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

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

| | |
|---|---|
| AP42 Section: | 9.10.1.2 |
| Background Chapter | 4 |
| Reference: | 16 |
| Title: | Results of the February 22-24, 1994, Air Emission Compliance Testing of Process Sources at the American Crystal Sugar East Grand Forks Plant, Interpoll Laboratories, Inc., Circle Pines, MN,<br><br>March 21, 1994. |

# 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

# 1 INTRODUCTION

During February 22 - 24, 1994 Interpoll Laboratories Personnel conducted State Air Emission Compliance Tests on the following sources at the American Crystal Sugar (ACS) Plant in East Grand Forks, Minnesota:

| SOURCE | POLLUTANT | EMISSION POINT NO. |
|---|---|---|
| "A" Pulp Dryer Stack | PM,$NO_x$ | 3 |
| "B" Pulp Dryer Stack | PM,NOx,Cascade Impactor | 4 |
| "C" Pulp Dryer Stack | PM,$NO_x$ | 5 |
| No. 1 Boiler Stack | PM,CO | 1 |
| No. 2 Boiler Stack | PM,CO | 2 |

Scott Bainville, Duane Van Hoever, Dave Vaaler, Ed Juers, and Ken Nuessmeier performed the on-site portion of the test. Coordination between testing activities and plant operation was provided by Bruce Keifenheim, Stuart Eickhoff, and Doug Ransdell of ACS. A member of the Minnesota Pollution Control Agency did not witness the test.

Particulate evaluations were performed in accordance with EPA Methods 1 - 5, CFR Title 40, Part 60, Appendix A (revised July 1, 1992). Preliminary determinations of the gas linear velocity profile was made before the first particulate determination at each site 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 reference was used to extract particulate samples by means of a glass-lined probe. Wet catch samples were collected in the back half of the Method 5 sampling train and analyzed as per *Minnesota Rules, Part 7005.0500.*

The oxides of nitrogen samples were collected during the particulate determinations using an all-glass Method 7 sampling train. A heated stainless steel probe was used to extract the samples from the exhaust stream. A plug of glass-wool was used in the end of the probe to remove particulate material.

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.

## 2 SUMMARY AND DISCUSSION

The results of the air emission tests are summarized in Tables 1 - 13. The compliance status of each source in each parameter is presented in the tables below.

### PARTICULATE COMPLIANCE STATUS

| EMISSION POINT Number | SOURCE NAME | *PM Emission Limit* (LB/HR) | PM Emission Rate (LB/HR) |
|---|---|---|---|
| 3 | "A" Pulp Dryer | 15.94 | 10.1 |
| 4 | "B" Pulp Dryer | 17.94 | 17.1 |
| 5 | "C" Pulp Dryer | 14.62 | 13.0 |
| 1 | No. 1 Boiler | 14.6 | 8.29 |
| 2 | No. 2 Boiler | 14.6 | 6.87 |

### OXIDES OF NITROGEN COMPLIANCE STATUS

| EMISSION POINT Number | SOURCE NAME | *$NO_x$ Emission Limit* (LB/HR) | $NO_x$ Emission Rate (LB/HR) |
|---|---|---|---|
| 3 | "A" Pulp Dryer | 13.04 | 11.4 |
| 4 | "B" Pulp Dryer | 14.79 | 16.0 |
| 5 | "C" Pulp Dryer | 13.04 | 15.2 |

Note that the average $NO_x$ emissions for the B and C Dryers are based upon six $NO_x$ samples each as an error in the field resulted in double sampling of $NO_x$ flasks 43-48, which includes all of Run 1 on the B Pulp Dryer and Run 3 on the C Pulp Dryer. No other difficulties were encountered in the field or in the laboratory evaluation of the samples. On the basis of these facts and a complete review of the data and results, it is our opinion that the results reported herein are accurate and closely reflect the actual values which existed at the time the test was performed.

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

* For process information - see Appendix E.

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 | Run 2 | Run 3 |
|---|---|---|---|
| Date of run | 02-22-94 | 02-22-94 | 02-22-94 |
| 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. 5
C Pulp Dryer Stack

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

| | |
|---|---|
| Date of Determination..... | 02-24-94 |
| Time of Determination.....(HRS) | 1021 |
| Barometric pressure.....(IN.HG) | 29.28 |
| 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) | -1.2 |
| Avg. gas temp.....(DEG-F) | 214 |
| Moisture content.....(% V/V) | 28.67 |
| Avg. linear velocity.....(FT/SEC) | 61.1 |
| Gas density.....(LB/ACF) | .04989 |
| Molecular weight.....(LB/LBMOLE) | 28.00 |
| Mass flow of gas.....(LB/HR) | 137911 |
| Volumetric flow rate..... | |
| actual.....(ACFM) | 46076 |
| dry standard.....(DSCFM) | 25121 |

Test No. 2
B Pulp Dryer Stack

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

| | Run 1 | Run 2 | Run 3 |
|---|---|---|---|
| Date of run | 02-23-94 | 02-23-94 | 02-23-94 |
| 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 5**

| | Run 1 | Run 2 | Run 3 |
|---|---|---|---|
| Date of run | 02-24-94 | 02-24-94 | 02-24-94 |
| Time run start/end.....(HRS) | 930/1134 | 1200/1405 | 1425/1625 |
| Static pressure.....(IN.WC) | -0.78 | -0.78 | -0.78 |
| 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) | 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 |

Interpoll Labs Report No. 3-1638
American Crystal Suger
East Grand Forks, Minnesota

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

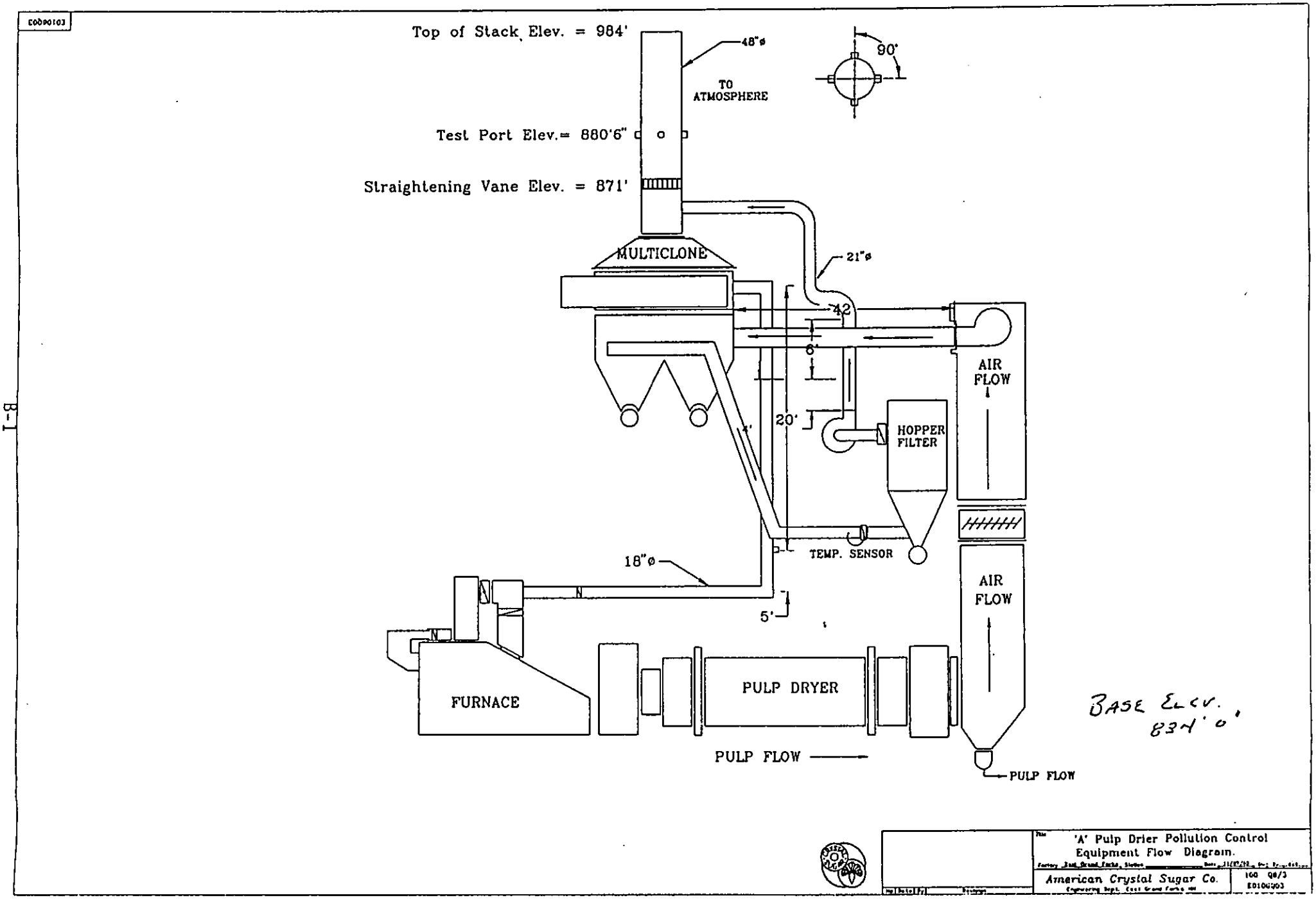
| | Run 1 | |
|---|---|---|
| Stage | um | % ≥ |
| Preimpactor | 10.0 | 10.9 |
| 1 | 6.1 | 18.0 |
| 2 | 4.0 | 23.0 |
| 3 | 2.5 | 29.8 |
| 4 | 1.5 | 33.2 |
| 5 | 0.98 | 36.0 |
| 6 | 0.61 | 39.5 |
| 7 | 0.35 | 45.6 |

