSES			
CONDENSER (ml.)	381.00	398.00	407.00
IMPINGER (ml.)	0.00	0.00	0.00
DESSICCANT (grams)	206.00	179.00	120.00
TOTAL (grams)	587.00	577.00	527.00
SAMPLE GAS MOISTURE CONTENT (%)	39.35	42.06	40.72
TOTAL PARTICULATE COLLECTED (g)	1.1431	1.0204	1.0523
DRY GAS METER COEFFICIENT	1.000	1.000	1.000
BAROMETRIC PRESSURE (in. Hg)	28.70	28.70	28.70
AVG. ORIFICE PRESSURE DROP (in. H ₂ O)	0.85	0.66	0.62
AVG. GAS METER TEMP. (degrees F)	124.8	125.0	128.2
VOLUME THROUGH GAS METER			
AT METER CONDITIONS (cf)	49.12	43.19	41.92
STANDARD CONDITIONS (dscf)	42.62	37.44	36.14
TOTAL SAMPLING TIME (min.)	96	96	96
NOZZLE DIAMETER (in.)	0.313	0.313	0.313
AVG. STACK GAS TEMP. (degrees F)	243.0	242.8	242.8
AVG. STACK GAS VELOCITY (ft./sec)	27.56	27.31	27.09
VOLUMETRIC FLOWRATE			
ACTUAL (acfm)	88431	87614	86927
DRY STANDARD (dscfm)	38918	36846	37402
ISOKINETIC VARIATION (%)	105.87	105.98	100.77
PARTICULATE CONCENTRATION			
ACTUAL (gr/acf)	0.1822	0.1769	0.1934
DRY STANDARD (gr/dscf)	0.4139	0.4206	0.4494
PARTICLE MASS RATE (lb/hr)	137.931	132.691	143.911

AMERICAN CRYSTAL SUGAR
MOORHEAD, MINNESOTA

TEST NO.

3

SOURCE/SITE:

SOUTH DRYER MULTI-CLONE INLET

RESULTS OF PARTICULATE LOADING DETERMINATIONS - METHOD 5

	RUN 1	RUN 2	RUN 3
DATE OF RUN	23-Jan-92	23-Jan-92	23-Jan-92
RUN START TIME	945	1220	1450
RUN END TIME	1130	1400	1640
STACK STATIC PRESSURE (in. H2O)	2.60	2.60	2.60
CROSS SECTIONAL AREA (sq. ft.)	53.472	53.472	53.472
PITOT TUBE COEFFICIENT	0.840	0.840	0.840
SAMPLE GAS MOISTURE ANALYSES			
CONDENSER (ml.)	416.00	423.00	424.00
IMPINGER (ml.)	0.00	0.00	0.00
DESSICCANT (grams)	125.00	140.00	98.00
TOTAL (grams)	541.00	563.00	522.00
SAMPLE GAS MOISTURE CONTENT (%)	42.88	44.87	43.13
TOTAL PARTICULATE COLLECTED (g)	1.0501	1.0421	1.1957
DRY GAS METER COEFFICIENT	1.000	1.000	1.000
BAROMETRIC PRESSURE (in. Hg)	28.68	28.68	28.68
AVG. ORIFICE PRESSURE DROP (in. H2O)	0.53	0.50	0.49
AVG. GAS METER TEMP. (degrees F)	105.6	106.8	108.7
VOLUME THROUGH GAS METER			
AT METER CONDITIONS (cf)	37.90	36.45	36.40
STANDARD CONDITIONS (dscf)	33.94	32.58	32.42
TOTAL SAMPLING TIME (min.)	96	96	96
NOZZLE DIAMETER (in.)	0.313	0.313	0.313
AVG. STACK GAS TEMP. (degrees F)	243.6	243.3	244.0
AVG. STACK GAS VELOCITY (ft/sec)	25.16	25.05	25.26
VOLUMETRIC FLOWRATE			
ACTUAL (acfm)	80713	80381	81039
DRY STANDARD (dscfm)	33386	32101	33356
ISOKINETIC VARIATION (%)	106.05	105.85	101.38
PARTICULATE CONCENTRATION			
ACTUAL (gr/acf)	0.1975	0.1972	0.2343
DRY STANDARD (gr/dscf)	0.4774	0.4937	0.5692
PARTICLE MASS RATE (lb/hr)	136.465	135.681	162.548

AMERICAN CRYSTAL SUGAR
MOORHEAD, MINNESOTA

TEST NO.

4

SOURCE/SITE:

SOUTH DRYER MULTI-CLONE INLET

RESULTS OF PARTICULATE LOADING DETERMINATIONS - METHOD 5

	RUN 1	RUN 2	RUN 3
DATE OF RUN	24-Jan-92	24-Jan-92	24-Jan-92
RUN START TIME	1015	1245	1505
RUN END TIME	1200	1426	1645
STACK STATIC PRESSURE (in. H2O)	2.75	2.75	2.75
CROSS SECTIONAL AREA (sq. ft.)	53.472	53.472	53.472
PITOT TUBE COEFFICIENT	0.840	0.840	0.840
SAMPLE GAS MOISTURE ANALYSES			
CONDENSER (ml.)	413.00	571.00	563.00
IMPINGER (ml.)	0.00	0.00	0.00
DESSICCANT (grams)	223.00	22.00	30.00
TOTAL (grams)	636.00	593.00	593.00
SAMPLE GAS MOISTURE CONTENT (%)	42.35	43.45	43.48
TOTAL PARTICULATE COLLECTED (g)	1.2384	1.2746	1.1254
DRY GAS METER COEFFICIENT	1.000	1.000	1.000
BAROMETRIC PRESSURE (in. Hg)	28.83	28.83	28.83
AVG. ORIFICE PRESSURE DROP (in. H2O)	0.74	0.59	0.60
AVG. GAS METER TEMP. (degrees F)	116.9	118.7	124.1
VOLUME THROUGH GAS METER			
AT METER CONDITIONS (cf)	46.17	41.30	41.64
STANDARD CONDITIONS (dscf)	40.78	36.35	36.31
TOTAL SAMPLING TIME (min.)	96	96	96
NOZZLE DIAMETER (in.)	0.313	0.313	0.313
AVG. STACK GAS TEMP. (degrees F)	246.6	244.2	247.5
AVG. STACK GAS VELOCITY (ft/sec)	28.26	27.69	28.26
VOLUMETRIC FLOWRATE			
ACTUAL (acfm)	90671	88849	90663
DRY STANDARD (dscfm)	37901	36556	37106
ISOKINETIC VARIATION (%)	104.99	103.72	102.06
PARTICULATE CONCENTRATION			
ACTUAL (gr/acf)	0.1959	0.2227	0.1958
DRY STANDARD (gr/dscf)	0.4687	0.5411	0.4783
PARTICLE MASS RATE (lb/hr)	152.087	169.361	151.958

AMERICAN CRYSTAL SUGAR
MOORHEAD, MINNESOTA

TEST NO. 1
SOURCE/SITE: SOUTH DRYER STACK

RESULTS OF ORSAT & MOISTURE ANALYSES - METHODS 3 & 4 (%V/V)

	RUN 1	RUN 2	RUN 3
DATE OF TEST	21-Jan-92	21-Jan-92	21-Jan-92

DRY BASIS (ORSAT), %			
CARBON DIOXIDE	4.12	4.08	4.11
OXYGEN	16.00	15.50	15.25
CARBON MONOXIDE	0.00	0.00	0.00
NITROGEN	79.88	80.42	80.64

WET BASIS (ORSAT), %			
CARBON DIOXIDE	2.79	2.73	2.79
OXYGEN	10.82	10.37	10.35
CARBON MONOXIDE	0.00	0.00	0.00
NITROGEN	54.01	53.81	54.71
WATER VAPOR	32.39	33.09	32.16
DRY MOLECULAR WEIGHT	29.30	29.27	29.27
WET MOLECULAR WEIGHT	25.64	25.54	25.64

AMERICAN CRYSTAL SUGAR
MOORHEAD, MINNESOTA

TEST NO.

2

SOURCE/SITE:

SOUTH DRYER STACK

RESULTS OF ORSAT & MOISTURE ANALYSES - METHODS 3 & 4 (%V/V)

	RUN 1	RUN 2	RUN 3
DATE OF TEST	22-Jan-92	22-Jan-92	22-Jan-92
DRY BASIS (ORSAT), %			
CARBON DIOXIDE	5.50	6.00	5.20
OXYGEN	14.75	14.25	15.10
CARBON MONOXIDE	0.00	0.00	0.00
NITROGEN	79.75	79.75	79.70
WET BASIS (ORSAT), %			
CARBON DIOXIDE	3.15	3.45	2.91
OXYGEN	8.46	8.20	8.44
CARBON MONOXIDE	0.00	0.00	0.00
NITROGEN	45.73	45.91	44.55
WATER VAPOR	42.65	42.44	44.10
DRY MOLECULAR WEIGHT	29.47	29.53	29.44
WET MOLECULAR WEIGHT	24.58	24.64	24.39

AMERICAN CRYSTAL SUGAR
MOORHEAD, MINNESOTA

TEST NO.

3

SOURCE/SITE:

SOUTH DRYER STACK

RESULTS OF ORSAT & MOISTURE ANALYSES - METHODS 3 & 4 (%V/V)

	RUN 1	RUN 2	RUN 3
DATE OF TEST	23-Jan-92	23-Jan-92	23-Jan-92
DRY BASIS (ORSAT), %			
CARBON DIOXIDE	5.02	5.79	4.85
OXYGEN	15.10	14.58	15.50
CARBON MONOXIDE	0.00	0.00	0.00
NITROGEN	79.88	79.63	79.65
WET BASIS (ORSAT), %			
CARBON DIOXIDE	2.71	3.08	2.73
OXYGEN	8.15	7.76	8.72
CARBON MONOXIDE	0.00	0.00	0.00
NITROGEN	43.12	42.41	44.83
WATER VAPOR	46.02	46.75	43.71
DRY MOLECULAR WEIGHT	29.41	29.51	29.40
WET MOLECULAR WEIGHT	24.16	24.13	24.41

AMERICAN CRYSTAL SUGAR
MOORHEAD, MINNESOTA

TEST NO.

4

SOURCE/SITE:

SOUTH DRYER STACK

RESULTS OF ORSAT & MOISTURE ANALYSES - METHODS 3 & 4 (%V/V)

	RUN 1	RUN 2	RUN 3
DATE OF TEST	24-Jan-92	24-Jan-92	24-Jan-92
DRY BASIS (ORSAT), %			
CARBON DIOXIDE	6.12	6.58	6.58
OXYGEN	14.00	13.65	13.88
CARBON MONOXIDE	0.00	0.00	0.00
NITROGEN	79.88	79.77	79.54
WET BASIS (ORSAT), %			
CARBON DIOXIDE	3.47	3.64	3.60
OXYGEN	7.93	7.55	7.59
CARBON MONOXIDE	0.00	0.00	0.00
NITROGEN	45.24	44.10	43.48
WATER VAPOR	43.37	44.71	45.34
DRY MOLECULAR WEIGHT	29.54	29.60	29.61
WET MOLECULAR WEIGHT	24.54	24.41	24.35

AMERICAN CRYSTAL SUGAR
MOORHEAD, MINNESOTA

TEST NO.
SOURCE/SITE:

1
SOUTH DRYER MULTI-CLONE INLET

RESULTS OF ORSAT & MOISTURE ANALYSES - METHODS 3 & 4 (%V/V)

	RUN 1	RUN 2	RUN 3
DATE OF TEST	21-Jan-92	21-Jan-92	21-Jan-92
DRY BASIS (ORSAT), %			
CARBON DIOXIDE	4.12	4.08	4.11
OXYGEN	16.00	15.50	15.25
CARBON MONOXIDE	0.00	0.00	0.00
NITROGEN	79.88	80.42	80.64
WET BASIS (ORSAT), %			
CARBON DIOXIDE	2.84	2.79	2.83
OXYGEN	11.03	10.58	10.50
CARBON MONOXIDE	0.00	0.00	0.00
NITROGEN	55.05	54.90	55.50
WATER VAPOR	31.09	31.74	31.18
DRY MOLECULAR WEIGHT	29.30	29.27	29.27
WET MOLECULAR WEIGHT	25.79	25.69	25.75

AMERICAN CRYSTAL SUGAR
MOORHEAD, MINNESOTA

TEST NO.
SOURCE/SITE:

2
SOUTH DRYER MULTI-CLONE INLET

RESULTS OF ORSAT & MOISTURE ANALYSES - METHODS 3 & 4 (%V/V)

	RUN 1	RUN 2	RUN 3
DATE OF TEST	22-Jan-92	22-Jan-92	22-Jan-92
DRY BASIS (ORSAT), %			
CARBON DIOXIDE	5.50	6.00	5.20
OXYGEN	14.75	14.25	15.10
CARBON MONOXIDE	0.00	0.00	0.00
NITROGEN	79.75	79.75	79.70
WET BASIS (ORSAT), %			
CARBON DIOXIDE	3.34	3.48	3.08
OXYGEN	8.94	8.26	8.95
CARBON MONOXIDE	0.00	0.00	0.00
NITROGEN	48.36	46.21	47.25
WATER VAPOR	39.36	42.06	40.72
DRY MOLECULAR WEIGHT	29.47	29.53	29.44
WET MOLECULAR WEIGHT	24.96	24.68	24.78

AMERICAN CRYSTAL SUGAR
MOORHEAD, MINNESOTA

TEST NO.

3

SOURCE/SITE:

SOUTH DRYER MULTI-CLONE INLET

RESULTS OF ORSAT & MOISTURE ANALYSES - METHODS 3 & 4 (%V/V)

	RUN 1	RUN 2	RUN 3
DATE OF TEST	23-Jan-92	23-Jan-92	23-Jan-92
DRY BASIS (ORSAT), %			
CARBON DIOXIDE	5.02	5.79	4.85
OXYGEN	15.10	14.58	15.50
CARBON MONOXIDE	0.00	0.00	0.00
NITROGEN	79.88	79.63	79.65
WET BASIS (ORSAT), %			
CARBON DIOXIDE	2.87	3.19	2.76
OXYGEN	8.62	8.04	8.82
CARBON MONOXIDE	0.00	0.00	0.00
NITROGEN	45.62	43.90	45.30
WATER VAPOR	42.89	44.88	43.13
DRY MOLECULAR WEIGHT	29.41	29.51	29.40
WET MOLECULAR WEIGHT	24.51	24.34	24.48

AMERICAN CRYSTAL SUGAR
MOORHEAD, MINNESOTA

TEST NO.

4

SOURCE/SITE:

SOUTH DRYER MULTI-CLONE INLET

RESULTS OF ORSAT & MOISTURE ANALYSES - METHODS 3 & 4 (%V/V)

	RUN 1	RUN 2	RUN 3
DATE OF TEST	24-Jan-92	24-Jan-92	24-Jan-92
DRY BASIS (ORSAT), %			
CARBON DIOXIDE	6.12	6.58	6.12
OXYGEN	14.00	13.65	13.88
CARBON MONOXIDE	0.00	0.00	0.00
NITROGEN	79.88	79.77	80.00
WET BASIS (ORSAT), %			
CARBON DIOXIDE	3.53	3.72	3.46
OXYGEN	8.07	7.72	7.85
CARBON MONOXIDE	0.00	0.00	0.00
NITROGEN	46.05	45.10	45.22
WATER VAPOR	42.35	43.46	43.47
DRY MOLECULAR WEIGHT	29.54	29.60	29.53
WET MOLECULAR WEIGHT	24.65	24.56	24.52

LAB NO: 2034
SOURCE: steck
SITE: _____
LOCATION: _____

TEST NO: 1
RUN NO.'S 1, 2, 3
DATE: 2.13.92
ANALYST: R. Hessler

SUMMARY OF PARTICULATE ANALYSES

Lab No.	Run No.	Total Corrected Wt. (g)
<u>18908, '942, '973</u>	<u>1</u>	<u>0.4594</u>
<u>18910, '943, '974</u>	<u>2</u>	<u>0.4335</u>
<u>18912, '944, '975</u>	<u>3</u>	<u>0.4454</u>
_____	_____	_____

BLANK VALUE ANALYSES

ACETONE

Lab No.	Final Wt. (g)	Tare Wt. (g)	Gain (g) (residue)
<u>18954</u>	<u>21.2536</u>	<u>- 21.2525</u>	<u>= 0.0011</u>

Residue (g)	Volume (l)	g/l
<u>0.0011</u>	<u>/ 0.135</u>	<u>= 0.0081</u>

CONDENSIBLE ORGANICS

Lab No.	Final Wt. (g)	Tare Wt. (g)	Gain (g) (residue)
<u>18941</u>	<u>140.7325</u>	<u>- 140.7303</u>	<u>= 0.0022</u>

Residue (g)	Volume (l)	g/l
<u>0.0022</u>	<u>/ 0.200</u>	<u>= 0.011</u>

NOTE: (l)=Liter
(g)=Gram
(g/l)=gram per liter

LAB NO: 2034
SOURCE: steck
SITE: _____
LOCATION: _____

TEST NO: 1
RUN NO: 1
DATE: 2-13-92
ANALYST: R. Hessler

FILTERS

<u>Lab No.</u>	<u>Final Wt. (g)</u>	<u>Tare Wt. (g)</u>	<u>Gain (g)</u>
<u>18973</u>	<u>0.9356</u>	<u>- 0.6204</u>	<u>= 0.3152</u>
			TOTAL <u>0.3152</u>

Probe & Front Half Wash

<u>Lab No.</u>	<u>Final Wt. (g)</u>	<u>Tare Wt. (g)</u>	<u>Gain (g)</u>
<u>18942</u>	<u>21.4289</u>	<u>- 21.3372</u>	<u>= 0.0917</u>
BLANK <u>0.092</u> (1) * <u>0.0081</u> (g/l) = <u>0.0007</u> (g)			
			CORRECTED TOTAL <u>0.0910</u>

IMPINGER CATCH

<u>Lab No.</u>	<u>Final Wt. (g)</u>	<u>Tare Wt. (g)</u>	<u>Gain (g)</u>
<u>18908</u>	<u>141.7641</u>	<u>- 141.7008</u>	<u>= 0.0633</u>
BLANK <u>0.915</u> (1) * <u>0.011</u> (g/l) = <u>0.0101</u>			
			CORRECTED TOTAL <u>0.0532</u>

SUMMARY OF CORRECTED TOTALS (g)

<u>RUN NO.</u>	<u>FILTER</u>	<u>PROBE WASH</u>	<u>IMP. CATCH</u>	<u>TOTAL</u>
<u>1</u>	<u>0.3152</u>	<u>+ 0.0910</u>	<u>+ 0.0532</u>	<u>= 0.4594</u>

LAB NO: 2034
 SOURCE: Stack
 SITE: _____
 LOCATION: _____

 TEST NO: 1
 RUN NO: 2
 DATE: 2.13.92
 ANALYST: R Hessler
FILTERS

Lab No.	Final Wt. (g)	Tare Wt. (g)	Gain (g)
<u>18974</u>	<u>0.9284</u>	<u>0.6217</u>	<u>0.3067</u>
			TOTAL <u>0.3067</u>

Probe & Front Half Wash

Lab No.	Final Wt. (g)	Tare Wt. (g)	Gain (g)
<u>18943</u>	<u>21.4370</u>	<u>21.3611</u>	<u>0.0759</u>
BLANK <u>0.095</u> (1) * <u>0.0081</u> (g/l) = <u>0.0008</u> (g)			
			CORRECTED TOTAL <u>0.0751</u>

IMPINGER CATCH

Lab No.	Final Wt. (g)	Tare Wt. (g)	Gain (g)
<u>18910</u>	<u>137.3848</u>	<u>137.3233</u>	<u>0.0615</u>
BLANK <u>0.890</u> (1) * <u>0.011</u> (g/l) = <u>0.0098</u>			
			CORRECTED TOTAL <u>0.0517</u>

SUMMARY OF CORRECTED TOTALS (g)

RUN NO.	FILTER	PROBE WASH	IMP. CATCH	TOTAL
<u>2</u>	<u>0.3067</u>	<u>+ 0.0751</u>	<u>+ 0.0517</u>	<u>= 0.4335</u>

LAB NO: 2034
SOURCE: stock
SITE: _____
LOCATION: _____

TEST NO: 1
RUN NO: 3
DATE: 2.13.92
ANALYST: R. Hessler

FILTERS

<u>Lab No.</u>	<u>Final Wt. (g)</u>	<u>Tare Wt. (g)</u>	<u>Gain (g)</u>
<u>18975</u>	<u>0.9156</u>	<u>- 0.6261</u>	<u>= 0.2895</u>
			<u>TOTAL 0.2895</u>

Probe & Front Half Wash

<u>Lab No.</u>	<u>Final Wt. (g)</u>	<u>Tare Wt. (g)</u>	<u>Gain (g)</u>
<u>18944</u>	<u>21.3925</u>	<u>- 21.3138</u>	<u>= 0.0787</u>
BLANK <u>0.066</u> (1) * <u>0.0081</u> (g/l) = <u>- 0.0005</u> (g)			
			<u>CORRECTED TOTAL 0.0782</u>

IMPINGER CATCH

<u>Lab No.</u>	<u>Final Wt. (g)</u>	<u>Tare Wt. (g)</u>	<u>Gain (g)</u>
<u>18912</u>	<u>135.2443</u>	<u>- 135.1561</u>	<u>= 0.0882</u>
BLANK <u>0.955</u> (1) * <u>0.011</u> (g/l) = <u>- 0.0005</u>			
			<u>CORRECTED TOTAL 0.0777</u>

SUMMARY OF CORRECTED TOTALS (g)

<u>RUN NO.</u>	<u>FILTER</u>	<u>PROBE WASH</u>	<u>IMP. CATCH</u>	<u>TOTAL</u>
<u>3</u>	<u>0.2895</u>	<u>+ 0.0782</u>	<u>+ 0.0777</u>	<u>= 0.4454</u>

LAB NO: 2034
 SOURCE: stock
 SITE: _____
 LOCATION: _____

 TEST NO: 2
 RUN NO.'S 1, 2, 3
 DATE: 2.13.92
 ANALYST: R. Hesse
SUMMARY OF PARTICULATE ANALYSES

Lab No.	Run No.	Total Corrected Wt. (g)
18914, '945, '976	1	0.5441
18917, '946, '977	2	0.4578
18920, '947, '978	3	0.5965

BLANK VALUE ANALYSES

ACETONE

Lab No.	Final Wt. (g)	Tare Wt. (g)	Gain (g) (residue)
18954	21.2536	21.2525	0.0011

Residue (g)	Volume (l)	g/l
0.0011	0.135	0.0081

CONDENSIBLE ORGANICS

Lab No.	Final Wt. (g)	Tare Wt. (g)	Gain (g) (residue)
18941	140.7325	140.7303	0.0022

Residue (g)	Volume (l)	g/l
0.0022	0.200	0.011

 NOTE: (l)=Liter
 (g)=Gram
 (g/l)=gram per liter

LAB NO: 2034
SOURCE: Stock
SITE: _____
LOCATION: _____

TEST NO: 2
RUN NO: 1
DATE: 2.13.92
ANALYST: R. Hessler

FILTERS

Lab No.	Final Wt. (g)	Tare Wt. (g)	Gain (g)
<u>16976</u>	<u>1.0051</u>	<u>0.6219</u>	<u>0.3835</u>
			TOTAL <u>0.3835</u>

Probe & Front Half Wash

Lab No.	Final Wt. (g)	Tare Wt. (g)	Gain (g)
<u>18945</u>	<u>21.3288</u>	<u>21.2513</u>	<u>0.0775</u>
BLANK <u>0.087</u> (1) * <u>0.008</u> (g/l) = <u>0.007</u> (g)			
			CORRECTED TOTAL <u>0.0768</u>

IMPINGER CATCH

Lab No.	Final Wt. (g)	Tare Wt. (g)	Gain (g)
<u>18914</u>	<u>136.8943</u>	<u>136.7975</u>	<u>0.0968</u>
BLANK <u>1.180</u> (1) * <u>0.011</u> (g/l) = <u>0.020</u>			
			CORRECTED TOTAL <u>0.0838</u>

SUMMARY OF CORRECTED TOTALS (g)

RUN NO.	FILTER	PROBE WASH	IMP. CATCH	TOTAL
<u>1</u>	<u>0.3835</u>	<u>0.0768</u>	<u>0.0838</u>	<u>0.5441</u>

LAB NO: 2034
SOURCE: Stack
SITE: _____
LOCATION: _____

TEST NO: 2
RUN NO: 2
DATE: 2/13/92
ANALYST: R. Hessler

FILTERS

Lab No.	Final Wt.(g)	Tare Wt.(g)	Gain (g)
<u>18477</u>	<u>0.9627</u>	<u>- 0.6341</u>	<u>= 0.3286</u>

TOTAL 0.3286

Probe & Front Half Wash

Lab No.	Final Wt.(g)	Tare Wt.(g)	Gain (g)
<u>18446</u>	<u>21.4229</u>	<u>- 21.3557</u>	<u>= 0.0672</u>

BLANK 0.064 (1) * 0.0081 (g/l) = -0.0005 (g)

CORRECTED TOTAL 0.0667

IMPINGER CATCH

Lab No.	Final Wt.(g)	Tare Wt.(g)	Gain (g)
<u>18917</u>	<u>138.2972</u>	<u>- 138.2205</u>	<u>= 0.0767</u>

BLANK 1.295 (1) * 0.011 (g/l) = -0.0142

CORRECTED TOTAL 0.0625

SUMMARY OF CORRECTED TOTALS (g)

RUN NO.	FILTER	PROBE WASH	IMP. CATCH	TOTAL
<u>2</u>	<u>0.3286</u>	<u>+ 0.0667</u>	<u>+ 0.0625</u>	<u>= 0.4578</u>

LAB NO: 2034
SOURCE: stock
SITE: _____
LOCATION: _____

TEST NO: 2
RUN NO: 3
DATE: 2.13.92
ANALYST: R. Hesser

FILTERS

<u>Lab No.</u>	<u>Final Wt. (g)</u>	<u>Tare Wt. (g)</u>	<u>Gain (g)</u>
<u>18978</u>	<u>0.9565</u>	<u>- 0.6244</u>	<u>= 0.3321</u>
			TOTAL <u>0.3321</u>

Probe & Front Half Wash

<u>Lab No.</u>	<u>Final Wt. (g)</u>	<u>Tare Wt. (g)</u>	<u>Gain (g)</u>
<u>18947</u>	<u>21.4479</u>	<u>- 21.3038</u>	<u>= 0.1441</u>
BLANK <u>0.090</u> (l) * <u>0.0081</u> (g/l) = <u>- 0.0007</u> (g)			
			CORRECTED TOTAL <u>0.1434</u>

IMPINGER CATCH

<u>Lab No.</u>	<u>Final Wt. (g)</u>	<u>Tare Wt. (g)</u>	<u>Gain (g)</u>
<u>18920</u>	<u>137.8898</u>	<u>- 137.7530</u>	<u>= 0.1368</u>
BLANK <u>1.440</u> (l) * <u>0.011</u> (g/l) = <u>- 0.0158</u>			
			CORRECTED TOTAL <u>0.1210</u>

SUMMARY OF CORRECTED TOTALS (g)

<u>RUN NO.</u>	<u>FILTER</u>	<u>PROBE WASH</u>	<u>IMP. CATCH</u>	<u>TOTAL</u>
<u>3</u>	<u>0.3321</u>	<u>+ 0.1434</u>	<u>+ 0.1210</u>	<u>= 0.5965</u>

LAB NO: 2034
SOURCE: steck
SITE: _____
LOCATION: _____

TEST NO: 3
RUN NO.'S 1, 2, 3
DATE: 2.13.92
ANALYST: R. Hessler

SUMMARY OF PARTICULATE ANALYSES

Lab No.	Run No.	Total Corrected Wt. (g)
18423, '948, '979	1	0.4289
18426, '949, '980	2	0.4762
18429, '950, '981	3	0.4544
_____	_____	_____

BLANK VALUE ANALYSES

ACETONE

Lab No.	Final Wt. (g)	Tare Wt. (g)	Gain (g) (residue)
18954	21.2536	21.2525	0.0011

Residue (g)	Volume (l)	g/l
0.0011	0.135	0.0081

CONDENSIBLE ORGANICS

Lab No.	Final Wt. (g)	Tare Wt. (g)	Gain (g) (residue)
18941	140.7325	140.7303	0.0022

Residue (g)	Volume (l)	g/l
0.0022	0.200	0.011

NOTE: (l)=Liter
(g)=Gram
(g/l)=gram per liter

LAB NO: 2034
SOURCE: stack
SITE: _____
LOCATION: _____

TEST NO: 3
RUN NO: _____
DATE: 213.92
ANALYST: R. Hessb

FILTERS

<u>Lab No.</u>	<u>Final Wt. (g)</u>	<u>Tare Wt. (g)</u>	<u>Gain (g)</u>
<u>18979</u>	<u>0.8987</u>	<u>- 0.6095</u>	<u>= 0.2892</u>
			TOTAL <u>0.2892</u>

Probe & Front Half Wash

<u>Lab No.</u>	<u>Final Wt. (g)</u>	<u>Tare Wt. (g)</u>	<u>Gain (g)</u>
<u>18948</u>	<u>21.4469</u>	<u>- 21.3712</u>	<u>= 0.0757</u>
BLANK <u>0.060</u> (1) * <u>0.0051</u> (g/l) = <u>- 0.0005</u> (g)			
			CORRECTED TOTAL <u>0.0752</u>

IMPINGER CATCH

<u>Lab No.</u>	<u>Final Wt. (g)</u>	<u>Tare Wt. (g)</u>	<u>Gain (g)</u>
<u>18923</u>	<u>137.5262</u>	<u>- 137.4492</u>	<u>= 0.0770</u>
BLANK <u>1.140</u> (1) * <u>0.011</u> (g/l) = <u>- 0.0125</u>			
			CORRECTED TOTAL <u>0.0645</u>

SUMMARY OF CORRECTED TOTALS (g)

<u>RUN NO.</u>	<u>FILTER</u>	<u>PROBE WASH</u>	<u>IMP. CATCH</u>	<u>TOTAL</u>
<u>1</u>	<u>0.2892</u>	<u>+ 0.0752</u>	<u>+ 0.0645</u>	<u>= 0.4289</u>

LAB NO: 2034
SOURCE: stack
SITE: _____
LOCATION: _____

TEST NO: 3
RUN NO: 2
DATE: 2.13.92
ANALYST: R. Hessler

FILTERS

Lab No.	Final Wt.(g)	Tare Wt.(g)	Gain (g)
<u>18980</u>	<u>0.9048</u>	<u>0.6144</u>	<u>0.2904</u>

TOTAL 0.2904

Probe & Front Half Wash

Lab No.	Final Wt.(g)	Tare Wt.(g)	Gain (g)
<u>18949</u>	<u>21.5347</u>	<u>21.3994</u>	<u>0.1353</u>

BLANK 0.077 (l) * 0.0051 (g/l) = 0.0006 (g)

CORRECTED TOTAL 0.1347

IMPINGER CATCH

Lab No.	Final Wt.(g)	Tare Wt.(g)	Gain (g)
<u>18926</u>	<u>135.4499</u>	<u>135.3837</u>	<u>0.0662</u>

BLANK 1.370 (l) * 0.011 (g/l) = 0.0151

CORRECTED TOTAL 0.0511

SUMMARY OF CORRECTED TOTALS (g)

RUN NO.	FILTER	PROBE WASH	IMP. CATCH	TOTAL
<u>2</u>	<u>0.2904</u>	<u>+ 0.1347</u>	<u>+ 0.0511</u>	<u>= 0.4762</u>

LAB NO: 2034
 SOURCE: stock
 SITE: _____
 LOCATION: _____

 TEST NO: 3
 RUN NO: 3
 DATE: 2.13.92
 ANALYST: R. Hess
FILTERS

Lab No.	Final Wt. (g)	Tare Wt. (g)	Gain (g)
<u>18951</u>	<u>0.7079</u>	<u>0.6148</u>	<u>0.0931</u>
			TOTAL <u>0.2931</u>

Probe & Front Half Wash

Lab No.	Final Wt. (g)	Tare Wt. (g)	Gain (g)
<u>18950</u>	<u>21.5119</u>	<u>21.3617</u>	<u>0.1502</u>
BLANK <u>0.075</u> (l) * <u>0.0081</u> (g/l) = <u>0.006</u> (g)			
			CORRECTED TOTAL <u>0.1496</u>

IMPINGER CATCH

Lab No.	Final Wt. (g)	Tare Wt. (g)	Gain (g)
<u>18929</u>	<u>136.6045</u>	<u>136.5283</u>	<u>0.0762</u>
BLANK <u>1.245</u> (l) * <u>0.011</u> (g/l) = <u>0.037</u>			
			CORRECTED TOTAL <u>0.0625</u>

SUMMARY OF CORRECTED TOTALS (g)

RUN NO.	FILTER	PROBE WASH	IMP. CATCH	TOTAL
<u>3</u>	<u>0.2931</u>	<u>+ 0.1496</u>	<u>+ 0.0625</u>	<u>= 0.5052</u>

LAB NO: 2034
SOURCE: Stock
SITE: _____
LOCATION: _____

TEST NO: 4
RUN NO.'S 1, 2, 3
DATE: 2.13.92
ANALYST: R. Hessler

SUMMARY OF PARTICULATE ANALYSES

Lab No.	Run No.	Total Corrected Wt. (g)
18432, '951, '952	1	0.6358
18435, '952, '983	2	0.5193
18438, '953, '984	3	0.4688

BLANK VALUE ANALYSES

ACETONE

Lab No.	Final Wt. (g)	Tare Wt. (g)	Gain (g) (residue)
18954	21.2536	21.2525	0.0011

Residue (g)	Volume (l)	g/l
0.0011	0.135	0.0081

CONDENSIBLE ORGANICS

Lab No.	Final Wt. (g)	Tare Wt. (g)	Gain (g) (residue)
18941	140.7325	140.7303	0.0022

Residue (g)	Volume (l)	g/l
0.0022	0.200	0.011

NOTE: (l)=Liter
(g)=Gram
(g/l)=gram per liter

LAB NO: 2034
SOURCE: Stack
SITE: _____
LOCATION: _____

TEST NO: 4
RUN NO: 1
DATE: 2.13.92
ANALYST: R. Hessler

FILTERS

<u>Lab No.</u>	<u>Final Wt. (g)</u>	<u>Tare Wt. (g)</u>	<u>Gain (g)</u>
<u>18982</u>	<u>0.9505</u>	<u>- 0.6222</u>	<u>= 0.3283</u>

