3/3

REPORT FINALIZATION AND QUALITY ASSURANCE FORM

PROJECT INFORMATION

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WORD PROCESSING REQUEST

Draft No.	Submitted By	Submitted On	Requested Back By	Work Requested	Work Completed	Completed By	Completed On
1	AD	Date: 3/3/05 Time: 1340	☐ Today - AM ☑ Today - PM ☐ Tomorrow - AM ☐ Tomorrow - PM ☐ This Week ☐ Other: Date: Time:	☐ Letter Head ☑ Edit marked text ☑ Create standard cover page ☑ Create TOC/LOT/LOF ☑ Update TOC/LOT/LOF ☑ Add/update page numbers ☑ Add appendices cover pages ☐ Number appendices ☑ Add/fix document footers ☑ Add/fix document headings ☑ Fix document formatting ☑ Run spell checker ☐ Proofread recent edits only ☐ Proofread entire document ☐ Perform technical editing	☐ Yes ☑ Yes ☑ Yes ☑ Yes ☑ Yes ☑ Yes ☑ Yes ☐ Yes ☑ Yes ☑ Yes ☑ Yes ☑ Yes ☑ Yes ☑ Yes ☐ Yes	JW	Date: 3/7/05 Time: 9:35
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QUALITY ASSURANCE FINAL REVIEW CHECKLIST FOR REPORTS

	Document Elements	Quality Assurance Items To Be Checked	DPS Review	Tech Editor Review	QA Officer Concurrence	PM or CSM Concurrence
DPS RESPONSIBILITY	Report Cover	Is the report title correct? Is the client name and address correct? Is the WESTON work order number referenced? Is the date of the report shown? Is the report labeled draft if it is a draft? Does the final report need to have a PE/PG seal?	☐ Yes ☐ NA ☐ Yes ☐ NA ☐ Yes ☐ NA ☐ Yes ☐ NA ☐ Yes ☐ NA ☐ Yes ☐ NA	☐ Yes ☐ No ☐ Corrected	☐ Yes ☐ No ☐ Corrected	☐ Yes ☐ No ☐ Corrected
	Report Format	Is the report in the standard WESTON format? Is paragraph and line spacing format correct/consistent? Are section and subsection titles properly positioned? Are document footers/header correct for each section? Are fonts used consistent throughout the report? Has the report been spell checked?	☐ Yes ☐ NA ☐ Yes ☐ NA ☐ Yes ☐ NA ☐ Yes ☐ NA ☐ Yes ☐ NA ☐ Yes ☐ NA	☐ Yes ☐ No ☐ Corrected	☐ Yes ☐ No ☐ Corrected	☐ Yes ☐ No ☐ Corrected
	Table of Contents	Are all report sections included in the list? Do the report titles in list match titles in text? Are the section page numbers correct? Is the title header of this section correct?	☐ Yes ☐ NA ☐ Yes ☐ NA ☐ Yes ☐ NA ☐ Yes ☐ NA	☐ Yes ☐ No ☐ Corrected	☐ Yes ☐ No ☐ Corrected	☐ Yes ☐ No ☐ Corrected
	List of Appendices	Are all appendices cited in text included in list? Do appendix names in list match titles on appendix sheets? Are appendices numbered in the text in numerical sequence?	☐ Yes ☐ NA ☐ Yes ☐ NA ☐ Yes ☐ NA	☐ Yes ☐ No ☐ Corrected	☐ Yes ☐ No ☐ Corrected	☐ Yes ☐ No ☐ Corrected
	List of Figures	Are all cited figures included in the list? Do figure titles in list match titles in report? Are all cited figures actually present in report? Are correct figure pages referenced? Is figure format consistent within report? Were figures proofread for typos? Do figures have correct title block and scale? Do maps have a north arrow? Do figures contain a footer reference? Have data in figures been checked for transcription accuracy? Do figures have a PE/PG seal if needed?	☐ Yes ☐ NA ☐ Yes ☐ NA ☐ Yes ☐ NA ☐ Yes ☐ NA ☐ Yes ☐ NA ☐ Yes ☐ NA ☐ Yes ☐ NA ☐ Yes ☐ NA ☐ Yes ☐ NA ☐ Yes ☐ NA ☐ Yes ☐ NA	☐ Yes ☐ No ☐ Corrected	☐ Yes ☐ No ☐ Corrected	☐ Yes ☐ No ☐ Corrected
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CSM RESPONSIBILITY	Executive Summary	Is an executive summary needed/provided? Is the executive summary concise enough (1 to 2 pages)? Does the summary include one paragraph per report section?	☐ Yes ☐ NA ☐ Yes ☐ NA ☐ Yes ☐ NA	☐ Yes ☐ No ☐ Corrected	☐ Yes ☐ No ☐ Corrected	☐ Yes ☐ No ☐ Corrected
	Introduction	Is the purpose of the document described? Is the client authorization described? Is the project background described? Is the scope of work summarized? Is the report organization described if needed?	☐ Yes ☐ NA ☐ Yes ☐ NA ☐ Yes ☐ NA ☐ Yes ☐ NA ☐ Yes ☐ NA	☐ Yes ☐ No ☐ Corrected	☐ Yes ☐ No ☐ Corrected	☐ Yes ☐ No ☐ Corrected
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	Methods/Approach	Are field methods described? Are laboratory methods described? Is the data evaluation approach described? Are formulas and calculations described? Are quality control methods described? Is field documentation referenced? Are work/sampling locations shown on figures?	☐ Yes ☐ NA ☐ Yes ☐ NA ☐ Yes ☐ NA ☐ Yes ☐ NA ☐ Yes ☐ NA ☐ Yes ☐ NA ☐ Yes ☐ NA	☐ Yes ☐ No ☐ Corrected	☐ Yes ☐ No ☐ Corrected	☐ Yes ☐ No ☐ Corrected
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	Analysis/Discussion	Are the project results analyzed and discussed? Are the analyses/discussions of the results correct? Do you agree with the analysis/discussion?	☐ Yes ☐ NA ☐ Yes ☐ NA ☐ Yes ☐ NA	☐ Yes ☐ No ☐ Corrected	☐ Yes ☐ No ☐ Corrected	☐ Yes ☐ No ☐ Corrected
	Conclusions	Are the conclusions listed out and clearly presented? Are the conclusions proven in analysis? Is no new information presented in conclusions? Are all conclusions supported in text presented? Are conclusions separated from recommendations? Do you agree with the conclusions?	☐ Yes ☐ NA ☐ Yes ☐ NA ☐ Yes ☐ NA ☐ Yes ☐ NA ☐ Yes ☐ NA ☐ Yes ☐ NA	☐ Yes ☐ No ☐ Corrected	☐ Yes ☐ No ☐ Corrected	☐ Yes ☐ No ☐ Corrected
	Recommendations	Are the recommendations listed out? Are the recommendations supported by the results? Are the recommendations separated from conclusions? Are all recommendations supported in text presented? Do you agree with the recommendations?	☐ Yes ☐ NA ☐ Yes ☐ NA ☐ Yes ☐ NA ☐ Yes ☐ NA ☐ Yes ☐ NA	☐ Yes ☐ No ☐ Corrected	☐ Yes ☐ No ☐ Corrected	☐ Yes ☐ No ☐ Corrected
	References	Is a reference section needed and included? Were outside data sources properly cited throughout the text? Are references correctly listed in the reference section?	☐ Yes ☐ NA ☐ Yes ☐ NA ☐ Yes ☐ NA	☐ Yes ☐ No ☐ Corrected	☐ Yes ☐ No ☐ Corrected	☐ Yes ☐ No ☐ Corrected
	Appendices	Are all appendix materials attached? Are the appendices in the proper order? Are the appendix materials legible when copied?	☐ Yes ☐ NA ☐ Yes ☐ NA ☐ Yes ☐ NA	☐ Yes ☐ No ☐ Corrected	☐ Yes ☐ No ☐ Corrected	☐ Yes ☐ No ☐ Corrected
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Weston Solutions, Inc.
1625 Pumphrey Avenue
Auburn, Alabama 36832-4303
334-466-5600 • Fax 334-466-5660
www.westonsolutions.com

9 March 2005

Ms. Jacquelyn Taylor
Bowater Incorporated
5300 Cureton Ferry Road
Catawba, South Carolina 29704

Work Order No. 03917.008.003

Re: No. 3 Recovery Furnace Particulate Matter Engineering Test Report

Dear Ms. Taylor:

Enclosed are three copies of the above-referenced test report. Submission of this report was authorized by your purchase order. An invoice has been forwarded under separate cover.

Production data will be inserted into Appendix G by Bowater personnel.

We appreciate the cooperation and help you and your staff provided during the project. If there are any questions regarding the report, or if we can be of additional assistance to you in any way, please contact me at 334-466-5627. We look forward to working with you in the future.

Sincerely,

WESTON SOLUTIONS, INC.

Templeton Simpkins

Templeton Simpkins
Project Manager

md

Enclosure

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9 March 2005, 6:30 a.m. Version

Work Order No. 03917.008.003

No. 3 Recovery Furnace Particulate Matter Emission Test Report

Bowater Incorporated
Catawba, South Carolina
15-16 February 2005

Prepared For

BOWATER INCORPORATED
5300 Cureton Ferry Road
Catawba, South Carolina 29704

Templeton Simpkins
Project Manager
Approved for Transmittal

Wayne Roberts
Report Review
Approved for Transmittal

Prepared By

WESTON SOLUTIONS, INC.
1625 Pumphrey Ave.
Auburn, Alabama 36832-4303
Phone: (334) 466-5600 Fax: (334) 466-5660

9 March 2005

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SECTION 1
INTRODUCTION

Weston Solutions, Inc. (WESTON®) was retained by Bowater Incorporated (Bowater) to conduct particulate matter (PM) emission testing on the Inlet and Outlet of the No. 3 Recovery Furnace at the mill in Catawba, South Carolina. The emission test results generated from this study are for Bowater's internal use only and were not performed for any regulatory requirements or permit conditions.

WESTON performed the emission testing during 15-16 February 2005. The project team was comprised of the following individuals.

Name	Project Role
Temp Simpkins	Project Manager/Test Team Leader
Wayne Roberts	Technical Director
Jon Howard	Quality Assurance Manager
Matt Savin	Test Team Member
Corey Landers	Test Team Member
Chad Burns	Test Team Member
Natalie Hornsby	Report Coordinator

Ms. Jacquelyn Taylor of Bowater coordinated the testing with mill operations and served as WESTON's technical contact throughout the effort.

SECTION 2
RESULTS AND DISCUSSION

Table 2-1 presents the removal efficiency of the No. 3 Recovery Furnace. The east inlet emission rate was doubled and compared to the outlet emission rate measured on 16 February 2005. The west inlet emission rate was doubled and compared to the outlet emission rate measured on 15 February 2005. Then, the east and west emission rates were summed and compared to the average of the outlet emission rates from 15 and 16 February 2005.

TABLE 2-1
NO. 3 RECOVERY FURNACE REMOVAL EFFICIENCY

Parameter	Inlet	Outlet	Removal Efficiency %
	West	**2/15/05**	99.3
2/15/05 Emission Rate, lb/hr	3525 x 2 7,050	48.7	
	East	**2/16/05**	99.6
2/16/05 Emission Rate, lb/hr	5921 x 2 11,842	45.4	
	Total **East + West**	**Average** **(2/15 & 2/16)**	99.5
2/15 and 2/16 Emission Rate, lb/hr	3525 + 5921 9,446	47.1	

Table 2-2 presents the mean results of the emission testing with comparison to the permit limit. The results are less than the applicable standard for the source.

TABLE 2-2
NO. 3 RECOVERY FURNACE
SUMMARY OF EMISSION RESULTS

	Particulate Matter Mean Test Value	Permit Limit
Inlet – West 2/15/05		
Concentration, gr/dscf @ 8%	4.96	----
Emission Rate, lb/hr	3,525	----
Outlet – 2/15/05		
Concentration, gr/dscf @ 8%	0.031	0.036
Emission Rate, lb/hr	48.7	----
Inlet – East 2/16/05		
Concentration, gr/dscf @ 8%	6.94	----
Emission Rate, lb/hr	5,921	----
Outlet – 2/16/05		
Concentration, gr/dscf @ 8%	0.028	0.036
Emission Rate, lb/hr	45.4	----

Tables 2-3 and 2-4 provide detailed summaries of the emission results. Any differences between the calculated results presented in the appendices and the results reported in the summary tables are due to rounding for presentation.

TABLE 2-3
NO. 3 RECOVERY FURNACE (2/15/05)
SUMMARY OF PM EMISSION RESULTS

	Run 1		Run 2		Run 3		Mean	
	West Inlet Stack	**Outlet Stack**	**West Inlet Stack**	**Outlet Stack**	**West Inlet Stack**	**Outlet Stack**	**West Inlet Stack**	**Outlet Stack**
Date	2/15/05		2/15/05		2/15/05		----	
Time Began	1245		1417		1559		----	
Time Ended	1347		1516		1647		----	
Stack Gas Data								
Temperature, °F	353	331	351	331	353	332	353	331
Velocity, ft/sec	47	65	48	67	48	67	48	66
Moisture, %	25	27	26	26	30	26	27	26
CO_2 Concentration, %	14.0	14.0	14.0	14.0	15.5	14.0	14.5	14.0
O_2 Concentration, %	5.5	7.0	5.5	6.8	5.0	7.0	5.3	6.9
VFR, x 10^5 dscfm	0.70	1.66	0.70	1.75	0.66	1.74	0.69	1.72
Particulate Matter								
Isokinetic Sampling Rate, %	94	109	104	97	110	98	103	102
Concentration, gr/dscf	5.80	0.030	6.81	0.030	5.30	0.039	5.97	0.033
Concentration, gr/dscf @ 8% O_2	4.87	0.028	5.71	0.028	4.31	0.036	4.96	0.031
Permit Limit, gr/dscf @ 8% O_2	----	----	----	----	----	----	----	**0.036**
Emission Rate, lb/hr	3,468	42.5	4,092	45.5	3,016	58.2	3,525	48.7

TABLE 2-4
NO. 3 RECOVERY FURNACE (2/16/05)
SUMMARY OF PM EMISSION RESULTS

	Run 1		Run 2		Run 3		Mean	
	East Inlet Stack	**Outlet Stack**	**East Inlet Stack**	**Outlet Stack**	**East Inlet Stack**	**Outlet Stack**	**East Inlet Stack**	**Outlet Stack**
Date	2/16/05		2/16/05		2/16/05		----	
Time Began	0940		1125		1302		----	
Time Ended	1031		1220		1400		----	
Stack Gas Data								
Temperature, °F	360	333	360	332	359	333	360	333
Velocity, ft/sec	49	69	64	70	62	70	58	69
Moisture, %	27	26	29	27	28	26	28	26
CO_2 Concentration, %	15.0	14.0	14.0	13.0	15.5	12.5	14.8	13.2
O_2 Concentration, %	6.0	7.8	4.5	7.5	4.5	6.8	5.0	7.4
VFR, x 10^5 dscfm	0.70	1.78	0.88	1.79	0.87	1.81	0.82	1.79
Particulate Matter								
Isokinetic Sampling Rate, %	98	100	106	100	104	98	103	99
Concentration, gr/dscf	9.22	0.032	6.69	0.027	9.60	0.030	8.50	0.030
Concentration, gr/dscf @ 8% O_2	7.99	0.032	5.27	0.026	7.56	0.027	6.94	0.028
Permit Limit, gr/dscf @ 8% O_2	----	----	----	----	----	----	----	**0.036**
Emission Rate, lb/hr	5,537	49.2	5,069	41.1	7,157	46.0	5,921	45.4

SECTION 3
SOURCE TESTING METHODOLOGY

The emission testing program was conducted in accordance with the U.S. EPA Reference Methods summarized in Table 3-1. Method descriptions and quality assurance data are provided in the referenced appendices.

TABLE 3-1
SOURCE TESTING METHODOLOGY

Parameter	Method Number	Appendix Reference		Comments
		Method Description	Quality Control Data	
Volumetric Flow Rate	1,2,3,4	B.1	F	
Particulate Matter	5	B.2	F	
Particulate Matter	17	B.3	F	Inlet

APPENDIX A
SAMPLE CALCULATIONS

SAMPLE CALCULATIONS

No. 2 Recovery Furnace – Outlet
Run No. 1 – 2/16/05

Meter Pressure (Pm), in. Hg

$$Pm = Pb + \frac{\Delta H}{13.6\ in.\ H_2O/in.\ Hg}$$

where, Pb = barometric pressure, in. Hg
ΔH = Pressure differential of orifice in. H_2O

$$Pm = 29.82\ in.\ Hg + \frac{1.483\ in.\ H_2O}{13.6\ in.\ H_2O/in.\ Hg} = 29.93\ in.\ Hg$$

Absolute Stack Gas Pressure (Ps), in. Hg

$$Ps = Pb + \frac{Pg}{13.6\ in.\ H_2O/in.\ Hg}$$

where, Pb = barometric pressure, in. Hg
Pg = Static Pressure, in. H_2O

$$Ps = 29.82\ in.\ Hg + \frac{-1.00\ in.H_2O}{13.6\ in.\ H_2O/in.\ Hg} = 29.75\ in.\ Hg$$

Standard Meter Volume (Vmstd), dscf

$$Vmstd = \frac{17.64\,°R/in.\ Hg\ \ x\ Y\ \ x\ Vm\ \ x\ Pm}{Tm}$$

where, Y = meter correction factor
Vm = meter volume, cf
Pm = meter pressure, in. Hg
Tm = meter temperature, °R

$$Vmstd = \frac{17.64\,°R/in.\ Hg\ \ x\ 1.0140\ \ x\ 30.651\,cf\ \ x\ 29.93\,in.\ Hg}{536\,°R} = 30.619\,dscf$$

Standard Wet Volume (Vwstd), scf

$$Vwstd = 0.04707\ ft^3/mL\ x\ Vlc$$

where, Vlc = volume of H_2O collected, mL

$$Vwstd = 0.04707\ ft^3/mL\ x\ 226.3\ mL = 10.652\ scf$$

Moisture Fraction (Measured), (Bws)

$$Bws = \frac{Vwstd}{(Vwstd + Vmstd)} = \frac{10.652\ scf}{10.652\ scf + 30.619\ dscf} = 0.258$$

where, Vwstd = standard wet volume, scf
Vmstd = standard meter volume, dscf

Moisture, % (M%)

$$M\% = Bws\ x\ 100 = 0.258\ x\ 100 = 25.8$$

where, Bws = moisture fraction, measured or at saturation, whichever is lowest

Molecular Weight (DRY) (Md), lb/lb-mole

$$Md = (0.44\ x\ \%\ CO_2) + (0.32\ x\ \%\ O_2) + (0.28(100 - \%\ CO_2 - \%\ O_2))$$

$$Md = (0.44\ x\ 14.0) + (0.32\ x\ 7.8) + (0.28(100 - 14.0 - 7.8)) = 30.55\ lb/lb\text{-}mole$$

Molecular Weight (WET) (Ms), lb/lb-mole

$$Ms = Md\ (1 - Bws) + 18(Bws)$$

where, Md = molecular weight (DRY), lb/lb-mole
Bws = moisture fraction, dimensionless

$$Ms = 30.55\ lb/lb\text{-}mole\ (1 - 0.258) + 18(0.258) = 27.31\ lb/lb\text{-}mole$$

Average Velocity (Vs), ft/sec

$$Vs = 85.49 \frac{ft}{sec} \sqrt{\frac{(lb/lb\text{-}mole)(in.\,Hg)}{(°R)(in.\,H_2O)}} \; x \; Cp \; x \; \sqrt{Delta\ P}\ avg. \; x \; \sqrt{\frac{Ts}{Ps \; x \; Ms}}$$

where, Cp = pitot tube coefficient
Delta P = velocity head of stack gas, in. H_2O
Ts = absolute stack temperature, °R
Ps = absolute stack gas pressure, in. Hg
Ms = molecular weight of stack gas, lb/lb-mole

$$Vs = 85.49 \frac{ft}{sec} \sqrt{\frac{(lb/lb\text{-}mole)(in.\,Hg)}{(°R)(in.H_2O)}} \; x \; 0.84 \; x \; 0.969\, in.\,H_2O \; x \; \sqrt{\frac{793\ °R}{29.75\, in.\,Hg \; x \; 27.31\, lb/lb\text{-}mole}}$$

$$Vs = 68.75\ ft/sec$$

Average Stack Gas Flow at Stack Conditions (Qa), acfm

$$Qa = 60\, sec/min \; x \; Vs \; x \; As$$

where, Vs = stack gas velocity, ft/sec
As = cross-sectional area of stack, ft^2

$$Qa = 60\, sec/min \; x \; 68.75\, ft/sec \; x \; 87.97\, ft^2 = 3.63E+05\, acfm$$

