7-10

REPORT FINALIZATION AND QUALITY ASSURANCE FORM

PROJECT INFORMATION

Client Name:	Bowater	Primary Author:	TS
Project Name:		Project Manager:	Temp Simpkins
Document Title:	No. 1+2 Combination Boiler	QA Officer:	
Work Order No.:	33917-008-0~~0834~~ 004	Final Due to PM On:	
Client E-mail Address:		Final Due To Client On:	
File Location:			

ACTION REQUEST

1	Edit marked text	9	Fix document formatting
2	Create standard cover page	10	Run spell checker
3	Create TOC/LOT/LOF	11	Proofread recent edits only
4	Update TOC/LOT/LOF	12	Letter Head
5	Add/update page numbers	13	Number appendices
6	Add appendices cover pages	14	Review
7	Add/fix document footers	15	Send Draft
8	Add/fix document headings	16	Copy and Send Final Report

Draft No.	Submitted By:	Submitted On:	Requested Back By:	Work Requested:	Requested From:	Work Completed By:	Date Completed:
1	Temp Simpkins	Date: 7/15/05 Time: 8:15	☑ Today ☐ Tomorrow ☐ This Week ☐ Other: Date: Time:	1-10	DPS	jill	7-15-05
2		Date: 7/15/05 Time:	☑ Today ☐ Tomorrow ☐ This Week ☐ Other: Date: Time:	1	DPS	MD	7/15/05
3	TSimpkins	Date: 7/15/05 Time: 3:30	☐ Today ☐ Tomorrow ☐ This Week ? ☐ Other: Date: Time:	14	WP		
4		Date: __/__/__ Time:	☐ Today ☐ Tomorrow ☐ This Week ☐ Other: Date: Time:			MD E-mailed to Laqua & Taylor	7/15/05
5		Date: __/__/__ Time:	☐ Today ☐ Tomorrow ☐ This Week ☐ Other: Date: Time:		jill	jill 13	7-18

Report Review Requirements

Review Element & Objective	Critical Considerations	Responsibility For:	Completed By: Initials	Completed By: Action
Test Program Scope	Were all quoted sources tested?	PM		
	Were quoted methods used?	PM		
Did we do what we were hired to do?	Were test conditions right?	PM		
	Were there method, condition or source additions?	PM		
Test Program Methods	Were quoted methods applied as required by method and permit/standard?	TD		
Did we do the work the way we said we would?	Were calculations performed as required by the method?	TD		
	Are deviations identified and explained?	TD		
Calculations	Were the correct data sheets used?	TD		
	Were the correct spreadsheets used?	TD		
Did we reduce the data properly?	Were the data sheets and spreadsheets used correctly?	TD		
	Are data reported in the correct units?	TD		
Quality Control & Accreditation	Have the QC "basics" been checked?	QM		
	Has all required QC been performed?	QM		
Does the data set have integrity?	Have QC results been presented and explained?	QM		
	Have we fulfilled and documented accreditation requirements if required?	QM		
Test Program Results	Do the data make sense (run-to-run, for the process, etc.)?	PM/TD		
What does it all mean?	Have we presented our conclusion?	PM/TD		
Have we drawn a conclusion?	Have we described the impact of outlying source or QC data?	PM/TD		
Test Program Personnel	Are test team members and responsibilities identified?	PM		
Who is accountable for the test program?	Are client contacts and responsibilities identified?	PM		
	Are agency observers identified?	PM		
Style and Grammar	Was a standard template used?	QM		
	Does the format conform to Weston Style Guide?	QM		
Does the document reflect the work of a top-tier consulting firm?	Has the document been checked (copy quality, completeness, shipping info, signatures)?	QM		

Initials: Provide the initials of the person providing the review.
Action: Use a number to identify required action and index the information below.

Number	Corrective Action
1	Data entry error; error has been corrected.
2	Data entry error; error needs correction.
3	Appendices out of order.
4	QC documentation missing.
5	Production data missing or used improperly.
6	Incorrect or missing field team member/state representative.
7	Needs further explanation.
8	Items need to be removed.
9	Source results should be split into separate reports.
10	Need verification from client.
11	Sample calculations need correction.
12	Address is incorrect.
13	Copy and/or shipping requirements need correction.
14	
15	
16	
17	

DRAFT REQUEST

Send to:	Send By:	Method of Delivery	Document Type:	Sent By:	Completed On:	Comments Received:
	Date: __/__/__ Time: _____	☐ Email ☐ Fax ☐ FedEx ☐ Hand ☐ 2nd Day ☐ Other:	☐ Word - Body Only ☐ PDF - Body Only ☐ PDF - Body and Appendix ☐ Word - Body and PDF - Appendix ☐ Hard Copy ☐ Results Only		Date: __/__/__ Time: _____	Date: __/__/__ Time: _____
	Date: __/__/__ Time: _____	☐ Email ☐ Fax ☐ FedEx ☐ Hand ☐ 2nd Day ☐ Other:	☐ Word - Body Only ☐ PDF - Body Only ☐ PDF - Body and Appendix ☐ Word - Body and PDF - Appendix ☐ Hard Copy ☐ Results Only		Date: __/__/__ Time: _____	Date: __/__/__ Time: _____

If draft is sent via email, indicate message to be included with draft: _____

DUPLICATION AND SHIPPING

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BINDING INSTRUCTIONS:

_____ 3-ring Notebook
_____ Spiral Binder

ADDITIONAL INSTRUCTIONS/NOTES:

This is Bowaton
Report
Need typed
TB

ADDRESSES/FAX INFORMATION:

19.0

Weston Solutions, Inc.
1625 Pumphrey Avenue
Auburn, Alabama 36832-4303
334-466-5600 • Fax 334-466-5660
www.westonsolutions.com

15 July 2005

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

Work Order No. 03917.008.004

Re: No. 1 and No. 2 Combination Boilers
Emission 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.

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

an employee-owned company

Work Order No. 03917.008.004

No. 1 and No. 2 Combination Boilers Nitrogen Oxides, Sulfur Dioxide, and Carbon Monoxide Emission Test Report

Bowater Incorporated
Catawba, South Carolina
29 June 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

15 July 2005

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SECTION 1
INTRODUCTION

Weston Solutions, Inc. (WESTON®) was retained by Bowater Incorporated (Bowater) to conduct emission testing on the No. 1 and No. 2 Combination Boilers 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 on 29 June 2005. The project team was comprised of the following individuals.

Name	Project Role
Templeton Simpkins	Project Manager/Report Coordinator
Wayne Roberts	Technical Director
Jon Howard	Quality Assurance Manager
Billy Routhier	Test Team Leader
Theo Melo	Test Team Member

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

Tables 2-1 through 2-3 provide a detailed summary of the emission results, with comparison to the permit limit. 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 2-1
NO. 1 COMBINATION BOILER
SUMMARY OF NO_X, SO_2, AND CO EMISSION RESULTS
(RUNS 1-3)

	Run 1	Run 2	Run 3	Mean
Operating Condition	Bark, TDF, NCG; No Oil	NCG's Out	TDF Out	----
Date	6/29/05	6/29/05	6/29/05	-----
Time Began	0932	1018	1100	----
Time Ended	1014	1059	1124	----
Stack Gas Data				
Temperature, °F	369	369	369	369
Velocity, ft/sec	49	49	49	49
Moisture, %	17.1	17.1	17.1	17.1
CO_2 Concentration, %	6.2	7.2	7.4	6.9
O_2 Concentration, %	12.5	11.7	12.0	12.1
VFR, x 10^5 dscfm	1.2	1.2	1.2	1.2
Nitrogen Oxides				
Concentration, ppm	111	78	93	94
Emission Rate, lb/hr	96	67	80	81
Sulfur Dioxide				
Concentration, ppm	421	19	5	148
Emission Rate, lb/hr	503	22	6	177
Carbon Monoxide				
Concentration, ppm	119	199	222	180
Emission Rate, lb/hr	62	104	116	94

Note: Emission rates for Runs 1-3 were calculated using a single flow and moisture measurement taken at 0945.

TABLE 2-2
NO. 1 COMBINATION BOILER
SUMMARY OF NO_x, SO_2, AND CO EMISSION RESULTS
(RUNS 4-5)

	Run 1	Run 2	Mean
Operating Condition	Bark, TDF, Oil and NCG's	NCG's Out	----
Date	6/29/05	6/29/05	----
Time Began	1229	1338	----
Time Ended	1337	1357	----
Stack Gas Data			
Temperature, °F	360	360	360
Velocity, ft/sec	51	51	51
Moisture, %	19.8	19.8	19.8
CO_2 Concentration, %	6.7	7.9	7.3
O_2 Concentration, %	11.1	9.6	10.4
VFR, x 10^5 dscfm	1.2	1.2	1.2
Nitrogen Oxides			
Concentration, ppm	132	88	110
Emission Rate, lb/hr	113	75	94
Sulfur Dioxide			
Concentration, ppm	498	54	276
Emission Rate, lb/hr	596	64	330
Carbon Monoxide			
Concentration, ppm	94	198	146
Emission Rate, lb/hr	49	103	76

Note: Emission rates for Runs 4-5 were calculated using a single flow and moisture measurement taken at 1250.

TABLE 2-3
NO. 2 COMBINATION BOILER
SUMMARY OF NO_X, SO_2, AND CO EMISSION RESULTS

	Run 1	Run 2	Mean
Operating Condition	High Load	Low Load	----
Date	6/29/05	6/29/05	----
Time Began	1454	1655	----
Time Ended	1645	1804	----
Stack Gas Data			
Temperature, °F	407	407	407
Velocity, ft/sec	69	63	66
Moisture, %	12.2	12.9	12.6
CO_2 Concentration, %	8.3	7.1	7.7
O_2 Concentration, %	12.0	13.9	13
VFR, x 10^5 dscfm	1.69	1.53	1.61
Nitrogen Oxides			
Concentration, ppm	127	76	102
Emission Rate, lb/hr	153	84	118
Sulfur Dioxide			
Concentration, ppm	330	21	176
Emission Rate, lb/hr	555	32	293
Carbon Monoxide			
Concentration, ppm	349	871	610
Emission Rate, lb/hr	256	583	419

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.

TABLE 3-1
SOURCE TESTING METHODOLOGY

Parameter	Method Number	Comments
Volumetric Flow Rate	1,2,3,4	
Nitrogen Oxides	7E	Instrumental
Sulfur Dioxide	6C	Instrumental
Carbon Monoxide	10	Instrumental
Oxygen/Carbon Dioxide	3A	Instrumental

Note: Due to extended run duration data was extracted and averaged for each condition. The run averages are not corrected for sample line bias because the differences between bias corrected averages and raw averages are negligible.

APPENDIX A
FIELD DATA – NO. 1 COMBINATION BOILER

EMISSION CALCULATIONS

	Run 1	Run 2	Run 3	Mean
Date	**6/29/05**	**6/29/05**	**6/29/05**	---
Time Began	**932**	**1018**	**1100**	---
Time Ended	**1014**	**1059**	**1124**	---
Volumetric Flow Rate, (Qs), DSCFM	1.20E+05	1.20E+05	1.20E+05	1.20E+05
BWS	0.171	0.171	0.171	0.171
% Oxygen	12.5	11.7	12.0	12.1
Nitrogen Oxides MW= 46.01				
Concentration, ppm	111.4	78.1	93.3	94.3
Emission Rate, lb/hr	95.7	67.0	80.0	80.9
Sulfur Dioxide MW= 64.06				
Concentration, ppm	420.7	18.6	5.4	148.2
Emission Rate, lb/hr	503.2	22.2	6.4	177.3
Carbon Monoxide MW= 28.00				
Concentration, ppm	118.9	198.5	221.8	179.7
Emission Rate, lb/hr	62.2	103.6	115.7	93.8

Run No.	**Operating Condition**
1	**Bark, TDF, NCG; No Oil**
2	**NCG's Out**
3	**TDF Out**

✓ TS

Bowater
Catawba, SC

03917.008.004
No. 1 Combination Boiler

VOLUMETRIC FLOW CALCULATIONS

Run Number	1	2	3	Average
Date	6/29/2005	6/29/2005	6/29/2005	---
Time	0945	0945	0945	---
Volumetric Flow Data				
Velocity Head, in. H2O				
Point 1	0.54	0.54	0.54	0.54
Point 2	0.58	0.58	0.58	0.58
Point 3	0.58	0.58	0.58	0.58
Point 4	0.55	0.55	0.55	0.55
Point 5	0.54	0.54	0.54	0.54
Point 6	0.38	0.38	0.38	0.38
Point 7	0.30	0.30	0.30	0.30
Point 8	0.30	0.30	0.30	0.30
Point 9	0.55	0.55	0.55	0.55
Point 10	0.54	0.54	0.54	0.54
Point 11	0.53	0.53	0.53	0.53
Point 12	0.53	0.53	0.53	0.53
Point 13	0.49	0.49	0.49	0.49
Point 14	0.38	0.38	0.38	0.38
Point 15	0.35	0.35	0.35	0.35
Point 16	0.31	0.31	0.31	0.31
Square Root of Delta P, (in. H20)^½	0.678	0.678	0.678	0.678
Pitot Tube Coefficient (Cp)	0.84	0.84	0.84	0.84
Barometric Pressure (Pb), in. Hg	29.24	29.24	29.24	29.24
Static Pressure (Pg), in. H2O	-0.75	-0.75	-0.75	-0.75
Stack Pressure (Ps), in. Hg	29.18	29.18	29.18	29.18
Stack Diameter (I.D.), in.	120.0	120.0	120.0	120.0
Stack Cross-sectional Area, ft^2	78.54	78.54	78.54	78.54
Stack Gas				
Temperature (ts), °F	369	369	369	369
Moisture (Bws)	0.171	0.171	0.171	0.171
CO2 Concentration (CO2), %	6.2	7.2	7.4	6.9
O2 Concentration (O2), %	12.5	11.7	12.0	12.1
Molecular Weight (Ms), lb/lb-mole	27.5	27.6	27.7	27.6
Velocity (Vs), ft/sec	49.4	49.3	49.3	49.4
Volumetric Flow Rate,				
At Stack Conditions (Qa), ACFM	232977	232529	232375	232627
At Standard Conditions (Qs), DSCFM	**119941**	**119711**	**119632**	**119761** ✓

✓ TS

EMISSION CALCULATIONS

	Run 4	Run 5	Mean
Date	**6/29/05**	**6/29/05**	---
Time Began	**1229**	**1338**	---
Time Ended	**1337**	**1357**	---
Volumetric Flow Rate, (Qs), DSCFM	1.20E+05	1.20E+05	1.20E+05
BWS	0.198	0.198	0.198
% Oxygen	11.1	9.6	10.4
Nitrogen Oxides MW= 46.01			
Concentration, ppm	131.5	87.8	109.7
Emission Rate, lb/hr	113.1	75.4	94.2
Sulfur Dioxide MW= 64.06			
Concentration, ppm	498.1	53.9	276.0
Emission Rate, lb/hr	596.4	64.4	330.4
Carbon Monoxide MW= 28.00			
Concentration, ppm	94.0	198.0	146.0
Emission Rate, lb/hr	49.2	103.4	76.3

Run No.	**Operating Condition**
4	**Bark, TDF,Oil and NCG's**
5	**NCG's Out**

✓ TS

VOLUMETRIC FLOW CALCULATIONS

Run Number	1	2	Average
Date	6/29/2005	6/29/2005	---
Time	1250	1250	---
Volumetric Flow Data			
Velocity Head, in. H2O			
Point 1	0.60	0.60	0.60
Point 2	0.60	0.60	0.60
Point 3	0.53	0.53	0.53
Point 4	0.61	0.61	0.61
Point 5	0.53	0.53	0.53
Point 6	0.42	0.42	0.42
Point 7	0.38	0.38	0.38
Point 8	0.31	0.31	0.31
Point 9	0.57	0.57	0.57
Point 10	0.68	0.68	0.68
Point 11	0.64	0.64	0.64
Point 12	0.58	0.58	0.58
Point 13	0.43	0.43	0.43
Point 14	0.36	0.36	0.36
Point 15	0.30	0.30	0.30
Point 16	0.30	0.30	0.30
Square Root of Delta P, (in. H20)^½	0.694	0.694	0.694
Pitot Tube Coefficient (Cp)	0.84	0.84	0.840
Barometric Pressure (Pb), in. Hg	29.24	29.24	29.240
Static Pressure (Pg), in. H2O	-0.85	-0.85	-0.850
Stack Pressure (Ps), in. Hg	29.18	29.18	29.178
Stack Diameter (I.D.), in.	120.0	120.0	120.000
Stack Cross-sectional Area, ft^2	78.54	78.54	78.540
Stack Gas			
Temperature (ts), °F	360	360	360.000
Moisture (Bws)	0.198	0.198	0.198
CO2 Concentration (CO2), %	6.7	7.9	7.300
O2 Concentration (O2), %	11.1	9.6	10.350
Molecular Weight (Ms), lb/lb-mole	27.2	27.3	27.289
Velocity (Vs), ft/sec	50.6	50.5	50.557
Volumetric Flow Rate,			
At Stack Conditions (Qa), ACFM	238478	238015	238246
At Standard Conditions (Qs), DSCFM	**120048**	**119815**	**119932**