TOTAL 0.3283

Probe & Front Half Wash

<u>Lab No.</u>	<u>Final Wt. (g)</u>	<u>Tare Wt. (g)</u>	<u>Gain (g)</u>
<u>18951</u>	<u>21.6776</u>	<u>- 21.4506</u>	<u>= 0.2270</u>

BLANK 0.076 (1) * 0.0081 (g/l) = -0.0006 (g)

CORRECTED TOTAL 0.2264

IMPINGER CATCH

<u>Lab No.</u>	<u>Final Wt. (g)</u>	<u>Tare Wt. (g)</u>	<u>Gain (g)</u>
<u>18932</u>	<u>139.6786</u>	<u>- 139.5835</u>	<u>= 0.0951</u>

BLANK 1.275 (1) * 0.011 (g/l) = -0.0140

CORRECTED TOTAL 0.0811

SUMMARY OF CORRECTED TOTALS (g)

<u>RUN NO.</u>	<u>FILTER</u>	<u>PROBE WASH</u>	<u>IMP. CATCH</u>	<u>TOTAL</u>
<u>1</u>	<u>0.3283</u>	<u>+ 0.2264</u>	<u>+ 0.0811</u>	<u>= 0.6358</u>

LAB NO: 2034
SOURCE: stock
SITE: _____
LOCATION: _____

TEST NO: 4
RUN NO: 2
DATE: 2.13.92
ANALYST: R. Hessler

FILTERS

<u>Lab No.</u>	<u>Final Wt. (g)</u>	<u>Tare Wt. (g)</u>	<u>Gain (g)</u>
<u>18983</u>	<u>0.9165</u>	<u>- 0.6289</u>	<u>= 0.2876</u>

TOTAL 0.2876

Probe & Front Half Wash

<u>Lab No.</u>	<u>Final Wt. (g)</u>	<u>Tare Wt. (g)</u>	<u>Gain (g)</u>
<u>18952</u>	<u>21.4627</u>	<u>- 21.3043</u>	<u>= 0.1584</u>

BLANK 0.076 (1) * 0.0051 (g/l) = -0.0006 (g)

CORRECTED TOTAL 0.1578

IMPINGER CATCH

<u>Lab No.</u>	<u>Final Wt. (g)</u>	<u>Tare Wt. (g)</u>	<u>Gain (g)</u>
<u>18935</u>	<u>139.1562</u>	<u>- 139.0667</u>	<u>= 0.0895</u>

BLANK 1.415 (1) * 0.011 (g/l) = -0.0156

CORRECTED TOTAL 0.0739

SUMMARY OF CORRECTED TOTALS (g)

<u>RUN NO.</u>	<u>FILTER</u>	<u>PROBE WASH</u>	<u>IMP. CATCH</u>	<u>TOTAL</u>
<u>2</u>	<u>0.2876</u>	<u>+ 0.1578</u>	<u>+ 0.0739</u>	<u>= 0.5193</u>

LAB NO: 2034
SOURCE: stock
SITE: _____
LOCATION: _____

TEST NO: 4
RUN NO: 3
DATE: 2/13/92
ANALYST: R. Hessler

FILTERS

<u>Lab No.</u>	<u>Final Wt. (g)</u>	<u>Tare Wt. (g)</u>	<u>Gain (g)</u>
<u>18984</u>	<u>0.9261</u>	<u>- 0.6357</u>	<u>= 0.2904</u>
			<u>TOTAL 0.2904</u>

Probe & Front Half Wash

<u>Lab No.</u>	<u>Final Wt. (g)</u>	<u>Tare Wt. (g)</u>	<u>Gain (g)</u>
<u>18953</u>	<u>21.3424</u>	<u>- 21.2453</u>	<u>= 0.0971</u>
BLANK <u>0.062</u> (l) * <u>0.0081</u> (g/l) = <u>- 0.005</u> (g)			
			<u>CORRECTED TOTAL 0.0966</u>

IMPINGER CATCH

<u>Lab No.</u>	<u>Final Wt. (g)</u>	<u>Tare Wt. (g)</u>	<u>Gain (g)</u>
<u>18938</u>	<u>139.9249</u>	<u>- 139.8271</u>	<u>= 0.0978</u>
BLANK <u>1.455</u> (l) * <u>0.011</u> (g/l) = <u>- 0.0160</u>			
			<u>CORRECTED TOTAL 0.0818</u>

SUMMARY OF CORRECTED TOTALS (g)

<u>RUN NO.</u>	<u>FILTER</u>	<u>PROBE WASH</u>	<u>IMP. CATCH</u>	<u>TOTAL</u>
<u>3</u>	<u>0.2904</u>	<u>+ 0.0966</u>	<u>+ 0.0818</u>	<u>= 0.4688</u>

Pulp Dryer Data Sheets

Date 1/24/92

Name _____

	Time of Day	1500	1530	1600	1630	1700	
1	Slice Rate, Tph	204		204	203	212	
2	Total Pulp Flow, Tph	58.3		58.3	47.4	53.8	
3							
4	NORTH Unit						
5	Grate Speed, %	34.9		49.3			
6	ID Damper, %	94.0		94.0			
7	ID Fan, rpm	711.5		699.7			
8	Pulp Feed Gate, % open	32.5		32.5			
9	Draft Control, %	-3.3		29.0			
10	FD Air Flow, MPPH			10.41			
11	BH Temp In, °C	115		109			
12	Out, °C	108		107			
13	BH AP	6.22		6.33			
14	Multiclane, AP	3.80		3.86			
15	Dryer Throat, °C	531		503			
16	Dryer Exit, °C	134		123			
17	Furnace Pressure	-0.73		-0.14			
18	Exit Pressure	-1.84		-1.63			
19	Dryer AP	0.60		0.73			
20	Aspiration Flow, acfm	5.7		5.3			
21	Drum, amps	16.5		16.5			
22	ID Fan, amps	14.9		14.9			
23							
24	W/A = 23/4"	29.0/29.0					
25	measured = 25 1/4"	8" in SE					
26	SOUTH Unit						
27	Grate Speed, %	51.7		51.6	54.6	46.0	56.6
28	ID Damper, %	97.0		97.0	97.0	97.0	97.0
29	ID Fan, rpm	589.0		590.1	591.9	592.9	594.6
30	Pulp Feed Gate, % open	62.3		62.3 rpm	62.3 rpm	20	20
31	Draft Control, %	38.5		39.1	39.5	30.9	41.4
32	FD Air Flow, MPPH	17.32		13.31	19.24	0.00	20.07
33	BH Temp In, °C	115		115	115	117	115
34	Out, °C	113		113	113	114	114
35	BH AP	2.29		2.28	2.24	2.33	2.35
36	Multiclane, AP	2.33		2.21	2.27	2.29	2.24
37	Dryer Throat, °C	776		827	837	812	780
38	Dryer Exit, °C	129		130	131	130	127
39	Furnace Pressure	-0.23		-0.70	-0.18	-0.26	-0.19
40	Exit Pressure	-1.09		-1.05	-1.07	-1.13	-1.06
41	Dryer AP	0.46		0.48	0.51	0.49	0.47
42	Aspiration Flow, acfm	7.9		7.6	7.7	7.6	7.4
43	Drum, amps	18.0		18.0	17.5	17.5	17.6
44	ID Fan, amps	164		165	165	166	166
45							
46		50.4/47.9		58.1/42.1			
47		8" in 77 sec		8" in 100 sec			
48	Unit Pressure						
49							
50							

1/21/92 cont'd

<u>Time</u>		<u>Draft Control</u>
1915	SO Side AP	14.2%
1917		12.3%
1919		11.0%
1921		13.4%
1925	No Side AP	20.1%
1928		24.3%
1930		23.6%

Check on pulp feed

5³00 Tph slice 5% More 60% handle

221 Tph slice 11.04 Tph dry solids = 52.58 Tph
 @ 79% H₂O
 60% = 31.55 Tph

50 = 26 0.52 Tph / rpm
 31.55 = 62 rpm

APPENDIX T

REPORT EXCERPTS FROM REFERENCE 21

(American Crystal Sugar Company, December 11, 1990)

Interpoll Laboratories, Inc.
4500 Ball Road N.E.
Circle Pines, Minnesota 55014-1819

TEL: (612) 786-6020
FAX: (612) 786-7854

RESULTS OF THE NOVEMBER 14 AND 15, 1990
STATE PARTICULATE EMISSION COMPLIANCE
TEST ON THE SUGAR COOLER AND SUGAR
GRANULATOR AT THE ACS MOORHEAD PLANT

Submitted to:

AMERICAN CRYSTAL SUGAR COMPANY
2500 North Eleventh Street
P.O. Box 1037
Moorhead, Minnesota 56560

Attention:

Dave Waldon

Approved by:

Report Number 0-3202
December 11, 1990
KE/kce


Perry Lonnes, Ph.D.
Director
Field Testing Division

1 INTRODUCTION

On November 14 and 15, 1990, Interpoll Laboratories personnel conducted a particulate emission compliance test on the Sugar Cooler and Sugar Granulator at the American Crystal Sugar (ACS) Plant located in Moorhead, Minnesota. On-site testing was performed by D. Van Hoever and M. Kaehler. Coordination between testing activities and plant operation was provided by Dan Gust of ACS. The tests were not witnessed by a member of the Minnesota Pollution Control Agency.

The granulator and sugar cooler dry and cool the sugar in the later part of the overall process. After the juice is boiled down to the point where the crystal size and concentration in the mother liquor is appropriate; the entire mass is mixed; the crystal separated from the mother liquor and washed with high purity water in centrifugals; then scrolled off and conveyed by elevator to the granulator. The granulator is a horizontal rotary drum dryer. Heated air flows counter current to the sugar crystals passage through the drum and removes the excess moisture. Louvers in the drum cause the sugar to be carried up the side of the rotating drum, much like a cement mixer. This causes the sugar to fall through the heated air stream and increases the speed and efficiency of drying. The dried sugar is then conveyed by elevator to the sugar cooler which is also a horizontal rotary drum. The counter current flow of ambient air through the drum cools the sugar. Finally, the cooled sugar is screened for crystal size control. Particulate emissions from the granulator and cooler are controlled by Rotoclones.

Evaluations were performed in accordance with EPA Methods 1 - 5, CFR Title 40, Part 60, Appendix A (revised July 1, 1989). A preliminary determination of the gas linear velocity profile was made before the first particulate determination to allow selection of the appropriate nozzle diameter required for isokinetic sample withdrawal. An Interpoll Labs sampling train which meets or exceeds specifications in the above-cited

Table 1. Summary of the Results of the November 14, 1990 Particulate Emission Compliance Test on the Sugar Cooler at the American Crystal Sugar Company in Moorhead, Minnesota.

ITEM	Run 1	Run 2	Run 3
Date of test	11-14-90	11-14-90	11-14-90
Time runs were done (HRS)	938/1040	1102/1204	1226/1329
Process rate (TPH)	39.7	34.1	36.6
Volumetric flow actual (ACFM)	14075	14382	12971
standard (DSCFM)	12162	12397	11167
Gas temperature (DEG-F)	97	97	98
Moisture content (%V/V)	4.65	4.87	4.79
Gas composition (%V/V, dry)			
carbon dioxide	0.03	0.03	0.03
oxygen	20.90	20.90	20.90
nitrogen	79.07	79.07	79.07
Isokinetic variation (%)	102.0	103.3	98.8
Particulate concentration			
actual (GR/ACF)	.0412	.0424	.0426
standard (GR/DSCF)	.0477	.0492	.0496
Part. emission rate (LB/HR)	4.97	5.23	4.74

Note: Dry + Organic Wet Catch

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Impinger Catch/Minnesota Protocol

Job A.C.5/marcher Source Sagan Center
Team Leader HK Test Site Stack
Date Submitted 11-16-90 Date of Test 11-14-90
Test No. 1 No. of Runs Completed 3
Date of Analysis 11-19-90 Technician R. Gibson

0	Test <u>1</u> Run <u>0</u> Field Blank Log Number <u>1743.03</u> Comments _____	Dish No. <u>2</u> Dish Tare Wt. <u>46.2262</u> Dish+Sample Wt. <u>46.2268</u> Sample Wt. <u>0.0006</u>
1	Test <u>1</u> Run <u>1</u> Log Number <u>-06</u> Comments _____	Dish No. <u>7</u> Dish Tare Wt. <u>50.0319</u> Dish+Sample Wt. <u>50.0357</u> Sample Wt. <u>0.0038</u>
2	Test <u>1</u> Run <u>2</u> Log Number <u>-09</u> Comments _____	Dish No. <u>11</u> Dish Tare Wt. <u>47.7584</u> Dish+Sample Wt. <u>47.7628</u> Sample Wt. <u>0.0044</u>
3	Test <u>1</u> Run <u>3</u> Log Number <u>-12</u> Comments _____	Dish No. <u>14</u> Dish Tare Wt. <u>49.7341</u> Dish+Sample Wt. <u>49.7379</u> Sample Wt. <u>0.0038</u>
4	Test _____ Run _____ Log Number _____ Comments _____	Dish No. _____ Dish Tare Wt. _____ Dish+Sample Wt. _____ Sample Wt. _____
5	Test _____ Run _____ Log Number _____ Comments _____	Dish No. _____ Dish Tare Wt. _____ Dish+Sample Wt. _____ Sample Wt. _____

Blank Solvent Wt. 0.0006g

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
0.0006	0.0032	0.0038	0.0032	0-1	

LSC-C

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EPA Method 5 Data Reporting Sheet
Probe/Cyclone Wash

Job A.C.S./Moonhead Source Jugan Creek
Team Leader MR Test Site Stack
Date Submitted 11-15-90 Date of Test 11-14-90
Test No. 1 No. of Runs Completed 3
Date of Analysis 11-16-90 Technician R. Sullivan
Transport Leakage ☒ None ☐ ml Solvent DI H₂O

0	Test <u>1</u> Run <u>0</u> Field Blank Log Number <u>1743-01</u> Vol. of Solvent <u>100</u> ml *Solvent Residue <u>2.0</u> ug/ml	Dish No. <u>72</u> Dish Tare Wt. <u>64.1083</u> g Dish+Sample Wt. <u>64.1085</u> g Sample Wt. <u>0.0002</u> g
1	Test <u>1</u> Run <u>1</u> Vol. of Solvent <u>170</u> ml Log Number <u>-04</u> Comments _____	Dish No. <u>76</u> Dish Tare Wt. <u>70.2561</u> g Dish+Sample Wt. <u>70.3397</u> g Sample Wt. <u>0.0836</u> g
2	Test <u>1</u> Run <u>2</u> Vol. of Solvent <u>170</u> ml Log Number <u>-07</u> Comments _____	Dish No. <u>77</u> Dish Tare Wt. <u>80.0596</u> g Dish+Sample Wt. <u>80.1473</u> g Sample Wt. <u>0.0877</u> g
3	Test <u>1</u> Run <u>3</u> Vol. of Solvent <u>170</u> ml Log Number <u>-10</u> Comments _____	Dish No. <u>79</u> Dish Tare Wt. <u>85.9295</u> g Dish+Sample Wt. <u>86.0004</u> g Sample Wt. <u>0.0709</u> g
4	Test _____ Run _____ Vol. of Solvent _____ ml Log Number _____ Comments _____	Dish No. _____ Dish Tare Wt. _____ g Dish+Sample Wt. _____ g Sample Wt. _____ g
5	Test _____ Run _____ Vol. of Solvent _____ ml Log Number _____ Comments _____	Dish No. _____ Dish Tare Wt. _____ g Dish+Sample Wt. _____ g Sample Wt. _____ g

*Solvent Residue 2.0 ug/ml = [(Sample Wt. 0.0002 g) (10⁶)] / Vol. of Sol. 100 ml

EPA-MS Acetone Residue Blank Spec. 7.3 ug/ml

Results:

Field Blk. Run 1 Run 2 Run 3 Run 4 Run 5

0.0002	0.0833	0.0874	0.0706	D-2	

LSC-01

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EPA Method 5 Data Reporting Sheet
Filter Gravimetrics

Job A.C.S. / moonhead Source Sugar Cooler
Team Leader MK Test Site Stack
Date Submitted 11-15-90 Date of Test 11-14-90
Test No. 1 No. of Runs Completed 3
Date of Analysis 11-16-90 Technician R. Collins

0	Test <u>1</u> Run <u>0</u> Field Blank Log Number <u>1793-02</u> Comments _____	Filter No. <u>2811</u> Filter Type <u>4" GF</u> Filter Tare Wt. <u>.9299</u> Filter+Sample Wt. <u>.9300</u> Sample Wt. <u>0.0001</u>	9 9 9 9
1	Test <u>1</u> Run <u>1</u> Log Number <u>-05</u> Comments _____	Filter No. <u>2814</u> Filter Type <u>4" GF</u> Filter Tare Wt. <u>.9296</u> Filter+Sample Wt. <u>.9508</u> Sample Wt. <u>0.0212</u>	9 9 9 9
2	Test <u>1</u> Run <u>2</u> Log Number <u>-08</u> Comments _____	Filter No. <u>2832</u> Filter Type <u>4" GF</u> Filter Tare Wt. <u>.9442</u> Filter+Sample Wt. <u>.9675</u> Sample Wt. <u>0.0233</u>	9 9 9 9
3	Test <u>1</u> Run <u>3</u> Log Number <u>-11</u> Comments _____	Filter No. <u>2833</u> Filter Type <u>4" GF</u> Filter Tare Wt. <u>.9147</u> Filter+Sample Wt. <u>.9403</u> Sample Wt. <u>0.0256</u>	9 9 9 9
4	Test _____ Run _____ Log Number _____ Comments _____	Filter No. _____ Filter Type _____ Filter Tare Wt. _____ Filter+Sample Wt. _____ Sample Wt. _____	9 9 9 9
5	Test _____ Run _____ Log Number _____ Comments _____	Filter No. _____ Filter Type _____ Filter Tare Wt. _____ Filter+Sample Wt. _____ Sample Wt. _____	9 9 9 9

Results:

Field Blk. Run 1 Run 2 Run 3 Run 4 Run 5

0.0001	0.0212	0.0233	0.0256		

Field Blk. Run 1 Run 2 Run 3 Run 4 Run 5

	0.1077	0.1145	0.0444		

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EPA Method 5 Data Reporting Sheet
Impinger Catch/Minnesota Protocol

Job ACS/impinger Source Granulator
Team Leader MR Test Site Stack
Date Submitted 11-16-90 Date of Test 11-15-90
Test No. _____ No. of Runs Completed 3
Date of Analysis 11-14-90 Technician P. Gilman

0	Test <u>Run 0</u> Field Blank Log Number _____ Comments _____	Dish No. _____ Dish Tare Wt. _____ g Dish+Sample Wt. _____ g Sample Wt. _____ g
1	Test <u>2</u> Run <u>1</u> Log Number <u>1743-15</u> Comments _____	Dish No. <u>16</u> Dish Tare Wt. <u>52.8212</u> g Dish+Sample Wt. <u>52.8254</u> g Sample Wt. <u>0.0042</u> g
2	Test <u>2</u> Run <u>2</u> Log Number <u>-18</u> Comments _____	Dish No. <u>61</u> Dish Tare Wt. <u>44.5893</u> g Dish+Sample Wt. <u>44.5948</u> g Sample Wt. <u>0.0055</u> g
3	Test <u>2</u> Run <u>3</u> Log Number <u>-21</u> Comments _____	Dish No. <u>107</u> Dish Tare Wt. <u>44.0702</u> g Dish+Sample Wt. <u>44.0749</u> g Sample Wt. <u>0.0047</u> g
4	Test _____ Run _____ Log Number _____ Comments _____	Dish No. _____ Dish Tare Wt. _____ g Dish+Sample Wt. _____ g Sample Wt. _____ g
5	Test _____ Run _____ Log Number _____ Comments _____	Dish No. _____ Dish Tare Wt. _____ g Dish+Sample Wt. _____ g Sample Wt. _____ g

Blank Solvent Wt. 0.0006 g

Results:

Field Blk. Run 1 Run 2 Run 3 Run 4 Run 5

0.0006	0.0036	0.0044	0.0041	D-4	

LSC

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EPA Method 5 Data Reporting Sheet
Probe/Cyclone Wash

Job A.C.S. / Moorhead Source Granulator
Team Leader mk Test Site Stack
Date Submitted 11-15-90 Date of Test 11-15-90
Test No. 2 No. of Runs Completed 3
Date of Analysis 11-16-90 Technician R. E. G.
Transport Leakage ☒ None ☐ _____ ml Solvent DI H₂O

0	Test <u>Run 0</u> Field Blank Log Number _____ Vol. of Solvent _____ ml *Solvent Residue <u>2.0</u> ug/ml	Dish No. _____ Dish Tare Wt. _____ g Dish+Sample Wt. _____ g Sample Wt. _____ g
1	Test <u>2</u> Run <u>1</u> Vol. of Solvent <u>160</u> ml Log Number <u>1743-13</u> Comments _____	Dish No. <u>303</u> Dish Tare Wt. <u>49.5732</u> g Dish+Sample Wt. <u>49.6228</u> g Sample Wt. <u>0.0496</u> g
2	Test <u>2</u> Run <u>2</u> Vol. of Solvent <u>160</u> ml Log Number <u>-16</u> Comments _____	Dish No. <u>304</u> Dish Tare Wt. <u>60.5533</u> g Dish+Sample Wt. <u>60.5769</u> g Sample Wt. <u>0.0236</u> g
3	Test <u>2</u> Run <u>3</u> Vol. of Solvent <u>150</u> ml Log Number <u>-19</u> Comments _____	Dish No. <u>305</u> Dish Tare Wt. <u>56.0210</u> g Dish+Sample Wt. <u>56.1239</u> g Sample Wt. <u>0.1029</u> g
4	Test _____ Run _____ Vol. of Solvent _____ ml Log Number _____ Comments _____	Dish No. _____ Dish Tare Wt. _____ g Dish+Sample Wt. _____ g Sample Wt. _____ g
5	Test _____ Run _____ Vol. of Solvent _____ ml Log Number _____ Comments _____	Dish No. _____ Dish Tare Wt. _____ g Dish+Sample Wt. _____ g Sample Wt. _____ g

*Solvent Residue ___ ug/ml = [(Sample Wt. ___ g) (10⁶)] / Vol. of Sol. ___ ml

EPA-M5 Acetone Residue Blank Spec. {7.3 ug/ml

Results:

Field Blk. Run 1 Run 2 Run 3 Run 4 Run 5

0.0002	0.0493	0.0233	0.1026	D-5	

LSC-01

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EPA Method 5 Data Reporting Sheet
Filter Gravimetrics

Job A.C.S. / Moonhead Source Granulator
Team Leader MK Test Site Stack
Date Submitted 11-15-90 Date of Test 11-15-90
Test No. 1 No. of Runs Completed 3
Date of Analysis 11-16-90 Technician R. Culham

0	Test <u>Run 0</u> Field Blank Log Number _____ Comments _____	Filter No. _____ Filter Type _____ Filter Tare Wt. _____ g Filter+Sample Wt. _____ g Sample Wt. _____ g
1	Test <u>2</u> Run <u>1</u> Log Number <u>1793 -14</u> Comments _____	Filter No. <u>2815</u> Filter Type <u>4" GF</u> Filter Tare Wt. <u>.9335</u> g Filter+Sample Wt. <u>.9435</u> g Sample Wt. <u>0.0100</u> g
2	Test <u>2</u> Run <u>2</u> Log Number <u>-17</u> Comments _____	Filter No. <u>2816</u> Filter Type <u>4" GF</u> Filter Tare Wt. <u>.9138</u> g Filter+Sample Wt. <u>.9241</u> g Sample Wt. <u>0.0203</u> g
3	Test <u>2</u> Run <u>3</u> Log Number <u>-20</u> Comments _____	Filter No. <u>2807</u> Filter Type <u>4" GF</u> Filter Tare Wt. <u>.9404</u> g Filter+Sample Wt. <u>.9637</u> g Sample Wt. <u>0.0233</u> g
4	Test _____ Run _____ Log Number _____ Comments _____	Filter No. _____ Filter Type _____ Filter Tare Wt. _____ g Filter+Sample Wt. _____ g Sample Wt. _____ g
5	Test _____ Run _____ Log Number _____ Comments _____	Filter No. _____ Filter Type _____ Filter Tare Wt. _____ g Filter+Sample Wt. _____ g Sample Wt. _____ g

Results:

Field Blk. Run 1 Run 2 Run 3 Run 4 Run 5

0.0001	0.0100	0.0203	0.0233		

Field Blk. Run 1 Run 2 Run 3 Run 4 Run 5

	0.0629	0.0485	0.1300		

Filename: BEET21.WQ1

Date: 18-Jan-95

Facility: American Crystal Sugar

Location: Moorehead, Minnesota

Source: Sugar cooler (horiz. rotating drum cooled w/ ambient air) with rotoclone

Test date: November 14, 1990

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	97	97	98	
Sugar cooler with rotoclone	Pressure	in. HG	28.62	28.62	28.62	
	Moisture	%	4.65	4.87	4.79	
	Oxygen	%	20.9	20.9	20.9	
	Volumetric flow, actual	acfm	14075	14382	12971	
	Volumetric flow, standard*	dscfm	12169	12406	11178	
	Isokinetic variation	%	102	103.3	98.8	
Sugar cooler throughput rate		TPH	39.70	34.10	36.60	
Pollutant concentrations:						
	Total PM	G/dscf	0.0477	0.0492	0.0496	
	Filterable PM	G/dscf	0.0463	0.0476	0.0480	
	Condensable organic PM	G/dscf	0.00142	0.001633	0.00160	
	CO2	% vol	0.03%	0.03%	0.03%	
Pollutant mass flux rates:						
	Filterable PM	lb/hr	4.83	5.06	4.60	
	Condensable organic PM	lb/hr	0.148	0.174	0.153	
	CO2	lb/hr	0.250	0.255	0.230	
Emission factors (ENGLISH UNITS):						AVERAGE
	Filterable PM	lb/ton	0.12	0.15	0.13	0.13
	Condensable organic PM	lb/ton	0.0037	0.0051	0.0042	0.0043
	CO2	lb/ton	0.0063	0.0075	0.0063	neglig.
Emission factors (METRIC UNITS):						AVERAGE
	Filterable PM	kg/Mg	0.061	0.074	0.063	0.066
	Condensable organic PM	kg/Mg	0.0019	0.0025	0.0021	0.0022
	CO2	kg/Mg	0.0032	0.0037	0.0031	neglig.

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

Filename: BEET21A.WQ1

Date: 18-Jan-95

Facility: American Crystal Sugar

Location: Moorehead, Minnesota

Source: Sugar granulator (horiz. rotating drum dryer) with rotoclone

Test date: November 15, 1990

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	108	104	105	
Sugar granulator with rotoclone	Pressure	in. HG	28.75	28.75	28.75	
	Moisture	%	7.82	7.14	6.89	
	Oxygen	%	20.9	20.9	20.9	
	Volumetric flow, actual	acfm	12572	12039	11958	
	Volumetric flow, standard*	dscfm	10351	10057	9998	
	Isokinetic variation	%	103.4	99.1	99.7	
Sugar granulator output rate		TPH	39.70	34.10	36.60	
Pollutant concentrations:						
Total PM		G/dscf	0.03235	0.01506	0.04037	
Filterable PM		G/dscf	0.0305	0.0135	0.0391	
Condensable organic PM		G/dscf	0.00185	0.001522	0.00127	
CO2		% vol	0.03%	0.03%	0.03%	
Pollutant mass flux rates:						
Filterable PM		lb/hr	2.71	1.17	3.35	
Condensable organic PM		lb/hr	0.164	0.131	0.109	
CO2		lb/hr	0.213	0.207	0.206	
Emission factors (ENGLISH UNITS):						AVERAGE
Filterable PM		lb/ton	0.07	0.03	0.09	0.05
Condensable organic PM		lb/ton	0.0041	0.0038	0.0030	0.003
CO2		lb/ton	0.0054	0.0061	0.0056	neglig.
Emission factors (METRIC UNITS):						AVERAGE
Filterable PM		kg/Mg	0.034	0.017	0.046	0.03
Condensable organic PM		kg/Mg	0.0021	0.0019	0.0015	0.0018
CO2		kg/Mg	0.0027	0.0030	0.0028	neglig.

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

APPENDIX U

REPORT EXCERPTS FROM REFERENCE 22

(American Crystal Sugar Company, April 15, 1993)

**Unit Nos. 1 and 2 Pulp Dryer Stacks
EMISSION TESTING RESULTS**

for the
Feburary 22-26, 1993 Testing of
Particulate

conducted at the

**American Crystal Sugar Company
Crookston, Minnesota**

Submitted to:

Mr. Dave Noble
American Crystal Sugar Company
Highway 75 South
Crookston, Minnesota 56716

Submitted by:

BAY WEST, INC.
FIVE EMPIRE DRIVE
ST. PAUL, MINNESOTA 55103
Telephone (612) 291-0456
Fax (612) 291-0099

Timothy Roland Nelson
Project Manager
Air Quality

April 15, 1993
Project No. BW920441

TABLE 1

CLIENT: AMERICAN CRYSTAL SUGAR, CROOKSTON
SOURCE/SITE: NO. 1 PULP DRYER STACK

RESULTS OF ORSAT & MOISTURE ANALYSES - EPA METHODS 3 & 4 (%V/V)

TEST NO.: 1	RUN 1	RUN 2
DATE OF TEST	22-Feb-93	22-Feb-93
DRY BASIS (ORSAT), %		
CARBON DIOXIDE	9.03	9.67
OXYGEN	10.42	9.76
CARBON MONOXIDE	NM	NM
NITROGEN	80.55	80.57
WET BASIS (ORSAT), %		
CARBON DIOXIDE	4.67	4.95
OXYGEN	5.39	5.00
CARBON MONOXIDE	NM	NM
NITROGEN	41.65	41.26
WATER VAPOR	48.29	48.80
DRY MOLECULAR WEIGHT	29.86	29.94
WET MOLECULAR WEIGHT	24.13	24.11

NM = NOT MEASURED

TABLE 2

CLIENT: AMERICAN CRYSTAL SUGAR, CROOKSTON
 SOURCE/SITE: NO. 1 PULP DRYER STACK

RESULTS OF PARTICULATE LOADING DETERMINATIONS - EPA METHOD 5

TEST NO.: 1	RUN 1	RUN 2
DATE OF RUN	22-Feb-93	22-Feb-93
RUN START TIME	1200	1420
RUN END TIME	1340	1600
STACK STATIC PRESSURE (in. H ₂ O)	-0.60	-0.60
CROSS SECTIONAL AREA (sq. ft.)	19.634	19.634
PITOT TUBE COEFFICIENT	0.840	0.840
SAMPLE GAS MOISTURE ANALYSES		
CONDENSER (ml.)	0.00	0.00
IMPINGER (ml.)	814.00	793.00
DESSICCANT (grams)	7.00	5.00
TOTAL (grams)	821.00	798.00
SAMPLE GAS MOISTURE CONTENT (%)	48.29	48.80
DRY GAS METER COEFFICIENT	1.039	1.039
BAROMETRIC PRESSURE (in. Hg)	29.30	29.30
AVG. ORIFICE PRESSURE DROP (in. H ₂ O)	0.57	0.52
AVG. GAS METER TEMP. (degrees F)	94	94
VOLUME THROUGH GAS METER		
AT METER CONDITIONS (cf)	42.67	40.62
STANDARD CONDITIONS (dscf)	41.40	39.44
TOTAL SAMPLING TIME (min.)	96	96
NOZZLE DIAMETER (in.)	0.250	0.250
AVG. STACK GAS TEMP. (degrees F)	209	210
AVG. STACK GAS VELOCITY (ft/sec)	49.58	49.63
VOLUMETRIC FLOWRATE		
ACTUAL (acfm)	58413	58464
DRY STANDARD (dscfm)	23301	23076
ISOKINETIC VARIATION. %	106.67	102.61
PARTICULATE COLLECTED		
FILTER CATCH (g)	0.0752	0.1337
PROBE WASH (g)	0.1101	0.0984
IMPINGER CATCH (g)	0.0703	0.0722
TOTAL PARTICULATE COLLECTED (g)	0.2556	0.3043
PARTICULATE CONCENTRATION		
ACTUAL (gr/acf)	0.0380	0.0470
DRY STANDARD (gr/dscf)	0.0953	0.1191
PARTICULATE MASS RATE (lb/hr)	19.028	23.550

TABLE 3

CLIENT: AMERICAN CRYSTAL SUGAR, CROOKSTON
SOURCE/SITE: NO. 1 PULP DRYER STACK

RESULTS OF ORSAT & MOISTURE ANALYSES - EPA METHODS 3 & 4 (%V/V)

TEST NO.: 2	RUN 1	RUN 2	RUN 3
DATE OF TEST	23-Feb-93	23-Feb-93	23-Feb-93
DRY BASIS (ORSAT), %			
CARBON DIOXIDE	6.71	6.12	6.05
OXYGEN	13.15	13.86	13.93
CARBON MONOXIDE	NM	NM	NM
NITROGEN	80.14	80.02	80.02
WET BASIS (ORSAT), %			
CARBON DIOXIDE	4.08	3.76	3.75
OXYGEN	8.00	8.52	8.65
CARBON MONOXIDE	NM	NM	NM
NITROGEN	48.75	49.19	49.66
WATER VAPOR	39.17	38.53	37.93
DRY MOLECULAR WEIGHT	29.60	29.53	29.53
WET MOLECULAR WEIGHT	25.06	25.09	25.15

