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REPORT ON COMPLIANCE TESTING

Performed for:
WHEELABRATOR NORTH BROWARD, INC.
ASH HANDLING SYSTEM, LIME SILO VENT,
UNITS 1, 2 AND 3 SDA INLETS, FF OUTLETS AND STACKS
POMPANO BEACH, FL
VOLUME I OF III

Client Reference No: Service Agreement
CleanAir Project No: 12218-1
Revision 0: April 30, 2013

To the best of our knowledge, the data presented in this report are accurate, complete, error free, legible and representative of the actual emissions during the test program. Clean Air Engineering operates in conformance with the requirements of ASTM D7036-04 Standard Practice for Competence of Air Emission Testing Bodies.

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REVISION HISTORY

REPORT ON COMPLIANCE TESTING

DRAFT REPORT REVISION HISTORY

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D0a	04/22/13	All	Draft version of original document.

FINAL REPORT REVISION HISTORY

Revision:	Date	Pages	Comments
0	04/30/13	All	Final version of original document.

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VOLUME I

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PROJECT OVERVIEW

INTRODUCTION

Wheelabrator North Broward, Inc. operates a Refuse-to-Energy facility, located in Pompano Beach, Florida. The facility's emission levels are regulated by the Florida Department of Environmental Protection (DEP). Wheelabrator North Broward, Inc. contracted Clean Air Engineering (CleanAir) to perform a compliance test program.

The Lime Silo Fabric Filter (FF) Vent was observed for visual emissions (VEs) and the Ash Handling System was observed for fugitive emissions. The VEs were determined by the facility's continuous opacity monitor system (COMS) data, as provided under 40 CFR 60.11(e)(5). Testing was conducted in accordance with the Wheelabrator North and South Broward Protocol on Compliance, dated February 3, 2012, 40 CFR 60, Subpart Cb, and applicable sections of the facility's Title V Permit No. 0112120-010-AV.

All testing was conducted in accordance with the regulations set-forth by the United States Environmental Protection Agency (EPA) and the DEP.

Key Project Participants

Individuals responsible for coordinating and conducting the test program were:

C. Faller – Wheelabrator North Broward, Inc.
S. Brown – CleanAir

Various individuals from the DEP were present for portions of the test program.

The CleanAir test crew consisted of the following individuals:

H. Nguyen
D. Luckhard
P. Bihun
A. Obuchowski
W. Berry
S. Joint

The names of the laboratory employees that performed each specific analysis, along with the respective laboratory reports, are presented in Appendix I of this report.

Test Program Parameters

The sampling was conducted at the Units 1, 2 and 3 Spray Dryer Absorption (SDA) Inlet, FF Outlets, Ash Handling System and Lime Silo Vent from March 19 through 21, 2013, and included the following emissions measurements:

- filterable particulate matter (FPM)
- polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDD/F); Unit 2 only
- hydrogen chloride (HCl)
- mercury (Hg)
- cadmium (Cd)
- lead (Pb)
- flue gas composition (e.g., O_2, CO_2, H_2O)
- flue gas flow rate
- flue gas temperature
- fugitive emissions
- visible emissions (VEs)

TEST PROGRAM SYNOPSIS

Test Schedule

The on-site schedule followed during the test program is outlined in Table 1-1.

Table 1-1:
Schedule of Activities

Run Number	Location	Method	Analyte	Date	Start Time	End Time
1	Unit 2 FF Outlet	USEPA Method 5/29	Particulate/Metals	03/19/13	07:54	10:07
1	Unit 1 SDA Inlet / FF Outlet	USEPA Method 26A	HCl	03/19/13	08:15	09:15
2	Unit 1 SDA Inlet / FF Outlet	USEPA Method 26A	HCl	03/19/13	09:48	10:48
1	Unit 2 FF Outlet	USEPA Method 23	PCDD/PCDF	03/19/13	10:16	14:38
2	Unit 2 FF Outlet	USEPA Method 5/29	Particulate/Metals	03/19/13	10:35	12:48
3	Unit 1 SDA Inlet / FF Outlet	USEPA Method 26A	HCl	03/19/13	11:19	12:19
1	Unit 1 FF Outlet	USEPA Method 5/29	Particulate/Metals	03/19/13	12:58	15:14
3	Unit 2 FF Outlet	USEPA Method 5/29	Particulate/Metals	03/19/13	13:25	15:37
2	Unit 2 FF Outlet	USEPA Method 23	PCDD/PCDF	03/20/13	07:40	11:59
2	Unit 1 FF Outlet	USEPA Method 5/29	Particulate/Metals	03/20/13	07:43	09:55
1	Unit 3 SDA Inlet / FF Outlet	USEPA Method 26A	HCl	03/20/13	08:13	09:13
NA	Lime Silo	USEPA Method 9	Visible Emission	03/20/13	09:23	11:23
2	Unit 3 SDA Inlet / FF Outlet	USEPA Method 26A	HCl	03/20/13	09:39	10:39
3	Unit 1 FF Outlet	USEPA Method 5/29	Particulate/Metals	03/20/13	10:17	12:28
3	Unit 3 SDA Inlet / FF Outlet	USEPA Method 26A	HCl	03/20/13	11:00	12:00
3	Unit 2 FF Outlet	USEPA Method 23	PCDD/PCDF	03/20/13	12:21	16:40
1	Unit 3 FF Outlet	USEPA Method 5/29	Particulate/Metals	03/20/13	12:35	14:50
4	Unit 1 FF Outlet	USEPA Method 29	Mercury	03/20/13	12:52	15:03
2	Unit 3 FF Outlet	USEPA Method 5/29	Particulate/Metals	03/21/13	07:42	09:54
1	Unit 3 SDA Inlet / FF Outlet	USEPA Method 26A	HCl	03/21/13	07:54	08:54
NA	Ash Handling System	USEPA Method 22	Fugitive Emissions	03/21/13	09:08	12:50
2	Unit 3 SDA Inlet / FF Outlet	USEPA Method 26A	HCl	03/21/13	09:15	10:15
3	Unit 3 FF Outlet	USEPA Method 5/29	Particulate/Metals	03/21/13	10:15	12:27
3	Unit 3 SDA Inlet / FF Outlet	USEPA Method 26A	HCl	03/21/13	10:35	11:35
4	Unit 2 FF Outlet	USEPA Method 29	Mercury	03/21/13	12:05	14:26
4	Unit 3 FF Outlet	USEPA Method 29	Mercury	03/21/13	12:41	14:52

Results Summary

Table 1-2 summarizes the results of the test program. A more detailed presentation of the test conditions and results of analysis are shown on pages 2-1 through 2-19.

Table 1-2:
Summary of Test Results

Source	Average Unit 1	Average Unit 2	Average Unit 3	Permit Limit[1]
Constituent				
Particulate (mg/dscm @7% O_2)	0.73	1.5	0.81	25 (27)
Visual Emissions (%, by COMS)[2]	1	1	1	10
Total PCCD/PCDF (ng/dscm @ 7% O_2)	NA	5.8	NA	30
Hydrogen Chloride (ppmdv @ 7% O_2) or	3.2	1.1	5.5	29
Hydrogen Chloride Removal (%)[3]	99.4%	99.8%	98.9%	>95
Cadmium (mg/dscm @ 7% O_2)	<0.00012	0.00063	<0.00012	0.035 (0.040)
Lead (mg/dscm @ 7% O_2)	<0.00011	0.0049	<0.00012	0.40 (0.44)
Mercury (µg/dscm @ 7% O_2)	1.4	3.6	4.0	50 (70)
Average Steam Flow (Klbs/hr)[4]	184.0	183.9	183.9	186
Average FF Inlet Temperature (^{o}F)[4]	320	320	320	NA

[1] Limits obtained from facilities Title V Permit 0112120-010-AV. If a second limit is shown that limit is being implemented by the EPA as of April 28, 2009. Respective PSD limits are presented in parenthesis.
[2] Visual Emissions (opacity) was obtained from the facilities COMS data as allowed under 40CFR60.11(e)(5).
[3] Removal for hydrogen chloride calculated in the unit of its standard. The hydrogen chloride limit is 29 ppmdv @ 7% O2 or 85% removal, whichever is less stringent.
[4] From all compliance test runs.

A more detailed presentation of the test conditions and results of analysis are shown in Tables 2-1 through 2-20 on pages 2-1 through 2-19. Subpart Cb required operating data is summarized in Table 1-3. Opacity and fugitive emission results are presented in Table 1-4 and both tables are on page 1-5.