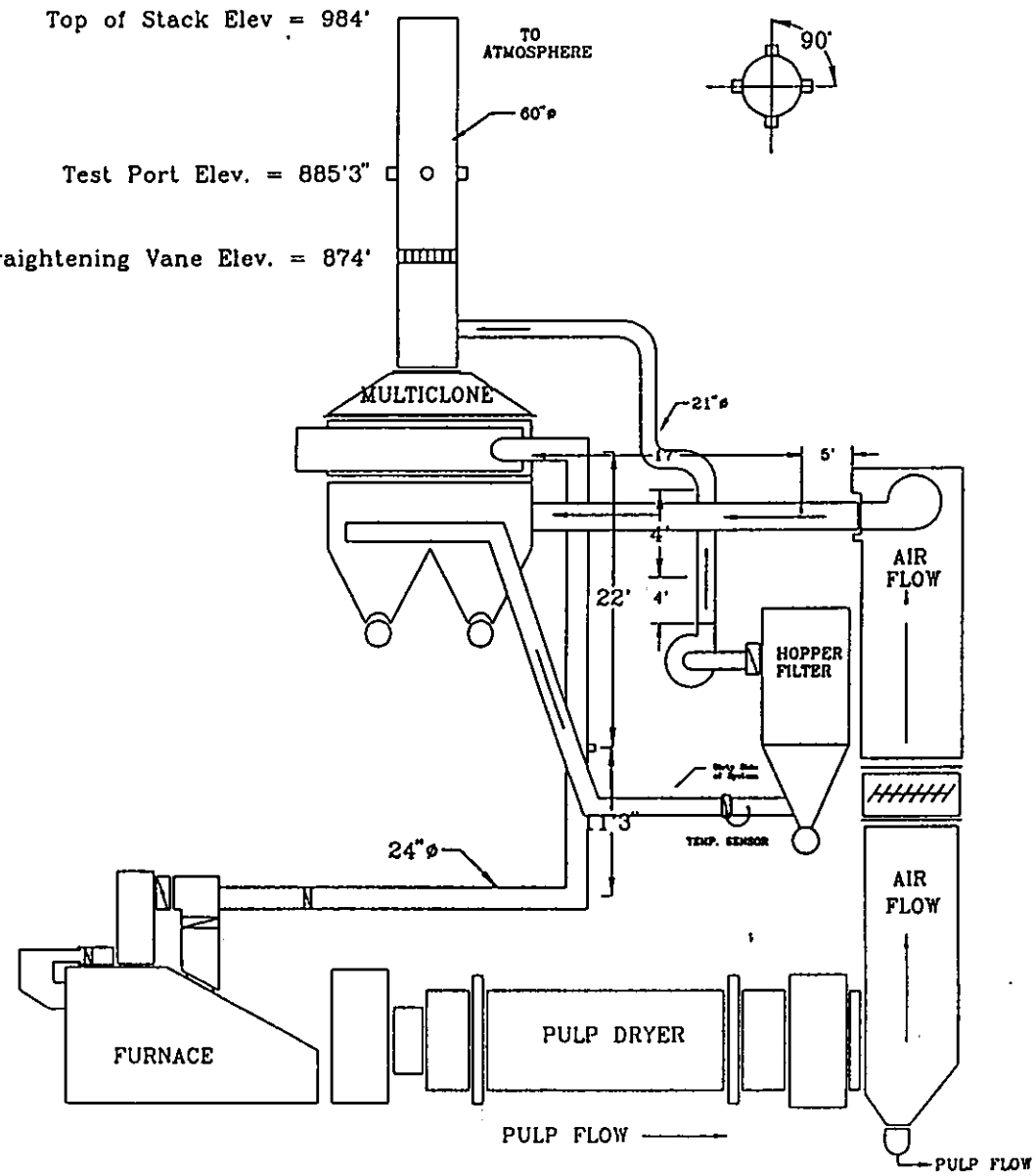
um — Aerodynamic equivalent diameter in microns
% ≥ — Relative cumulative frequency - percent by mass of aerosol with diameters greater than stated size

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 |


Top of Stack Elev. = 984'
48"ø
TO ATMOSPHERE
90°
Test Port Elev.= 880'6"
Straightening Vane Elev. = 871'
MULTICLONE
21"ø
42
6'
20'
4'
AIR FLOW
HOPPER FILTER
TEMP. SENSOR
18"ø
5'
AIR FLOW
FURNACE
PULP DRYER
PULP FLOW
PULP FLOW
BASE ELEV. 834'0"
'A' Pulp Drier Pollution Control Equipment Flow Diagram.
American Crystal Sugar Co.

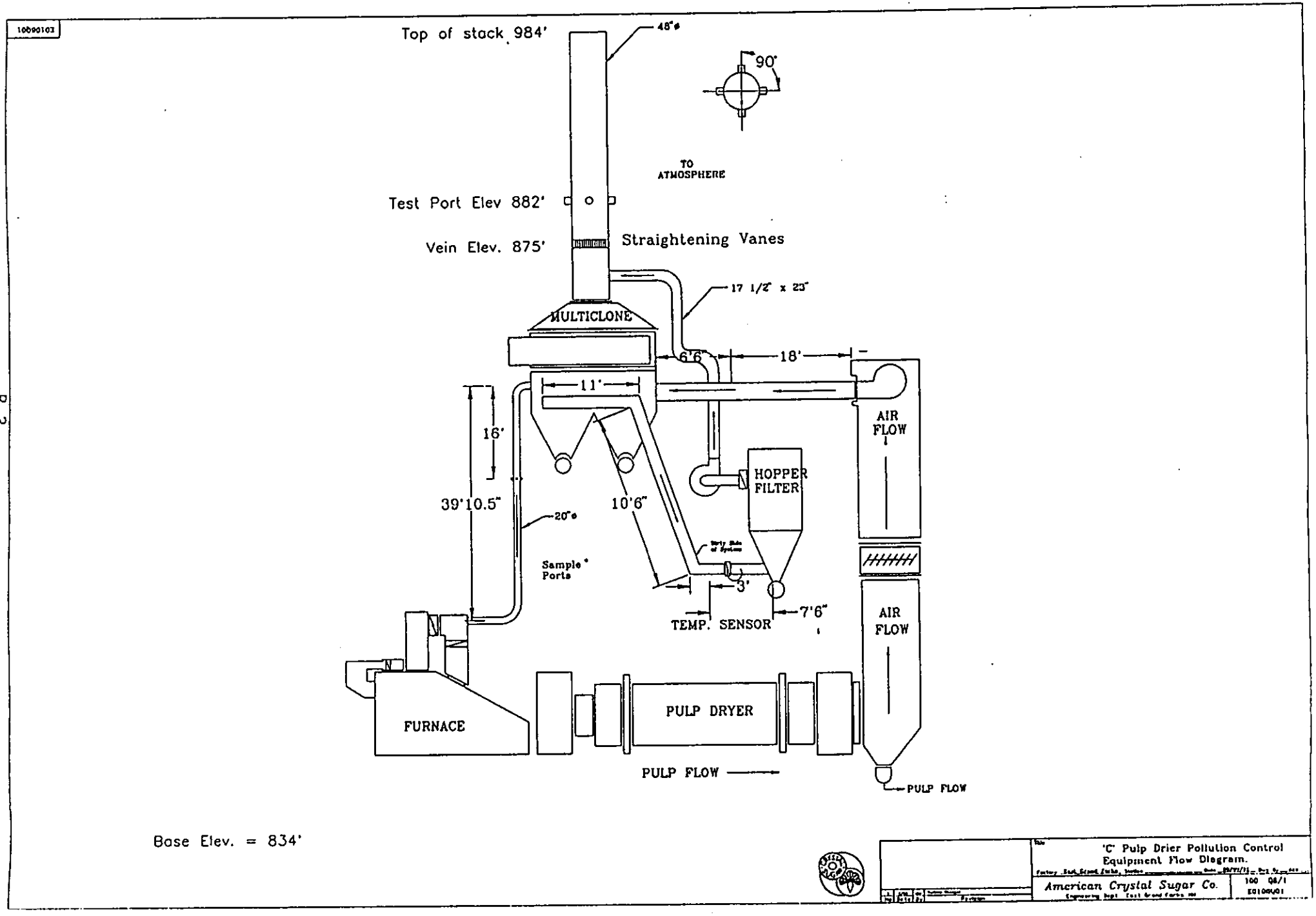



"B" Pulp Drier Pollution Control Equipment Flow Diagram.