NM = NOT MEASURED

TABLE 4

CLIENT: AMERICAN CRYSTAL SUGAR, CROOKSTON
SOURCE/SITE: NO. 1 PULP DRYER STACK

RESULTS OF PARTICULATE LOADING DETERMINATIONS - EPA METHOD 5

TEST NO.: 2	RUN 1	RUN 2	RUN 3
DATE OF RUN	23-Feb-93	23-Feb-93	23-Feb-93
RUN START TIME	835	1050	1315
RUN END TIME	1015	1230	1455
STACK STATIC PRESSURE (in. H2O)	-0.65	-0.65	-0.65
CROSS SECTIONAL AREA (sq. ft.)	19.634	19.634	19.634
PITOT TUBE COEFFICIENT	0.840	0.840	0.840
SAMPLE GAS MOISTURE ANALYSES			
CONDENSER (ml.)	0.00	0.00	0.00
IMPINGER (ml.)	693.00	652.00	645.00
DESSICCANT (grams)	3.00	6.00	6.00
TOTAL (grams)	696.00	658.00	651.00
SAMPLE GAS MOISTURE CONTENT (%)	39.17	38.53	37.93
DRY GAS METER COEFFICIENT	1.039	1.039	1.039
BAROMETRIC PRESSURE (in. Hg)	29.40	29.40	29.40
AVG. ORIFICE PRESSURE DROP (in. H2O)	0.88	0.82	0.85
AVG. GAS METER TEMP. (degrees F)	99	98	100
VOLUME THROUGH GAS METER			
AT METER CONDITIONS (cf)	52.73	51.11	51.99
STANDARD CONDITIONS (dscf)	50.91	49.44	50.17
TOTAL SAMPLING TIME (min.)	96	96	96
NOZZLE DIAMETER (in.)	0.250	0.250	0.250
AVG. STACK GAS TEMP. (degrees F)	207	208	209
AVG. STACK GAS VELOCITY (ft/sec)	52.98	52.86	52.93
VOLUMETRIC FLOWRATE			
ACTUAL (acfm)	62418	62273	62355
DRY STANDARD (dscfm)	29486	29663	29946
ISOKINETIC VARIATION. %	103.65	100.06	100.57
PARTICULATE COLLECTED			
FILTER CATCH (g)	0.0478	0.0887	0.0685
PROBE WASH (g)	0.1106	0.0961	0.1198
IMPINGER CATCH (g)	0.0604	0.0567	0.0431
TOTAL PARTICULATE COLLECTED (g)	0.2188	0.2415	0.2314
PARTICULATE CONCENTRATION			
ACTUAL (gr/acf)	0.0313	0.0359	0.0342
DRY STANDARD (gr/dscf)	0.0663	0.0754	0.0712
PARTICULATE MASS RATE (lb/hr)	16.763	19.166	18.271

TABLE 5

CLIENT: AMERICAN CRYSTAL SUGAR, CROOKSTON
SOURCE/SITE: NO. 2 PULP DRYER STACK

RESULTS OF ORSAT & MOISTURE ANALYSES - EPA METHODS 3 & 4 (%V/V)

TEST NO.: 3	RUN 1	RUN 2	RUN 3
DATE OF TEST	24-Feb-93	24-Feb-93	24-Feb-93
DRY BASIS (ORSAT), %			
CARBON DIOXIDE	5.57	5.02	4.55
OXYGEN	14.45	15.10	15.63
CARBON MONOXIDE	NM	NM	NM
NITROGEN	79.98	79.88	79.82
WET BASIS (ORSAT), %			
CARBON DIOXIDE	3.58	3.29	3.07
OXYGEN	9.30	9.88	10.53
CARBON MONOXIDE	NM	NM	NM
NITROGEN	51.47	52.29	53.77
WATER VAPOR	35.64	34.54	32.64
DRY MOLECULAR WEIGHT	29.47	29.41	29.35
WET MOLECULAR WEIGHT	25.38	25.47	25.65

NM = NOT MEASURED

TABLE 6

CLIENT: AMERICAN CRYSTAL SUGAR, CROOKSTON
SOURCE/SITE: NO. 2 PULP DRYER STACK

RESULTS OF PARTICULATE LOADING DETERMINATIONS - EPA METHOD 5

TEST NO.: 3	RUN 1	RUN 2	RUN 3
DATE OF RUN	24-Feb-93	24-Feb-93	24-Feb-93
RUN START TIME	1010	1230	1440
RUN END TIME	1150	1410	1620
STACK STATIC PRESSURE (in. H ₂ O)	-0.85	-0.85	-0.85
CROSS SECTIONAL AREA (sq. ft.)	12.306	12.306	12.306
PITOT TUBE COEFFICIENT	0.840	0.840	0.840
SAMPLE GAS MOISTURE ANALYSES			
CONDENSER (ml.)	0.00	0.00	0.00
IMPINGER (ml.)	428.00	683.00	637.00
DESSICCANT (grams)	2.00	9.00	7.00
TOTAL (grams)	430.00	692.00	644.00
SAMPLE GAS MOISTURE CONTENT (%)	35.64	34.54	32.64
DRY GAS METER COEFFICIENT	1.039	1.039	1.039
BAROMETRIC PRESSURE (in. Hg)	29.43	29.43	29.43
AVG. ORIFICE PRESSURE DROP (in. H ₂ O)	0.44	1.26	1.31
AVG. GAS METER TEMP. (degrees F)	88	94	100
VOLUME THROUGH GAS METER			
AT METER CONDITIONS (cf)	37.13	63.25	64.78
STANDARD CONDITIONS (dscf)	36.57	61.77	62.61
TOTAL SAMPLING TIME (min.)	96	96	96
NOZZLE DIAMETER (in.)	0.190	0.250	0.250
AVG. STACK GAS TEMP. (degrees F)	195	195	195
AVG. STACK GAS VELOCITY (ft/sec)	61.72	61.59	61.38
VOLUMETRIC FLOWRATE			
ACTUAL (acfm)	45571	45475	45322
DRY STANDARD (dscfm)	23190	23547	24147
ISOKINETIC VARIATION. %	102.72	98.70	97.55
PARTICULATE COLLECTED			
FILTER CATCH (g)	0.0502	0.0664	0.0647
PROBE WASH (g)	0.1111	0.1714	0.1599
IMPINGER CATCH (g)	0.0296	0.0635	0.0521
TOTAL PARTICULATE COLLECTED (g)	0.1909	0.3013	0.2767
PARTICULATE CONCENTRATION			
ACTUAL (gr/acf)	0.0410	0.0390	0.0363
DRY STANDARD (gr/dscf)	0.0806	0.0753	0.0682
PARTICULATE MASS RATE (lb/hr)	16.013	15.192	14.116

TABLE 7

CLIENT: AMERICAN CRYSTAL SUGAR, CROOKSTON
SOURCE/SITE: NO. 2 PULP DRYER STACK

RESULTS OF ORSAT & MOISTURE ANALYSES - EPA METHODS 3 & 4 (%V/V)

TEST NO.: 4	RUN 1	RUN 2	RUN 3
DATE OF TEST	25-Feb-93	25-Feb-93	25-Feb-93
DRY BASIS (ORSAT), %			
CARBON DIOXIDE	3.18	3.74	3.75
OXYGEN	17.25	16.59	16.56
CARBON MONOXIDE	NM	NM	NM
NITROGEN	79.57	79.67	79.69
WET BASIS (ORSAT), %			
CARBON DIOXIDE	2.36	2.64	2.67
OXYGEN	12.79	11.72	11.79
CARBON MONOXIDE	NM	NM	NM
NITROGEN	58.98	56.29	56.73
WATER VAPOR	25.88	29.35	28.81
DRY MOLECULAR WEIGHT	29.20	29.26	29.26
WET MOLECULAR WEIGHT	26.30	25.96	26.02

NM = NOT MEASURED

TABLE 8

CLIENT: AMERICAN CRYSTAL SUGAR, CROOKSTON
 SOURCE/SITE: NO. 2 PULP DRYER STACK

RESULTS OF PARTICULATE LOADING DETERMINATIONS - EPA METHOD 5

TEST NO.: 4	RUN 1	RUN 2	RUN 3
DATE OF RUN	25-Feb-93	25-Feb-93	25-Feb-93
RUN START TIME	910	1135	1350
RUN END TIME	1150	1315	1530
STACK STATIC PRESSURE (in. H ₂ O)	-0.76	-0.76	-0.76
CROSS SECTIONAL AREA (sq. ft.)	12.306	12.306	12.306
PITOT TUBE COEFFICIENT	0.840	0.840	0.840
SAMPLE GAS MOISTURE ANALYSES			
CONDENSER (ml.)	0.00	0.00	0.00
IMPINGER (ml.)	463.00	575.00	547.00
DESSICCANT (grams)	8.00	14.00	14.00
TOTAL (grams)	471.00	589.00	561.00
SAMPLE GAS MOISTURE CONTENT (%)	25.88	29.35	28.81
DRY GAS METER COEFFICIENT	1.039	1.039	1.039
BAROMETRIC PRESSURE (in. Hg)	29.40	29.40	29.40
AVG. ORIFICE PRESSURE DROP (in. H ₂ O)	1.32	1.49	1.43
AVG. GAS METER TEMP. (degrees F)	89	100	105
VOLUME THROUGH GAS METER			
AT METER CONDITIONS (cf)	64.47	69.20	68.16
STANDARD CONDITIONS (dscf)	63.54	66.78	65.29
TOTAL SAMPLING TIME (min.)	96	96	96
NOZZLE DIAMETER (in.)	0.250	0.250	0.250
AVG. STACK GAS TEMP. (degrees F)	193	194	194
AVG. STACK GAS VELOCITY (ft/sec)	58.97	59.42	60.19
VOLUMETRIC FLOWRATE			
ACTUAL (acfm)	43538	43872	44437
DRY STANDARD (dscfm)	25591	24558	25036
ISOKINETIC VARIATION. %	93.42	102.32	98.12
PARTICULATE COLLECTED			
FILTER CATCH (g)	0.0390	0.0521	0.0430
PROBE WASH (g)	0.1360	0.1017	0.1241
IMPINGER CATCH (g)	0.0440	0.0420	0.0350
TOTAL PARTICULATE COLLECTED (g)	0.2190	0.1958	0.2021
PARTICULATE CONCENTRATION			
ACTUAL (gr/acf)	0.0313	0.0253	0.0269
DRY STANDARD (gr/dscf)	0.0532	0.0452	0.0478
PARTICULATE MASS RATE (lb/hr)	11.667	9.524	10.251

TABLE 9

CLIENT: AMERICAN CRYSTAL SUGAR, CROOKSTON
SOURCE/SITE: NO. 2 PULP DRYER STACK

RESULTS OF ORSAT & MOISTURE ANALYSES - EPA METHODS 3 & 4 (%V/V)

TEST NO.: 5	RUN 1	RUN 2	RUN 3
DATE OF TEST	26-Feb-93	26-Feb-93	26-Feb-93
DRY BASIS (ORSAT), %			
CARBON DIOXIDE	3.92	3.60	3.46
OXYGEN	16.37	16.76	16.93
CARBON MONOXIDE	NM	NM	NM
NITROGEN	79.71	79.64	79.61
WET BASIS (ORSAT), %			
CARBON DIOXIDE	2.80	2.60	2.53
OXYGEN	11.69	12.10	12.37
CARBON MONOXIDE	NM	NM	NM
NITROGEN	56.93	57.51	58.17
WATER VAPOR	28.58	27.78	26.94
DRY MOLECULAR WEIGHT	29.28	29.25	29.23
WET MOLECULAR WEIGHT	26.06	26.12	26.21

NM = NOT MEASURED

TABLE 10

CLIENT: AMERICAN CRYSTAL SUGAR, CROOKSTON
SOURCE/SITE: NO. 2 PULP DRYER STACK

RESULTS OF PARTICULATE LOADING DETERMINATIONS - EPA METHOD 5

TEST NO.: 5	RUN 1	RUN 2	RUN 3
DATE OF RUN	26-Feb-93	26-Feb-93	26-Feb-93
RUN START TIME	805	1020	1230
RUN END TIME	945	1200	1410
STACK STATIC PRESSURE (in. H2O)	-0.82	-0.82	-0.82
CROSS SECTIONAL AREA (sq. ft.)	12.306	12.306	12.306
PITOT TUBE COEFFICIENT	0.840	0.840	0.840
SAMPLE GAS MOISTURE ANALYSES			
CONDENSER (ml.)	0.00	0.00	0.00
IMPINGER (ml.)	581.00	547.00	532.00
DESSICCANT (grams)	7.00	10.00	10.00
TOTAL (grams)	588.00	557.00	542.00
SAMPLE GAS MOISTURE CONTENT (%)	28.58	27.78	26.94
DRY GAS METER COEFFICIENT	1.039	1.039	1.039
BAROMETRIC PRESSURE (in. Hg)	29.52	29.52	29.52
AVG. ORIFICE PRESSURE DROP (in. H2O)	1.57	1.49	1.61
AVG. GAS METER TEMP. (degrees F)	93	100	104
VOLUME THROUGH GAS METER			
AT METER CONDITIONS (cf)	70.42	70.37	71.88
STANDARD CONDITIONS (dscf)	69.20	68.19	69.25
TOTAL SAMPLING TIME (min.)	96	96	96
NOZZLE DIAMETER (in.)	0.250	0.250	0.250
AVG. STACK GAS TEMP. (degrees F)	195	194	196
AVG. STACK GAS VELOCITY (ft/sec)	61.34	59.12	61.21
VOLUMETRIC FLOWRATE			
ACTUAL (acfm)	45293	43647	45191
DRY STANDARD (dscfm)	25677	25072	26167
ISOKINETIC VARIATION. %	101.40	102.33	99.57
PARTICULATE COLLECTED			
FILTER CATCH (g)	0.0480	0.0452	0.0509
PROBE WASH (g)	0.1581	0.1573	0.1656
IMPINGER CATCH (g)	0.0436	0.0412	0.0457
TOTAL PARTICULATE COLLECTED (g)	0.2497	0.2437	0.2622
PARTICULATE CONCENTRATION			
ACTUAL (gr/acf)	0.0316	0.0317	0.0338
DRY STANDARD (gr/dscf)	0.0557	0.0552	0.0584
PARTICULATE MASS RATE (lb/hr)	12.256	11.852	13.106

02/22/93

NUMBER 1 DRYER, NORTH

TIME OF DAY	1030	1130		1200	1230	1300	
SLICE RATE, TPH	198	229		239	238	1300	
TOTAL PULP FLOW, TPH	56	57		59	59	231	
GRATE SPEED, %	91.58	77.70		85.41	76.27	64	
DRYER EXIT, °C	108.6	108.8		109.1	108.9	76.69	
ID FAN SPEED, %	85	85.0		85.0	85.0	109.01	
PULP FEED SCROLL, %	27.2	27.6	5	25.8	85.0	85.0	
PULP GATE, % CLOSED	40.0	40.0		40.0	28.1	26.6	
FD DAMPER, % OPEN	27.6	24.5	0	35.9	40.0	40.0	
RECYCLE DAMPERS, % OPEN	17.6	47.0		47.0	23.3	28.57	
RATIO SETUP	Manual	Manual	T	Manual	Manual	47.0	
DRYER THROAT	86.7	86.4		848	847	Manual	
DRYER EXIT, °C	105	105	#1	105	105	839	
FURNACE PRESS, IN H2O	0	-0.9		-0.6	-0.9	106	
EXIT PRESS, INC H2O	1.6	1.5	(2)	-1.6	-1.6	-0.7	
DRYER ΔP, IN H2O	0.50	0.40		0.4	0.4	-1.5	
DRUM AMPS	32	33		35	33	0.2	
ID FAN, AMPS	168	168	1200	170	169	35	
ID FLOW	61	62		61	62	169	
REC. FLOW	13.6	13.8		13.5	13.7	61	
M.C. ΔP	5.8	5.8		5.8	5.75	13.7	
BAGHOUSE ΔP	7.18	7.11		7.10	7.07	5.8	
ASP	8.0	7.0		8.0	7.0	7.9	
FD FLOW, ΔP	0.49	0.50		0.50	0.50	0.49	
#1 PULP FEED, TPH	31	31		31	31	31	01811/1314
#2 PULP FEED, TPH	24	27		29	32	31	83.78/93.33
	11.05	7.5		4.1	4.4	4.6	8572
							16" in 96 sec
	10.1.1	10.1.2		10.4.7	104.7	104.8	Wheel
	79.1	79.6		99.4	99.4	99.6	No 50
							3.75 4

02/22/93

NUMBER 1 DRYER, NORTH

TIME OF DAY	1330	1400		1430	1500	1530
SLICE RATE, TPH	246	229		215	151	245
TOTAL PULP FLOW, TPH	63	59		56	55	57
GRATE SPEED, %	86.25	89.14		78.12	81.66	91.48
DRYER EXIT, °C	108.5	108.4		109.1	108.6	108.7
ID FAN SPEED, %	95.0	85.0	5	85.0	85.0	85.0
PULP FEED SCROLL, %	27.8	27.6	6	27.9	31.2	31.6
PULP GATE, % CLOSED	40.0	40.0	0	70.0	70.0	40.0
FD DAMPER, % OPEN	47.08	37.66		24.92	43.96	44.14
RECYCLE DAMPERS, % OPEN	47.0	47.0	I	47.0	47.0	47.0
RATIO SETUP						
DRYER THROAT	938	818	#2	827	938	888
DRYER EXIT, °C	106	105		106	105	105
FURNACE PRESS, IN H2O	-0.1	-0.6	(2)	-0.8	-0.3	-0.1
EXIT PRESS, INC H2O	-1.5	-1.5		-1.6	-1.5	-1.6
DRYER AP, IN H2O	0.1	0	1420	0	0.1	0.2
DRUM AMPS	32	32		33.5	34	33.5
ID FAN, AMPS	170	170		168	170	168
ID FLOW	60	62		60	60	59
REC. FLOW	13.8	13.7		13.6	13.4	13.3
M.C.P.	5.8	5.85		5.8	5.8	5.7
BAGHOUSE ΔP	4.11	4.09		4.13	4.13	4.21
ASP	8.0	8.0		7.9	8.0	7.8
FD FLOW, ΔP	0.49	0.48		0.49	0.50	0.52
#1 PULP FEED, TPH	31	31		31	31	31
#2 PULP FEED, TPH	28	33		27	21	25
O ₂ , %...	4.2	4.5		4.5	4.2	3.1
BH in, °C...	105.0	104.9		105.0	105.1	105.2
out, °C...	99.4	99.6		99.7	900.6	99.7

time/wps1

02/22/93

NUMBER 1 DRYER, NORTH

TIME OF DAY
 SLICE RATE, TPH
 TOTAL PULP FLOW, TPH
 GRATE SPEED, %
 DRYER EXIT, °C
 ID FAN SPEED, %
 PULP FEED SCROLL, %
 PULP GATE, % CLOSED
 FD DAMPER, % OPEN
 RECYCLE DAMPERS, % OPEN
 RATIO SETUP
 DRYER THROAT
 DRYER EXIT, °C
 FURNACE PRESS, IN H2O
 EXIT PRESS, INC H2O
 DRYER AP, IN H2O
 DRUM AMPS
 ID FAN, AMPS
 ID FLOW
 REC. FLOW
 M.C. AP
 BAGHOUSE AP
 ASP
 FD FLOW, AP
 #1 PULP FEED, TPH
 #2 PULP FEED, TPH

1600
 210
 61
 92.31
 108.9
 85.0
 33.2
 40
~~34.1~~
 47.0
 —
 918
 105
 -0.1
 -1.6
 0.3
 34
 167
 —
 13.2
 5.7
 4.29
 7.8
 0.52
 31
 31
 2.4
 105.1
 99.7

O₂, %...

BH in, °C...
 out, °C...

02/23/93

NUMBER 1 DRYER (Nov 6h)

TIME OF DAY	1100	1130	1200	1230	1300		
SLICE RATE, TPH	225	224	226	223	202		1330
TOTAL PULP FLOW, TPH	60	59	58	60	58		231
GRATE SPEED, %	67.78	91.95	76.69	77.47	63.41		60
DRYER EXIT, °C	107.7	108.3	108.2	107.8	109.2		74.50
ID FAN SPEED, %	78.0	79.0	78.0	78.0	78.0		107.5
PULP FEED SCROLL, %	20.3	20.3	20.3	20.9	20.2	5	78.0
PULP GATE, % CLOSED	40.0	40.0	40.0	40.0	40.0		19.8
FD DAMPER, % OPEN	21.15	14.22	16.90	27.58	12.86	0	40.0
RECYCLE DAMPERS, % OPEN	47.0	47.0	47.0	47.0	47.0		27.62
RATIO SETUP						T	47.0
DRYER THROAT	595	586	576	587	593		586
DRYER EXIT, °C	105	105	105	105	105	#3	105
FURNACE PRESS, IN H2O	-0.9	-1.0	-1.0	-0.7	-1.0		-0.8
EXIT PRESS, INC H2O	-1.6	-1.5	-1.5	-1.6	-1.4	(2)	-1.6
DRYER AP, IN H2O	0.7	0.6	0.6	0.5	0.5		0.4
DRUM AMPS	32	32	32	32	32		31
ID FAN, AMPS	158	158	158	157	158	1315	158
ID FLOW	62	60	60	60	62		60
REC. FLOW	13.6	13.5	13.5	13.3	13.5		13.5
M.C. AP	4.8	4.75	4.8	4.75	4.8		4.8
BAGHOUSE AP	4.28	4.25	4.24	4.22	4.22		4.24
ASP	8.1	7.9	8.0	8.0	8.0		7.9
FD FLOW, AP	0.44	0.44	0.45	0.45	0.43		0.45
#1 PULP FEED, TPH	26	26	26	26	26		26
#2 PULP FEED, TPH	28	31	24	26	24		25
O ₂ , %...	7.0	7.7	7.7	6.9	7.5		7.4
BH _{in} , °C...	104.4	104.4	104.4	104.5	104.3		104.4
and, °C...	99.1	99.6	99.4	99.1	99.4		99.6

02/24/93

NUMBER 2 DRYER (South)

TIME OF DAY
SLICE RATE, TPH
TOTAL PULP FLOW, TPH
GRATE SPEED, %
DRYER EXIT, °C
ID FAN SPEED, %
PULP FEED SCROLL, %
PULP GATE, % CLOSED
FD DAMPER, % OPEN
RECYCLE DAMPERS, % OPEN
RATIO SETUP
DRYER THROAT
DRYER EXIT, °C
FURNACE PRESS, IN H2O
EXIT PRESS, INC H2O
DRYER ΔP, IN H2O
DRUM AMPS
ID FAN, AMPS
ID FLOW
REC. FLOW
M.C. ΔP
BAGHOUSE ΔP
ASP
FD FLOW, ΔP
#1 PULP FEED, TPH
#2 PULP FEED, TPH
O₂, %
BH in, °C
out, °C

0830
227
68
70.07
100.3
70.0
103.3
68.25
16.20
26.0
Manual
704
101
-1.3
-1.0
1.2
28
154
32
5.0
4.05
4.78
7.4
1.03
32
26
9.5
103.0
93.7

0910
271
55
79.50
100.5
70.0
103.3
-3.34
24.79
65.0
Manual
609
101
-1.2
-1.0
1.2
27.5
154
34
10.6
4.05
4.70
6.9
1.03
28
27
8.8
102.5
93.9

0935
228
63
79.16
100.1
70.0
103.3
-3.34
28.96
49.0
Manual
612
100
-1.2
-1.1
1.1
26.5
154
33
9.6
4.05
4.69
7.25
1.03
33
30
8.8
102.4
93.5

1000
225
62
73.56
99.9
70.0
103.3
60.00
27.73
45.0
Manual
651
100
-1.2
-1.0
1.1
27
154
32
8.7
4.05
4.69
7.4
1.03
31
27
8.8
102.6
93.3

1030
225
63
71.66
99.9
70.0
103.3
61.51
19.95
45.0
Manual
653
100
-1.3
-1.1
1.2
27.5
154
33
8.6
4.05
4.65
6.7
1.03
31
27
9.0
102.8
93.3

1106
234
66
74.40
99.8
70.0
103.3
61.35
27.66
45.0
Manual
649
100
-1.2
-1.1
1.2
27
154
32.5
8.3
3.8
4.67
7.3
1.03
32
30
9.3
102.5
93.5

6.3.9

47

time/wp51

02/24/93

NUMBER 2 DRYER (South)

TIME OF DAY	1400	1430		1500	1530	1600	1630
SLICE RATE, TPH	228	229		230	229	220	217
TOTAL PULP FLOW, TPH	59	58		57	56	55	57
GRATE SPEED, %	75.13	78.22		78.28	67.50	67.26	74.86
DRYER EXIT, °C	100.0	99.8		100.0	100.0	99.8	99.8
ID FAN SPEED, %	70.0	70.0		70.0	70.0	70.0	70.0
PULP FEED SCROLL, %	103.3	103.3		103.3	103.3	103.3	103.3
PULP GATE, % CLOSED	60.0	60.0		60.0	60.0	60.0	60.0
FD DAMPER, % OPEN	22.66	28.96		26.35	22.11	12.58	20.42
RECYCLE DAMPERS, % OPEN	45.0	45.0		45.0	45.0	45.0	45.0
RATIO SETUP	Manual	Manual		Manual	Manual	Manual	Manual
DRYER THROAT	58.2	57.7	5	57.3	52.3	50.4	55.9
DRYER EXIT, °C	100	100	0	100	100	100	101
FURNACE PRESS, IN H2O	-1.2	-1.2		-1.3	-1.4	-1.4	-1.3
EXIT PRESS, INC H2O	-1.1	-1.1		-1.1	-1.1	-1.1	-1.1
DRYER ΔP, IN H2O	1.3	1.3	T	1.3	1.2	1.2	1.3
DRUM AMPS	26.5	27		27	27	27	27
ID FAN, AMPS	155	156	#3	154	154	154	154
ID FLOW	33	33		32.5	34	34	33.5
REC. FLOW	9.3	9.4	(4)	9.6	8.7	9.0	9.6
M.C. ΔP	2.9	3.1		2.9	3.95	3.95	3.95
BAGHOUSE ΔP	4.62	4.62	1440	4.54	4.54	4.62	4.50
ASP	6.9	7.1		7.2	7.0	7.1	7.2
FD FLOW, AP	1.03	1.03		1.03	1.03	1.03	1.03
#1 PULP FEED, TPH	30	30		30	30	29	31
#2 PULP FEED, TPH	27	27		27	26	27	27
O ₂ , %	9.8	9.1		9.5	10.2	10.4	9.4
BH in, °C	103.2	103.2		103.2	103.2	103.2	103.4
out, °C	93.5	93.7		93.4	93.4	93.4	94.0

02/25/93

NUMBER 2 DRYER (South)

TIME OF DAY	0900		0930	1000		1030	1100
SLICE RATE, TPH	233		233	227		160	234
TOTAL PULP FLOW, TPH	61		52	54		55	58
GRATE SPEED, %	67.10		62.42	64.50		67.18	77.83
DRYER EXIT, °C	98.9		98.9	98.8		98.8	98.8
ID FAN SPEED, %	70.0		70.0	70.0		70.0	70.0
PULP FEED SCROLL, %	103.3		103.3	103.3		103.3	103.3
PULP GATE, % CLOSED	65.00	5	60.00	60.00		60.00	60.00
FD DAMPER, % OPEN	17.16		13.23	15.03		17.60	25.96
RECYCLE DAMPERS, % OPEN	45.0	0	45.0	45.0		45.0	45.0
RATIO SETUP	Manual		Manual	Manual		Manual	Manual
DRYER THROAT	473	To	405	356		384	433
DRYER EXIT, °C	99	#1	99	99		99	99
FURNACE PRESS, IN H2O	-1.3		-1.4	-1.4		-1.4	-1.3
EXIT PRESS, INC H2O	-1.0		-0.8	-0.9		-0.9	-1.1
DRYER AP, IN H2O	1.1		1.3	1.3		1.3	1.3
DRUM AMPS	26.5		26.0	26.5		26.5	27
ID FAN, AMPS	156	0910	156	155		154	154
ID FLOW	34		35	35		35	34
REC. FLOW	10		9.3	9.4		9.5	9.5
M.C. AP	4.05		4.05	4.05		4.05	4.05
BAGHOUSE AP	24.76		4.72	4.78		4.74	4.67
ASP	7.0		7.2	6.9		7.0	7.0
FD FLOW, AP	1.03		1.03	1.03		1.03	1.03
#1 PULP FEED, TPH	35		33	33		34	33
#2 PULP FEED, TPH	22		19	22		23	26
O ₂ , %...	10.9		12.6	12.4		11.7	11.0
BH _{in} , %...	102.8		102.8	102.7		102.8	103.0
end, %...	91.6		91.3	91.6		91.8	92.4
						1040-1044	
						68.54/67.64	
						69.34	
						8" in 99 sec.	

02/25/93

NUMBER 2 DRYER (South)

TIME OF DAY	1130		1200	1230	1300	1315	1330
SLICE RATE, TPH	230		226	230	228	228	220
TOTAL PULP FLOW, TPH	60		64	67	66	64	63
GRATE SPEED, %	68.29		79.73	74.92	64.08	73.41	67.89
DRYER EXIT, °C	98.9		98.7	98.9	99.0	98.8	98.8
ID FAN SPEED, %	70.0		70.0	70.0	70.0	70.0	70.0
PULP FEED SCROLL, %	103.3		103.3	103.3	103.3	103.3	103.3
PULP GATE, % CLOSED	62.03		70.75	69.97	70.65	70.65	69.50
FD DAMPER, % OPEN	21.43	5	32.68	24.74	13.02	21.38	19.09
RECYCLE DAMPERS, % OPEN	45.0		45.0	45.0	45.0	45.0	45.0
RATIO SETUP	Manual	0	Manual	Manual	Manual	Manual	Manual
DRYER THROAT	467		482	439	427	429	434
DRYER EXIT, °C	99	7	99	99	99	99	99
FURNACE PRESS, IN H2O	-1.4		-1.2	-1.4	-1.5	-1.4	-1.4
EXIT PRESS, INC H2O	-0.9	#2	-1.2	-1.1	-1.1	-1.2	-1.0
DRYER MP, IN H2O	1.3		1.1	1.3	1.3	1.2	1.2
DRUM AMPS	27	(4)	27	27	27	27.5	26.5
ID FAN, AMPS	154		154	154	154	155	154
ID FLOW	35	1135	34	33	33.5	33	33
REC. FLOW	9.4		9.4	9.6	9.4	9.4	9.3
M.C. AP	4.05		4.05	4.05	4.05	4.05	4.05
BAGHOUSE AP	4.66		4.61	4.63	4.57	4.57	4.63
ASP	7.0		7.0	7.2	7.0	7.0	6.9
FD FLOW, AP	1.03		1.03	1.03	1.03	1.03	1.03
#1 PULP FEED, TPH	35		35	35	36	36	36
#2 PULP FEED, TPH	26		22	22	22	21	20
0 ₂ , %	10.4		10.7	11.5		11.3	11.4
BH _{in} , %	103.2		103.1	103.2		103.4	103.5
0 ₂ , %	92.6		92.6	92.6		92.7	92.8
				1230-1234			
				68.17/69.89			
				68.15			

8-in air
7.14 sec.

02/25/93

NUMBER 2 DRYER (South)

TIME OF DAY	1400	1430	1500	1530	
SLICE RATE, TPH	228	230	226	225	
TOTAL PULP FLOW, TPH	61	61	60	58	
GRATE SPEED, %	78.33	61.30	65.05	65.67	
DRYER EXIT, °C	99.1	98.9	98.9	98.8	
ID FAN SPEED, %	70.0	70.0	70.0	70.0	
PULP FEED SCROLL, %	103.3	103.3	103.3	103.3	
PULP GATE, % CLOSED	67.0	69.76	69.76	69.76	
FD DAMPER, % OPEN	30.29	14.04	13.78	16.54	
RECYCLE DAMPERS, % OPEN	45.0	45.0	45.0	45.0	
RATIO SETUP	Manual	Manual	Manual	Manual	
DRYER THROAT	440	455	445	404	
DRYER EXIT, °C	100	99	99	99	
FURNACE PRESS, IN H2O	-1.3	-1.5	-1.5	-1.5	
EXIT PRESS, INC H2O	-1.1	-1.1	-1.0	-1.0	
DRYER AP, IN H2O	1.2	1.3	1.3	1.2	
DRUM AMPS	27	26	27	26.5	
ID FAN, AMPS	154	154	154	154	
ID FLOW	35	33.5	34.5	36	
REC. FLOW	9.5	9.4	9.3	9.2	
M.C. AP	4.05	4.05	4.05	4.05	
BAGHOUSE AP	4.57	4.53	4.54	4.57	
ASP	7.1	7.0	6.9	6.8	
FD FLOW, AP	1.03	1.03	1.03	1.03	
#1 PULP FEED, TPH	35	35	35	35	
#2 PULP FEED, TPH	24	22	21	21	
O ₂ , %	10.7	11.0	11.2	11.7	
BH in, °C	103.5	103.2	103.3	103.3	
out, °C	93.2	93.1	93.0	92.6	
	1406				
	46.53/49.46				
	5.45				
	5.45				

2/26/93

NUMBER 2 DRYER (South)

TIME OF DAY	0830	0900	0930	1000		
SLICE RATE, TPH	235	141	247	200		1030
TOTAL PULP FLOW, TPH	55	58	61	62		205
GRATE SPEED, %	64.21	79.92	83.93	66.09		56 ~~4.5~~
DRYER EXIT, °C	99.9	99.9	99.8	100.2		63.51
ID FAN SPEED, %	72.0	72.0	72.0	72.0		99.6
PULP FEED SCROLL, %	44.4	103.0	103.3	103.3		72.0
PULP GATE, % CLOSED	-3.34	60.0	60.0	67.65		103.3
FD DAMPER, % OPEN	16.48	29.17	32.42	17.16		60.0
RECYCLE DAMPERS, % OPEN	45.0	45.0	45.0	45.0		13.57
RATIO SETUP	Manual	Manual	Manual	Manual		45.0
DRYER THROAT	372	431	486	466	S	Manual
DRYER EXIT, °C	100	100	100	100		391
FURNACE PRESS, IN H2O	-1.4	-1.1	-1.1	-1.3		100
EXIT PRESS, INC H2O	-0.9	-1.1	-1.2	-1.1		-1.4
DRYER ΔP, IN H2O	1.3	1.1	1.2	1.2	T	-1.1
DRUM AMPS	25.5	26.5	26.5	26.0		1.3
ID FAN, AMPS	156	155	155	156	#2	26.0
ID FLOW	37	36	36	36		156
REC. FLOW	9.3	9.4	9.3	9.4	(A)	36.5
M.C. ΔP	4.05	4.05	4.05	4.05		4.35
BAGHOUSE ΔP	4.76	4.78	4.78	4.77	1020	4.05
ASP	6.9	6.7	7.0	6.7		4.80
FD FLOW, ΔP	1.03	1.03	1.03	1.03		7.1
#1 PULP FEED, TPH	34	33	35	34		1.03
#2 PULP FEED, TPH	24	25	25	23		33
	12.0	10.9	10.2	11.1		23
						12.0
	102.8	102.6	102.8	102.8		102.7
	92.9	93.4	93.4	93.1		93.1
	042.2		093.4/093.7			
	Grate Speed		64.02/65.15			
	Grate		66.0			
	-0.16 to -0.19		8" in 96 sec.			
	in-H2O					
	Use 10 fan					
						1. wheel @ 3.5

02/26/93

NUMBER 2 DRYER (South)

TIME OF DAY	1100	1130	1200	1230	1300
SLICE RATE, TPH	210	220	226	183	200
TOTAL PULP FLOW, TPH	55	53	54	58	52
GRATE SPEED, %	71.53	68.67	69.16	75.52	64.65
DRYER EXIT, °C	99.9	99.7	99.8	98.8	99.8
ID FAN SPEED, %	72.0	72.0	72.0	72.0	72.0
PULP FEED SCROLL, %	103.3	103.3	103.3	103.3	103.3
PULP GATE, % CLOSED	60.0	60.0	60.0	64.01	60.0
FD DAMPER, % OPEN	22.47	18.96	20.13	22.45	14.84
RECYCLE DAMPERS, % OPEN	45.0	45.0	45.0	45.0	45.0
RATIO SETUP	Manual	Manual	Manual	Manual	Manual
DRYER THROAT	404	428	442	452	399
DRYER EXIT, °C	100	100	100	100	100
FURNACE PRESS, IN H2O	-1.2	-1.3	-1.3	-1.2	-1.4
EXIT PRESS, IN H2O	1.1	1.1	1.1	1.0	1.0
DRYER ΔP, IN H2O	1.3	1.2	1.3	1.2	1.4
DRUM AMPS	26.5	26.5	26	26.5	26.0
ID FAN, AMPS	157	156	156	157	156
ID FLOW	36.5	37	36.5	36.5	37
REC. FLOW	9.3	9.2	9.3	9.6	9.3
M.C. ΔP	4.05	4.05	4.05	4.05	4.05
BAGHOUSE ΔP	4.80	4.74	4.75	4.79	4.73
ASP	6.9	6.8	6.8	6.8	6.6
FD FLOW, ΔP	1.03	1.03	1.03	1.03	1.03
#1 PULP FEED, TPH	31	30	32	34	31
#2 PULP FEED, TPH	24	24	25	23	23
O ₂ , %	11.4	11.3	11.1	11.3	12.1
BH in, °C	102.7	102.7	102.8	103.1	103.0
out, °C	93.1	93.4	93.5	93.5	93.4
1123/1126					
6927/7297					
4" in 93 sec.					
1205/1308					
63.25/67.16					
9" in 95 sec.					