✓ TB

RUN

Number 1

Client: Bowater Project Number: 03917.008.004
Source: #1 Combination Boiler Operator: Billy Routhier
Date: 29-Jun-05

Time	O2 %	CO2 %	CO ppm	NOx ppm	SO2 ppm
Bark, TDF, NCG, No Oil					
9:32	10.8	9.2	70	156	394
9:33	11.5	8.3	80	143	391
9:34	12.3	7.4	100	127	371
9:35	12.2	7.7	90	126	377
9:36	12.2	7.5	83	123	386
9:37	12.2	7.7	87	122	393
9:38	12.5	7.4	105	116	394
9:39	12.6	7	108	116	388
9:40	12.8	4.7	100	121	388
9:41	12.6	5.5	98	120	414
9:42	12.7	5.5	99	120	410
9:43	12.5	5.9	86	121	409
9:44	12.4	6.2	81	123	423
9:45	12.9	5.7	123	116	406
9:46	13.1	5.7	134	114	421
9:47	13	5.8	146	102	416
9:48	13.1	5.5	197	90	424
9:49	13.3	5.4	328	83	406
9:50	12.9	5.4	209	90	391
9:51	12.9	5.5	158	97	408
9:52	13	5.8	181	95	417
9:53	13.1	5.4	182	94	434
9:54	12.8	5.7	149	100	428
9:55	12.7	5.5	107	106	441
9:56	12.7	5.4	101	110	444
9:57	12.8	5.3	101	108	442
9:58	13	5.3	125	107	456
9:59	12.6	5.6	106	114	465
10:00	12.6	5.7	103	110	431
10:01	12.9	5.6	148	106	355
10:02	12.5	5.9	119	122	412
10:03	12.5	6	104	122	440
10:04	12.4	6.4	101	107	514
10:05	12.3	6.4	100	98	482
10:06	12.1	6.2	92	93	445
10:07	12.5	6.3	129	94	407
10:08	12.2	6.4	98	105	416
10:09	12.3	6.4	93	105	426
10:10	12.4	6.6	97	104	421
10:11	12.4	6.5	103	109	444
10:12	12.2	6.7	99	115	455

10:13	12.2	6.4	94	119	455
10:14	12.2	6.3	97	123	452
AVG	**12.5**	**6.2**	**118.9**	**111.4**	**420.7**

Source: #1 Combination Boiler Run No. 2

NCG's Out	O2	CO2	CO	NOx	SO2
10:18	11.5	7.5	135	79	72
10:19	11.5	7.5	137	79	48
10:20	11.9	7.5	151	77	37
10:21	12.1	7.1	186	78	30
10:22	11.8	7.4	147	83	29
10:23	11.7	7.2	137	81	27
10:24	11.3	7.6	112	81	27
10:25	11.4	7.7	108	78	27
10:26	11.6	7.8	114	73	26
10:27	11.8	7.6	149	74	24
10:28	11.7	7.7	136	78	22
10:29	12.3	6.9	215	70	18
10:30	13.7	5.8	574	56	14
10:31	15	4.5	995	44	11
10:32	15.3	1.9	1006	43	10
10:33	14.2	2.1	849	54	11
10:34	13	3.3	332	61	13
10:35	12.3	4.7	220	67	16
10:36	11.6	6	145	74	18
10:37	11.2	7	109	77	19
10:38	11.1	7.8	111	77	19
10:39	11.2	7.8	103	76	19
10:40	11.3	7.4	101	74	19
10:41	11.2	7.1	86	74	17
10:42	10.7	7.7	65	75	17
10:43	10.5	8.4	67	76	17
10:44	10.4	7.2	60	77	16
10:45	10.5	7.8	81	79	14
10:46	11.2	7.4	95	79	13
10:47	11	7.2	80	81	12
10:48	10.9	7.8	82	84	12
10:49	11.4	7.4	105	89	11
10:50	12.1	6.9	149	79	10
10:51	12.5	6.8	184	72	8
10:52	12.3	7.9	185	74	7
10:53	11.8	9.4	144	80	7
10:54	11.3	9.5	110	90	9
10:55	10.7	9.8	101	102	10
10:56	10.5	8.6	99	110	11
10:57	10.6	8.8	116	111	12
10:58	10.9	9.1	125	109	12
10:59	11.1	10.3	133	105	10
AVG	**11.7**	**7.2**	**198.5476**	**78.1**	**18.6**

Source: #1 Combination Boiler Run No. 3

TDF Out	O2	CO2	CO	NOx	SO2
11:00	11.2	11.1	137	105	9
11:01	11.1	11.3	140	104	9
11:02	11.2	10.4	125	99	8
11:03	11.8	9.5	149	91	7
11:04	12.2	8.7	198	87	6
11:05	12	7.2	199	92	5
11:06	11.5	6.3	139	96	5
11:07	11.5	6.7	129	96	5
11:08	11.2	7.6	121	101	5
11:09	11.3	7	132	100	5
11:10	11.5	7	163	99	6
11:11	11.8	6.7	175	97	5
11:12	12	7.1	172	98	5
11:13	11.9	7.1	175	97	5
11:14	12.1	6.4	207	93	5
11:15	12.4	6.4	253	88	4
11:16	12.4	6.1	257	88	4
11:17	12.2	6.2	219	93	4
11:18	12.1	7.1	217	94	5
11:19	12.1	7.1	195	96	5
11:20	12.3	7.6	233	93	5
11:21	12.4	7.4	245	91	5
11:22	12.9	6.4	320	85	5
11:23	13.4	5.9	443	81	4
11:24	14.3	4.4	803	69	4
AVG	**12.0**	**7.4**	**221.8**	**93.3**	**5.4**

RUN

Number 4-b

Client: Bowater Project Number: 03917.008.004
Source: #1 Combination Boiler Operator: Billy Routhier
Date: 29-Jun-05

Bark,TDF,Oil,and NCG's Time	O2 %	CO2 %	CO ppm	NOx ppm	SO2 ppm
12:29	13.2	7.7	195	148	421
12:30	13	6.7	166	147	431
12:31	13	6.5	154	140	434
12:32	13.2	6.6	183	142	437
12:33	13.4	7	233	135	458
12:34	12.9	7.5	197	120	462
12:35	12	8.3	118	116	438
12:36	11.7	8.9	107	107	412
12:37	12.1	5.5	104	106	389
12:38	13	3.4	179	101	402
12:39	14.2	2.2	714	92	415
12:40	14.2	2.1	717	96	450
12:41	13.5	2.7	314	106	472
12:42	13.1	3.1	145	114	485
12:43	13.1	2.7	124	114	494
12:44	13.1	2.4	107	116	497
12:45	12.7	3.1	84	124	487
12:46	11.5	4.4	62	135	559
12:47	10.9	5.2	37	142	572
12:48	11.4	5.1	41	140	551
12:49	11.5	5.2	52	143	555
12:50	11.7	4.9	66	141	544
12:51	12.1	4.5	77	139	554
12:52	12.4	4.6	85	135	548
12:53	12.2	5	77	139	556
12:54	12.3	4.8	80	134	562
12:55	12.5	3.5	96	130	549
12:56	12	4.8	85	129	551
12:57	10.7	7.5	48	147	562
12:58	10	8.9	35	146	564
12:59	9.7	7.6	22	145	501
13:00	10	5.9	15	143	426
13:01	10.2	5.8	21	141	470
13:02	10	6.3	22	143	498
13:03	10	6.5	28	142	495
13:04	10.1	6.5	29	144	498
13:05	10	6.9	35	161	599
13:06	10.2	7.3	33	145	590
13:07	10.3	7.5	40	125	537
13:08	10.5	7.7	45	115	498
13:09	10.7	7.9	54	113	475
13:10	10.3	8.6	47	124	487

13:11	9.8	7.1	34	127	508
13:12	9.6	6.6	25	127	510
13:15	10	6.7	50	133	504
13:16	9.5	8	60	136	507
13:17	9.2	10	50	129	408
13:18	9.7	9.8	39	131	446
13:19	10	9.9	41	136	514
13:20	10	10.2	42	140	503
13:21	9.9	10.7	44	143	512
13:22	10.1	10.4	42	145	609
13:23	10.2	10.6	50	143	567
13:24	10.6	10	49	143	556
13:25	10.6	9.8	48	145	551
13:26	10.2	7.7	29	143	559
13:27	9.9	7.1	21	147	570
13:28	9.5	8.6	30	144	585
13:29	9.5	9	37	142	571
13:30	10.1	6.7	64	138	527
13:31	10.6	6.7	48	133	485
13:32	10.6	8	57	133	479
13:33	10.4	9.3	60	133	474
13:34	9.8	6.9	31	137	486
13:35	9.7	6.5	34	130	498
13:36	10	6.7	72	97	411
13:37	9.6	7.5	165	91	145
AVG	**11.1**	**6.7**	**94.0**	**131.5**	**498.1**

Source: #1 Combination Boiler Run No. 5

NCG's Out	O2	CO2	CO	NOx	SO2
13:38	8.8	9.6	173	91	88
13:39	8.7	11.3	261	89	78
13:40	8.6	12.2	265	89	73
13:41	8.9	12.5	293	90	68
13:42	9	9.9	150	92	65
13:43	9	7.2	138	89	66
13:44	9.1	7.1	244	86	66
13:45	8.6	7.6	353	87	68
13:46	8.7	7.7	199	88	67
13:47	9.2	7.4	143	90	63
13:48	9.1	7.6	192	91	60
13:49	9.7	7.2	324	87	58
13:50	10.4	6.6	286	85	45
13:51	10.4	6.5	232	86	34
13:52	10.6	6.4	181	86	31
13:53	10.3	6.6	158	89	30
13:54	10	6.9	108	90	31
13:55	10.3	6.7	79	88	32
13:56	10.8	6.4	83	85	28
13:57	11.3	5.4	98	78	26
AVG	**9.6**	**7.9**	**198**	**87.8**	**53.9**

Determination of Stack Gas Velocity - Method 2

Client: Bowater | Operator: BB/Tim | Pitot Coeff (Cp): .84
Location/Plant: Catawba, SC | Date: 6-29-05 | Stack Area, ft² (As): 78.321
Source: No. 1 Comb. Boiler | W.O. Number: 03917.005.04 | Pitot Tube/Thermo ID:

Run Number	1	2	
Time	945	1252	
Barometric Press, in Hg (Pb)	29.24	29.24	
Static Press, in H_20 (Pstatic)	-.75	-.85	
Source Moisture, % (BWS)			
O_2, %			
CO_2, %			

Cyclonic Flow Determination		Traverse Location		Leak Check good ? Y / N		Leak Check good ? Y / N		Leak Check good ? Y / N	
Delta P at O°	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	.54	368	.60	359		
			2	.58	368	.60	359		
			3	.56	368	.53	359		
			4	.55	369	.61	359		
			5	.54	370	.53	359		
			6	.38	370	.42	359		
			7	.30	370	.38	359		
			8	.30	365	.31	355		
		B	1	.55	369	.57	362		
			2	.54	369	.68	363		
			3	.53	370	.64	363		
			4	.53	370	.58	363		
			5	.49	370	.43	363		
			6	.38	370	.34	363		
			7	.35	368	.30	362		
			8	.31	364	.30	359		
Avg Angle		Avg Delta P & Temp		.678	368.6		360.4		
		avg √DeltaP		.678		~~.678~~ .694			
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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Determination of Moisture Content in Stack Gases - Method 4

Client: Bowater
Location/Plant: Catawba
Source: NO.1 Combination Boiler
W.O. Number: 03917.008.004
Operator: BR/TM
Meter Box ID: D018
Temperature °C or °F: °F
Date: 6-29-05
Meter Box Y: .982
Sample Volume, ft³ or L: FT3

Run Number		Sample Time (min)	Meter Volume, Vm	Meter Temp (or ambient temp for rotometer) Inlet	Outlet	Meter Press, Delta H (in H_2O)	Impinger Volume, ml	Silica Gel Weight, g	Corrected Volume, Vm(std)	Leak Rate Check
1									36.5467	Initial
	End Test	1034	649.025	110	85	1.4	~~348~~	290.0		Final
Baro Press., Pb (in Hg)	Start Test	934	610.609	58	59	1.5	200	278.6	Moisture Volume, Vw(std)	Percent Moisture (%), BWS
29.44	Avg. or Total	60	38.416	73		1.5	148	11.4	7.5103 ~~5.2510~~	17.05 ~~12.56~~ BR

Run Number		Sample Time (min)	Meter Volume, Vm	Meter Temp (or ambient temp for rotometer) Inlet	Outlet	Meter Press, Delta H (in H_2O)	Impinger Volume, ml	Silica Gel Weight, g	Corrected Volume, Vm(std)	Leak Rate Check
2									31.276	Initial
	End Test	1348	683.055	89	117	1.3	352	310.4		Final
Baro Press., Pb (in Hg)	Start Test	1258	649.510	80	80	1.5	200	299.5	Moisture Volume, Vw(std)	Percent Moisture (%), BWS
29.44	Avg. or Total	50	33.545	91.50		1.4	152	10.9	7.6747	19.78

Run Number		Sample Time (min)	Meter Volume, Vm	Meter Temp (or ambient temp for rotometer) Inlet	Outlet	Meter Press, Delta H (in H_2O)	Impinger Volume, ml	Silica Gel Weight, g	Corrected Volume, Vm(std)	Leak Rate Check
										Initial
	End Test									Final
Baro Press., Pb (in Hg)	Start Test								Moisture Volume, Vw(std)	Percent Moisture (%), BWS
	Avg. or Total									

$$Vm(std) = \frac{17.64 * Y * Vm * (Pb + (deltaH / 13.6))}{(Tm + 460)}$$

if Tm is C° than $Tm = (Tmc * 1.8) + 32$

if Vm is liters than $Vm = Vml * 28.32$

$$Vw(std) = (0.04707 * Vwc) + (0.04715 * Wwsg)$$

$$BWS = \left(\frac{Vw(std)}{Vw(std) + Vm(std)}\right) * 100$$

WHERE:
Vm(std)= Sample volume corrected to standard temp and pressure, scf or L
Vm= Actual sample volume, calculated, scf
Vml= Actual sample volume, calculated, Liters
Y= Dry gas meter calibration factor.
Pb= Barometric pressure, in. Hg
delta H= Meter pressure, in H2O
Tm= Average temperature of meter (DGM is used) or rotomter, degrees °
Tmc= Average temperature of meter (DGM is used) or rotomter, degrees °
Vw(std)= Volume of water vapor at standard conditions, scf or L
Vwc= Volume of water condensed, mL
Wwsg= Weight of Silica Gel, g
Bws= Water vapor in gas stream, percer

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Use either ft³ or liters in calculations. DO NOT MIX CUBIC FEET AND LITERS IN ANY CALCULATION.