Average Stack Gas Flow at Standard Conditions (Qs), dscfm

$$Qs = 17.64 \frac{°R}{in.\,Hg} \; x \; Qa \; x \; (1 - Bws) \; x \; \frac{Ps}{Ts}$$

where, Qa = average stack gas flow at stack conditions, ft^3/min
Bws = moisture content (dimensionless)
Ps = absolute stack gas pressure, in. Hg
Ts = absolute stack temperature, °R

$$Qs = 17.64 \frac{°R}{in.\,Hg} \; x \; 3.63\,E+05 \frac{acf}{min} \; x \; (1 - 0.258) \; x \; \frac{29.75\, in.\,Hg}{793\,°R} = 1.78\,E+05\ dscfm$$

Percent Isokinetic Sampling Rate (%I)

$$\%I = \frac{0.0945(in.Hg)(min)/(°R)(sec)\ x\ Ts\ x\ Vmstd}{Ps\ x\ Vs\ x\ An\ x\ \Theta\ x\ (1-Bws)}$$

where, Ts = avg. stack temperature, °R
Vmstd = standard meter volume, dscf
Ps = absolute stack gas pressure, in. Hg
Vs = stack gas velocity, ft/sec
An = cross-sectional area of nozzle, ft^2
Θ = total sampling time, min
Bws = moisture content (dimensionless)

$$\%I = \frac{0.0945(in.Hg)(min)/(°R)(sec)\ x\ 793°R\ x\ 30.619\ dscf}{29.75\ in.Hg\ x\ 68.75\ ft/sec\ x\ 3.17\ E\text{-}04\ ft^2\ x\ 48\ min\ x\ (1-0.258)}$$

$$\%I = 99.5$$

Particulate Matter Concentration at Standard Conditions (Cs), gr/dscf

$$Cs = 15.43\frac{gr}{g}\ x\ \frac{Mn}{Vmstd} = 15.43\frac{gr}{g}\ x\ \frac{0.0640\ g}{30.619\ dscf} = 0.0323\ gr/dscf$$

where, Mn = particulate matter collected, g
Vmstd = std. meter volume, dscf

Particulate Matter Concentration Corrected for O_2, Cs @ 8% O_2

$$Cs, \frac{gr}{dscf}\ x\ \frac{20.9 - 8\%\ O_2}{20.9 - measured\ \%\ O_2}$$

Note: O_2 corrections are based on source category or specific sources, i.e. 10% for Lime Kilns 8 % for Recovery Boilers

$$= 0.0323, \frac{gr}{dscf}\ x\ \frac{20.9 - 8\%\ O_2}{20.9 - 7.8\%\ O_2}$$

$$= 0.0318$$

Particulate Matter Emission Rate (PMR), lb/hr

$$PMR = \frac{Cs \ x \ Qs \ x \ 60 \frac{min}{hr}}{7000 \frac{gr}{lb}}$$

where, Cs = particulate conc. at std. cond., gr/dscf
Qs = avg. stack gas flow at std. cond., dscf/min

$$PMR = \frac{0.0323 \frac{gr}{dscf} \ x \ 1.78 \, E+05 \frac{dscf}{min} \ x \ 60 \frac{min}{hr}}{7000 \frac{gr}{lb}} = 49.2 \, lb/hr$$

APPENDIX B
TEST METHODOLOGY

B.1 VOLUMETRIC FLOW RATE

B.2 PARTICULATE MATTER

B.3 PARTICULATE MATER (METHOD 17)

B.1 VOLUMETRIC FLOW RATE

Mass emission rates are calculated by multiplying measured target analyte concentrations by calculated volumetric flow rates. Volumetric flow rates are calculated using measurement data obtained by EPA Reference Methods 1-4.

The ductwork is measured at the sample location to the nearest 0.25 inch using a steel tape measure. Traverse points are selected in accordance with EPA Reference Method 1 on the basis of ductwork dimensions, geometry, and upstream and downstream disturbances. When a sample location does not meet EPA Reference Method 1 criteria, the maximum recommended number of traverse points is used.

Gas Velocity

The velocity of the gas stream is measured in accordance with EPA Reference Method 2 by reading the instantaneous velocity pressure with an inclined manometer at each traverse point using either a standard "P" type or an "S" type pitot tube. The stack pressure is calculated from the measured static pressure of the stack and the ambient barometric pressure. The static pressure is measured by using the static side of the pitot tube, and the barometric pressure is measured using a calibrated aneroid barometer. Magnahelic® gauges with scales of 0 to 5 and 0 to 25 inches of water or an inclined manometer with a scale of 0 to 10 inches of water are used for velocity pressure measurements. Manometer selection is determined by the velocity pressure of the gas stream. A manometer with a 0 to 0.25 inch scale may be used when the velocity pressure of the gas stream is less than 0.02 inches of water. By convention, any measured velocity pressures of less than 0.005 inches of water are recorded and reported as less than 0.005 inches of water. The stack temperature is measured with a calibrated thermocouple and pyrometer.

For low velocity pressure measurements (less than 0.005 inches of water) a hot wire anemometer may be used to measure the velocity of the gas stream. The indicated velocity is used without correction when the gas stream is ambient air with a moisture content of less than 65%. The indicated velocity is corrected in accordance with procedures specified by the manufacturer when the moisture content exceeds 65% or when the dry gas fraction is something other than ambient air.

Gas Composition and Moisture Content

The composition of the gas stream is measured in accordance with EPA Reference Method 3 using an Orsat or Fyrite Combustion Gas Analyzer. Gas composition determinations are conducted using either integrated or grab sampling techniques.

Grab samples are analyzed using a Fyrite analyzer by withdrawing a gas sample from the source and introducing the sample directly to a zeroed oxygen or carbon dioxide combustion gas analyzer.

After introduction of the gas sample, the analyzer is inverted the prescribed number of times and the analyzer fluid level is recorded giving a percent by volume determination of the oxygen or carbon dioxide concentrations.

Integrated samples are collected by withdrawing a sample from the source through a moisture condenser into a Tedlar® sample bag. The bag is then analyzed using an Orsat analyzer.

The moisture content of the gas stream is determined using one of the following procedures:

- For sources requiring testing by EPA Reference or Test Methods 5, 8, 12, 13, 17, 23, 26A, 29, 0010, or 0011, moisture is determined by EPA Reference Method 4. At the conclusion of each run the volume of condensed moisture in the impingers of the sampling train is measured and used to calculate the moisture content of the gas stream.

- For sources with temperatures greater than 212 °F, the approximation technique described in EPA Reference Method 4 may be used with midget impingers to condense moisture before dry gas volume measurement.

- For sources with a temperature of less than 212 °F, wet bulb/dry bulb temperature measurements may be made, and the moisture content calculated using vapor pressure tables.

When multiple methods are used for moisture determinations, the lowest moisture value is used for volumetric flow calculations.

The molecular weight of the gas stream is calculated using the measured moisture, oxygen, and carbon dioxide concentrations. The balance of the gas stream is assumed to be nitrogen. The volumetric flow is then calculated at stack and standard conditions using the calculated molecular weight, the measured stack temperature, and measured velocity, stack and barometric pressures. Standard conditions are 68 °F and 29.92 inches of mercury and 0% moisture.

Data Acquisition and Reporting

Data are recorded at the time of collection on preprinted data sheets. Calculations are performed (where possible) with preprogrammed calculators or spreadsheet software.

Quality Control

Quality control procedures for volumetric flow measurements involve leak checks of pitot tubes, pitot tube lines and manometers; periodic analysis of ambient air and duplicate analysis of source gas samples with the Fyrite analyzer; triplicate analysis with the Orsat analyzer; and periodic calibration checks of thermocouples and pyrometers.

Data transfers are minimized. Data sheets are checked for completeness and accuracy. Calculations are verified by a second person.

B.2 PARTICULATE MATTER

Particulate matter (PM) emission testing is conducted using EPA Reference Method 5. EPA Reference Methods 1-4 are used, as appropriate, for traverse point selection, determination of stack gas molecular weight, stack gas moisture determination, and volumetric flow rate.

Sampling Equipment and Procedures

The sampling train utilized to perform the PM sampling is an EPA Reference Method 5 train manufactured by Graseby-Nutech, Graseby-Anderson, or Apex Instruments (see Figure B-1). A measured borosilicate, quartz glass, or stainless steel (316) nozzle is attached to a heated (248 ± 25 °F) borosilicate or quartz glass, or stainless steel probe of appropriate length. The probe is connected to a heated (248 ± 25 °F) borosilicate glass filter holder containing a 9-cm glass fiber filter (preweighed to a constant 0.1 mg weight). The first and second impingers each contain 100 mL of distilled water, the third impinger is empty, and the fourth impinger contains 200 to 300 grams of dry preweighed silica gel. The second impinger is a standard Greenburg-Smith type. The first, third, and fourth impingers are of a modified design. All impingers are maintained in a crushed ice bath. A gas measuring control console with a leak-free vacuum pump, a calibrated dry gas meter, a calibrated orifice, and inclined manometers are connected to the final impinger, probe, heated filter holder, and pitot tube via an umbilical cord to complete the train.

Flue gas velocity is measured with a calibrated S-type pitot tube (provided with extensions) fastened alongside the sampling nozzle. Flue gas temperature is monitored with a calibrated direct readout pyrometer equipped with a chromel-alumel (Type K) thermocouple positioned near the sampling nozzle. The probe, filter box, and impinger exit gas temperatures are monitored with a calibrated direct readout pyrometer equipped with Type K thermocouples positioned in the probe, heated filter chamber, and in the sample gas stream after the last impinger. Stack gas stream composition (carbon dioxide and oxygen content) is determined as previously described. The sampling rate is adjusted, based on stack velocity, at each point to ensure the sample is collected isokinetically.

At the conclusion of each test, the sampling train is leak checked. Upon completion of a successful leak check, the sampling train is dismantled, openings are sealed, and the components recovered as described below.

- The glass fiber filter(s) is/are removed from its holder with tweezers and placed in its original container, along with any particulate and filter fragments (Sample Fraction 1).

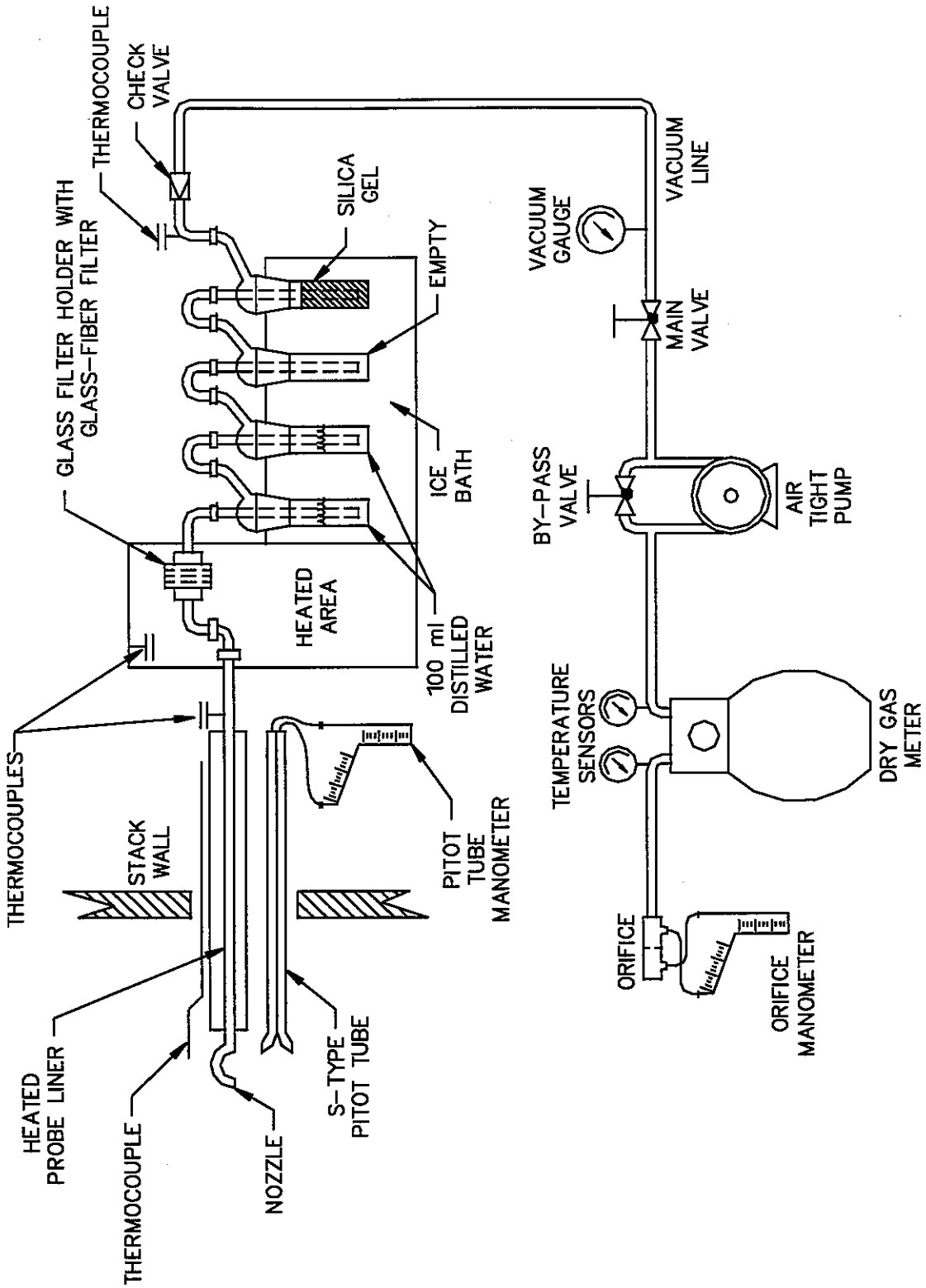

Figure B-1 EPA Reference Method 5 Sampling Train

- The probe and nozzle are separated and the particulate rinsed with distilled water or acetone into a polyethylene container while brushing a minimum of three times. Particulate adhering to the brush is rinsed with the appropriate solvent into the same container. The front half of the filter holder and connecting glassware are also rinsed. These rinses are combined (Sample Fraction 2).

- The total liquid content of impingers one, two, and three are measured volumetrically for stack gas moisture content calculation. This liquid is discarded.

- The silica gel is removed from the last impinger and immediately weighed to the nearest 0.1 g for stack gas moisture content calculation.

- Aliquots of the appropriate solvents and a filter are retained for blank analyses.

Each sample bottle is labeled to clearly identify its contents. The liquid level is marked on each bottle. The samples are then secured for transport to a laboratory for analysis. Sample integrity is assured by maintaining chain-of-custody records.

Sample Analysis

The particulate analysis proceeds as follows:

- The sample filters (Sample Fraction 1) and blank filter are desiccated for 24 hours and weighed to the nearest 0.1 mg to constant (± 0.5 mg) weight.

- The nozzle, probe, and front half of the filter holder wash samples (Sample Fraction 2), along with the solvent blank, are evaporated in tared beakers, then desiccated and weighed to the nearest 0.1 mg to constant (± 0.5 mg) weights.

The total weight of material measured in the front half wash in addition to the weight of material collected on the glass fiber filter represent the total PM catch for each train. Blank corrections are made where appropriate for all sample weights.

Data Acquisition and Reduction

Data are recorded at the time of collection on preprinted data sheets. Calculations are performed with preprogrammed calculators or spreadsheet software. Data transfers are minimized. Field and laboratory data sheets are be checked for completeness and accuracy. Calculations are verified by a second person.

Quality Control

Dry gas meters are calibrated before and after sampling. Thermocouples are calibrated against mercury thermometers, and aneroid barometers are calibrated against a mercury barometer. WESTON participated satisfactorily in the most recent dry gas meter audit supplied by the EPA. Those data are on file at WESTON.

Prior to and following each run, the sampling train is leak checked. An acceptable leak rate does not exceed the lesser of 0.02 actual cubic feet per minute (acfm) or 4% of the actual sampling rate. The isokinetic sampling rate is calculated at the completion of each sample run. If the isokinetic sampling rate is not within 100% ± 10%, the sample run is repeated.

Samples are transported to the laboratory under chain-of-custody. Solvent blanks and filter blanks are analyzed at the same time as the samples. The mass collected on the filters and the mass in the probe wash are corrected by the blank measurements.

WESTON uses Class S weights during each stage of the analysis to verify the accuracy of the balance. The balance is repaired and recalibrated before proceeding if there is a significant difference in the actual mass and measured mass.

B.2 PARTICULATE MATTER (METHOD 17)

Particulate matter (PM) emission testing is conducted using EPA Reference Method 17. EPA Reference Methods 1-4 are used, as appropriate, for traverse point selection, determination of stack gas molecular weight, stack gas moisture determination, and volumetric flow rate.

Sampling Equipment and Procedures

The sampling train utilized to perform the PM sampling is an EPA Reference Method 17 train manufactured by Graseby-Nutech, Graseby-Anderson, or Apex Instruments. A measured stainless steel (316) nozzle is attached to an in-stack filter holder. The filter holder is connected to the impingers through a probe and umbilical. The first and second impingers each contain 100 mL of distilled water, the third impinger is empty, and the fourth impinger contains 200 to 300 grams of dry preweighed silica gel. The second impinger is a standard Greenburg-Smith type. The first, third, and fourth impingers are of a modified design. All impingers are maintained in a crushed ice bath. A gas measuring control console with a leak-free vacuum pump, a calibrated dry gas meter, a calibrated orifice, and inclined manometers are connected to the final impinger, probe, and pitot tube via an umbilical cord to complete the train.

Flue gas velocity is measured with a calibrated S-type pitot tube (provided with extensions) fastened alongside the sampling nozzle. Flue gas temperature is monitored with a calibrated direct readout

pyrometer equipped with a chromel-alumel (Type K) thermocouple positioned near the sampling nozzle. The probe, and impinger exit gas temperatures are monitored with a calibrated direct readout pyrometer equipped with Type K thermocouples positioned in the probe, and in the sample gas stream after the last impinger. Stack gas stream composition (carbon dioxide and oxygen content) is determined as previously described. The sampling rate is adjusted, based on stack velocity, at each point to ensure the sample is collected isokinetically.

At the conclusion of each test, the sampling train is leak checked. Upon completion of a successful leak check, the sampling train is dismantled, openings are sealed, and the components recovered as described below.

- The glass fiber filter(s) is/are removed from its holder and placed in its original container, along with any particulate and filter fragments (Sample Fraction 1).
- The nozzle is separated from the filter holder and the particulate rinsed with distilled water or acetone into a polyethylene container while brushing a minimum of three times. Particulate adhering to the brush is rinsed with the appropriate solvent into the same container. The front half of the filter holder and connecting glassware are also rinsed. These rinses are combined (Sample Fraction 2).
- The total liquid content of impingers one, two, and three are measured volumetrically for stack gas moisture content calculation. This liquid is discarded.
- The silica gel is removed from the last impinger and immediately weighed to the nearest 0.1 g for stack gas moisture content calculation.
- Aliquots of the appropriate solvents and a filter are retained for blank analyses.

Each sample bottle is labeled to clearly identify its contents. The liquid level is marked on each bottle. The samples are then secured for transport to a laboratory for analysis. Sample integrity is assured by maintaining chain-of-custody records.

Sample Analysis

The particulate analysis proceeds as follows:

- The sample filters (Sample Fraction 1) and blank filter are desiccated for 24 hours and weighed to the nearest 0.1 mg to constant (± 0.5 mg) weight.
- The nozzle, and front half of the filter holder wash samples (Sample Fraction 2), along with the solvent blank, are evaporated in tared beakers, then desiccated and weighed to the nearest 0.1 mg to constant (± 0.5 mg) weights.

The total weight of material measured in the front half wash in addition to the weight of material collected on the glass fiber filter represent the total PM catch for each train. Blank corrections are made where appropriate for all sample weights.

Data Acquisition and Reduction

Data are recorded at the time of collection on preprinted data sheets. Calculations are performed with preprogrammed calculators or spreadsheet software. Data transfers are minimized. Field and laboratory data sheets are be checked for completeness and accuracy. Calculations are verified by a second person.

Quality Control

Dry gas meters are calibrated before and after sampling. Thermocouples are calibrated against mercury thermometers, and aneroid barometers are calibrated against a mercury barometer. WESTON participated satisfactorily in the most recent dry gas meter audit supplied by the EPA. Those data are on file at WESTON.

Prior to and following each run, the sampling train is leak checked. An acceptable leak rate does not exceed the lesser of 0.02 actual cubic feet per minute (acfm) or 4% of the actual sampling rate. The isokinetic sampling rate is calculated at the completion of each sample run. If the isokinetic sampling rate is not within 100% ± 10%, the sample run is repeated.

Samples are transported to the laboratory under chain-of-custody. Solvent blanks and filter blanks are analyzed at the same time as the samples. The mass collected on the filters and the mass in the probe wash are corrected by the blank measurements.

WESTON uses Class S weights during each stage of the analysis to verify the accuracy of the balance. The balance is repaired and recalibrated before proceeding if there is a significant difference in the actual mass and measured mass.