02226/93

NUMBER 2 DRYER (South)

TIME OF DAY
SLICE RATE, TPH
TOTAL PULP FLOW, TPH
GRATE SPEED, %
DRYER EXIT, °C
ID FAN SPEED, %
PULP FEED SCROLL, %
PULP GATE, % CLOSED
FD DAMPER, % OPEN
RECYCLE DAMPERS, % OPEN
RATIO SETUP
DRYER THROAT
DRYER EXIT, °C
FURNACE PRESS, IN H2O
EXIT PRESS, INC H2O
DRYER AP, IN H2O
DRUM AMPS
ID FAN, AMPS
ID FLOW
REC. FLOW
M.C. AP
BAGHOUSE AP
ASP
FD FLOW, AP
#1 PULP FEED, TPH
#2 PULP FEED, TPH
O₂, %
BH in, °C
out, °C
Pulp
Pulp
4x4-0.0
about
grade

1330
200
56
71.19
99.8
72.0
103.3
60.0
20.96
45.0
Manual
285
100
-1.3
-1.1
1.3
26.5
156
34.5
9.6
4.05
4.71
6.8
1.03
29
24
11.9
102.8
93.5
Pulp
Pulp
4x4-0.0
about
grade

1400
204
51
72.03
99.9
72.0
103.3
60.0
19.11
45.0
Manual
427
100
-1.3
-1.1
1.2
26.5
156
34.5
9.5
4.05
4.66
6.9
1.03
30
24
11.2
103.2
93.8

1430
218
57
92.99
100.0
72.0
103.3
60.0
42.76
45.0
Manual
485
100
-1.0
-1.3
1.2
27
155
33
9.5
4.05
4.60
6.8
1.03
33
27
10.0
103.6
94.2

1500
215
57
86.72
99.9
72.0
103.3
60.0
28.59
45.0
Manual
479
100
-1.2
-1.2
1.2
26.5
156
33.5
9.6
4.05
4.61
7.0
1.03
34
24
11.0
103.6
93.9

Filename: BEET22.WQ1
 Date: 19-Jan-95
 Facility: American Crystal Sugar
 Location: Crookston, Minnesota
 Source: No. 1 pulp dryer (coal-fired) w/multiclones and stack filter system
 Test date: February 22, 1993

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported				
			Run 1	Run 2	Run 3	Run 4	Run 5
1	Stack temperature	Deg F	209	210	207	208	209
No. 1 pulp dryer	Pressure	in. HG	29.30	29.30	29.40	29.40	29.40
	Moisture	%	48.29	48.80	39.17	38.53	37.93
	Oxygen	%	10.42	9.765	13.15	13.86	13.93
	Volumetric flow, actual	acfm	58413	58464	62418	62273	62355
	Volumetric flow, standard*	dscfm	23345	23101	29534	29731	30016
	Isokinetic variation	%	106.67	102.61	103.65	100.06	100.57
Pulp dryer feed rate		TPH	31.0	31.0	26.0	26.0	26.0
NEED TO CHECK W/PLANT!!							
Pollutant concentrations:							
	Total PM	G/dscf	0.0953	0.1191	0.0663	0.0754	0.0712
	Filterable PM	G/dscf	0.0656	0.0908	0.0480	0.0577	0.0579
	Condensable organic PM	G/dscf	0.0297	0.0283	0.0183	0.0177	0.0133
	CO2	% vol	9.03	9.67	6.71	6.12	6.05
Pollutant mass flux rates:							
	Filterable PM	lb/hr	13.1	18.0	12.2	14.7	14.9
	Condensable organic PM	lb/hr	5.94	5.60	4.63	4.51	3.41
	CO2	lb/hr	14447	15309	13581	12470	12445
Emission factors (ENGLISH UNITS):							
	Filterable PM	lb/ton	0.42	0.58	0.47	0.57	0.57
	Condensable organic PM	lb/ton	0.19	0.18	0.18	0.17	0.13
	CO2	lb/ton	466	494	522	480	479
Emission factors (METRIC UNITS):							
	Filterable PM	kg/Mg	0.21	0.29	0.23	0.28	0.29
	Condensable organic PM	kg/Mg	0.096	0.090	0.089	0.087	0.066
	CO2	kg/Mg	233	247	261	240	239
							AVERAGE
							0.52
							0.17
							488
							0.26
							0.086
							244

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

Filename: BEET22A.WQ1

Date: 19-Jan-95

Facility: American Crystal Sugar

Location: Crookston, Minnesota

Source: No. 2 pulp dryer (coal-fired) w/multiclones and stack filter system

Test date: February 24-25, 1993

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported								
			Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Run 7	Run 8	Run 9
No. 2 pulp dryer	Stack temperature	Deg F	195	195	195	193	194	194	195	194	196
	Pressure	in. HG	29.43	29.43	29.43	29.40	29.40	29.40	29.52	29.52	29.52
	Moisture	%	35.64	34.54	32.64	25.88	29.35	28.81	28.58	27.78	26.94
	Oxygen	%	14.45	15.1	15.63	17.25	16.59	16.56	16.37	16.76	16.93
	Volumetric flow, actual	acfm	45571	45475	45322	43538	43872	44437	45293	43647	45191
	Volumetric flow, standard*	dscfm	23256	23603	24207	25640	24589	25096	25728	25109	26219
Pulp dryer feed rate NEED TO CHECK W/PLANT!!	Isokinetic variation	%	102.72	98.7	97.55	93.42	102.32	98.12	101.4	102.33	99.57
	TPH		28.0	27.0	26.8	23.2	22.0	22.0	24.3	24.0	23.5
Pollutant concentrations:											
Total PM	G/dscf		0.0806	0.0753	0.0682	0.0532	0.0452	0.0478	0.0557	0.0552	0.0584
	Filterable PM	G/dscf	0.0681	0.0594	0.0554	0.0425	0.0355	0.0395	0.0460	0.0459	0.0482
	Condensable organic PM	G/dscf	0.0125	0.0159	0.0128	0.0107	0.0097	0.008278	0.009726	0.009332	0.0102
	CO2	% vol	5.57	5.02	4.55	3.18	3.74	3.75	3.92	3.6	3.46
Pollutant mass flux rates:											
Filterable PM	lb/hr		13.6	12.0	11.5	9.3	7.5	8.5	10.1	9.9	10.8
	lb/hr		2.49	3.21	2.66	2.35	2.04	1.78	2.14	2.01	2.29
	CO2	lb/hr	8877	8120	7548	5588	6303	6450	6912	6195	6217
Emission factors (ENGLISH UNITS):											
Filterable PM	lb/ton		0.48	0.45	0.43	0.40	0.34	0.39	0.42	0.41	0.46
	Condensable organic PM	lb/ton	0.089	0.12	0.10	0.10	0.093	0.081	0.088	0.084	0.097
	CO2	lb/ton	317	301	282	241	286	293	285	258	265
Emission factors (METRIC UNITS):											
Filterable PM	kg/Mg		0.24	0.22	0.21	0.20	0.17	0.19	0.21	0.21	0.23
	Condensable organic PM	kg/Mg	0.044	0.059	0.050	0.051	0.046	0.040	0.044	0.042	0.049
	CO2	kg/Mg	159	150	141	120	143	147	143	129	132
AVERAGE											0.42
											0.095
											281
AVERAGE											0.21
											0.047
											140

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

APPENDIX V

REPORT EXCERPTS FROM REFERENCE 23

(Michigan Sugar Company, December 14, 1989)

PARTICULATE EMISSION STUDY
FOR
MICHIGAN SUGAR COMPANY
CARO, MICHIGAN

DATE OF TESTING:
December 14, 1989

Prepared For:

Michigan Sugar Company
P.O. Box 1348
Saginaw, Michigan 48605

Prepared By:

Swanson Environmental, Inc.
24156 Haggerty Road
Farmington Hills, Michigan 48024

MA-5491



SWANSON ENVIRONMENTAL INC.

SWANSON ENVIRONMENTAL INC.

EMISSION STUDY
PULP DRIER STACK
MICHIGAN SUGAR COMPANY
CARO, MICHIGAN
JANUARY 11, 1990
MA-5491

EXECUTIVE SUMMARY

Swanson Environmental, Inc., was retained by Michigan Sugar Company to conduct a study of the particulate emissions from the beet pulp drier at the Caro, Michigan facility.

The purpose of the study was to determine if the particulate emissions were in compliance with Michigan Sugar's Operations Permit (Number 566-89) Special Conditions requirements. The results of the study are as follows:

TABLE 1

TEST NO.	TEST DATE	STACK GAS FLOW RATE (DSCFM)	GRAIN PER DSCF	LBS/1000 LBS ACTUAL-GAS	LBS/1000 LBS DRY 50% EA*	LBS/HOUR
P-1	12-14-89	41580	0.0595	0.089	0.202	21.22
P-2	12-14-89	35799	0.0669	0.089	0.230	20.52
P-4	12-14-89	31426	0.0727	0.092	0.247	19.58
P-5	12-14-89	31940	0.0676	0.085	0.229	18.49
AVERAGE (P2, P4, P5)		33055	0.0691	0.089	0.235	19.53

• EA = Excess Air

The average result of 0.089 pounds of total particulate per 1000 pounds of air meets the permit requirements of 0.10 pounds as established by the Michigan Department of Natural Resources (MDNR).

Note:

The average results were calculated using only the results from tests P-2, P-4 and P-5. The data obtained in test P-1 was deemed invalid and test P-3 was discontinued during sampling (see Section 7.0).

EMISSION STUDY
PULP DRIER STACK
MICHIGAN SUGAR COMPANY
CARO, MICHIGAN
JANUARY 11, 1990
MA-5491

1.0 INTRODUCTION

Swanson Environmental, Inc., was retained by Michigan Sugar Company, of Saginaw, Michigan to conduct a particulate emission study on the beet pulp drier stack at their Caro, Michigan facility.

The purpose of the study was to determine if the particulate emissions were in compliance with Michigan Sugar's Operating Permit (Number 566-89) Special Conditions. The test was conducted in accordance with the procedures outlined in 40 CFR 60, Appendix A, for U.S. EPA Method 17.

The study was conducted on December 14, 1989, by Mr. Dan Larin, Mr. Andrew Secord, Mr. Mark Hook and Mr. Thomas Wilk of Swanson Environmental, Inc. Mr. Mark Suhr of Michigan Sugar assisted in the study. Mr. Fred Harris, the MDNR field representative, was present to monitor the study.

2.0 PROCESS DESCRIPTION

The pulp, after being extracted from the beets and discharged from the diffuser, is pressed to remove excess moisture. The pulp is then dried by feeding the material into large revolving drums through which hot air is blown.

The drying reduces the pulp moisture to approximately 12% from a high of approximately 80%. The moist air leaves the drum and passes through a multiclone, which separates particulate from the air stream. The hopper of the multiclone is aspirated and the air flow is recirculated back to the combustion chamber of the drying furnace. The particulate suspended in the air flow is incinerated by the flame of the drying furnace. The moist air leaving the multiclone is discharged via a 60 x 70 inch rectangular duct inside the facility.

3.0 PRELIMINARY TESTS AND CALCULATIONS

Prior to the start of testing, the stack diameter was measured and a total of 30 traverse points were selected. Five 4-inch diameter sampling ports were previously installed on the rectangular duct (see Figure 1). Preliminary velocity traverses (U.S. EPA Method 2) and wet bulb-dry bulb moisture determinations (U.S. EPA Method 4) were performed at the sampling location. All velocity measurements were determined by using a calibrated S-type pitot tube with an attached thermocouple probe.

Following the calculation of gas density and gas velocities, a sampling nozzle size was determined which would allow isokinetic sampling at all measured points.

SWANSON ENVIRONMENTAL, INC.
PARTICULATE SAMPLING DATA AND CALCULATIONS

PLANT: MICH. SUGAR
DATE: 12/14/89

SOURCE: PULP DRIER

=====				
CLOCK TIME:	60.00	60.00	60.00	60.00
1.00 NUMBER	P-1	P-2	P-4	P-5
B. STACK DIAMETER, In	73.01	73.01	73.01	73.01
C. STACK AREA, Sq.Ft	29.08	29.08	29.08	29.08
D. No. SAMPLE POINTS	30.00	30.00	30.00	30.00
E. TOTAL SAMPLE TIME, MIN.	60.00	60.00	60.00	60.00
F. NOZZLE DIAMETER, In.	0.248	0.248	0.248	0.248
G. NOZZLE AREA, Sq.Ft.	0.00034	0.00034	0.00034	0.00034
H. CALIBRATION FACTORS:				
PITOT TUBE, Cp	0.840	0.840	0.840	0.840
GAS METER, y	1.005	1.005	1.005	1.005
I. BAROMETRIC PRESSURE,	29.30	29.30	29.30	29.30
In.Hg.				
J. STACK STATIC PRESSURE	1.30	1.30	1.30	1.30
In.H2O				
K. STACK GAS TEMP.	213.83	269.40	280.17	288.90
L. AVG. Sq. Rt. VEL. HEAD	0.66	0.68	0.64	0.66
M. AVG. METER TEMP.	89.37	92.27	88.13	86.53
N. AVG. METER PRESS., H2O	0.40	0.67	0.39	0.39
O. METER VOL., ACTUAL				
Cu. Ft.	27.86	24.13	21.13	20.91
P. METER VOL., @STP	26.48	22.83	20.13	19.98
Q. LIQUID VOL., H2O COND.,	249.70	336.80	348.80	355.20
Ml.				
R. VAPOR VOL., H2O COND.,	11.84	15.96	16.53	16.84
@STP, Cu.Ft.				
S. TOTAL GAS SAMPLED,	38.32	38.79	36.66	36.81
@ STP, Cu.Ft.				
T. %MOISTURE IN EXHAUST GAS				
1) AT TEST LOCATION	30.89	41.15	45.10	45.74
2) BEFORE COLLECTOR	0.00	0.00	0.00	0.00
U. DRY GAS COMP. %O2	13.6	13.7	13.6	13.6
%CO2	2.4	1.9	1.6	2.0
%CO	0.0	0.0	0.0	0.0
%N2	84.0	84.4	84.8	84.4
V. DENSITY & MOL. Wt. -STACK GAS				
1) DRY, @ STP, Lbs/Cu.Ft.	0.0748	0.0746	0.0745	0.0746
2) WET, @ STP, Lbs/Cu.Ft.	0.0661	0.0630	0.0619	0.0618
3) WET @ STACK, Lbs/Cu.Ft.	0.0509	0.0449	0.0434	0.0428
4) MOL.Wt., @ STP, Lb/MOLE	28.94	28.86	28.81	28.87

W. WEIGHT OF GAS SAMPLED:				
1) DRY GAS, Lbs	1.98	1.70	1.50	1.49
2) WET GAS, Lbs	2.53	2.45	2.27	2.27
X. TOTAL PARTICULATE COLLECTED	0.1023	0.0990	0.0949	0.0875
(GRAMS)				
Y. AVERAGE GAS VELOCITY, FPM	2686.50	2940.34	2807.53	2921.04
Z. STACK GAS FLOW RATE				
1) AT STACK, Qa, ACFM	78111	85492	81631	84931
2) AT Std., Qstd, SCFM	60165	60833	57241	58860
3) Std. DRY, Qdg, SCFM	41580	35799	31426	31940
AA. PERCENT EXCESS AIR	158.58	159.64	154.77	156.65
BB. CONCENTRATION CONVERSION FACTORS:				
1) 50% E.A., AFTER COLLECTOR	1.52	1.45	1.40	1.40
2) 50% E.A., BEFORE COLLECTOR	2.27	2.58	2.68	2.71
3) MOISTURE BEFORE COLLECTOR	1.28	1.44	1.51	1.53
CC. PARTICULATE CONCENTRATION:				
1) Lbs/1000 Lbs., ACTUAL	0.089	0.089	0.092	0.085
2) Lbs/1000 Lbs., DRY	0.114	0.128	0.140	0.129
3) Lbs/1000 Lbs., WET @ 50%E.A	0.135	0.129	0.129	0.119
4) Lbs/1000 Lbs., DRY @ 50%E.A	0.202	0.230	0.247	0.229
5) GRAINS / DSCF	0.0595	0.0669	0.0727	0.0675
6) POUNDS / HOUR	21.22	20.52	19.58	18.49
DD. PERCENT ISOKINETIC	91.70	91.82	92.22	90.05

DIFFUSER DATA

No. Days Slicing 2 1/2
Beginning 7:00 A.M.

DATE: 1/2/89

TEMPERATURE										TOWER		SCREEN	PH				DIFFUSION JUICE				SUGAR			WEIGHTOMETER		KNIFE CHANGE	REMARKS
1	2	3	4	5	6	7	8	Amp.	Level	Pressure	C.S.	Fresh Water	C.S.	Fresh Water	Rate	Purity	g/l	Fresh Water	Coast.	Amalg	Tons	Time	Place				
5.4	6.9	6.1	7.1	7.1	8.1	4.7	7.4	3.4	6.0	5.7	5.6	6.3	15.1	88.74	6.0	1.66	17.4	233480	130					100 Sol water			
6.0	6.9	6.1	7.1	7.1	8.1	4.6	7.6	4.0	5.8	8.5	5.6	5.8			5.8	1.14			70								
6.3	6.8	6.2	7.1	7.1	8.0	4.7	10.0	6.0	6.0	5.6	6.0	6.1	15.1	87.11	5.4	1.64	18.0	233888	135								
5.7	6.8	5.8	7.0	7.0	8.0	4.5	7.8	5.8	6.0	5.6	6.4	6.0			5.9	.82			135								
5.8	6.8	5.9	7.0	7.0	8.0	4.4	7.6	5.1	6.0	5.5	3.4	6.0	11.1	87.14	6.0	.84	17.8	233840	140								
5.7	6.8	5.8	7.1	7.1	8.0	4.5	7.4	5.1	5.8	5.7	4.8	5.8			5.4	1.73			135								
5.4	6.8	6.0	7.0	7.0	8.0	4.7	7.4	5.6	6.0	5.4	5.4	5.6	18.8	87.14	5.8	1.64	17.6	233110	135								
5.8	6.8	5.9	7.1	7.1	8.0	4.6	7.6	4.8	6.0	5.4	5.8	5.6			5.8	1.92			135								
5.9	6.7	5.9	7.1	7.1	7.6	4.7	7.8	4.8	6.0	5.6	5.8	6.0	15.2	88.84	5.4	2.13	17.6	233780	135								
5.8	6.9	5.9	7.1	7.1	8.0	4.8	8.0	4.8	5.8	5.7	5.4	5.8			5.9	1.79			135								
5.8	6.9	5.9	7.1	7.1	8.0	4.8	8.0	4.6	5.8	5.7	6.0	5.9	15.9	90.56	5.9	1.78	7.4	233450	135								
6.2	6.8	6.2	7.0	7.0	8.0	4.9	8.0	4.6	6.0	5.6	5.6	5.9			5.9	1.79			135								
6.0	6.8	6.0	7.0	7.0	8.0	5.0	8.4	4.0	6.0	5.8	5.9	5.8	15.9	89.95	5.9	1.80	18.2	233900	135								
5.9	6.7	6.0	7.0	7.0	8.0	4.6	9.0	5.0	6.0	5.6	6.0	5.9	14.6	90.41	5.9	1.59	18.0	234080	135								
5.8	6.6	5.9	7.1	7.1	8.0	4.7	8.0	4.8	5.8	5.4	5.9	5.8			5.8	1.19			135								
5.7	6.6	5.7	7.0	7.0	8.0	4.5	7.6	4.6	6.0	5.5	5.9	5.8	14.9	90.80	5.8	1.35	17.8	234460	135								
5.8	6.6	5.9	7.0	7.0	8.0	4.5	7.6	4.8	6.0	5.8	6.1	5.8			5.9	1.35			135								
5.9	6.8	6.0	7.0	7.0	8.0	4.9	7.8	5.4	6.0	5.9	6.3	6.0	15.9	89.80	6.0	1.45	12.2	234740	135								
6.1	7.0	6.1	7.0	7.0	8.0	4.5	7.6	5.2	6.0	5.8	5.5	5.7			6.0	1.50			135								
5.9	6.9	6.2	6.7	6.7	7.9	4.8	7.4	5.6	6.0	5.7	6.0	6.0	15.9	89.30	6.0	1.56	17.6	235000	135								
5.9	6.9	6.0	7.0	7.0	8.0	4.3	7.2	5.4	6	5.8	6.1	6.0			6.0	1.56			135								
6.1	6.8	6.1	7.0	7.0	8.0	4.4	7.2	5.4	6	5.7	6.2	5.9	15.6	89.10	6.0	1.64	18.0	235270	135								
6.0	6.8	6.0	7.1	7.1	8.0	4.6	7.4	5.4	6	5.8	6.2	6.0			6.0	1.66			135								

995	1: TONS SLICED

Sheet 1: Tons Sliced

SHEET 1: TONS SLICED 995
... 8:15- 8:30: DAY OF KICK-OUT

SHIFT DELAYS:

SHIFT 11: TONS SLICED

SHIFT II: TONS SLICED 1080

SHIFT II: TONS SLICED 1480
DELAYS: 1

SHIFT III:
DELAYS.

SHIFT III: TONS SLICED 1080 TONS 3155

PULP PRODUCED										PRESSED PULP				DRY PULP				PELLET PULP				SUGAR IN PRESSED PULP										
DATE		DAY		TONS		Z		ON BEETS		PRESSED PULP		DRY PULP		PELLET PULP		SUGAR IN PRESSED PULP																
DAY	DAY	DAY	DAY	DAY	DAY	DAY	DAY	DAY	DAY	DAY	DAY	DAY	DAY	DAY	DAY	DAY	DAY															
11/24	11/25	11/26	11/27	11/28	11/29	11/30	WK 9	12/01	12/02	12/03	12/04	12/05	12/06	12/07	WK 10	12/08	12/09	12/10	12/11	12/12	12/13	12/14	WK 11	12/15	12/16	12/17	12/18	12/19	12/20	12/21	WK 12	
58	59	60	61	62	63	64	1075	65	66	67	68	69	70	71	943	72	73	74	75	76	77	78	1105	79	80	81	82	83	84	85	1229	
179	169	168	126	133	155	145	5.50	159	177	114	118	164	152	159	943	175	166	182	174	168	174	174	1105	181	190	186	171	182	156	163	1229	
9995	10132	10364	10458	10591	10746	10891	5.50	11050	11127	11241	11359	11675	11834	11834	5.50	12009	12175	12357	12531	12599	12765	12939	12939	13120	13310	13496	13667	13849	14705	14868	14868	
5.49	5.51	5.49	5.51	5.52	5.50	5.50	5.50	5.49	5.48	5.52	5.50	5.51	5.51	5.51	5.50	5.50	5.51	5.51	5.52	5.48	5.50	5.52	5.51	5.50	5.51	5.49	5.49	5.49	5.51	5.77	5.50	
172	172	172	171	171	171	170	170	170	169	168	167	167	167	167	166	167	167	167	167	166	166	166	166	166	166	166	167	167	175	175	175	
73.18	66.82	66.55	66.53	69.52	66.10	67.03	68.10	70.62	70.03	72.42	73.43	71.08	71.72	74.96	72.53	77.03	75.23	74.55	75.95	73.08	77.16	75.28	75.28	73.38	71.88	73.00	77.87	73.93	71.58	71.62	73.32	
4116.37	4183.19	4249.77	4317.27	4386.79	4452.89	4519.92	74.10	4590.54	4660.57	4736.42	4809.85	4880.93	4952.65	5027.61	73.94	5104.64	5178.62	5253.85	5328.40	5404.35	5477.43	5554.59	74.06	5627.97	5699.85	5772.85	5850.72	5924.65	5996.23	6067.85	74.00	
673.31	683.69	693.93	705.92	717.12	731.83	744.97	12.02	755.06	763.52	771.73	781.26	793.94	803.65	812.87	11.78	822.46	833.74	844.79	855.59	865.85	877.60	890.41	11.72	902.51	914.51	926.48	937.29	949.60	960.69	970.75	11.70	
12.02	11.99	11.99	11.96	11.95	12.00	12.02	11.83	10.09	8.46	8.21	7.81	7.93	8.03	8.12	9.70	9.59	11.28	11.05	10.80	11.75	11.70	11.72	11.08	12.10	12.00	11.97	10.81	12.31	11.09	10.06	11.48	
595.72	606.06	616.79	628.23	639.37	650.78	661.39	10.97	672.43	682.95	693.27	704.01	715.73	726.26	736.57	10.67	747.29	757.36	767.59	778.27	788.60	799.77	810.66	10.58	821.43	832.27	843.14	853.80	864.75	875.21	886.28	10.68	
10.64	10.63	10.63	10.65	10.66	10.67	10.67	.26	10.67	10.67	10.67	10.67	10.67	10.68	10.67	.28	10.68	10.67	10.66	10.66	10.66	10.66	10.67	10.58	10.67	10.67	10.67	10.67	10.68	10.67	10.68	10.68	
9.77	7.36	8.25	6.17	6.75	5.41	5.48	50.90	7.53	2.95	6.61	5.15	5.83	5.89	5.99	45.61	10.18	9.03	10.25	8.52	2.73	6.95	9.15	56.81	7.90	9.32	9.48	10.28	8.61	6.76	6.24	58.63	
512.	519.	528.	534.	541.	548.	553.		16	11	11	11	11	11	11		42	30	31	27	22	23	29	28	24	27	27	28	26	24	21	26	
553.63	553.63	553.63	553.63	553.63	553.63	553.63		561.16	564.11	570.72	575.87	583.92	589.72	599.24		609.42	618.45	628.70	637.22	639.95	646.90	656.05		663.95	673.27	682.75	693.03	701.65	708.44	714.68	714.68	
TD	TD	TD	TD	TD	TD	TD	TD	TD	TD	TD	TD	TD	TD	TD	TD	TD	TD	TD	TD	TD	TD	TD	TD	TD	TD	TD	TD	TD	TD	TD	TD	TD

Filename: BEET23.WQ1

Date: 19-Jan-95

Facility: Michigan Sugar Company

Location: Caro, Michigan

Source: Pulp dryer with multiclones (Natural gas-fired)

Test date: December 14, 1989

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 2	Run 4	Run 5	Average
1	Stack temperature	Deg F	269.4	280.17	288.9	
	Pressure	in. HG	29.30	29.30	29.30	
	Moisture	%	41.15	45.1	45.74	
	Oxygen	%	13.7	13.6	13.6	
	Volumetric flow, actual	acfm	85492	81631	84931	
	Volumetric flow, standard*	dscfm	35800	31425	31938	
	Isokinetic variation	%	91.7	91.82	92.22	
Wet pulp feed rate		TPH	35.7	23.1	21.2	
Pollutant concentrations:						
	Filterable PM	G/dscf	0.0669	0.0727	0.0676	
	CO2	% dv	1.9	1.6	2.0	
Pollutant mass flux rates:						
	Filterable PM	lb/hr	20.5	19.6	18.5	
	CO2	lb/hr	4662	3446	4378	
Emission factors (ENGLISH UNITS):						AVERAGE
	Filterable PM	lb/ton	0.58	0.85	0.87	0.77
	CO2	lb/ton	131	149	206	162
Emission factors (METRIC UNITS):						AVERAGE
	Filterable PM	kg/Mg	0.29	0.42	0.44	0.38
	CO2	kg/Mg	65	75	103	81

*DSCFM BASED ON A STANDARD TEMPERATURE OF 70 DEGREES FAHRENHEIT

T'HA'OUR

No Recycle, 14% Aspiration, 34 Tph Pulp

ISS. 'TE' LOG. ILET

Pre-:id

ATE:

171

PULP DRYER: South

[illegible]

800 - 7.6	830 - 6.2
900 - 6.5	930 - 8.2
1000 - 6.4	1030 - 6.9
1100 - 6.5	1130 - 6.8
1200 - 7.8	1230 - 7.1
1300 - 9.1	
1330 - 9.2	230 - 6.4
300 - 7.4	
330 - 8.9	400 - 6.6
400 - 8.5	

1/23/92
 Product Pulp
 Moisture
 South Dryer
 MHD

Pulp Dryer Data Sheets

Date 11/22/92

Name

	Time of Day	1500	1500	1530	1600	1630	1700	1730
1	Slice Rate, Tph	219		195	199	194	202	205
2	Total Pulp Flow, Tph	54.3		49.4	45.5	52.7	53.9	50.6
3								
4	NORTH Unit							
5	Grate Speed, %	43.0			24.2		42.7	57.0
6	ID Damper, %	94.1			94.0		94.0	94.0
7	ID Fan, rpm	627			700.0		698.9	698.9
8	Pulp Feed Gate, % Open	25.4			34.5		33.4	30.4
9	Draft Control, %	43.1			4.8		31.6	45.0
10	FD Air Flow, MPPH	5.11					2.02	7.60
11	BH Temp In, °C	114			120		107	108
12	Out, °C	112			115		107	104
13	BH ΔP	3.12			6.12		6.24	6.23
14	Multiclone, AP	2.13			3.53		3.80	3.73
15	Dryer Throat, °C	832			544		561	578
16	Dryer Exit, °C	127			133		114	125
17	Furnace Pressure	-0.50			-0.92		-0.57	-0.38
18	Exit Pressure	-1.06			-2.00		-1.74	-1.59
19	Dryer AP	0.76			0.59		0.79	0.74
20	Aspiration Flow, acfm	7.9			6.1		5.9	5.7
21	Drum, amps	20.0			16.5		17.5	17.0
22	ID Fan, amps	16.6			149		149	149
23								
24								47.1/45.7
25								8" in 45 sec
26	SOUTH Unit							
27	Grate Speed, %	50.8		52.3	52.5	56.6	56.6	50.8
28	ID Damper, %	97.0		97.0	97.0	97.0	97.0	97.0
29	ID Fan, rpm	596.3		597.9	597.9	593.4	596.3	595.5
30	Pulp Feed Gate, % Open	62.4		67.2	62.2	same	same	same
31	Draft Control, %	37.0		37.6	36.5	41.1	39.6	35.9
32	FD Air Flow, MPPH	11.65		12.73	13.50	21.3	18.4	10.20
33	BH Temp In, °C	114		114	114	113	114	115
34	Out, °C	112		112	112	112	112	112
35	BH ΔP	3.12		3.19	3.23	3.29	3.35	3.42
36	Multiclone, AP	2.16		2.17	2.11	2.14	2.14	2.16
37	Dryer Throat, °C	830		829	834	865	872	886
38	Dryer Exit, °C	128		127	127	125	129	128
39	Furnace Pressure	-0.49		-0.48	-0.45	-0.43	-0.42	-0.43
40	Exit Pressure	-1.08		-1.12	-1.09	-1.01	-1.05	-1.03
41	Dryer AP	0.43		0.46	0.46	0.47	0.47	0.45
42	Aspiration Flow, acfm	7.9		7.8	7.7	7.7	7.7	7.5
43	Drum, amps	18.0		20.0	19.0	20.0	20.5	20.5
44	ID Fan, amps	167		167	166	166	166	164
45								
46				51.2/50.7		62.7/58.3		50.7/52.1
47				8" in 111 sec		8" in 85 sec		9" in 95 sec
48								
49								

Name _____

Time of Day	1430	1700	5	5	7	8	9
Slice Rate, Tph	193	206					
Total Pulp Flow, Tph	62.9	54.2					
NORTH Unit							
Grate Speed, %	45.1	32.3					
I.D. Damper, %	94.8	94.0					
I.D. Fan, rpm	698.9	678.6					
Pulp Feed Gate, % open	47.52 ^{47.52 rpm}	26.55 ^{26.55 rpm}					
Draft Control, %	16.1	5.5					
FD Air Flow, MPPH	-1.40	-1.40					
BH Temp. In, °C	108	108					
Out, °C	103	102					
BH ΔP	6.40	6.44					
Multiclane, AP	3.87	3.66					
Dryer Throat, °C	610	623					
Dryer Exit, °C	125	132					
Furnace Pressure	-0.46	-0.74					
Exit Pressure	-1.66	-1.76					
Dryer AP	0.70	0.61					
Aspiration Flow, acfm	5.1	5.3					
Drum, amps	14.5	14.5					
I.D. Fan, amps	14.9	14.9					
SOUTH Unit							
Grate Speed, %	50.2	52.0					
I.D. Damper, %	97.0	97.0					
I.D. Fan, rpm	580.2	581.2					
Pulp Feed Gate, % open	62.2 ^{62.2 rpm}	62.2 ^{62.2 rpm}					
Draft Control, %	36.2	38.7					
FD Air Flow, MPPH	13.47	15.21					
BH Temp. In, °C	114	114					
Out, °C	111	111					
BH ΔP	4.14	4.29					
Multiclane, AP	2.44	2.46					
Dryer Throat, °C	787	770					
Dryer Exit, °C	129	127					
Furnace Pressure	-0.16	-0.16					
Exit Pressure	-0.89	-1.01					
Dryer AP	0.40	0.77					
Aspiration Flow, acfm	7.4	7.7					
Drum, amps	17.5	18.0					
I.D. Fan, amps	16.3	16.4					