Table 1-3:
Subpart Cb - Required Operating Data

Process Condition	
Unit 1 Maximum Demonstrated Combustor Load (Klbs/hr)[1]	184.0 [2]
Unit 2 Maximum Demonstrated Combustor Load (Klbs/hr)[1]	184.2
Unit 3 Maximum Demonstrated Combustor Load (Klbs/hr)[1]	184.2 [3]
Unit 1 Maximum Particulate Control Device Inlet Temperature (°F)[4]	321 [2]
Unit 2 Maximum Particulate Control Device Inlet Temperature (°F)[4]	320
Unit 3 Maximum Particulate Control Device Inlet Temperature (°F)[4]	320 [3]

[1] From 40CFR60.58b (i) (8) the maximum demonstrated load during PCDD/PCDF testing, four hour average.

[2] From CleanAir Cb test report dated May 9, 2012 (Project 11414).

[3] From CleanAir Cb test report dated May 4, 2011 (Project 11182).

[4] From 40CFR60.58b (i) (9) the highest four hour average during PCDD/PCDF testing.

Table 1-4:
Opacity and Fugitive Emission Results

Source / Constituent	Sampling Method	Results	Permit Limit[1]
Ash Handling System[2]			
Fugitive Emissions (% of obseravtion time)	EPA M22	0	5%
Fugitive Emissions (minutes)		0	9 minutes
Lime Silo[3]			
Visual Emisssions (%)	EPA M9	0	5%

[1] Limits obtained from 40 Code of Federal Register part 60 Subpart Cb - Emission Guidelines and Compliance Times for Large Municipal Waste Combustors That Are Constructed on or Before September 20, 1994 published in Federal Register as 62 FR 45123 on December 19, 1995 as modifed on August 25, 1997, Florida's Rule 62-296.416, F.A.C. and PSD-FL-105.

[2] The Ash Handling System was observed at various locations for a total of 3 hours.

[3] The Lime Silo was observed for one complete truck unloading.

Discussion of Test Program

All test methods were done in triplicate with the exception of mercury, which had a fourth run performed on each unit. All data that is reported in the units of lb/MMBTU utilized the Fd of 9,570, as per EPA Method 19.

All equipment utilized for compliance testing was manufactured by CleanAir, except for the Servomex O_2/CO_2 analyzer utilized for all of the integrated gas sample (IGS) bag analyses.

During the compliance testing, all three (3) boilers were operated within 10% of the 186,000 lb/hr maximum steam flow rating. The boilers and air pollution control equipment are in a well-maintained operating condition. Normal operating parameters for the fabric filters are a pressure drop of 2 to 7 inches of water and scrubber dilution water flow varies from 0 to 40 gallons per minute (gpm). The equipment operated within these ranges during compliance testing. The results tables present each boiler's steam output for every test run.

Andy Obuchowski performed the fugitive emission readings, per EPA Method 22, on the Ash Handling System, and Dan Luckhard performed the VE readings, per EPA Method 9, on the Lime Silo during one (1) entire truck unloading. Mr. Luckhard's VE evaluation certificate is presented in Appendix J of this report.

Any fractions of the mercury analysis that were reported as not detected were summed as zero if there was at least one (1) fraction detected in that run. The cadmium and lead front- and back-half fractions were combined proportionately for analysis, per EPA Method 29, Section 5.4.

Field blanks were collected for the Methods 23 and 29 testing by assembling a used set of glassware, taking the complete train to the outlet location and performing a leak-check. These samples were treated exactly as the other samples. The results for the method and field blanks are presented in Table 2-18 on page 2-17, as well as Appendix I of this report. The results of the Method 29 reagent blank analysis were used to correct any data, as outlined in Method 29.

All Method 23 samples were analyzed with the DB-5S column with modified calibration and additional quality assurance procedures as a direct substitute for the DB-5 and DB-225 columns. Confirmation of the 2,3,7,8 TCDF and TCDD 2,3,7,8 isomers was performed on the DB-5S column. The DB-5S column and modified calibration procedures meet the column separation requirement and can be used as a direct substitute for the DB-5 and DB-225 columns, in accordance with Method 23 as approved by the EPA. All QA/QC data (spikes and recoveries) for Method 23 are presented in Appendix I.

The Method 23 results for Runs 2 and 3 contained at least one (1) estimated maximum possible concentration (EMPC) value. EMPC results do not meet all the identification criteria required by Method 23 to be positively identified as a dioxin or furan. Specifically, the integrated ion abundance ratios were not within 15% of the theoretical value limits specified in Method 23, Section 5.3.2.5, Table 4. The laboratory reports EMPC results as zero and, for this reason, all EMPC results are enclosed in brackets and are considered zero when calculating total dioxin/furans.

Methylene chloride was omitted in the Method 23 sample recovery, per approved Alternative Test Method 052 (ALT-052).

Chuck Faller of Wheelabrator provided the process (operating) data. This data is presented in its entirety in Appendix D of this report. All process data and CleanAir run times are based on Bailey Computer Time which is the same as Eastern Standard Time (EST). The Lime Silo initial and final truck weights were recorded using EST.

IGS's were collected in a vinyl sample bag from every sample train. The contents of the bag were then analyzed for oxygen (O_2) and carbon dioxide (CO_2) concentrations, using an O_2/CO_2 continuous monitoring analyzer calibrated with EPA Protocol gases. A linearity and bias check was performed on the analyzers before each set of bags was analyzed, and then a post bias check was performed after each set of bags was analyzed. All data was recorded using CleanAir's data acquisition system. The results of the IGS bag analyses are presented in Appendix H of this report.

One (1) eight-hour greenhouse gas (GHG) sample was collected in accordance with ASTM Method D7459-08 and analyzed by Beta Analytic, Inc. in Miami, Florida, in accordance with ASTM D6866-08. The ASTM D6866-08 sample bag was obtained from the Method 23 Unit 2, Runs 2 and 3 (four hours per run). The results of analysis are presented in Appendix A of this report.

The eight-hour samples were collected within 10% of the initial sample rate from the isokinetic sample train's IGS. The IGS bags were leak-checked prior to use, and all collected within 10% of the initial sample rate using the orifice off of the dry gas meter in conjunction with a rotometer. The IGS bag contents were then combined proportionally into a 3L Tedlar® bag. Both four-hour samples met the two (2) times relative standard deviation (2RSD) criteria by stack flow rate (<30%).

The Ash Handling System fugitive emission readings were made for 90 minutes at three (3) locations. Since for a majority of the time all the doors associated with the ash handling system are closed, notations were made on the data sheets to record the length of time that the doors were open. During the entire 3-hour (180 minutes) observation period there were open doors, which would allow fugitive emission to occur, for 21 minutes.

Test Method Modifications

Metals and particulate matter sampling were combined during this test program, per the Method 29, Section 1.2 principle, "This method may be used to determine particulate emissions in addition to the metals emissions if the prescribed procedures and precautions are followed.".

Sixty-minute Method 26A sample trains at the SDA Inlets and FF Outlets were utilized to exhibit compliance with each unit's HCl limit(s). Method 26A was modified to a single-point constant sampling rate at all test locations. In an effort to reduce the size of the report, the chloride chromatograms are not included in this report but are available upon request.

End of Section 1 – Project Overview

RESULTS

Table 2-1:
Unit 1 FF Outlet – Particulate and Metals

Run No.		1	2	3	Average
Date (2013)		Mar 19	Mar 20	Mar 20	
Start Time (approx.)		12:58	07:43	10:17	
Stop Time (approx.)		15:14	09:55	12:28	
Process Conditions					
R_P	Steam Production Rate - (Klbs/hr)	184.0	183.7	183.7	**183.8**
P_1	Fabric Filter Inlet Temperature - (°F)	320	319	320	**320**
Gas Conditions					
O_2	Oxygen (dry volume %)	8.7	9.3	9.3	**9.1**
CO_2	Carbon dioxide (dry volume %)	10.7	10.0	9.6	**10.1**
T_s	Sample temperature (°F)	304	305	305	**305**
B_w	Actual water vapor in gas (% by volume)	22.2	22.5	21.6	**22.1**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	176,000	184,000	186,000	**182,000**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	92,100	95,700	97,400	**95,100**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	75.00	80.15	79.72	**78.29**
%I	Isokinetic sampling (%)	100.4	103.3	100.9	**101.5**
Particulate Laboratory Data					
m_{filter}	Matter collected on filter(s) (g)	0.00020	0.00030	0.00010	
m_s	Matter collected in solvent rinse(s) (g)	0.00085	0.00109	0.00157	
m_n	Total FPM (g)	0.00105	0.00139	0.00167	
FPM Results					
C_{sd}	Particulate Concentration (mg/dscm)	0.49	0.61	0.74	**0.62**
C_{sd7}	Particulate Concentration @7% O_2 (mg/dscm)	0.56	0.73	0.89	**0.73**
$E_{lb/hr}$	Particulate Rate (lb/hr)	0.17	0.22	0.27	**0.22**
E_{Fd}	Particulate Rate - F_d-based (lb/MMBtu)	0.00050	0.00066	0.00080	**0.00065**
Cadmium Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	<0.2000	0.2790	<0.2000	
Cadmium Results - Total					
C_{sd}	Concentration (mg/dscm)	<0.000094	0.00012	<0.000089	**<0.00010**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<0.00011	0.00015	<0.00011	**<0.00012**
$E_{lb/hr}$	Rate (lb/hr)	<3.3E-05	4.4E-05	<3.2E-05	**<3.6E-05**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	<9.6E-08	1.3E-07	<9.6E-08	**<1.1E-07**
Lead Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	0.2173	<0.2000	<0.2000	
Lead Results - Total					
C_{sd}	Concentration (mg/dscm)	0.00010	<0.000088	<0.000089	**<0.000093**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	0.00012	<0.00011	<0.00011	**<0.00011**
$E_{lb/hr}$	Rate (lb/hr)	3.5E-05	<3.2E-05	<3.2E-05	**<3.3E-05**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	1.0E-07	<9.5E-08	<9.6E-08	**<9.8E-08**