PARTICLE SIZE DISTRIBUTION

An Andersen Mark III cascade impactor is utilized to determine particle size distribution. Guidelines for the use of this device are obtained from the following source:

> "Operating Manual for Andersen Mark II and Mark III Particle Sizing Stack Samplers," Andersen Samplers, Inc., Atlanta, February, 1984.

Stack gas velocity, temperature, and moisture data from the immediately preceding Method 5 sampling is used to select the impactor sample point, nozzle size, and sample flow rate. The EPA Method 5 sample point with a velocity value closest to the mean velocity value is selected as the

impactor sample point for the duration of the run. A nozzle is selected to obtain a sample flow rate at the nozzle in the 0.4 - 0.7 ACFM range. The sampling rate, at meter conditions necessary to yield isokinetic sampling at the nozzle, is estimated through calculations. The calculated flow rate is then maintained for the duration of the run.

After each run, the impactor is removed from the stack, transported to an area free of drafts, and allowed to cool. After cooling, the outside of the impactor is washed with distilled water and dried. The impactor is then disassembled, and particulate matter that has accumulated in the nozzle and on the stage zero plate is washed into a polyethylene bottle with distilled water. The filters are then removed from each stage of the impactor and placed in aluminum foil. After cleaning of the inner surfaces, the impactor is then reassembled with new filters. The bottles containing nozzle wash and the aluminum foil containing the filters are returned to the laboratory for analysis.

The nozzle wash is placed in a tared beaker, the water is evaporated, and the beaker is weighed to determine the mass of the residue. Each of the filters is dried and weighed. The filter tare weight is then subtracted from the final filter weight to determine the amount of particulate collected.

The mass of particulate collected on each stage of the impactor is expressed as a percentage of the total mass of particulate collected by the impactor. The percentage of mass collected on a given filter corresponds to the percentage of particles in a specified size range. The size range for a given stage is dependent on the gas flow rate through the impactor, as indicated in the graphs in Appendix D.

Standard EPA Reference Method 5 calculations are employed to calculate stack gas flow, gas flow through the impactor, and isokinetic sampling rates. Volumetric flow through the impactor is calculated based on impactor temperature and measured moisture concentrations. Isokinetic sampling rate calculations are based on stack gas temperatures and the lesser of saturation moisture concentrations or measured moisture concentrations.

APPENDIX C
FIELD DATA – NO. 3 RECOVERY FURNACE
2/15/05

INLET WEST

Bowater
Catawba, SC

03917.008.003
#3 Recovery Inlet West

ISOKINETIC CALCULATIONS

Run Number		1	2	3	Mean
Date		2/15/05	2/15/05	2/15/05	---
Time Began		1245	1417	1559	---
Time Ended		1347	1516	1639	---
INPUT DATA					
Sampling Time, min	(Theta)	48	48	36	44
Stack Diameter, in.	(Dia.)	96x78.5	96x78.5	96x78.5	0.00
Barometric Pressure, in. Hg	(Pb)	29.84	29.84	29.84	29.84
Static Pressure, in. H2O	(Pg)	-12.00	-12.00	-12.00	-12.00
Pitot Tube Coefficient	(Cp)	0.84	0.84	0.84	0.84
Meter Correction Factor	(Y)	1.0220	1.0220	1.0220	1.0220
Orifice Calibration Value	(Delta H@)	1.9120	1.9120	1.9120	1.9120
Nozzle Diameter, in.	(Dn)	0.307	0.275	0.275	0.286
Meter Volume, ft^3	(Vm)	30.537	27.290	20.628	26.152
Meter Temperature, °F	(Tm)	72.0	76.3	77.3	75.2
Meter Temperature, °R	(Tm-R)	532.0	536.3	537.3	535.2
Meter Orifice Pressure, in. H2O	(Delta H)	1.687	1.180	1.153	1.340
Ave Sq Rt Orifice Press, (in. H2O)^½	((Delta H)½)avg)	1.267	1.062	1.060	1.130
Volume H2O Collected, mL	(Vlc)	224.6	204.9	189.2	206.2
CO2 Concentration, %	(CO2)	14.0	14.0	15.5	14.5
O2 Concentration, %	(O2)	5.5	5.5	5.0	5.3
Ave Sq Rt Velo Head, (in. H2O)^½	((Delta P)½)avg)	0.651	0.658	0.656	0.655
Stack Temperature, °F	(Ts)	353.0	351.3	353.4	352.6
Stack Temperature, °R	(Ts-R)	813.0	811.3	813.4	812.6
Particulate Collected, g	(Mn)	11.6568	12.1123	7.1131	10.2941
CALCULATED DATA					
Nozzle Area, ft^2	(An)	5.14E-04	4.12E-04	4.12E-04	4.45E-04
Stack Area, ft^2	(As)	52.33	52.33	52.33	52.33
Stack Pressure, in. Hg	(Ps)	28.96	28.96	28.96	28.96
Meter Pressure, in. Hg	(Pm)	29.96	29.93	29.92	29.94
Standard Meter Volume, ft^3	(Vmstd)	31.007	27.454	20.712	26.391
Standard Water Volume, ft^3	(Vwstd)	10.572	9.645	8.906	9.707
Moisture Fraction (Measured)	(BWS)	0.254	0.260	0.301	0.272
Moisture Fraction (lower sat/meas)	(BWS)	0.254	0.260	0.301	0.272
Mol. Wt. of Dry Gas, lb/lb-mole	(Md)	30.46	30.46	30.68	30.53
Mol. Wt. of Stack Gas, lb/lb-mole	(Ms)	27.29	27.22	26.87	27.13
Average Stack Gas Velocity, ft/sec	(Vs)	47.42	47.94	48.17	47.84
Stack Gas Flow, actual, ft^3/min	(Qa)	148876	150516	151237	150210
Stack Gas Flow, Std , ft^3/min	(Qs)	69756	70131	66418	68768
Isokinetic Sampling Rate, %	(%I)	94.3	103.5	109.9	102.6
Particulate Conc @ Std Cond, gr/ft^3	(Cs)	5.8007	6.8075	5.2991	5.9691
Particulate Conc @ 8% O_2, gr/ft^3 8	(Cs@8%O2)	4.8651	5.7095	4.3055	4.9601
Particulate Emission, lb/hr	(PMR)	3467.7	4091.5	3016.3	3525.2
Calibration check	(Yqa)	1.0576	0.9966	0.9844	1.013
Percent difference from Y					-0.89%

CT 813

ISOKINETIC FIELD DATA SHEET

Method 5 17

Page 1 of 1

Client	Bowater
W.O.#	03917.006.003
Project ID	
Mode/Source ID	No. 3 Recovery Inlet (West)
Samp. Loc. ID	Catawba, SC
Run No.ID	1
Test Method ID	5 17
Date ID	2/15/05
Source/Location	No. 3 Rec. Inlet (West)
Sample Date	2/15/05
Baro. Press (in Hg)	29.84
Operator	TS / CL

Stack Conditions

	Assumed	Actual
% Moisture	27	
Impinger Vol (ml)		218
Silica gel (g)		6.6
CO2, % by Vol	14.0	
O2, % by Vol	5.5	
Temperature (°F)	348	
Meter Temp (°F)	70	
Static Press (in H_2O)	-12	
Ambient Temp (°F)		

Meter Box ID	107
Meter Box Y	1.022
Meter Box Del H	1.912
Probe ID / Length	PR100 / 9'
Probe Material	SS
Pitot / Thermocouple ID	
Pitot Coefficient	.84
Nozzle ID	AN.3-1
Avg Nozzle Dia (in)	.307
Area of Stack (ft^2)	52.33
Sample Time	48
Total Traverse Pts	24

K Factor 3.9 3.8

Leak Checks	Initial	Mid-Point	Final
Sample Train (ft^3)	.005		.003
Leak Check @ (in Hg)	18"		17"
Pitot good	yes / no	yes / no	yes / no
Orsat good	yes / no	yes / no	yes / no

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp		
Reference Temp		
Pass/Fail (+/- 2°)	Pass / Fail	Pass / Fail
Temp Change Response ?	yes / no	yes / no

TRAVERSE POINT NO	SAMPLE TIME (min)	CLOCK TIME (military)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM TEMP (°F)	CO2 (%)	O2 (%)	FILTER BOX TEMP (°F)	IMPINGER EXIT TEMP (°F)	VACUUM TRAPPED (in Hg)		COMMENTS
	0	1245			707.038									
A 1	2		.63	2.3	708.5	349	68				57	5		
2	4		.69	2.6	710.1	351	69				56	6		
3	6		.60	2.3	711.6	355	69				55	7		
4	8		.34	1.3	712.8	355	69				54	6		
5	10		.38	1.4	714.0	354	69				53	6		
6	12		.25	0.95	715.0	356	71				54	6		
B 1	14		.71	2.7	716.8	352	71				56	10		
2	16		.58	2.2	718.2	353	70				56	8		
3	18		.66	2.5	719.9	356	71				56	9		
4	20		.50	1.9	721.2	356	71				58	9		
5	22		.36	1.4	722.4	355	71				59	7		
6	24		.20	0.76	723.4	355	71				60	5		1310
C 1	26		.69	2.6	724.9	349	72				58	12		
2	28		.65	2.5	726.5	348	73				58	10		
3	30		.48	1.8	727.9	353	73				59	7 8		
4	32		.24	0.91	728.8	354	74				59	8		
5	34		.23	0.87	729.7	353	74				59	11		
6	36		.18	0.68	730.6	347	74				60	12		
D 1	38		.65	2.5	732.0	351	74				59	14		
2	40		.59	2.2	733.4	350	74				59	15		
3	42		.41	1.6	734.6	354	75				60	14		
4	44		.25	0.95	735.6	355	75				61	12 13		
5	46		.22	0.84	736.4	356	76				62	12 13		
6	48	1347	.19	0.72	737.575	354	75				63	13		
			Avg Sqrt Delta P .651	Avg Delta H 1.687	Total Volume 30.537	Avg Ts 353.0		Avg Tm 72.0	Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	

WESTON MANAGERS DESIGNERS/CONSULTANTS

AVG. = .445

Avg Sqrt Del H 1.267

Comments:

ISO = 94.3
Most. = 25.4
SCFM = 69755.5
SVOL = 31.0

C2

CT814

ISOKINETIC FIELD DATA SHEET

Method 17

Page 1 of 1

Client	Bowater
W.O.#	03917.008.003
Project ID	
Mode/Source ID	No.3 Recovery Inlet (West)
Samp. Loc. ID	Catawba, SC
Run No.ID	2
Test Method ID	17
Date ID	2/15/05
Source/Location	No.3 Rec. Inlet (West)
Sample Date	2/15/05
Baro. Press (in Hg)	29.44
Operator	TS/CL

Stack Conditions

	Assumed	Actual
% Moisture	26	
Impinger Vol (ml)		200
Silica gel (g)		4.9
CO2, % by Vol	14.6	
O2, % by Vol	5.5	
Temperature (°F)	353	
Meter Temp (°F)	76	
Static Press (in H_2O)	-12	
Ambient Temp (°F)		

Meter Box ID	107
Meter Box Y	1.022
Meter Box Del H	1.912
Probe ID / Length	PR100 9'
Probe Material	SS
Pitot / Thermocouple ID	
Pitot Coefficient	.84
Nozzle ID	1-9
Avg Nozzle Dia (in)	.275
Area of Stack (ft^2)	52.33
Sample Time	48
Total Traverse Pts	24

Leak Checks

	Initial	Mid-Point	Final
Sample Train (ft^3)	.015		.010
Leak Check @ (in Hg)	18"		19"
Pitot good	yes / no	yes / no	yes / no
Orsat good	yes / no	yes / no	yes / no

K Factor 2.6

Temp Check

	Pre-Test Set	Post-Test Set
Meter Box Temp		
Reference Temp		
Pass/Fail (+/- 2°)	Pass / Fail	Pass / Fail
Temp Change Response ?	yes / no	yes / no

TRAVERSE POINT NO	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM TEMP (°F)	CO2 (%)	PROBE TEMP (°F)	FILTER BOX TEMP (°F)	IMPINGER EXIT TEMP (°F)	SAMPLE TRAIN VACUUM (in Hg)		COMMENTS
	0	~~1319~~ 1417			737.907									
A 1	2		.30	2.1	739.5	354	73				62	4		
2	4		.65	1.7	740.9	356	73				62	4		
3	6		.60	1.6	742.1	358	74				57	6		
4	8		.57	1.5	743.4	355	74				52	6		
5	10		.30	0.78	744.3	351	74				49	6		
6	12		.29	0.75	745.2	350	74				48	6		
B 1	14		.69	1.8	746.7	349	75				48	10		
2	16		.66	1.7	748.1	350	75				47	12		
3	18		.60	1.6	749.3	353	76				47	14		
4	20		.31	0.81	750.2	353	76				46	11		
5	22		.26	0.68	751.1	348	77				45	11		
6	24		.23	0.60	752.0	346	77				46	12		
C 1	26		.65	1.7	753.4	349	76				51	13		
2	28		.69	1.8	754.9	350	77				49	13		
3	30		.50	1.3	756.2	353	77				47	11		
4	32		.35	0.91	757.2	355	77				47	9		
5	34		.27	0.68	758.1	355	77				47	7		
6	36		.20	0.52	758.9	347	77				47	7		
D 1	38		.55	1.4	760.2	349	78				50	12		
2	40		.50	1.3	761.4	350	78				49	11		
3	42		.44	1.1	762.6	351	78				48	11		
4	44		.29	0.75	763.5	351	79				48	9		
5	46		.26	0.68	764.4	351	79				47	11		
6	48	1516	.21	0.55	765.197	349	79				48	12		
			Avg Sqrt Delta P .654	Avg Delta H 1.180	Total Volume 27.290	Avg Ts 351.3	Avg Tm 76.3		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	

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AVG. = .447

Avg Sqrt Del H 1.062

Comments:

Iso = 104.1
Moist. = 26.0
SCFM = 6970.97
SVOL = 27.5

CT 815

ISOKINETIC FIELD DATA SHEET

Method 17

Page 1 of 1

			Stack Conditions Assumed	Stack Conditions Actual			
Client	Bowater				Meter Box ID	A07	
W.O.#	03917.008.003				Meter Box Y	1.022	
Project ID		% Moisture	26		Meter Box Del H	1.912	
Mode/Source ID	No. 3 Recovery Inlet (Wet)	Impinger Vol (ml)		186	Probe ID / Length	TR100 / 9'	
Samp. Loc. ID	Catawba, SC	Silica gel (g)		3.2	Probe Material	SS	
Run No.ID	3	CO2, % by Vol	14.0	15.5	Pilot / Thermocouple ID		
Test Method ID	17	O2, % by Vol	5.5	5.0	Pilot Coefficient	.84	
Date ID	2/15/05	Temperature (°F)	350		Nozzle ID	1-9	
Source/Location	No. 3 Rec. Inlet (Wet)	Meter Temp (°F)	79		Avg Nozzle Dia (in)	.275	
Sample Date	2/15/05	Static Press (In H_2O)	-12		Area of Stack (ft^2)	52.33	
Baro. Press (in Hg)	29.84				Sample Time		
Operator	TS / CL	Ambient Temp (°F)			Total Traverse Pts	24	

Leak Checks	Initial	Mid-Point	Final
Sample Train (ft^3)	.008		.008
Leak Check @ (in Hg)	18"		17
Pilot good	yes / no	yes / no	yes / no
Orsat good	yes / no	yes / no	yes / no

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp		
Reference Temp		
Pass/Fail (+/- 2°)	Pass / Fail	Pass / Fail
Temp Change Response ?	yes / no	yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	PROBE TEMP (°F)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	0	1559			765.795									
A1	2		.63	1.6	767.2	348	74				55	4		
2	4		.46	1.2	768.4	353	75				54	4		
3	6		.45	1.2	769.5	356	75				52	5		
4	8		.30	0.78	770.4	352	75				50	5		
5	10		.33	0.86	771.4	353	76				49	6		
6	12		.31	0.81	772.4	348	76				49	7		
D1	14		.58	1.5	773.8	351	77				51	7		
2	16		.53	1.4	775.1	352	77				50	7		
3	18		.60	1.6	776.5	355	78				49	7		
4	20		.46	1.2	777.7	358	78				49	6		
5	22		.37	0.96	778.7	358	78				49	6		
6	24		.22	0.57	779.5	350	78				49	5		
C1	26		.68	1.8	780.9	349	79				52	5		
2	28		.57	1.5	782.2	354	80				50	7		
3	30		.55	1.4	783.4	358	79				49	8		
4	32		.38	0.99	784.5	359	78				49	7		
5	34		.30	0.78	785.4	356	79				49	7		
6	36	1639	.23	0.60	786.23	358	79				49	7.8		16
D1	38													
2	40													
3	42													
4	44													
5	46													
6	48													
			Avg Sqrt Delta P .656	Avg Delta H 1.153	Total Volume 20.628	Avg Ts 353.8	Avg Tm 77.3	Min/Max	Min/Max	Max Temp	Max Vac	Max Temp		
				Avg Sqrt Del H 1.060										

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AVG = .442

Comments:

4

ISO: 110
Moist.: 30.1
SCFM: 66401.5
SVOL: 20.7

SAMPLE RECOVERY FIELD DATA

Method 17

Client: Bowater
Location/Plant: Catawba, SC
W.O. #: 03917.008.003
Source & Location: No. 3 Recovery Inlet (West)

Run No. 1 — Sample Date 2/15/05 — Recovery Date 2/15/05
Sample I.D. — Analyst C. Landis — Filter Number CT 813

	Impinger 1	2	3	4	5	6	Imp.Total	7	Total
Contents	H_2O	H_2O						S.Gel	
Final	300	118	—				418	284.1	702.1
Initial	100	100	—				200	277.5	477.5
Gain	200	18					218	6.6	224.6

Impinger Color: Cloudy — Labeled? ✓
Silica Gel Condition: Good — Sealed? ✓

Run No. 2 — Sample Date 2/15/05 — Recovery Date 2/15/05
Sample I.D. — Analyst C. Landis — Filter Number CT 814

	Impinger 1	2	3	4	5	6	Imp.Total	7	Total
Contents	H_2O	H_2O						S.Gel	
Final	290	110					400	289.0	689.0
Initial	100	100	—				200	284.1	484.1
Gain	190	10					200	4.9	204.9

Impinger Color: Cloudy — Labeled? ✓
Silica Gel Condition: Used — Sealed? ✓

Run No. 3 — Sample Date 2/15/05 — Recovery Date 2/16/05
Sample I.D. — Analyst C. Landis — Filter Number CT 815

	Impinger 1	2	3	4	5	6	Imp.Total	7	Total
Contents	H_2O	H_2O						S.Gel	
Final	282	104					386	291.7	
Initial	100	100	—				200	288.5	488.5
Gain	182	4					186	3.2	189.2

Impinger Color: Cloudy — Labeled? ✓
Silica Gel Condition: Good — Sealed? ✓

Check COC for Sample IDs of Media Blanks

WESTON

Determination of Stack Gas Velocity - Method 2

Client: Bowater
Location/Plant: Catawba, SC
Source: No. 3 Rec. Inlet (West)

Operator: TS/CL
Date: 2/15/05
W.O. Number: 03917.009.003

Pitot Coeff (Cp): .84
Stack Area, ft² (As): 52.33
Pitot Tube/Thermo ID: _____

Run Number	1		
Time	1109		
Barometric Press, in Hg (Pb)	29.84		
Static Press, in H_2O (Pstatic)			
Source Moisture, % (BWS)	27		
O_2, %	5.5		
CO_2, %	14.0		

Cyclonic Flow Determination		Traverse Location		Leak Check good ? (Y) N		Leak Check good ? Y / N		Leak Check good ? Y / N	
Delta P at 0°	Angle yeilding zero Delta P	Port	Point	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)
		A	1	(CK) .65.55	347				
			2	.55	349				
			3	.56	351				
			4	.36	352				
			5	.33	351				
			6	.20	345				
		B	1	.63	347				
			2	.57	348				
			3	.60	350				
			4	.42	353				
			5	.32	347				
			6	.25	349				
		C	1	.58	348				
			2	.61	349				
			3	.46	352				
			4	.27	350				
			5	.27	347				
			6	.21	345				
		D	1	.49	345				
			2	.48	347				
			3	.41	348				
			4	.23	348				
			5	.20	349				
			6	.18	346				
Avg Angle		Avg Delta P & Temp		.465	348.5				
		avg $\sqrt{DeltaP}$		.625					
Average gas stream velocity, ft/sec.									
Vol. flow rate @ actual conditions, wacf/min									
Vol. flow rate at standard conditions, dscf/min									

$$MWd = (0.32 * O_2) + (0.44 * CO_2) + (0.28 * (100 - (CO_2 + O_2)))$$

$$MWs = (MWd * (1 - (BWS/100))) + (18 * (BWS/100))$$

$$Tsa = Ts + 460$$

$$Ps = Pb + (Pstatic/13.6)$$

$$Vs = 85.49 * Cp * avg\sqrt{DeltaP} * \sqrt{Tsa/(Ps * MWs)}$$

$$Qs(act) = 60 * Vs * As$$

$$Qs(std) = 17.64 * (1 - (BWS/100)) * (Ps/Tsa) * Qs(act)$$

where:
MWd = Dry molecular weight source gas, lb/lb-mole.
MWs = Wet molecular weight source gas, lb/lb-mole.
Tsa = Source Temperature, absolute(oR)
Ps = Absolute stack static pressure, inches Hg.
Vs = Average gas stream velocity, ft/sec.
Qs(act) = Volumetric flow rate of wet stack gas at actual,
Qs(std) = Volumetric flow rate of dry stack gas at standard conditions, dscf/min