American Crystal Sugar Co.

100 04/2

B-2


10090103
Top of stack 984'
48"ø
90°
TO ATMOSPHERE
Test Port Elev 882'
Vein Elev. 875'
Straightening Vanes
17 1/2" x 23"
MULTICLONE
6'6"
18'
11'
16'
39'10.5"
20"ø
10'6"
HOPPER FILTER
AIR FLOW
Sample Ports
3'
7'6"
TEMP. SENSOR
AIR FLOW
FURNACE
PULP DRYER
PULP FLOW
PULP FLOW
Base Elev. = 834'
'C' Pulp Drier Pollution Control Equipment Flow Diagram.
American Crystal Sugar Co.
100 08/1
EQ100Q01

Interpoll Laboratories
(612) 786-6020

# EPA Method 5 Data Reporting Sheet
## Impinger Catch/Minnesota Protocol

Job ACS / EGF
Team Leader DWH
Date Submitted 2-25-94
Test No. 1
Date of Analysis 3-6-94

Source C dryer
Test Site stack
Date of Test 2-22-94
No. of Runs Completed 3
Technician R. ELDEM

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

Blank Solvent Wt. 0.0004 g

*Results:*

| Field Blk. | Run 1 | Run 2 | Run 3 | Run 4 | Run 5 |
|---|---|---|---|---|---|
| | 0.0116 | 0.0105 | 0.0113 | 0-12 | |

LSC-03.GI

Interpoll Laboratories
(612) 786-6020

# EPA Method 5 Data Reporting Sheet
## Probe/Cyclone Wash

Job ACS - EGF
Team Leader DVH
Date Submitted 2-25-94
Test No. 1
Date of Analysis 3-3-94
Transport Leakage ☐ None ☒ _____ ml

Source C Dryer
Test Site Stack
Date of Test 1
No. of Runs Completed 3
Technician R. ELDEM
Solvent acetone

| | | |
|---|---|---|
| 0 | Test 1 Run 0<br>Field Blank<br>Log Number 2326-05P<br>Vol. of Solvent 100 ml<br>*Solvent Residue 3.00 ug/ml | Dish No. 502<br>Dish Tare Wt. 46.9039 g<br>Dish+Sample Wt. 46.9038 g<br>Sample Wt. 0.0003 g |
| 1 | Test 1 Run 1<br>Vol. of Solvent 225 ml<br>Log Number -06P<br>Comments | Dish No. 504<br>Dish Tare Wt. 50.0215 g<br>Dish+Sample Wt 50.0644 g<br>Sample Wt. 0.0429 g |
| 2 | Test 1 Run 2<br>Vol. of Solvent 190 ml<br>Log Number -07P<br>Comments | Dish No. 522<br>Dish Tare Wt. 47.0022 g<br>Dish+Sample Wt 47.0816 g<br>Sample Wt. 0.0794 g |
| 3 | Test 1 Run 3<br>Vol. of Solvent 150 ml<br>Log Number -08P<br>Comments | Dish No. 609<br>Dish Tare Wt. 45.5609 g<br>Dish+Sample Wt. 45.5828 g<br>Sample Wt. 0.0219 g |
| 4 | Test ____ Run ____<br>Vol. of Solvent ____ ml<br>Log Number<br>Comments | Dish No.<br>Dish Tare Wt. ____ g<br>Dish+Sample Wt. ____ g<br>Sample Wt. ____ g |
| 5 | Test ____ Run ____<br>Vol. of Solvent ____ ml<br>Log Number<br>Comments | Dish No.<br>Dish Tare Wt. ____ g<br>Dish+Sample Wt. ____ g<br>Sample Wt. ____ g |

*Solvent Residue 3.0 ug/ml = [(Sample Wt. 0.0003 g)(10⁶)]/Vol. of Sol. 100 ml
EPA-M5 Acetone Residue Blank Spec. ≤ 7.8 ug/ml

*Results:*

| Field Blk. | Run 1 | Run 2 | Run 3 | Run 4 | Run 5 |
|---|---|---|---|---|---|
| | 0.0423 | 0.0788 | 0.0214 | | |

D-13

LSC-01YR

Interpoll Laboratories
(612) 786-6020

# EPA Method 5 Data Reporting Sheet
## Filter Gravimetrics

Job: AGS/EGF
Team Leader: DVH
Date Submitted: 2-25-94
Test No.: 1
Date of Analysis: 3-3-94

Source: C Dryer
Test Site: Stack
Date of Test: 2-22-94
No. of Runs Completed: 3
Technician: C. Helgeson

| | | |
|---|---|---|
| 0 | Test 1 Run 0<br>Field Blank<br>Log Number 2326-05F<br>Comments | Filter No. 6263<br>Filter Type 4"GF<br>Filter Tare Wt. .8703 g<br>Filter+Sample Wt. .8703 g<br>Sample Wt. g |
| 1 | Test 1 Run 1<br>Log Number -06F<br>Comments | Filter No. 6139<br>Filter Type 4"GF<br>Filter Tare Wt. .8880 g<br>Filter+Sample Wt. 1.0089 g<br>Sample Wt. 0.1209 g |
| 2 | Test 1 Run 2<br>Log Number -07F<br>Comments | Filter No. 6141<br>Filter Type 4"GF<br>Filter Tare Wt. .8786 g<br>Filter+Sample Wt. .9898 g<br>Sample Wt. 0.1112 g |
| 3 | Test 1 Run 3<br>Log Number -08F<br>Comments | Filter No. 6258<br>Filter Type 4"GF<br>Filter Tare Wt. .8791 g<br>Filter+Sample Wt. .9971 g<br>Sample Wt. 0.1180 g |
| 4 | Test Run<br>Log Number<br>Comments | Filter No.<br>Filter Type<br>Filter Tare Wt. g<br>Filter+Sample Wt. g<br>Sample Wt. g |
| 5 | Test Run<br>Log Number<br>Comments | Filter No.<br>Filter Type<br>Filter Tare Wt. g<br>Filter+Sample Wt. g<br>Sample Wt. g |

*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 | | |

LSC-02PR

Interpoll Laboratories
(612) 786-6020

# EPA Method 5 Data Reporting Sheet
## Impinger Catch/Minnesota Protocol

Job ACS / EGF
Team Leader DUH
Date Submitted 2-25-94
Test No. 2
Date of Analysis 3-6-94

Source R dryer
Test Site Stack
Date of Test 2-23-94
No. of Runs Completed 3
Technician R. ELDEM

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

Blank Solvent Wt. 0.0004 g

*Results:*

| Field Blk. | Run 1 | Run 2 | Run 3 | Run 4 | Run 5 |
|---|---|---|---|---|---|
| | 0.0076 | 0.0077 | 0.0067 | D-18 | |

LSC-03.GF

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(612) 786-6020

# EPA Method 5 Data Reporting Sheet
## Probe/Cyclone Wash

Job ACS - EGF
Team Leader Dutt
Date Submitted 2-25-94
Test No. 2
Date of Analysis 3-3-94
Transport Leakage ☐ None ☐ _____ ml