ATE: 1/23/91

ЭНД

pip

FEEDER RPH

MOISTURES (%)

THROAT TEMP. (°C)

P DRUM

.C. ΔP

SP. AIRFLOW

RECYCLE AIRFLOW (CFM)

[illegible]

Filename: BEET17.WQ1

Date: 19-Dec-94

Facility: American Crystal Sugar

Location: Moorhead, Minnesota

Source: South pulp dryer--coal-fired rotary drum with multiclone and stack filter system

Test date: January 21, 1992

*All condensible PM is condensibl.
organic PM only!!*

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	233.3	232.8	228.8	
South pulp dryer	Pressure	in. HG	28.8	28.8	28.8	
	Moisture	%	32.39	33.09	32.16	
	Oxygen	%	16	15.5	15.25	
	Volumetric flow, actual	acfm	68336	68733	68225	
	Volumetric flow, standard*	dscfm	33857	33726	34139	
	Isokinetic variation	%	109.64	104.7	100.84	
Wet Pulp Feed Rate To Dryer		TPH	27.0	28.6	27.7	
Pollutant concentrations:						
	Total PM	G/dscf	0.0724	0.0718	0.0757	
	Filterable PM	G/dscf	0.0640	0.0632	0.0625	
	Condensible PM	G/dscf	0.00838	0.00856	0.0132	
	CO2	% dv	4.12	4.08	4.11	
Pollutant mass flux rates:						
	Filterable PM	lb/hr	18.6	18.28	18.29	
	Condensible PM	lb/hr	2.43	2.48	3.86	
	CO2	lb/hr	9560	9430	9616	
Emission factors (ENGLISH UNITS):						AVERAGE
	Filterable PM	lb/ton	0.69	0.64	0.66	0.66
	Condensible PM	lb/ton	0.090	0.086	0.14	0.11
	CO2	lb/ton	354	329	348	344
Emission factors (METRIC UNITS):						AVERAGE
	Filterable PM	kg/Mg	0.34	0.32	0.33	0.33
	Condensible PM	kg/Mg	0.045	0.043	0.070	0.053
	CO2	kg/Mg	177	165	174	172

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

Total emission factors for 12 test runs

	<i>controlled</i>	<i>uncontrolled</i>
Filterable PM	$0.31 \frac{K_1}{M_3} (0.61 \text{ lb/ton})$	$2.2 \frac{K_1}{M_3} (4.4 \text{ lb/ton})$
Condensible organic PM	$0.053 \frac{K_2}{M_3} (0.12 \text{ lb/ton})$	No Data
CO2	$151 \frac{K_2}{M_3} (302 \text{ lb/ton})$	$155 \frac{K_2}{M_3} (310 \text{ lb/ton})$

Filename: BEET17A.WQ1

Date: 19-Dec-94

Facility: American Crystal Sugar

Location: Moorhead, Minnesota

Source: South pulp dryer--coal-fired rotary drum with multiclone and stack filter system

Test date: January 22, 1992

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
2	Stack temperature	Deg F	227.8	218.4	219.8	
South pulp dryer	Pressure	in. HG	28.7	28.7	28.7	
	Moisture	%	42.65	42.44	44.09	
	Oxygen	%	14.75	14.25	15.1	
	Volumetric flow, actual	acfm	63134	62566	62962	
	Volumetric flow, standard*	dscfm	26633	26857	26198	
	Isokinetic variation	%	109.19	104.6	104.29	
Wet Pulp Feed Rate To Dryer		TPH	34.7	34.1	33.7	
Pollutant concentrations:						
	Total PM	G/dscf	0.1001	0.0953	0.1277	
	Filterable PM	G/dscf	0.0847	0.0823	0.102	
	Condensable PM	G/dscf	0.0154	0.0130	0.0259	
	CO2	% dv	5.5	6	5.2	
Pollutant mass flux rates:						
	Filterable PM	lb/hr	19.3	18.94	22.86	
	Condensable PM	lb/hr	3.52	3.00	5.82	
	CO2	lb/hr	10039	11044	9336	
Emission factors (ENGLISH UNITS):						AVERAGE
	Filterable PM	lb/ton	0.56	0.56	0.68	0.60
	Condensable PM	lb/ton	0.10	0.088	0.17	0.12
	CO2	lb/ton	290	324	277	297
Emission factors (METRIC UNITS):						AVERAGE
	Filterable PM	kg/Mg	0.28	0.28	0.34	0.30
	Condensable PM	kg/Mg	0.051	0.044	0.086	0.060
	CO2	kg/Mg	145	162	139	148

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

Filename: BEET17B.WQ1

Date: 26-Jan-95

Facility: American Crystal Sugar

Location: Moorhead, Minnesota

Source: South pulp dryer--coal-fired rotary drum with multiclone and stack filter system

Test date: January 23, 1992

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
3	Stack temperature	Deg F	217.1	213.1	203.3	
South pulp dryer	Pressure	in. HG	28.6	28.6	28.6	
	Moisture	%	46.02	46.74	43.7	
	Oxygen	%	15.1	14.58	15.5	
	Volumetric flow, actual	acfm	57117	57148	56430	
	Volumetric flow, standard*	dscfm	23021	22860	24213	
	Isokinetic variation	%	109.02	108.94	100.6	
Wet Pulp Feed Rate To Dryer		TPH	33.0	32.1	31.7	
Pollutant concentrations:						
	Total PM	G/dscf	0.0979	0.1119	0.1213	
	Filterable PM	G/dscf	0.0832	0.0999	0.106	
	Condensable PM	G/dscf	0.0147	0.0120	0.0150	
	CO2	% dv	5.02	5.79	4.85	
Pollutant mass flux rates:						
	Filterable PM	lb/hr	16.4	19.6	22.1	
	Condensable PM	lb/hr	2.91	2.35	3.11	
	CO2	lb/hr	7920	9071	8048	
Emission factors (ENGLISH UNITS):						AVERAGE
	Filterable PM	lb/ton	0.50	0.61	0.70	0.60
	Condensable PM	lb/ton	0.088	0.073	0.098	0.086
	CO2	lb/ton	240	283	254	259
Emission factors (METRIC UNITS):						AVERAGE
	Filterable PM	kg/Mg	0.25	0.30	0.35	0.30
	Condensable PM	kg/Mg	0.044	0.037	0.0491	0.043
	CO2	kg/Mg	120	141	127	129

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

Run three PM does not match PM in report. Mistake in reporting condensibles in report.

Filename: BEET17C.WQ1

Date: 19-Dec-94

Facility: American Crystal Sugar

Location: Moorhead, Minnesota

Source: South pulp dryer--coal-fired rotary drum with multiclone and stack filter system

Test date: January 24, 1992

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
4	Stack temperature	Deg F	209.5	201.5	190.8	
South pulp dryer	Pressure	in. HG	28.8	28.8	28.8	
	Moisture	%	43.35	44.73	45.34	
	Oxygen	%	14	13.65	13.88	
	Volumetric flow, actual	acfm	58851	58123	58206	
	Volumetric flow, standard*	dscfm	25297	24675	24840	
	Isokinetic variation	%	108.32	108.55	108.92	
Wet Pulp Feed Rate To Dryer		TPH	36.7	33.8	36.6	
Pollutant concentrations:						
	Total PM	G/dscf	0.1295	0.1134	0.1014	
	Filterable PM	G/dscf	0.1130	0.0973	0.0837	
	Condensable PM	G/dscf	0.0165	0.0161	0.0177	
	CO2	% dv	6.12	6.58	6.58	
Pollutant mass flux rates:						
	Filterable PM	lb/hr	24.5	20.57	17.82	
	Condensable PM	lb/hr	3.58	3.41	3.77	
	CO2	lb/hr	10610	11127	11202	
Emission factors (ENGLISH UNITS):						AVERAGE
	Filterable PM	lb/ton	0.67	0.61	0.49	0.59
	Condensable PM	lb/ton	0.10	0.10	0.10	0.10
	CO2	lb/ton	289	330	306	308
Emission factors (METRIC UNITS):						AVERAGE
	Filterable PM	kg/Mg	0.33	0.30	0.24	0.29
	Condensable PM	kg/Mg	0.049	0.051	0.051	0.050
	CO2	kg/Mg	145	165	153	154

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

Filename: BEET17D.WQ1

Date: 19-Dec-94

Facility: American Crystal Sugar

Location: Moorhead, Minnesota

Source: South pulp dryer--coal-fired rotary drum multiclone inlet

Test date: January 21, 1992

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	248.8	247.2	244.4	
South pulp dryer multiclone inlet	Pressure	in. HG	29.06	29.06	29.06	
	Moisture	%	31.09	31.76	31.18	
	Oxygen	%	16	15.5	15.25	
	Volumetric flow, actual	acfm	81456	80531	81030	
	Volumetric flow, standard*	dscfm	40609	39847	40596	
	Isokinetic variation	%	109.42	102.8	100.98	
Wet Pulp Feed Rate To Dryer		TPH	27	28.6	27.7	
Pollutant concentrations:						
	Filterable PM	G/dscf	0.3533	0.4167	0.3414	
	CO2	% dv	4.12	4.08	4.11	
Pollutant mass flux rates:						
	Filterable PM	lb/hr	123	142	119	
	CO2	lb/hr	11466	11142	11435	
Emission factors (ENGLISH UNITS):						AVERAGE
	Filterable PM	lb/ton	4.6	5.0	4.3	4.6
	CO2	lb/ton	425	390	413	409
Emission factors (METRIC UNITS):						AVERAGE
	Filterable PM	kg/Mg	2.3	2.5	2.1	2.3
	CO2	kg/Mg	212	195	206	205

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

Filename: BEET17E.WQ1

Date: 19-Dec-94

Facility: American Crystal Sugar

Location: Moorhead, Minnesota

Source: South pulp dryer--coal-fired rotary drum multicloner inlet

Test date: January 22, 1992

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
2	Stack temperature	Deg F	243	242.8	242.8	
South pulp dryer multicloner inlet	Pressure	in. HG	28.91	28.91	28.91	
	Moisture	%	39.35	42.06	40.72	
	Oxygen	%				
	Volumetric flow, actual	acfm	88431	87614	86927	
	Volumetric flow, standard*	dscfm	38918	36846	37403	
	Isokinetic variation	%	105.87	105.98	100.77	
Wet Pulp Feed Rate To Dryer		TPH	34.7	34.1	33.7	
Pollutant concentrations:						
	Filterable PM	G/dscf	0.4139	0.4206	0.4494	
	CO2	% dv	5.5	6	5.2	
Pollutant mass flux rates:						
	Filterable PM	lb/hr	138	133	144	
	CO2	lb/hr	14670	15151	13329	
Emission factors (ENGLISH UNITS):						AVERAGE
	Filterable PM	lb/ton	4.0	3.9	4.3	4.0
	CO2	lb/ton	423	444	396	421
Emission factors (METRIC UNITS):						AVERAGE
	Filterable PM	kg/Mg	2.0	1.9	2.1	2.0
	CO2	kg/Mg	211	222	198	210

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

Filename: BEET17F.WQ1

Date: 19-Dec-94

Facility: American Crystal Sugar

Location: Moorhead, Minnesota

Source: South pulp dryer--coal-fired rotary drum multiclone inlet

Test date: January 23, 1992

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
3	Stack temperature	Deg F	243.6	243.3	244	
South pulp dryer multiclone inlet	Pressure	in. HG	28.87	28.87	28.87	
	Moisture	%	42.88	44.87	43.13	
	Oxygen	%	15.1	14.58	15.5	
	Volumetric flow, actual	acfm	80713	80381	81039	
	Volumetric flow, standard*	dscfm	33386	32104	33356	
	Isokinetic variation	%	106.05	105.85	101.38	
Wet Pulp Feed Rate To Dryer		TPH	33	32.1	31.7	
Pollutant concentrations:						
	Filterable PM	G/dscf	0.4774	0.4937	0.5692	
	CO2	% dv	5.02	5.79	4.85	
Pollutant mass flux rates:						
	Filterable PM	lb/hr	137	136	163	
	CO2	lb/hr	11486	12739	11087	
Emission factors (ENGLISH UNITS):						AVERAGE
	Filterable PM	lb/ton	4.1	4.2	5.1	4.5
	CO2	lb/ton	348	397	350	365
Emission factors (METRIC UNITS):						AVERAGE
	Filterable PM	kg/Mg	2.1	2.1	2.6	2.3
	CO2	kg/Mg	174	198	175	182

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

Filename: BEET17G.WQ1

Date: 19-Dec-94

Facility: American Crystal Sugar

Location: Moorhead, Minnesota

Source: South pulp dryer--coal-fired rotary drum multiclone inlet

Test date: January 24, 1992

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
4	Stack temperature	Deg F	246.6	244.2	247.5	
South pulp dryer multiclone inlet	Pressure	in. HG	29.03	29.03	29.03	
	Moisture	%	42.35	43.45	43.48	
	Oxygen	%	14	13.65	13.88	
	Volumetric flow, actual	acfm	90671	88849	90663	
	Volumetric flow, standard*	dscfm	37901	36556	37106	
	Isokinetic variation	%	106.05	105.85	101.38	
Wet Pulp Feed Rate To Dryer		TPH	36.7	33.8	36.6	
Pollutant concentrations:						
Filterable PM		G/dscf	0.4687	0.5411	0.4783	
CO2		% dv	6.12	6.58	6.12	
Pollutant mass flux rates:						
Filterable PM		lb/hr	152	170	152	
CO2		lb/hr	15897	16485	15563	
Emission factors (ENGLISH UNITS):						AVERAGE
Filterable PM		lb/ton	4.1	5.0	4.2	4.4
CO2		lb/ton	433	488	425	449
Emission factors (METRIC UNITS):						AVERAGE
Filterable PM		kg/Mg	2.1	2.5	2.1	2.2
CO2		kg/Mg	217	244	213	224

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

MIDWEST RESEARCH INSTITUTE

Project/Acct. No. _____ Date/Time _____

Project Title _____

Signature _____ Verified by _____

(signature/date)

Phone Contact ☐

Meeting Notes ☐

Work Sheet ☐

Page ____ of ____

PROCESS RATES FOR AMERICAN CRYSTAL SUGAR 1/92 TESTS

TEST #	RUN #	DATE	NET PULP FEED RATE
1	1	1/21 13:15-15:19	$\frac{(29.1 + 24.9)}{2} = 27.0 \text{ TPH}$
	2	1/21 16:00-17:45	$\frac{(27.5 + 29.4 + 30)}{3} = 28.6 \text{ TPH}$
	3	1/21 18:15-20:13	$\frac{(30.4 + 25.4 + 27.4 + 27.4)}{4} = 27.7 \text{ TPH}$
2	1	1/22 10:20-12:12	$\frac{(35.9 + 37.1 + 32.5 + 33.1)}{4} = 34.7 \text{ TPH}$
	2	1/22 12:50-14:30	$\frac{(33.3 + 36.2 + 32.4 + 34.6)}{4} = 34.1 \text{ TPH}$
	3	1/22 15:15-16:52	$\frac{(37.3 + 31.9 + 31.8)}{3} = 33.7 \text{ TPH}$
3	1	1/23 10:05-11:45	$\frac{(31.5 + 35.8 + 31.8)}{3} = 33.0 \text{ TPH}$
	2	1/23 12:20-13:55	$\frac{(30.3 + 31.2 + 34.8)}{3} = 32.1 \text{ TPH}$
	3	1/23 14:45-16:30	$\frac{(34.9 + 32.0 + 25.8 + 34.2)}{4} = 31.7 \text{ TPH}$
4	1	1/24 10:15-12:10	$\frac{(37.2 + 35.5 + 35.5 + 38.5)}{4} = 36.7 \text{ TPH}$
	2	1/24 12:45-14:20	$\frac{(36.1 + 35.1 + 30.1)}{3} = 33.8 \text{ TPH}$
	3	1/24 15:05-16:55	$\frac{(39.6 + 36.1 + 34.2)}{3} = 36.6 \text{ TPH}$

APPENDIX R

REPORT EXCERPTS FROM REFERENCE 19

(American Crystal Sugar Company, March 11, 1993)

Report Number: 4232-93-2259-5

Report Issued: April 16, 1993

AIR EMISSION TEST REPORT
RESULTS OF A
SOURCE EMISSION COMPLIANCE TEST ON
THE SUGAR COOLER STACK AT
AMERICAN CRYSTAL SUGAR COMPANY
CROOKSTON, MINNESOTA
MARCH 11, 1993

Submitted to:

AMERICAN CRYSTAL SUGAR COMPANY
Highway 75, P.O. Box 600
Crookston, MN 56716

Submitted by:

TWIN CITY TESTING CORPORATION
Air Quality Services Department
737 Pelham Blvd.
St. Paul, Minnesota 55114

Prepared by:


Alan L. Trowbridge
Manager, Source and Ambient Testing
Air Quality Services

Approved by:


Ahto Niemioja, P.E.
Director
Air Quality Services



twin city testing
corporation

FIGURE 1. PROCESS SCHEMATIC WITH SAMPLING PORT LOCATION

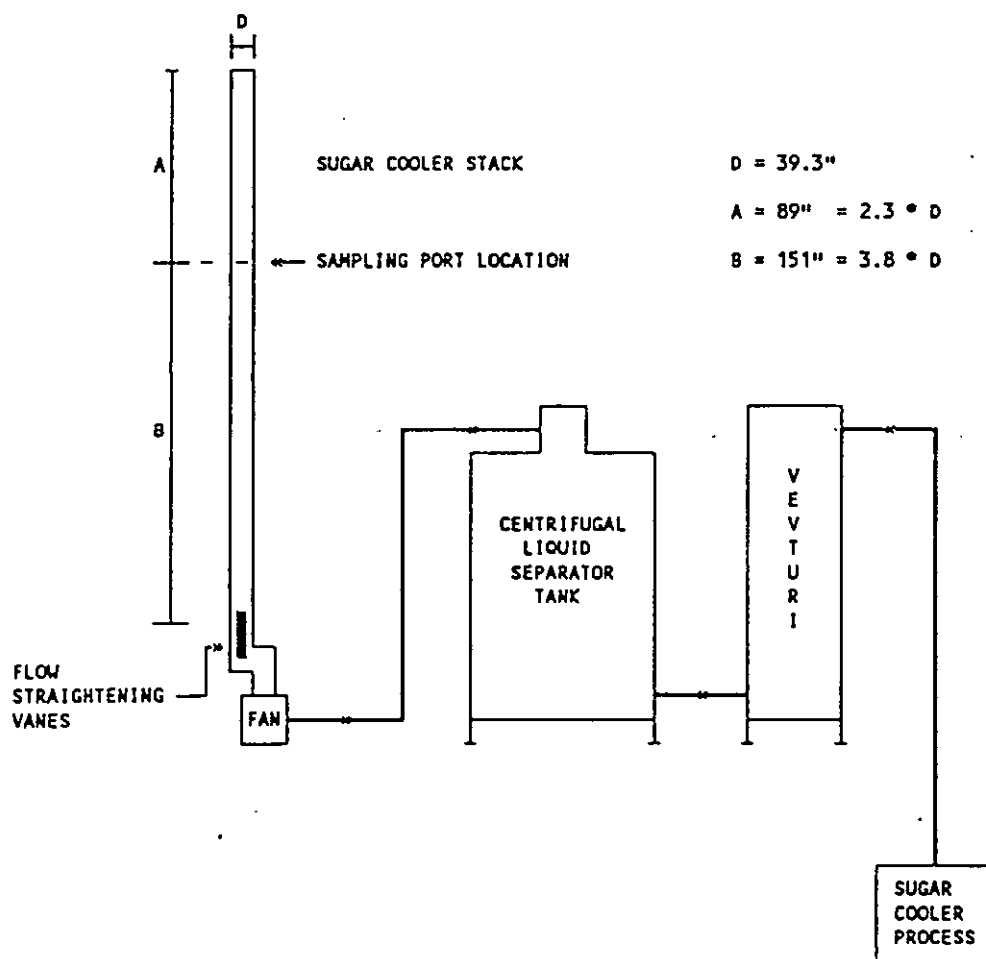


Table 1
Summary of particulate emission test results
American Crystal Sugar Company, Crookston, Minnesota
Sugar Cooler Scrubber Stack
March 11, 1993

<u>Parameter</u>	<u>Run #1</u>	<u>Run #2</u>	<u>Run #3</u>	<u>Average</u>
Time of Test;				
Start	0945	1137	1313	---
Finish	1050	1242	1420	---
Effluent Temperature, °F	117	113	111	114
Effluent Moisture Content, % v/v	9.0	8.3	7.5	8.3
Effluent Composition, % v/v dry;				
Carbon Dioxide	0.0	0.0	0.0	0.0
Oxygen	20.6	20.5	20.5	20.5
Effluent Volumetric Flow Rate;				
Actual Conditions, acfm	28,154	28,854	30,359	29,122
Standard Conditions, scfm	25,773	26,728	28,224	26,908
Dry Standard Conditions, dscfm	23,453	24,523	26,102	24,693
Isokinetic Variation, %	99.2	98.6	95.3	97.7
Effluent Particulate Concentration;				
Actual Conditions, gr/acf	0.0161	0.0105	0.0098	0.0121
Standard Conditions, gr/scf	0.0176	0.0113	0.0106	0.0132
Dry Standard Conditions, gr/dscf	0.0193	0.0123	0.0114	0.0143
Source Particulate Emission Rate;				
Classical Method, lb/hr	3.89	2.59	2.56	3.01
Ratio of Areas Method, lb/hr	3.85	2.56	2.44	2.95
Process Weight Rate, ton/hr	43.30	41.05	37.30	40.55

Standard Conditions: 68°F, 29.92 in. Hg. Particulate concentration and emission rates are based on analysis of the sampling train front and back catches.

SUMMARY OF PARTICULATE EMISSION TEST LABORATORY DATA

PROJECT NUMBER: 4232-93-2259
TEST NUMBER: 5

COMPANY: American Crystal Sugar
SOURCE: Sugar Cooler

MASS OF PARTICULATE MATTER COLLECTED, GRAMS

RUN NUMBER	FRONT CATCH			BACK CATCH			TOTAL PARTICULATE MASS COLLECTED
	FRONT WASH	CYCLONE CATCH	FILTER CATCH	FRONT TOTAL	IMPINGER CATCH **	IMPINGER WASH	BACK TOTAL
1	0.0429	0.0000	0.0054	0.0483	0.0031	0.0029	0.0060
2	0.0291	0.0000	0.0040	0.0331	0.0015	0.0014	0.0029
3	0.0263	0.0000	0.0020	0.0283	0.0025	0.0035	0.0060

* NOT APPLICABLE

** CHLOROFORM/ETHYL ETHER EXTRACTION



twin city testing
corporation

A-4

PARTICULATE EMISSION TEST CALCULATIONS

PROJECT NUMBER: 93-2259 COMPANY: American Crystal Sugar
 TEST NUMBER: 5 SOURCE: Sugar Cooler
 RUN NUMBER: 1 TIME: 3/11/93 0945-1050

TEST DATA

GAS METER COEFFICIENT	0.9908 Y	VOLUME OF LIQUID COLLECTED, ML	91.0 V1
PITOT TUBE COEFFICIENT	0.840 Cp	GAS COMPOSITION, % V/V DRY;	
NOZZLE DIMENSIONS;		CARBON DIOXIDE	0.00 CD
DIAMETER, IN	0.219 Dn	OXYGEN	20.60 OX
AREA, SF	0.000262 An	CARBON MONOXIDE	0.00 CM
STACK DIMENSIONS;		NITROGEN (BY DIFFERENCE)	79.40 NI
DIAMETER/LENGTH, IN	39.30 S1	AVE. TRAVERSE POINT DATA;	
WIDTH, IN	0.00 Sw	STACK TEMP., DEG F	117 Ts
AREA, SF	8.424 As	METER TEMP., DEG F	92 Tm
BAROMETRIC PRESSURE, IN HG	29.92 Pb	ORIFICE PRESSURE, IN WC	2.092 Po
STACK PRESSURES;		SQRT VELOCITY P., IN WC	0.932 Pv
STATIC, IN WC	0.00 Pg	MASS OF PARTICULATE MATTER	
ABSOLUTE, IN HG	29.92 Ps	COLLECTED, G;	
SAMPLING TIME, MIN	60.00 Ti	FRONT CATCH (89.0%)	0.0483 Wf
VOLUME OF GAS SAMPLED AT METER, DCF	45.495 Vm	BACK CATCH (11.0%)	0.0060 Wb
		TOTAL CATCH	0.0543 Wt

CALCULATED RESULTS

VOLUME OF GAS SAMPLED AT METER, DSCF	43.306 Vms	GAS MOLECULAR WEIGHT;	
EQUIVALENT VOLUME OF WATER VAPOR COLLECTED, SCF	4.283 Vw	DRY BASIS, LB/LB-MOLE	28.82 Hd
GAS MOISTURE CONTENT;		WET BASIS, LB/LB-MOLE	27.85 Hb
VOLUME FRACTION	0.0900 Bws	AVERAGE GAS VELOCITY, FPS	55.70 Vs
PERCENT BY VOLUME	9.00 Bwp	GAS VOLUMETRIC FLOW RATE;	
		ACTUAL, ACFM	28154 Qa
		STANDARD, SCFM	25773 Qs
		DRY STANDARD, DSCFM	23453 Qsd
		ISOKINETIC VARIATION, %	99.16 I

PARTICULATE EMISSION PARAMETER	FRONT CATCH	BACK CATCH	TOTAL CATCH
PARTICULATE CONCENTRATION			
ACTUAL, GR/ACF	0.0143 Caf	0.0018 Cab	0.0161 Cat
STANDARD, GR/SCF	0.0157 Cwf	0.0019 Cwb	0.0176 Cwt
DRY STANDARD, GR/DSCF	0.0172 Csf	0.0021 Csb	0.0193 Cst
PARTICULATE EMISSION RATE, LB/HR			
CLASSICAL METHOD	3.46 Rcf	0.43 Rcb	3.89 Rct
RATIO OF AREAS METHOD	3.43 Rrf	0.43 Rrb	3.85 Rrt

STANDARD CONDITIONS: 68 DEG F, 29.92 IN HG

* NON-APPLICABLE DATA



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A-1

PARTICULATE EMISSION TEST CALCULATIONS

PROJECT NUMBER: 93-2259 COMPANY: American Crystal Sugar
 TEST NUMBER: 5 SOURCE: Sugar Cooler
 RUN NUMBER: 2 TIME: 3/11/93 1137-1242

TEST DATA

GAS METER COEFFICIENT	0.9908 Y	VOLUME OF LIQUID COLLECTED, ML	86.0 V1
PITOT TUBE COEFFICIENT	0.840 Cp	GAS COMPOSITION, % V/V DRY;	
NOZZLE DIMENSIONS;		CARBON DIOXIDE	0.00 CD
DIAMETER, IN	0.219 Dn	OXYGEN	20.50 OX
AREA, SF	0.000262 An	CARBON MONOXIDE	0.00 CM
		NITROGEN (BY DIFFERENCE)	79.50 NI
STACK DIMENSIONS;		AVE. TRAVERSE POINT DATA;	
DIAMETER/LENGTH, IN	39.30 S1	STACK TEMP., DEG F	113 Ts
WIDTH, IN	0.00 Sw	METER TEMP., DEG F	94 Tm
AREA, SF	8.424 As	ORIFICE PRESSURE, IN WC	2.254 Po
BAROMETRIC PRESSURE, IN HG	30.08 Pb	SQRT VELOCITY P., IN WC	0.963 Pv
STACK PRESSURES;		MASS OF PARTICULATE MATTER	
STATIC, IN WC	0.00 Pg	COLLECTED, G;	
ABSOLUTE, IN HG	30.08 Ps	FRONT CATCH (91.9%)	0.0331 Wf
		BACK CATCH (8.1%)	0.0029 Wb
SAMPLING TIME, MIN	60.00 Ti	TOTAL CATCH	0.0360 Wt
VOLUME OF GAS SAMPLED AT METER, DCF	47.114 Vm		

CALCULATED RESULTS

VOLUME OF GAS SAMPLED AT METER, DSCF	45.003 Vms	GAS MOLECULAR WEIGHT;	
		DRY BASIS, LB/LB-MOLE	28.82 Md
		WET BASIS, LB/LB-MOLE	27.93 Ms
EQUIVALENT VOLUME OF WATER VAPOR COLLECTED, SCF	4.048 Vw	AVERAGE GAS VELOCITY, FPS	57.09 Vs
GAS MOISTURE CONTENT;		GAS VOLUMETRIC FLOW RATE;	
VOLUME FRACTION	0.0825 Bws	ACTUAL, ACFM	28854 Qa
PERCENT BY VOLUME	8.25 Bwp	STANDARD, SCFM	26728 Qs
		DRY STANDARD, DSCFM	24523 Qsd
		ISOKINETIC VARIATION, %	98.55 I

PARTICULATE EMISSION PARAMETER	FRONT CATCH	BACK CATCH	TOTAL CATCH
PARTICULATE CONCENTRATION			
ACTUAL, GR/ACF	0.0096 Caf	0.0008 Cab	0.0105 Cat
STANDARD, GR/SCF	0.0104 Cwf	0.0009 Cwb	0.0113 Cwt
DRY STANDARD, GR/DSCF	0.0113 Csf	0.0010 Csb	0.0123 Cst
PARTICULATE EMISSION RATE, LB/HR			
CLASSICAL METHOD	2.39 Rcf	0.21 Rcb	2.59 Rct
RATIO OF AREAS METHOD	2.35 Rrf	0.21 Rrb	2.56 Rrt

STANDARD CONDITIONS: 68 DEG F, 29.92 IN HG

• NON-APPLICABLE DATA



twin city testing
 corporation

A-8

PARTICULATE EMISSION TEST CALCULATIONS

PROJECT NUMBER: 93-2259 COMPANY: American Crystal Sugar
 TEST NUMBER: 5 SOURCE: Sugar Cooler
 RUN NUMBER: 3 TIME: 3/11/93 1313-1420

TEST DATA

GAS METER COEFFICIENT	0.9908 Y	VOLUME OF LIQUID COLLECTED, ML	80.0 V1
PITOT TUBE COEFFICIENT	0.840 Cp	GAS COMPOSITION, % V/V DRY;	
NOZZLE DIMENSIONS;		CARBON DIOXIDE	0.00 CD
DIAMETER, IN	0.219 Dn	OXYGEN	20.50 OX
AREA, SF	0.000262 An	CARBON MONOXIDE	0.00 CM
		NITROGEN (BY DIFFERENCE)	79.50 NI
STACK DIMENSIONS;		AVE. TRAVERSE POINT DATA;	
DIAMETER/LENGTH, IN	39.30 S1	STACK TEMP., DEG F	111 Ts
WIDTH, IN	0.00 Sw	METER TEMP., DEG F	92 Tm
AREA, SF	8.424 As	ORIFICE PRESSURE, IN WC	2.538 Po
BAROMETRIC PRESSURE, IN HG	30.09 Pb	SQRT VELOCITY P., IN WC	1.016 Pv
STACK PRESSURES;		MASS OF PARTICULATE MATTER	
STATIC, IN WC	0.00 Pg	COLLECTED, G;	
ABSOLUTE, IN HG	30.09 Ps	FRONT CATCH (82.5%)	0.0283 Wf
SAMPLING TIME, MIN	60.00 Ti	BACK CATCH (17.5%)	0.0060 Wb
		TOTAL CATCH	0.0343 Wt
VOLUME OF GAS SAMPLED AT METER, DCF	48.313 Vm		

CALCULATED RESULTS

VOLUME OF GAS SAMPLED AT METER, DSCF	46.321 Vms	GAS MOLECULAR WEIGHT;	
		DRY BASIS, LB/LB-MOLE	28.82 Md
EQUIVALENT VOLUME OF WATER VAPOR COLLECTED, SCF	3.766 Vw	WET BASIS, LB/LB-MOLE	28.01 Ms
GAS MOISTURE CONTENT;		AVERAGE GAS VELOCITY, FPS	60.06 Vs
VOLUME FRACTION	0.0752 Bws	GAS VOLUMETRIC FLOW RATE;	
PERCENT BY VOLUME	7.52 Bwp	ACTUAL, ACFM	30359 Qa
		STANDARD, SCFM	28224 Qs
		DRY STANDARD, DSCFM	26102 Qsd
		ISOKINETIC VARIATION, %	95.30 I
PARTICULATE EMISSION PARAMETER		FRONT CATCH	BACK CATCH TOTAL CATCH
PARTICULATE CONCENTRATION			
ACTUAL, GR/ACF		0.0081 Caf	0.0017 Cab 0.0098 Cat
STANDARD, GR/SCF		0.0087 Cwf	0.0018 Cwb 0.0106 Cwt
DRY STANDARD, GR/DSCF		0.0094 Csf	0.0020 Csb 0.0114 Cst
PARTICULATE EMISSION RATE, LB/HR			
CLASSICAL METHOD		2.11 Rcf	0.45 Rcb 2.56 Rct
RATIO OF AREAS METHOD		2.01 Rrf	0.43 Rrb 2.44 Rrt

STANDARD CONDITIONS: 68 DEG F, 29.92 IN HG

• NON-APPLICABLE DATA



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A-

Filename: BEET19.WQ1

Date: 19-Dec-94

Facility: American Crystal Sugar

Location: Crookston, Minnesota

Source: Sugar cooler with venturi scrubber (5-7" pressure drop)

Test date: March 11, 1993

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	117	113	111	
Sugar cooler	Pressure	in. HG	29.92	30.08	30.09	
	Moisture	%	9.00	8.25	7.52	
	Oxygen	%	20.6	20.5	20.5	
	Volumetric flow, actual	acfm	28154	28854	30359	
	Volumetric flow, standard*	dscfm	23444	24525	26109	
	Isokinetic variation	%	99.2	98.6	95.3	
Sugar cooler throughput rate		TPH	43.30	41.05	37.30	
Pollutant concentrations:						
	Total PM	G/dscf	0.0193	0.0123	0.0114	
	Filterable PM	G/dscf	0.0172	0.0113	0.00941	
	Condensable organic PM	G/dscf	0.00110	0.000513	0.00083	
	Condensable inorganic PM	G/dscf	0.00103	0.000478	0.00116	
Pollutant mass flux rates:						
	Filterable PM	lb/hr	3.45	2.38	2.10	
	Condensable organic PM	lb/hr	0.221	0.108	0.186	
	Condensable inorganic PM	lb/hr	0.207	0.101	0.260	
Emission factors (ENGLISH UNITS):						AVERAGE
	Filterable PM	lb/ton	0.080	0.058	0.056	0.065
	Condensable organic PM	lb/ton	0.0051	0.0026	0.0050	0.0042
	Condensable inorganic PM	lb/ton	0.0048	0.0024	0.0070	0.0047
Emission factors (METRIC UNITS):						AVERAGE
	Filterable PM	kg/Mg	0.040	0.029	0.028	0.032
	Condensable organic PM	kg/Mg	0.0026	0.0013	0.0025	0.0021
	Condensable inorganic PM	kg/Mg	0.0024	0.0012	0.0035	0.0024

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

APPENDIX S

REPORT EXCERPTS FROM REFERENCE 20

(American Crystal Sugar Company, December 3, 1993)

Interpoll Laboratories, Inc.
4500 Ball Road N.E.
Circle Pines, Minnesota 55014-1819

TEL: (612) 786-6020

FAX: (612) 786-7854

RESULTS OF THE NOVEMBER 9 - 11, 1993
AIR EMISSION TESTING
OF PROCESS SOURCES
AT THE AMERICAN CRYSTAL SUGAR
EAST GRAND FORKS PLANT

Submitted to:

AMERICAN CRYSTAL SUGAR COMPANY
Business Highway 220
P.O. Box 357
East Grand Forks, Minnesota 56721

Attention:

Bruce Keifenheim

Approved by:



Daniel Despen

Manager

Stationary Source Testing Department

Report Number 3-1636
December 3, 1993
SP/slp

Table 1a. Summary of the Results of the November 11, 1993 Particulate Emission Test on the A - Pulp Dryer Stack at the American Crystal Sugar Plant Located in East Grand Forks, Minnesota.