Comments _____

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Sample and Velocity Traverse Point Data Sheet - Method 1

Client Bowater
Loaction/Plant Catawba, SC
Source No.3 Rec. Inlet (East & West)

Operator CL / TS
Date 2/15/05
W.O. Number 03917.008.003

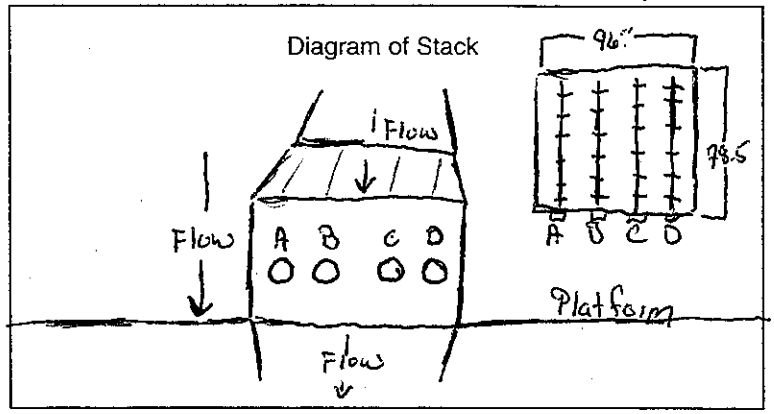
Duct Type	☐ Circular	☑ Rectangular Duct	Indicate appropriate type
Traverse Type	☑ Particulate Traverse	☐ Velocity Traverse	

Distance from far wall to outside of port (in.) = C	101.0
Port Depth (in.) = D	22.5
Depth of Duct, diameter (in.) = C-D	78.5
Area of Duct (ft^2)	52.33
Total Traverse Points	24
Total Traverse Points per Port	6

Rectangular Ducts Only	
Width of Duct, rectangular duct only (in.)	96.0
Total Ports (rectangular duct only)	4

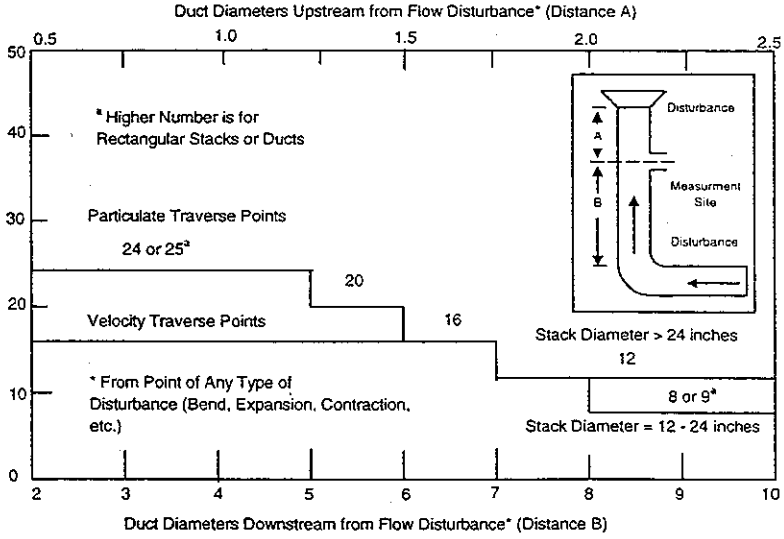
Flow Disturbances	
Upstream - A (ft)	4
Downstream - B (ft)	5
Upstream - A (duct diameters)	.488
Downstream - B (duct diameters)	.610

Diagram of Stack



Traverse Point Locations

Traverse Point	% of Duct	Distance from Inside Duct Wall (in)	Distance from Outside of Port (in)
1	8.3		29.0
2	25.0		42.1
3	41.7		55.2
4	58.3		68.3
5	75.0		81.4
6	91.7		94.5
7			
8			
9			
10			
11			
12			



Equivalent Diameter = (2*L*W)/(L+W)

Traverse Point Location Percent of Stack -Circular

Traverse Point	Number of Traverse Points: 1	2	3	4	5	6	7	8	9	10	11	12
1		14.6		6.7		4.4		3.2		2.6		2.1
2		85.4		25		14.6		10.5		8.2		6.7
3				75		29.6		19.4		14.6		11.8
4				93.3		70.4		32.3		22.6		17.7
5						85.4		67.7		34.2		25
6						95.6		80.6		65.8		35.6
7								89.5		77.4		64.4
8								96.8		85.4		75
9										91.8		82.3
10										97.4		88.2
11												93.3
12												97.9

Traverse Point Location Percent of Stack -Rectangular

Traverse Point	Number of Traverse Points: 1	2	3	4	5	6	7	8	9	10	11	12
1		25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2
2		75.0	50.0	37.5	30.0	25.0	21.4	18.8	16.7	15.0	13.6	12.5
3			83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	22.7	20.8
4				87.5	70.0	58.3	50.0	43.8	38.9	35.0	31.8	29.2
5					90.0	75.0	64.3	56.3	50.0	45.0	40.9	37.5
6						91.7	78.6	68.8	61.1	55.0	50.0	45.8
7							92.9	81.3	72.2	65.0	59.1	54.2
8								93.8	83.3	75.0	68.2	62.5
9									94.4	85.0	77.3	70.8
10										95.0	86.4	79.2
11											95.5	87.5
12												95.8

Rectangular Stack Points & Matrix
9 - 3 x 3
12 - 4 x 3
16 - 4 x 4
20 - 5 x 4
25 - 5 x 5
30 - 6 x 5
36 - 6 x 6
42 - 7 x 6
49 - 7 x 7

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OUTLET

Bowater
Catawba, SC

03917.008.003
#3 Recovery Outlet

ISOKINETIC CALCULATIONS

		1	2	3	Mean
Run Number		1	2	3	Mean
Date		2/15/05	2/15/05	2/15/05	---
Time Began		1246	1417	1559	---
Time Ended		1342	1510	1647	---
INPUT DATA					
Sampling Time, min	(Theta)	48.0	48	48	48
Stack Diameter, in.	(Dia.)	127.00	127.00	127.00	127.00
Barometric Pressure, in. Hg	(Pb)	29.71	29.71	29.71	29.71
Static Pressure, in. H2O	(Pg)	-0.87	-1.10	-1.10	-1.02
Pitot Tube Coefficient	(Cp)	0.84	0.84	0.84	0.84
Meter Correction Factor	(Y)	1.0140	1.0140	1.0140	1.0140
Orifice Calibration Value	(Delta H@)	1.8540	1.8540	1.8540	1.8540
Nozzle Diameter, in.	(Dn)	0.219	0.241	0.241	0.234
Meter Volume, ft^3	(Vm)	25.934	29.836	30.082	28.617
Meter Temperature, °F	(Tm)	73.4	81.8	84.5	79.9
Meter Temperature, °R	(Tm-R)	533.4	541.8	544.5	539.9
Meter Orifice Pressure, in. H2O	(Delta H)	1.002	1.425	1.413	1.280
Ave Sq Rt Orifice Press, (in. H2O)^½	((Delta H)½)avg)	1.000	1.191	1.184	1.125
Volume H2O Collected, mL	(Vlc)	198.5	215.4	215.1	209.7
CO2 Concentration, %	(CO2)	14.0	14.0	14.0	14.0
O2 Concentration, %	(O2)	7.0	6.8	7.0	6.9
Ave Sq Rt Velo Head, (in. H2O)^½	((Delta P)½)avg)	0.911	0.950	0.942	0.935
Stack Temperature, °F	(Ts)	331.3	330.5	331.9	331.2
Stack Temperature, °R	(Ts-R)	791.3	790.5	791.9	791.2
Particulate Collected, g	(Mn)	0.0501	0.0577	0.0747	0.0608
CALCULATED DATA					
Nozzle Area, ft^2	(An)	2.62E-04	3.17E-04	3.17E-04	2.98E-04
Stack Area, ft^2	(As)	87.97	87.97	87.97	87.97
Stack Pressure, in. Hg	(Ps)	29.65	29.63	29.63	29.63
Meter Pressure, in. Hg	(Pm)	29.78	29.81	29.81	29.80
Standard Meter Volume, ft^3	(Vmstd)	25.902	29.368	29.462	28.244
Standard Water Volume, ft^3	(Vwstd)	9.343	10.139	10.125	9.869
Moisture Fraction (Measured)	(BWS)	0.265	0.257	0.256	0.259
Moisture Fraction (lower sat/meas)	(BWS)	0.265	0.257	0.256	0.259
Mol. Wt. of Dry Gas, lb/lb-mole	(Md)	30.52	30.51	30.52	30.52
Mol. Wt. of Stack Gas, lb/lb-mole	(Ms)	27.20	27.30	27.32	27.27
Average Stack Gas Velocity, ft/sec	(Vs)	64.83	67.46	66.93	66.41
Stack Gas Flow, actual, ft^3/min	(Qa)	342204	356077	353245	350509
Stack Gas Flow, Std , ft^3/min	(Qs)	166203	175009	173514	171575
Isokinetic Sampling Rate, %	(%I)	109.2	97.1	98.3	101.5
Particulate Conc @ Std Cond, gr/ft^3	(Cs)	0.0298	0.0303	0.0391	0.0331
Particulate Conc @ 8% O_2, gr/ft^3	(Cs @ 8 %O2)	0.0277	0.0278	0.0363	0.0306
Particulate Emission, lb/hr	(PMR)	42.5	45.5	58.2	48.7
Calibration check	(Yqa)	1.0014	1.0445	1.0323	1.026
Percent difference from Y					1.19%

CZ6505

ISOKINETIC FIELD DATA SHEET

Method 5

Page ____ of ____

Client	Bowater
W.O.#	03117.008.003
Project ID	
Mode/Source ID	#3 Rec Outlet
Samp. Loc. ID	Catawba, SC
Run No.ID	1
Test Method ID	5
Date ID	2-15-05
Source/Location	
Sample Date	2-15-05
Baro. Press (in Hg)	29.71
Operator	CB / MS

Stack Conditions	Assumed	Actual
% Moisture	23	
Impinger Vol (ml)		190
Silica gel (g)		8.5
CO2, % by Vol	14.0	14
O2, % by Vol	5.5	7.0
Temperature (°F) MS	~~340~~ 333	
Meter Temp (°F)	~~65~~ 75	
Static Press (in H_2O)	~~-1.0~~ -.87	-.87
Ambient Temp (°F)		

Meter Box ID	408	
Meter Box Y	1.014	
Meter Box Del H	1.854	
Probe ID / Length	PR43	12'
Probe Material	SS	
Pitot / Thermocouple ID	P	
Pitot Coefficient	.84	
Nozzle ID	MS AVG ~~247~~ .217	
Avg Nozzle Dia (in)	MS ~~.249~~ .219	
Area of Stack (ft^2)	87.97	
Sample Time	MS ~~60~~ 48	
Total Traverse Pts	24	

K Factor MS ~~1.0~~ 1.2

Leak Checks	Initial	Mid-Point	Final
Sample Train (ft^3)	MS ~~.015~~		.012
Leak Check @ (in Hg)	12		9
Pitot good	yes / no	yes / no	yes / no
Orsat good	yes / no	yes / no	yes / no

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp		
Reference Temp		
Pass/Fail (+/- 2°)	Pass / Fail	Pass / Fail
Temp Change Response ?	yes / no	yes / no

TRAVERSE POINT NO	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H_2O)	ORIFICE PRESSURE Delta H (in H_2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM INLET TEMP (°F) MS	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (°F)	IMPINGER EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	1246			777.110									
A 1	~~2~~ 5 2		.73	.88	~~778.2~~	330	64		239	257	68	3		
2	~~5~~ 4		.83	1.0	779.3	332	71		238	257	55	3		290
3	~~7~~ 6		.90	1.1	780.4	333	74		234	260	53	4		
4	~~10~~ 8		.90	1.1	781.5	333	73		233	250	53	4		
5	~~12~~ 10		.88	1.1	782.6	333	73		234	243	52	4		
6	~~15~~ 12		.74	.89	783.7	333	72		236	242	51	4		
7	~~17.5~~ 14		MS ~~.80~~ ~~.78~~	.94	784.7	333	71		238	244	50	4		
8	~~20~~ 16		MS .89 ~~.79~~	~~.95~~ 1.1	785.8	333	72		237	243	51	4		
9	~~22.5~~ 18		.94	1.1	786.9	333	72		239	243	52	4		
10	~~25~~ 20		.95	1.1	787.9	332	72		239	244	52	4		
11	~~27.5~~ 22		.98	1.2	789.1	333	73		237	242	52	5		
12	~~30~~ 24		.91	1.1	790.2	333	74		235	242	52	5		
B 1	~~32.5~~ 26		.80	.96	791.6	320	70		223	228	51	4		
2	~~35~~ 28		.76	.91	792.5	332	~~72~~		233	227	53	4		
3	~~37.5~~ 30		.92	1.1	793.5	333	73		235	229	53	4		
4	~~40~~ 32		.85	1.02	794.5	333	74		240	229	52	5		
5	~~42.5~~ 34		.82	.98	795.7	333	74		251	229	52	5		
6	~~45~~ 36		.81	.97	796.7	333	75		255	229	52	4.5		
7	~~47.5~~ 38		.81	.97	797.9	332	75		261	226	52	5		
8	~~50~~ 40		.76	.91	798.8	332	77		253	226	52	5		
9	~~52.5~~ 42		.75	.90	799.9	332	77		251	229	52	5		
10	~~55~~ 44		.80	.96	800.9	332	77		246	228	53	5		
11	~~57.5~~ 46		.78	.93	802.0	332	78		243	229	53	5		
12	~~60~~ 48	1342	.69	.83	803.044	316	78		233	229	54	5		
			Avg Sqrt Delta P .9114	Avg Delta H 1.002	Total Volume 25.934 MS	Avg Ts 331.4	Avg Tm 73.4		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	

AVG. .0325

Avg Sqrt Del H .9999

Comments:

3

Q_s = 166200

BWS = .265

%I = 109.2

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CZ6506

ISOKINETIC FIELD DATA SHEET

Method 5

Page ____ of ____

Client	Bowater
W.O.#	
Project ID	
Mode/Source ID	#3 Rec. Out.
Samp. Loc. ID	Catawba, SC
Run No.ID	2
Test Method ID	5
Date ID	2-15-05
Source/Location	Catawba, SC
Sample Date	2-15-05
Baro. Press (in Hg)	29.71
Operator	MS/CB

Stack Conditions

	Assumed	Actual
% Moisture	25	
Impinger Vol (ml)		212
Silica gel (g)		3.4
CO2, % by Vol	14.5	14
O2, % by Vol	6	6.8
Temperature (°F)	333	
Meter Temp (°F)	80	
Static Press (in H_2O)	-.87	-1.1
Ambient Temp (°F)		

Meter Box ID	A08
Meter Box Y	1.014
Meter Box Del H	1.854
Probe ID / Length	9R43 / 12'
Probe Material	SS
Pitot / Thermocouple ID	
Pitot Coefficient	.84
Nozzle ID	AVN 241
Avg Nozzle Dia (in)	241
Area of Stack (ft^2)	87.97
Sample Time	48
Total Traverse Pts	24

K Factor 1.6

Leak Checks	Initial	Mid-Point	Final
Sample Train (ft^3)	.012		.014
Leak Check @ (in Hg)	12		10
Pitot good	yes / no	yes / no	yes / no
Orsat good	yes / no	yes / no	yes / no

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp		
Reference Temp		
Pass/Fail (+/- 2°)	Pass / Fail	Pass / Fail
Temp Change Response ?	yes / no	yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (°F)	IMPINGER EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	1417			803.980									
B 1	2		.84	~~1.34~~ 1.3	805.2	332	~~78~~ 78		~~228~~ 223	239	66	4		
2	4		1.1	1.7	806.5	332	78		224	242	62	4		
3	6		1.0	1.6	807.8	331	80		224	243	60	5		
4	8		1.1	1.7	809.2	333	81		224	245	58	5		
5	10		1.0	1.6	810.5	333	81		233	243	56	5		
6	12		.98	1.5	811.8	333	81		252	242	55	5		
7	14		.88	1.4	813.1	333	81		257	243	55	5		
8	16		.85	1.3	814.3	332	82		257	243	56	5		
9	18		.87	1.4	815.6	332	82		265	244	57	5		
10	20		.80	1.3	816.7	332	83		266	244	57	5		
11	22		.70	1.1	817.8	332	83		268	243	57	5		
12	24		.68	1.1	818.9	322	83		245	242	57	5		
A 1	26		.80	1.3	820.0	360	80		245	244	57	5		
2	28		.68	1.1	821.2	327	81		240	243	57	5		
3	30		.85	1.3	822.4	332	83		240	243	56	5		
4	32		.90	1.4	823.5	333	82		240	243	56	5		
5	34		.88	1.4	824.7	333	83		240	243	55	5		
6	36		.85	1.3	826.0	333	83		240	243	54	5		
7	38		.94	1.5	827.2	333	83		239	243	54	5		
8	40		1.0	1.6	828.5	333	83		240	243	54	5		
9	42		1.1	1.7	829.8	333	83		240	244	54	5		
10	44		1.1	1.7	831.2	333	83		241	243	54	5		
11	46		.98	1.5	832.5	333	83		235	243	54	5		
12	48	1510	.90	1.4	833.816	332	83		240	243	54	5		
			Avg Sqrt Delta P .9503	Avg Delta H 1.425	Total Volume 29.836	Avg Ts 330.4	Avg Tm 81.8		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	

AVG .9075

Avg Sqrt Del H 1.191

Comments:

5

Qs = 175000

BWS = .257

I = 97.1

WESTON MANAGERS DESIGNERS/CONSULTANTS

CZ6507

ISOKINETIC FIELD DATA SHEET

Method 5

Page ____ of ____

Client	Bowater
W.O.#	
Project ID	
Mode/Source ID	#3 Rec. Out
Samp. Loc. ID	Catawba, SC
Run No.ID	3
Test Method ID	5
Date ID	2-15-05
Source/Location	Catawba, SC
Sample Date	2-15-05
Baro. Press (in Hg)	29.71
Operator	CB/MS

Stack Conditions

	Assumed	Actual
% Moisture	25	
Impinger Vol (ml)		210
Silica gel (g)		5.1
CO2, % by Vol	14	14
O2, % by Vol	7	7
Temperature (°F)	330	
Meter Temp (°F)	85	
Static Press (in H_2O)	-1.1	
Ambient Temp (°F)		

Meter Box ID	A08
Meter Box Y	1.014
Meter Box Del H	1.854
Probe ID / Length	PR 43 / 12
Probe Material	SS
Pitot / Thermocouple ID	
Pitot Coefficient	.84
Nozzle ID	AON .241
Avg Nozzle Dia (in)	.241
Area of Stack (ft^2)	87.97
Sample Time	48
Total Traverse Pts	24

K Factor 1.6

Leak Checks	Initial	Mid-Point	Final
Sample Train (ft^3)	.010		.02
Leak Check @ (in Hg)	10		11
Pitot good	yes / no	yes / no	yes / no
Orsat good	yes / no	yes / no	yes / no

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp		
Reference Temp		
Pass/Fail (+/- 2°)	Pass / Fail	Pass / Fail
Temp Change Response ?	yes / no	yes / no

TRAVERSE POINT NO	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft^3)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (°F)	IMPINGER EXIT TEMP (°F)	SAMPLE TRAIN VAC (in Hg)		COMMENTS
	0	1859			834.500									
A 1	2		.65	1.0	835.7	304	70		230	240	65	4		
2	4		.68	1.1	836.7	330	80		235	243	60	4		
3	6		.80	1.3	837.8	331	83		235	244	57	4		
4	8		.75	1.2	839.0	330	84		235	245	55	4		
5	10		.74	1.2	840.2	330	84		235	245	54	4		
6	12		.82	1.3	841.4	332	85		234	245	54	4		
7	14		.90	1.4	842.6	332	86		235	246	53	4		
8	16		1.1	1.7	843.9	332	85		234	246	58	4		
9	18		1.1	1.7	845.3	333	85		233	246	52	5		
10	20		1.1	1.7	846.7	333	86		232	246	52	5		
11	22		1.0	1.6	848.0	333	86		230	246	52	5		
12	24		.75	1.2	849.2	331	86		230	246	52	5		
B 1	26		.92	1.5	850.4	330	81		230	247	55	5		
2	28		1.0	1.6	851.8	330	83		230	246	54	5		
3	30		1.1	1.7	853.1	334	85		230	246	54	5		
4	32		1.1	1.7	854.5	335	86		230	246	53	5		
5	34		1.1	1.7	855.9	335	86		230	246	53	5		
6	36		.99	1.6	857.2	336	86		232	245	54	5		
7	38		.94	1.5	858.6	335	87		233	245	54	6		
8	40		.92	1.5	859.8	336	87		236	246	54	6		
9	42		.89	1.4	861.1	336	87		235	247	54	6		
10	44		.84	1.3	862.6	336	87		240	246	54	5		
11	46		.65	1.0	863.4	336	87		240	248	55	5		
12	48		.64	1.0	864.582	336	86		230	246	55	5		
			Avg Sqrt Delta P .9422	Avg Delta H 1.4125	Total Volume 30.082	Avg Ts ~~332.1~~	Avg Tm 84.5		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	
			AVG .895	Avg Sqrt Del H 1.1839	Comments:	331.9								

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Qs = 173500

Bws = .256

ISO = 98.3

SAMPLE RECOVERY FIELD DATA

Method 5

Client: Bowater
Location/Plant: Catawba, SC
W.O. #:
Source & Location: #3 Recovery Outlet

Run No. 1 | Sample Date 2-15-05 | Recovery Date 2-15-05
Sample I.D. | Analyst MS | Filter Number CZ6505

	Impinger								
	1	2	3	4	5	6	Imp.Total	7	Total
Contents	H_2O	H_2O	H_2O					5.6.	
Final	290	100	0				390	281.8	
Initial	100	100	0				200	273.3	
Gain	190	0	0				190	8.5	198.5

Impinger Color | Labeled?
Silica Gel Condition | Sealed?