Source B Dryer
Test Site Stack
Date of Test 2-23-94
No. of Runs Completed 3
Technician R. EIDEM
Solvent acetone

| | | |
|---|---|---|
| 0 | Test 2 Run 0<br>Field Blank<br>Log Number 2326-12P<br>Vol. of Solvent 100 ml<br>*Solvent Residue 3.00 ug/ml | Dish No. 40<br>Dish Tare Wt. 47.6433 g<br>Dish+Sample Wt. 47.6436 g<br>Sample Wt. 0.0003 g |
| 1 | Test 2 Run 1<br>Vol. of Solvent 150 ml<br>Log Number -13P<br>Comments | Dish No. 47<br>Dish Tare Wt. 48.4658 g<br>Dish+Sample Wt. 48.4968 g<br>Sample Wt. 0.0310 g |
| 2 | Test 2 Run 2<br>Vol. of Solvent 160 ml<br>Log Number -14P<br>Comments | Dish No. 64<br>Dish Tare Wt. 43.1473 g<br>Dish+Sample Wt. 43.1756 g<br>Sample Wt. 0.0283 g |
| 3 | Test 2 Run 3<br>Vol. of Solvent 125 ml<br>Log Number -15P<br>Comments | Dish No. 69<br>Dish Tare Wt. 47.9924 g<br>Dish+Sample Wt. 48.0209 g<br>Sample Wt. 0.0285 g |
| 4 | Test ____ Run ____<br>Vol. of Solvent ____ ml<br>Log Number<br>Comments | Dish No.<br>Dish Tare Wt. g<br>Dish+Sample Wt. g<br>Sample Wt. g |
| 5 | Test ____ Run ____<br>Vol. of Solvent ____ ml<br>Log Number<br>Comments | Dish No.<br>Dish Tare Wt. g<br>Dish+Sample Wt. g<br>Sample Wt. g |

*Solvent Residue 3.0 ug/ml = [(Sample Wt. 0.0003 g)(10⁶)]/Vol. of Sol. 100 ml
EPA-M5 Acetone Residue Blank Spec. ≤ 7.8 ug/ml

*Results:*

| Field Blk. | Run 1 | Run 2 | Run 3 | Run 4 | Run 5 |
|---|---|---|---|---|---|
| | 0.0305 | 0.0278 | 0.0281 | | |

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LSC-01YR

Interpoll Laboratories
(612) 786-6020

# EPA Method 5 Data Reporting Sheet
## Filter Gravimetrics

Job: ACS/EGF
Team Leader: DVH
Date Submitted: 2-25-94
Test No.: 2
Date of Analysis: 3-3-94

Source: B Dryer
Test Site: Stack
Date of Test: 2-23-94
No. of Runs Completed: 3
Technician: B. Blake

| | | |
|---|---|---|
| 0 | Test 2 Run 0<br>Field Blank<br>Log Number 2326-12F<br>Comments | Filter No. 6262<br>Filter Type 41'GF<br>Filter Tare Wt. .8607 g<br>Filter+Sample Wt. .8608 g<br>Sample Wt. 0.0001 g |
| 1 | Test 2 Run 1<br>Log Number -13F<br>Comments | Filter No. 6257<br>Filter Type 41'GF<br>Filter Tare Wt. .8697 g<br>Filter+Sample Wt. .9760 g<br>Sample Wt. 0.1063 g |
| 2 | Test 2 Run 2<br>Log Number -14F<br>Comments | Filter No. 6261<br>Filter Type 41'GF<br>Filter Tare Wt. .8723 g<br>Filter+Sample Wt. .9798 g<br>Sample Wt. 0.1075 g |
| 3 | Test 2 Run 3<br>Log Number -15F<br>Comments | Filter No. 6142<br>Filter Type 41'GF<br>Filter Tare Wt. .8724 g<br>Filter+Sample Wt. .9803 g<br>Sample Wt. 0.1079 g |
| 4 | Test ____ Run ____<br>Log Number<br>Comments | Filter No.<br>Filter Type<br>Filter Tare Wt. g<br>Filter+Sample Wt. g<br>Sample Wt. g |
| 5 | Test ____ Run ____<br>Log Number<br>Comments | Filter No.<br>Filter Type<br>Filter Tare Wt. g<br>Filter+Sample Wt. g<br>Sample Wt. 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 | | |



LSC-02PR

Interpoll Laboratories
(612) 786-6020

EPA Method 5 Data Reporting Sheet
Impinger Catch/Minnesota Protocol

Job ACS/EGF
Team Leader DUH
Date Submitted
Test No. 4
Date of Analysis 3-9-94

Source A Dryer
Test Site Stack
Date of Test 2-24-94
No. of Runs Completed 3
Technician C. Helgeson

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

Blank Solvent Wt. .0004 g

*Results:*

| Field Blk. | Run 1 | Run 2 | Run 3 | Run 4 | Run 5 |
|---|---|---|---|---|---|
| | 0.0151 | 0.0159 | 0.0158 | | |

D-21

LSC-03.0

Interpoll Laboratories
(612) 786-6020

# EPA Method 5 Data Reporting Sheet
## Probe/Cyclone Wash

Job: ACS-EGE
Team Leader: DVH
Date Submitted: 2-25-94
Test No.: 4
Date of Analysis: 3-3-94
Transport Leakage ☐ None ☑ ____ ml

Source: A Dryer
Test Site: stack
Date of Test: 2-24-94
No. of Runs Completed: 3
Technician: REIDEM
Solvent: acetone

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

*Solvent Residue ____ ug/ml = [(Sample Wt. ____ g)(10⁶)]/Vol. of Sol. ____ ml
EPA-M5 Acetone Residue Blank Spec. ≤ 7.8 ug/ml

*Results:*

| Field Blk. | Run 1 | Run 2 | Run 3 | Run 4 | Run 5 |
|---|---|---|---|---|---|
| | 0.0469 | 0.0293 | 0.0281 D-22 | | |

LSC-01YR

Interpoll Laboratories
(612) 786-6020

# EPA Method 5 Data Reporting Sheet
## Filter Gravimetrics

Job ACS ECGF
Team Leader DUH
Date Submitted 2-25-94
Test No. 4
Date of Analysis 3-3-94

Source A Dryer
Test Site stack
Date of Test 2-24-94
No. of Runs Completed 3
Technician B.D