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Determination of Moisture Content in Stack Gases - Method 4

Client	Bowater				
Location/Plant	Catawba, SC	Operator	BR/TM	Date	6/28/2005
Source	No. 1 Combination Boiler	Meter Box ID	AO18	Meter Box Y	0.982
W.O. Number	03917.008.004	Temperature °C or °F	F	Sample Volume, ft^3 or L	ft

Run Number		Sample Time (min)	Meter Volume, Vm	Meter Temp (or ambient temp for rotometer)		Meter Press, Delta H (in H_2O)	Impinger Volume, ml	Silica Gel Weight , g	Corrected Volume, Vm(std)	Leak Rate Check
1				Inlet	Outlet				36.5467	Initial
	End Test	1034	649.025	110	85	1.4	348	290		Final
Baro Press., Pb (in Hg)	Start Test	934	610.609	58	59	1.5	200	278.6	Moisture Volume, Vw(std)	Percent Moisture (%), BWS
29.44	Avg. or Total	60	38.416	78.00		1.5	148.0	11.4	7.5103	17.05

Run Number		Sample Time (min)	Meter Volume, Vm	Meter Temp (or ambient temp for rotometer)		Meter Press, Delta H (in H_2O)	Impinger Volume, ml	Silica Gel Weight , g	Corrected Volume, Vm(std)	Leak Rate Check
2				Inlet	Outlet				31.1276	Initial
	End Test	1348	683.055	89	117	1.3	352	310.4		Final
Baro Press., Pb (in Hg)	Start Test	1258	649.510	80	80	1.5	200	299.5	Moisture Volume, Vw(std)	Percent Moisture (%), BWS
29.44	Avg. or Total	50	33.545	91.50		1.4	152.0	10.9	7.6747	19.78

Run Number		Sample Time (min)	Meter Volume, Vm	Meter Temp (or ambient temp for rotometer)		Meter Press, Delta H (in H_2O)	Impinger Volume, ml	Silica Gel Weight , g	Corrected Volume, Vm(std)	Leak Rate Check
				Inlet	Outlet					Initial
	End Test									Final
Baro Press., Pb (in Hg)	Start Test								Moisture Volume, Vw(std)	Percent Moisture, %
	Avg. or Total									

$$Vm(std) = \frac{((3.85 \backslash delta H) + (Pb + (delta H \backslash 13.6)) * Vm * Y * 528.67)}{(Tm + 460)}$$

If Tm is Celsius $Tm = (Tmc * 1.8) + 32$

If Vm is liters then $Vm = Vml * 35.315$

$$Vw(std) = (0.04707 * Vwc) + (0.04715 * Wwsg)$$

$$BWS = \left(\frac{Vw(std)}{Vm(std) + Vw(std)}\right) * 100$$

WHERE:

Vm(std)= Sample volume corrected to standard temp and pressure, scf or L
Vm= Actual sample volume, calculated, scf
Vml= Actual sample volume, calculated, Liters
Y= Dry gas meter calibration factor.
Pb= Barometric pressure, in. Hg
delta H= Meter pressure, in H2O
Tm= Average temperature of meter (DGM is used) or rotomter, degrees °F
Tmc= Average temperature of meter (DGM is used) or rotomter, degrees °C
Vw(std)= Volume of water vapor at standard conditions, scf or L
Vwc= Volume of water condensed, mL
Wwsg= Weight of Silica Gel, g
Bws= Water vapor in gas stream, percent

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Use either ft^3 or liters in calculations. DO NOT MIX CUBIC FEET AND LITERS IN ANY CALCULATION.

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Sample and Velocity Traverse Point Data Sheet - Method 1

Client	Bowater	Operator	BR/TM
Loaction/Plant	Catawba, SC	Date	28-Jun-05
Source	No.1& 2 Comb. Boiler	W.O. Number	03917.008.004

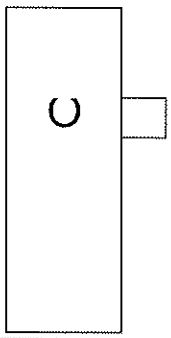
Duct Type	☑ Circular	☐ Rectangular Duct		Indicate appropriate type
Traverse Type	☐ Particulate Traverse	☑ Velocity Traverse		

Distance from far wall to outside of port (in.) = C	132.0
Port Depth (in.) = D	12.0
Depth of Duct, diameter (in.) = C-D	120
Area of Duct (ft^2)	78.54
Total Traverse Points	16
Total Traverse Points per Port	8

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

Flow Disturbances	
Upstream - A (ft)	45.0
Downstream - B (ft)	32.0
Upstream - A (duct diameters)	4.50
Downstream - B (duct diameters)	3.20

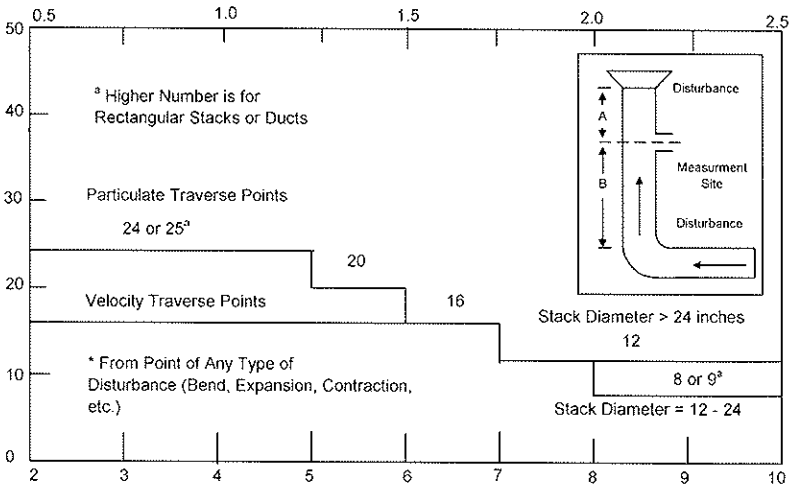
Diagram of Stack



Traverse Point Locations

Traverse Point	% of Duct	Distance from Inside Duct Wall (in)	Distance from Outside of Port (in)
1	3.2	4	16
2	10.5	12 1/2	24 1/2
3	19.4	23 1/2	35 1/2
4	32.3	39	51
5	67.7	81	93
6	80.6	96 1/2	108 1/2
7	89.5	107 1/2	119 1/2
8	96.8	116	128
9			
10			
11			
12			

Duct Diameters Upstream from Flow Disturbance* (Distance A)



Duct Diameters Downstream from Flow Disturbance* (Distance B)

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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RUN SUMMARY

Number 1

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**#1 Combination Boiler**	Date:	**29 Jun 2005**
Calibration:	**1**		

Analyzer	O2	CO2	CO	NOx	SO2
Method	EPA 3A	EPA 3A	EPA 10	EPA 7E	EPA 6C
Conc. Units	%	%	ppm	ppm	ppm
		Time: 09:31 to 12:14			
		Run Averages			
	12.3	6.9	249	93	135
		Pre-run Bias at 08:17			
Zero Bias	0.2	0.1	N/A	-4	-3
Span Bias	10.0	10.3	N/A	439	431
Span Gas	10.1	10.2	N/A	446	450
		Post-run Bias at 12:15			
Zero Bias	0.1	0.0	N/A	-2	2
Span Bias	10.0	10.3	N/A	440	437
Span Gas	10.1	10.2	N/A	446	450
		Run averages corrected for the average of the pre-run and post-run bias			
	12.5	6.8	249*	97	140

*No Correction

RUN SUMMARY

Number 2

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**#1 Combination Boiler**	Date:	**29 Jun 2005**
Calibration:	**1**		

Analyzer	O2	CO2	CO	NOx	SO2
Method	EPA 3A	EPA 3A	EPA 10	EPA 7E	EPA 6C
Conc. Units	%	%	ppm	ppm	ppm
		Time: 12:28 to 13:57			
		Run Averages			
	10.7	7.0	118	121	396
		Pre-run Bias at 12:15			
Zero Bias	0.1	0.0	N/A	-2	2
Span Bias	10.0	10.3	N/A	440	437
Span Gas	10.1	10.2	N/A	446	450
		Post-run Bias at 13:57			
Zero Bias	0.0	0.0	N/A	-3	3
Span Bias	10.0	10.2	N/A	440	434
Span Gas	10.1	10.2	N/A	446	450
		Run averages corrected for the average of the pre-run and post-run bias			
	10.8	7.0	118*	124	409

*No Correction

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RUN DATA

Number 1

Client: **Bowater**
Location: **Catawba, SC**
Source: **#1 Combination Boiler**
Calibration: **1**

Project Number: **03917.008.004**
Operator: **Billy Routhier**
Date: **29 Jun 2005**

Time	O2		CO2		CO		NOx	
	mv	%	mv	%	mv	ppm	mv	ppm
			Starting time 09:31					
			Bark, TDF, NCG, No Oil					
09:32	4329	10.8	3676	9.2	593	70	1597	156
09:33	4592	11.5	3325	8.3	692	80	1468	143
09:34	4897	12.3	2989	7.4	893	100	1307	127
09:35	4868	12.2	3090	7.7	790	90	1302	126
09:36	4852	12.2	3028	7.5	726	83	1268	123
09:37	4874	12.2	3102	7.7	761	87	1259	122
09:38	4994	12.5	2960	7.4	950	105	1200	116
09:39	5034	12.6	2802	7.0	975	108	1195	116
09:40	5094	12.8	1912	4.7	895	100	1245	121
09:41	5043	12.6	2200	5.5	875	98	1243	120
09:42	5049	12.7	2212	5.5	889	99	1236	120
09:43	4983	12.5	2393	5.9	759	86	1248	121
09:44	4929	12.4	2492	6.2	700	81	1274	123
09:45	5149	12.9	2300	5.7	1123	123	1198	116
09:46	5227	13.1	2279	5.7	1237	134	1184	114
09:47	5192	13.0	2321	5.8	1361	146	1056	102
09:48	5246	13.1	2209	5.5	1867	197	941	90
09:49	5304	13.3	2157	5.4	3192	328	869	83
09:50	5156	12.9	2188	5.4	1990	209	938	90
09:51	5155	12.9	2207	5.5	1477	158	1007	97
09:52	5173	13.0	2347	5.8	1707	181	986	95
09:53	5211	13.1	2176	5.4	1721	182	975	94
09:54	5124	12.8	2291	5.7	1384	149	1043	100
09:55	5060	12.7	2202	5.5	964	107	1097	106
09:56	5078	12.7	2191	5.4	907	101	1143	110
09:57	5113	12.8	2118	5.3	906	101	1118	108
09:58	5185	13.0	2131	5.3	1150	125	1111	107
09:59	5021	12.6	2256	5.6	955	106	1176	114
10:00	5015	12.6	2277	5.7	929	103	1136	110
10:01	5139	12.9	2256	5.6	1380	148	1100	106
10:02	5003	12.5	2357	5.9	1082	119	1258	122

RUN DATA

Number 1

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**#1 Combination Boiler**	Date:	**29 Jun 2005**
Calibration:	**1**		

Time	SO2 mv	SO2 ppm
Starting time 09:31		
Bark, TDF, NCG, No Oil		
09:32	4006	394
09:33	3976	391
09:34	3775	371
09:35	3837	377
09:36	3928	386
09:37	3993	393
09:38	4010	394
09:39	3951	388
09:40	3951	388
09:41	4212	414
09:42	4163	410
09:43	4154	409
09:44	4299	423
09:45	4123	406
09:46	4275	421
09:47	4224	416
09:48	4305	424
09:49	4129	406
09:50	3980	391
09:51	4143	408
09:52	4234	417
09:53	4412	434
09:54	4347	428
09:55	4474	441
09:56	4508	444
09:57	4487	442
09:58	4625	456
09:59	4723	465
10:00	4383	431
10:01	3611	355
10:02	4190	412

RUN DATA

Number 1

Client: **Bowater**
Location: **Catawba, SC**
Source: **#1 Combination Boiler**
Calibration: **1**

Project Number: **03917.008.004**
Operator: **Billy Routhier**
Date: **29 Jun 2005**

Time	O2		CO2		CO		NOx	
	mv	%	mv	%	mv	ppm	mv	ppm
10:03	4987	12.5	2414	6.0	940	104	1262	122
10:04	4944	12.4	2555	6.4	904	101	1114	107
10:05	4901	12.3	2567	6.4	897	100	1021	98
10:06	4831	12.1	2504	6.2	810	92	965	93
10:07	4979	12.5	2550	6.3	1191	129	983	94
10:08	4861	12.2	2579	6.4	879	98	1094	105
10:09	4901	12.3	2563	6.4	825	93	1085	105
10:10	4943	12.4	2657	6.6	869	97	1083	104
10:11	4950	12.4	2627	6.5	921	103	1126	109
10:12	4856	12.2	2698	6.7	881	99	1189	115
10:13	4864	12.2	2581	6.4	831	94	1228	119
10:14	4867	12.2	2544	6.3	860	97	1273	123
			NCG's Out					
10:15	4840	12.1	2647	6.6	818	92	1355	132
10:16	4905	12.3	2675	6.7	1293	140	873	83
10:17	4712	11.8	2953	7.3	1402	150	840	80
10:18	4588	11.5	3010	7.5	1247	135	833	79
10:19	4605	11.5	2997	7.5	1270	137	831	79
10:20	4734	11.9	3001	7.5	1410	151	812	77
10:21	4846	12.1	2868	7.1	1761	186	822	78
10:22	4714	11.8	2965	7.4	1364	147	867	83
10:23	4662	11.7	2895	7.2	1265	137	852	81
10:24	4520	11.3	3067	7.6	1017	112	850	81
10:25	4551	11.4	3104	7.7	971	108	819	78
10:26	4610	11.6	3126	7.8	1040	114	767	73
10:27	4696	11.8	3048	7.6	1385	149	784	74
10:28	4651	11.7	3087	7.7	1261	136	821	78
10:29	4901	12.3	2769	6.9	2048	215	735	70
10:30	5470	13.7	2331	5.8	5663	574	596	56
10:31	6001	15.0	1803	4.5	9894	995	478	44
10:32	6096	15.3	761	1.9	10000	1006	469	43
10:33	5649	14.2	857	2.1	8423	849	583	54
10:34	5173	13.0	1326	3.3	3230	332	654	61

RUN DATA

Number 1

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**#1 Combination Boiler**	Date:	**29 Jun 2005**
Calibration:	**1**		

Time	SO2 mv	SO2 ppm
10:03	4467	440
10:04	5215	514
10:05	4890	482
10:06	4517	445
10:07	4135	407
10:08	4228	416
10:09	4326	426
10:10	4275	421
10:11	4508	444
10:12	4621	455
10:13	4619	455
10:14	4587	452
	NCG's Out	
10:15	4691	462
10:16	4276	421
10:17	2281	222
10:18	776	72
10:19	537	48
10:20	426	37
10:21	358	30
10:22	346	29
10:23	322	27
10:24	321	27
10:25	324	27
10:26	314	26
10:27	293	24
10:28	271	22
10:29	236	18
10:30	190	14
10:31	164	11
10:32	152	10
10:33	165	11
10:34	185	13

RUN DATA

Number 1

Client: **Bowater**
Location: **Catawba, SC**
Source: **#1 Combination Boiler**
Calibration: **1**

Project Number: **03917.008.004**
Operator: **Billy Routhier**
Date: **29 Jun 2005**

Time	O2		CO2		CO		NOx	
	mv	%	mv	%	mv	ppm	mv	ppm
10:35	4924	12.3	1885	4.7	2101	220	713	67
10:36	4645	11.6	2411	6.0	1349	145	775	74
10:37	4482	11.2	2801	7.0	982	109	813	77
10:38	4432	11.1	3150	7.8	1007	111	806	77
10:39	4461	11.2	3116	7.8	922	103	800	76
10:40	4495	11.3	2981	7.4	903	101	781	74
10:41	4453	11.2	2869	7.1	750	86	780	74
10:42	4258	10.7	3098	7.7	543	65	791	75
10:43	4173	10.5	3371	8.4	564	67	800	76
10:44	4150	10.4	2899	7.2	491	60	810	77
10:45	4196	10.5	3127	7.8	706	81	827	79
10:46	4454	11.2	2984	7.4	844	95	829	79
10:47	4398	11.0	2912	7.2	699	80	847	81
10:48	4333	10.9	3122	7.8	712	82	883	84
10:49	4561	11.4	2967	7.4	950	105	926	89
10:50	4843	12.1	2784	6.9	1385	149	834	79
10:51	4982	12.5	2734	6.8	1739	184	758	72
10:52	4908	12.3	3169	7.9	1745	185	780	74
10:53	4716	11.8	3755	9.4	1342	144	837	80
10:54	4501	11.3	3832	9.5	995	110	938	90
10:55	4280	10.7	3950	9.8	903	101	1058	102
10:56	4172	10.5	3446	8.6	890	99	1138	110
10:57	4233	10.6	3543	8.8	1054	116	1154	111
10:58	4350	10.9	3650	9.1	1142	125	1129	109
10:59	4429	11.1	4139	10.3	1226	133	1090	105
				TDF Out				
11:00	4455	11.2	4451	11.1	1268	137	1086	105
11:01	4434	11.1	4533	11.3	1293	140	1077	104
11:02	4467	11.2	4181	10.4	1149	125	1030	99
11:03	4697	11.8	3811	9.5	1389	149	949	91
11:04	4867	12.2	3499	8.7	1884	198	914	87
11:05	4809	12.0	2883	7.2	1890	199	962	92
11:06	4589	11.5	2523	6.3	1283	139	996	96