RESULTS

Table 2-2:
Unit 1 FF Outlet – Mercury

Run No.		1	2	3	4	Average
Date (2013)		Mar 19	Mar 20	Mar 20	Mar 20	
Start Time (approx.)		12:58	07:43	10:17	12:52	
Stop Time (approx.)		15:14	09:55	12:28	15:03	
Process Conditions						
R_P	Steam Production Rate - (Klbs/hour)	184.0	183.7	183.7	184.0	**183.9**
P_1	Fabric Filter Inlet Temperature - (°F)	320	319	320	320	**320**
Gas Conditions						
O_2	Oxygen (dry volume %)	8.7	9.3	9.3	9.2	**9.1**
CO_2	Carbon dioxide (dry volume %)	10.7	10.0	9.6	9.8	**10.0**
T_s	Sample temperature (°F)	304	305	305	305	**305**
B_w	Actual water vapor in gas (% by volume)	22.2	22.5	21.6	21.8	**22.0**
Gas Flow Rate						
Q_a	Volumetric flow rate, actual (acfm)	176,000	184,000	186,000	189,000	**184,000**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	92,100	95,700	97,400	98,800	**96,000**
Sampling Data						
V_{mstd}	Volume metered, standard (dscf)	75.00	80.15	79.72	81.04	**78.98**
%I	Isokinetic sampling (%)	100.4	103.3	100.9	101.2	**101.4**
Laboratory Data						
$m_{n\text{-}1b}$	Fraction 1B (µg)	<0.1000	<0.1000	<0.1000	<0.1000	
$m_{n\text{-}2b}$	Fraction 2B (µg)	3.0256	2.7628	2.5297	2.2635	
$m_{n\text{-}3a}$	Fraction 3A (µg)	<0.2000	<0.2000	<0.2000	<0.2000	
$m_{n\text{-}3b}$	Fraction 3B (µg)	<0.5000	<0.5000	<0.5000	<0.5000	
$m_{n\text{-}3c}$	Fraction 3C µg)	<0.4000	<0.4000	<0.4000	<0.4000	
m_n	Total matter corrected for allowable blanks (µg)	3.0256	2.7628	2.5297	2.2635	
Mercury Results - Total						
C_{sd}	Concentration (µg/dscm)	1.4	1.2	1.1	0.99	**1.2**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	1.6	1.5	1.3	1.2	**1.4**
$E_{lb/hr}$	Rate (lb/hr)	4.9E-04	4.4E-04	4.1E-04	3.6E-04	**4.3E-04**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	1.5E-06	1.3E-06	1.2E-06	1.1E-06	**1.3E-06**

RESULTS

Table 2-3:
Unit 1 FF Outlet and SDA Inlet – Hydrogen Chloride

Run No.		1	2	3	Average
Date (2013)		Mar 19	Mar 19	Mar 19	
Start Time (approx.)		08:15	09:48	11:19	
Stop Time (approx.)		09:15	10:48	12:19	
Process Conditions					
R_P	Steam Production Rate - (Klbs/hour)	184.5	183.7	184.2	**184.1**
P_1	Fabric Filter Inlet Temperature - (°F)	319	320	320	**320**
SDA Inlet Gas Conditions					
O_2	Oxygen (dry volume %)	7.9	8.2	7.9	**8.0**
CO_2	Carbon dioxide (dry volume %)	11.2	11.1	11.5	**11.2**
T_s	Sample temperature (°F)	471	480	482	**478**
B_w	Actual water vapor in gas (% by volume)	18.4	18.7	18.4	**18.5**
SDA Inlet Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	33.42	33.41	33.30	**33.38**
SDA Inlet Laboratory Data					
m_n	Total HCl collected (mg)	847.826	768.147	588.441	
SDA Inlet Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (ppmdv)	591	536	412	**513**
C_{sd7}	HCl Concentration @7% O_2 (ppmdv)	630	588	442	**553**
C_{sd}	HCl Concentration (mg/dscm)	896	812	624	**777**
C_{sd7}	HCl Concentration @7% O_2 (mg/dscm)	955	890	669	**838**
E_{Fd}	HCl Rate - Fd-based (lb/MMBtu)	0.86	0.80	0.60	**0.75**
FF Outlet Gas Conditions					
O_2	Oxygen (dry volume %)	8.5	8.8	9.1	**8.8**
CO_2	Carbon dioxide (dry volume %)	10.6	10.5	10.3	**10.5**
T_s	Sample temperature (°F)	301	302	302	**302**
B_w	Actual water vapor in gas (% by volume)	22.0	21.9	21.7	**21.9**
FF Outlet Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	39.51	39.72	39.55	**39.59**
FF Outlet Laboratory Data					
m_n	Total HCl collected (mg)	5.142	4.857	4.003	
FF Outlet Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (ppmdv)	3.0	2.9	2.4	**2.7**
C_{sd7}	HCl Concentration @7% O_2 (ppmdv)	3.4	3.3	2.8	**3.2**
C_{sd}	HCl Concentration (mg/dscm)	4.6	4.3	3.6	**4.2**
C_{sd7}	HCl Concentration @7% O_2 (mg/dscm)	5.2	5.0	4.2	**4.8**
E_{Fd}	HCl Rate - Fd-based (lb/MMBtu)	0.0046	0.0045	0.0038	**0.0043**
RE	Reduction Efficiency (% Removal)	99.5%	99.4%	99.4%	**99.4%**

RESULTS

Table 2-4:
Unit 2 FF Outlet – Particulate and Metals

Run No.		1	2	3	Average
Date (2013)		Mar 19	Mar 19	Mar 19	
Start Time (approx.)		07:54	10:35	13:25	
Stop Time (approx.)		10:07	12:48	15:37	
Process Conditions					
R_P	Steam Production Rate - (Klbs/hr)	184.2	183.6	183.7	**183.8**
P_1	Fabric Filter Inlet Temperature - (°F)	320	320	320	**320**
Gas Conditions					
O_2	Oxygen (dry volume %)	7.2	7.3	7.3	**7.3**
CO_2	Carbon dioxide (dry volume %)	11.7	11.7	11.8	**11.8**
T_s	Sample temperature (°F)	306	305	306	**306**
B_w	Actual water vapor in gas (% by volume)	23.7	23.2	23.5	**23.5**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	158,000	152,000	153,000	**154,000**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	80,900	78,400	78,500	**79,300**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	64.61	61.07	61.77	**62.49**
%I	Isokinetic sampling (%)	101.0	98.5	99.6	**99.7**
Particulate Laboratory Data					
m_{filter}	Matter collected on filter(s) (g)	0.00120	0.00100	0.00110	
m_s	Matter collected in solvent rinse(s) (g)	0.00190	0.00041	0.00207	
m_n	Total FPM (g)	0.00310	0.00141	0.00317	
FPM Results					
C_{sd}	Particulate Concentration (mg/dscm)	1.7	0.82	1.8	**1.4**
C_{sd7}	Particulate Concentration @7% O_2 (mg/dscm)	1.7	0.83	1.9	**1.5**
$E_{lb/hr}$	Particulate Rate (lb/hr)	0.51	0.24	0.53	**0.43**
E_{Fd}	Particulate Rate - F_d-based (lb/MMBtu)	0.0015	0.00075	0.0017	**0.0013**
Cadmium Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	1.1982	1.1173	0.9498	
Cadmium Results - Total					
C_{sd}	Concentration (mg/dscm)	0.00065	0.00065	0.00054	**0.00061**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	0.00066	0.00066	0.00056	**0.00063**
$E_{lb/hr}$	Rate (lb/hr)	2.0E-04	1.9E-04	1.6E-04	**1.8E-04**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	6.0E-07	5.9E-07	5.0E-07	**5.6E-07**
Lead Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	7.9262	10.2772	7.1546	
Lead Results - Total					
C_{sd}	Concentration (mg/dscm)	0.0043	0.0059	0.0041	**0.0048**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	0.0044	0.0061	0.0042	**0.0049**
$E_{lb/hr}$	Rate (lb/hr)	1.3E-03	1.7E-03	1.2E-03	**1.4E-03**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	3.9E-06	5.4E-06	3.8E-06	**4.4E-06**