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

Campaign Day: 169

Date: Feb 24, 1994

# PULP DRIER STACK TESTING

"A" Drier  Test # Run 1

☐ Engineering
☒ Compliance

| Hr. | Stack Rate Hr. TPH | Avg Stack F.O. Air Hr. °C | 1/2 Hr. °C | Stack Profile: Recycle Air Hr. °C | 1/2 Hr. °C | Dryer Hr. °C | 1/2 Hr. °C | Burn Exit Hr. °C | 1/2 Hr. °C | Air/Fuel Ratio Hr. % | 1/2 Hr. % | Pressed Pulp Feed Hr. TPH | 1/2 Hr. TPH | Damper Position: Fd Hr. % Open | Recycle Hr. % Open | Ir Hr. % Open | Coal Rate Hr. TPH | 1/2 Hr. TPH | Grate Speed Hr. | 1/2 Hr. | K Moisture: Pressed Pulp Hr. % | 1/2 Hr. % | Dried Pulp Hr. % | 1/2 Hr. % | Pressure Drop (Fan Inlet): Multiclone Hr. "$H_2O$ | 1/2 Hr. "$H_2O$ | Multiclone Inlet Hr. "$H_2O$ | 1/2 Hr. "$H_2O$ | Pressure Residual: Furnace Hr. "$H_2O$ | Hr. "$H_2O$ | Manometer Readings: Hr. "$H_2O$ | Hr. "$H_2O$ | CO Hr. | Hr. | $O_2$ % | Opacity Hr. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9:00 | 295 | 82 | 84 | 103 | — | 574 | 575 | 103 | 102 | — | — | 18 | 19 | 36.8 | 82.1 | 60 | — | — | 37.2 | 37.8 | 69.8 | 68.8 | 6.6 | 5.7 | 6.49 | 6.48 | 6.70 | 6.68 | -.21 | -.19 | 6.30 | .50 | 2400 | 4.15 | — | -.32 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 6.30 | .30 | 2509 | 4.18 | 12.2 | -.34 |
| 10:00 | 321 | 84 | | — | — | 612 | 632 | 101 | 102 | — | — | 21.4 | 21.1 | 55.1 | 77.1 | 60 | — | — | 45.3 | 39.0 | 68.8 | 68.4 | 6.4 | 8.2 | 6.42 | 6.39 | 6.69 | 6.68 | -.22 | -.51 | — | .35 | 2511 | 4.37 | 11.3 | -.32 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | — | | 2486 | 4.61 | — | — |
| 11:00 | 322 | | | — | — | 582 | 596 | 102 | 101 | — | — | 19.9 | 20.8 | 28.1 | 82.2 | 60 | — | — | 37.5 | 37.3 | 69.2 | 68.4 | 7.5 | 5.2 | 6.45 | 6.53 | 6.69 | 6.69 | -.18 | -.47 | 6.40 | .25 | 2506 | 4.34 | 11.0 | -.32 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | — | .25 | 2496 | 4.53 | — | — |
| 12:00 | 310 | 85 | 82 | — | — | 621 | 609 | 99 | 99 | — | — | 21.5 | 19.9 | 34.0 | 78.9 | 60 | — | — | 34.2 | 37.6 | 68.6 | 68.0 | 6.6 | 9.0 | 6.46 | 6.43 | 6.69 | 6.69 | -.19 | -.48 | 6.5 | .25 | 2538 | 4.52 | 10.0 | -.24 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | — | .25 | 2542 | 4.68 | — | — |
| 1:00 | 307 | 82 | 82 | — | — | 624 | 590 | 100 | 100 | — | — | 15.2 | 19.4 | 27.9 | 80.3 | 60 | — | — | 38.3 | 39.2 | 68.3 | 69.6 | 8.0 | 7.2 | 6.47 | 6.51 | 6.70 | 6.70 | -.18 | -.55 | 6.5 | .25 | 2535 | 4.18 | 10.9 | -.21 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | — | .25 | 2540 | 4.27 | — | — |
| 2:00 | 330 | 82 | 82 | — | — | 640 | 610 | 99 | 99 | — | — | 19.9 | 19.7 | 33.9 | 80.7 | 60 | — | — | 34.8 | 37.0 | 70.8 | 70.0 | 7.8 | 7.3 | 6.41 | 6.35 | 6.68 | 6.68 | -.14 | -.50 | 6.6 | .25 | 2583 | 4.05 | 10.4 | -.16 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | — | .25 | 2501 | 4.05 | — | — |
| 3:00 | 324 | 80 | 80 | — | — | 612 | 591 | 99 | 99 | — | — | 20.4 | 19.5 | 34.0 | 79.3 | 60 | — | — | 37.7 | 39.9 | 69.2 | 70.3 | 8.4 | 8.7 | 6.45 | 6.52 | 6.68 | 6.68 | -.11 | -.51 | 6.5 | .25 | 2574 | 4.14 | 8.0 | -.22 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | — | .25 | 2593 | 4.13 | — | — |
| 4:00 | 28 | 81 | | — | — | 601 | | | | — | — | 23.4 | | 28.6 | 78.3 | 60 | — | — | 37.7 | | | | 7.7 | | 6.54 | | 6.69 | | -.19 | -.51 | 6.5 | .25 | 2561 | 4.29 | 4.0 | -.24 |
| | | | | — | — | | | | | — | — | | | | | 60 | — | — | | | | | | | | | | | | | — | | | | — | — |
| | | | | — | — | | | | | — | — | | | | | 60 | — | — | | | | | | | | | | | | | — | | | | — | — |
| | | | | — | — | | | | | — | — | | | | | 60 | — | — | | | | | | | | | | | | | — | | | | — | — |

Air Registers:

Run #1:
Closed 1,2,7,8
25%
50%
75%
100% 3,4,5

Run #2:
Closed
25%
50%
75%
100%

Run 1 Start: 9:30 AM End: 11:30 AM
Run 2 Start: 12:00 N End:

| Container Name | Left | Right |
|---|---|---|
| Particleboard | 75 | 450 |
| Bagasse Pith | 2500 | |
| | | |
| | | |

NOTES: Run 1
Cool Bottle weight = 2.75"
Dry pulp

NOTES: Run 2

GENERAL NOTES:

DOE 8711001

Sheet 1 of 1

Campaign Day: 168

Date: Feb 23, 1994

# PULP DRIER STACK TESTING

B Drier Test # 2 Runs 1, 2 + 3.

☐ Engineering
☒ Compliance

| Hr. | Stock Rate Hr. TPH | Pre Heat F.D. Air Hr. °C | Pre Heat F.D. Air 1/2 Hr. °C | Heat Profile: Recycle Air Hr. °C | Recycle Air 1/2 Hr. °C | Throat Hr. °C | Throat 1/2 Hr. °C | Drum Exit Hr. °C | Drum Exit 1/2 Hr. °C | Air/Fuel Ratio Hr. % | Air/Fuel Ratio 1/2 Hr. % | Pressed Pulp Feed Hr. TPH | Pressed Pulp Feed 1/2 Hr. TPH | Damper Position: FD Hr. % Open | Damper Position: Recycle Hr. % Open | Damper Position: ID Hr. % Open | Coal Rate Hr. TPH | Coal Rate 1/2 Hr. TPH | Grate Speed Hr. | Grate Speed 1/2 Hr. | % Moisture: Pressed Pulp Hr. % | % Moisture: Pressed Pulp 1/2 Hr. % | % Moisture: Dried Pulp Hr. % | % Moisture: Dried Pulp 1/2 Hr. % | Pressure Drop (Fact Sensor): Multiclone Hr. "$H_2O$ | Pressure Drop (Fact Sensor): Multiclone 1/2 Hr. "$H_2O$ | Pressure Drop (Fact Sensor): Multiclone Inlet Hr. "$H_2O$ | Pressure Drop (Fact Sensor): Multiclone Inlet 1/2 Hr. "$H_2O$ | Pressure Readings: Furnace Hr. "$H_2O$ | Pressure Readings: Drum Exit Hr. "$H_2O$ | Manometer Readings: Multiclone Hot Air Hr. "$H_2O$ | Manometer Readings: FD Duct Hr. "$H_2O$ | Recycle Airflow (Control) | Hopper Filter D.P. "$H_2O$ | $O_2$ % | Methane Recycle Static | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9:00 | 301 | 74° | | - | - | 605 | | 112 | | - | - | 22.7 | | 384 | 80 | 55.0 | - | - | 30.2 | | | | 8.5 | 6.7 | 4.00 | | 4.50 | | -.23 | -.74 | | .75 | | 5.17 | | 2.0 | Hr |
| 9:30 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1/2 |
| 10:00 | 307 | 77° | 76 | - | - | 630 | 588 | 114 | 111 | - | - | 23.5 | 22.6 | 25.4 | 84.1 | 55 | - | - | 0 24.0 | 31.1 | 70 | 69.5 | 6.5 | 7.6 | 3.94 | 3.99 | 4.40 | 4.51 | -.26 | -.75 | 4.0 | .50 | 5846 | 5.14 | 11.8 | 2.2 | Hr |
| 10:30 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 4.0 | .50 | 5838 | 4.81 | — | — | 1/2 |
| 11:00 | 301 | 78 | 77 | - | - | 628 | 586 | 112 | 111 | - | - | 22.9 | 23.7 | 24.8 | 76.3 | 55 | - | - | 23.6 | 24.2 | 69.3 | 69.7 | 6.1 | 7.6 | 3.95 | 3.96 | 4.46 | 4.48 | -.30 | -.76 | 4.0 | .50 | 5827 | 4.93 | 11.8 | 2.2 | Hr |
| 11:30 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 4.0 | .50 | 5693 | 5.14 | — | — | 1/2 |
| 12:00 | 303 | 79 | 79 | - | - | 599 | 595 | 112 | 109 | - | - | 23.50 | 24.10 | 25.7 | 84.0 | 55 | - | - | 23.4 | 29.3 | 70.3 | 69.3 | 8.3 | 6.6 | 3.97 | 4.01 | 4.48 | 4.53 | -.29 | -.78 | 4.0 | .45 | 5755 | 4.78 | 12.2 | 2.2 | Hr |
| 12:30 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 4.0 | .50 | 5727 | 4.98 | — | — | 1/2 |
| 1:00 | 284 | 79 | 79 | - | - | 597 | 594 | 112 | 111 | - | - | 23.86 | 23.44 | 24.3 | 87.1 | 55 | - | - | 0 23.5 | 25.7 | 69.2 | 68.8 | 8.4 | 7.0 | 3.97 | 3.96 | 4.51 | 4.56 | -.31 | -.79 | 4.0 | .50 | 5934 | 5.15 | 12.2 | 2.4 | Hr |
| 1:30 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 4.0 | .50 | 5989 | 4.97 | — | — | 1/2 |
| 2:00 | 301 | 79 | 79 | - | - | 596 | 601 | 111 | 110 | - | - | 24.41 | 24.38 | 27.1 | 81.1 | 55 | - | - | 22.4 | 25.7 | 70.3 | 70.1 | 7.0 | 7.1 | 3.98 | 3.95 | 4.49 | 4.42 | -.31 | -.81 | 4.0 | .50 | 6006 | 5.12 | 12.2 | 2.4 | Hr |
| 2:30 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 4.0 | .75 | 5962 | 5.00 | — | — | 1/2 |
| 3:00 | 241 | 79 | 79 | - | - | 585 | 614 | 111 | 109 | - | - | 24.10 | 24.4 | 29.5 | 85.8 | 55 | - | - | 22.8 | 0 25.7 | 70.1 | 70.2 | 7.7 | 7.6 | 3.96 | 3.96 | 4.51 | 4.45 | -.31 | -.82 | 4.0 | .75 | 6104 | 5.20 | 12.0 | 2.4 | Hr |
| 3:30 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 4.0 | .50 | 6033 | 4.52 | — | — | 1/2 |
| 4:00 | 299 | 79 | 79 | - | - | 599 | 584 | 109 | 110 | - | - | 24.02 | 24.00 | 37.4 | 77.3 | 55 | - | - | 27.2 | 23.4 | 70.2 | 70.5 | | | 3.95 | 3.96 | 4.45 | 4.37 | -.32 | -.82 | 4.0 | .50 | 5939 | 5.05 | 12.0 | 2.4 | Hr |
| 4:30 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 4.0 | .50 | 6020 | 4.81 | — | — | 1/2 |
| 5:00 | 304 | 79 | 79 | - | - | 586 | 602 | 109 | 111 | - | - | 23.50 | 24.2 | 34.9 | 82.4 | 55 | - | - | 28.5 | 21.9 | 68.9 | — | | | 3.97 | 3.95 | 4.52 | 4.42 | -.27 | -.77 | 4.0 | .50 | 6045 | 5.09 | 12.0 | 2.4 | Hr |
| 5:30 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 4.0 | .50 | 6034 | 4.59 | — | — | 1/2 |
| 6:00 | 305 | 79 | 79 | - | - | 622 | 627 | 109 | | - | - | 24.8 | 24.5 | 33.7 | 85.8 | 55 | - | - | 27.2 | | 72.6 | 69.6 | | | 3.93 | 3.91 | 4.44 | 4.49 | -.22 | -.78 | 4.0 | .50 | 6110 | 4.98 | 12.2 | 2.4 | Hr |
| 6:30 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 4.0 | .50 | 6104 | 4.95 | — | — | 1/2 |