RUN DATA

Number 1

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**#1 Combination Boiler**	Date:	**29 Jun 2005**
Calibration:	**1**		

Time	SO2 mv	SO2 ppm
10:35	209	16
10:36	231	18
10:37	246	19
10:38	246	19
10:39	247	19
10:40	240	19
10:41	224	17
10:42	223	17
10:43	220	17
10:44	212	16
10:45	198	14
10:46	183	13
10:47	171	12
10:48	171	12
10:49	167	11
10:50	151	10
10:51	133	8
10:52	124	7
10:53	127	7
10:54	138	9
10:55	152	10
10:56	164	11
10:57	177	12
10:58	169	12
10:59	157	10
	TDF Out	
11:00	145	9
11:01	139	9
11:02	134	8
11:03	125	7
11:04	116	6
11:05	103	5
11:06	102	5

RUN DATA

Number 1

Client: **Bowater**
Location: **Catawba, SC**
Source: **#1 Combination Boiler**
Calibration: **1**

Project Number: **03917.008.004**
Operator: **Billy Routhier**
Date: **29 Jun 2005**

Time	O2		CO2		CO		NOx	
	mv	%	mv	%	mv	ppm	mv	ppm
11:07	4587	11.5	2698	6.7	1183	129	1002	96
11:08	4479	11.2	3061	7.6	1107	121	1050	101
11:09	4509	11.3	2826	7.0	1215	132	1037	100
11:10	4608	11.5	2830	7.0	1527	163	1028	99
11:11	4728	11.8	2691	6.7	1646	175	1006	97
11:12	4781	12.0	2838	7.1	1614	172	1016	98
11:13	4751	11.9	2843	7.1	1652	175	1006	97
11:14	4837	12.1	2589	6.4	1968	207	965	93
11:15	4933	12.4	2568	6.4	2436	253	919	88
11:16	4959	12.4	2452	6.1	2474	257	922	88
11:17	4875	12.2	2507	6.2	2091	219	965	93
11:18	4834	12.1	2868	7.1	2076	217	977	94
11:19	4818	12.1	2846	7.1	1854	195	1000	96
11:20	4907	12.3	3074	7.6	2233	233	973	93
11:21	4948	12.4	2962	7.4	2350	245	953	91
11:22	5155	12.9	2590	6.4	3104	320	890	85
11:23	5351	13.4	2381	5.9	4341	443	845	81
11:24	5699	14.3	1760	4.4	7964	803	729	69
			Bark Screw not functioning					
11:25	6038	15.1	1042	2.6	10000	1006	630	59
11:26	6097	15.3	1377	3.4	10000	1006	615	58
11:27	6201	15.5	1136	2.8	10000	1006	572	53
11:28	6591	16.5	783	1.9	10000	1006	456	42
11:29	6971	17.5	477	1.2	10000	1006	401	36
			Bark, TDF, Oil, and NCG's					
11:30	7047	17.7	339	0.8	10000	1006	391	35
11:31	7059	17.7	343	0.8	10000	1006	382	34
11:32	6947	17.4	570	1.4	10000	1006	393	35
11:33	6841	17.1	589	1.4	10000	1006	414	37
11:34	6694	16.8	829	2.0	10000	1006	449	41
11:35	6269	15.7	1336	3.3	10000	1006	605	57
11:36	5707	14.3	1910	4.7	8435	850	780	74
11:37	5517	13.8	2164	5.4	5619	570	815	78

RUN DATA

Number 1

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**#1 Combination Boiler**	Date:	**29 Jun 2005**
Calibration:	**1**		

Time	SO2 mv	SO2 ppm
11:07	105	5
11:08	104	5
11:09	106	5
11:10	108	6
11:11	104	5
11:12	104	5
11:13	100	5
11:14	98	5
11:15	94	4
11:16	90	4
11:17	94	4
11:18	100	5
11:19	102	5
11:20	106	5
11:21	102	5
11:22	101	5
11:23	95	4
11:24	88	4
Bark Screw not functioning		
11:25	77	2
11:26	77	2
11:27	74	2
11:28	69	2
11:29	60	1
Bark, TDF, Oil, and NCG's		
11:30	53	0
11:31	49	0
11:32	50	0
11:33	50	0
11:34	51	0
11:35	204	15
11:36	686	63
11:37	746	69

RUN DATA

Number 1

Client: **Bowater**
Location: **Catawba, SC**
Source: **#1 Combination Boiler**
Calibration: **1**

Project Number: **03917.008.004**
Operator: **Billy Routhier**
Date: **29 Jun 2005**

Time	O2		CO2		CO		NOx	
	mv	%	mv	%	mv	ppm	mv	ppm
11:38	5608	14.1	2131	5.3	6391	647	794	75
11:39	5517	13.8	2341	5.8	5654	573	803	76
11:40	5475	13.7	2182	5.4	4802	489	803	76
11:41	5411	13.6	2290	5.7	4932	502	821	78
11:42	5150	12.9	2486	6.2	2613	271	878	84
11:43	5029	12.6	2792	6.9	1886	199	915	88
11:44	5055	12.7	2947	7.3	2524	262	869	83
11:45	5215	13.1	2916	7.3	3678	377	822	78
11:46	5354	13.4	2701	6.7	5086	517	804	76
11:47	5151	12.9	2963	7.4	3698	379	869	83
11:48	4636	11.6	3540	8.8	1468	157	983	94
11:49	4485	11.2	3223	8.0	1030	113	1006	97
11:50	4186	10.5	3883	9.7	1644	175	1076	104
11:51	3776	9.5	4327	10.8	2905	300	1122	108
11:52	3718	9.3	4357	10.9	2921	302	1143	110
11:53	3940	9.9	4167	10.4	2703	280	1115	108
11:54	4228	10.6	3963	9.9	1115	122	1068	103
11:55	4507	11.3	3675	9.2	1362	146	1032	99
11:56	4576	11.5	3638	9.1	1330	143	1040	100
11:57	4421	11.1	3827	9.5	1160	126	1089	105
11:58	4470	11.2	3839	9.6	1212	132	1080	104
11:59	4642	11.6	3762	9.4	1481	158	1075	104
12:00	4565	11.4	3765	9.4	1338	144	1113	107
12:01	4507	11.3	3369	8.4	1133	124	1123	108
12:02	4549	11.4	3599	9.0	1252	136	1148	111
12:03	4244	10.6	3799	9.5	915	102	1259	122
12:04	4211	10.5	3467	8.6	872	98	1263	122
12:05	4163	10.4	3066	7.6	846	95	1298	126
12:06	4069	10.2	3526	8.8	925	103	1331	129
12:07	4102	10.3	4127	10.3	1264	137	1351	131
12:08	4252	10.7	4119	10.3	1246	135	1407	137
12:09	4163	10.4	4263	10.6	1234	134	1424	138
12:10	4647	11.6	3804	9.5	1681	178	1263	122

RUN DATA

Number 1

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**#1 Combination Boiler**	Date:	**29 Jun 2005**
Calibration:	**1**		

Time	SO2 mv	SO2 ppm
11:38	656	60
11:39	647	59
11:40	645	59
11:41	649	59
11:42	658	60
11:43	649	59
11:44	623	57
11:45	602	55
11:46	587	53
11:47	618	56
11:48	691	64
11:49	724	67
11:50	741	69
11:51	770	71
11:52	781	73
11:53	695	64
11:54	509	45
11:55	454	40
11:56	429	38
11:57	439	39
11:58	439	39
11:59	412	36
12:00	420	37
12:01	428	37
12:02	423	37
12:03	448	39
12:04	459	40
12:05	456	40
12:06	453	40
12:07	448	39
12:08	412	36
12:09	401	35
12:10	372	32

RUN DATA

Number 1

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**#1 Combination Boiler**	Date:	**29 Jun 2005**
Calibration:	**1**		

Time	O2		CO2		CO		NOx	
	mv	%	mv	%	mv	ppm	mv	ppm
12:11	4944	12.4	3599	9.0	2010	211	1199	116
12:12	5076	12.7	3600	9.0	2447	254	1162	112
12:13	5139	12.9	3630	9.0	2404	250	1148	111
12:14	5270	13.2	3494	8.7	2681	278	1136	110
Run Avg	**4922**	**12.3**	**2771**	**6.9**	**2394**	**249**	**970**	**93**

RUN DATA

Number 1

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**#1 Combination Boiler**	Date:	**29 Jun 2005**
Calibration:	**1**		

Time	SO2	
	mv	ppm
12:11	328	27
12:12	306	25
12:13	298	24
12:14	286	23
Run Avg	**1407**	**135**

RUN DATA

Number 2

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**#1 Combination Boiler**	Date:	**29 Jun 2005**
Calibration:	**1**		

Time	O2		CO2		CO		NOx	
	mv	%	mv	%	mv	ppm	mv	ppm
			Starting time 12:28					
12:29	5271	13.2	3094	7.7	1849	195	1522	148
12:30	5204	13.0	2697	6.7	1559	166	1509	147
12:31	5199	13.0	2631	6.5	1435	154	1443	140
12:32	5267	13.2	2636	6.6	1733	183	1460	142
12:33	5335	13.4	2819	7.0	2228	233	1391	135
12:34	5135	12.9	3014	7.5	1873	197	1239	120
12:35	4784	12.0	3353	8.3	1072	118	1204	116
12:36	4652	11.7	3563	8.9	967	107	1113	107
12:37	4827	12.1	2218	5.5	938	104	1101	106
12:38	5182	13.0	1387	3.4	1694	179	1054	101
12:39	5673	14.2	905	2.2	7070	714	962	92
12:40	5664	14.2	862	2.1	7100	717	1004	96
12:41	5407	13.5	1103	2.7	3049	314	1104	106
12:42	5212	13.1	1266	3.1	1351	145	1181	114
12:43	5222	13.1	1114	2.7	1137	124	1176	114
12:44	5208	13.1	988	2.4	964	107	1201	116
12:45	5062	12.7	1267	3.1	734	84	1278	124
12:46	4598	11.5	1776	4.4	511	62	1386	135
12:47	4331	10.9	2078	5.2	263	37	1457	142
12:48	4563	11.4	2048	5.1	306	41	1444	140
12:49	4594	11.5	2104	5.2	413	52	1474	143
12:50	4665	11.7	1955	4.9	552	66	1448	141
12:51	4811	12.1	1802	4.5	665	77	1427	139
12:52	4964	12.4	1843	4.6	740	85	1394	135
12:53	4881	12.2	2025	5.0	667	77	1425	139
12:54	4899	12.3	1944	4.8	698	80	1380	134
12:55	4991	12.5	1402	3.5	852	96	1335	130
12:56	4774	12.0	1953	4.8	745	85	1325	129
12:57	4276	10.7	3032	7.5	376	48	1508	147
12:58	3989	10.0	3573	8.9	242	35	1503	146
12:59	3889	9.7	3056	7.6	109	22	1487	145
13:00	4008	10.0	2368	5.9	37	15	1469	143

RUN DATA

Number 2

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**#1 Combination Boiler**	Date:	**29 Jun 2005**
Calibration:	**1**		

Time	SO2 mv	SO2 ppm
Starting time 12:28		
12:29	4277	421
12:30	4378	431
12:31	4411	434
12:32	4436	437
12:33	4646	458
12:34	4689	462
12:35	4453	438
12:36	4183	412
12:37	3952	389
12:38	4088	402
12:39	4221	415
12:40	4565	450
12:41	4788	472
12:42	4924	485
12:43	5010	494
12:44	5042	497
12:45	4939	487
12:46	5668	559
12:47	5795	572
12:48	5582	551
12:49	5621	555
12:50	5511	544
12:51	5609	554
12:52	5551	548
12:53	5638	556
12:54	5694	562
12:55	5558	549
12:56	5582	551
12:57	5692	562
12:58	5714	564
12:59	5083	501
13:00	4328	426

RUN DATA

Number 2

Client: **Bowater**
Location: **Catawba, SC**
Source: **#1 Combination Boiler**
Calibration: **1**

Project Number: **03917.008.004**
Operator: **Billy Routhier**
Date: **29 Jun 2005**

Time	O2		CO2		CO		NOx	
	mv	%	mv	%	mv	ppm	mv	ppm
13:01	4062	10.2	2323	5.8	103	21	1454	141
13:02	3985	10.0	2530	6.3	112	22	1467	143
13:03	3991	10.0	2606	6.5	170	28	1460	142
13:04	4039	10.1	2627	6.5	180	29	1478	144
13:05	3997	10.0	2788	6.9	237	35	1645	161
13:06	4056	10.2	2923	7.3	220	33	1492	145
13:07	4116	10.3	3027	7.5	289	40	1288	125
13:08	4208	10.5	3101	7.7	342	45	1186	115
13:09	4268	10.7	3172	7.9	432	54	1171	113
13:10	4106	10.3	3470	8.6	360	47	1284	124
13:11	3898	9.8	2849	7.1	227	34	1308	127
13:12	3821	9.6	2653	6.6	138	25	1311	127
13:15	3985	10.0	2680	6.7	397	50	1374	133
13:16	3807	9.5	3222	8.0	495	60	1395	136
13:17	3665	9.2	4017	10.0	389	50	1327	129
13:18	3856	9.7	3946	9.8	279	39	1347	131
13:19	3979	10.0	3993	9.9	300	41	1402	136
13:20	3978	10.0	4090	10.2	314	42	1436	140
13:21	3953	9.9	4305	10.7	335	44	1465	143
13:22	4019	10.1	4162	10.4	316	42	1489	145
13:23	4066	10.2	4267	10.6	391	50	1468	143
13:24	4229	10.6	4034	10.0	383	49	1465	143
13:25	4231	10.6	3928	9.8	369	48	1490	145
13:26	4081	10.2	3094	7.7	180	29	1469	143
13:27	3933	9.9	2850	7.1	96	21	1505	147
13:28	3791	9.5	3460	8.6	188	30	1482	144
13:29	3804	9.5	3633	9.0	259	37	1459	142
13:30	4034	10.1	2714	6.7	533	64	1418	138
13:31	4218	10.6	2681	6.7	372	48	1366	133
13:32	4219	10.6	3198	8.0	467	57	1365	133
13:33	4141	10.4	3733	9.3	490	60	1368	133
13:34	3899	9.8	2789	6.9	206	31	1411	137
13:35	3891	9.7	2625	6.5	232	34	1336	130

RUN DATA

Number 2

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**#1 Combination Boiler**	Date:	**29 Jun 2005**
Calibration:	**1**		

Time	SO2	
	mv	ppm
13:01	4772	470
13:02	5051	498
13:03	5019	495
13:04	5047	498
13:05	6064	599
13:06	5970	590
13:07	5442	537
13:08	5049	498
13:09	4817	475
13:10	4936	487
13:11	5151	508
13:12	5167	510
13:15	5108	504
13:16	5146	507
13:17	4146	408
13:18	4527	446
13:19	5214	514
13:20	5104	503
13:21	5192	512
13:22	6163	609
13:23	5739	567
13:24	5631	556
13:25	5581	551
13:26	5665	559
13:27	5775	570
13:28	5920	585
13:29	5783	571
13:30	5347	527
13:31	4921	485
13:32	4857	479
13:33	4810	474
13:34	4935	486
13:35	5051	498

RUN DATA

Number 2

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**#1 Combination Boiler**	Date:	**29 Jun 2005**
Calibration:	**1**		