ITEM	Run 1	Run 2	Run 3
Date of test	11-11-93	11-11-93	11-11-93
Time runs were done (HRS)	930/1037	1100/1208	1230/1334
* Process rate			
Volumetric flow actual (ACFM)	50585	51776	51507
standard (DSCFM)	22618	24090	24043
Gas temperature (DEG-F)	214	214	215
Moisture content (%V/V)	41.60	39.20	38.96
Gas composition (%V/V, dry)			
carbon dioxide	6.60	3.30	6.30
oxygen	13.60	13.80	13.90
nitrogen	79.80	82.90	79.80
Isokinetic variation (%)	105.1	101.1	102.0
Particulate concentration actual (GR/ACF)	.0425	.0328	.0347
standard (GR/DSCF)	.0950	.0706	.0745
Part. emission rate (LB/HR)	18.43	14.58	15.35

Note: Dry + Organic Wet Catch

* For Process Rate Information - See Appendix E.

Table 1b. Summary of the Results of the November 11, 1993 Particulate Emission Test on the A - Pulp Dryer Stack at the American Crystal Sugar Plant Located in East Grand Forks, Minnesota.

ITEM	Run 1	Run 2	Run 3
Date of test	11-11-93	11-11-93	11-11-93
Time runs were done (HRS)	930/1037	1100/1208	1230/1334
* Process rate			
Volumetric flow actual (ACFM) standard (DSCFM)	50585 22618	51776 24090	51507 24043
Gas temperature (DEG-F)	214	214	215
Moisture content (%V/V)	41.60	39.20	38.96
Gas composition (%V/V, dry) carbon dioxide oxygen nitrogen	6.60 13.60 79.80	3.30 13.80 82.90	6.30 13.90 79.80
Isokinetic variation (%)	105.1	101.1	102.0
Particulate concentration actual (GR/ACF) standard (GR/DSCF)	.0370 .0827	.0295 .0634	.0320 .0685
Part. emission rate (LB/HR)	16.03	13.09	14.12

* For Process Rate Information, See Appendix E
Note: Dry Catch Only

Table 2a. Summary of the Results of the November 10, 1993 Particulate Emission Test on the B - Pulp Dryer Stack at the American Crystal Sugar Plant Located in East Grand Forks, Minnesota.

ITEM	Run 1	Run 2	Run 3
Date of test	11-10-93	11-10-93	11-10-93
Time runs were done (HRS)	905/1106	1130/1332	1350/1551
* Process rate			
Volumetric flow actual (ACFM) standard (DSCFM)	76428 43382	76312 44674	74513 43695
Gas temperature (DEG-F)	243	234	232
Moisture content (%V/V)	23.30	21.92	21.97
Gas composition (%V/V, dry) carbon dioxide oxygen nitrogen	3.40 17.10 79.50	3.00 17.50 79.50	3.30 17.20 79.50
Isokinetic variation (%)	103.9	96.0	99.6
Particulate concentration actual (GR/ACF) standard (GR/DSCF)	.0283 .0498	.0365 .0624	.0323 .0551
Part. emission rate (LB/HR)	18.53	23.89	20.63

Note: Dry + Organic Wet Catch

* For Process Rate Information - See Appendix F.

Table 9. Summary of the Results of the November 9 - 11, 1993 Sulfur Dioxide Emission Compliance Tests at the American Crystal Sugar Plant in East Grand Forks, Minnesota.

<u>Date</u>	<u>Time</u>	<u>Concentration (ppm,d)</u>	<u>Emission Rate (LB/HR)</u>
(A - Pulp Dryer Stack)			
11-11-93	0930-1037	21	4.73
11-11-93	1100-1208	16	3.92
11-11-93	1230-1334	16	3.91
Average		18	4.19
(B - Pulp Dryer Stack)			
11-10-93	0905-1106	18	7.76
11-10-93	1130-1332	16	7.32
11-10-93	1350-1551	14	5.99
Average		16	7.02
(C - Pulp Dryer Stack)			
11-09-93	1030-1235	19	4.80
11-09-93	1315-1517	12	3.08
11-09-93	1535-1738	25	5.87
Average		19	4.58

Table 10. Summary of the Results of the November 9 - 11, 1993 Oxides of Nitrogen Emission Compliance Tests at the American Crystal Sugar Plant in East Grand Forks, Minnesota.

Date	Time	Concentration (ppm,d)	Emission Rate (LB/HR)
(A - Pulp Dryer Stack)			
11-11-93	0930-1037	95	15.3
11-11-93	1100-1208	99	17.2
11-11-93	1230-1334	100	17.2
Average		98	16.6
(B - Pulp Dryer Stack)			
11-10-93	0905-1106	69	21.3
11-10-93	1130-1332	67	21.5
11-10-93	1350-1551	66	20.8
Average		67	21.2
(C - Pulp Dryer Stack)			
11-09-93	1030-1235	97	17.2
11-09-93	1315-1517	98	17.8
11-09-93	1535-1738	90	15.1
Average		95	16.7
(No. 1 Boiler Stack)			
11-10-93	0810-0917	284	186
11-10-93	0948-1053	273	179
11-10-93	1115-1220	278	179
Average		278	181
(No. 2 Boiler Stack)			
11-11-93	0830-0947	319	186
11-11-93	1011-1124	335	200
11-11-93	1146-1257	329	192
Average		328	193

Table 11. Summary of the Results of the November 9 - 11, 1993 Total Hydrocarbon Emission Compliance Tests at the American Crystal Sugar Plant in East Grand Forks, Minnesota.

Date	Time	Concentration (ppmC,w)	Emission Rate (LB/HR)
(A - Pulp Dryer Stack)			
11-11-93	0930-1037	310	22.4
11-11-93	1100-1208	264	19.6
11-11-93	1230-1334	246	18.1
Average		273	20.0
(B - Pulp Dryer Stack)			
11-10-93	0905-1106	106	11.2
11-10-93	1130-1332	72	7.70
11-10-93	1350-1551	65	6.80
Average		81	8.57
(C - Pulp Dryer Stack)			
11-09-93	1030-1235	123	8.61
11-09-93	1315-1517	177	12.2
11-09-93	1535-1738	172	12.0
Average		157	10.9

Table 12. Summary of the Results of the November 9 - 11, 1993 Carbon Monoxide Emission Compliance Tests at the American Crystal Sugar Plant in East Grand Forks, Minnesota.

<u>Date</u>	<u>Time</u>	<u>Concentration (ppm,d)</u>	<u>Emission Rate (LB/HR)</u>
(A - Pulp Dryer Stack)			
11-11-93	0930-1037	540	53.3
11-11-93	1100-1208	500	52.5
11-11-93	1230-1334	450	47.2
Average		497	51.0
(B - Pulp Dryer Stack)			
11-10-93	0905-1106	750	142
11-10-93	1130-1332	830	162
11-10-93	1350-1551	590	112
Average		723	139
(C - Pulp Dryer Stack)			
11-09-93	1030-1235	240	26.0
11-09-93	1315-1517	260	28.8
11-09-93	1535-1738	290	29.7
Average		263	28.2
(No. 1 Boiler Stack)			
11-10-93	0810-0917	319	128
11-10-93	0948-1053	336	134
11-10-93	1115-1220	330	130
Average		328	131
(No. 2 Boiler Stack)			
11-11-93	0830-0947	580	206
11-11-93	1011-1124	535	194
11-11-93	1146-1257	375	134
Average		497	178

Test No. 9
A - Pulp Dryer Stack

Results of Particulate Loading Determinations-----Method 5

Date of run	Run 1 11-11-93	Run 2 11-11-93	Run 3 11-11-93
Time run start/end.....(HRS)	930/1037	1100/1208	1230/1334
Static pressure.....(IN.WC)	-0.70	-0.70	-0.70
Cross sectional area (SQ.FT)	12.05	12.05	12.05
Pitot tube coefficient.....	.840	.840	.840
Water in sample gas			
condenser.....(ML)	0.0	0.0	0.0
impingers.....(GRAMS)	617.0	575.0	574.0
desiccant.....(GRAMS)	17.0	13.0	12.0
total.....(GRAMS)	634.0	588.0	586.0
Total particulate material.. collected(grams)	0.2585	0.1968	0.2089
Gas meter coefficient.....	0.9985	0.9975	0.9975
Barometric pressure..(IN.HG)	29.30	29.30	29.30
Avg. orif.pres.drop..(IN.WC)	1.78	1.74	1.72
Avg. gas meter temp..(DEF-F)	77.2	78.8	78.2
Volume through gas meter....			
at meter conditions...(CF)	43.49	44.74	44.99
standard conditions.(DSCF)	41.97	43.00	43.28
Total sampling time....(MIN)	60.00	60.00	60.00
Nozzle diameter.....(IN)	.255	.255	.255
Avg.stack gas temp ..(DEG-F)	214	214	215
Volumetric flow rate.....			
actual.....(ACFM)	50585	51776	51507
dry standard.....(DSCFM)	22618	24090	24043
Isokinetic variation.....(%)	105.1	101.1	102.0
Particulate concentration...			
actual.....(GR/ACF)	0.04248	0.03285	0.03475
dry standard.....(GR/DSCF)	0.09504	0.07062	0.07447
Particle mass rate...(LB/HR)	18.426	14.583	15.347

Test No. 9
A - Pulp Dryer Stack

Results of Sulfur Dioxide Determinations-----Method 6

	Run 1	Run 2	Run 3
Date of run	11-11-93	11-11-93	11-11-93
Time run start/end.....(HRS)	0930-1037	1100-1208	1230-1334
Barometric pressure...(IN.HG)	29.30	29.30	29.30
Meter temperature....(DEG-F)	77.20	78.80	78.20
Meter correction coefficient	0.9985	0.9975	0.9975
Volume through gas meter....			
at meter conditions...(CF)	43.490	44.740	44.990
standard conditions...(SCF)	41.967	42.997	43.283
Total sampling time....(MIN)	60.0	60.0	60.0
Moisture content.....(%V/V)	41.60	39.20	38.96
Oxygen content....(%V/V DRY)	13.60	13.80	13.90
Milliequivalents of SO4 in..			
gas sample.....	2.0700	1.6500	1.6600
<u>Sulfur dioxide concentration</u>			
(GR/DSCF).....	0.0244	0.0190	0.0190
(MG/DSCM).....	56	43	43
(PPM-DRY).....	21	16	16
(PPM-WET).....	12	10	10
SO2 Emission rate....(LB/HR)	4.73	3.92	3.91

Test No. 9
A - Pulp Dryer Stack

Results of Oxides of Nitrogen (NOx) Determinations-----Method 7

	Run 1A	Run 1B	Run 1C	Run 1D
Date of run.....	11-11-93	11-11-93	11-11-93	11-11-93
Time of run.....(HRS)	930	945	1000	1015
Flask number.....	13	14	15	16
Volume of flask.....(ML)	2060	2048	2045	2067
Data: time of sampling				
flask temperature..(DEG-F)	40.00	40.00	38.00	37.00
bar. press.....(IN.HG)	29.30	29.30	29.30	29.30
flask vacuum.....(IN.HG)	27.65	27.60	27.65	27.60
flask abs. press...(IN.HG)	1.65	1.70	1.65	1.70
Data: Time of Flask Opening				
flask temperature..(DEG-F)	72.00	72.00	72.00	72.00
lab. bar. press....(IN.HG)	29.16	29.16	29.16	29.16
flask static press.(IN.HG)	-0.40	0.20	-0.20	-0.10
flask abs. press...(IN.HG)	28.76	29.36	28.96	29.06
Volume gas sampled....(DSML)	1822	1848	1822	1844
Moisture content.....(%V/V)	41.59	41.59	41.59	41.59
Oxygen content.....(%V/V, DRY)	13.60	13.60	13.60	13.60
Nitrate in gas sample...(JG)	443.0	460.0	441.0	445.0
NO2 in gas sample.....(JG)	328.7	341.3	327.2	330.2
<u>NOx Concentration</u>				
(GR/DSCF).....	0.0788	0.0807	0.0785	0.0782
(MG/DSCM).....	180	185	180	179
(PPM-DRY).....	94	97	94	94
(PPM-WET).....	55	56	55	55
NOx Emission rate....(LB/HR)	15.28	15.65	15.22	15.17
NOx emission factor.....				
.....(LB/MMBTU)*	0.315	0.323	0.314	0.313

* F = 9780 DSCF/MMBTU

Test No. 9
A - Pulp Dryer Stack

Results of Oxides of Nitrogen (NOx) Determinations-----Method

	Run 2A	Run 2B	Run 2C	Run 2D
Date of run.....	11-11-93	11-11-93	11-11-93	11-11-93
Time of run.....(HRS)	1105	1130	1145	1150
Flask number.....	17	18	73	74
Volume of flask.....(ML)	2054	2045	2065	2070
Data: time of sampling				
flask temperature...(DEG-F)	37.00	38.00	40.00	39.00
bar. press.....(IN.HG)	29.30	29.30	29.30	29.30
flask vacuum.....(IN.HG)	27.65	27.65	27.60	27.60
flask abs. press...(IN.HG)	1.65	1.65	1.70	1.70
Data: Time of Flask Opening				
flask temperature...(DEG-F)	72.00	72.00	72.00	72.00
lab. bar. press.....(IN.HG)	29.16	29.16	29.16	29.16
flask static press.(IN.HG)	0.30	0.10	0.10	-0.60
flask abs. press...(IN.HG)	29.46	29.26	29.26	28.50
Volume gas sampled....(DSML)	1863	1842	1857	1815
Moisture content.....(%V/V)	39.20	39.20	39.20	39.20
Oxygen content.....(%V/V, DRY)	13.80	13.80	13.80	13.80
Nitrate in gas sample...(JG)	455.0	458.0	500.0	479.0
NO2 in gas sample.....(JG)	337.6	339.8	371.0	355.4
<u>NOx Concentration</u>				
(GR/DSCF).....	0.0792	0.0806	0.0873	0.0856
(MG/DSCM).....	181	185	200	196
(PPM-DRY).....	95	96	104	102
(PPM-WET).....	58	59	64	62
NOx Emission rate....(LB/HR)	16.35	16.65	18.03	17.67
NOx emission factor.....				
.....(LB/MMBTU)*	0.326	0.332	0.359	0.352

* F = 9780 DSCF/MMBTU

Test No. 9
A - Pulp Dryer Stack

Results of Oxides of Nitrogen (NOx) Determinations-----Method 7

	Run 3A	Run 3B	Run 3C	Run 3D
Date of run.....	11-11-93	11-11-93	11-11-93	11-11-93
Time of run.....(HRS)	1235	1255	1310	1325
Flask number.....	75	76	77	78
Volume of flask.....(ML)	2066	2093	2104	2077
Data: time of sampling				
flask temperature...(DEG-F)	40.00	40.00	40.00	40.00
bar. press.....(IN.HG)	29.30	29.30	29.30	29.30
flask vacuum.....(IN.HG)	27.60	27.60	27.60	27.60
flask abs. press...(IN.HG)	1.70	1.70	1.70	1.70
Data: Time of Flask Opening				
flask temperature...(DEG-F)	72.00	72.00	72.00	72.00
lab. bar. press...(IN.HG)	29.16	29.16	29.16	29.16
flask static press...(IN.HG)	0.20	1.50	0.40	0.70
flask abs. press...(IN.HG)	29.36	30.66	29.56	29.86
Volume gas sampled....(DSML)	1865	1978	1913	1909
Moisture content.....(%V/V)	38.96	38.96	38.96	38.96
Oxygen content.....(%V/V, DRY)	13.90	13.90	13.90	13.90
Nitrate in gas sample...(JG)	487.0	489.0	499.0	499.0
NO2 in gas sample.....(JG)	361.3	362.8	370.2	370.2
<u>NOx Concentration</u>				
(GR/DSCF).....	0.0847	0.0801	0.0846	0.0848
(MG/DSCM).....	194	183	194	194
(PPM-DRY).....	101	96	101	101
(PPM-WET).....	62	59	62	62
NOx Emission rate....(LB/HR)	17.45	16.52	17.43	17.47
NOx emission factor.....				
.....(LB/MMBTU)*	0.353	0.334	0.353	0.354

* F = 9780 DSCF/MMBTU

Test No. 9
 A - Pulp Dryer Stack

Results of CO Determinations -----Method 10

	Run 1	Run 2	Run 3
Date of run	11-11-93	11-11-93	11-11-93
Time run start/end.....(HRS)	0930/1037	1100/1208	1230/1334
Total sampling time....(MIN)	60.0	60.0	60.0
Moisture content.....(%V/V)	41.60	39.20	38.96
O2 Concentration.....(%V/V)	13.60	13.80	13.90
Volumetric flow rate (DSCFM)	22618	24090	24043
CO concentration.....			
(GR/DSCF).....	0.2748	0.2544	0.2290
(MG/DSCM).....	629.10	582.50	524.25
(PPM-WET).....	315.36	304.00	274.68
(PPM-DRY).....	540.00	500.00	450.00
(PPM-DRY @ 7% O2).....	1021.	972.22	887.32
CO emission rate.....(LB/HR)	53.268	52.532	47.187

CO = Carbon monoxide

A trailing '<' symbol indicates that the true value
 is less than or equal to the reported value

Interpoll Laboratories
(512) 786-6020

EPA Method 5 Data Reporting Sheet
Impinger Catch/Minnesota Protocol

Job ACS Source A Pulp Dryer
Team Leader SCB Test Site Stack
Date Submitted 11-12-93 Date of Test 11-11-93
Test No. 9 No. of Runs Completed 3
Date of Analysis 11-24-93 Technician C. Helgeson

0	Test <u> </u> Run <u>0</u> Field Blank Log Number <u> </u> Comments <u> </u>	Dish No. <u> </u> Dish Tare Wt. <u> </u> g Dish+Sample Wt. <u> </u> g Sample Wt. <u> </u> g
1	Test <u>9</u> Run <u>1</u> Log Number <u>1636-103</u> Comments <u> </u>	Dish No. <u>61A</u> Dish Tare Wt. <u>51.4730</u> g Dish+Sample Wt. <u>51.5067</u> g Sample Wt. <u>0.0337</u> g
2	Test <u>9</u> Run <u>2</u> Log Number <u>-105</u> Comments <u> </u>	Dish No. <u>62</u> Dish Tare Wt. <u>50.8880</u> g Dish+Sample Wt. <u>50.9082</u> g Sample Wt. <u>0.0202</u> g
3	Test <u>9</u> Run <u>3</u> Log Number <u>-107</u> Comments <u> </u>	Dish No. <u>65</u> Dish Tare Wt. <u>44.6566</u> g Dish+Sample Wt. <u>44.6734</u> g Sample Wt. <u>0.0168</u> g
4	Test <u> </u> Run <u> </u> Log Number <u> </u> Comments <u> </u>	Dish No. <u> </u> Dish Tare Wt. <u> </u> g Dish+Sample Wt. <u> </u> g Sample Wt. <u> </u> g
5	Test <u> </u> Run <u> </u> Log Number <u> </u> Comments <u> </u>	Dish No. <u> </u> Dish Tare Wt. <u> </u> g Dish+Sample Wt. <u> </u> g Sample Wt. <u> </u> g

Blank Solvent Wt. 0.0001 g

Results:

Field Blk. Run 1 Run 2 Run 3 Run 4 Run 5

	0.0336	0.0201	0.0167	0-11	

LSC-03

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Probe/Cyclone Wash

Job ACS Source A-Pulp Dryer
Team Leader SLB Test Site Stack
Date Submitted 11-12-93 Date of Test 11-11-93
Test No. 9 No. of Runs Completed 3
Date of Analysis 11-23-93 Technician C. Halgeson
Transport Leakage ☒ None ☐ ml Solvent Acetone

0	Test <u>Run 0</u> Field Blank Log Number _____ Vol. of Solvent _____ ml *Solvent Residue <u>4.0</u> ug/ml	Dish No. _____ Dish Tare Wt. _____ g Dish+Sample Wt. _____ g Sample Wt. _____ g
1	Test <u>9</u> Run <u>1</u> Vol. of Solvent <u>100</u> ml Log Number <u>1636-1009</u> Comments _____	Dish No. <u>46</u> Dish Tare Wt. <u>45.4233</u> g Dish+Sample Wt. <u>45.4402</u> g Sample Wt. <u>0.0169</u> g
2	Test <u>9</u> Run <u>2</u> Vol. of Solvent <u>110</u> ml Log Number <u>-101P</u> Comments _____	Dish No. <u>47</u> Dish Tare Wt. <u>48.4658</u> g Dish+Sample Wt. <u>48.4863</u> g Sample Wt. <u>0.0205</u> g
3	Test <u>9</u> Run <u>3</u> Vol. of Solvent <u>100</u> ml Log Number <u>-102P</u> Comments _____	Dish No. <u>48</u> Dish Tare Wt. <u>47.8872</u> g Dish+Sample Wt. <u>47.9087</u> g Sample Wt. <u>0.0215</u> g
4	Test _____ Run _____ Vol. of Solvent _____ ml Log Number _____ Comments _____	Dish No. _____ Dish Tare Wt. _____ g Dish+Sample Wt. _____ g Sample Wt. _____ g
5	Test _____ Run _____ Vol. of Solvent _____ ml Log Number _____ Comments _____	Dish No. _____ Dish Tare Wt. _____ g Dish+Sample Wt. _____ g Sample Wt. _____ g

*Solvent Residue ug/ml = [(Sample Wt. _____ g) (10⁶)] / Vol. of Sol. _____ ml

EPA-MS Acetone Residue Blank Spec. {7.3 ug/ml

Results:

Field Blk. Run 1 Run 2 Run 3 Run 4 Run 5

	0.0165	0.0201	0.0211	0-12	

SC-01100

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Filter Gravimetrics

Job ACS Source A-Pulp Dryer
Team Leader SLP Test Site Stack
Date Submitted 11-12-93 Date of Test 11-11-93
Test No. 9 No. of Runs Completed 3
Date of Analysis 11-24-93 Technician C. Helgeson

0	Test <u> </u> Run <u>0</u> Field Blank Log Number <u> </u> Comments <u> </u>	Filter No. <u> </u> Filter Type <u> </u> Filter Tare Wt. <u> </u> g Filter+Sample Wt. <u> </u> g Sample Wt. <u> </u> g
1	Test <u>9</u> Run <u>1</u> Log Number <u>1636-100F</u> Comments <u> </u>	Filter No. <u>6014</u> Filter Type <u>4" GF</u> Filter Tare Wt. <u>.8867</u> g Filter+Sample Wt. <u>1.0951</u> g Sample Wt. <u>0.2084</u> g
2	Test <u>9</u> Run <u>2</u> Log Number <u>-101F</u> Comments <u> </u>	Filter No. <u>9999</u> Filter Type <u>4" GF</u> Filter Tare Wt. <u>.8785</u> g Filter+Sample Wt. <u>1.0351</u> g Sample Wt. <u>0.1566</u> g
3	Test <u>9</u> Run <u>3</u> Log Number <u>-102F</u> Comments <u> </u>	Filter No. <u>5953</u> Filter Type <u>4" GF</u> Filter Tare Wt. <u>.9287</u> g Filter+Sample Wt. <u>1.0998</u> g Sample Wt. <u>0.1711</u> g
4	Test <u> </u> Run <u> </u> Log Number <u> </u> Comments <u> </u>	Filter No. <u> </u> Filter Type <u> </u> Filter Tare Wt. <u> </u> g Filter+Sample Wt. <u> </u> g Sample Wt. <u> </u> g
5	Test <u> </u> Run <u> </u> Log Number <u> </u> Comments <u> </u>	Filter No. <u> </u> Filter Type <u> </u> Filter Tare Wt. <u> </u> g Filter+Sample Wt. <u> </u> g Sample Wt. <u> </u> g

Results:

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.2084	0.1566	0.1711		

Field Blk.	Run 1	Run 2	Run 3	Run 4	Run 5
	0.2585	0.1968	0.2089		



Campaign Day: Tue!

Date: 11.10.1953

Drier

test #

Engineering
Compliance

[illegible]

Air Registers:

1: 11

Closed
25%
50%
75%
100%

2.00 42:

Closed
25%
50%
75%
100%

$$\frac{2.22}{2.22}$$

Start: 1965

Start: 10:14. End: 10:14.7.

1990

Contractor Name:	Atic Bid	Bid

NOTES: Run 1

NOTES: Run 1

NOTES: Run 2

2000-2001

$12.40 - 12.45$
 $12.45 - 1.00$

Filename: BEET20.WQ1

Date: 31-Jan-95

Facility: American Crystal Sugar

Location: East Grand Forks, Minnesota

Source: Coal-fired pulp dryer 'A' (several other sources were tested, but process data are not provided for these sources)

Test date: November 11, 1993

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	214	214	215	
Pulp dryer A	Pressure	in. HG	29.30	29.30	29.30	
	Moisture	%	41.60	39.20	38.96	
	Oxygen	%	13.6	13.8	13.9	
	Volumetric flow, actual	acfm	50585	51776	51507	
	Volumetric flow	scfm	38806	39720	39455	
	Volumetric flow, standard*	dscfm	22663	24150	24083	
	Isokinetic variation	%	105.1	101.1	102	
Pressed pulp feed to dryer		TPH	23.0	22.0	22.6	
Pollutant concentrations:						
Total PM		G/dscf	0.0606	0.069	0.0776	
Filterable PM		G/dscf	0.0538	0.0624	0.07180	
Condensable organic PM		G/dscf	0.00680	0.00660	0.00580	
CO2		% vol	5.2	5.6	5.6	
SO2		ppmdv	21	16	16	
NOx		ppmdv	95	99	100	
THC as carbon		ppmwv	310	264	246	
CO		ppmdv	540	500	450	
Pollutant mass flux rates:						
Filterable PM		lb/hr	10.45	12.92	14.82	
Condensable organic PM		lb/hr	1.321	1.366	1.197	
CO2		lb/hr	8076	9268	9243	
SO2		lb/hr	4.75	3.85	3.84	
NOx		lb/hr	15.4	17.1	17.3	
THC as carbon		lb/hr	22.5	19.6	18.1	
THC as methane		lb/hr	30.0	26.1	24.2	
CO		lb/hr	53.4	52.7	47.3	
Emission factors (ENGLISH UNITS):						AVERAGE
Filterable PM		lb/ton	0.45	0.59	0.66	0.57
Condensable organic PM		lb/ton	0.057	0.062	0.053	0.058
CO2		lb/ton	351	422	410	394
SO2		lb/ton	0.21	0.18	0.17	0.18
NOx		lb/ton	0.67	0.78	0.77	0.74
THC as methane		lb/ton	1.3	1.2	1.1	1.2
CO		lb/ton	2.3	2.4	2.1	2.3
Emission factors (METRIC UNITS):						AVERAGE
Filterable PM		kg/Mg	0.23	0.29	0.33	0.28
Condensable organic PM		kg/Mg	0.029	0.031	0.027	0.029
CO2		kg/Mg	176	211	205	197
SO2		kg/Mg	0.10	0.088	0.085	0.092
NOx		kg/Mg	0.34	0.39	0.38	0.37
THC as methane		kg/Mg	0.65	0.60	0.54	0.59
CO		kg/Mg	1.2	1.2	1.0	1.1

*DSCFM BASED ON A STANDARD TEMPERATURE OF 68 DEGREES FAHRENHEIT

MIDWEST RESEARCH INSTITUTE

Project/Acct. No. 4602-03 Date/Time 12/9/94

Project Title SUGAR BEET PROCESSING AP-42

Phone Contact ☐

Meeting Notes ☐

Work Sheet ☒

Signature YEL Verified by _____

(signature/date)

Page 1 of 2

CARD, Michigan Facility

TEST DATE: 12/14/89

TEST NO.	TIME DURATION
P-2	3:13 - 4:23 PM
P-4	7:35 - 9:25 AM
P-5	10:00 - 11:10 PM

TOTAL DRY Pulp Produced on 12/14/89 = 174 tons = 7.25 tons/hr. AVERAGE

AVERAGE OVER TEST RUN

TEST NO.	SLICE RATE (tons/hr)	PRESSED Pulp MOISTURE (%)	DRIED Pulp MOISTURE (%)
P-2	135	82.6	15.0
P-4	135	71.3	9.4
P-5	135	71.3	16.45

% Solids = $\frac{\text{Dry Pulp Produced} - \text{Dry Pulp Moisture} \times \text{Pulp Produced}}{\text{Beets Sliced}}$

P-2: % Solids = $\frac{7.25 - (0.15 \times 7.25)}{135} = \frac{6.16}{135} \times 100 = 4.6\%$

P-4: % Solids = $\frac{7.25 - (0.094 \times 7.25)}{135} = \frac{6.57}{135} \times 100 = 4.9\%$

P-5: % Solids = $\frac{7.25 - (0.1645 \times 7.25)}{135} = \frac{6.06}{135} \times 100 = 4.5\%$

MIDWEST RESEARCH INSTITUTE

Project/Acct. No. 4602-03 Date/Time 12/9/94

Project Title Sugar Beet Processing - AP-42

Phone Contact ☐

Meeting Notes ☐

Work Sheet ☒

Signature Yul Verified by _____
(signature/date)

Page 2 of 2

$$\text{Process Rate (tons/hr)} = \frac{\text{Beets Sliced} \times \% \text{ Solids}}{1 - \left(\frac{\text{Wet Pulp Moisture (\%)}}{100} \right)}$$

$$\text{P-2: Rate} = \frac{135 \times 0.046}{1 - \left(\frac{82.6}{100} \right)} = \frac{6.21}{0.174} = 35.7 \text{ tons/hr.}$$

$$\text{P-4: Rate} = \frac{135 \times 0.049}{1 - \left(\frac{71.3}{100} \right)} = \frac{6.62}{0.287} = 23.1 \text{ tons/hr.}$$

$$\text{P-5: Rate} = \frac{135 \times 0.045}{1 - \left(\frac{71.3}{100} \right)} = \frac{6.08}{0.287} = 21.2 \text{ tons/hr.}$$

APPENDIX W

REPORT EXCERPTS FROM REFERENCE 24

(Michigan Sugar Company, November 1989)

DEC 11 1989

PARTICULATE EMISSION STUDY
FOR
MICHIGAN SUGAR COMPANY
CARROLTON, MICHIGAN

DATES OF TESTING:
November 14 and 16, 1989

Prepared For:

Michigan Sugar Company
P.O. Box 1348
Saginaw, Michigan 48605

Prepared By:

Swanson Environmental, Inc.
24156 Haggerty Road
Farmington Hills, Michigan 48024

MA-5490



SWANSON ENVIRONMENTAL INC.

1.0 INTRODUCTION

Swanson Environmental, Inc., was retained by Michigan Sugar Company, of Saginaw, Michigan to conduct two particulate emission tests on the beet pulp drier stack at the Carrolton plant, located in Carrolton, Michigan.

The purpose of the study was to determine whether the particulate emissions from two different aspiration rates were in compliance with Michigan Sugar's Special Conditions Permit Number 300-86A. The tests were in accordance with the procedures outlined for Method 17 of 40 CFR 60, Appendix A.

The study was conducted on November 14 and 16, 1989 by Mr. Mark Hook, Mr. Dan Larin, Mr. Mark Morter, and Mr. Andrew Secord of Swanson Environmental, Inc. Mr. Mark Suhr of Michigan Sugar assisted in the study.

2.0 PROCESS DESCRIPTION

Expanded cossettes, or pulp, discharged from the diffuser is pressed to remove excess moisture. The pulp is then dried by feeding the material into large revolving drums through which hot air is drawn. The drying reduces the pulp moisture to approximately 12% from a high of approximately 80%. The moist air leaves the drum and passes through a multiclone and a side stream is sent through a baghouse. The bag house is aspirated at two different rates and the recirculated air is used to

combust the heating flame. The drier exhaust is discharged to the atmosphere via a 100 foot high, 8 foot diameter stack. Sampling was performed from the elevated walkway located approximately 60 feet above ground level.

3.0 GENERAL

Prior to the start of testing the stack diameter was measured and a total of 12 traverse points were selected. Four 4-inch diameter sampling ports were previously installed on the 96" diameter stack (Figure 1). Preliminary velocity traverses (USEPA Method 2) and wet bulb-dry bulb moisture determinations (USEPA Method 4) were performed at the sampling location. All velocity measurements used a calibrated S-type pitot tube with an attached thermocouple probe.

Following the calculation of gas density and gas velocities, a sampling nozzle size was determined which would allow isokinetic sampling at all measured points.

4.0 PARTICULATE SAMPLING PROCEDURE

The sampling train used to sample the drier stack emissions followed 40 CFR 60, Appendix A, USEPA Method 17. This method is also approved by the Michigan Department of Natural Resources, as Method 5C. The sampling train components were:

1. An appropriately sized stainless steel sample nozzle;
2. One 47 MM A/E glass fiber filter backed up with a ceramic thimble and a holder for each;

SWANSON ENVIRONMENTAL, INC.