Run No. 2 | Sample Date 2-15-05 | Recovery Date 2-15-05
Sample I.D. | Analyst MS | Filter Number CZ6506

	Impinger								
	1	2	3	4	5	6	Imp.Total	7	Total
Contents	H_2O	H_2O	H_2O					5.6.	
Final	312	100	0				412	285.2	
Initial	100	100	0				200	281.8	
Gain	212	0	0				212	3.4	215.4

Impinger Color | Labeled?
Silica Gel Condition | Sealed?

Run No. 3 | Sample Date 2-15-05 | Recovery Date 2-15-05
Sample I.D. | Analyst MS | Filter Number CZ6507

	Impinger								
	1	2	3	4	5	6	Imp.Total	7	Total
Contents	H_2O	H_2O	H_2O					5.6.	
Final	310	100	0				410	277.4	
Initial	100	100	0				200	272.3	
Gain	210	0	0				210	5.1	215.1

Impinger Color | Labeled?
Silica Gel Condition | Sealed?

Check COC for Sample IDs of Media Blanks

WESTON MANAGERS DESIGNERS/CONSULTANTS

Sample and Velocity Traverse Point Data Sheet - Method 1

Client: Bowater
Loaction/Plant: Catawba, SC
Source: #3 Rec Outlet

Operator: MS
Date: 2-15-05
W.O. Number: 03917.008.003

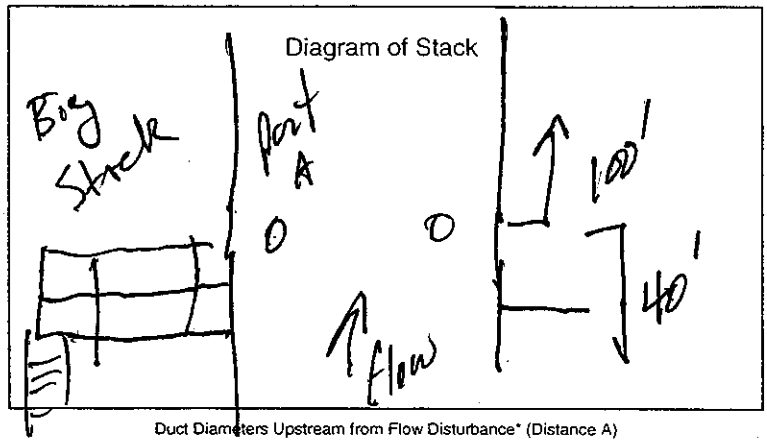
Duct Type	☒ Circular	☐ Rectangular Duct	Indicate appropriate type
Traverse Type	☒ Particulate Traverse	☐ Velocity Traverse	

Distance from far wall to outside of port (in.) = C	139
Port Depth (in.) = D	12
Depth of Duct, diameter (in.) = C-D	127
Area of Duct (ft^2)	87.97
Total Traverse Points	24
Total Traverse Points per Port	12

Rectangular Ducts Only	
Width of Duct, rectangular duct only (in.)	
Total Ports (rectangular duct only)	

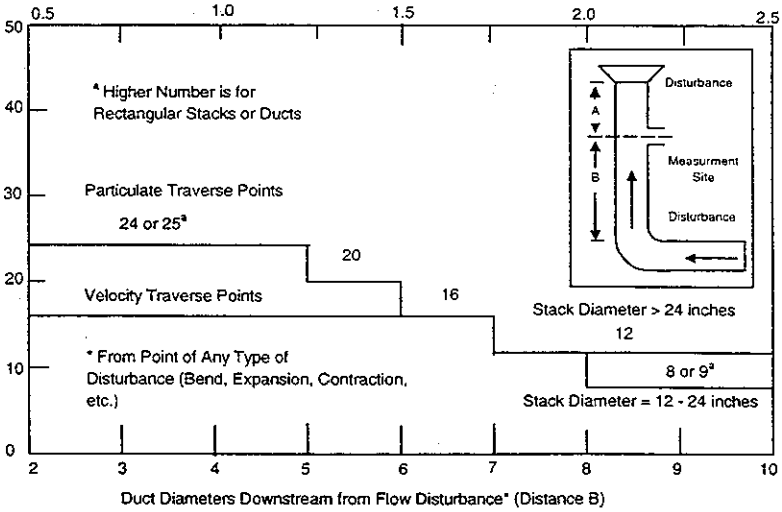
Flow Disturbances	
Upstream - A (ft)	100'
Downstream - B (ft)	40'
Upstream - A (duct diameters)	9.45
Downstream - B (duct diameters)	3.78

Diagram of Stack



Traverse Point Locations

Traverse Point	% of Duct	Distance from Inside Duct Wall (in)	Distance from Outside of Port (in)
1	2.1	2.5	14.5
2	6.7	8.5	20.5
3	11.8	15	27
4	17.7	22.5	34.5
5	25.0	32	44
6	35.6	45	57
7	64.4	82	94
8	75.0	95.5	107.5
9	82.3	104.5	116.5
10	88.2	112	124
11	93.3	118.5	130.5
12	97.9	124.5	136.5



Equivalent Diameter = (2*L*W)/(L+W)

Traverse Point Location Percent of Stack -Circular

Traverse Point Location	Number of Traverse Points: 1	2	3	4	5	6	7	8	9	10	11	12
1		14.6		6.7		4.4		3.2		2.6		2.1
2		85.4		25		14.6		10.5		8.2		6.7
3				75		29.6		19.4		14.6		11.8
4				93.3		70.4		32.3		22.6		17.7
5						85.4		67.7		34.2		25
6						95.6		80.6		65.8		35.6
7								89.5		77.4		64.4
8								96.8		85.4		75
9										91.8		82.3
10										97.4		88.2
11												93.3
12												97.9

Traverse Point Location Percent of Stack -Rectangular

Traverse Point Location	Number of Traverse Points: 1	2	3	4	5	6	7	8	9	10	11	12
1		25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2
2		75.0	50.0	37.5	30.0	25.0	21.4	18.8	16.7	15.0	13.6	12.5
3			83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	22.7	20.8
4				87.5	70.0	58.3	50.0	43.8	38.9	35.0	31.8	29.2
5					90.0	75.0	64.3	56.3	50.0	45.0	40.9	37.5
6						91.7	78.6	68.8	61.1	55.0	50.0	45.8
7							92.9	81.3	72.2	65.0	59.1	54.2
8								93.8	83.3	75.0	68.2	62.5
9									94.4	85.0	77.3	70.8
10										95.0	86.4	79.2
11											95.5	87.5
12												95.8

Rectangular Stack Points & Matrix
9 - 3 x 3
12 - 4 x 3
16 - 4 x 4
20 - 5 x 4
25 - 5 x 5
30 - 6 x 5
36 - 6 x 6
42 - 7 x 6
49 - 7 x 7

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APPENDIX D
FIELD DATA – NO. 3 RECOVERY FURNACE
2/16/05

INLET EAST

Bowater
Catawba, SC

03917.008.003
#3 Recovery Inlet East

ISOKINETIC CALCULATIONS

		1	2	3	Mean
Run Number		1	2	3	Mean
Date		2/16/05	2/16/05	2/16/05	---
Time Began		940	1125	1302	---
Time Ended		1014	1206	1350	---
INPUT DATA					
Sampling Time, min	(Theta)	26	35	37	33
Barometric Pressure, in. Hg	(Pb)	29.80	29.80	29.80	29.80
Static Pressure, in. H2O	(Pg)	-12.00	-12.00	-12.00	-12.00
Pitot Tube Coefficient	(Cp)	0.84	0.84	0.84	0.84
Meter Correction Factor	(Y)	1.0220	1.0220	1.0220	1.0220
Orifice Calibration Value	(Delta H@)	1.9120	1.9120	1.9120	1.9120
Nozzle Diameter, in.	(Dn)	0.275	0.246	0.246	0.256
Meter Volume, ft^3	(Vm)	13.882	20.595	21.173	18.550
Meter Temperature, °F	(Tm)	69.9	78.8	80.4	76.4
Meter Temperature, °R	(Tm-R)	529.9	538.8	540.4	536.4
Meter Orifice Pressure, in. H2O	(Delta H)	1.308	1.231	1.176	1.238
Ave Sq Rt Orifice Press, (in. H2O)^½	((Delta H)½)avg)	1.065	1.098	1.067	1.077
Volume H2O Collected, mL	(Vlc)	112.7	182.2	174.3	156.4
CO2 Concentration, %	(CO2)	15.0	14.0	15.5	14.8
O2 Concentration, %	(O2)	6.0	4.5	4.5	5.0
Ave Sq Rt Velo Head, (in. H2O)^½	((Delta P)½)avg)	0.673	0.868	0.842	0.794
Stack Temperature, °F	(Ts)	360.0	359.8	359.4	359.7
Stack Temperature, °R	(Ts-R)	820.0	819.8	819.4	819.7
Particulate Collected, g	(Mn)	8.4368	8.9242	13.1322	10.1644
CALCULATED DATA					
Nozzle Area, ft^2	(An)	4.12E-04	3.30E-04	3.30E-04	3.57E-04
Stack Area, ft^2	(As)	52.33	52.33	52.33	52.33
Stack Pressure, in. Hg	(Ps)	28.92	28.92	28.92	28.92
Meter Pressure, in. Hg	(Pm)	29.90	29.89	29.89	29.89
Standard Meter Volume, ft^3	(Vmstd)	14.120	20.598	21.110	18.609
Standard Water Volume, ft^3	(Vwstd)	5.305	8.576	8.204	7.362
Moisture Fraction (Measured)	(BWS)	0.273	0.294	0.280	0.282
Moisture Fraction (lower sat/meas)	(BWS)	0.273	0.294	0.280	0.282
Mol. Wt. of Dry Gas, lb/lb-mole	(Md)	30.64	30.42	30.66	30.57
Mol. Wt. of Stack Gas, lb/lb-mole	(Ms)	27.19	26.77	27.12	27.02
Average Stack Gas Velocity, ft/sec	(Vs)	49.36	64.15	61.81	58.44
Stack Gas Flow, actual, ft^3/min	(Qa)	154970	201406	194069	183482
Stack Gas Flow, Std , ft^3/min	(Qs)	70076	88481	87002	81853
Isokinetic Sampling Rate, %	(%I)	98.3	105.5	104.0	102.6
Particulate Conc @ Std Cond, gr/ft^3	(Cs)	9.2198	6.6853	9.5987	8.5012
Particulate Conc @ 8% O_2, gr/ft^3 8	(Cs@8 %O2)	7.9905	5.2672	7.5626	6.9401
Particulate Emission, lb/hr	(PMR)	5537.0	5069.3	7156.9	5921.1
Calibration check	(Yqa)	1.0553	0.9991	0.9960	1.017
Percent difference from Y					-0.51%

CT816

ISOKINETIC FIELD DATA SHEET

Method 17

Page 1 of 1

Client	Bowater
W.O.#	03917.006.003
Project ID	
Mode/Source ID	No. 3 Recovery Inlet (East)
Samp. Loc. ID	Catawba, SC
Run No.ID	1
Test Method ID	17
Date ID	2/16/05
Source/Location	No. 3 Rec. Inlet (East)
Sample Date	2/16/05
Baro. Press (in Hg)	29.80
Operator	TS / CL

Stack Conditions

	Assumed	Actual
% Moisture	26	
Impinger Vol (ml)		110
Silica gel (g)		2.7
CO2, % by Vol	15.0	15.0
O2, % by Vol	5.0	6.0
Temperature (°F)	~~350~~ 359	
Meter Temp (°F)	70	
Static Press (in H_2O)	-12	
Ambient Temp (°F)		

Meter Box ID	A07
Meter Box Y	1.022
Meter Box Del H	1.912
Probe ID / Length	PN00 / 9'
Probe Material	SS
Pitot / Thermocouple ID	P167
Pitot Coefficient	.84
Nozzle ID	.225
Avg Nozzle Dia (in)	1-9
Area of Stack (ft^2)	52.33
Sample Time	
Total Traverse Pts	24

K Factor ~~2.6~~ 2.5

Leak Checks	Initial	Mid-Point	Final
Sample Train (ft^3)	.007		.007
Leak Check @ (in Hg)	17"		17"
Pitot good	yes / no	yes / no	yes / no
Orsat good	yes / no	yes / no	yes / no

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp		
Reference Temp		
Pass/Fail (+/- 2°)	Pass / Fail	Pass / Fail
Temp Change Response ?	yes / no	yes / no

TRAVERSE POINT NO	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM TEMP (°F)			FILTER BOX TEMP (°F)	IMPINGER TEMP (°F)		Pitot B, C, D Flow	
	0	940			786.956									
A 1	2		1.1	2.8	788.6	359	64				64	5		
2	4		1.0	2.5	790.3	362	68				61	6		
3	6		1.1	2.8	791.9	366	68				60	8		
4	8		.80	2.0	793.2	370	69				58	9		
5	10		.30	0.75	794.1	354	69				55	7		
6	12		.22	0.55	794.9	356	69				55	6		
B 1	14		.06	1.7	796.2	358	70				60	10		
2	16		.06	1.5	797.5	360	70				59	10		
3	18		.15	0.35	798.3	359	71				57	6	1.0	
4	20		.16	0.40	798.9	355	71				56	8	.72	
5	22		.15	0.35	799.6	358	72				55	9	.65	
6	24		.12	0.30	800.2	363	72				55	10	.61	
C 1	26	1014	.40	1.0	806.740	360	72				54	15	1.1	25 min
2	28												1.0	
3	30												.80	
4	32												.60	
5	34												.35	
6	36												.30	
D 1	38												1.0	
2	40												.78	
3	42												.65	
4	44												.58	
5	46												.47	
6	48												.40	
			Avg Sqrt Delta P .673	Avg Delta H 1.308	Total Volume 13.882	Avg Ts 360.0	Avg Tm 69.9	Min/Max	Min/Max	Max Temp	Max Vac	~~Max Temp~~ .819		

$\sqrt{AVG}$, $\overline{AVG}$ = .700

AVG. = .520

Avg Sqrt Del H 1.065

Comments: ~~No~~ Filter clogged @ 25 minutes into run.

ISO = 102.2
Moist. = 27.3
SCFM = 70113.1

WESTON MANAGERS DESIGNERS/CONSULTANTS

CT 817

ISOKINETIC FIELD DATA SHEET

Method 17

Page 1 of 1

Client	Bowater
W.O.#	03917.008.003
Project ID	
Mode/Source ID	No.3 Recovery Inlet (East)
Samp. Loc. ID	Catawba, SC
Run No.ID	2
Test Method ID	17
Date ID	2/16/05
Source/Location	No.3 Rec. Inlet (East)
Sample Date	2/16/05
Baro. Press (in Hg)	29.80
Operator	TS / CL

Stack Conditions	Assumed	Actual
% Moisture	27	
Impinger Vol (ml)		178
Silica gel (g)		4.2
CO2, % by Vol	15.0	14.0
O2, % by Vol	1.0	4.5
Temperature (°F)	361	
Meter Temp (°F)	72	
Static Press (in H_2O)	-12	
Ambient Temp (°F)		

Meter Box ID	A07
Meter Box Y	1.022
Meter Box Del H	1.912
Probe ID / Length	PR100 / 9'
Probe Material	SS
Pitot / Thermocouple ID	
Pitot Coefficient	.84
Nozzle ID	AN24-10
Avg Nozzle Dia (in)	.246
Area of Stack (ft^2)	59.33
Sample Time	35
Total Traverse Pts	24

K Factor 1.6

Leak Checks	Initial	Mid-Point	Final
Sample Train (ft^3)	.0006		.006
Leak Check @ (in Hg)	16"		16"
Pitot good	yes / no	yes / no	yes / no
Orsat good	yes / no	yes / no	yes / no

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp		
Reference Temp		
Pass/Fail (+/- 2°)	Pass / Fail	Pass / Fail
Temp Change Response ?	yes / no	yes / no

TRAVERSE POINT NO	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (°F)	IMPINGER EXIT TEMP (°F)	IMPINGER TRAP VAC (in Hg)		COMMENTS
	0	1125			800.902									
A1	2		0.98	1.6	802.3	354	78				59	4		
2	4		.89	1.4	803.5	357	78				58	4		
3	6		.88	1.4	804.8	363	78				55	5		
4	8		.71	1.1	806.0	362	77				52	6		
5	10		.58	0.93	807.0	363	78				51	6		
6	12		.51	0.82	808.0	360	78				50	6		
B1	14		1.1	1.8	809.5	359	78				53	7		
2	16		1.0	1.6	810.8	358	78				50	7		
3	18		.99	1.6	812.1	360	79				49	9		
4	20		.70	1.1	813.3	364	78				48	11		
5	22		.62	0.99	814.3	366	79				48	11		
6	24		.55	0.88	815.332	363	79				49	13		
C1	26		1.1	1.8	816.7	359	80				51	11		
2	28		.95	1.5	818.0	359	80				50	11		
3	30		.74	1.2	819.2	358	80				49	10		
4	32		.51	0.82	820.2	361	80				49	8		
5	34		.53	0.85	821.1	356	80				50	9		
6	~~36~~ 35	1206	.48	0.77	821.497	355	80				52	12		
D1	38		1.1											
2	40		.84											
3	42		.52											
4	44		.34											
5	46		.35											
6	48		.33											
			Avg Sqrt Delta P .968	Avg Delta H 1.231	Total Volume 20.595	Avg Ts 359.8	Avg Tm 78.8		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	

WESTON MANAGERS DESIGNERS/CONSULTANTS

AVG = .768

Avg Sqrt Del H 1.098

Comments: Averaged ΔP to where I stopped the run. Filter clogged after 35 min.