Time	O2		CO2		CO		NOx	
	mv	%	mv	%	mv	ppm	mv	ppm
13:36	3999	10.0	2711	6.7	615	72	1014	97
13:37	3820	9.6	3006	7.5	1546	165	951	91
			NCG's Out					
13:38	3531	8.8	3839	9.6	1631	173	945	91
13:39	3467	8.7	4516	11.3	2518	261	928	89
13:40	3430	8.6	4875	12.2	2557	265	926	89
13:41	3545	8.9	5031	12.5	2840	293	942	90
13:42	3599	9.0	3965	9.9	1402	150	962	92
13:43	3600	9.0	2909	7.2	1275	138	926	89
13:44	3614	9.1	2851	7.1	2345	244	901	86
13:45	3448	8.6	3058	7.6	3439	353	905	87
13:46	3481	8.7	3080	7.7	1893	199	922	88
13:47	3657	9.2	2964	7.4	1327	143	940	90
13:48	3650	9.1	3035	7.6	1820	192	950	91
13:49	3853	9.7	2903	7.2	3144	324	914	87
13:50	4147	10.4	2650	6.6	2765	286	893	85
13:51	4168	10.4	2626	6.5	2218	232	897	86
13:52	4214	10.6	2555	6.4	1706	181	896	86
13:53	4107	10.3	2647	6.6	1481	158	931	89
13:54	4011	10.0	2765	6.9	974	108	944	90
13:55	4120	10.3	2706	6.7	684	79	915	88
13:56	4295	10.8	2586	6.4	721	83	890	85
13:57	4507	11.3	2163	5.4	877	98	824	78
Run Avg	**4289**	**10.7**	**2814**	**7.0**	**1075**	**118**	**1254**	**121**

RUN DATA

Number 2

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**#1 Combination Boiler**	Date:	**29 Jun 2005**
Calibration:	**1**		

Time	SO2 mv	SO2 ppm
13:36	4182	411
13:37	1511	145
	NCG's Out	
13:38	934	88
13:39	832	78
13:40	784	73
13:41	739	68
13:42	707	65
13:43	714	66
13:44	716	66
13:45	735	68
13:46	728	67
13:47	680	63
13:48	657	60
13:49	637	58
13:50	503	45
13:51	389	34
13:52	367	31
13:53	354	30
13:54	364	31
13:55	376	32
13:56	337	28
13:57	313	26
Run Avg	**4026**	**396**

BIAS

Number 1

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**#1 Combination Boiler**	Date:	**29 Jun 2005**

Starting Time: 08:17

O2

Method: EPA 3A
Span Conc. 25.0 %

Bias Results

Gas	Cal %	Bias Response mv	Bias Response %	Bias Error
Zero	0.0	78	0.2	0.8%
Span	10.0	3984	10.0	0.0%

CO2

Method: EPA 3A
Span Conc. 25.0 %

Bias Results

Gas	Cal %	Bias Response mv	Bias Response %	Bias Error
Zero	0.0	56	0.1	0.4%
Span	10.3	4115	10.3	0.0%

NOx

Method: EPA 7E
Span Conc. 1000 ppm

Bias Results

Gas	Cal ppm	Bias Response mv	Bias Response ppm	Bias Error
Zero	-3	4	-4	-0.1%
Span	453	4426	439	-1.4%

BIAS

Number 1

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**#1 Combination Boiler**	Date:	**29 Jun 2005**

Starting Time: 08:17

SO2
Method: EPA 6C
Span Conc. 1000 ppm

Bias Results

Gas	Cal ppm	Bias Response mv	Bias Response ppm	Bias Error
Zero	1	22	-3	-0.4%
Span	447	4375	431	-1.6%

BIAS AND CALIBRATION DRIFT

Number 2

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**#1 Combination Boiler**	Date:	**29 Jun 2005**

Starting Time: 12:15

O2
Method: EPA 3A
Span Conc. 25.0 %

Bias Results

Gas	Cal %	Bias Response mv	Bias Response %	Bias Error
Zero	0.0	46	0.1	0.4%
Span	10.0	3984	10.0	0.0%

Calibration Drift

Gas	Initial* %	Initial* mv	Final %	Drift
Zero	0.2	46	0.1	-0.4%
Span	10.0	3984	10.0	0.0%

*Bias No. 1

CO2
Method: EPA 3A
Span Conc. 25.0 %

Bias Results

Gas	Cal %	Bias Response mv	Bias Response %	Bias Error
Zero	0.0	-4	0.0	0.0%
Span	10.3	4144	10.3	0.0%

Calibration Drift

Gas	Initial* %	Initial* mv	Final %	Drift
Zero	0.1	-4	0.0	-0.4%
Span	10.3	4144	10.3	0.0%

*Bias No. 1

BIAS AND CALIBRATION DRIFT

Number 2

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**#1 Combination Boiler**	Date:	**29 Jun 2005**

Starting Time: 12:15

CO
Method: EPA 10
Span Conc. 1000 ppm

Calibration Drift

Gas	Initial* ppm	mv	Final ppm	Drift
Zero	6	-46	6	0.0%
Span	904	9016	908	0.4%

*Cal No. 1

NOx
Method: EPA 7E
Span Conc. 1000 ppm

Bias Results

Gas	Cal ppm	Bias Response mv	ppm	Bias Error
Zero	-3	24	-2	0.1%
Span	453	4440	440	-1.3%

Calibration Drift

Gas	Initial* ppm	mv	Final ppm	Drift
Zero	-4	24	-2	0.2%
Span	439	4440	440	0.1%

*Bias No. 1

BIAS AND CALIBRATION DRIFT

Number 2

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**#1 Combination Boiler**	Date:	**29 Jun 2005**

Starting Time: 12:15

SO2
Method: EPA 6C
Span Conc. 1000 ppm

Bias Results

Gas	Cal ppm	Bias Response mv	Bias Response ppm	Bias Error
Zero	1	74	2	0.1%
Span	447	4438	437	-1.0%

Calibration Drift

Gas	Initial* ppm	Final mv	Final ppm	Drift
Zero	-3	74	2	0.5%
Span	431	4438	437	0.6%

*Bias No. 1

BIAS AND CALIBRATION DRIFT

Number 3

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**#1 Combination Boiler**	Date:	**29 Jun 2005**

Starting Time: 13:57

O2

Method: EPA 3A

Span Conc. 25.0 %

Bias Results

Gas	Cal %	Bias Response mv	Bias Response %	Bias Error
Zero	0.0	-8	0.0	0.0%
Span	10.0	3997	10.0	0.0%

Calibration Drift

Gas	Initial* %	Initial* mv	Final %	Drift
Zero	0.1	-8	0.0	-0.4%
Span	10.0	3997	10.0	0.0%

*Bias No. 2

CO2

Method: EPA 3A

Span Conc. 25.0 %

Bias Results

Gas	Cal %	Bias Response mv	Bias Response %	Bias Error
Zero	0.0	13	0.0	0.0%
Span	10.3	4079	10.2	-0.4%

Calibration Drift

Gas	Initial* %	Initial* mv	Final %	Drift
Zero	0.0	13	0.0	0.0%
Span	10.3	4079	10.2	-0.4%

*Bias No. 2

BIAS AND CALIBRATION DRIFT

Number 3

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**#1 Combination Boiler**	Date:	**29 Jun 2005**

Starting Time: 13:57

CO
Method: EPA 10
Span Conc. 1000 ppm

Calibration Drift

	Initial*		Final	
Gas	**ppm**	**mv**	**ppm**	**Drift**
Zero	6	-46	6	0.0%
Span	904	9016	908	0.4%

*Cal No. 1

NOx
Method: EPA 7E
Span Conc. 1000 ppm

Bias Results

	Cal	Bias Response		Bias
Gas	**ppm**	**mv**	**ppm**	**Error**
Zero	-3	8	-3	0.0%
Span	453	4440	440	-1.3%

Calibration Drift

	Initial*		Final	
Gas	**ppm**	**mv**	**ppm**	**Drift**
Zero	-2	8	-3	-0.1%
Span	440	4440	440	0.0%

*Bias No. 2

BIAS AND CALIBRATION DRIFT

Number 3

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**#1 Combination Boiler**	Date:	**29 Jun 2005**

Starting Time: 13:57

SO2
Method: EPA 6C
Span Conc. 1000 ppm

Bias Results

Gas	Cal ppm	Bias Response mv	Bias Response ppm	Bias Error
Zero	1	85	3	0.2%
Span	447	4405	434	-1.3%

Calibration Drift

Gas	Initial* ppm	Final mv	Final ppm	Drift
Zero	2	85	3	0.1%
Span	437	4405	434	-0.3%

*Bias No. 2

CALIBRATION

Number 1

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**#1 Combination Boiler**	Date:	**29 Jun 2005**

Starting Time: 07:43

O2

Method: EPA 3A

Calibration Type: Linear Regression

Calibration Results

%	Cylinder ID	Result, mv
Zero	-	24
10.1	XC024011B	3994
20.0	CC63371	7998

Curve Coefficients

Slope	Intercept	Corr. Coeff.
398.7	5.4	>0.9999

CO2

Method: EPA 3A

Calibration Type: Linear Regression

Calibration Results

%	Cylinder ID	Result, mv
Zero	-	4
10.2	XC024011B	4117
19.6	CC63371	7844

Curve Coefficients

Slope	Intercept	Corr. Coeff.
400.0	14.3	>0.9999

CALIBRATION

Number 1

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**#1 Combination Boiler**	Date:	**29 Jun 2005**

Starting Time: 07:43

CO

Method: EPA 10

Calibration Type: Linear Regression

Calibration Results

ppm	Cylinder ID	Result, mv
Zero	-	-51
296	SG861407NB	2815
600	CC163325	5845
897	SG9137899	8975

Curve Coefficients

Slope	Intercept	Corr. Coeff.
10.053	-110.2	0.9998

NOx

Method: EPA 7E

Calibration Type: Linear Regression

Calibration Results

ppm	Cylinder ID	Result, mv
Zero	-	4
446	CC102672	4569
901	CC73520	9016

Curve Coefficients

Slope	Intercept	Corr. Coeff.
10.001	39.3	0.9999

CALIBRATION

Number 1

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**#1 Combination Boiler**	Date:	**29 Jun 2005**

Starting Time: 07:43

SO2

Method: EPA 6C

Calibration Type: Linear Regression

Calibration Results

ppm	Cylinder ID	Result, mv
Zero	-	65
450	CC12947	4544
904	SG9168910	9139

Curve Coefficients

Slope	Intercept	Corr. Coeff.
10.037	52.6	>0.9999

CALIBRATION ERROR

Number 1

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**#1 Combination Boiler**	Date:	**29 Jun 2005**

Starting Time: 07:43

O2

Method: EPA 3A

Slope 398.7 **Intercept** 5.4

Standard, %	Response, mV	%	Error, %
Zero	24	0.0	0.0
10.10	3994	10.0	-0.4
20.0	7998	20.0	0.0

CO2

Method: EPA 3A

Slope 400.0 **Intercept** 14.3

Standard, %	Response, mV	%	Error, %
Zero	4	0.0	0.0
10.20	4117	10.3	0.4
19.6	7844	19.6	0.0

CO

Method: EPA 10

Slope 10.053 **Intercept** -110.2

Standard, ppm	Response, mV	ppm	Error, %
Zero	-51	6	0.6
296	2815	291	-0.5
600	5845	592	-0.8
897	8975	904	0.7

CALIBRATION ERROR

Number 1

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**#1 Combination Boiler**	Date:	**29 Jun 2005**

Starting Time: 07:43

NOx

Method: EPA 7E

Slope 10.001 **Intercept** 39.3

Standard, ppm	Response, mV	ppm	Error, %
Zero	4	-3	-0.3
446	4569	453	0.7
901	9016	898	-0.3

SO2

Method: EPA 6C

Slope 10.037 **Intercept** 52.6

Standard, ppm	Response, mV	ppm	Error, %
Zero	65	1	0.1
450	4544	447	-0.3
904	9139	905	0.1

ANALYZER INFORMATION

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**#1 Combination Boiler**	Date:	**28 Jun 2005**

File Name: C:\Data\Bowater- Catawba, SC\june 2005\No 1 comb boiler.cem
Computer: WSAUB60 **Trailer:** 261

Analog Input Device: **Keithley KPCMCIA 16AI Card**

Channel 1

Analyte	**O2**
Method	**EPA 3A**, Using Bias
Analyzer Make & Model	**CA 300**
Full-Scale Output, mv	**10000**
Span Concentration, %	**25.0**

Channel 2

Analyte	**CO2**
Method	**EPA 3A**, Using Bias
Analyzer Make & Model	**CA 300**
Full-Scale Output, mv	**10000**
Span Concentration, %	**25.0**

Channel 3

Analyte	**CO**
Method	**EPA 10**, Not Using Bias
Analyzer Make & Model	**CAI Model 300**
Full-Scale Output, mv	**10000**
Span Concentration, ppm	**1000**

Channel 4

Analyte	**NOx**
Method	**EPA 7E**, Using Bias
Analyzer Make & Model	**CA-400-CLD**
Full-Scale Output, mv	**10000**
Span Concentration, ppm	**1000**

Channel 5

Analyte	**SO2**
Method	**EPA 6C**, Using Bias
Analyzer Make & Model	**Bovar 721-M**
Full-Scale Output, mv	**10000**
Span Concentration, ppm	**1000**

APPENDIX B
FIELD DATA – NO. 2 COMBINATION BOILER

Bowater
Catawba, SC

03917.008.004
No. 2 Combination Boiler

EMISSION CALCULATIONS

	Run 1	Run 2	Mean
Date	**6/29/05**	**6/29/05**	---
Time Began	**1454**	**1655**	---
Time Ended	**1645**	**1804**	---
Volumetric Flow Rate, (Qs), DSCFM	1.69E+05	1.53E+05	1.61E+05
BWS	0.122	0.129	0.126
% Oxygen	12.0	13.9	13.0
Nitrogen Oxides MW= 46.01			
Concentration, ppm	127.0	76.0	101.5
Emission Rate, lb/hr	153.3	83.5	118.4
Sulfur Dioxide MW= 64.06			
Concentration, ppm	330.0	21.0	175.5
Emission Rate, lb/hr	554.7	32.1	293.4
Carbon Monoxide MW= 28.00			
Concentration, ppm	349.0	871.0	610.0
Emission Rate, lb/hr	256.4	582.5	419.5

Run No.	**Operating Condition**
1	**High Load**
2	**Low Load**

✓ TS

Bowater
Catawba, SC

03917.008.004
No. 2 Combination Boiler

VOLUMETRIC FLOW CALCULATIONS

Run Number	1	2	Average
Date	6/29/2005	6/29/2005	---
Time	1430	1705	---
Volumetric Flow Data			
Velocity Head, in. H2O			
Point 1	0.79	0.61	0.70
Point 2	0.79	0.61	0.70
Point 3	0.83	0.66	0.75
Point 4	0.89	0.78	0.84
Point 5	0.96	0.87	0.92
Point 6	0.91	0.86	0.89
Point 7	0.92	0.88	0.90
Point 8	0.85	0.81	0.83
Point 9	0.79	0.56	0.68
Point 10	0.79	0.57	0.68
Point 11	0.83	0.61	0.72
Point 12	1.20	0.76	0.98
Point 13	0.95	0.89	0.92
Point 14	0.86	0.82	0.84
Point 15	0.84	0.78	0.81
Point 16	0.80	0.68	0.74
Square Root of Delta P, (in. H20)^½	0.934	0.854	0.894
Pitot Tube Coefficient (Cp)	0.84	0.84	0.840
Barometric Pressure (Pb), in. Hg	29.24	29.24	29.240
Static Pressure (Pg), in. H2O	-1.20	-1.20	-1.200
Stack Pressure (Ps), in. Hg	29.15	29.15	29.152
Stack Diameter (I.D.), in.	120.0	120.0	120.000
Stack Cross-sectional Area, ft^2	78.54	78.54	78.540
Stack Gas			
Temperature (ts), °F	407	407	407.000
Moisture (Bws)	0.122	0.129	0.126
CO2 Concentration (CO2), %	8.3	7.1	7.700
O2 Concentration (O2), %	12.0	13.9	12.950
Molecular Weight (Ms), lb/lb-mole	28.4	28.2	28.276
Velocity (Vs), ft/sec	68.7	63.0	65.848
Volumetric Flow Rate,			
At Stack Conditions (Qa), ACFM	323632	296975	310303
At Standard Conditions (Qs), DSCFM	**168535**	**153420**	**160978**

✓ TS

RUN

Number 1

Client: Bowater Project Number: 03917.008.004
Source: No.2 Combination Boiler Operator: Billy Routhier
Date: 29-Jun-05