TABLE 4

PLANT: MI SUGAR
LOCATION: CARROLLTON
DATE: 11-14-89

PARTICULATE EMISSION RATE

TEST No.	TEST DATE	STACK GAS FLOW RATE (DSCFM)	GRAIN PER DSCF	EMISSION CONC. RATE		EMISSION RATE	
				LBS/1000 LBS DRY-GAS	LBS/1000 LBS DRY 50%E A*	LBS HOUR	

P-1	11-14-89	33672	0.0643	0.084	0.251	18.56
P-2	11-14-89	37871	0.0462	0.064	0.225	14.98
P-3	11-14-89	38795	0.0703	0.100	0.363	23.39
AVERAGE		36779.46	0.06	0.083	0.280	18.98

* E A = EXCESS AIR

SWANSON ENVIRONMENTAL, INC.
PARTICULATE SAMPLING DATA AND CALCULATIONS

PLANT: MI SUGAR
DATE: 11-~~7~~-89 14

SOURCE: PULP DRIER

=====

CLOCK TIME:	60.00	60.00	60.00
1.00 NUMBER	P-1	P-2	P-3
B. STACK DIAMETER, In	96.00	96.00	96.00
C. STACK AREA, Sq.Ft	50.27	50.27	50.27
D. No. SAMPLE POINTS	12.00	12.00	12.00
E. TOTAL SAMPLE TIME, MIN.	60.00	60.00	60.00
F. NOZZLE DIAMETER, In.	0.310	0.310	0.310
G. NOZZLE AREA, Sq.Ft.	0.00052	0.00052	0.00052
H. CALIBRATION FACTORS:			
PITOT TUBE, Cp	0.828	0.828	0.828
GAS METER, y	1.005	1.005	1.005
I. BAROMETRIC PRESSURE,	29.33	29.34	29.30
In.Hg.			
J. STACK STATIC PRESSURE	0.04	0.04	0.04
In.H2O			
K. STACK GAS TEMP.	178.17	197.92	203.75
L. AVG. Sq. Rt. VEL. HEAD	0.36	0.38	0.38
M. AVG. METER TEMP.	64.50	64.75	61.25
N. AVG. METER PRESS., H2O	0.53	0.57	0.54
O. METER VOL., ACTUAL			
Cu. Ft.	23.29	24.17	24.68
P. METER VOL., @STP	23.22	24.09	24.73
Q. LIQUID VOL., H2O COND.,	362.70	304.10	278.40
Ml.			
R. VAPOR VOL., H2O COND.,	17.19	14.41	13.20
@STP, Cu.Ft.			
S. TOTAL GAS SAMPLED,	40.41	38.51	37.93
@ STP, Cu.Ft.			
T. %MOISTURE IN EXHAUST GAS			
1) AT TEST LOCATION	42.55	37.43	34.79
2) BEFORE COLLECTOR	0.00	0.00	0.00
U. DRY GAS COMP. %O2	14.3	15.7	16.3
%CO2	3.1	2.4	1.8
%CO	0.1	0.2	0.1
%N2	81.3	81.0	82.7
V. DENSITY & MOL. Wt. -STACK GAS			
1) DRY, @ STP, Lbs/Cu.Ft.	0.0743	0.0744	0.0754
2) WET, @ STP, Lbs/Cu.Ft.	0.0625	0.0640	0.0654
3) WET @ STACK, Lbs/Cu.Ft.	0.0509	0.0505	0.0511
4) MOL.Wt., @ STP, Lb/MOLE	28.75	28.79	29.19
W. WEIGHT OF GAS SAMPLED:			
1) DRY GAS, Lbs	1.73	1.79	1.87
2) WET GAS, Lbs	2.52	2.46	2.48
X. TOTAL PARTICULATE COLLECTED	0.0968	0.0721	0.1128

	(GRAMS)			
Y. AVERAGE GAS VELOCITY, FPM	1432.16	1524.35	1513.72	
Z. STACK GAS FLOW RATE				
1)AT STACK, Qa, ACFM	71988	76622	76088	
2)AT Std., Qstd, SCFM	58607	60528	59497	
3)Std. DRY, Qdg, SCFM	33672	37871	38795	
AA. PERCENT EXCESS AIR	200.11	276.65	297.10	
BB. CONCENTRATION CONVERSION FACTORS:				
1)50% E.A., AFTER COLLECTOR	1.53	1.79	1.91	
2)50% E.A., BEFORE COLLECTOR	2.97	3.49	3.62	
3)MOISTURE BEFORE COLLECTOR	1.46	1.37	1.33	
CC. PARTICULATE CONCENTRATION:				
1)Lbs/1000 Lbs., ACTUAL	0.084	0.064	0.100	
2)Lbs/1000 Lbs., DRY	0.124	0.089	0.133	
3)Lbs/1000 Lbs., WET @ 50%E.A	0.129	0.115	0.191	
4)Lbs/1000 Lbs., DRY @ 50%E.A	0.251	0.225	0.363	
5)GRAINS / DSCF	0.0643	0.0462	0.0703	
6)POUNDS / HOUR	18.56	14.98	23.39	
DD. PERCENT ISOKINETIC	110.19	101.67	101.88	

SWANSON ENVIRONMENTAL, INC.

TABLE 4

PLANT: MI SUGAR
LOCATION: CARROLLTON
DATE: 11-16-89

PARTICULATE EMISSION RATE

		EMISSION CONC. RATE		EMISSION RATE		
TEST No.	TEST DATE	STACK GAS FLOW RATE (DSCFM)	GRAIN PER DSCF	LBS/1000 LBS GAS	LBS/1000 LBS DRY 50%E A*	LBS HOUR
=====						

P-1	11-16-89	46482	0.0411	0.069	0.238	16.37
P-2	11-16-89	37617	0.0478	0.067	0.230	15.42
P-3	11-16-89	41090	0.0558	0.085	0.203	19.65
AVERAGE		41729.76	0.05	0.074	0.224	17.15

* E A = EXCESS AIR

SWANSON ENVIRONMENTAL, INC.
PARTICULATE SAMPLING DATA AND CALCULATIONS

PLANT: MI SUGAR
DATE: 11-16-89

SOURCE: PULP DRIER

=====

CLOCK TIME:	60.00	60.00	60.00
1.00 NUMBER	P-1	P-2	P-3
B. STACK DIAMETER, In	96.00	96.00	96.00
C. STACK AREA, Sq.Ft	50.27	50.27	50.27
D. No. SAMPLE POINTS	12.00	12.00	12.00
E. TOTAL SAMPLE TIME, MIN.	60.00	60.00	60.00
F. NOZZLE DIAMETER, In.	0.310	0.310	0.310
G. NOZZLE AREA, Sq.Ft.	0.00052	0.00052	0.00052
H. CALIBRATION FACTORS:			
PITOT TUBE, Cp	0.828	0.828	0.828
GAS METER, y	1.005	1.005	1.005
I. BAROMETRIC PRESSURE,	28.85	28.85	28.85
In.Hg.			
J. STACK STATIC PRESSURE	4.20	4.20	4.20
In.H2O			
K. STACK GAS TEMP.	190.92	191.50	195.17
L. AVG. Sq. Rt. VEL. HEAD	0.37	0.37	0.37
M. AVG. METER TEMP.	51.25	55.50	52.50
N. AVG. METER PRESS., H2O	0.51	0.54	0.52
O. METER VOL., ACTUAL			
Cu. Ft.	23.29	24.17	24.68
P. METER VOL., @STP	23.43	24.11	24.77
Q. LIQUID VOL., H2O COND.,	107.80	293.30	202.70
Ml.			
R. VAPOR VOL., H2O COND.,	5.11	13.90	9.61
@STP, Cu.Ft.			
S. TOTAL GAS SAMPLED;	28.54	38.02	34.37
@ STP, Cu.Ft.			
T. %MOISTURE IN EXHAUST GAS			
1) AT TEST LOCATION	17.91	36.57	27.95
2) BEFORE COLLECTOR	0.00	0.00	0.00
U. DRY GAS COMP. %O2	16.7	15.8	14.2
%CO2	2.0	3.3	3.5
%CO	0.0	0.0	0.0
%N2	81.3	81.0	82.7
V. DENSITY & MOL. Wt. -STACK GAS			
1) DRY, @ STP, Lbs/Cu.Ft.	0.0749	0.0754	0.0755
2) WET, @ STP, Lbs/Cu.Ft.	0.0698	0.0648	0.0674
3) WET @ STACK, Lbs/Cu.Ft.	0.0548	0.0508	0.0526
4) MOL.Wt., @ STP, Lb/MOLE	28.99	29.17	29.22
W. WEIGHT OF GAS SAMPLED:			
1) DRY GAS, Lbs	1.76	1.82	1.87
2) WET GAS, Lbs	1.99	2.46	2.32
X. TOTAL PARTICULATE COLLECTED	0.0624	0.0748	0.0896

	(GRAMS)			
Y.	AVERAGE GAS VELOCITY, FPM	1434.72	1504.07	1454.58
Z.	STACK GAS FLOW RATE			
	1)AT STACK, Qa, ACFM	72117	75603	73115
	2)AT Std., Qstd, SCFM	56620	59304	57032
	3)Std. DRY, Qdg, SCFM	46482	37617	41090
AA.	PERCENT EXCESS AIR	345.36	280.21	184.49
BB.	CONCENTRATION CONVERSION FACTORS:			
	1)50% E.A., AFTER COLLECTOR	2.44	1.81	1.63
	2)50% E.A., BEFORE COLLECTOR	3.45	3.43	2.39
	3)MOISTURE BEFORE COLLECTOR	1.14	1.36	1.24
CC.	PARTICULATE CONCENTRATION:			
	1)Lbs/1000 Lbs., ACTUAL	0.069	0.067	0.085
	2)Lbs/1000 Lbs., DRY	0.078	0.091	0.106
	3)Lbs/1000 Lbs., WET @ 50%E.A	0.169	0.121	0.139
	4)Lbs/1000 Lbs., DRY @ 50%E.A	0.238	0.230	0.203
	5)GRAINS / DSCF	0.0411	0.0478	0.0558
	6)POUNDS / HOUR	16.37	15.42	19.65
DD.	PERCENT ISOKINETIC	79.70	101.38	95.31

Filename: BEET24.WQ1

Date: 19-Jan-95

Facility: Michigan Sugar Company

Location: Carrollton, Michigan

Source: Pulp dryer with multiclones (Natural gas-fired)

Test date: November 14 and 16, 1989

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported						
			Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Average
1	Stack temperature	Deg F	178.17	197.92	203.75	190.92	191.5	195.17	
	Pressure	in. HG	29.33	29.34	29.30	28.85	28.85	28.85	
	Moisture	%	42.55	37.43	34.79	17.91	36.57	27.95	
	Oxygen	%	14.3	15.7	16.3	16.7	15.8	14.2	
	Volumetric flow, actual	acfm	71988	76622	76088	72117	75603	73115	
	Volumetric flow, standard*	dscfm	33670	37872	38798	46479	37617	41091	
	Isokinetic variation	%	110.19	101.67	101.88	79.7	101.38	95.31	
Wet pulp feed rate		TPH	30.6	30.6	27.5	43.6	42.9	27.8	
Pollutant concentrations:									
	Filterable PM	G/dscf	0.0643	0.0462	0.0703	0.0411	0.0478	0.0558	
	CO2	% dv	3.1	2.4	1.8	2	3.3	3.5	
Pollutant mass flux rates:									
	Filterable PM	lb/hr	void	15.0	23.4	void	15.4	19.7	
	CO2	lb/hr	void	6229	4786	void	8507	9856	
Emission factors (ENGLISH UNITS):									AVERAGE
	Filterable PM	lb/ton		0.49	0.85		0.36	0.71	0.60
	CO2	lb/ton		204	174		198	355	233
Emission factors (METRIC UNITS):									AVERAGE
	Filterable PM	kg/Mg		0.25	0.43		0.18	0.35	0.30
	CO2	kg/Mg		102	87		99	177	116

*DSCFM BASED ON A STANDARD TEMPERATURE OF 70 DEGREES FAHRENHEIT

MIDWEST RESEARCH INSTITUTE

Project/Acct. No. 4602-03 Date/Time 12/9/94

Project Title SUGAR BEET PROCESSING - AP-42

Phone Contact ☐

Meeting Notes ☐

Work Sheet ☒

Signature YML Verified by _____
(signature/date)

Page 1 of 2

CARROLLTON, MICHIGAN FACILITY

TEST DATES: 11/14/89 and 11/16/89

TEST No.

Time

11/14/89

TOTAL DRY PULP PRODUCED = 186 tons

P-1

10:40 - 11:55

7.75 tons/hr. AVERAGE

P-2

NA (not available)

P-3

NA (not available)

11/16/89

TOTAL DRY PULP PRODUCED = 166 tons

P-1

11:11 - 12:20

6.92 tons/hr. AVERAGE

P-2

1:47 - 2:49

P-3

3:29 - 7:11

AVERAGE OVER TEST RUN

<u>TEST No.</u>	<u>SLICE RATE (tons/hr)</u>	<u>PRESSED PULP MOISTURE (%)</u>	<u>DRIED PULP MOISTURE (%)</u>
<u>11/14/89</u>			
P-1	<u>130</u>	<u>77.5</u>	<u>11.0</u>
P-2	<u>130</u>	<u>77.5 (est.)</u>	<u>11.0 (est.)</u>
P-3	<u>130</u>	<u>74.5 (est.)</u>	<u>10.1 (est.)</u>

11/16/89

P-1

130

86.0

12.5

P-2

125

86.0

12.5

P-3

111

78.0

11.2

% Solids = $\frac{\text{Dry Pulp Produced} - \text{Dry Pulp Moisture} \times \text{Pulp Produced}}{\text{Beets Sliced}}$

11/14/89:

P-1:

$$\% \text{ Solids} = \frac{7.75 - (0.11 \times 7.75)}{130} = \frac{6.90}{130} \times 100 = 5.3\%$$

MIDWEST RESEARCH INSTITUTE

Project/Acct. No. 4602-23 Date/Time 12/9/94

Project Title SUGAR BEET PROCESSING AT-42

Phone Contact ☐

Meeting Notes ☐

Work Sheet ☒

Signature gwt Verified by _____ (signature/date)

Page 2 of 2

P-2: % Solids = $\frac{7.75 - (0.11 \times 7.75)}{130} = \frac{6.90}{130} \times 100 = 5.3\%$

P-3: % Solids = $\frac{7.75 - (0.101 \times 7.75)}{130} = \frac{6.97}{130} \times 100 = 5.4\%$

11/16/89:

P-1: % Solids = $\frac{6.92 - (0.125 \times 6.92)}{130} = \frac{6.05}{130} \times 100 = 4.7\%$

P-2: % Solids = $\frac{6.92 - (0.125 \times 6.92)}{125} = \frac{6.05}{125} \times 100 = 4.8\%$

P-3: % Solids = $\frac{6.92 - (0.112 \times 6.92)}{111} = \frac{6.14}{111} \times 100 = 5.5\%$

Process Rate = $\frac{\text{Beets Sliced} \times \% \text{ Solids}}{1 - \left(\frac{\text{wet pulp moisture}(\%)}{100} \right)}$
(tons/hr)

11/14/89

P-1: Rate = $\frac{130 \times 0.053}{1 - \left(\frac{77.5}{100} \right)} = \frac{6.89}{0.225} = 30.6 \text{ tons/hr.}$

P-2: Rate = $\frac{130 \times 0.053}{1 - \left(\frac{77.5}{100} \right)} = \frac{6.89}{0.225} = 30.6 \text{ tons/hr.}$

P-3: Rate = $\frac{130 \times 0.054}{1 - \left(\frac{76.5}{100} \right)} = \frac{7.02}{0.255} = 27.5 \text{ tons/hr.}$

11/16/89

P-1: Rate = $\frac{130 \times 0.047}{1 - \left(\frac{86.0}{100} \right)} = \frac{6.11}{0.14} = 43.6 \text{ tons/hr.}$

P-2: Rate = $\frac{125 \times 0.048}{1 - \left(\frac{86.0}{100} \right)} = \frac{6.00}{0.14} = 42.9 \text{ tons/hr.}$

P-3: Rate = $\frac{111 \times 0.055}{1 - \left(\frac{78.0}{100} \right)} = \frac{6.11}{0.22} = 27.8 \text{ tons/hr.}$

APPENDIX X

REPORT EXCERPTS FROM REFERENCE 25

(Michigan Sugar Company, November 19, 1990)

PARTICULATE EMISSION STUDY

MICHIGAN SUGAR COMPANY
CROSWELL, MICHIGAN

Report Prepared For:

Michigan Sugar Company
P. O. Box 1348
Saginaw, Michigan 48605

November 19, 1990
MA-6482



SWANSON ENVIRONMENTAL INC.

24156 Haggerty Road • Farmington Hills, Michigan 48335
(313) 478-2700 Fax: (313) 478-3819

SWANSON ENVIRONMENTAL INC.

PARTICULATE EMISSION STUDY
MICHIGAN SUGAR COMPANY
CROSWELL, MICHIGAN
NOVEMBER 19, 1990
MA-6482

EXECUTIVE SUMMARY

Swanson Environmental, Inc. (SEI) was retained by Michigan Sugar Company to perform a particulate emissions study on the exhaust gases discharged from the Pulp Drier at their Croswell, Michigan facility.

The study took place on November 13, 1990 and was conducted in accordance with U.S. EPA Methods 1, 2, 3, 4 and MDNR Method 5B for the purpose of fulfilling compliance requirements. The results of the study are as follows:

Drier Exhaust

Test No.	Test Date	Stack Gas Flow Rate (DSCFM)	Lbs/1000 Lbs EG @ (Dry)	Lbs/1000 Lbs dry 50% EA*	Lbs/1000 Lbs EG @	Lbs/Hour
P-1	11-13-90	32426	0.110	0.262	0.078	16.175
P-2	11-13-90	34044	0.102	0.263	0.072	15.819
P-3	11-13-90	33804	0.099	0.275	0.070	15.152
Average		33425	0.104	0.267	0.073	15.715

EA * = Excess Air

EG @ = Exhaust Gas

SWANSON ENVIRONMENTAL, INC.
PARTICULATE SAMPLING DATA AND CALCULATIONS

PLANT: MI SUGAR

SOURCE: DRYER EXH.

DATE: 11-13-90

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=====
CLOCK TIME:                60.00        60.00        60.00

1.00 NUMBER                P-1          P-2          P-3
B.  STACK DIAMETER, In      72.000      72.000      72.000
C.  STACK AREA, Sq.Ft      28.27       28.27       28.27
D.  No. SAMPLE POINTS      24.00       24.00       24.00
E.  TOTAL SAMPLE TIME, MIN. 60.00       60.00       60.00
F.  NOZZLE DIAMETER, In.   0.357       0.357       0.357
G.  NOZZLE AREA, Sq.Ft.    0.00070     0.00070     0.00070
H.  CALIBRATION FACTORS:
    PITOT TUBE, Cp         0.8090      0.8090      0.8090
    GAS METER, y           0.970       0.970       0.970
I.  BAROMETRIC PRESSURE,    30.49       30.52       30.54
    In.Hg.
J.  STACK STATIC PRESSURE   0.32        0.32        0.32
    In.H2O
K.  STACK GAS TEMP.        279.54      270.79      276.96
L.  AVG. Sq. Rt. VEL. HEAD 0.64        0.67        0.67
M.  AVG. METER TEMP.       76.75      77.50      77.38
N.  AVG. METER PRESS., H2O  2.16       2.43       2.36
O.  METER VOL., ACTUAL      Cu. Ft.
    47.29       50.51       46.81
P.  METER VOL., @STP        46.41      49.59      45.99
Q.  LIQUID VOL., H2O COND., 646.10      714.90     651.20
    Ml.
R.  VAPOR VOL., H2O COND., 30.63       33.89      30.87
    @STP, Cu.Ft.
S.  TOTAL GAS SAMPLED,     77.04      83.47      76.85
    @ STP, Cu.Ft.
T.  %MOISTURE IN EXHAUST GAS
    1) AT TEST LOCATION    39.75      40.60      40.16
    2) BEFORE COLLECTOR    0.00       0.00       0.00
U.  DRY GAS COMP.          %O2        15.4       15.8       16.2
    %CO2                   4.0        4.2        3.8
    %CO                     0.0         0.0        0.0
    %N2                     80.6       80.0       80.0
V.  DENSITY & MOL. Wt. -STACK GAS
    1) DRY, @ STP, Lbs/Cu.Ft. 0.0756     0.0758     0.0756
    2) WET, @ STP, Lbs/Cu.Ft. 0.0641     0.0639     0.0639
    3) WET @ STACK, Lbs/Cu.Ft. 0.0468     0.0473     0.0469
    4) MOL.Wt., @ STP, Lb/MOLE 29.26      29.31      29.26
W.  WEIGHT OF GAS SAMPLED:
    1) DRY GAS, Lbs         3.51       3.76       3.48
    2) WET GAS, Lbs         4.93       5.33       4.91
X.  TOTAL PARTICULATE COLLECTED 0.1752     0.1743     0.1560
    (GRAMS)

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Y.	AVERAGE GAS VELOCITY, FPM	2607	2740	2722
Z.	STACK GAS FLOW RATE			
	1)AT STACK, Qa, ACFM	73698	77469	76959
	2)AT Std., Qstd, SCFM	53822	57310	56494
	3)Std. DRY, Qdg, SCFM	32426	34044	33804
AA.	PERCENT EXCESS AIR	262	297	329
BB.	CONCENTRATION CONVERSION FACTORS:			
	1)50% E.A., AFTER COLLECTOR	1.70	1.76	1.83
	2)50% E.A., BEFORE COLLECTOR	3.35	3.66	3.93
	3)MOISTURE BEFORE COLLECTOR	1.41	1.42	1.41
CC.	PARTICULATE CONCENTRATION:			
	1)Lbs/1000 Lbs., ACTUAL	0.078	0.072	0.070
	2)Lbs/1000 Lbs., DRY	0.110	0.102	0.099
	3)Lbs/1000 Lbs., WET @ 50%E.A	0.133	0.127	0.128
	4)Lbs/1000 Lbs., DRY @ 50%E.A	0.262	0.263	0.275
	5)GRAINS / DSCF	0.058	0.054	0.052
	6)POUNDS / HOUR	16.175	15.819	15.152
DD.	PERCENT ISOKINETIC	96.9	98.6	92.1

+++++

Michigan Sugar Company

Pulp Drier Data

Date:

11-13-80

Operator:

Location:

Crescent

Equip. No.:

*Gallons on Oil, SCFH on Natural Gas
**If Applicable

Time	Slice Rate (Tons/Hr)	Totalizer Fuel Reading (Gallons)*	% Fuel Rate (GPH)*	Furnace Temp. (°F)	Exit Temp. (°F)	Pressure Differential Across The Drum (In. Of Water)	Pressure Differential Across The Collector (In. Of Water)	Flow Rate (ACFH)	Pressed Pulp Moisture (Feed) (% Water)	Dried Pulp Moisture (Product) (% Water)	**Feed Screw Speed Drier #1 (RPH)	Drier #2 (RPH)
6:00	168	60503	7.9	1590	266	1.03	8.1	11770	74.1	8.1	2530	15
6:15	163	60636	8.5	1620	280	.80	7.7	11360	74.9	11.1	2490	14
6:30	157	60728	6.5	1720	271	.60	5.2	12160	75.1	10.1	2010	16
6:45	152	60838	7.3	1530	271	1.19	8.0	11930	73.8	3.7	2550	16
7:00	156	60970	8.8	1530	250	1.25	8.2	11700	76.4	5.2	2560	15
7:15	150	61083	7.5	1530	253	.93	7.9	1190	77.5	13.3	2510	14
7:30	150	61224	9.4	1610	279	.80	8.3	11760	78.3	16.5	2560	15
7:45	145	61332	7.2	1610	284	.92	8.2	11750	75.9	12.9	2530	16
8:00	150	61447	7.7	1620	285	.94	8.2	11570	75.6	8.9	2570	15
8:15	140	61590	9.5	1670	285	.95	8.2	11550	72.8	7.1	2600	15
8:30	147	61862	11.5	1670	285	.95	8.2	11550	73.9	8.4	2600	15
8:45	146	61990	8.5	1580	284	.89	7.6	12570	73.7	6.5	2510	13
9:00	140	62128	9.2	1630	266	1.20	7.4	12760	74.4	3.5	2470	13
9:15	143	62266	5.9	1600	268	.95	7.8	12600	74.5	6.9	2510	15
9:30	150	62350	8.9	1590	266	.97	7.9	12510	77.2	8.9	2520	15
9:45	145	62514	10.9	1590	276	.96	7.7	12760	75.9	11.2	2500	14
10:00	153	62617	6.9	1620	274	.81	7.6	12560	74.0	11.1	2480	15
10:15	153	62714	6.5	1560	271	1.17	6.1	12850	74.0	3.4	2200	14
10:30	149	62828	7.6	1540	267	1.03	6.3	12480	68.1	2.8	2260	14
10:45	141	62942	7.1	1420	267	1.03	6.8	12840	1.92			

AM

Michigan Sugar Company

Pulp Drier Data

Date:

11-13-90

Operator:

Location:

Equip. No.:

Fuel Type:

*Gallons on Oil, SCFH on Natural Gas

*If Applicable

Line	Slide Rate (Tons/hr)	Totalizer Fuel Reading (Gallons)*	Fuel Rate (GPH)*	Furnace Temp. (°F)	Exit Temp. (°F)	Pressure Differential Across The Drum (In. Of Water)	Pressure Differential Across The Collector (In. Of Water)	FCR Flow Rate (ACFH)	Pressed Pulp Moisture (Feed) (X Water)	Dried Pulp Moisture (Product) (X Water)	*Press. Drier #1 (RPH)	*Press. Drier #2 (RPH)
1115	139	63057	7.7	1810	272	7.2	5.1	12590	68.1	4.1	2010	14
1130	147	63153	6.4	1780	268	9.0	5.5	12590	72.1	3.3	2090	14
1145	140	63263	7.3	1770	269	7.9	5.4	12550	73.3	2.2	2080	15
1160	142	63378	7.7	1760	259	9.4	5.7	12570	75.6	2.2	2160	14
1175	136	63505	8.5	1750	265	9.4	7.5	13200	73.9	4.8	2450	16
1190	145	63608	6.9	1720	260	7.4	4.8	13270	73.7	6.3	1950	16
1205	138	63710	6.8	1630	259	9.0	6.6	13310	69.0	3.2	2320	14
1220	130	63835	8.3	1650	267	7.3	5.7	13260	75.2	2.6	2130	15
1235	144	63944	7.3	1630	262	7.8	6.2	13620	69.1	3.3	2220	14
1250	140	64061	7.8	1550	262	8.5	6.2	13200	74.1	2.5	2230	14
1265	140	64177	7.7	1630	263	7.6	6.2	13500	73.5	2.5	2210	14
1280	140	64280	6.9	1690	284	8.9	5.9	13590	74.1	2.5	2190	15
1295	147	64390	7.3	1680	264	8.2	6.0	13840	73.2	2.5	2200	14
1310	151	64504	7.6	1710	265	8.8	6.1	13700	73.4	2.2	2200	14
1325	146	64610	7.1	1670	264	8.0	6.0	13720	72.4	2.2	2100	14
1340	142	64748	9.2	1650	262	9.6	6.2	13600	72.7	2.2	2280	14
1355	147	64832	5.6	1630	259	8.2	6.6	13640	73.3	2.5	2260	14
1370	133	64957	8.1	1650	260	9.1	6.4	13470	72.0	3.3	2250	14
1385	138	65077		1320	260	9.4	6.3	1400	69.5		2240	18
1400	160	65137		1530	270	7.3	6.2	1411			2230	15
1415	140	65208		1530	262	7.7	6.2	1370			2210	15

1991

PULP PRODUCED				PRESSED PULP				DRY PULP				PELLET PULP				SUGAR IN PRESSED PULP									
DATE		DAY		Z ON BEETS		AVE		MOISTURE		DAY		TOTAL		MOISTURE		DAY		TOTAL		Z SUGAR		DAY		TOTAL	
DATE		DAY		Z ON BEETS		AVE		MOISTURE		DAY		TOTAL		MOISTURE		DAY		TOTAL		Z SUGAR		DAY		TOTAL	
10/26	32	122	4279	3.99	4.58	134	74.48	2210.24	73.67	11.35	291.30	9.71	11.56	328.86	10.96	.30	36	9.17	334.80						
10/27	33	180	4459	5.00	4.59	135	73.26	2283.50	73.66	9.15	300.45	9.69	12.24	341.10	11.00	.31	36	11.16	345.96						
10/28	34	150	4609	4.50	4.59	136	73.85	2357.35	73.67	9.75	310.20	9.69	11.32	352.42	11.01	.37	36	12.35	358.31						
10/29	35	178	4787	4.99	4.60	137	75.93	2433.28	73.74	9.83	320.03	9.74	12.18	364.60	11.05	.43	36	15.33	373.64						
10/30	36	152	4939	4.49	4.60	137	76.85	2510.13	73.83	11.23	331.26	9.74	11.78	376.38	11.07	.40	36	13.55	387.19						
10/31	37	146	5085	4.50	4.60	137	73.16	2583.29	73.81	10.05	341.31	9.75	10.19	386.57	11.04	.33	36	10.71	397.90						
11/01	38	92	5177	4.00	4.58	136	71.66	2654.95	73.75	9.50	350.81	9.74	11.14	397.71	11.05	.40	36	10.91	407.11						
TK 5	1020		4.53				74.17			10.12			11.49			.36		81.48							
TD			5177		4.58		73.75			9.74					11.05		.36		407.11						
11/02	39	158	5335	5.01	4.60	137	73.90	2728.85	73.75	10.22	361.03	9.76	11.26	408.97	11.05	.42	36	13.24	420.35						
11/03	40	163	5498	4.99	4.61	137	75.24	2804.09	73.79	9.53	370.56	9.75	11.39	420.36	11.06	.43	36	14.04	434.39						
11/04	41	145	5643	5.01	4.62	138	74.23	2878.32	73.80	10.10	380.66	9.76	11.65	432.01	11.08	.35	36	10.13	444.52						
11/05	42	88	5731	4.95	4.62	136	76.60	2954.92	73.87	8.43	389.09	9.73	10.96	442.97	11.07	.42	36	7.46	451.98						
11/06	43	93	5824	5.00	4.63	135	74.98	3029.90	73.90	9.09	398.18	9.71	11.06	454.03	11.07	.37	36	6.89	458.87						
11/07	44	111	5935	4.99	4.63	135	69.55	3099.45	73.80	8.12	406.30	9.67	11.38	465.41	11.08	.30	36	6.67	465.54						
11/08	45	85	6020	2.97	4.60	134	67.55	3167.00	73.65	7.26	413.56	9.62	10.96	476.37	11.08	.35	36	10.02	475.56						
TK 6	843		4.67				73.15			8.96			11.24			.38		68.45							
TD			6020		4.60		73.65			9.62					11.08		.36		475.56						
11/09	46	168	6188	5.01	4.61	135	70.48	3237.48	73.58	9.03	422.59	9.60	10.58	486.95	11.07	.31	36	10.40	485.96						
11/10	47	159	6347	4.99	4.62	135	73.86	3311.34	73.59	10.17	432.74	9.62	10.34	498.29	11.06	.37	36	11.79	497.75						
11/11	48	132	6479	4.49	4.61	135	74.74	3386.08	73.61	9.17	441.91	9.61	10.51	508.80	11.06	.45	36	13.23	510.98						
11/12	49	144	6623	4.50	4.61	135	74.81	3460.89	73.64	9.93	451.84	9.61	10.86	519.66	11.06	.44	37	14.07	525.05						
11/13	50	165	6788	5.00	4.62	136	73.70	3534.59	73.64	9.94	461.78	9.62	10.74	530.40	11.05	.34	36	11.22	536.27						
11/14	51	155	6943	4.98	4.63	136	72.92	3607.51	73.62	9.87	471.65	9.63	11.62	542.02	11.06	.37	37	11.51	547.78						
11/15	52	171	7114	4.99	4.63	137	73.72	3681.23	73.62	9.72	481.62	9.63	11.48	553.50	11.07	.48	37	16.46	564.24						
TK 7	1094		4.86				73.46			9.72			11.02			.39		88.68							
TD			7114		4.63		73.62			9.63					11.07		.37		564.24						
11/16	53	144	7258	4.98	4.64	137	75.05	3756.28	73.65	10.11	491.73	9.64	10.32	563.82	11.06	.47	37	13.60	577.84						
11/17	54	151	7409	5.00	4.65	137	70.40	3826.68	73.59	8.13	499.86	9.61	10.26	574.78	11.05	.38	37	11.48	589.32						
11/18	55	151	7560	5.00	4.65	137	75.36	3902.04	73.62	9.31	509.17	9.61	11.22	586.00	11.06	.37	37	11.17	600.49						
11/19	56	152	7712	4.97	4.66	138	74.39	3976.43	73.64	9.84	519.01	9.61	11.81	597.81	11.07	.40	37	12.71	612.72						
11/20	57	145	7857	4.98	4.67	138	73.27	4049.70	73.63	8.41	527.42	9.59	11.56	608.37	11.06	.54	37	15.71	628.43						
11/21	58	160	8017	4.94	4.67	138	72.92	4122.64	73.62	7.81	535.23	9.56	11.16	619.53	11.06	.43	37	13.94	642.37						
11/22	59	90	8107	4.93	4.67	137	74.23	4196.87	73.63	6.66	541.89	9.51	10.59	630.12	11.05	.54	38	9.86	652.23						
TK 8	993		4.97				73.66			8.61			10.95			.44		87.99							
TD			8107		4.67		73.63			9.51					11.05		.38		652.23						

Filename: BEET25.WQ1
 Date: 19-Jan-95
 Facility: Michigan Sugar Company
 Location: Croswell, Michigan
 Source: Pulp dryer with multiclones (fuel-oil fired)
 Test date: November 19, 1990

D. Emission Data/Mass Flux Rates/Emission Factors

Test ID	Parameter	Units	Values reported			
			Run ~~2~~ 1	Run ~~4~~ 2	Run ~~5~~ 3	Average
1	Stack temperature	Deg F	279.54	270.79	276.96	
	Pressure	in. HG	30.49	30.52	30.54	
	Moisture	%	39.75	40.6	40.16	
	Oxygen	%	15.4	15.8	16.2	
	Volumetric flow, actual	acfm	73698	77469	76959	
	Volumetric flow, standard*	dscfm	32428	34042	33806	
	Isokinetic variation	%	96.9	98.6	92.1	
Wet pulp feed rate		TPH	24.1	23.7	24.9	
Pollutant concentrations:						
	Filterable PM	G/dscf	0.058	0.054	0.052	
	CO2	% dv	4	4.2	3.8	
Pollutant mass flux rates:						
	Filterable PM	lb/hr	16.2	15.8	15.2	
	CO2	lb/hr	8890	9799	8804	
Emission factors (ENGLISH UNITS):						AVERAGE
	Filterable PM	lb/ton	0.67	0.67	0.61	0.65
	CO2	lb/ton	369	413	354	379
Emission factors (METRIC UNITS):						AVERAGE
	Filterable PM	kg/Mg	0.34	0.33	0.30	0.32
	CO2	kg/Mg	184	207	177	189

*DSCFM BASED ON A STANDARD TEMPERATURE OF 70 DEGREES FAHRENHEIT

MIDWEST RESEARCH INSTITUTE

Project/Acct. No. 4602-03 Date/Time 12/9/94

Project Title SUGAR BEET PROCESSING AP-42

Phone Contact ☐

Meeting Notes ☐

Work Sheet ☒

Signature YCH

Verified by _____
(signature/date)

Page 1 of 2

CROSWELL, MICHIGAN FACILITY

TEST DATE: 11/13/90

TEST No.