Air Registers:

Run #1:
Closed 1,2,6-9
25%
50%
75%
100% 3,4,5

Run #2:
Closed
25%
50%
75%
100%

Run 1 Start: 10:22 End: 12:30

Run #2 Start: 13:00 End: 15:05

| Controller Name: | Ratio | Bias |
|---|---|---|
| Recycle Airflow | .5900 | |
| Grate Speed | | -1.0 |
| Ratio | | .75 |
| | | |

Run #3
15:45

NOTES: Run 1
3.5" Grate Height

NOTES: Run 2

GENERAL NOTES:

CAO/ E7111D01

Campaign Day: 167

Date: Feb. 22, 1994

# PULP DRIER STACK TESTING

C Drier · Test # 1 Sheet #1 of 2

☐ Engineering
☒ Compliance

| Hr. | SSco Rate Hr. TPH | Pre Heat F.D. Air Hr. °C | Pre Heat F.D. Air 1/2 Hr. °C | Heat Profile Recycle Air Hr. °C | Recycle Air 1/2 Hr. °C | Throat Hr. °C | Throat 1/2 Hr. °C | Drum Exit Hr. °C | Drum Exit 1/2 Hr. °C | Air/Fuel Ratio Hr. % | Air/Fuel Ratio 1/2 Hr. % | Pressed Pulp Feed Hr. TPH | Pressed Pulp Feed 1/2 Hr. TPH | Damper Position FD Hr. % Open | Damper Position Recycle Hr. % Open | Damper Position ID Hr. % Open | Coal Rate Hr. TPH | Coal Rate 1/2 Hr. TPH | Grate Speed Hr. | Grate Speed 1/2 Hr. | % Moisture Pressed Pulp Hr. % | % Moisture Pressed Pulp 1/2 Hr. % | % Moisture Dried Pulp Hr. % | % Moisture Dried Pulp 1/2 Hr. % | Pressure Drop (Fold Sensor) Multiclone Hr. "$H_2O$ | Multiclone 1/2 Hr. "$H_2O$ | Multiclone Inlet Hr. "$H_2O$ | Multiclone Inlet 1/2 Hr. "$H_2O$ | Pressure Readings Furnace Hr. "$H_2O$ | Furnace Exit Hr. "$H_2O$ | Manometer Readings Multiclone Inlet Hr. "$H_2O$ | FD Duct Hr. "$H_2O$ | 6 Recycle Airflow (Control) | Hopper Filter D.P. 1 "$H_2O$ | $O_2$ % | Cyclone Maintenance | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9:00 9:30 | 302 | 67 | 66 | 103 | 105 | 720 | 711 | 105 | 104 | — | — | 24.83 | 24.23 | 35.6 | 51.9 | 85 | — | — | 26.8 | 28.3 | 71.9 | 71.9 | 8.9 | 9.8 | 5.88 | 5.89 | 6.23 | 6.28 | -.22 | -.49 | — | .60 | 4453 | 4.7 | — | — | Hr |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 6.1 | .75 | 4463 | 4.60 | - | — | 1/2 |
| 10:00 10:30 | 309 | 64 | 65 | 105 | 105 | 690 | 680 | 106 | 105 | — | — | 22.66 | 23.80 | 33.1 | 56.0 | 85 | - | - | 24.0 | 25.2 | 71.8 | 71.3 | 8.4 | 7.3 | 5.94 | 5.99 | 6.26 | 6.27 | -.26 | -.41 | 6.1 | .45 | 4467 | 4.80 | - | — | Hr |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 6.0 | .50 | 4465 | 4.90 | - | — | 1/2 |
| 11:00 11:30 | 301 | 65 | 65 | 105 | 104 | 650 | 697 | 103 | 105 | - | - | 22.24 | 20.47 | 44.7 | 53.0 | 85 | - | - | 21.5 | 30.0 | 72.3 | 70.7 | 8.0 | 7.6 | 6.02 | 5.90 | 6.33 | 6.27 | -.17 | -.51 | 6.0 | 1.25 | 4431 | 4.86 | - | - | Hr |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 5.9 | 1.00 | 4475 | 4.70 | — | - | 1/2 |
| 12:00 12:30 | 300 | 65 | 65 | 104 | 104 | 677 | 715 | 104 | 106 | - | - | 21.02 | 20.89 | 44.9 | 52.4 | 85 | - | - | 24.7 | 23.4 | 70.7 | 71.0 | 8.3 | 7.7 | 5.93 | 5.98 | 6.30 | 6.17 | -.19 | -.61 | 6.0 | 1.00 | 4462 | 4.10 | - | — | Hr |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 6.0 | .75 | 4470 | 4.7 | - | - | 1/2 |
| 1:00 1:30 | 300 | 64 | 64 | 105 | 105 | 680 | 678 | 106 | 105 | - | - | 21.08 | 20.12 | 38.2 | 54.7 | 85 | - | - | 22.70 | 23.10 | 70.7 | 70.0 | 7.3 | 6.6 | 6.01 | 6.06 | 6.29 | 6.29 | -.23 | -.50 | 6.0 | .50 | 4480 | 4.7 | - | - | Hr |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 6.0 | .45 | 4486 | 4.8 | - | - | 1/2 |
| 2:00 2:30 | 300 | 63 | 63 | 104 | 102 | 681 | 707 | 102 | 105 | - | - | 21.67 | 19.71 | 45.1 | 55.5 | 85 | - | - | 24.2 | 23.1 | 71.0 | 71.0 | 8.6 | 8.4 | 6.03 | 5.99 | 6.23 | 6.20 | -.23 | -.55 | 6.0 | .75 | 4495 | 4.8 | - | - | Hr |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 6.0 | .50 | 4410 | 4.6 | - | 1.2 | 1/2 |
| 3:00 3:30 | 320 | 64 | 63 | 102 | 102 | 680 | 649 | 105 | 105 | - | - | 23.46 | 20.41 | 37.7 | 57.3 | 85 | - | - | 23.1 | 21.1 | 71.0 | 65.8 | 7.9 | 7.5 | 6.08 | 6.04 | 6.27 | 6.22 | -.21 | -.56 | 6.0 | .45 | 4507 | 4.8 | - | 1.4 | Hr |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 6.0 | .35 | 4507 | 4.8 | - | 1.4 | 1/2 |
| 4:00 4:30 | 302 | 65 | 64 | 102 | 102 | 666 | 675 | 104 | 103 | - | - | 20.03 | 19.09 | 36.9 | 57.3 | 85 | - | - | 23.5 | 28.6 | 69.3 | 71.6 | 7.6 | 9.4 | 6.09 | 6.03 | 6.38 | 6.21 | -.22 | -.69 | 6.0 | .50 | 4480 | 4.8 | - | 1.4 | Hr |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 6.0 | .60 | | | - | 1.2 | 1/2 |
| 5:00 5:30 | | | | | | | | | | - | - | | | | | 85 | - | - | | | | | | | | | | | | | | | | - | | Hr |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | - | | 1/2 |
| | | | | | | | | | | — | | | | | | 85 | - | - | | | | | | | | | | | | | | | | - | | Hr |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | - | — | 1/2 |