Time	O2 %	CO2 %	CO ppm	NOx ppm	SO2 ppm
High Load					
14:54	11.6	9.8	226	129	378
14:55	11.5	9.6	218	136	396
14:56	11.7	9.6	236	127	395
14:57	11.6	9.7	226	133	399
14:58	11.4	9.7	214	131	403
14:59	11.5	9.8	233	129	396
15:00	11.6	9.5	238	136	431
15:01	11.9	9.2	253	131	425
15:02	12.2	9	274	127	416
15:03	12.3	8.7	281	124	413
15:04	12.4	8.9	296	120	418
15:05	12.6	8.9	309	123	427
15:06	12.7	9	334	114	407
15:07	12.9	9	360	113	398
15:08	13.2	8.8	382	111	405
15:09	13	8.9	376	116	405
15:10	12	9.8	258	129	420
15:11	11.8	10.2	258	136	427
15:12	11.8	10.6	262	134	438
15:13	11.8	10.2	263	136	440
15:14	11.7	10	256	132	435
15:15	12	9.2	291	132	425
15:16	12.4	8.6	335	124	401
15:17	12.4	8.4	339	127	412
15:18	12.7	8.1	366	124	409
15:19	12.7	6.6	354	118	396
15:20	12.7	5.6	343	122	396
15:21	12.7	5.5	326	127	417
15:22	12.6	5.5	323	123	413
15:23	12.4	5.7	295	124	417
15:24	12.2	6.2	276	121	413
15:25	11.8	6.7	248	130	410
15:26	11.3	7.3	207	143	436
15:27	11.2	7.3	196	139	436
15:28	10.7	7.1	165	149	438
15:29	10.3	7.8	153	151	442
15:30	10.3	8.2	162	149	405
15:31	9.9	8.7	141	157	395
15:32	9.8	8.9	139	153	435
15:33	9.8	8	126	157	444
15:34	9.7	7.9	126	159	443

15:35	10.4	8.1	176	145	412
15:36	11.2	8	235	147	424
15:37	11.6	8	259	145	483
15:38	11.6	8	260	138	365
15:39	11.2	8.1	224	146	372
15:40	11.1	7.9	213	140	430
15:41	11.9	7.4	286	130	400
15:42	12.4	7.1	340	135	373
15:43	12.6	6.4	361	128	356
15:44	12.7	5.4	373	124	355
15:45	12.8	5.9	363	128	385
15:46	12.3	7	298	129	373
15:47	12	7.6	276	137	366
15:48	11.6	8.1	255	139	369
15:49	11.7	8.1	251	132	358
15:50	11.5	8.3	245	137	374
15:51	11.5	8.7	260	127	327
15:52	11.2	9	234	138	331
15:53	11.3	8.9	245	143	365
15:54	11.4	8.9	249	134	357
15:55	11.3	8.9	240	136	349
15:56	10.7	9.4	190	155	412
15:57	10.9	9.4	202	156	428
15:58	11.1	9.6	219	159	402
15:59	11.1	9.7	216	160	396
16:00	10.7	10.2	195	157	382
16:01	10.7	10	196	167	383
16:02	10.8	7.6	184	164	384
16:03	11	7.9	196	156	375
16:04	11.3	8.4	224	162	384
16:05	11.7	8.2	265	151	382
16:06	12.2	8	308	136	369
16:07	12.5	7.8	335	134	370
16:08	12.7	8.2	356	136	392
16:09	12.6	8.6	357	132	389
16:10	12.9	8.6	382	131	386
16:11	12.9	8.6	391	125	385
16:12	13.1	7.9	424	124	376
16:13	12.9	8	391	130	400
16:14	12.7	8.5	365	127	378
16:15	12.6	8.8	368	129	372
16:16	12.3	9.2	331	142	394
16:17	12.2	9.1	320	140	404
16:18	12.2	9.4	325	139	395
16:19	11.9	9.4	293	145	401
16:20	11.8	9.3	294	143	397
16:21	11.8	9.7	301	131	408
16:22	12	9.4	368	112	269
16:23	12	8.8	396	111	121
16:24	12.1	6.7	381	112	107
16:25	11.6	6.9	307	115	103
16:26	11.9	6.8	351	112	100

16:27	12.5	6.5	440	104	100
16:28	12.7	6.6	451	102	101
16:29	12.8	6.8	456	100	97
16:30	13	7	549	97	93
16:31	13.2	7.6	606	93	91
16:32	13.4	7.4	739	88	80
16:33	13.3	7.7	712	91	74
16:34	13.1	8.4	655	92	73
16:35	13.6	8.2	902	85	50
16:36	13.5	8.4	893	86	40
16:37	13.1	9.3	712	92	39
16:38	13.3	9	763	89	41
16:39	13.4	8.4	812	87	41
16:40	13.4	8.6	840	86	40
16:41	13.4	8.1	870	84	39
16:42	13.4	8.2	964	83	37
16:43	13	7.8	748	87	36
16:44	12.9	6.3	696	88	39
16:45	12.6	6.8	592	89	41
Avgs	12	8.3	349	127	330

RUN

Number 2

Client: Bowater Project Number: 03917.008.004
Source: No.2 Combination Boiler Operator: Billy Routhier
Date: 29-Jun-05

Time	O2 %	CO2 %	CO ppm	NOx ppm	SO2 ppm
Low Load					
16:55	15.4	5.8	1021	64	22
16:56	15	6.2	1021	71	25
16:57	14.6	6.6	1021	75	25
16:58	14.5	6.9	1021	76	27
16:59	14.1	7	1021	80	27
17:00	13.5	6.7	852	87	26
17:01	13.7	5.4	848	89	25
17:02	13.6	5.3	787	93	24
17:03	13.4	5.9	730	93	24
17:04	13.2	6.4	669	92	23
17:05	13.2	6.6	728	89	22
17:06	13	7	674	91	20
17:07	12.5	7.9	562	92	20
17:08	12.5	8.5	587	90	20
17:09	12.1	8.9	488	93	22
17:10	11.8	9.2	460	95	21
17:11	11.6	9.7	439	95	23
17:12	11.9	9.8	486	93	23
17:13	11.8	9.9	478	93	22
17:14	11.8	10.5	489	94	21
17:15	11.6	10.6	445	97	22
17:16	12.1	10.5	529	91	21
17:17	12.7	10	664	86	20
17:18	13.1	10	771	83	18
17:19	13.4	9.5	825	79	16
17:20	14.1	7.5	1020	71	16
17:21	14.5	6.5	1021	66	14
17:22	14.9	6.3	1021	62	12
17:23	15.3	6.3	1021	59	11
17:24	15.2	6.8	1021	62	10
17:25	14.9	7.1	1021	63	9
17:26	15.2	6.6	1021	61	9
17:27	14.5	7	1021	71	9
17:28	14.1	7.9	1021	73	10
17:29	14.3	7.9	1021	69	12
17:30	14.6	7.4	1021	67	13
17:31	14.7	7.3	1021	66	12
17:32	14.5	7	1021	69	11
17:33	14.6	5.9	1021	66	11
17:34	14.6	5.7	1021	66	12
17:35	14.6	5.2	1011	65	12

17:36	14.5	4.8	931	67	13
17:37	14.3	5.3	858	70	16
17:38	14.1	5.7	835	73	18
17:39	13.8	6.3	787	78	19
17:40	13.8	6.6	901	77	21
17:41	14.1	6.3	1021	73	20
17:42	13.9	6.5	1019	77	19
17:43	13.8	5.6	928	78	21
17:44	14	5.6	1001	77	24
17:45	13.7	6.4	874	80	26
17:46	13.4	7.1	734	84	28
17:47	12.9	7.5	605	88	30
17:48	13	7.6	630	87	30
17:49	13.3	7.6	746	84	33
17:50	13.8	6.8	968	77	34
17:51	14.6	4.9	1021	67	31
17:52	14.9	5.6	1021	64	25
17:53	14.9	6.4	1021	64	21
17:54	14.5	7	1021	68	21
17:55	13.9	7.8	1021	72	25
17:56	13.8	7.8	990	72	31
17:57	13.9	7.8	1007	71	34
17:58	13.9	8	946	72	30
17:59	14.4	7.6	1021	65	26
18:00	14.8	6.9	1021	61	23
18:01	15.4	6	1021	54	25
18:02	15.2	6.4	1021	56	24
18:03	15.2	6	1021	54	23
18:04	15.4	4.4	1021	53	22
Avgs	13.9	7.1	871	76	21

Determination of Moisture Content in Stack Gases - Method 4

Client Bowater
Location/Plant Catawba, SC
Source No. 2 Comb. Anal. Ind
W.O. Number 03417.002.004

Operator BR/TM
Meter Box ID AO 18
Temperature °C or °F °F

Date 6-23-05
Meter Box Y .982
Sample Volume, ft³ or L ft³

Run Number		Sample Time (min)	Meter Volume, Vm	Meter Temp (or ambient temp for rotometer) Inlet	Outlet	Meter Press, Delta H (in H_2O)	Impinger Volume, ml	Silica Gel Weight, g	Corrected Volume, Vm(std)	Leak Rate Check
1									32.2645	Initial —
	End Test	1544	718.299	107	90	1.3	280	300.0		Final —
Baro Press., Pb (in Hg)	Start Test	1454	683.511	86	86	1.5	200	285.3	Moisture Volume, Vw(std)	Percent Moisture (%), BWS
29.41	Avg. or Total	50	34.788	92.3		1.4	80	14.7	4.4670	12.18 ✓

Run Number		Sample Time (min)	Meter Volume, Vm	Meter Temp (or ambient temp for rotometer) Inlet	Outlet	Meter Press, Delta H (in H_2O)	Impinger Volume, ml	Silica Gel Weight, g	Corrected Volume, Vm(std)	Leak Rate Check
2									31.8750	Initial —
	End Test	1745	751.222	106	92	1.4	283	299.1		Final —
Baro Press., Pb (in Hg)	Start Test	1700	716.635	87	87	1.5	200	282.1	Moisture Volume, Vw(std)	Percent Moisture (%), BWS
29.41	Avg. or Total	45	34.587	93		1.5	83	17.0	4.7780	12.86 ✓

Run Number		Sample Time (min)	Meter Volume, Vm	Meter Temp (or ambient temp for rotometer) Inlet	Outlet	Meter Press, Delta H (in H_2O)	Impinger Volume, ml	Silica Gel Weight, g	Corrected Volume, Vm(std)	Leak Rate Check
										Initial —
	End Test									Final —
Baro Press., Pb (in Hg)	Start Test								Moisture Volume, Vw(std)	Percent Moisture (%), BWS
	Avg. or Total									

$$Vm(std) = \frac{17.64 * Y * Vm * (Pb + (deltaH / 13.6))}{(Tm + 460)}$$

if Tm is C° than $Tm = (Tmc * 1.8) + 32$

if Vm is liters than $Vm = Vml * 28.32$

$$Vw(std) = (0.04707 * Vwc) + (0.04715 * Wwsg)$$

$$BWS = \left(\frac{Vw(std)}{Vw(std) + Vm(std)}\right) * 100$$

WHERE:
Vm(std)= Sample volume corrected to standard temp and pressure, scf or L
Vm= Actual sample volume, calculated, scf
Vml= Actual sample volume, calculated, Liters
Y= Dry gas meter calibration factor.
Pb= Barometric pressure, in. Hg
delta H= Meter pressure, in H2O
Tm= Average temperature of meter (DGM is used) or rotomter, degrees °
Tmc= Average temperature of meter (DGM is used) or rotomter, degrees °
Vw(std)= Volume of water vapor at standard conditions, scf or L
Vwc= Volume of water condensed, mL
Wwsg= Weight of Silica Gel, g
Bws= Water vapor in gas stream, percer

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Use either ft³ or liters in calculations. DO NOT MIX CUBIC FEET AND LITERS IN ANY CALCULATION.

✓ TS

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Determination of Stack Gas Velocity - Method 2

Client: Bowater | Operator: BR/TM | Pitot Coeff (Cp): .84
Location/Plant: Catawba, SC | Date: 6-29-05 | Stack Area, ft² (As): 78.54
Source: No. 2 Power Boiler | W.O. Number: 03917-008-004 | Pitot Tube/Thermo ID:

Run Number	1		2
Time	1430		1705
Barometric Press, in Hg (Pb)	29.34		29.
Static Press, in H_2O (Pstatic)	-1.2		-1.2
Source Moisture, % (BWS)			
O_2, %			
CO_2, %			

Cyclonic Flow Determination		Traverse Location		Leak Check good ? (Y) / N		Leak Check good ? Y / N		Leak Check good ? (Y) / N	
Delta P at O°	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	.79	402			.61	404
			2	.79	402			.61	404
			3	.83	404			.66	405
			4	.89	405			.78	407
			5	.96	407			.87	407
			6	.91	407			.86	409
			7	.92	407			.88	411
			8	.85	409			.81	407
		B	1	.79	403			.56	405
			2	.79	403			.57	405
			3	.83	406			.61	406
			4	1.2	407			.76	407
			5	.95	408			.89	407
			6	.86	411			.82	408
			7	.84	414			.78	410
			8	.80	410			.68	406
Avg Angle		Avg Delta P & Temp			406.6				406.8
		avg $\sqrt{DeltaP}$		.934				.854	
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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Determination of Moisture Content in Stack Gases - Method 4

Client	Bowater				
Location/Plant	Catawba, SC	Operator	BR/TM	Date	6/29/2005
Source	No. 2 Combination Boiler	Meter Box ID	AO18	Meter Box Y	0.982
W.O. Number	03917.008.004	Temperature °C or °F	F	Sample Volume, ft³ or L	ft

Run Number		Sample Time (min)	Meter Volume, Vm	Meter Temp (or ambient temp for rotometer)		Meter Press, Delta H (in H_2O)	Impinger Volume, ml	Silica Gel Weight , g	Corrected Volume, Vm(std)	Leak Rate Check
				Inlet	Outlet					
1									32.2045	Initial
	End Test	1544	718.299	107	90	1.3	280	300		Final
Baro Press., Pb (in Hg)	Start Test	1454	683.511	86	86	1.5	200	285.3	Moisture Volume, Vw(std)	Percent Moisture (%), BWS
29.41	Avg. or Total	50	34.788	92.25		1.4	80.0	14.7	4.4670	12.18

Run Number		Sample Time (min)	Meter Volume, Vm	Meter Temp (or ambient temp for rotometer)		Meter Press, Delta H (in H_2O)	Impinger Volume, ml	Silica Gel Weight , g	Corrected Volume, Vm(std)	Leak Rate Check
				Inlet	Outlet					
									31.9790	Initial
	End Test	1745	751.222	106	92	1.4	283	299.1		Final
Baro Press., Pb (in Hg)	Start Test	1700	716.635	87	87	1.5	200	282.1	Moisture Volume, Vw(std)	Percent Moisture (%), BWS
29.41	Avg. or Total	45	34.587	93.00		1.5	83.0	17.0	4.7180	12.86

Run Number		Sample Time (min)	Meter Volume, Vm	Meter Temp (or ambient temp for rotometer)		Meter Press, Delta H (in H_2O)	Impinger Volume, ml	Silica Gel Weight , g	Corrected Volume, Vm(std)	Leak Rate Check
				Inlet	Outlet					
										Initial
	End Test									Final
Baro Press., Pb (in Hg)	Start Test								Moisture Volume, Vw(std)	Percent Moisture, %
	Avg. or Total									

$$Bws = \left(\frac{Vw(std)}{Vw(std) + Vm(std)}\right) * 100$$

$$Vw(std) = (0.0470 * Vwc) + (0.0447 * Wwsg)$$

If Vm is liters then $Vm = Vml * 35.35$

If Tm is C^o then $Tm = (Tmc * 1.8) + 32$

$$Vm(std) = \frac{((Pb + (delta\ H / 13.6)) * Vm * Y * 528.7)}{(Tm + 460)}$$

WHERE:

Vm(std)= Sample volume corrected to standard temp and pressure, scf or L
Vm= Actual sample volume, calculated, scf
Vml= Actual sample volume, calculated, Liters
Y= Dry gas meter calibration factor.
Pb= Barometric pressure, in. Hg
delta H= Meter pressure, in H2O
Tm= Average temperature of meter (DGM is used) or rotomter, degrees °F
Tmc= Average temperature of meter (DGM is used) or rotomter, degrees °C
Vw(std)= Volume of water vapor at standard conditions, scf or L
Vwc= Volume of water condensed, mL
Wwsg= Weight of Silica Gel, g
Bws= Water vapor in gas stream, percent

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Use either ft³ or liters in calculations. DO NOT MIX CUBIC FEET AND LITERS IN ANY CALCULATION.