Iso = 105.5
Moist. = 29.4
SCFM = 88480.437

CT818

ISOKINETIC FIELD DATA SHEET

Method 17

Page 1 of 1

		Stack Conditions	Assumed	Actual
Client	Bowater			
W.O.#	03917.008.003			
Project ID		% Moisture	28	
Mode/Source ID	No.3 Recover. Inlet (East)	Impinger Vol (ml)		170
Samp. Loc. ID	Catawba, SC	Silica gel (g)		4.3
Run No.ID	3	CO2, % by Vol	14.5	15.5
Test Method ID	17	O2, % by Vol	5.0	4.5
Date ID	2/16/05	Temperature (°F)	360	
Source/Location	No.3 Recov. Inlet (East)	Meter Temp (°F)	80	
Sample Date	2/16/05	Static Press (In H_2O)	-12	
Baro. Press (in Hg)	29.90			
Operator	TS / CL	Ambient Temp (°F)		

Meter Box ID	407
Meter Box Y	1.028
Meter Box Del H	1.912
Probe ID / Length	PR100 9'
Probe Material	SS
Pitot / Thermocouple ID	
Pitot Coefficient	.84
Nozzle ID	AN 24-10
Avg Nozzle Dia (in)	.246
Area of Stack (ft^2)	52.33
Sample Time	37
Total Traverse Pts	24

K Factor 1.6

Leak Checks	Initial	Mid-Point	Final
Sample Train (ft^3)	.013		.011
Leak Check @ (in Hg)	17"		17
Pitot good	yes / no	yes / no	yes / no
Orsat good	yes / no	yes / no	yes / no

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp		
Reference Temp		
Pass/Fail (+/- 2°)	Pass / Fail	Pass / Fail
Temp Change Response ?	yes / no	yes / no

TRAVERSE POINT NO	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (In H2O)	ORIFICE PRESSURE Delta H (In H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM INLET TEMP (°F)	DGM OUTLET TEMP (°F)	PROBE TEMP (°F)	FILTER BOX TEMP (°F)	IMPINGER EXIT TEMP (°F)	SAMPLE TRAIN VAC (IN HG)		COMMENTS
	0	1302			822.427									
D 1	2		1.0	1.6	823.8	353	80				61	4		
2	4		.75	1.2	825.0	352	79				61	4		
3	6		.58	0.93	826.0	354	79				60	5		
4	8		.42	0.67	826.9	360	80				60	5		
5	10		.42	0.67	827.8	358	80				60	5		
6	12		.37	0.59	828.7	358	80				59	6		
C 1	14		1.0	1.6	830.2	356	81				62	7		
2	16		.85	1.4	831.4	359	80				61	8		
3	18		.72	1.2	832.5	358	80				60	8		
4	20		.50 .45 (CL)	0.80	833.5	362	80				58	7		
5	22		.56	0.90	834.5	361	80				57	8		
6	24		.49	0.78	835.5	361	80				56	8		
B 1	26		1.2	1.9	837.1	360	81				59	8		
2	28		1.1	1.8	838.5	362	80				57	9		
3	30		(CL) ~~1.0~~ 1.1	1.8	839.9	367	80				57	10		
4	32		.71	1.1	841.2	365	82				58	10		
5	34		.59	0.94	842.3	368	83				58	10		
6	36		.54	0.86	843.2	362	81				60	10		
A 1	~~37~~	1350	1.0	1.6	843.600	358	81				63	14		
2	40		.94											
3	42		.98											
4	44		.72											
5	46		.56											
6	48		.53											
			Avg Sqrt Delta P .842	Avg Delta H 1.176	Total Volume 21.173	Avg Ts 359.4	Avg Tm 80.4		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	

WESTON MANAGERS DESIGNERS/CONSULTANTS

AVG = .732

Avg Sqrt Del H 1.067

Comments: Averaged to point where I stopped run
Filter clogged @ 37 min.

Iso = 104.0
Moist. = 28.0
SCFM = 87001.5

D-4

SAMPLE RECOVERY FIELD DATA

Method 17

Client: Bowater
Location/Plant: Catawba, SC
W.O. #: 03917.008.003
Source & Location: No. 3 Recovery Inlet (East)

Run No. 1 — Sample Date 2/16/05 — Recovery Date 2/16/05
Sample I.D. — Analyst C. Landers — Filter Number CT816

	Impinger 1	2	3	4	5	6	Imp.Total	7	Total
Contents	H_2O	H_2O						S.Gel	
Final	210	100	—				310	294.4	604.4
Initial	100	100	—				200	291.7	491.7
Gain	110	—	—				110	2.7	112.7

Impinger Color: Cloudy — Labeled? ✓
Silica Gel Condition: Used — Sealed? ✓

Run No. 2 — Sample Date 2/16/05 — Recovery Date 2/16/05
Sample I.D. — Analyst C. Landers — Filter Number CT817

	Impinger 1	2	3	4	5	6	Imp.Total	7	Total
Contents	H_2O	H_2O						S.Gel	
Final	274	104	—				378	280.2	658.2
Initial	100	100	—				200	276.0	476.0
Gain	174	4	—				178	4.2	182.2

Impinger Color: Cloudy — Labeled? ✓
Silica Gel Condition: Used — Sealed? ✓

Run No. 3 — Sample Date 2/16/05 — Recovery Date 2/16/05
Sample I.D. — Analyst C. Landers — Filter Number CT818

	Impinger 1	2	3	4	5	6	Imp.Total	7	Total
Contents	H_2O	H_2O						S.Gel	
Final	264	106	—					284.5	
Initial	100	100	—				200	280.2	480.2
Gain	164	6	—				170	4.32 ~~4.3~~	~~174.3~~ 174.3

Impinger Color: Cloudy — Labeled? ✓
Silica Gel Condition: Used — Sealed? ✓

Check COC for Sample IDs of Media Blanks

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Determination of Stack Gas Velocity - Method 2

Client: Bowater
Location/Plant: Catawba, SC
Source: No. 3 Rec. Inlet (West)
Operator: TS/CL
Date: 6/21/6/05
W.O. Number: 03917.008.003
Pitot Coeff (Cp): .84
Stack Area, ft² (As): 52.33
Pitot Tube/Thermo ID: _____

Run Number	1		
Time			
Barometric Press, in Hg (Pb)	29.80		
Static Press, in H_2O (Pstatic)	-12		
Source Moisture, % (BWS)	26		
O_2, %	15.0		
CO_2, %	15.0		

Cyclonic Flow Determination		Traverse Location		Leak Check good ? (Y) N		Leak Check good ? Y / N		Leak Check good ? Y / N	
Delta P at 0°	Angle yeilding zero Delta P	Port	Point	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)	Delta P	Source Temp, F° (Ts)
		A	1	.56	348				
			2	.54	349				
			3	.44	350				
			4	.23	351				
			5	.21	352				
			6	.18	349				
		B	1	.64	352				
			2	.66	355				
			3	.53	360				
			4	.29	361				
			5	.34	359				
			6	.26	354				
		C	1	.73	355				
			2	.70	356				
			3	.58	361				
			4	.35	364				
			5	.40	365				
			6	.31	360				
		D	1	.62	349				
			2	.59	352				
			3	.46	357				
			4	.44	358				
			5	.35	355				
			6	.31	353				
Avg Angle		Avg Delta P & Temp		.447	355.2				
		avg $\sqrt{DeltaP}$		.657					
		Average gas stream velocity, ft/sec.		47.917					
		Vol. flow rate @ actual conditions, wacf/min		150448.252					
		Vol. flow rate at standard conditions, dscf/min		69682.351					

$$MWd = (0.32 * O_2) + (0.44 * CO_2) + (0.28 * (100 - (CO_2 + O_2)))$$

$$MWs = (MWd * (1 - (BWS/100))) + (18 * (BWS/100))$$

$$Tsa = Ts + 460$$

$$Ps = Pb + (Pstatic/13.6)$$

$$Vs = 85.49 * Cp * avg\sqrt{DeltaP} * \sqrt{Tsa/(Ps * MWs)}$$

$$Qs(act) = 60 * Vs * As$$

$$Qs(std) = 17.64 * (1 - (BWS/100)) * (Ps/Tsa) * Qs(act)$$

Comments _____

where:
MWd = Dry molecular weight source gas, lb/lb-mole.
MWs = Wet molecular weight source gas, lb/lb-mole.
Tsa = Source Temperature, absolute(oR)
Ps = Absolute stack static pressure, inches Hg.
Vs = Average gas stream velocity, ft/sec.
Qs(act) = Volumetric flow rate of wet stack gas at actual,
Qs(std) = Volumetric flow rate of dry stack gas at standard conditions, dscf/min

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OUTLET

Bowater
Catawba, SC

03917.008.003
#3 Recovery Outlet

ISOKINETIC CALCULATIONS

Run Number		1	2	3	Mean
Date		2/16/05	2/16/05	2/16/05	---
Time Began		940	1125	1302	---
Time Ended		1031	1220	1400	---
INPUT DATA					
Sampling Time, min	(Theta)	48.0	48	48	48
Stack Diameter, in.	(Dia.)	127.00	127.00	127.00	127.00
Barometric Pressure, in. Hg	(Pb)	29.82	29.82	29.82	29.82
Static Pressure, in. H2O	(Pg)	-1.00	-1.00	-1.20	-1.07
Pitot Tube Coefficient	(Cp)	0.84	0.84	0.84	0.84
Meter Correction Factor	(Y)	1.0140	1.0140	1.0140	1.0140
Orifice Calibration Value	(Delta H@)	1.8540	1.8540	1.8540	1.8540
Nozzle Diameter, in.	(Dn)	0.241	0.241	0.241	0.241
Meter Volume, ft^3	(Vm)	30.651	31.135	30.913	30.900
Meter Temperature, °F	(Tm)	75.9	78.6	80.8	78.4
Meter Temperature, °R	(Tm-R)	535.9	538.6	540.8	538.4
Meter Orifice Pressure, in. H2O	(Delta H)	1.483	1.518	1.517	1.506
Ave Sq Rt Orifice Press, (in. H2O)^½	((Delta H)½)avg)	1.216	1.228	1.228	1.224
Volume H2O Collected, mL	(Vlc)	226.3	237.7	227.2	230.4
CO2 Concentration, %	(CO2)	14.0	13.0	12.5	13.2
O2 Concentration, %	(O2)	7.8	7.5	6.8	7.4
Ave Sq Rt Velo Head, (in. H2O)^½	((Delta P)½)avg)	0.969	0.979	0.981	0.976
Stack Temperature, °F	(Ts)	333.3	332.2	333.0	332.8
Stack Temperature, °R	(Ts-R)	793.3	792.2	793.0	792.8
Particulate Collected, g	(Mn)	0.0640	0.0537	0.0588	0.0588
CALCULATED DATA					
Nozzle Area, ft^2	(An)	3.17E-04	3.17E-04	3.17E-04	3.17E-04
Stack Area, ft^2	(As)	87.97	87.97	87.97	87.97
Stack Pressure, in. Hg	(Ps)	29.75	29.75	29.73	29.74
Meter Pressure, in. Hg	(Pm)	29.93	29.93	29.93	29.93
Standard Meter Volume, ft^3	(Vmstd)	30.619	30.949	30.603	30.724
Standard Water Volume, ft^3	(Vwstd)	10.652	11.189	10.694	10.845
Moisture Fraction (Measured)	(BWS)	0.258	0.266	0.259	0.261
Moisture Fraction (lower sat/meas)	(BWS)	0.258	0.266	0.259	0.261
Mol. Wt. of Dry Gas, lb/lb-mole	(Md)	30.55	30.38	30.27	30.40
Mol. Wt. of Stack Gas, lb/lb-mole	(Ms)	27.31	27.09	27.09	27.17
Average Stack Gas Velocity, ft/sec	(Vs)	68.75	69.72	69.92	69.46
Stack Gas Flow, actual, ft^3/min	(Qa)	362858	368018	369038	366638
Stack Gas Flow, Std , ft^3/min	(Qs)	178065	179038	180868	179324
Isokinetic Sampling Rate, %	(%I)	99.5	100.0	97.9	99.1
Particulate Conc @ Std Cond, gr/ft^3	(Cs)	0.0323	0.0268	0.0296	0.0296
Particulate Conc @ 8% O_2, gr/ft^3 8	(Cs @ 8%O2)	0.0318	0.0258	0.0271	0.0282
Particulate Emission, lb/hr	(PMR)	49.2	41.1	46.0	45.4
Calibration check	(Yqa)	1.0298	1.0292	1.0406	1.033
Percent difference from Y					1.89%

/ NA

CZ 6508

ISOKINETIC FIELD DATA SHEET

Method 5

		Stack Conditions	Assumed	Actual
Client	Bowater	% Moisture	25	
W.O.#	03917.008.002	Impinger Vol (ml)		218
Project ID		Silica gel (g)		8.3
Mode/Source ID	#3 Recovery Outlet	CO2, % by Vol	14	14
Samp. Loc. ID	Bowater, SC	O2, % by Vol	7	7.8
Run No.ID	1	Temperature (°F)	333	
Test Method ID	5	Meter Temp (°F)	65	
Date ID	2/16/05	Static Press (in H_2O)	-1.1	-1.0
Source/Location	Bowater, SC			
Sample Date	2/16/05			
Baro. Press (in Hg)	27.82			
Operator	CB/MS	Ambient Temp (°F)	58	

Meter Box ID	A08
Meter Box Y	1.014
Meter Box Del H	1.854
Probe ID / Length	12'
Probe Material	SS
Pitot / Thermocouple ID	P73
Pitot Coefficient	.84
Nozzle ID	AVN .241
Avg Nozzle Dia (in)	.241
Area of Stack (ft²)	87.97
Sample Time	CB 60 48
Total Traverse Pts	~~12~~ CB 24

Page ____ of ____

K Factor 1.6

Leak Checks	Initial	Mid-Point	Final
Sample Train (ft³)	.012		.010
Leak Check @ (in Hg)	10		10
Pitot good	yes / no	yes / no	yes / no
Orsat good	yes / no	yes / no	yes / no

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp		
Reference Temp		
Pass/Fail (+/- 2°)	Pass / Fail	Pass / Fail
Temp Change Response ?	yes / no	yes / no

TRAVERSE POINT NO.	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DRY BULB TEMP (°F)	IMP OUTLET TEMP (°F)	PROBE TEMP (°F)	HEATED BOX TEMP (°F)	IMPINGER EXIT TEMP (°F)	SAMPLING TRAIN VAC (in Hg)		COMMENTS
	0	940			867.279									
B 1	2		.88	1.4	868.5	330	65		235	240	61	4		
2	4		.84	1.3	869.7	335	72		235	244	52	4		
3	6		1.0	1.6	871.0	335	76		230	245	49	5		
4	8		1.1	1.7	872.3	334	74		230	242	46	5		
5	10		1.1	1.7	873.6	335	75		230	243	48	5		
6	12		1.1	1.7	875.0	335	75		230	244	49	5		
7	14		.97	1.5	876.3	334	76		230	244	50	5		
8	16		.97	1.5	877.6	335	76		230	245	51	5		
9	18		.98	1.5	878.9	334	76		230	244	52	5		
10	20		.88	1.4	880.1	335	78		230	245	52	5		
11	22		.85	1.4	881.4	335	78		230	245	52	5		
12	24		.68	1.0	882.7	329	78		230	250	54	5		
A 1	26		.84	1.3	883.9	330	74		230	250	54	5		
2	28		.88	1.4	885.1	330	75		230	249	53	5		
3	30		.87	1.4	886.3	333	78		230	249	54	5		
4	32		.93	1.5	887.7	333	77		230	248	54	5		
5	34		.90	1.4	888.9	333	78		231	248	54	5		
6	36		.94	1.5	890.1	333	78		230	249	55	5		
7	38		.92	1.5	891.4	332	76		231	243	51	5		
8	40		1.0	1.6	892.7	333	76		230	247	55	5		
9	42		1.0	1.6	894.0	334	77		231	248	55	5		
10	44		1.1	1.7	895.3	333	77		230	248	55	5		
11	46		.94	1.5	896.6	335	78		229	249	57	5		
12	48	1043 ~~1031~~	.92	1.5	897.93	335	78		229	249	55	5		
			Avg Sqrt Delta P	Avg Delta H	Total Volume	Avg Ts	Avg Tm		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	
			.9688	1.483	30.651	333.3	75.9							
			AVG .9413	Avg Sqrt Del H 1.216	Comments:									

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150 99.5
% Moist 25.8
SCFM 178062

D-8

CZ6509

ISOKINETIC FIELD DATA SHEET

Method 5

Page ____ of ____

		Stack Conditions	Assumed	Actual					
Client	Bowater				Meter Box ID	A08		K Factor	1.6
W.O.#	0397.008.003				Meter Box Y	1.014			
Project ID		% Moisture	26		Meter Box Del H	1.954	Leak Checks	Initial	Mid-Point / Final
Mode/Source ID	#3 Recovery Outlet	Impinger Vol (ml)		230	Probe ID / Length	12'	Sample Train (ft³)	.010	.010
Samp. Loc. ID	Bowater, SC	Silica gel (g)		7.7	Probe Material	SS	Leak Check @ (in Hg)	12	10
Run No.ID	2	CO2, % by Vol	14	13	Pitot / Thermocouple ID	P73	Pitot good	yes / no	yes / no
Test Method ID	5	O2, % by Vol	8	7.5	Pitot Coefficient	.84	Orsat good	yes / no	yes / no
Date ID	2/16/05	Temperature (°F)	CB 83	330	Nozzle ID	AUN .241	Temp Check	Pre-Test Set	Post-Test Set
Source/Location	Bowater, SC	Meter Temp (°F)	83		Avg Nozzle Dia (in)	.241	Meter Box Temp		
Sample Date	2/16/05	Static Press (in H_2O)	-1.1	-1.0	Area of Stack (ft²)	97.97	Reference Temp		
Baro. Press (in Hg)	29.82				Sample Time	48	Pass/Fail (+/- 2°)	Pass / Fail	Pass / Fail
Operator	CB/MS	Ambient Temp (°F)	65		Total Traverse Pts	24	Temp Change Response ?	yes / no	yes / no

TRAVERSE POINT NO	SAMPLE TIME (min)	CLOCK TIME (24 hr)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DRY GAS METER TEMP (°F)		PROBE TEMP (°F)	FILTER BOX TEMP (°F)	IMPINGER EXIT TEMP (°F)			
	0	1125			898.666									
A 1	2		.80	1.3	899.8	330	76		230	248	62	5		
2	4		.90	1.4	901.1	332	74		230	254	60	5		
3	6		.95	1.5	902.3	333	77		229	252	58	5		
4	8		.96	1.5	903.6	333	77		230	251	57	5		
5	10		.90	1.4	904.8	332	77		230	252	56	5		
6	12		.90	1.4	906.2	332	76		230	252	57	5		
7	14		1.1	1.7	907.4	333	78		230	251	57	6		
8	16		1.2	1.9	908.8	333	80		236	253	60	6		
9	18		1.1	1.7	910.1	332	80		234	250	58	6		
10	20		1.1	1.7	911.5	333	80		230	255	61	6		
11	22		.92	1.5	912.9	333	80		232	254	62	6		
12	24		.70	1.1	914.0	330	79		230	251	63	6		
B 1	26		1.1	1.7	915.3	334	76		230	249	66	6		
2	28		1.1	1.7	916.6	334	78		229	251	65	6		
3	30		1.1	1.7	918.0	333	80		230	254	63	6		
4	32		1.2	1.9	919.5	331	79		230	251	67	6		
5	34		1.1	1.7	920.9	332	79		230	254	63	6		
6	36		1.0	1.6	922.2	332	78		230	252	61	6		
7	38		.99	1.6	923.5	332	80		230	254	65	6		
8	40		.95	1.5	924.9	332	[illegible]		230	256	65	6		
9	42		.92	1.5	926.2	332	81		230	257	67	6		
10	44		.81	1.3	927.4	332	81		230	256	67	6		
11	46		.78	1.2	928.5	332	81		229	257	68	6		
12	48	1220	.59	.94	929.801	331	81		229	255	68	5		
			Avg Sqrt Delta P .9793	Avg Delta H 1.518	Total Volume 31.135	Avg Ts 332.2	Avg Tm 78.6		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	
			AVG .9654	Avg Sqrt Del H 1.228										

Comments:

78.6

ISO 100.03
Moist 26.6
SCFM 179,036

WESTON MANAGERS DESIGNERS/CONSULTANTS

CZ 6510

ISOKINETIC FIELD DATA SHEET

Method 5

Page ____ of ____

Client	Bowater
W.O.#	03917.008.003
Project ID	
Mode/Source ID	#3 Reg Outlet
Samp. Loc. ID	Catawba, SC
Run No.ID	3
Test Method ID	5
Date ID	2-16-05
Source/Location	Catawba, SC
Sample Date	2-16-05
Baro. Press (in Hg)	29.82
Operator	CB/MS

Stack Conditions	Assumed	Actual
% Moisture	26	
Impinger Vol (ml)		221
Silica gel (g)		6.2
CO2, % by Vol	13	12.5
O2, % by Vol	7	6.8
Temperature (°F)	332	
Meter Temp (°F)	82	
Static Press (in H_2O)	-1.1	-1.2
Ambient Temp (°F)		

Meter Box ID	H08
Meter Box Y	1.014
Meter Box Del H	1.854
Probe ID / Length	PR 43 / 12
Probe Material	SS
Pitot / Thermocouple ID	P 73
Pilot Coefficient	.84
Nozzle ID	AVN 241
Avg Nozzle Dia (in)	.241
Area of Stack (ft^2)	87.97
Sample Time	48
Total Traverse Pts	24

K Factor 1.6

Leak Checks	Initial	Mid-Point	Final
Sample Train (ft^3)	.010		.010
Leak Check @ (in Hg)	12		10
Pitot good	yes / no	yes / no	yes / no
Orsat good	yes / no	yes / no	yes / no

Temp Check	Pre-Test Set	Post-Test Set
Meter Box Temp		
Reference Temp		
Pass/Fail (+/- 2°)	Pass / Fail	Pass / Fail
Temp Change Response ?	yes / no	yes / no

TRAVERSE POINT NO	SAMPLE TIME (min)	CLOCK TIME (plant time)	VELOCITY PRESSURE Delta P (in H2O)	ORIFICE PRESSURE Delta H (in H2O)	DRY GAS METER READING (ft³)	STACK TEMP (°F)	DGM INLET TEMP (°F)		PROBE TEMP (°F)	FILTER BOX TEMP (°F)	IMPINGER EXIT TEMP (°F)	SAMPLE VACUUM (in Hg)		
	0	1202			930.350									
A 1	2		.89	1.4	931.6	334	72		228	253	66	4		
2	4		.95	1.5	932.9	334	79		228	255	66	4		
3	6		.90	1.4	934.1	334	81		228	257	63	4		
4	8		.95	1.5	935.4	333	81		230	255	60	5		
5	10		.84	1.3	936.6	333	81		230	255	60	5		
6	12		.94	1.5	937.7	334	81		232	255	60	5		
7	14		.85	1.4	938.8	331	79		230	250	58	5		
8	16		1.0	1.6	940.3	333	80		229	251	60	5		
9	18		1.2	1.9	941.8	333	80		229	255	59	5		
10	20		1.2	1.9	943.3	332	80		230	254	57	6		
11	22		.90	1.4	944.5	333	82		230	255	57	6		
12	24		.82	1.3	945.7	332	81		230	254	58	5		
B 1	26		1.2	1.9	947.1	331	80		230	254	60	5		
2	28		1.2	1.9	948.5	332	81		229	254	60	5		
3	30		1.1	1.6	949.8	333	81		229	254	59	5		
4	32		1.2	1.9	951.3	334	81		229	253	60	5		
5	34		1.1	1.6	952.7	334	82		229	254	61	6		
6	36		1.1	1.6	954.0	335	83		229	254	63	5		
7	38		.85	1.4	955.3	333	81		229	253	61	5		
8	40		.95	1.5	956.6	333	81		230	253	62	5		
9	42		.82	1.3	957.8	333	82		230	254	63	5		
10	44		.90	1.4	959.0	335	83		229	254	64	5		
11	46		.75	1.2	960.1	334	83		229	254	65	5		
12	48		.65	1.0	961.263	333	84		229	255	65	5		
			Avg Sqrt Delta P .9813	Avg Delta H 1.517	Total Volume 30.913	Avg Ts 333	Avg Tm 80.8		Min/Max	Min/Max	Max Temp	Max Vac	Max Temp	

tVc	.9692
Avg Sqrt Del H	1.228

Comments:

150 97.95
% Moist 25.9
SCFM 180,797

WESTON MANAGERS DESIGNERS/CONSULTANTS

SAMPLE RECOVERY FIELD DATA

Method 5

Client: Bowater
Location/Plant: Catawba, SC
W.O. #:
Source & Location: #3 Rec. Outlet

Run No. 1 — Sample Date 2-16-05 — Recovery Date 2-16-05
Sample I.D. — Analyst MS — Filter Number CZ6508

	Impinger 1	2	3	4	5	6	Imp.Total	7	Total
Contents	H_2O	H_2O	H_2O					5.6	
Final	318	100	0				418	273.1	
Initial	100	100	0				200	264.8	
Gain	218	0	0				218	8.3	226.3

Impinger Color — Labeled?
Silica Gel Condition — Sealed?