Air Registers:

Run #1: Start: 14:18 End: 16:22 Start: End:

Closed 1,2;6-9
25%
50%
75%
100% 3,4,5

| Controller Name | Ratio | Bias |
|---|---|---|
| Grate | .70 | -1.0 |
| | | |
| | | |

Run #2:

Closed
25%
50%
75%
100%

NOTES: Run 1

Coal Height = 2.75"; Exit Temp & Pr. [illegible]

Overall, run was very stable in as much as the furnace + exit temp, plus a steady product moisture. Coal burn-off was better than usual. The furnace lancing and sifting was performed near end of run (15:45).

NOTES: Run 2

Furnace O penetration plugged through last hour and a half of test.

GENERAL NOTES:

CAD/ E7111001

Campaign Day: 167

Date: 2/22/94

# PULP DRIER STACK TESTING

C Drier · Test # 1 Sheet 2 of 2

☐ Engineering
☒ Compliance

| Hr. | Sludge Rate Hr. TPH | Pre Heat F.D. Air Hr. °C | Pre Heat F.D. Air 1/2 Hr. °C | Heat Profile: Recycle Air Hr. °C | Recycle Air 1/2 Hr. °C | Throat Hr. °C | Throat 1/2 Hr. °C | Drum Exit Hr. °C | Drum Exit 1/2 Hr. °C | Air/Fuel Ratio Hr. % | Air/Fuel Ratio 1/2 Hr. % | Pressed Pulp Feed Hr. TPH | Pressed Pulp Feed 1/2 Hr. TPH | Damper Position: FD Hr. % Open | Recycle Hr. % Open | ID Hr. % Open | Coal Rate Hr. TPH | Coal Rate 1/2 Hr. TPH | Grate Speed Hr. | Grate Speed 1/2 Hr. | % Moisture: Pressed Pulp Hr. % | Pressed Pulp 1/2 Hr. % | Dried Pulp Hr. % | Dried Pulp 1/2 Hr. % | Pressure Drop (Flue Sensor): Multicyclone Hr. "$H_2O$ | Multicyclone 1/2 Hr. "$H_2O$ | Multicyclone Inlet Hr. "$H_2O$ | Multicyclone Inlet 1/2 Hr. "$H_2O$ | Pressure Readings: Furnace Hr. "$H_2O$ | Drum Exit Hr. "$H_2O$ | Manometer Readings: Combustion Air Inlet Hr. "$H_2O$ | FD Duct Hr. "$H_2O$ | Recycle Airflow (Control) | Hopper Filter O.P. 1 "$H_2O$ | $O_2$ % | Check Calibration | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5:00 5:30 | 326 | 60 | 63 | 101 | 102 | 628 | 738 | 101 | 108 | – | – | 19.65 | 23.10 | 59.4 | 51.2 | 85 | – | – | 42.4 | 26.7 | 70.5 | 70.1 | 9.0 | 9.4 | 6.09 | 5.87 | 6.31 | 6.12 | -.14 | -.53 | 6.00 | .75 | 4518 | 4.7 | | 1.2 | Hr |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 6.10 | .50 | 4469 | 4.8 | | 1.2 | 1/2 |
| 6:00 6:30 | 340 | 72 | 70 | 102 | 102 | 694 | 630 | 108 | 104 | – | – | 20.70 | 21.13 | 29.1 | 67.8 | 85 | – | – | 17.6 | 23.3 | 65.4 | 70.0 | 6.8 | 6.9 | 5.84 | 6.09 | 6.09 | 6.29 | -.32 | -.60 | 6.00 | 0.0 | 4537 | 4.8 | | 1.2 | Hr |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 6.00 | .40 | 4529 | 4.7 | | 1.4 | 1/2 |
| 7:00 7:30 | 325 | 65 | 65 | 102 | 102 | 658 | 679 | 102 | 103 | – | – | 20.01 | 21.39 | 44.5 | 53.7 | 85 | – | – | 29.4 | 30.7 | 69.9 | 71.2 | 7.2 | | 6.02 | 6.37 | 6.31 | 6.32 | -.14 | -.51 | 6.00 | .50 | 4328 | 4.8 | | 1.4 | Hr |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 6.00 | .75 | 4334 | 4.7 | | 1.4 | 1/2 |
| 8:00 8:30 | 309 | 65 | 64 | 102 | 102 | 663 | 661 | 100 | 105 | – | – | 20.34 | 20.23 | 37.9 | 56.0 | 85 | – | – | 23.5 | 24.3 | 71.2 | 72.0 | 7.8 | 7.7 | 6.15 | 6.02 | 6.43 | 6.48 | -.20 | -.53 | 1.10 | .50 | 4357 | 4.7 | | 1.4 | Hr |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 6.00 | .40 | 4317 | 4.8 | | 1.2 | 1/2 |
| 9:00 9:30 | | 64 | 64 | 102 | 102 | 662 | 664 | 105 | 104 | – | – | 19.37 | 21.99 | 37.7 | 56.0 | 85 | – | – | 24.4 | 27.2 | 70.1 | 68.25 | 9.1 | 9.0 | 6.11 | 6.04 | 6.24 | 6.35 | -.20 | -.51 | 6.10 | .50 | 4274 | 4.7 | | 1.2 | Hr |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 6.00 | .50 | 4335 | 4.6 | | | 1/2 |
| 10:00 10:30 | | | | | | | | | | – | – | | | | | 85 | – | – | | | | | | | | | | | | | | | | | | | Hr |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1/2 |
| | | | | | | | | | | – | – | | | | | 85 | – | – | | | | | | | | | | | | | | | | | | | Hr |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1/2 |
| | | | | | | | | | | – | – | | | | | 85 | – | – | | | | | | | | | | | | | | | | | | | Hr |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1/2 |
| | | | | | | | | | | – | – | | | | | 85 | – | – | | | | | | | | | | | | | | | | | | | Hr |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1/2 |
| | | | | | | | | | | – | – | | | | | 85 | – | – | | | | | | | | | | | | | | | | | | | Hr |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | 1/2 |

Air Registers:

Run #1: Closed, 25%, 50%, 75%, 100%

Run #2: Closed, 25%, 50%, 75%, 100%

Start: 17:05 End: 19:11

Start: 19:45 End: 21:45

| Controller Name: | Ratio | Bias |
|---|---|---|
| | | |
| | | |
| | | |
| | | |

NOTES: Run 1

NOTES: Run 2

GENERAL NOTES:

CAD/ E7111001

E-22

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 |
| **NOx Concentration** | | | | |
| (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 |
| **<u>NOx Concentration</u>** | | | | |
| (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 | 0 |
| | 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 | |
| | Condensible 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 | |
| | Condensible 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 |
| | Condensible 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 |
| | Condensible 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: BEET16A.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 | |
| | Condensible 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 | |
| | Condensible 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 |
| | Condensible 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 |
| | Condensible 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 | |
| | Condensible 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 | |
| | Condensible 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 |
| | Condensible 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 |
| | Condensible 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

The $NO_x$ samples were collected in volume-calibrated two-liter all-glass flasks. An aliquot of 25 cc of absorbing solution was added to each flask on-site; the flask was closed; inserted into the sampling train; and evacuated. The probe was then purged and the sample collected over a 15 second interval. The flask was then closed; the flask removed from the sampling train; shook for two minutes and then secured for transport to the laboratory.