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RUN SUMMARY

Number 1

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**No.2 Combination Boiler**	Date:	**29 Jun 2005**
Calibration:	**1**		

Analyzer	O2	CO2	CO	NOx	SO2
Method	EPA 3A	EPA 3A	EPA 10	EPA 7E	EPA 6C
Conc. Units	%	%	ppm	ppm	ppm
		Time: 14:53 to 16:45			
		Run Averages			
	12.0	8.3	349	127	330
		Pre-run Bias at 14:44			
Zero Bias	0.2	0.2	N/A	0	6
Span Bias	10.0	10.2	N/A	439	436
Span Gas	10.1	10.2	N/A	446	450
		Post-run Bias at 16:46			
Zero Bias	0.2	0.2	N/A	-3	7
Span Bias	10.0	10.2	N/A	443	435
Span Gas	10.1	10.2	N/A	446	450
		Run averages corrected for the average of the pre-run and post-run bias			
	12.2	8.3	349*	130	339

*No Correction

RUN SUMMARY

Number 2

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**No.2 Combination Boiler**	Date:	**29 Jun 2005**
Calibration:	**1**		

Analyzer	O2	CO2	CO	NOx	SO2
Method	EPA 3A	EPA 3A	EPA 10	EPA 7E	EPA 6C
Conc. Units	%	%	ppm	ppm	ppm
		Time: 16:54 to 18:04			
		Run Averages			
	13.9	7.1	871	76	21
		Pre-run Bias at 16:46			
Zero Bias	0.2	0.2	N/A	-3	7
Span Bias	10.0	10.2	N/A	443	435
Span Gas	10.1	10.2	N/A	446	450
		Post-run Bias at 18:05			
Zero Bias	0.2	0.3	N/A	-3	-1
Span Bias	10.1	10.4	N/A	442	431
Span Gas	10.1	10.2	N/A	446	450
		Run averages corrected for the average of the pre-run and post-run bias			
	14.0	7.0	871*	79	19

*No Correction

RUN DATA

Number 1

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**No.2 Combination Boiler**	Date:	**29 Jun 2005**
Calibration:	**1**		

Time	O2		CO2		CO		NOx	
	mv	%	mv	%	mv	ppm	mv	ppm
			Starting time 14:53					
			High Load					
14:54	4611	11.6	3930	9.8	2161	226	1333	129
14:55	4571	11.5	3832	9.6	2075	218	1402	136
14:56	4679	11.7	3866	9.6	2253	236	1314	127
14:57	4640	11.6	3881	9.7	2154	226	1367	133
14:58	4558	11.4	3903	9.7	2040	214	1354	131
14:59	4600	11.5	3910	9.8	2228	233	1332	129
15:00	4632	11.6	3826	9.5	2280	238	1404	136
15:01	4750	11.9	3691	9.2	2421	253	1353	131
15:02	4854	12.2	3602	9.0	2626	274	1312	127
15:03	4919	12.3	3504	8.7	2698	281	1280	124
15:04	4953	12.4	3559	8.9	2846	296	1237	120
15:05	5010	12.6	3562	8.9	2972	309	1266	123
15:06	5074	12.7	3625	9.0	3218	334	1184	114
15:07	5155	12.9	3597	9.0	3484	360	1174	113
15:08	5249	13.2	3546	8.8	3697	382	1147	111
15:09	5199	13.0	3583	8.9	3634	376	1202	116
15:10	4794	12.0	3919	9.8	2473	258	1334	129
15:11	4723	11.8	4096	10.2	2473	258	1398	136
15:12	4728	11.8	4228	10.6	2513	262	1378	134
15:13	4716	11.8	4100	10.2	2526	263	1396	136
15:14	4685	11.7	4023	10.0	2457	256	1360	132
15:15	4805	12.0	3706	9.2	2802	291	1357	132
15:16	4956	12.4	3464	8.6	3237	335	1277	124
15:17	4960	12.4	3372	8.4	3273	339	1308	127
15:18	5064	12.7	3237	8.1	3536	366	1282	124
15:19	5077	12.7	2666	6.6	3421	354	1220	118
15:20	5078	12.7	2238	5.6	3311	343	1264	122
15:21	5050	12.7	2214	5.5	3145	326	1310	127
15:22	5030	12.6	2207	5.5	3111	323	1269	123
15:23	4952	12.4	2306	5.7	2842	295	1282	124
15:24	4873	12.2	2507	6.2	2655	276	1246	121

RUN DATA

Number 1

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**No.2 Combination Boiler**	Date:	**29 Jun 2005**
Calibration:	**1**		

Time	SO2 mv	SO2 ppm
Starting time 14:53		
High Load		
14:54	3842	378
14:55	4028	396
14:56	4017	395
14:57	4056	399
14:58	4098	403
14:59	4030	396
15:00	4379	431
15:01	4318	425
15:02	4227	416
15:03	4197	413
15:04	4248	418
15:05	4334	427
15:06	4139	407
15:07	4048	398
15:08	4122	405
15:09	4113	405
15:10	4268	420
15:11	4336	427
15:12	4444	438
15:13	4469	440
15:14	4416	435
15:15	4318	425
15:16	4079	401
15:17	4189	412
15:18	4153	409
15:19	4024	396
15:20	4027	396
15:21	4234	417
15:22	4195	413
15:23	4234	417
15:24	4197	413

RUN DATA

Number 1

Client: **Bowater**
Location: **Catawba, SC**
Source: **No.2 Combination Boiler**
Calibration: **1**

Project Number: **03917.008.004**
Operator: **Billy Routhier**
Date: **29 Jun 2005**

Time	O2		CO2		CO		NOx	
	mv	%	mv	%	mv	ppm	mv	ppm
15:25	4714	11.8	2679	6.7	2378	248	1342	130
15:26	4496	11.3	2928	7.3	1968	207	1470	143
15:27	4453	11.2	2927	7.3	1864	196	1425	139
15:28	4262	10.7	2837	7.1	1553	165	1534	149
15:29	4093	10.3	3133	7.8	1435	153	1546	151
15:30	4125	10.3	3300	8.2	1525	162	1528	149
15:31	3934	9.9	3473	8.7	1315	141	1608	157
15:32	3907	9.8	3555	8.9	1295	139	1565	153
15:33	3922	9.8	3229	8.0	1171	126	1611	157
15:34	3892	9.7	3186	7.9	1170	126	1629	159
15:35	4154	10.4	3254	8.1	1667	176	1489	145
15:36	4465	11.2	3211	8.0	2244	235	1506	147
15:37	4642	11.6	3193	8.0	2486	259	1494	145
15:38	4623	11.6	3192	8.0	2489	260	1417	138
15:39	4468	11.2	3245	8.1	2137	224	1496	146
15:40	4444	11.1	3183	7.9	2033	213	1440	140
15:41	4740	11.9	2979	7.4	2746	286	1337	130
15:42	4946	12.4	2843	7.1	3286	340	1385	135
15:43	5041	12.6	2557	6.4	3490	361	1317	128
15:44	5073	12.7	2171	5.4	3606	373	1282	124
15:45	5099	12.8	2371	5.9	3507	363	1316	128
15:46	4904	12.3	2828	7.0	2865	298	1329	129
15:47	4795	12.0	3056	7.6	2652	276	1408	137
15:48	4645	11.6	3267	8.1	2439	255	1427	139
15:49	4657	11.7	3241	8.1	2406	251	1364	132
15:50	4597	11.5	3344	8.3	2345	245	1408	137
15:51	4606	11.5	3483	8.7	2490	260	1312	127
15:52	4454	11.2	3628	9.0	2237	234	1421	138
15:53	4522	11.3	3558	8.9	2346	245	1466	143
15:54	4557	11.4	3553	8.9	2387	249	1380	134
15:55	4510	11.3	3573	8.9	2295	240	1401	136
15:56	4285	10.7	3768	9.4	1800	190	1590	155
15:57	4361	10.9	3785	9.4	1917	202	1604	156

RUN DATA

Number 1

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**No.2 Combination Boiler**	Date:	**29 Jun 2005**
Calibration:	**1**		

Time	SO2	
	mv	ppm
15:25	4170	410
15:26	4432	436
15:27	4429	436
15:28	4445	438
15:29	4491	442
15:30	4118	405
15:31	4017	395
15:32	4417	435
15:33	4507	444
15:34	4500	443
15:35	4187	412
15:36	4305	424
15:37	4899	483
15:38	3721	365
15:39	3785	372
15:40	4364	430
15:41	4071	400
15:42	3801	373
15:43	3623	356
15:44	3614	355
15:45	3913	385
15:46	3795	373
15:47	3725	366
15:48	3761	369
15:49	3650	358
15:50	3804	374
15:51	3339	327
15:52	3377	331
15:53	3715	365
15:54	3640	357
15:55	3555	349
15:56	4189	412
15:57	4352	428

RUN DATA

Number 1

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**No.2 Combination Boiler**	Date:	**29 Jun 2005**
Calibration:	**1**		

Time	O2		CO2		CO		NOx	
	mv	%	mv	%	mv	ppm	mv	ppm
15:58	4412	11.1	3861	9.6	2084	219	1627	159
15:59	4431	11.1	3905	9.7	2061	216	1637	160
16:00	4281	10.7	4105	10.2	1852	195	1612	157
16:01	4272	10.7	4013	10.0	1863	196	1710	167
16:02	4328	10.8	3050	7.6	1741	184	1680	164
16:03	4395	11.0	3167	7.9	1863	196	1602	156
16:04	4499	11.3	3389	8.4	2141	224	1657	162
16:05	4685	11.7	3284	8.2	2543	265	1552	151
16:06	4853	12.2	3222	8.0	2967	308	1401	136
16:07	4976	12.5	3145	7.8	3232	335	1384	134
16:08	5075	12.7	3281	8.2	3442	356	1402	136
16:09	5043	12.6	3433	8.6	3445	357	1359	132
16:10	5129	12.9	3454	8.6	3700	382	1353	131
16:11	5142	12.9	3444	8.6	3785	391	1293	125
16:12	5228	13.1	3171	7.9	4112	424	1275	124
16:13	5166	12.9	3221	8.0	3788	391	1338	130
16:14	5062	12.7	3405	8.5	3524	365	1309	127
16:15	5032	12.6	3515	8.8	3563	368	1331	129
16:16	4898	12.3	3699	9.2	3197	331	1460	142
16:17	4865	12.2	3649	9.1	3083	320	1438	140
16:18	4852	12.2	3751	9.4	3134	325	1432	139
16:19	4735	11.9	3758	9.4	2819	293	1492	145
16:20	4727	11.8	3711	9.3	2826	294	1467	143
16:21	4715	11.8	3874	9.7	2892	301	1349	131
16:22	4800	12.0	3784	9.4	3556	368	1160	112
16:23	4806	12.0	3514	8.8	3830	396	1153	111
16:24	4819	12.1	2701	6.7	3684	381	1155	112
16:25	4627	11.6	2755	6.9	2958	307	1193	115
16:26	4734	11.9	2726	6.8	3386	351	1159	112
16:27	4984	12.5	2626	6.5	4264	440	1084	104
16:28	5051	12.7	2668	6.6	4375	451	1061	102
16:29	5108	12.8	2737	6.8	4422	456	1042	100
16:30	5170	13.0	2827	7.0	5343	549	1006	97

RUN DATA

Number 1

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**No.2 Combination Boiler**	Date:	**29 Jun 2005**
Calibration:	**1**		

Time	SO2	
	mv	ppm
15:58	4087	402
15:59	4026	396
16:00	3886	382
16:01	3899	383
16:02	3909	384
16:03	3821	375
16:04	3910	384
16:05	3882	382
16:06	3759	369
16:07	3769	370
16:08	3989	392
16:09	3956	389
16:10	3925	386
16:11	3913	385
16:12	3829	376
16:13	4065	400
16:14	3847	378
16:15	3783	372
16:16	4010	394
16:17	4108	404
16:18	4021	395
16:19	4080	401
16:20	4036	397
16:21	4152	408
16:22	2749	269
16:23	1269	121
16:24	1125	107
16:25	1090	103
16:26	1057	100
16:27	1054	100
16:28	1064	101
16:29	1028	97
16:30	985	93

RUN DATA

Number 1

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**No.2 Combination Boiler**	Date:	**29 Jun 2005**
Calibration:	**1**		

Time	O2		CO2		CO		NOx	
	mv	%	mv	%	mv	ppm	mv	ppm
16:31	5254	13.2	3056	7.6	5910	606	967	93
16:32	5361	13.4	2988	7.4	7216	739	924	88
16:33	5325	13.3	3085	7.7	6951	712	951	91
16:34	5246	13.1	3353	8.4	6394	655	956	92
16:35	5435	13.6	3276	8.2	8824	902	888	85
16:36	5404	13.5	3367	8.4	8743	893	901	86
16:37	5236	13.1	3741	9.3	6955	712	955	92
16:38	5298	13.3	3616	9.0	7457	763	925	89
16:39	5331	13.4	3352	8.4	7941	812	913	87
16:40	5330	13.4	3435	8.6	8218	840	896	86
16:41	5354	13.4	3259	8.1	8512	870	877	84
16:42	5360	13.4	3297	8.2	9438	964	873	83
16:43	5195	13.0	3131	7.8	7305	748	910	87
16:44	5149	12.9	2554	6.3	6797	696	918	88
16:45	5030	12.6	2723	6.8	5764	592	931	89
Run Avg	**4799**	**12.0**	**3315**	**8.3**	**3375**	**349**	**1314**	**127**

RUN DATA

Number 1

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**No.2 Combination Boiler**	Date:	**29 Jun 2005**
Calibration:	**1**		

Time	SO2	
	mv	ppm
16:31	965	91
16:32	857	80
16:33	797	74
16:34	782	73
16:35	557	50
16:36	457	40
16:37	440	39
16:38	466	41
16:39	464	41
16:40	458	40
16:41	446	39
16:42	420	37
16:43	415	36
16:44	440	39
16:45	466	41
Run Avg	**3366**	**330**

RUN DATA

Number 2

Client: **Bowater**
Location: **Catawba, SC**
Source: **No.2 Combination Boiler**
Calibration: **1**

Project Number: **03917.008.004**
Operator: **Billy Routhier**
Date: **29 Jun 2005**

Time	O2		CO2		CO		NOx	
	mv	%	mv	%	mv	ppm	mv	ppm
			Starting time 16:54					
			Low Load					
16:55	6149	15.4	2339	5.8	10000	1021	684	64
16:56	5982	15.0	2499	6.2	10000	1021	747	71
16:57	5824	14.6	2639	6.6	10000	1021	791	75
16:58	5773	14.5	2755	6.9	10000	1021	799	76
16:59	5632	14.1	2810	7.0	10000	1021	842	80
17:00	5399	13.5	2711	6.7	8331	852	912	87
17:01	5464	13.7	2158	5.4	8293	848	932	89
17:02	5412	13.6	2156	5.3	7695	787	965	93
17:03	5348	13.4	2382	5.9	7134	730	965	93
17:04	5260	13.2	2556	6.4	6531	669	960	92
17:05	5287	13.2	2670	6.6	7109	728	931	89
17:06	5178	13.0	2802	7.0	6575	674	951	91
17:07	4993	12.5	3189	7.9	5473	562	959	92
17:08	5000	12.5	3427	8.5	5724	587	941	90
17:09	4816	12.1	3581	8.9	4738	488	972	93
17:10	4702	11.8	3707	9.2	4468	460	990	95
17:11	4632	11.6	3901	9.7	4260	439	988	95
17:12	4730	11.9	3941	9.8	4726	486	966	93
17:13	4720	11.8	3985	9.9	4647	478	966	93
17:14	4714	11.8	4190	10.5	4751	489	982	94
17:15	4647	11.6	4259	10.6	4318	445	1006	97
17:16	4818	12.1	4206	10.5	5149	529	949	91
17:17	5071	12.7	4019	10.0	6475	664	896	86
17:18	5231	13.1	4023	10.0	7534	771	868	83
17:19	5335	13.4	3806	9.5	8067	825	828	79
17:20	5623	14.1	3030	7.5	9991	1020	747	71
17:21	5804	14.5	2602	6.5	10000	1021	696	66
17:22	5945	14.9	2541	6.3	10000	1021	661	62
17:23	6112	15.3	2517	6.3	10000	1021	625	59
17:24	6046	15.2	2721	6.8	10000	1021	656	62
17:25	5962	14.9	2842	7.1	10000	1021	671	63

RUN DATA

Number 2

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**No.2 Combination Boiler**	Date:	**29 Jun 2005**
Calibration:	**1**		