TIME (ESTIMATED)*

* ESTIMATED BASED ON 60 MINUTES PER TEST RUN AND INDICATED TIMES ON PULP DRIER DATA SHEET FOR 11-13-90

P-1

11:00 - 12:00

P-2

12:15 - 1:15

P-3

2:00 - 3:00

TOTAL DRY PULP PRODUCED ON 11/13/90 = 165 tons = 6.9 tons/hr.
AVERAGE

AVERAGE OVER 60 MINUTE TEST RUN

TEST No.

SLICE RATE
(tons/hr)

PROCESSED PULP
MOISTURE (%)

DRIED PULP
MOISTURE (%)

P-1

142

72.3

3.0

P-2

139

71.8

3.9

P-3

147

72.9

2.3

% SOLIDS = $\frac{\text{DRY PULP PRODUCED} - \text{DRY PULP MOISTURE} \times \text{PULP PRODUCED}}{\text{BEETS SLICED}}$

P-1: % SOLIDS = $\frac{6.9 - (0.03 \times 6.9)}{142} = \frac{6.69}{142} \times 100 = 4.7\%$

P-2: % SOLIDS = $\frac{6.9 - (0.039 \times 6.9)}{139} = \frac{6.63}{139} \times 100 = 4.8\%$

P-3: % SOLIDS = $\frac{6.9 - (0.023 \times 6.9)}{147} = \frac{6.74}{147} \times 100 = 4.6\%$

MIDWEST RESEARCH INSTITUTE

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Work Sheet ☒

Signature YWL Verified by _____

(signature/date)

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$$\text{Process Rate} = \frac{\text{Beets Sliced} \times \% \text{ Solids}}{(\text{tons/hr}) \left(1 - \frac{(\text{wet pulp moisture } (\%))}{100} \right)}$$

$$\text{P-1: Rate} = \frac{142 \times 0.047}{1 - \left(\frac{72.3}{100} \right)} = \frac{6.67}{0.277} = 24.1 \text{ tons/hr.}$$

$$\text{P-2: Rate} = \frac{139 \times 0.048}{1 - \left(\frac{71.8}{100} \right)} = \frac{6.67}{0.282} = 23.7 \text{ tons/hr.}$$

$$\text{P-3: Rate} = \frac{147 \times 0.046}{1 - \left(\frac{72.9}{100} \right)} = \frac{6.76}{0.271} = 24.9 \text{ tons/hr.}$$

APPENDIX Y

REPORT EXCERPTS FROM REFERENCE 26

(Western Sugar Company, January 10, 1995)

"EMISSIONS SURVEY CONDUCTED AT WESTERN SUGAR
COMPANY, LOCATED IN SCOTTSBLUFF, NEBRASKA"

CEM Supervisor:

J. Paul Benson

EPA 5 Supervisor:

Greg E. Johnson

Technicians:

Ryan B. Benson
Todd B. Benson
Rick P. Hawkins
JD Schiller
David F. Hunt

Test Dates:

December 14-17, 1994

Submittal Date:

January 10, 1995

Prepared for: Mr. Steve Geist

Western Sugar
2100 East Overland Drive
Scottsbluff, Nebraska 69361-1768

Prepared by: Mr. V. Brent Benson, Technical Director

American Environmental Testing, Inc.
565 South Birch Drive
Spanish Fork, Utah 84660

Table 2.1.2

(PM₁₀ Emissions Summary)

Pulp Dryer North Stack

Test Run	DSCF Collected	Emissions Rates	
		Lbs/hr	gr/dscf
1	30.8168	9.3954	0.0681
2	44.6983	6.8885	0.0510
3	44.5181	6.1525	0.0472
Average =	40.0111	7.4788	0.0554

Table 2.1.3

(PM₁₀ Emissions Summary)

Pulp Dryer South Stack

Test Run	DSCF Collected	Emissions Rates	
		Lbs/hr	gr/dscf
1	31.8780	6.1424	0.0444
2	44.8184	5.7570	0.0424
3	45.3842	6.1298	0.0456
Average =	40.6935	6.0097	0.0441

The average measured PM₁₀ emission concentration for the Pulp Dryer's North & South Stacks combined was 13.4885 lbs/hr, which is 67.44% of the NDEQ permitted allowable ceiling level of 20.0 lbs/hr.

AMERICAN ENVIRONMENTAL TESTING, INCORPORATED

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Spanish Fork, Utah 84660

**TABLE 4.1.12
(FIELD AND LABORATORY DATA SUMMARY)**

Plant : The Western Sugar Company
Source: Pulp Dryer North Stack
Type : EPA Method #5/202, 6C & 7E
Date : 12/14/94

Symbol	Description	Units	Test #1	Test #2	Test #3
Vm	Volume dry gas	ft3	37.931	53.963	55.754
	sampled @ meter conditions	iso	34.783	49.484	51.126
Pb	Barometric Pres	"Hg abs	26.11	26.25	26.21
ΔH	Average Pres drop across the orifice meter	"H2O	0.6106	1.2721	1.297
Tm	Average gas meter temp	°R	520.06	512.83	531.19
		°F	60.06	52.83	71.19
Yi	Meter Coefficient		0.917	0.917	0.917
Vw	Total H2O collected, impingers & silica gel	ml	532.1	797.9	849.5
CO2		%	7.2	4.6	4.7
O2		%	12.9	12.6	12.6
N2 + CO		%	79.9	82.8	82.7
Rn	Nozzle Dia.	in.	0.312	0.377	0.377
Ts	Stack Temp	°R	626.21	629.5	629.79
		°F	166.21	169.5	169.79
Sqr rt ΔP	Velocity head of stack gas	"H2O	0.4717	0.4657	0.4621
Cp	Pitot Tube Coefficient		0.8429	0.8429	0.8429
Ps	Static Pres	"H2O	-0.22	-0.22	-0.22
Pabs	Absolute Pres	"Hg	26.09	26.23	26.19
As	Area stack	ft2	19.635	19.635	19.635
	Stack in inches		60	60	60
Tt	Net time of test	min.	72	72	72
Mgp			136.1	147.8	136.3

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Spanish Fork, Utah 84660

**TABLE 4.1.13
(FIELD AND LABORATORY DATA SUMMARY)**

Plant : The Western Sugar Company
Source: Pulp Dryer South Stack
Type : EPA Method #5/202. 6C & 7E
Date : 12/13/94

Symbol	Description	Units	Test #1	Test #2	Test #3
Vm	Volume dry gas	ft ³	35.935	50.35	50.906
	sampled @ meter	iso	35.288	49.444	49.990
	conditions				
Pb	Barometric Pres	"Hg abs	26.49	26.25	26.23
ΔH	Average Pres	"H ₂ O	0.5273	1.2387	1.2473
	drop across the				
	orifice meter				
Tm	Average gas	°R	517.48	511.04	509.85
	meter temp	°F	57.48	51.04	49.85
Yi	Meter Coefficient		0.982	0.982	0.982
Vw	Total H ₂ O	ml	528.8	750.5	789.3
	collected, impingers				
	& silica gel				
CO ₂		%	8.4	4.7	4.6
O ₂		%	12.5	12.7	12.7
N ₂ + CO		%	79.1	82.6	82.7
Rn	Nozzle Dia.	in.	0.302	0.376	0.376
Ts	Stack Temp	°R	632.17	632.71	631.33
		°F	172.17	172.71	171.33
Sqr rt ΔP	Velocity head	"H ₂ O	0.4664	0.4583	0.4603
	of stack gas				
Cp	Pitot Tube		0.8414	0.8414	0.8414
	Coefficient				
Ps	Static Pres	"H ₂ O	-0.22	-0.22	-0.22
Pabs	Absolute Pres	"Hg	26.47	26.23	26.21
As	Area stack	ft ²	19.635	19.635	19.635
	Stack in inches		60	60	60
Tt	Net time	min.	72	72	72
	of test				
Mgp			91.7	123.2	134.1

AMERICAN ENVIRONMENTAL TESTING, INCORPORATED

565 So. Birch Drive 801-266-7111

Spanish Fork, Utah 84660

TABLE 4.1.20
(CALCULATED COMPLIANCE CRITERIA)

Plant : The Western Sugar Company
Source: Pulp Dryer North Stack
Type : EPA Method #5/202 . 6C & 7E
Date : 12/14/94

SYMBOL	DESCRIPTION	UNITS	Test #1	Test #2	Test #3
Vm std	Volume dry gas	dscfm	0.4280	0.6208	0.6183
	sampld @ standard	dscf	30.8168	44.6983	44.5181
	Conditions				
Vw gas	Volume water	scf	25.0459	37.5572	39.986
	vapor collected @				
	standard conditions				
Bws	Proportion by		0.4483	0.4566	0.4732
	volume of water				
	vapor in gas stream				
	dimensionless				
Md	Dry molecular	lb/lb mole	29.668	29.24	29.256
	weight				
Ms	Wet molecular	lb/lb mole	24.4367	24.1079	23.9298
	weight				
Vs	Stack gas	ft/sec	33.6831	33.4809	33.3799
	velocity				
Qs	Volumetric flow	ft ³ /hr	9.6583	9.4579	9.1233
	rate dry basis		x E +5	x E +5	x E +5
	standard conditions				
Iso	Isokinetic	%	98.4543	99.9774	103.2254
	variation				
Cs	Conc. Particulate	lb/scf	4.4164	3.3066	3.0617
	matter in stack		x E -3	x E -3	x E -3
	gas dry basis				
Emr	Emission rate *	lbs/dscf	9.7278	7.2833	6.7438
			x E -6	x E -6	x E -6
		gr/dscf	0.0681	0.051	0.0472
		lbs/hr	9.3954	6.8885	6.1525

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**TABLE 4.1.21
(CALCULATED COMPLIANCE CRITERIA)**

Plant : The Western Sugar Company

Source: Pulp Dryer South Stack

Type : EPA Method #5/202, 6C & 7E

Date : 12/14/94

SYMBOL	DESCRIPTION	UNITS	Test #1	Test #2	Test #3
Vm std	Volume dry gas	dscfm	0.4428	0.6225	0.6303
	sampled @ standard Conditions	dscf	31.878	44.8184	45.3842
Vw gas	Volume water vapor collected @ standard conditions	scf	24.8906	35.326	37.1524
Bws	Proportion by volume of water vapor in gas stream dimensionless		0.4385	0.4408	0.4501
Md	Dry molecular weight	lb/lb mole	29.844	29.26	29.244
Ms	Wet molecular weight	lb/lb mole	24.6509	24.2968	24.1827
Vs	Stack gas velocity	ft/sec	33.0189	32.8449	33.0414
Qs	Volumetric flow rate dry basis standard conditions	ft3/hr	9.6858	9.4998	9.4101
			x E +5	x E +5	x E +5
Iso	Isokinetic variation	%	108.3778	100.3349	102.569
Cs	Conc. Particulate matter in stack gas dry basis	lb/scf	2.8766	2.7489	2.9548
			x E -3	x E -3	x E -3
Emr	Emission rate *	lbs/dscf	6.3417	6.0601	6.514
			x E -6	x E -6	x E -6
		gr/dscf	0.0444	0.0424	0.0456
		lbs/hr	6.1424	5.757	6.1298
			*RUN #1	RUN #2	RUN #3
	NOx	ppm	63.12	53.19	61.82
		lbs/hr	14.554	12.056	13.663
	SO2	ppm	2.84	0.88	1.5
		lbs/hr	0.838	0.258	0.305

*For Pulp Dryer System (combined flow from North and South exhaust stacks)

American Environmental Testing Company, Inc.

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(801) 266-7111

LABORATORY DATA
EPA Method 5

Rack Box New One

Company: Western Sugar Run Number: #1 comp

Sampling Location: North Pulp Dryer Date: 12-15-94

Moisture Collected

	Initial Weight	Final Weight	Weight Gain
Impinger 1	<u>596.7</u>	<u>898.8</u>	<u>302.1</u>
Impinger 2	<u>570.6</u>	<u>731.4</u>	<u>160.8</u>
Impinger 3	<u>460.3</u>	<u>507.3</u>	<u>47.0</u>
Impinger 4	<u>399.4</u>	<u>412.7</u>	<u>13.3</u>
Impinger 5	<u>784.2</u>	<u>793.1</u>	<u>8.9</u>
		Total Gain =	<u>532.1</u>

Particulate Collected

Front - Half Analysis (Nozzle, Probe, Filter and Oven Glassware)

1. Filter Final Weight	<u>0.5490</u>
2. Filter Tare Weight	<u>0.5019</u> NP-1
3. Total Filter Weight	<u>0.0471</u> <u>47.1 mg</u>
4. Particulate caught in nozzle, probe and glassware	<u>0.0862</u>
5. Total Front - Half Catch	<u>0.1333</u>

Back - Half Analysis (Impingers, and Connecting Glassware)

1. Particulate caught in impingers
evaporated down at less than
120° F. 2.8 mg

Total Particulate Catch (Sum of Front and Back - Half Catches)

136.1 mg

POST TEST CALCULATION

VOLUME DRY GAS

$V_m(\text{std}) = 30.8168$

VOLUME H2O VAPOR

$V_w(\text{std}) = 25.0459$

MOISTURE CONTENT

$B_{ws} = 0.4483$

$V_m = 37.9310$

$V_m(\text{std}) = 30.8168$

$V_{wc}(\text{mls}) = 532.1$

$V_w(\text{std}) = 25.0459$

MOL WT DRY STACK GASES

$M_{ds} = 29.6680$

STACK VELOCITY

$V_s = 33.6831$

DRY STACK FLOW RATE

$Q(\text{std}) = 9.6583E+5$

$K_p = 85.49$

MOL WT WET STACK GASES

$V_s = 33.6831$

$M_{ws} = 24.4367$

ISOKINETIC CALCULATION

$A_n = 5.3093E-4$

% ISO = 98.4543

PARTICULATE CONCENTRATION

$C_s = 4.4164E-3$

$M_n = 136.1$

$C_s = 4.4164E-3$

lbs/dscf = 9.7278E-6

grains/dscf = 0.0681

lbs/hr = 9.3954

Initial Leak Check Rate

Finish 257.288

Start 257.285

Rate = 0.0030

Pitot Tubes

A = OK

B = OK

Vac. = 19.5

Final Leak Check Rate

Finish 295.451

Start 295.448

Rate = 0.0030

Pitot Tubes

A = OK

B = OK

Vac. = 18.9

American Environmental Testing Company, Inc.

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Spanish Fork, Utah 84660
(801) 266-7111

LABORATORY DATA
EPA Method 5

New Rack Box

Company: Western Sugar

Run Number: #2 Compliance

Sampling Location: North Pulp Dryer

Date: 12-15-94

Moisture Collected

	Initial Weight	Final Weight	Weight Gain
Impinger 1	<u>600.2</u>	<u>868.8</u>	<u>268.6</u>
Impinger 2	<u>573.8</u>	<u>837.4</u>	<u>263.6</u>
Impinger 3	<u>460.9</u>	<u>711.1</u>	<u>250.2</u>
Impinger 4	<u>400.3</u>	<u>402.2</u>	<u>1.9</u>
Impinger 5	<u>793.1</u>	<u>806.7</u>	<u>13.6</u>
Total Gain =			<u>797.9</u>

Particulate Collected

Front - Half Analysis (Nozzle, Probe, Filter and Oven Glassware)

1. Filter Final Weight	<u>0.5712</u>	NP-2
2. Filter Tare Weight	<u>0.5053</u>	
3. Total Filter Weight	<u>0.0659</u>	
4. Particulate caught in nozzle, probe and glassware	<u>0.0787</u>	
5. Total Front - Half Catch	<u>0.1456</u>	

Back - Half Analysis (Impingers, and Connecting Glassware)

1. Particulate caught in impingers
evaporated down at less than
120° F.

2.2

Total Particulate Catch (Sum of Front and Back - Half Catches)

147.8 mg

POST TEST CALCULATION

VOLUME DRY GAS

$V_m(\text{std}) = 44.6983$

$V_m = 53.9630$

$V_m(\text{std}) = 44.6983$

VOLUME H2O VAPOR

$V_w(\text{std}) = 37.5572$

$V_w(\text{mb}) = 777.9$

$V_w(\text{std}) = 37.5572$

MOISTURE CONTENT

$B_{ws} = 0.4566$

MOL WT DRY STACK GASES

$M_{ds} = 29.2400$

MOL WT WET STACK GASES

$M_{ws} = 24.1079$

STACK VELOCITY

$V_s = 33.4809$

$K_p = 85.49$

$V_s = 33.4809$

DRY STACK FLOW RATE

$Q(\text{std}) = 9.4579E+5$

ISOKINETIC CALCULATION

$A_n = 7.7519E-4$

$\% \text{ ISO} = 99.9774$

PARTICULATE CONCENTRATION

$C_s = 3.3066E-3$

$M_n = 147.8$

$C_s = 3.3066E-3$

$\text{lbs/dscf} = 7.2833E-6$

$\text{grains/dscf} = 0.0510$

$\text{lbs/hr} = 6.8885$

Initial Leak Check Rate

Finish 295.728

Start 295.722

Rate = 0.0060

Vac. = 20.2

Pitot Tubes

A = OK

B = OK

Final Leak Check Rate

Finish 349.826

Start 349.822

Rate = 0.0040

Vac. = 16.4

Pitot Tubes

A = OK

B = OK

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LABORATORY DATA

EPA Method 5

New Rack Box

Company: Western Sugar

Run Number: #3 Compliance

Sampling Location: North Pulo Dryer

Date: 12-16-74

Moisture Collected

	Initial Weight	Final Weight	Weight Gain
Impinger 1	<u>602.2</u>	<u>865.5</u>	<u>263.3</u>
Impinger 2	<u>575.2</u>	<u>803.4</u>	<u>228.2</u>
Impinger 3	<u>463.1</u>	<u>795.4</u>	<u>332.3</u>
Impinger 4	<u>400.6</u>	<u>409.2</u>	<u>8.6</u>
Impinger 5	<u>826.4</u>	<u>843.5</u>	<u>17.1</u>
		Total Gain =	<u>849.5</u>

Particulate Collected

Front - Half Analysis (Nozzle, Probe, Filter and Oven Glassware)

1. Filter Final Weight	<u>0.5549</u>	
2. Filter Tare Weight	<u>0.5070</u>	
3. Total Filter Weight	<u>0.0479</u>	
4. Particulate caught in nozzle, probe and glassware	<u>0.0854</u>	
5. Total Front - Half Catch	<u>0.1333</u>	

NP-3

Back - Half Analysis (Impingers, and Connecting Glassware)

1. Particulate caught in impingers
evaporated down at less than
120° F.

3.0 mg

Total Particulate Catch (Sum of Front and Back - Half Catches)

136.3 mg

POST TEST CALCULATION

VOLUME DRY GAS

$V_m(\text{std}) = 44.5181$

VOLUME H2O VAPOR

$V_w(\text{std}) = 39.9860$

MOISTURE CONTENT

$B_{ws} = 0.4732$

$V_m = 55.7540$

$V_m(\text{std}) = 44.5181$

$V_{wc}(\text{mls}) = 649.5$

$V_w(\text{std}) = 39.9860$

MOL WT DRY STACK GASES

$M_{ds} = 29.2560$

STACK VELOCITY

$V_s = 33.3799$

DRY STACK FLOW RATE

$Q(\text{std}) = 9.1233E+5$

$K_p = 85.49$

MOL WT WET STACK GASES

$V_s = 33.3799$

$M_{ws} = 23.9298$

ISOKINETIC CALCULATION

$A_n = 7.7519E-4$

% ISO = 103.2254

PARTICULATE CONCENTRATION

$C_s = 3.0617E-3$

$M_n = 136.3$

$C_s = 3.0617E-3$

$\text{lbs/dscf} = 6.7438E-6$

$\text{grains/dscf} = 0.0472$

$\text{lbs/hr} = 6.1525$

Initial Leak Check Rate

Finish 350.119

Start 350.115

Rate = 0.0040

Pitot Tubes

A = OK

B = OK

$V_{ac} = 19.6$

Final Leak Check Rate

Finish 406.343

Start 406.337

Rate = 0.0060

Pitot Tubes

A = OK

B = OK

$V_{ac} = 15.8$

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LABORATORY DATA

EPA Method 5

Company: Western Sugar Run Number: #1 comp.
Sampling Location: South Pk. Rd Date: 12-13-94

Moisture Collected

	Initial Weight	Final Weight	Weight Gain
Impinger 1	<u>600.3</u>	<u>860.8</u>	<u>260.5</u>
Impinger 2	<u>518.0</u>	<u>738.0</u>	<u>220.0</u>
Impinger 3	<u>506.8</u>	<u>540.9</u>	<u>34.1</u>
⁴ Impinger ~~4~~ 5	<u>405.9</u>	<u>413.6</u>	<u>7.7</u>
	<u>836.7</u>	<u>843.2</u>	<u>6.5</u>

Total Gain = 528.8

Particulate Collected

Front - Half Analysis (Nozzle, Probe, Filter and Oven Glassware)

1. Filter Final Weight	<u>0.7547</u>	
2. Filter Tare Weight	<u>0.7071</u>	<u>Sp-1</u>
3. Total Filter Weight	<u>0.0476</u>	<u>47.6 mg</u>
4. Particulate caught in nozzle, probe and glassware	<u>0.0425</u>	
5. Total Front - Half Catch	<u>0.0901</u>	<u>90.1</u>

Back - Half Analysis (Impingers, and Connecting Glassware)

1. Particulate caught in impingers
evaporated down at less than
120° F.

1.6 mg

Total Particulate Catch (Sum of Front and Back - Half Catches)

91.7 mg

POST TEST CALCULATION

VOLUME DRY GAS
 $V_m(\text{std}) = 31.8780$

VOLUME H2O VAPOR
 $V_w(\text{std}) = 24.8906$

MOISTURE CONTENT
 $B_{ws} = 0.4385$

V_m 35.9350
 $V_m(\text{std}) = 31.8780$

$V_{ic}(\text{mls})$ 528.8
 $V_w(\text{std}) = 24.8906$

MOL WT DRY STACK GASES

STACK VELOCITY
 $V_s = 33.0189$

DRY STACK FLOW RATE

$M_{ds} = 29.8440$

$Q(\text{std}) = 9.6858E+5$

MOL WT WET STACK GASES

K_p 85.49
 $V_s = 33.0189$

$M_{ws} = 24.6509$

ISOKINETIC CALCULATION

PARTICULATE CONCENTRATION

$A_n = 4.9744E-4$

$C_s = 2.8766E-3$

% ISO = 108.3778

M_n 91.7

$C_s = 2.8766E-3$

$\text{lbs/dscf} = 6.3417E-6$

$\text{grains/dscf} = 0.0444$

$\text{grams/dscm} = 0.1016$

$\text{lbs/hr} = 6.1424$

Initial Leak Check Rate

Finish 667.154

Pitot Tubes

Start 667.152

A = OK

Rate = 0.0020

B = OK

Vac. = 20.5

Final Leak Check Rate

Finish 703.459

Pitot Tubes

Start 703.456

A = OK

B = OK

Rate = 0.0030

Vac. = 19.9

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LABORATORY DATA

EPA Method 5

Company: Western Sugar Run Number: #2 comp

Sampling Location: Int'l Pulp Dryer Date: 12-14-94

Moisture Collected

	Initial Weight	Final Weight	Weight Gain
Impinger 1	<u>596.8</u>	<u>871.0</u>	<u>274.2</u>
Impinger 2	<u>518.5</u>	<u>695.0</u>	<u>176.5</u>
Impinger 3	<u>508.8</u>	<u>734.2</u>	<u>227.4</u>
Impinger 4	<u>406.6</u>	<u>448.3</u>	<u>41.7</u>
Impinger 5	<u>842.8</u>	<u>873.5</u>	<u>30.7</u>
		Total Gain =	<u>750.5</u>

Particulate Collected

Front - Half Analysis (Nozzle, Probe, Filter and Oven Glassware)

1. Filter Final Weight	<u>0.7821</u>	
2. Filter Tare Weight	<u>0.7143</u>	Sp-2
3. Total Filter Weight	<u>0.0678</u>	
4. Particulate caught in nozzle, probe and glassware	<u>0.0531</u>	
5. Total Front - Half Catch	<u>0.1209</u>	

Back - Half Analysis (Impingers, and Connecting Glassware)

1. Particulate caught in impingers evaporated down at less than 120° F.	<u>2.3</u>

Total Particulate Catch (Sum of Front and Back - Half Catches)

23.2

POST TEST CALCULATION

VOLUME DRY GAS

$V_m(\text{std}) = 44.8184$

VOLUME H2O VAPOR

$V_w(\text{std}) = 35.3260$

MOISTURE CONTENT

$Bws = 0.4408$

$V_m = 50.3500$

$V_m(\text{std}) = 44.8184$

$V_w(\text{mls}) = 750.5$

$V_w(\text{std}) = 35.3260$

MOL WT DRY STACK GASES

$Mds = 29.2600$

STACK VELOCITY

$V_s = 32.8449$

DRY STACK FLOW RATE

$Q(\text{std}) = 9.4998E+5$

$K_p = 85.49$

MOL WT WET STACK GASES

$V_s = 32.8449$

$Mws = 24.2968$

ISOKINETIC CALCULATION

$A_n = 7.7109E-4$

$\% \text{ ISO} = 100.3349$

PARTICULATE CONCENTRATION

$C_s = 2.7489E-3$

$M_n = 123.2$

$C_s = 2.7489E-3$

$\text{lbs/dscf} = 6.0601E-6$

$\text{grains/dscf} = 0.0424$

$\text{grams/dscm} = 0.0971$

$\text{lbs/hr} = 5.7570$

Initial Leak Check Rate

Finish 703.615

Start 703.612

Rate = 0.0030

Vac. = 19

Pitot Tubes

A = OK

B = OK

Final Leak Check Rate

Finish 754.219

Start 754.215

Rate = 0.0040

Vac. = 20.5

Pitot Tubes

A = OK

B = OK

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LABORATORY DATA

EPA Method 5

Company: Western Sugar

UT Box
Run Number: #3 Compliance

Sampling Location: South Pulp Dryer

Date: 12-16-94

Moisture Collected

	Initial Weight	Final Weight	Weight Gain
Impinger 1	<u>598.5</u>	<u>869.0</u>	<u>270.5</u>
Impinger 2	<u>525.1</u>	<u>720.6</u>	<u>195.5</u>
Impinger 3	<u>508.8</u>	<u>810.0</u>	<u>301.2</u>
Impinger 4	<u>408.2</u>	<u>413.2</u>	<u>5.0</u>
Impinger 5	<u>750.8</u>	<u>767.9</u>	<u>17.1</u>
		Total Gain =	<u>789.3</u>

Particulate Collected

Front - Half Analysis (Nozzle, Probe, Filter and Oven Glassware)

1. Filter Final Weight	<u>0.7952</u>	
2. Filter Tare Weight	<u>0.7130</u>	~~Sp~~ Sp-3
3. Total Filter Weight	<u>0.0822</u>	
4. Particulate caught in nozzle, probe and glassware	<u>0.0500</u>	
5. Total Front - Half Catch	<u>0.1322</u>	

Back - Half Analysis (Impingers, and Connecting Glassware)

1. Particulate caught in impingers
evaporated down at less than
120° F. 1.9 mg

Total Particulate Catch (Sum of Front and Back - Half Catches)

134.1 mg

POST TEST CALCULATION

VOLUME DRY GAS
Vm(std) = 45.3842

VOLUME H2O VAPOR
Vw(std) = 37.1524

MOISTURE CONTENT
Bws = 0.4501

Vm 50.9060
Vm(std) = 45.3842

Vic(mls) 789.3
Vw(std) = 37.1524

MOL WT DRY STACK GASES

STACK VELOCITY

DRY STACK FLOW RATE

Mds = 29.2440

Vs = 33.0414

Q(std) = 9.4101E+5

MOL WT WET STACK GASES

Kp 85.49

Vs = 33.0414

Mws = 24.1827

ISOKINETIC CALCULATION

PARTICULATE CONCENTRATION

An = 7.7109E-4

Cs = 2.9548E-3

% ISO = 102.5690

Mn 134.1

Cs = 2.9548E-3

lbs/dscf = 6.5140E-6

grains/dscf = 0.0456

grams/dscm = 0.1043

lbs/hr = 6.1298

Initial Leak Check Rate

Finish 754.864

Pitot Tubes

Start 754.861

A = OK

Rate = 0.0030

B = OK

Vac. = 18.7

Final Leak Check Rate

Pitot Tubes

Finish 806.026

A = OK

Start 806.024

B = OK

Rate = 0.0020

Vac. = 15.8

Filename: BEET26.WQ1

Date: 12-Feb-96

Facility: Western Sugar Company

Location: Scottsbluff, Nebraska

Source: North and South Pulp Dryer Stacks

Natural gas-fired rotary drum beet pulp dryer controlled with a wet scrubber

Test date: Dec. 13-14, 1994

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
1	Stack temperature	Deg F	166.21	169.5	169.79	
NORTH STACK	Pressure	in. HG	26.09	26.23	26.19	
	Moisture	%	44.83	45.66	47.32	
	Oxygen	%	12.9	12.6	12.6	
	Volumetric flow, actual	acfm	ND	ND	ND	
	Volumetric flow, standard*	dscfm	16097	15763	15206	
	Isokinetic variation	%	98.5	100	103.2	
Circle: Production or feed rate		TPH	36.39	36.39	36.39	
Capacity:						
Pollutant concentrations:						
	Total PM	G/dscf	0.0681	0.0510	0.0472	
	Filterable PM	G/dscf	0.0667	0.0502	0.0462	
	Condensable inorganic PM	G/dscf	0.00140	0.00076	0.00104	
	CO2	% vol	7.2	4.6	4.7	
Pollutant mass flux rates:						
	Filterable PM	lb/hr	9.20	6.79	6.02	
	Condensable inorganic PM	lb/hr	0.193	0.103	0.135	
	CO2	lb/hr	7941	4968	4897	
	Total PM	lb/hr	9.40	6.89	6.15	
Emission factors (ENGLISH UNITS):						AVERAGE
	Filterable PM	lb/ton	0.253	0.187	0.165	0.202
	Condensable inorganic PM	lb/ton	0.00531	0.00282	0.00372	0.00395
	CO2	lb/ton	218	137	135	163
Emission factors (METRIC UNITS):						AVERAGE
	Filterable PM	kg/Mg	0.126	0.093	0.083	0.101
	Condensable inorganic PM	kg/Mg	0.00266	0.00141	0.00186	0.00198
	CO2	kg/Mg	109	68.3	67.3	81.6

Test ID	Parameter	Units	Values reported			
			Run 1	Run 2	Run 3	Run 4
2	Stack temperature	Deg F	172.17	172.71	171.33	
SOUTH STACK	Pressure	in. HG	26.47	26.23	26.21	
	Moisture	%	43.85	44.08	45.01	
	Oxygen	%	12.5	12.7	12.7	
	Volumetric flow, actual	acfm	ND	ND	ND	
	Volumetric flow, standard*	dscfm	16143	15833	15684	
	Isokinetic variation	%	108.4	100.3	102.6	
Circle: Production or feed rate		TPH	36.39	36.39	36.39	
Capacity:						
Pollutant concentrations:						
	Total PM	G/dscf	0.0444	0.0424	0.0456	
	Filterable PM	G/dscf	0.0436	0.0416	0.0419	
	Condensable inorganic PM	G/dscf	0.00077	0.00079	0.00371	
	CO2	% vol	8.4	4.7	4.6	
	NOx	ppmdv	63.12	53.19	61.82	
	SO2	ppmdv	2.84	0.88	1.5	
Pollutant mass flux rates:						
	Filterable PM	lb/hr	6.04	5.65	5.63	
	Condensable inorganic PM	lb/hr	0.107	0.107	0.498	
	CO2	lb/hr	9291	5099	4943	
	Total PM	lb/hr	6.14	5.75	6.13	
	NOx	lb/hr	7.3	6.0	6.9	
	SO2	lb/hr	0.457	0.139	0.234	
Emission factors (ENGLISH UNITS):						AVERAGE
	Filterable PM	lb/ton	0.166	0.155	0.155	0.159
	Condensable inorganic PM	lb/ton	0.00295	0.00295	0.0137	0.00653
	CO2	lb/ton	255	140	136	177
	NOx	lb/ton	0.201	0.166	0.191	0.186
	SO2	lb/ton	0.0126	0.00382	0.00644	0.00761
Emission factors (METRIC UNITS):						AVERAGE
	Filterable PM	kg/Mg	0.0829	0.0776	0.0774	0.0793
	Condensable inorganic PM	kg/Mg	0.00147	0.00148	0.00685	0.00327
	CO2	kg/Mg	128	70.1	67.9	88.6
	NOx	kg/Mg	0.100	0.0829	0.0954	0.0929
	SO2	kg/Mg	0.00628	0.00191	0.00322	0.00380

TOTAL EMISSION FACTORS FOR BOTH STACKS	Emission factors (ENGLISH UNITS):					AVERAGE
	Filterable PM	lb/ton	0.419	0.342	0.320	0.360
	Condensable inorganic PM	lb/ton	0.00826	0.00577	0.0174	0.0105
	CO2	lb/ton	474	277	270	340
	NOx (calc. uses N+S stack flow)	lb/ton	0.401	0.331	0.376	0.369
	SO2 (calc. uses N+S stack flow)	lb/ton	0.0251	0.00762	0.0127	0.0151
	Emission factors (METRIC UNITS):					AVERAGE
	Filterable PM	kg/Mg	0.209	0.171	0.160	0.180
	Condensable inorganic PM	kg/Mg	0.00413	0.00289	0.00871	0.00524
	CO2	kg/Mg	237	138	135	170
	NOx (calc. uses N+S stack flow)	kg/Mg	0.200	0.165	0.188	0.185
	SO2 (calc. uses N+S stack flow)	kg/Mg	0.0125	0.00381	0.00635	0.00756