Upon arrival at the laboratory, the $NO_x$ samples are logged in, placed in a designated area and maintained at 72 °F for 24 hours to allow completion of the conversion of NO to $NO_2$ and absorption in the acidified peroxide reagent. The flasks are then shook to complete absorption; attached to a mercury manometer and the static pressure and temperature recorded. The samples are then recovered and analyzed by ion chromatography.

An integrated flue gas sample was extracted simultaneously with each particulate sample using a specially designed gas sampling system. Integrated flue gas samples were collected in 44-liter Tedlar bags housed in a protective aluminum container. After sampling was complete, the bags were sealed and returned to the laboratory for Orsat analysis. Prior to sampling, the Tedlar bags are leak checked at 15 IN.HG. vacuum with an in-line rotameter. Bags with any detectable inleakage are discarded. The integrated flue gas samples on the No. 1 and 2 Boilers were also analyzed for carbon monoxide in accordance with EPA Method 10 (NDIR).

Testing on the "A" Pulp Dryer Stack was conducted from 2 test ports oriented at 90 degrees on the stack. The test ports are located diameters 2 downstream and 5.5 diameters upstream of the nearest flow disturbances. A 24-point traverse was used to collect representative particulate samples. Each traverse point was sampled 2.5 minutes to give a total sampling time of 60 minutes per run. Visible emission determinations were unable to be performed due to converging plumes.

Testing on the "B" Pulp Dryer Stack was conducted from 2 test ports oriented at 90 degrees on the stack. The test ports are located 2 diameters downstream of a flow straightener and 2 diameters upstream of the nearest flow disturbances. A 24-point traverse was used to collect representative particulate samples. Each traverse point was sampled 2.5 minutes to give a total sampling time of 60 minutes per run. Visible emission determinations were unable to be performed due to converging plumes.

Testing on the "C" Pulp Dryer Stack was conducted from 2 test ports oriented at 90 degrees on the stack. The test ports are located 2 diameters downstream and 2 diameters upstream of the nearest flow disturbances. A 24-point traverse was used to collect representative particulate samples. Each traverse point was sampled 2.5 minutes to give a total sampling time of 60 minutes per run. Visible emission determinations were unable to be performed due to converging plumes.

Testing on the No. 1 Boiler Stack was conducted from 4 test ports oriented at 90 degrees on the stack. The test ports are located 4.5 diameters downstream and 2.4 diameters upstream of the nearest flow disturbances. A 24-point traverse was used to collect representative particulate samples. Each traverse point was sampled 2.5 minutes to give a total sampling time of 60 minutes per run.

Testing on the No. 2 Boiler Stack was conducted from 4 test ports oriented at 90 degrees on the stack. The test ports are located 4.5 diameters downstream and 2.4 diameters upstream of the nearest flow disturbances. A 24-point traverse was used to collect representative particulate samples. Each traverse point was sampled 2.5 minutes to give a total sampling time of 60 minutes per run.

The important results of the test are summarized in Section 2. Detailed results are presented in Section 3. Field data and all other supporting information are presented in the appendices.

Test No. 2
B Pulp Dryer Stack

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

| | |
|---|---|
| Date of Determination..... | 02-23-94 |
| Time of Determination.....(HRS) | 845 |
| Barometric pressure.....(IN.HG) | 29.43 |
| Pitot tube coefficient..... | .84 |
| Number of sampling ports..... | 2 |
| Total number of points..... | 24 |
| Shape of duct..... | Round |
| Stack diameter.....(IN) | 59 |
| Duct area.....(SQ.FT) | 18.99 |
| Direction of flow..... | UP |
| Static pressure.....(IN.WC) | -.79 |
| Avg. gas temp.....(DEG-F) | 237 |
| Moisture content.....(% V/V) | 27.37 |
| Avg. linear velocity.....(FT/SEC) | 60.3 |
| Gas density.....(LB/ACF) | .05059 |
| Molecular weight.....(LB/LBMOLE) | 29.28 |
| Mass flow of gas.....(LB/HR) | 208383 |
| Volumetric flow rate..... | |
| actual.....(ACFM) | 68652 |
| dry standard.....(DSCFM) | 37082 |

Test No. 4
A Pulp Dryer Stack

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

| | |
|---|---|
| Date of Determination..... | 02-24-94 |
| Time of Determination.....(HRS) | 749 |
| Barometric pressure.....(IN.HG) | 29.28 |
| Pitot tube coefficient..... | .84 |
| Number of sampling ports..... | 2 |
| Total number of points..... | 24 |
| Shape of duct..... | Round |
| Stack diameter.....(IN) | 47 |
| Duct area.....(SQ.FT) | 12.05 |
| Direction of flow..... | UP |
| Static pressure.....(IN.WC) | -.78 |
| Avg. gas temp.....(DEG-F) | 209 |
| Moisture content.....(% V/V) | 31.36 |
| Avg. linear velocity.....(FT/SEC) | 60.2 |
| Gas density.....(LB/ACF) | .05161 |
| Molecular weight.....(LB/LBMOLE) | 29.34 |
| Mass flow of gas.....(LB/HR) | 134810 |
| Volumetric flow rate..... | |
| actual.....(ACFM) | 43532 |
| dry standard.....(DSCFM) | 23032 |

## Particulate Loadings and Emission Rates

The particulate emission rates were determined per EPA Methods 1-5, CFR title 40, Part 60, Appendix A (revised July 1, 1987). In this procedure, a preliminary velocity profile of the gases in the flue is obtained by means of a temperature and velocity traverse. On the basis of these values, sampling nozzles of appropriate diameter are selected to allow isokinetic sampling, a necessary prerequisite for obtaining a representative sample.

The sampling train consists of a heated glass-lined sampling probe equipped with a Type S pitot and a thermocouple. The probe is attached to a sampling module which houses the all-glass in line filter holder in a temperature controlled oven. In addition, the sampling module also houses the impinger case and a Drierite drying column. The sampling module is connected by means of an umbilical cord to the control module which houses the dry test gasmeter, the calibrated orifice, a leakless pump, two inclined manometers, and all controls required for operating the sampling train.

Particulate samples were collected as follows: The sample gas was drawn in through the sampling probe isokinetically and passed through a 4-inch diameter Gelman Type A/E glass fiber filter. The particulates were removed at this point and collected on the filter. The gases then passed through an ice-cooled impinger train and a desiccant-packed drying column which quantitatively absorb all moisture from the sample gas stream after which the sample gas passes through the pump and the dry test gasmeter which integrates the sample gas flow throughout the course of the test. A calibrated orifice attached to the outlet of the gasmeter provides instantaneous flow rate data.

A representative particulate sample was acquired by sampling for equal periods of time at the centroid of a number of equal area regions in the duct. The sampling rate is adjusted at each site such that an isokinetic sampling condition prevails. Nomographs are used to aid in the rapid determination of the sampling rate.

# Particulate Loading and Emission Rates

After sampling is complete, the filter is removed and placed in a clean container. The nozzle and inlet side of the filter holder are quantitatively washed with acetone and the washings are stored in a second container. A brush is often used in the cleaning step to help dislodge deposits. The samples are returned to the laboratory where they are logged in and analyzed. The volume of the acetone rinse ("probe wash") is noted and then the rinse is quantitatively transferred to a tared 120 cc porcelain evaporating dish and the acetone evaporated off at 97-105 °F. This temperature is used to prevent condensation of atmospheric moisture due to the cooling effect induced by the evaporation of acetone. The acetone-free sample is then transferred to an oven and dried at 105 °C for 30 minutes, cooled in a desiccator over Drierite, and then weighed to the nearest .01 mg. The filter sample is quantitatively transferred to a 6-inch watch glass and dried in an oven at 105 °C for two hours. The filter and watch glass are then cooled in a desiccator and the filter weighed to the nearest .01 mg. All weighings are performed in a balance room where the relative humidity is hydrostatted to less than 50% relative humidity. Microscopic examination of the samples is performed if any unusual characteristics are observed. The weight of the acetone rinse is corrected for the acetone blank. The Drierite column is weighed on-site and the water collected by Drierite is added to the condensate so that the total amount of absorbed water may be ascertained.

Integrated flue gas samples for Orsat analysis were collected simultaneously with each pollutant sample. The samples were collected in 15-liter gas sampling bags at a constant flow rate throughout each particulate run. The bags were at a constant flow rate throughout each particulate run. The bags were then returned to the laboratory and analyzed by Orsat analysis. Standard commercially prepared solutions were used in the Orsat analyzer (sat. KOH for carbon dioxide and reduced methylene blue for oxygen).