Time	SO2 mv	SO2 ppm
Starting time 16:54		
Low Load		
16:55	271	22
16:56	304	25
16:57	308	25
16:58	321	27
16:59	321	27
17:00	316	26
17:01	303	25
17:02	293	24
17:03	292	24
17:04	287	23
17:05	270	22
17:06	253	20
17:07	249	20
17:08	258	20
17:09	271	22
17:10	267	21
17:11	283	23
17:12	286	23
17:13	277	22
17:14	268	21
17:15	269	22
17:16	264	21
17:17	252	20
17:18	231	18
17:19	214	16
17:20	209	16
17:21	192	14
17:22	177	12
17:23	161	11
17:24	148	10
17:25	142	9

RUN DATA

Number 2

Client: **Bowater**
Location: **Catawba, SC**
Source: **No.2 Combination Boiler**
Calibration: **1**

Project Number: **03917.008.004**
Operator: **Billy Routhier**
Date: **29 Jun 2005**

Time	O2		CO2		CO		NOx	
	mv	%	mv	%	mv	ppm	mv	ppm
17:26	6084	15.2	2663	6.6	10000	1021	648	61
17:27	5802	14.5	2812	7.0	10000	1021	745	71
17:28	5635	14.1	3153	7.9	10000	1021	767	73
17:29	5713	14.3	3178	7.9	10000	1021	730	69
17:30	5807	14.6	2969	7.4	10000	1021	705	67
17:31	5866	14.7	2936	7.3	10000	1021	701	66
17:32	5791	14.5	2820	7.0	10000	1021	725	69
17:33	5824	14.6	2360	5.9	10000	1021	703	66
17:34	5837	14.6	2306	5.7	10000	1021	698	66
17:35	5844	14.6	2081	5.2	9902	1011	694	65
17:36	5795	14.5	1942	4.8	9114	931	714	67
17:37	5707	14.3	2140	5.3	8391	858	737	70
17:38	5636	14.1	2277	5.7	8172	835	767	73
17:39	5497	13.8	2541	6.3	7696	787	819	78
17:40	5514	13.8	2667	6.6	8815	901	806	77
17:41	5646	14.1	2537	6.3	10000	1021	774	73
17:42	5557	13.9	2622	6.5	9984	1019	806	77
17:43	5511	13.8	2240	5.6	9087	928	822	78
17:44	5594	14.0	2269	5.6	9810	1001	811	77
17:45	5485	13.7	2579	6.4	8551	874	835	80
17:46	5331	13.4	2842	7.1	7167	734	875	84
17:47	5139	12.9	3010	7.5	5901	605	921	88
17:48	5169	13.0	3072	7.6	6139	630	909	87
17:49	5312	13.3	3057	7.6	7293	746	878	84
17:50	5503	13.8	2749	6.8	9482	968	814	77
17:51	5818	14.6	1980	4.9	10000	1021	707	67
17:52	5947	14.9	2273	5.6	10000	1021	679	64
17:53	5940	14.9	2566	6.4	10000	1021	679	64
17:54	5797	14.5	2803	7.0	10000	1021	722	68
17:55	5565	13.9	3114	7.8	10000	1021	762	72
17:56	5521	13.8	3122	7.8	9692	990	761	72
17:57	5557	13.9	3134	7.8	9865	1007	753	71
17:58	5539	13.9	3208	8.0	9267	946	760	72

RUN DATA

Number 2

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**No.2 Combination Boiler**	Date:	**29 Jun 2005**
Calibration:	**1**		

Time	SO2 mv	SO2 ppm
17:26	139	9
17:27	139	9
17:28	154	10
17:29	176	12
17:30	179	13
17:31	169	12
17:32	162	11
17:33	164	11
17:34	169	12
17:35	178	12
17:36	186	13
17:37	214	16
17:38	234	18
17:39	246	19
17:40	261	21
17:41	257	20
17:42	248	19
17:43	260	21
17:44	297	24
17:45	316	26
17:46	338	28
17:47	349	30
17:48	355	30
17:49	384	33
17:50	397	34
17:51	361	31
17:52	303	25
17:53	267	21
17:54	265	21
17:55	301	25
17:56	367	31
17:57	398	34
17:58	356	30

RUN DATA

Number 2

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**No.2 Combination Boiler**	Date:	**29 Jun 2005**
Calibration:	**1**		

Time	O2		CO2		CO		NOx	
	mv	%	mv	%	mv	ppm	mv	ppm
17:59	5754	14.4	3045	7.6	10000	1021	689	65
18:00	5900	14.8	2780	6.9	10000	1021	646	61
18:01	6133	15.4	2425	6.0	10000	1021	583	54
18:02	6057	15.2	2594	6.4	10000	1021	595	56
18:03	6079	15.2	2421	6.0	10000	1021	581	54
18:04	6142	15.4	1788	4.4	10000	1021	571	53
Run Avg	**5542**	**13.9**	**2858**	**7.1**	**8519**	**871**	**796**	**76**

RUN DATA

Number 2

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**No.2 Combination Boiler**	Date:	**29 Jun 2005**
Calibration:	**1**		

Time	SO2	
	mv	ppm
17:59	317	26
18:00	288	23
18:01	299	25
18:02	296	24
18:03	281	23
18:04	272	22
Run Avg	**261**	**21**

BIAS

Number 1

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**No.2 Combination Boiler**	Date:	**29 Jun 2005**

Starting Time: 14:44

O2

Method: EPA 3A
Span Conc. 25.0 %

Bias Results

Gas	Cal %	Bias Response mv	Bias Response %	Bias Error
Zero	0.0	94	0.2	0.8%
Span	10.0	3997	10.0	0.0%

CO2

Method: EPA 3A
Span Conc. 25.0 %

Bias Results

Gas	Cal %	Bias Response mv	Bias Response %	Bias Error
Zero	0.0	87	0.2	0.8%
Span	10.3	4081	10.2	-0.4%

NOx

Method: EPA 7E
Span Conc. 1000 ppm

Bias Results

Gas	Cal ppm	Bias Response mv	Bias Response ppm	Bias Error
Zero	-3	36	0	0.3%
Span	453	4426	439	-1.4%

BIAS

Number 1

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**No.2 Combination Boiler**	Date:	**29 Jun 2005**

Starting Time: 14:44

SO2
Method: EPA 6C
Span Conc. 1000 ppm

Bias Results

Gas	Cal ppm	Bias Response mv	Bias Response ppm	Bias Error
Zero	1	118	6	0.5%
Span	447	4425	436	-1.1%

BIAS AND CALIBRATION DRIFT

Number 2

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**No.2 Combination Boiler**	Date:	**29 Jun 2005**

Starting Time: 16:46

O2

Method: EPA 3A

Span Conc. 25.0 %

Bias Results

Gas	Cal %	Bias Response mv	Bias Response %	Bias Error
Zero	0.0	91	0.2	0.8%
Span	10.0	3982	10.0	0.0%

Calibration Drift

Gas	Initial* %	Initial* mv	Final %	Drift
Zero	0.2	91	0.2	0.0%
Span	10.0	3982	10.0	0.0%

*Bias No. 1

CO2

Method: EPA 3A

Span Conc. 25.0 %

Bias Results

Gas	Cal %	Bias Response mv	Bias Response %	Bias Error
Zero	0.1	125	0.2	0.4%
Span	10.1	4079	10.2	0.4%

Calibration Drift

Gas	Initial* %	Initial* mv	Final %	Drift
Zero	0.2	125	0.2	0.0%
Span	10.2	4079	10.2	0.0%

*Bias No. 1

BIAS AND CALIBRATION DRIFT

Number 2

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**No.2 Combination Boiler**	Date:	**29 Jun 2005**

Starting Time: 16:46

CO

Method: EPA 10

Span Conc. 1000 ppm

Calibration Drift

	Initial*		Final	
Gas	**ppm**	**mv**	**ppm**	**Drift**
Zero	2	-55	2	0.0%
Span	898	8654	884	-1.4%

*Cal No. 1

NOx

Method: EPA 7E

Span Conc. 1000 ppm

Bias Results

	Cal	Bias Response		Bias
Gas	**ppm**	**mv**	**ppm**	**Error**
Zero	-3	6	-3	0.0%
Span	453	4474	443	-1.0%

Calibration Drift

	Initial*		Final	
Gas	**ppm**	**mv**	**ppm**	**Drift**
Zero	0	6	-3	-0.3%
Span	439	4474	443	0.4%

*Bias No. 1

WESTON SOLUTIONS

BIAS AND CALIBRATION DRIFT

Number 2

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**No.2 Combination Boiler**	Date:	**29 Jun 2005**

Starting Time: 16:46

SO2
Method: EPA 6C
Span Conc. 1000 ppm

Bias Results

Gas	Cal ppm	Bias Response mv	Bias Response ppm	Bias Error
Zero	1	127	7	0.6%
Span	447	4416	435	-1.2%

Calibration Drift

Gas	Initial* ppm	Final mv	Final ppm	Drift
Zero	6	127	7	0.1%
Span	436	4416	435	-0.1%

*Bias No. 1

BIAS AND CALIBRATION DRIFT

Number 3

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**No.2 Combination Boiler**	Date:	**29 Jun 2005**

Starting Time: 18:05

O2
Method: EPA 3A
Span Conc. 25.0 %

Bias Results

Gas	Cal %	Bias Response mv	Bias Response %	Bias Error
Zero	0.0	85	0.2	0.8%
Span	10.0	4028	10.1	0.4%

Calibration Drift

Gas	Initial* %	Initial* mv	Final %	Drift
Zero	0.2	85	0.2	0.0%
Span	10.0	4028	10.1	0.4%

*Bias No. 2

CO2
Method: EPA 3A
Span Conc. 25.0 %

Bias Results

Gas	Cal %	Bias Response mv	Bias Response %	Bias Error
Zero	0.1	148	0.3	0.8%
Span	10.1	4148	10.4	1.2%

Calibration Drift

Gas	Initial* %	Initial* mv	Final %	Drift
Zero	0.2	148	0.3	0.4%
Span	10.2	4148	10.4	0.8%

*Bias No. 2

BIAS AND CALIBRATION DRIFT

Number 3

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**No.2 Combination Boiler**	Date:	**29 Jun 2005**

Starting Time: 18:05

CO

Method: EPA 10

Span Conc. 1000 ppm

Calibration Drift

	Initial*		Final	
Gas	**ppm**	**mv**	**ppm**	**Drift**
Zero	2	-68	1	-0.1%
Span	898	8662	885	-1.3%

*Cal No. 1

NOx

Method: EPA 7E

Span Conc. 1000 ppm

Bias Results

	Cal	Bias Response		Bias
Gas	**ppm**	**mv**	**ppm**	**Error**
Zero	-3	5	-3	0.0%
Span	453	4462	442	-1.1%

Calibration Drift

	Initial*		Final	
Gas	**ppm**	**mv**	**ppm**	**Drift**
Zero	-3	5	-3	0.0%
Span	443	4462	442	-0.1%

*Bias No. 2

BIAS AND CALIBRATION DRIFT

Number 3

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**No.2 Combination Boiler**	Date:	**29 Jun 2005**

Starting Time: 18:05

SO2
Method: EPA 6C
Span Conc. 1000 ppm

Bias Results

Gas	Cal ppm	Bias Response mv	Bias Response ppm	Bias Error
Zero	1	42	-1	-0.2%
Span	447	4383	431	-1.6%

Calibration Drift

Gas	Initial* ppm	Final mv	Final ppm	Drift
Zero	7	42	-1	-0.8%
Span	435	4383	431	-0.4%

*Bias No. 2

CALIBRATION

Number 1

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**No.2 Combination Boiler**	Date:	**29 Jun 2005**

Starting Time: 14:36

O2

Method: EPA 3A

Calibration Type: Linear Regression

Calibration Results

%	Cylinder ID	Result, mv
Zero	-	24
10.1	XC024011B	3994
20.0	CC63371	7998

Curve Coefficients

Slope	Intercept	Corr. Coeff.
398.7	5.4	>0.9999

CO2

Method: EPA 3A

Calibration Type: Linear Regression

Calibration Results

%	Cylinder ID	Result, mv
Zero	-	51
10.2	XC024011B	4036
19.6	CC63371	7857

Curve Coefficients

Slope	Intercept	Corr. Coeff.
398.1	26.8	0.9999

CALIBRATION

Number 1

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**No.2 Combination Boiler**	Date:	**29 Jun 2005**

Starting Time: 14:36

CO

Method: EPA 10

Calibration Type: Linear Regression

Calibration Results

ppm	Cylinder ID	Result, mv
Zero	-	-51
296	SG861407NB	2815
600	CC163325	5845
897	SG9137899	8791

Curve Coefficients

Slope	Intercept	Corr. Coeff.
9.869	-73.8	>0.9999

NOx

Method: EPA 7E

Calibration Type: Linear Regression

Calibration Results

ppm	Cylinder ID	Result, mv
Zero	-	4
446	CC102672	4569
901	CC73520	9016

Curve Coefficients

Slope	Intercept	Corr. Coeff.
10.001	39.3	0.9999

CALIBRATION

Number 1

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**No.2 Combination Boiler**	Date:	**29 Jun 2005**

Starting Time: 14:36

SO2

Method: EPA 6C

Calibration Type: Linear Regression

Calibration Results

ppm	Cylinder ID	Result, mv
Zero	-	65
450	CC12947	4544
904	SG9168910	9139

Curve Coefficients

Slope	Intercept	Corr. Coeff.
10.037	52.6	>0.9999

CALIBRATION ERROR

Number 1

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**No.2 Combination Boiler**	Date:	**29 Jun 2005**

Starting Time: 14:36

O2

Method: EPA 3A

Slope 398.7 **Intercept** 5.4

Standard, %	Response, mV	%	Error, %
Zero	24	0.0	0.0
10.10	3994	10.0	-0.4
20.0	7998	20.0	0.0

CO2

Method: EPA 3A

Slope 398.1 **Intercept** 26.8

Standard, %	Response, mV	%	Error, %
Zero	51	0.1	0.4
10.20	4036	10.1	-0.4
19.6	7857	19.7	0.4

CO

Method: EPA 10

Slope 9.869 **Intercept** -73.8

Standard, ppm	Response, mV	ppm	Error, %
Zero	-51	2	0.2
296	2815	293	-0.3
600	5845	600	0.0
897	8791	898	0.1

CALIBRATION ERROR

Number 1

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**No.2 Combination Boiler**	Date:	**29 Jun 2005**

Starting Time: 14:36

NOx

Method: EPA 7E

Slope 10.001 **Intercept** 39.3

Standard, ppm	Response, mV	ppm	Error, %
Zero	4	-3	-0.3
446	4569	453	0.7
901	9016	898	-0.3

SO2

Method: EPA 6C

Slope 10.037 **Intercept** 52.6

Standard, ppm	Response, mV	ppm	Error, %
Zero	65	1	0.1
450	4544	447	-0.3
904	9139	905	0.1

ANALYZER INFORMATION

Client:	**Bowater**	Project Number:	**03917.008.004**
Location:	**Catawba, SC**	Operator:	**Billy Routhier**
Source:	**No.2 Combination Boiler**	Date:	**29 Jun 2005**

File Name: C:\Data\Bowater- Catawba, SC\june 2005\No2 Comb boiler.cem
Computer: WSAUB60 **Trailer:** 261

Analog Input Device: **Keithley KPCMCIA 16AI Card**

Channel 1

Analyte	**O2**
Method	**EPA 3A**, Using Bias
Analyzer Make & Model	**CA 300**
Full-Scale Output, mv	**10000**
Span Concentration, %	**25.0**

Channel 2

Analyte	**CO2**
Method	**EPA 3A**, Using Bias
Analyzer Make & Model	**CA 300**
Full-Scale Output, mv	**10000**
Span Concentration, %	**25.0**

Channel 3

Analyte	**CO**
Method	**EPA 10**, Not Using Bias
Analyzer Make & Model	**CAI Model 300**
Full-Scale Output, mv	**10000**
Span Concentration, ppm	**1000**

Channel 4

Analyte	**NOx**
Method	**EPA 7E**, Using Bias
Analyzer Make & Model	**CA-400-CLD**
Full-Scale Output, mv	**10000**
Span Concentration, ppm	**1000**

Channel 5

Analyte	**SO2**
Method	**EPA 6C**, Using Bias
Analyzer Make & Model	**Bovar 721-M**
Full-Scale Output, mv	**10000**
Span Concentration, ppm	**1000**

APPENDIX C
PROCESS OPERATING/PRODUCTION DATA