RESULTS

Table 2-5:
Unit 2 FF Outlet – PCDD/PCDF

Run No.		1	2	3	Average
Date (2013)		Mar 19	Mar 20	Mar 20	
Start Time (approx.)		10:16	07:40	12:21	
Stop Time (approx.)		14:38	11:59	16:40	
Process Conditions					
R_P	Steam Production Rate - (Klbs/hour)	184.0	184.2	183.7	**183.9**
P_1	Fabric Filter Inlet Temperature - (°F)	320	320	320	**320**
Gas Conditions					
O_2	Oxygen (dry volume %)	7.2	8.0	8.0	**7.7**
CO_2	Carbon dioxide (dry volume %)	11.9	11.2	10.9	**11.3**
T_s	Sample temperature (°F)	304	304	305	**304**
B_w	Actual water vapor in gas (% by volume)	23.6	23.9	23.3	**23.6**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	152,000	164,000	166,000	**161,000**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	78,100	84,100	85,600	**82,600**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	123.4	134.2	135.9	**131.2**
%I	Isokinetic sampling (%)	100.2	101.1	100.7	**100.7**
Results (ND and EMPC = 0)					
Laboratory Data from USEPA Method 23 (PCDD/PCDF)					
m_n	Total PCDDs & PCDFs (ng)	19.7000	19.9000	21.6000	
m_{n_TEQ}	Total TEQ PCDDs & PCDFs (ng)	0.1520	0.1550	0.1690	
Total PCDD/F Results (TEF=1)					
C_{sd}	PCDD/F Concentration (ng/dscm)	5.6	5.2	5.6	**5.5**
C_{sd7}	PCDD/F Concentration @7% O_2 (ng/dscm)	5.7	5.6	6.0	**5.8**
$E_{lb/hr}$	PCDD/F Rate (lb/hr)	1.6E-06	1.7E-06	1.8E-06	**1.7E-06**
E_{Fd}	PCDD/F Rate - F_d-based (lb/MMBtu)	5.2E-09	5.1E-09	5.4E-09	**5.2E-09**
Total PCDD/F TEQ Results (using USEPA/INTL 2005 TEFs)					
C_{sdTEQ}	TEQ Concentration (ng/dscm)	0.043	0.041	0.044	**0.043**
C_{sd7TEQ}	TEQ Concentration @7% O_2 (ng/dscm)	0.044	0.044	0.047	**0.045**
$E_{lb/hrTEQ}$	TEQ Rate (lb/hr)	1.3E-08	1.3E-08	1.4E-08	**1.3E-08**
E_{FdTEQ}	TEQ Rate - F_d-based (lb/MMBtu)	4.0E-11	3.9E-11	4.2E-11	**4.1E-11**
Results (ND and EMPC = actual value)					
Total PCDD/F Results (TEF=1)					
C_{sd}	PCDD/F Concentration (ng/dscm)	5.7	5.3	5.6	**5.5**
C_{sd7}	PCDD/F Concentration @7% O_2 (ng/dscm)	5.8	5.7	6.1	**5.8**
$E_{lb/hr}$	PCDD/F Rate (lb/hr)	1.7E-06	1.7E-06	1.8E-06	**1.7E-06**
E_{Fd}	PCDD/F Rate - F_d-based (lb/MMBtu)	5.2E-09	5.1E-09	5.5E-09	**5.2E-09**
Total PCDD/F TEQ Results (using USEPA/INTL 2005 TEFs)					
C_{sdTEQ}	TEQ Concentration (ng/dscm)	0.043	0.043	0.044	**0.044**
C_{sd7TEQ}	TEQ Concentration @7% O_2 (ng/dscm)	0.044	0.046	0.048	**0.046**
$E_{lb/hrTEQ}$	TEQ Rate (lb/hr)	1.3E-08	1.3E-08	1.4E-08	**1.3E-08**
E_{FdTEQ}	TEQ Rate - F_d-based (lb/MMBtu)	4.0E-11	4.1E-11	4.3E-11	**4.1E-11**

RESULTS

Table 2-6:
Unit 2 FF Outlet – Mercury

Run No.		1	2	3	4	Average
Date (2013)		Mar 19	Mar 19	Mar 19	Mar 21	
Start Time (approx.)		07:54	10:35	13:25	12:05	
Stop Time (approx.)		10:07	12:48	15:37	14:26	
Process Conditions						
R_P	Steam Production Rate - (Klbs/hour)	184.2	183.6	183.7	183.9	**183.8**
P_1	Fabric Filter Inlet Temperature - (°F)	320	320	320	320	**320**
Gas Conditions						
O_2	Oxygen (dry volume %)	7.2	7.3	7.3	7.2	**7.3**
CO_2	Carbon dioxide (dry volume %)	11.7	11.7	11.8	11.7	**11.7**
T_s	Sample temperature (°F)	306	305	306	304	**305**
B_w	Actual water vapor in gas (% by volume)	23.7	23.2	23.5	22.8	**23.3**
Gas Flow Rate						
Q_a	Volumetric flow rate, actual (acfm)	158,000	152,000	153,000	164,000	**157,000**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	80,900	78,400	78,500	85,000	**80,700**
Sampling Data						
V_{mstd}	Volume metered, standard (dscf)	64.61	61.07	61.77	68.25	**63.93**
%I	Isokinetic sampling (%)	101.0	98.5	99.6	99.0	**99.5**
Laboratory Data						
$m_{n\text{-}1b}$	Fraction 1B (µg)	<0.1000	<0.1000	<0.1000	<0.1000	
$m_{n\text{-}2b}$	Fraction 2B (µg)	7.1159	6.2235	7.3137	4.8649	
$m_{n\text{-}3a}$	Fraction 3A (µg)	<0.2000	<0.2000	<0.2000	<0.2000	
$m_{n\text{-}3b}$	Fraction 3B (µg)	<0.5000	<0.5000	<0.5000	<0.5000	
$m_{n\text{-}3c}$	Fraction 3C µg)	<0.4000	<0.4000	<0.4000	<0.4000	
m_n	Total matter corrected for allowable blanks (µg)	7.1159	6.2235	7.3137	4.8649	
Mercury Results - Total						
C_{sd}	Concentration (µg/dscm)	3.9	3.6	4.2	2.5	**3.5**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	3.9	3.7	4.3	2.6	**3.6**
$E_{lb/hr}$	Rate (lb/hr)	1.2E-03	1.1E-03	1.2E-03	8.0E-04	**1.1E-03**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	3.5E-06	3.3E-06	3.9E-06	2.3E-06	**3.2E-06**

RESULTS

Table 2-7:
Unit 2 FF Outlet and SDA Inlet – Hydrogen Chloride

Run No.		1	2	3	Average
Date (2013)		Mar 21	Mar 21	Mar 21	
Start Time (approx.)		07:54	09:15	10:35	
Stop Time (approx.)		08:54	10:15	11:35	
Process Conditions					
R_P	Steam Production Rate - (Klbs/hour)	183.6	184.2	183.7	**183.8**
P_1	Fabric Filter Inlet Temperature - (°F)	320	320	320	**320**
SDA Inlet Gas Conditions					
O_2	Oxygen (dry volume %)	6.4	6.1	6.5	**6.3**
CO_2	Carbon dioxide (dry volume %)	12.5	12.9	12.5	**12.6**
T_s	Sample temperature (°F)	504	501	504	**503**
B_w	Actual water vapor in gas (% by volume)	20.2	20.6	20.6	**20.5**
SDA Inlet Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	33.71	33.37	33.51	**33.53**
SDA Inlet Laboratory Data					
m_n	Total HCl collected (mg)	762.498	717.427	811.684	
SDA Inlet Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (ppmdv)	527	501	565	**531**
C_{sd7}	HCl Concentration @7% O_2 (ppmdv)	505	470	544	**506**
C_{sd}	HCl Concentration (mg/dscm)	799	759	855	**804**
C_{sd7}	HCl Concentration @7% O_2 (mg/dscm)	765	712	824	**767**
E_{Fd}	HCl Rate - Fd-based (lb/MMBtu)	0.69	0.64	0.74	**0.69**
FF Outlet Gas Conditions					
O_2	Oxygen (dry volume %)	7.9	7.5	7.2	**7.5**
CO_2	Carbon dioxide (dry volume %)	11.3	11.7	11.9	**11.6**
T_s	Sample temperature (°F)	307	306	306	**306**
B_w	Actual water vapor in gas (% by volume)	23.6	23.6	23.8	**23.7**
FF Outlet Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	40.90	40.83	40.47	**40.73**
FF Outlet Laboratory Data					
m_n	Total HCl collected (mg)	1.900	1.715	1.945	
FF Outlet Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (ppmdv)	1.1	0.98	1.1	**1.1**
C_{sd7}	HCl Concentration @7% O_2 (ppmdv)	1.2	1.01	1.1	**1.1**
C_{sd}	HCl Concentration (mg/dscm)	1.6	1.5	1.7	**1.6**
C_{sd7}	HCl Concentration @7% O_2 (mg/dscm)	1.7	1.5	1.7	**1.7**
E_{Fd}	HCl Rate - Fd-based (lb/MMBtu)	0.0016	0.0014	0.0016	**0.0015**
RE	Reduction Efficiency (% Removal)	99.8%	99.8%	99.8%	**99.8%**