Run No. 2 — Sample Date 2-16-05 — Recovery Date 2-16-05
Sample I.D. — Analyst MS — Filter Number CZ6509

	Impinger 1	2	3	4	5	6	Imp.Total	7	Total
Contents	H_2O	H_2O	H_2O					5.6	
Final	330	100	0				430	293.5	
Initial	100	100	0				200	285.8	
Gain	230	0	0				230	7.7	237.7

Impinger Color — Labeled?
Silica Gel Condition — Sealed?

Run No. 3 — Sample Date 2-16-05 — Recovery Date 2-16-05
Sample I.D. — Analyst MS — Filter Number CZ6510

	Impinger 1	2	3	4	5	6	Imp.Total	7	Total
Contents	H_2O	H_2O	H_2O					5.6	
Final	321	100	0				421	299.7	
Initial	100	100	0				200	293.5	
Gain	221	0	0				221	6.2	227.2

Impinger Color — Labeled?
Silica Gel Condition — Sealed?

Check COC for Sample IDs of Media Blanks

WESTON MANAGERS DESIGNERS/CONSULTANTS

207
114
321

APPENDIX E
LABORATORY DATA

Inter-Office Memorandum

WESTON SOLUTIONS
Restoring Resource Efficiency

Auburn Operations

TO: Temp Simpkins cc: file

FROM: Brian Benson BB DATE: 25 February 2005

PROJECT: Bowater – Catawba, SC

W.O.NO: 03917.008.003

SUBJECT: Method 5 and 17 Analysis Results.

ACTION: Analysis of samples received on 18 February 2005.

This letter with attachments constitutes our report of gravimetric determination of the glass fiber filters, water rinse and acetone rinse fractions submitted to the laboratory for particulate analysis. The samples arrived in good condition and in accordance with the chain-of-custody. The samples were prepared on 18 February 2005 and analyzed 21 February 2005 through 24 February 2005. The analysis followed procedures in USEPA Reference Method 5 for particulate emissions from stationary sources.

QUALITY ASSURANCE AND QUALITY CONTROL:

Quality control procedures conformed to the requirements of the reference method and our laboratory quality assurance program with the exception that the # 3 Recovery Inlet Run 1 probe rinse sample would not arrive at a constant weight; so, the average of the final two weights was used for the "Constant Final Weight." Duplicate filter weights differed less than 0.5 mg or 1% of the total weight less the tare weight, whichever is greater. The water wash fraction blank residue correction was greater than 0.001% of the total mass of wash solvent used, therefore the water wash fraction residue weight blank correction was calculated using 0.001% of the water wash mass. The acetone wash fraction blank residue correction was greater than 0.001% of the total mass of wash solvent used, therefore the acetone wash fraction residue weight blank correction was calculated using 0.001% of the acetone wash mass. Filter residue weights were not blank corrected.

Substantiating data is on file and available upon request.

tal

attachments

Analysis Report

for Particulates by EPA Method 17

CLIENT	: Bowater , Catawba, SC	Balance ID:	Mettler AE163
WESTON W.O. No.	: 03917.008.003	Lab Ambient Temp (F):	73.4
Date Received	: 18 February 2005	Lab Rel Humidity (%):	38
Analyst	: T. Landers	Barometric Pressure (Hg):	31.69

Source	**# 3 RECOVERY INLET - 2/15/05**			
Field Run No.	**ONE**	**TWO**	**THREE**	**FIELD BLANK**
LIQUID FRACTION				
Filter ID	CT 813	CT 814	CT 815	CT 819
Beaker ID	63-01	64-01	65-01	70-01
Liquid Volume (mL)	64	80	34	62
Constant Initial Weight (g)	**115.0517**	**89.8094**	**110.3100**	**100.2357**
Constant Final Weight (g)	**118.1270**	**92.2646**	**111.4077**	**100.2379**
Final-Initial Beaker Wts. (g)	3.0753	2.4552	1.0978	0.0023
Sample/Blank Volume Ratio	1.0323	1.2903	0.5484	
Liquid Blank Correction, ≤ 0.001% (g)	0.0023	0.0029	0.0012	
Liquid Blank Correction, > 0.001% (g)*	0.0006	0.0008	0.0003	
Liquid Particulate Weight (g)	**3.0746**	**2.4544**	**1.0974**	**0.0023**
FILTER FRACTION				
Filter ID	CT 813	CT 814	CT 815	CT 819
Constant Initial Weight (g)	5.1906	4.6812	4.7883	4.9450
Constant Final Weight (g)	13.7728	14.3391	10.8040	4.9457
Final-Initial Filter Wts. (g)	8.5822	9.6579	6.0157	0.0007
Filter Blank (g)	0.0007	0.0007	0.0007	
Filter Particulate Weight (g)	**8.5822**	**9.6579**	**6.0157**	
SUMMARY				
Filter Particulate Weight (g)	**8.5822**	**9.6579**	**6.0157**	
Liquid Particulate Weight (g)	**3.0746**	**2.4544**	**1.0974**	
Net Particulate Weight (g)	**11.6568**	**12.1123**	**7.1131**	

Sample Recovery Solution **Water**

Weight Percent of Blank Liquid Fraction **0.0036%**

***Note: If the blank liquid fraction has a residue correction of greater than 0.001 percent, then the samples are blank corrected upto 0.001 % of the mass of the wash solvent.**

Analysis Report

for Particulates by EPA Method 17

CLIENT : Bowater , Catawba, SC
WESTON W.O. No. : 03917.008.003
Date Received : 18 February 2005
Analyst : T. Landers

Balance ID: Mettler AE163
Lab Ambient Temp (F): 73.4
Lab Rel Humidity (%): 38
Barometric Pressure (Hg): 31.69

Source	**# 3 RECOVERY INLET - 2/16/05**			
Field Run No.	**ONE**	**TWO**	**THREE**	**FIELD BLANK**
LIQUID FRACTION				
Filter ID	CT 816	CT 817	CT 818	CT 819
Beaker ID	66-01	67-01	68-01	70-01
Liquid Volume (mL)	72	84	106	62
Constant Initial Weight (g)	**121.2219**	**110.9486**	**113.6215**	**100.2357**
Constant Final Weight (g)	**123.8099***	**114.0878**	**117.4220**	**100.2379**
Final-Initial Beaker Wts. (g)	2.5880	3.1392	3.8005	0.0023
Sample/Blank Volume Ratio	1.1613	1.3548	1.7097	
Liquid Blank Correction, ≤ 0.001% (g)	0.0026	0.0030	0.0038	
Liquid Blank Correction, > 0.001% (g)*	0.0007	0.0008	0.0011	
Liquid Particulate Weight (g)	**2.5873**	**3.1384**	**3.7994**	**0.0023**
FILTER FRACTION				
Filter ID	CT 816	CT 817	CT 818	CT 819
Constant Initial Weight (g)	5.1509	4.7239	4.6302	4.9450
Constant Final Weight (g)	11.0004	10.5098	13.9629	4.9457
Final-Initial Filter Wts. (g)	5.8495	5.7859	9.3328	0.0007
Filter Blank (g)	0.0007	0.0007	0.0007	
Filter Particulate Weight (g)	**5.8495**	**5.7859**	**9.3328**	
SUMMARY				
Filter Particulate Weight (g)	**5.8495**	**5.7859**	**9.3328**	
Liquid Particulate Weight (g)	**2.5873**	**3.1384**	**3.7994**	
Net Particulate Weight (g)	**8.4368**	**8.9242**	**13.1322**	

*Sample would not reach a constant weight, therefore the average of the final two weights was used.

Sample Recovery Solution **Water**
Weight Percent of Blank **0.0036%**
Liquid Fraction

***Note: If the blank liquid fraction has a residue correction of greater than 0.001 percent, then the samples are blank corrected upto 0.001 % of the mass of the wash solvent.**

Analysis Report

for Particulates by EPA Method 5

CLIENT : Bowater , Catawba, SC
WESTON W.O. No. : 03917.008.003
Date Received : 18 February 2005
Analyst : T. Landers

Balance ID: Mettler AE163
Lab Ambient Temp (F): 73.4
Lab Rel Humidity (%): 38
Barometric Pressure (Hg): 31.69

Source	**# 3 RECOVERY OUTLET - 2/15/05**			
Field Run No.	**ONE**	**TWO**	**THREE**	**FIELD BLANK**
LIQUID FRACTION				
Filter ID	CZ 6505	CZ 6506	CZ 6507	CZ 6504
Beaker ID	57-01	58-01	59-01	70-01
Liquid Volume (mL)	98	112	112	62
Constant Initial Weight (g)	**111.5284**	**124.1075**	**117.9313**	**100.2357**
Constant Final Weight (g)	**111.5423**	**124.1258**	**117.9697**	**100.2379**
Final-Initial Beaker Wts. (g)	0.0140	0.0183	0.0384	0.0023
Sample/Blank Volume Ratio	1.5806	1.8065	1.8065	
Liquid Blank Correction, ≤ 0.001% (g)	0.0036	0.0041	0.0041	
Liquid Blank Correction, > 0.001% (g)*	0.0010	0.0011	0.0011	
Liquid Particulate Weight (g)	**0.0130**	**0.0172**	**0.0373**	**0.0023**
FILTER FRACTION				
Filter ID	CZ 6505	CZ 6506	CZ 6507	CZ 6504
Constant Initial Weight (g)	**3.6134**	**3.5986**	**3.0599**	**2.9493**
Constant Final Weight (g)	**3.6505**	**3.6391**	**3.0973**	**2.9501**
Final-Initial Filter Wts. (g)	0.0371	0.0406	0.0374	0.0008
Filter Blank (g)	0.0008	0.0008	0.0008	
Filter Particulate Weight (g)	**0.0371**	**0.0406**	**0.0374**	
SUMMARY				
Filter Particulate Weight (g)	**0.0371**	**0.0406**	**0.0374**	
Liquid Particulate Weight (g)	**0.0130**	**0.0172**	**0.0373**	
Net Particulate Weight (g)	**0.0501**	**0.0577**	**0.0747**	

Sample Recovery Solution **Water**
Weight Percent of Blank Liquid Fraction **0.0036%**

***Note: If the blank liquid fraction has a residue correction of greater than 0.001 percent, then the samples are blank corrected upto 0.001 % of the mass of the wash solvent.**

Analysis Report

for Particulates by EPA Method 5

CLIENT : Bowater , Catawba, SC
WESTON W.O. No. : 03917.008.003
Date Received : 18 February 2005
Analyst : T. Landers

Balance ID: Mettler AE163
Lab Ambient Temp (F): 73.4
Lab Rel Humidity (%): 38
Barometric Pressure (Hg): 31.69

Source	**# 3 RECOVERY OUTLET - 2/16/05**			
Field Run No.	**ONE**	**TWO**	**THREE**	**FIELD BLANK**
LIQUID FRACTION				
Filter ID	CZ 6508	CZ 6509	CZ 6510	CZ 6504
Beaker ID	60-01	61-01	62-01	70-01
Liquid Volume (mL)	196	70	96	62
Constant Initial Weight (g)	**99.7603**	**128.2955**	**110.4119**	**100.2357**
Constant Final Weight (g)	**99.7835**	**128.3150**	**110.4387**	**100.2379**
Final-Initial Beaker Wts. (g)	0.0232	0.0195	0.0267	0.0023
Sample/Blank Volume Ratio	3.1613	1.1290	1.5484	
Liquid Blank Correction, ≤ 0.001% (g)	0.0071	0.0025	0.0035	
Liquid Blank Correction, > 0.001% (g)*	0.0020	0.0007	0.0010	
Liquid Particulate Weight (g)	**0.0212**	**0.0188**	**0.0258**	**0.0023**
FILTER FRACTION				
Filter ID	CZ 6508	CZ 6509	CZ 6510	CZ 6504
Constant Initial Weight (g)	**3.5290**	**3.2816**	**3.2357**	**2.9493**
Constant Final Weight (g)	**3.5718**	**3.3165**	**3.2688**	**2.9501**
Final-Initial Filter Wts. (g)	0.0428	0.0349	0.0331	0.0008
Filter Blank (g)	0.0008	0.0008	0.0008	
Filter Particulate Weight (g)	**0.0428**	**0.0349**	**0.0331**	
SUMMARY				
Filter Particulate Weight (g)	**0.0428**	**0.0349**	**0.0331**	
Liquid Particulate Weight (g)	**0.0212**	**0.0188**	**0.0258**	
Net Particulate Weight (g)	**0.0640**	**0.0537**	**0.0588**	

Sample Recovery Solution **Water**
Weight Percent of Blank **0.0036%**
Liquid Fraction

***Note: If the blank liquid fraction has a residue correction of greater than 0.001 percent, then the samples are blank corrected upto 0.001 % of the mass of the wash solvent.**

Custody Transfer Record / Lab Service Request

Client: Bowater Catawba, SC

Work Order No.: 03917.008.003

Desired TAT: 4 days Results Due By: 2/23/05

Project Manager: Simpkins

Submitted By: Savin Phone #: 5656

Weston Use Only LAB ID	Client ID/ Sample Description	Matrix	Date Collected	gravimetric (M-5)	Baker TD	Volume (mL)
CZ 6505	CZ 6505 #3 Rec Outlet Run 1 flt + FHR	flt/DI H_2O	2-15-05	X	57°1	98
6506	CZ 6506 #3 Rec Outlet Run 2 flt. + FHR	flt/DI H_2O	2-15-05		58°1	112
6507	CZ 6507 #3 Rec outlet Run 3 flt. + FHR	flt/DI H_2O	2-15-05		59°1	112
6508	CZ 6508 #3 Rec Outlet Run 1 flt + FHR	flt/DI H_2O	2-16-05		60°1	196
6509	CZ 6509 #3 Rec Outlet Run 2 flt + FHR	flt/DI H_2O	2-16-05		61°1	70
6510	CZ 6510 #3 Rec Outlet Run 3 flt + FHR	flt/DI H_2O	2-16-05		62°1	96
CT 813	CT 813 #3 Rec Inlet Run 1 flt + Noz rinse	flt/DI H_2O	2-15-05		63°1	64
814	CT 814 #3 Rec Inlet Run 2 flt + Noz rinse	flt/DI H_2O	2-15-05		64°1	80
815	CT 815 #3 Rec Inlet Run 3 flt. + Noz. rinse	flt/DI H_2O	2-15-05		65°1	34
816	CT 816 #3 Rec Inlet Run 1 flt. + Noz rinse	flt/DI H_2O	2-16-05		66°1	72
817	CT 817 #3 Rec Inlet Run 2 flt. + Noz Rinse	flt/DI H_2O	2-16-05		67°1	84
818	CT 818 #3 Rec Inlet Run 3 flt. + Noz Rinse	flt/DI H_2O	2-16-05		68°1	106
819	CT 819 #3 Rec Inlet flt Blank + DI Blank	flt/DI H_2O	2-16-05		70°1	62
CZ 6397	CZ 6397 #1 Power Boiler run 1 flt + ~~Acetone~~ ins ~~Ace~~ FHR	flt/Ace	2-17-05		5°2	62
6502	CZ 6502 #1 Power Boiler run 2 flt + FHR	flt/Ace	2-17-05		6°2	58
	TOTAL LISTED ON THIS COC			15		

RELINQUISHED BY	RECEIVED BY	DATE/TIME	# / CONDITION	RELINQUISHED BY	RECEIVED BY	DATE/TIME	# / CONDITION
Matt [illegible]	[illegible]	2-18-05 1000	15 cons / good				

WESTON Analytics Use Only

SAMPLES WERE: Shipped or Hand Deliv'd

Ambient or Chilled

Intact or Damaged

SECURITY SEALS WERE: Present or Absent

Intact or Broken

N/A

SAMPLE LOSS: Y or N

COC ACCURATE: Y or N

NOTE SAMPLE ID ON BACK

WESTON SOLUTIONS
Weston Solutions, Inc.
1625 Pumphrey Avenue
Auburn, Alabama 36832-4303
334-826-6100 • Fax 334-826-82
www.westonsolutions.com

Custody Transfer Record / Lab Service Request

Client: Bowater Catawba, SC

Work Order No.: 03917.008.003

Desired TAT: 4 days Results Due By: 2/23/05

Project Manager: Simpkins

Submitted By: Savin Phone #: 5656

Weston Use Only LAB ID	Client ID/ Sample Description	Matrix	Date Collected	gravimetric (ml-5)	Beaker #	Volume (ml)
CZ 6511	CZ5611 #1 Power Boiler Run 3 Flt + FHR	Flt/Ace	2-17-05	X	7°2	56
↓ 6509	CZ5609 * Filter Blank	Flt	2-17-05	↓	69°1	160
	Acetone Blank	Ace	2-17-05	↓		
	Water Blank	water	2-17-05	K	70°1	62
	TOTAL LISTED ON THIS COC					

ANALYSES REQUESTED

ANALYTICAL METHOD

RELINQUISHED BY	RECEIVED BY	DATE/TIME	# / CONDITION	RELINQUISHED BY	RECEIVED BY	DATE/TIME	# / CONDITION
Matthew [illegible]	[illegible]	2-18-05 1000	2 runs / good				

WESTON Analytics Use Only

SAMPLES WERE Shipped or Hand Dely'd

Ambient or Chilled

Intact or Damaged*

SECURITY SEALS WERE Present or Absent

Intact or Broken* or N/A

SAMPLE LOSS Y or N

COC ACCURATE Y or N

* NOTE SAMPLE ID ON BACK

WESTON SOLUTIONS
Weston Solutions, Inc.
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APPENDIX F
QUALITY CONTROL DATA

METHOD 5 DRY GAS METER CALIBRATION USING CRITICAL ORIFICES

1) Select three critical orifices to calibrate the dry gas meter which bracket the expected operating range.
2) Record barometric pressure before and after calibration procedure.
3) Run at tested vacuum (from Orifice Calibration Report), for a period of time necessary to achieve a minimum total volume of 5 cubic feet.
4) Record readings in outlined boxes below, other columns are automatically calculated.