RESULTS

Table 2-8:
Unit 3 FF Outlet – Particulate and Metals

Run No.		1	2	3	Average
Date (2013)		Mar 20	Mar 21	Mar 21	
Start Time (approx.)		12:35	07:42	10:15	
Stop Time (approx.)		14:50	09:54	12:27	
Process Conditions					
R_P	Steam Production Rate - (Klbs/hr)	183.4	184.3	184.3	**184.0**
P_1	Fabric Filter Inlet Temperature - (°F)	320	320	320	**320**
Gas Conditions					
O_2	Oxygen (dry volume %)	8.7	8.0	7.8	**8.2**
CO_2	Carbon dioxide (dry volume %)	10.2	11.0	11.4	**10.9**
T_s	Sample temperature (°F)	310	306	306	**307**
B_w	Actual water vapor in gas (% by volume)	22.9	23.2	23.1	**23.0**
Gas Flow Rate					
Q_a	Volumetric flow rate, actual (acfm)	170,000	164,000	159,000	**164,000**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	87,400	84,000	82,000	**84,500**
Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	67.84	66.72	64.75	**66.44**
%I	Isokinetic sampling (%)	98.2	100.5	99.9	**99.5**
Particulate Laboratory Data					
m_{filter}	Matter collected on filter(s) (g)	0.00010	0.00010	0.00010	
m_s	Matter collected in solvent rinse(s) (g)	0.00131	0.00105	0.00151	
m_n	Total FPM (g)	0.00141	0.00115	0.00161	
FPM Results					
C_{sd}	Particulate Concentration (mg/dscm)	0.73	0.61	0.88	**0.74**
C_{sd7}	Particulate Concentration @7% O_2 (mg/dscm)	0.84	0.65	0.93	**0.81**
$E_{lb/hr}$	Particulate Rate (lb/hr)	0.24	0.19	0.27	**0.23**
E_{Fd}	Particulate Rate - F_d-based (lb/MMBtu)	0.00075	0.00059	0.00084	**0.00073**
Cadmium Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	<0.2000	<0.2000	<0.2000	
Cadmium Results - Total					
C_{sd}	Concentration (mg/dscm)	<0.00010	<0.00011	<0.00011	**<0.00011**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<0.00012	<0.00011	<0.00012	**<0.00012**
$E_{lb/hr}$	Rate (lb/hr)	<3.4E-05	<3.3E-05	<3.3E-05	**<3.4E-05**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	<1.1E-07	<1.0E-07	<1.0E-07	**<1.0E-07**
Lead Laboratory Data					
m_n	Total matter corrected for allowable blanks (µg)	<0.2000	<0.2000	<0.2000	
Lead Results - Total					
C_{sd}	Concentration (mg/dscm)	<0.00010	<0.00011	<0.00011	**<0.00011**
C_{sd7}	Concentration @7% O_2 (mg/dscm)	<0.00012	<0.00011	<0.00012	**<0.00012**
$E_{lb/hr}$	Rate (lb/hr)	<3.4E-05	<3.3E-05	<3.3E-05	**<3.4E-05**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	<1.1E-07	<1.0E-07	<1.0E-07	**<1.0E-07**

RESULTS

Table 2-9:
Unit 3 FF Outlet – Mercury

Run No.		1	2	3	4	Average
Date (2013)		Mar 20	Mar 21	Mar 21	Mar 21	
Start Time (approx.)		12:35	07:42	10:15	12:41	
Stop Time (approx.)		14:50	09:54	12:27	14:52	
Process Conditions						
R_P	Steam Production Rate - (Klbs/hour)	183.4	184.3	184.3	183.9	**184.0**
P_1	Fabric Filter Inlet Temperature - (°F)	320	320	320	320	**320**
Gas Conditions						
O_2	Oxygen (dry volume %)	8.7	8.0	7.8	8.7	**8.3**
CO_2	Carbon dioxide (dry volume %)	10.2	11.0	11.4	10.2	**10.7**
T_s	Sample temperature (°F)	310	306	306	308	**307**
B_w	Actual water vapor in gas (% by volume)	22.9	23.2	23.1	23.2	**23.1**
Gas Flow Rate						
Q_a	Volumetric flow rate, actual (acfm)	170,000	164,000	159,000	165,000	**164,000**
Q_{std}	Volumetric flow rate, dry standard (dscfm)	87,400	84,000	82,000	84,500	**84,500**
Sampling Data						
V_{mstd}	Volume metered, standard (dscf)	67.84	66.72	64.75	66.79	**66.53**
%I	Isokinetic sampling (%)	98.2	100.5	99.9	100.0	**99.6**
Laboratory Data						
m_{n-1b}	Fraction 1B (µg)	<0.1000	<0.1000	<0.1000	<0.1000	
m_{n-2b}	Fraction 2B (µg)	5.5468	6.7204	7.0073	6.8956	
m_{n-3a}	Fraction 3A (µg)	<0.2000	<0.2000	<0.2000	<0.2000	
m_{n-3b}	Fraction 3B (µg)	<0.5000	<0.5000	0.7794	<0.5000	
m_{n-3c}	Fraction 3C µg)	<0.4000	<0.4000	<0.4000	<0.4000	
m_n	Total matter corrected for allowable blanks (µg)	5.5468	6.7204	7.7867	6.8956	
Mercury Results - Total						
C_{sd}	Concentration (µg/dscm)	2.9	3.6	4.2	3.6	**3.6**
C_{sd7}	Concentration @7% O_2 (µg/dscm)	3.3	3.8	4.5	4.2	**4.0**
$E_{lb/hr}$	Rate (lb/hr)	9.5E-04	1.1E-03	1.3E-03	1.2E-03	**1.1E-03**
E_{Fd}	Rate - Fd-based (lb/MMBtu)	3.0E-06	3.4E-06	4.1E-06	3.7E-06	**3.6E-06**

RESULTS

Table 2-10:
Unit 3 FF Outlet and SDA Inlet – Hydrogen Chloride

Run No.		1	2	3	Average
Date (2013)		Mar 20	Mar 20	Mar 20	
Start Time (approx.)		08:13	09:39	11:00	
Stop Time (approx.)		09:13	10:39	12:00	
Process Conditions					
R_P	Steam Production Rate - (Klbs/hour)	185.6	182.8	182.8	**183.8**
P_1	Fabric Filter Inlet Temperature - (°F)	320	321	321	**320**
SDA Inlet Gas Conditions					
O_2	Oxygen (dry volume %)	6.1	7.3	7.0	**6.8**
CO_2	Carbon dioxide (dry volume %)	12.8	11.6	12.1	**12.2**
T_s	Sample temperature (°F)	488	498	500	**495**
B_w	Actual water vapor in gas (% by volume)	21.1	21.1	18.8	**20.3**
SDA Inlet Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	33.30	33.29	33.27	**33.29**
SDA Inlet Laboratory Data					
m_n	Total HCl collected (mg)	823.784	738.976	663.210	
SDA Inlet Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (ppmdv)	577	517	465	**520**
C_{sd7}	HCl Concentration @7% O_2 (ppmdv)	542	529	463	**512**
C_{sd}	HCl Concentration (mg/dscm)	873	784	704	**787**
C_{sd7}	HCl Concentration @7% O_2 (mg/dscm)	821	802	702	**775**
E_{Fd}	HCl Rate - Fd-based (lb/MMBtu)	0.7377	0.7203	0.6306	**0.6962**
FF Outlet Gas Conditions					
O_2	Oxygen (dry volume %)	7.0	7.8	8.5	**7.8**
CO_2	Carbon dioxide (dry volume %)	12.1	11.3	10.8	**11.4**
T_s	Sample temperature (°F)	312	313	313	**313**
B_w	Actual water vapor in gas (% by volume)	24.4	23.5	22.3	**23.4**
FF Outlet Sampling Data					
V_{mstd}	Volume metered, standard (dscf)	39.98	40.53	40.61	**40.37**
FF Outlet Laboratory Data					
m_n	Total HCl collected (mg)	9.684	8.178	8.941	
FF Outlet Hydrogen Chloride (HCl) Results					
C_{sd}	HCl Concentration (ppmdv)	5.6	4.7	5.1	**5.2**
C_{sd7}	HCl Concentration @7% O_2 (ppmdv)	5.6	5.0	5.8	**5.5**
C_{sd}	HCl Concentration (mg/dscm)	8.6	7.1	7.8	**7.8**
C_{sd7}	HCl Concentration @7% O_2 (mg/dscm)	8.5	7.6	8.7	**8.3**
E_{Fd}	HCl Rate - Fd-based (lb/MMBtu)	0.0077	0.0068	0.0078	**0.0074**
RE	Reduction Efficiency (% Removal)	99.0%	99.1%	98.8%	**98.9%**

RESULTS

Table 2-11:
Units 1, 2 and 3 FF Outlets – Opacity by COMS

Run No.	1	2	3	Average
Unit 1				
Date (2013)	Mar 19	Mar 20	Mar 20	
Start Time (approx.)	12:58	07:43	10:17	
Stop Time (approx.)	15:14	09:55	12:28	
Visible Emissions (%)[1]				
Average Opacity	1	1	1	**1**
Maximum Reading	1	2	2	**2**
Minimum Reading	0	1	1	**1**
Unit 2				
Date (2013)	Mar 19	Mar 19	Mar 19	
Start Time (approx.)	07:54	10:35	13:25	
Stop Time (approx.)	10:07	12:48	15:37	
Visible Emissions (%)[1]				
Average Opacity	1	1	1	**1**
Maximum Reading	1	1	1	**1**
Minimum Reading	1	1	1	**1**
Unit 3				
Date (2013)	Mar 20	Mar 21	Mar 21	
Start Time (approx.)	12:35	07:42	10:15	
Stop Time (approx.)	14:50	09:54	12:27	
Visible Emissions (%)[1]				
Average Opacity	2	0	0	**1**
Maximum Reading	2	0	0	**1**
Minimum Reading	2	0	0	**1**

[1] Reading obtained from facility's continuous opacity monitoring system (COMS) as provided under 40 CFR 60.11(e)(5) and coincide with Method 5/29 test runs.

RESULTS

Table 2-12:
Ash Handling System – Fugitive Emissions

Source Constituent	Date (2013)	Start Time (approx.)	Stop Time (approx.)	Observation Duration (minutes)	Accumulated Emission Duration (seconds)	
Ash Unloading Area						
Visual Opacity (%)	March 21	9:08	10:18	60	0	
Door to Baghouse / Ash Unloading						
Visual Opacity (%)	March 21	10:24	11:34	60	0	
Rolling Door/Door to Baghouse						
Visual Opacity (%)	March 21	11:40	12:50	60	0	Permit Limit
				Total (% of observation time) = 0		< 5% of observation Time
				Total (minutes) = 0		< 9 minutes

Table 2-13:
Lime Silo Fabric Filter Outlet – Visible Emissions

Run No.	**1**
Date (2013)	Mar 20
Start Time (approx.)	09:23
Stop Time (approx.)	11:23
Process Conditions	
Total lime unloaded (tons)	25.23
Rate of unloading (tons/hr)	12.6
Visible Emissions	
Average (percent opacity)	0
Maximum reading (percent opacity)	0

RESULTS

Table 2-14:
Air Flow Summary

Run Number	Run Date	Run Time	Steam Flow Klbs/hour	Flue Gas Temp Deg F	Air Flow ACFM	O_2 %	CO_2 %	Air Flow, DSCFM	Air Flow, DSCFM@ 7%O_2
1-O-M5/29-1	3/19/2013	12:58-15:14	184.0	304	176,331	8.7	10.7	92,144	81,074
1-O-M5/29-2	3/20/2013	07:43-09:55	183.7	305	184,312	9.3	10.0	95,694	80,066
1-O-M5/29-3	3/20/2013	10:17-12:28	183.7	305	185,638	9.3	9.6	97,447	81,182
1-O-M29-4	3/20/2013	12:52-15:03	184.0	305	188,592	9.2	9.8	98,754	83,124
		Average	**183.9**	**305**	**183,719**	**9.1**	**10.0**	**96,010**	**81,361**
2-O-M5/29-1	3/19/2013	07:54-10:07	184.2	306	157,890	7.2	11.7	80,885	79,721
2-O-M5/29-2	3/19/2013	10:35-12:48	183.6	305	152,016	7.3	11.7	78,410	76,830
2-O-M5/29-3	3/19/2013	13:25-15:37	183.7	306	152,587	7.3	11.8	78,464	76,545
2-O-M29-4	3/21/2013	12:05-14:26	183.9	304	163,942	7.2	11.7	84,981	83,759
2-O-M23-1	3/19/2013	10:16-14:38	184.0	304	151,683	7.2	11.9	78,099	76,751
2-O-M23-2	3/20/2013	07:40-11:59	184.2	304	164,491	8.0	11.2	84,090	78,162
2-O-M23-3	3/20/2013	12:21-16:40	183.7	305	166,414	8.0	10.9	85,585	79,520
		Average	**183.9**	**305**	**158,432**	**7.5**	**11.6**	**81,502**	**78,755**
3-O-M5/29-1	3/20/2013	12:35-14:50	183.4	310	169,709	8.7	10.2	87,424	76,480
3-O-M5/29-2	3/21/2013	07:42-09:54	184.3	306	163,727	8.0	11.0	84,016	78,093
3-O-M5/29-3	3/21/2013	10:15-12:27	184.3	306	158,863	7.8	11.4	81,964	77,069
3-O-M29-4	3/21/2013	12:41-14:52	183.9	308	164,612	8.7	10.2	84,468	73,894
		Average	**184.0**	**307**	**164,228**	**8.3**	**10.7**	**84,468**	**76,384**
Facllity Average			**183.9**	**306**	**168,793**	**8.3**	**10.7**	**87,327**	**78,834**

Table 2-15:
Quality Control and Quality Assurance
PCDD/PCDF – Extraction Standard Percent Recoveries

Sample Number	Extraction Standard Percent Recoveries, %						
	^{13}C-TCDD	^{13}C-PeCDD	^{13}C-HxCDD	^{13}C-HxCDD	^{13}C-HxCDD	^{13}C-HpCDD	^{13}C-OCDD
Method Blank A5322	91.5	89.9	86.5	89.8	90.5	87.1	79.9
Unit 2 FF Outlet Field Bl	92.7	92.2	84.5	84.6	87.8	84.9	80.1
Unit 2 FF Outlet Run 1	81.3	81.7	75.3	77	78.4	76.6	71.3
Unit 2 FF Outlet Run 2	81.6	83.2	72.1	75.9	76.9	74.1	68.6
Unit 2 FF Outlet Run 3	93.1	92.5	84	86.5	85.4	83.8	77.1
Average	88	88	80	83	84	81	75
SD	6	5	6	6	6	6	5
Min	81.3	81.7	72.1	75.9	76.9	74.1	68.6
Max	93.1	92.5	86.5	89.8	90.5	87.1	80.1

Extraction Standard Percent Recoveries, %									
^{13}C-TCDF	^{13}C-PeCDF	^{13}C-PeCDF	^{13}C-HxCDF	^{13}C-HxCDF	^{13}C-HxCDF	^{13}C-HxCDF	^{13}C-HpCDF	^{13}C-HpCDF	^{13}C-OCDF
95.3	91.6	91	87.6	89.4	88.6	87.8	87.1	85.8	80.6
92.9	92.4	91.4	83.9	86	85.4	85.7	83.5	84.5	81.1
82.2	81.1	81	75.8	76.2	77.7	77.2	76.3	76.9	71.7
80.8	79.3	78.1	73.8	72.2	73.9	75	71.1	73.5	67.7
94.7	89.5	92.1	84.9	83.2	85	84.3	84.6	85.3	79.2
89	87	87	81	81	82	82	81	81	76
7	6	7	6	7	6	6	7	6	6
80.8	79.3	78.1	73.8	72.2	73.9	75	71.1	73.5	67.7
95.3	92.4	92.1	87.6	89.4	88.6	87.8	87.1	85.8	81.1

Table 2-16:
Quality Control and Quality Assurance
PCDD/PCDF – CS/SS Percent Recoveries