DATE: **12/9/04**
METER PART #: **AO7**

METER SERIAL #: 9416
6 ET SERIAL #: 13315

	INITIAL	FINAL	AVG (P_{bar})
BAROMETRIC PRESSURE (in Hg):	29.20	29.20	29.20

Calibrated by:

ORIFICE #	RUN #	K' FACTOR (AVG)	TESTED VACUUM (in Hg)	DGM READINGS (FT^3) INITIAL	FINAL	NET (V_m)	AMBIENT F°	DGM F° INITIAL	FINAL	DGM AVG	ELAPSED TIME (MIN) θ	DGM ΔH (in H_2O)	(1) V_m (STD)	(2) V_{cr} (STD)	(3) Y	(4) $\Delta H_@$
12	1	0.3359	22	647.808	659.442	11.634	71	74	74	74.0	27.0	0.59	11.245	11.496	1.022	1.831
16	2	0.4418	20	670.355	681.086	10.731	70	73	73	73.0	19.0	1.10	10.405	10.65	1.024	1.969
19	3	0.5188	19	685.213	706.395	21.182	70	73	73	73.0	32.0	1.50	20.559	21.063	1.024	1.947
25	4	0.6885	17	633.517	644.174	10.657	71	74	75	74.5	12.0	2.60	10.343	10.472	1.012	1.920
31	5	0.8376	16	596.646	623.202	26.556	70	73	74	73.5	25.0	3.80	25.900	26.567	1.026	1.893
														AVG =	**1.022**	**1.912**

USING THE CRITICAL ORIFICES AS CALIBRATION STANDARDS:

The following equations are used to calculate the standard volumes of air passed through the DGM, V_m (std), and the critical orifice, V_{cr} (std), and the DGM calibration factor, Y. These equations are automatically calculated in the spreadsheet above.

Individual Y's .02 from average? YES

Individual $\Delta H_@$ values 0.2 from average? YES

(1) $V_m\,(std) = K_1\, V_m \dfrac{P_{bar} + (\Delta H/13.6)}{T_m}$ = Net volume of gas sample passed through DGM, corrected to standard conditions

K_1 = 17.64 °R/in. Hg (English), 0.3858 °K/mm Hg (Metric)

T_m = Absolute DGM avg. temperature (°R - English, °K - Metric)

(2) $V_{cr}\,(std) = K' \sqrt{\dfrac{P_{bar}\,\theta}{T_{amb}}}$ = Volume of gas sample passed through the critical orifice, corrected to standard conditions

T_{amb} = Absolute ambient temperature (°R - English, °K - Metric)

K' = Average K' factor from Critical Orifice Calibration

(3) $Y = \dfrac{V_{cr}\,(std)}{V_m\,(std)}$ = DGM calibration factor

(4) $\Delta H_@ = \left(\dfrac{0.75\,\theta}{V_{cr}(std)}\right)^2 \Delta H$

METHOD 5 DRY GAS METER CALIBRATION USING CRITICAL ORIFICES

1) Select three critical orifices to calibrate the dry gas meter which bracket the expected operating range.
2) Record barometric pressure before and after calibration procedure.
3) Run at tested vacuum (from Orifice Calibration Report), for a period of time necessary to achieve a minimum total volume of 5 cubic feet.
4) Record readings in outlined boxes below, other columns are automatically calculated.

DATE: **12/7/04**

METER PART #: **AO8**

METER SERIAL #: 965587

CRITICAL ORIFICE SET SERIAL #: 13315

BAROMETRIC PRESSURE (in Hg): INITIAL 29.18 | FINAL 29.18 | AVG (P_{bar}) 29.18

Calibrated by:

ORIFICE #	RUN #	K' FACTOR (AVG)	TESTED VACUUM (in Hg)	DGM READINGS (FT^3) INITIAL	DGM READINGS (FT^3) FINAL	DGM READINGS (FT^3) NET (V_m)	AMBIENT F°	DGM F° INITIAL	DGM F° FINAL	DGM AVG	ELAPSED TIME (MIN) θ	DGM ΔH (in H_2O)	(1) V_m (STD)	(2) V_{cr} (STD)	(3) Y	(4) $\Delta H_@$
12	1	0.3359	21	316.322	328.446	12.124	76	67	74	70.5	28.0	0.58	11.788	11.858	1.006	1.819
16	2	0.4418	18	362.124	372.965	10.841	77	77	78	77.5	19.0	1.05	10.415	10.573	1.015	1.907
19	3	0.5188	20	377.023	387.731	10.708	77	76	77	76.5	16.0	1.40	10.316	10.455	1.014	1.844
25	4	0.6885	18	393.812	409.858	16.046	77	79	81	80.0	18.0	2.45	15.399	15.61	1.014	1.832
31	5	0.8376	15	346.015	358.816	12.801	76	77	78	77.5	12.0	3.70	12.380	12.672	1.024	1.866
														AVG =	**1.014**	**1.854**

USING THE CRITICAL ORIFICES AS CALIBRATION STANDARDS:

The following equations are used to calculate the standard volumes of air passed through the DGM, V_m (std), and the critical orifice, V_{cr} (std), and the DGM calibration factor, Y. These equations are automatically calculated in the spreadsheet above.

Individual Y's .02 from average? YES

Individual $\Delta H_@$ values 0.2 from average? YES

(1) $V_m\,(std) = K_1\, V_m \dfrac{P_{bar} + (\Delta H/13.6)}{T_m}$ = Net volume of gas sample passed through DGM, corrected to standard conditions

K_1 = 17.64 °R/in. Hg (English), 0.3858 °K/mm Hg (Metric)

T_m = Absolute DGM avg. temperature (°R - English, °K - Metric)

(2) $V_{cr}\,(std) = K' \sqrt{\dfrac{P_{bar}\,\theta}{T_{amb}}}$ = Volume of gas sample passed through the critical orifice, corrected to standard conditions

T_{amb} = Absolute ambient temperature (°R - English, °K - Metric)

K' = Average K' factor from Critical Orifice Calibration

(3) $Y = \dfrac{V_{cr}\,(std)}{V_m\,(std)}$ = DGM calibration factor

(4) $\Delta H_@ = \left(\dfrac{0.75\,\theta}{V_{cr}(std)}\right)^2 \Delta H$

Bowater
Catawba, SC

03917.008.003
#3 Recovery Inlet East

POST-TEST METER Y CALIBRATION CHECK

Meter ID: A07

Run Number		1	2	3	Mean
Sampling Time, min	(Theta)	26	35	37	33
Meter Volume, ft^3	(Vm)	13.882	20.595	21.173	18.550
Meter Temperature, R	(tm)	530	539	540	536
Barometric Pressure, in. Hg	(Pb)	29.80	29.80	29.80	29.80
Meter Orifice Pressure, in. H_2O	(dH)	1.308	1.231	1.176	1.238
Meter Pressure, in. Hg	(Pm)	29.90	29.89	29.89	29.89
Ave Sq Rt Meter Orifice Pressure, in. H_2O	((sqrt. dH)ave	1.065	1.098	1.067	1.077
Meter Orifice Calibraion Coefficient, in. H_2O	(dH@)	1.912	1.912	1.912	1.912
Dry Mol. Wt. of Stack Gas, lb/lb-mole	(Md)	30.64	30.42	30.66	30.57
Dry Gas Meter Cal. Check Value	(Yqa)	1.0553	0.9991	0.9960	1.0168
Meter Correction Factor	(Y)	1.0220	1.0220	1.0220	1.0220
Mean Percent Difference, %	< +/- 5%				**-0.51**

Post-Test Meter Calibration Check

Bowater
Catawba, SC

03917.008.003
#3 Recovery Inlet West

POST-TEST METER Y CALIBRATION CHECK

Meter ID: A07

Run Number		1	2	3	Mean
Sampling Time, min	(Theta)	48	48	48	48
Meter Volume, ft^3	(Vm)	30.537	27.290	20.628	26.152
Meter Temperature, R	(tm)	532	536	537	535
Barometric Pressure, in. Hg	(Pb)	29.84	29.84	29.84	29.84
Meter Orifice Pressure, in. H_2O	(dH)	1.687	1.180	1.153	1.340
Meter Pressure, in. Hg	(Pm)	29.96	29.93	29.92	29.94
Ave Sq Rt Meter Orifice Pressure, in. H_2O	((sqrt. dH)ave.	1.267	1.062	1.060	1.130
Meter Orifice Calibraion Coefficient, in. H_2O	(dH@)	1.912	1.912	1.912	1.912
Dry Mol. Wt. of Stack Gas, lb/lb-mole	(Md)	30.46	30.46	30.68	30.53
Dry Gas Meter Cal. Check Value	(Yqa)	1.0576	0.9966	1.3125	1.1222
Meter Correction Factor	(Y)	1.0220	1.0220	1.0220	1.0220
Mean Percent Difference, %	< +/- 5%				**9.81**

Post-Test Meter Calibration Check

Bowater
Catawba, SC

03917.008.003
#3 Recovery Outlet

POST-TEST METER Y CALIBRATION CHECK

Meter ID: A08

Run Number		1	2	3	Mean
Sampling Time, min	(Theta)	48	48	48	48
Meter Volume, ft^3	(Vm)	30.651	31.135	30.913	30.900
Meter Temperature, R	(tm)	536	539	541	538
Barometric Pressure, in. Hg	(Pb)	29.82	29.82	29.82	29.82
Meter Orifice Pressure, in. H_2O	(dH)	1.483	1.518	1.517	1.506
Meter Pressure, in. Hg	(Pm)	29.93	29.93	29.93	29.93
Ave Sq Rt Meter Orifice Pressure, in. H_2O	((sqrt. dH)ave	1.216	1.228	1.228	1.224
Meter Orifice Calibraion Coefficient, in. H_2O	(dH@)	1.854	1.854	1.854	1.854
Dry Mol. Wt. of Stack Gas, lb/lb-mole	(Md)	30.55	30.38	30.27	30.40
Dry Gas Meter Cal. Check Value	(Yqa)	1.0298	1.0292	1.0406	1.0332
Meter Correction Factor	(Y)	1.0140	1.0140	1.0140	1.0140
Mean Percent Difference, %	< +/- 5%				**1.89**

Bowater
Catawba, SC

03917.008.003
#3 Recovery Outlet

POST-TEST METER Y CALIBRATION CHECK

Meter ID: A08

Run Number		1	2	3	Mean
Sampling Time, min	(Theta)	48	48	48	48
Meter Volume, ft^3	(Vm)	25.934	29.836	30.082	28.617
Meter Temperature, R	(tm)	533	542	545	540
Barometric Pressure, in. Hg	(Pb)	29.71	29.71	29.71	29.71
Meter Orifice Pressure, in. H_2O	(dH)	1.002	1.425	1.413	1.280
Meter Pressure, in. Hg	(Pm)	29.78	29.81	29.81	29.80
Ave Sq Rt Meter Orifice Pressure, in. H_2O	((sqrt. dH)ave.	1.000	1.191	1.184	1.125
Meter Orifice Calibraion Coefficient, in. H_2O	(dH@)	1.854	1.854	1.854	1.854
Dry Mol. Wt. of Stack Gas, lb/lb-mole	(Md)	30.52	30.51	30.52	30.52
Dry Gas Meter Cal. Check Value	(Yqa)	1.0014	1.0445	1.0323	1.0261
Meter Correction Factor	(Y)	1.0140	1.0140	1.0140	1.0140
Mean Percent Difference, %	< +/- 5%				**1.19**

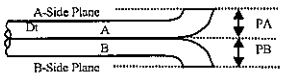
S - Type Pitot Tube Inspection Data Form

Pitot Tube ID NO. P167 Probe ID.No. PR100

If all Criteria PASS Cp is equal to 0.84

Inspection Date 10\16\04 Individual Conducting Inspection LOF

PASS/FAIL

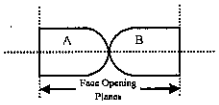


Distance to A Plane (PA) - inches 0.4710 PASS

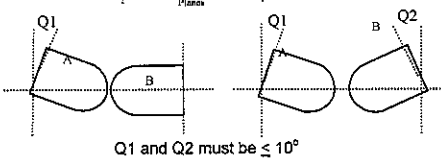
Distance to B Plane (PB) - inches 0.4700 PASS

Pitot OD (D_t) - inches 0.375

$1.05\ D_t < P < 1.5\ D_t$ PA must Equal PB



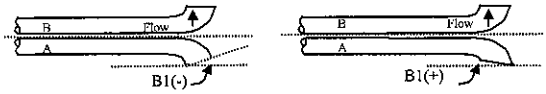
Are Open Faces Aligned Perpendicular to the Tube Axis ◉ YES ○ NO PASS



Angle of Q1 from vertical A Tube- degrees (absolute) 0 PASS

Angle of Q2 from vertical B Tube- degrees (absolute) 0 PASS

Q1 and Q2 must be ≤ 10°

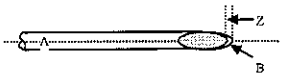


Angle of B1 from vertical A Tube- degrees (absolute) 3 PASS

Angle of B1 from vertical B Tube- degrees (absolute) 3 PASS

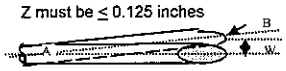
B1 or B2 must be ≤ 5°

Y = 1 O = 1



A = 0.941

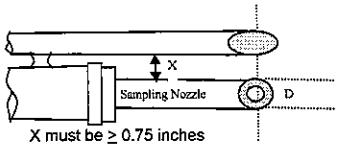
Z must be ≤ 0.125 inches



Z = A sin Y = 0.0164 PASS

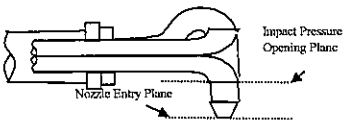
W = A sin O = 0.0164 PASS

W must be ≤ 0.03125 inches

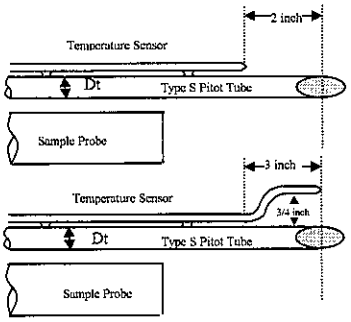


X must be ≥ 0.75 inches

Distance between Sample Nozzle and Pitot (X) - inches NA



Impact Pressure Opening Plane is above the Nozzle Entry Plane ◉ YES ○ NO ○ NA PASS



Thermocouple meets the Distance Criteria in the adjacent figure ○ YES ○ NO ◉ NA

Thermocouple meets the Distance Criteria in the adjacent figure ◉ YES ○ NO ○ NA PASS

POSTTEST CHECK

Client Bonneville Work Order Number 09917-008 003

Date 2-15-05 Damage Found? _____ YES _____ NO

Checked By TS

WESTON

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STACK TEMPERATURE SENSOR CALIBRATION DATA

Thermocouple Number: PR100 Length: 9FT
Date: 22-Dec-04 Pitot: P167
Ambient Temperature,°F : 71
Calibrator: CB

Reference Point Number	Reference Temperature °F	Thermocouple Temperature °F	Temperature Difference %
1 - A	42	43	0.20
B	42	42	0.00
C	42	42	0.00
2 - A	207	204	0.45
B	206	204	0.30
C	205	203	0.30
3 - A	73	73	0.00
B	73	73	0.00
C	73	73	0.00

$$\text{Temp Diff (\%)} = \left| \frac{(\text{Ref Temp, } ^\circ\text{F} + 460) - (\text{ Therm Temp } ^\circ\text{F} + 460)}{\text{Ref Temp, } ^\circ\text{F} + 460} \right| \times 100$$

Are all temperature differences less than +/- 1.5% ? YES

POSTTEST STACK TEMPERATURE SENSOR CALIBRATION DATA

Client: Bowater
Work Order Number: 03917 008 003
Date: 2-16-05
Calibrator: TS

Ambient Temp,° F	Reference Temp,° F	Thermocouple Temp,° F	Temperature Diff, %
51	51	51	0

Was a pretest temperature correction used ? ____yes ____no
Is temperature difference within +/- 1.5% ____yes ____no
If no, calculations done once with recorded values and once with corrected values _____

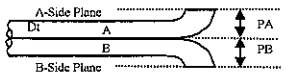
S - Type Pitot Tube Inspection Data Form

Pitot Tube ID NO. P73 Probe ID.No. PR43

If all Criteria PASS Cp is equal to 0.84

Inspection Date 12/23/2003 Individual Conducting Inspection JG

PASS/FAIL

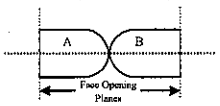


Distance to A Plane (PA) - inches 0.531 PASS

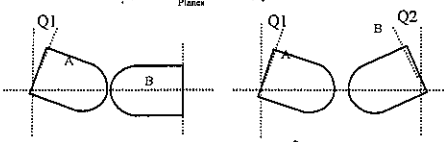
Distance to B Plane (PB) - inches 0.531 PASS

Pitot OD (D_t) - inches 0.375

$1.05\ D_t < P < 1.5\ D_t$ PA must Equal PB



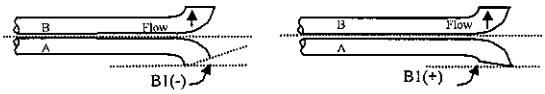
Are Open Faces Aligned Perpendicular to the Tube Axis ◉ YES ○ NO PASS



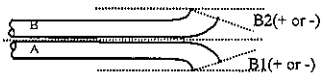
Angle of Q1 from vertical A Tube- degrees (absolute) 1 PASS

Angle of Q2 from vertical B Tube- degrees (absolute) 1 PASS

Q1 and Q2 must be ≤ 10°



Angle of B1 from vertical A Tube- degrees (absolute) 1 PASS



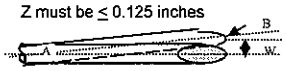
Angle of B1 from vertical B Tube- degrees (absolute) 2 PASS

B1 or B2 must be ≤ 5°

Y = 1 O = 0

A = 1.062

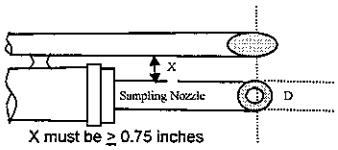
Z must be ≤ 0.125 inches



Z = A sin Y = 0.0185 PASS

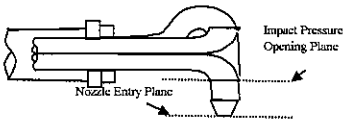
W = A sin O = 0.0000 PASS

W must be ≤ 0.03125 inches

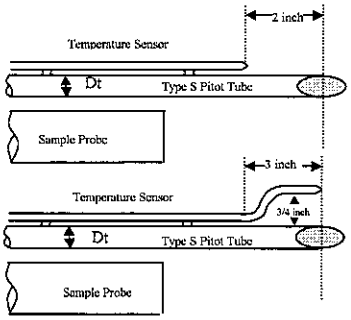


X must be ≥ 0.75 inches

Distance between Sample Nozzle and Pitot (X) - inches NA



Impact Pressure Opening Plane is above the Nozzle Entry Plane ◉ YES ○ NO ○ NA PASS



Thermocouple meets the Distance Criteria in the adjacent figure ○ YES ○ NO ◉ NA

Thermocouple meets the Distance Criteria in the adjacent figure ◉ YES ○ NO ○ NA PASS

POSTTEST CHECK

Client Bowater Work Order Number 03917-008-003

Date 2-15-05 Damage Found? ____ YES ____ NO

Checked By TB

WESTON MANAGERS DESIGNERS/CONSULTANTS

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STACK TEMPERATURE SENSOR CALIBRATION DATA

Thermocouple Number: PR43 Length: 12FT
Date: 23-Dec-03
Ambient Temperature,°F : 74.8
Calibrator: JG

Reference Point Number	Reference Temperature °F	Thermocouple Temperature °F	Temperature Difference %
1 - A	74.8	73.9	0.17
B	74.8	73.9	0.17
C	74.8	74	0.15
2 - A	211.9	211.4	0.07
B	212	211.5	0.07
C	212	211.5	0.07
3 - A	33.5	33.5	0.00
B	33.5	33.6	0.02
C	33.5	33.6	0.02

$$\text{Temp Diff (\%)} = \left| \frac{(\text{Ref Temp, } °F + 460) - (\text{ Therm Temp } °F + 460)}{\text{Ref Temp, } ° F + 460} \right| \times 100$$

Are all temperature differences less than +/- 1.5% ? YES

POSTTEST STACK TEMPERATURE SENSOR CALIBRATION DATA

Client: Bowater
Work Order Number: 03917-008-003
Date: 2-15-05
Calibrator: TS

Ambient Temp,° F	Reference Temp,° F	Thermocouple Temp,° F	Temperature Diff, %
53	53	53	0

Was a pretest temperature correction used ? ____ yes ____ no (no circled)
Is temperature difference within +/- 1.5% ____ yes (yes circled) ____ no
If no, calculations done once with recorded values and once with corrected values _____

APPENDIX G
PROCESS OPERATING/PRODUCTION DATA