Sample Number	CS/SS Percent Recoveries, %				
	^{37}Cl-TCDD	^{13}C-PeCDD	^{13}C-PeCDF	^{13}C-HxCDF	^{13}C-HpCDF
Method Blank A5322	99.7	99	94.4	97.4	97
Unit 2 FF Outlet Field Bl	99.6	101	91.1	97.5	98.2
Unit 2 FF Outlet Run 1	94.8	92.9	89.9	95.3	94.2
Unit 2 FF Outlet Run 2	98.5	99.2	93.5	102	99.7
Unit 2 FF Outlet Run 3	96.4	97	92.9	98.9	93.9
Average	98	98	92	98	97
SD	2	3	2	2	3
Min	94.8	92.9	89.9	95.3	93.9
Max	99.7	101	94.4	102	99.7

RESULTS

Table 2-17:
Quality Control and Quality Assurance – Metals

	RPD RESULTS				
Run Number	**FH Front Half**	**BH H_2O_2/HNO_4**	**A Empty Impinger**	**B $KMnO_4$**	**C HCl**
U1 FF Outlet R1	NA	0.3%	NA	NA	NA
U1 FF Outlet R2	NA	6.7%	NA	NA	NA
U1 FF Outlet R3	NA	1.5%	NA	NA	NA
U1 FF Outlet R4	NA	2.2%	NA	NA	NA
U2 FF Outlet R1	NA	1.0%	NA	NA	NA
U2 FF Outlet R2	NA	0.8%	NA	NA	NA
U2 FF Outlet R3	NA	0.3%	NA	NA	NA
U2 FF Outlet R4	NA	2.3%	NA	NA	NA
U3 FF Outlet R1	NA	0.4%	NA	NA	NA
U3 FF Outlet R2	NA	2.0%	NA	NA	NA
U3 FF Outlet R3	NA	0.8%	NA	3.4%	NA
U3 FF Outlet R4	NA	1.0%	NA	NA	NA
Field Blank	NA	NA	NA	NA	NA
Reagent Blank	NA	NA	NA	NA	NA

Element	**U1 FF Outlet R2 RPD 20209-2**	**U2 FF Outlet R2 RPD 20209-6**	**U3 FF Outlet R2 RPD 20209-10**
Cadmium	6.1%	8.2%	NA
Lead	0.3%	7.1%	8.9%

Table 2-17 (Continued):
Quality Control and Quality Assurance – Metals

		Sample Spike and Recovery				
Run Number		FH Front Half	BH H_2O_2/HNO_4	A Empty Impinger	B $KMnO_4$	C HCl
U1 FF Outlet R3	#1	96%	99%	93%	93%	94%
	#2	96%	96%	92%	92%	91%
U2 FF Outlet R3	#1	93%	95%	93%	95%	97%
	#2	94%	96%	91%	94%	95%
U3 FF Outlet R3	#1	89%	92%	96%	87%	103%
	#2	88%	91%	94%	85%	101%

Element	U1 FF Outlet R2 Recovery 20209-3	U2 FF Outlet R2 Recovery 20209-7	U3 FF Outlet R2 Recovery 20209-11
Cadmium	92%	100%	94%
Lead	103%	106%	102%

Second Source Calibration Verification

Element	1 ppb QC Std 2	50 ppb QC Std 5	100 ppb QC Std 4	250 ppb QC Std 3
Cadmium	104%	98%	100%	103%
Lead	106%	103%	104%	101%

Table 2-18:
Quality Control and Quality Assurance – Method and Field Blanks

Method 23	Method Blank A5322 pg	Unit 2 FF Outlet Field Blank pg
2,3,7,8-TCDD	(2.3)	(2.05)
1,2,3,7,8-PeCDD	(2.17)	(1.73)
1,2,3,4,7,8-HxCDD	(2.4)	(1.74)
1,2,3,6,7,8-HxCDD	(2.35)	(1.87)
1,2,3,7,8,9-HxCDD	(2.67)	(1.84)
1,2,3,4,6,7,8-HpCDD	(2.91)	(2.1)
OCDD	16.4	11.9
2,3,7,8-TCDF	(1.65)	(1.25)
1,2,3,7,8-PeCDF	(1.5)	(1.1)
2,3,4,7,8-PeCDF	(1.42)	(1.01)
1,2,3,4,7,8-HxCDF	(1.27)	(1.63)
1,2,3,6,7,8-HxCDF	(1.2)	(1.49)
2,3,4,6,7,8-HxCDF	(1.33)	(1.61)
1,2,3,7,8,9-HxCDF	(1.42)	(1.74)
1,2,3,4,6,7,8-HpCDF	(1.47)	(1.5)
1,2,3,4,7,8,9-HpCDF	(1.88)	(1.88)
OCDF	(3.09)	(2.1)
ITEF TEQ (ND=0; EMPC=0)	**0.0164**	**0.0119**
ITEF TEQ (ND=0; EMPC=EMPC)	**0.0164**	**0.0119**
ITEF TEQ (ND=DL/2; EMPC=0)	**2.85**	**2.44**
ITEF TEQ (ND=DL/2; EMPC=EMPC)	**2.85**	**2.44**
ITEF TEQ (ND=DL; EMPC=EMPC)	**5.68**	**4.86**

Method 29		Average Total Catch ug	FH Front Half	BH H_2O_2/HNO_4	A Empty Impinger	B $KMnO_4$	C HCl
Field Blank	**#1**	< 0.5	< 0.1	< 0.3	< 0.2	< 0.5	< 0.4
	#2		< 0.1	< 0.3	< 0.2	< 0.5	< 0.4
Reagent Blank	**#1**	< 0.5	< 0.1	< 0.2	< 0.2	< 0.5	< 0.4
	#2		< 0.1	< 0.2	< 0.2	< 0.5	< 0.4

Element	Field Blank Total µg 20209-13	Reagent Blank Total µg 20209-14
Cadmium	< 0.2	< 0.2
Lead	0.225	0.422

RESULTS

Table 2-19:
Metals Reagent Blank Correction Summary

Sample Number and Analytical Parameter	Catch Weight, ug	Reagent Blank Catch, ug	Maximum Allowable,	Corrected Catch Weight, ug
1-FFO-M29-1				
Cadmuim	< 0.2	<0.2	12.46	<0.2
Lead	0.639	0.422	12.46	0.22
1-FFO-M29-2				
Cadmuim	0.279	<0.2	12.46	0.279
Lead	0.515	0.422	12.46	<0.2
1-FFO-M29-3				
Cadmuim	< 0.2	<0.2	12.46	<0.2
Lead	0.561	0.422	12.46	<0.2
2-FFO-M29-1				
Cadmuim	1.20	<0.2	12.46	1.20
Lead	8.35	0.422	12.46	7.93
2-FFO-M29-2				
Cadmuim	1.12	<0.2	12.46	1.12
Lead	10.7	0.422	12.46	10.3
2-FFO-M29-3				
Cadmuim	0.950	<0.2	12.46	0.95
Lead	7.58	0.422	12.46	7.15
3-FFO-M29-1				
Cadmuim	< 0.2	<0.2	12.46	<0.2
Lead	0.407	0.422	12.46	<0.2
3-FFO-M29-2				
Cadmuim	<0.2	<0.2	12.46	<0.2
Lead	0.475	0.422	12.46	<0.2
3-FFO-M29-3				
Cadmuim	< 0.2	<0.2	12.46	<0.2
Lead	0.502	0.422	12.46	<0.2

Table 2-20:
Quality Control and Quality Assurance – Miscellaneous

Blanks	Result	
Acetone (g)	0.0003	
HCl DI H_2O (mg/l)	<0.041	
HCl 0.1 N H_2SO_4 (mg/l)	<0.041	
Meters - Post Cal	**Result**	**Limit**
61-11	1.4%	≤ ± 5%
66-6	-2.6%	≤ ± 5%
66-14	-1.3%	≤ ± 5%
66-18	-1.3%	≤ ± 5%
66-22	-1.5%	≤ ± 5%
85-2	-3.5%	≤ ± 5%

End of Section 2 – Results

DESCRIPTION OF INSTALLATION

PROCESS DESCRIPTION

The North Broward Resource Recovery facility operates three (3) 750 tons-per-day municipal refuse-fired, water-wall boiler trains. The trains were manufactured by Babcock and Wilcox to produce electricity for sale to a local utility company. The boilers are rated at a maximum steam flow of 186,000 lbs/hr.

Each boiler is equipped with the following air pollution controls (APCs): a Selective Non-Catalytic Reduction (SNCR) for nitrogen oxides (NO_X) control, Spray Dry Absorber (SDA) for acid gas removal and a Fabric Filter (FF) for the control of particulate emissions.

Each FF is followed by an induced draft (ID) fan that directs the flue gas to a dedicated flue in a common stack. The APC equipment is manufactured by Wheelabrator Air Pollution Control, Inc. All APC equipment is generally in excellent condition. Each boiler is also equipped with a continuous emission monitoring (CEM) system to demonstrate the compliance with sulfur dioxide (SO_2), nitrogen oxides (NO_X) and carbon monoxide (CO) limits.

Figure 3-1 shows a general schematic of the facility.

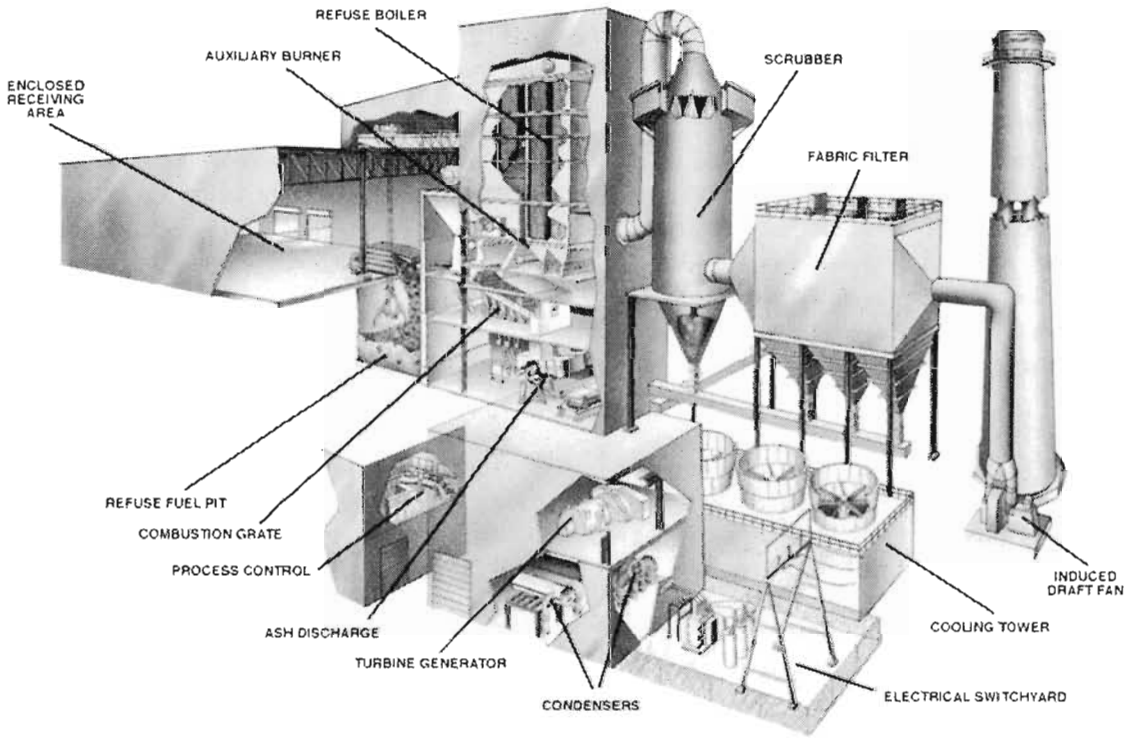


Figure 3-1: General Process Schematic

DESCRIPTION OF INSTALLATION

The general sampling locations for the Units 1, 2 and 3 SDA Inlets and FF Outlets are shown in Figure 3-2.

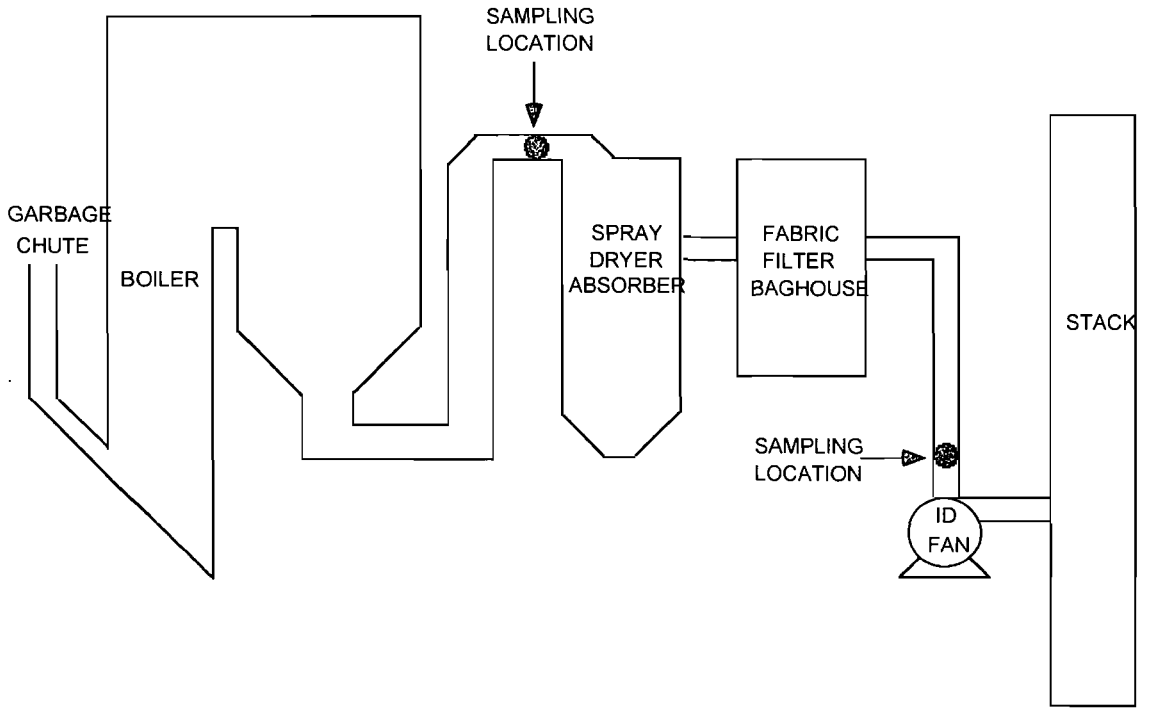


Figure 3-2: Sampling Locations

Table 3-1:
Unit 1 Compliance Test Process Data

PLANT NAME: NORTH BROWARD 2013						Data from DCS Printouts						Calculated		Lime Feed Rate			
Test	Unit No.	Run No.	Date	Time Start	Time Stop	Steam Flow klbs/hr	FF Inlet Temp deg F	Fabric Filter Delta In. H2O	SDA Inlet Temp deg F	Total SDA Flow gpm	Diluton H2O flow gpm	Slurry Flow gpm	Slurry Conc. %	Slurry Specific Gravity	Slurry CaO Density lb/gal	CaO Flow lbs/hr	Test Run Comments
M-26A	1	1	3/19/2013	0815	0915	184.5	319.4	6.3	481.2	30.6	20.6	9.9	32.0	1.108	1.130	673.9	All times based on DCS time
HCl		2	3/19/2013	0948	1048	183.7	320.3	6.3	490.0	32.6	22.8	9.8	30.1	1.107	1.120	659.9	
		3	3/19/2013	1119	1219	184.2	319.9	6.3	494.1	33.3	23.4	10.0	29.7	1.106	1.110	662.7	
					Avg	184.1	319.9	6.3	488.4	32.2	22.3	9.9	30.6	1.107	1.120	665.5	
M-29/5	1	1	3/19/2013	1258	1514	184.0	320.1	6.3	498.5	34.2	21.4	12.8	37.5	1.088	0.919	707.8	All times based on DCS time
Metals		2	3/20/2013	0743	0955	183.7	319.5	6.4	508.2	38.5	27.2	11.3	29.2	1.096	1.006	682.9	
PM		3	3/20/2013	1017	1228	183.7	319.9	6.4	500.5	38.2	27.5	10.7	27.7	1.099	1.039	665.2	
		4 (Hg)	3/20/2013	1252	1503	184.0	320.0	6.4	504.8	38.3	27.4	10.9	28.2	1.098	1.028	673.1	
					Avg	183.9	319.9	6.4	503.0	37.3	25.9	11.4	30.6	1.095	0.998	682.2	

DESCRIPTION OF INSTALLATION

Table 3-2:
Unit 2 Compliance Test Process Data

PLANT NAME: NORTH BROWARD 2013						Data From DCS Printouts						Calculated		Lime Feed Rate			
Test	Unit No.	Run No.	Date	Time Start	Time Stop	Steam Flow klbs/hr	FF Inlet Temp deg F	Fabric Filter Delta In. H2O	SDA Inlet Temp deg F	Total SDA Flow gpm	Diluton H2O flow gpm	Slurry Flow gpm	Slurry Conc. %	Slurry Specific Gravity	Slurry CaO Density lb/gal	CaO Flow lbs/hr	Test Run Comments
M-26A	2	1	3/21/2013	0754	0854	183.6	319.8	6.3	501.0	36.1	23.8	12.3	33.5	1.092	0.963	710.0	All times based on DCS time
HCl		2	3/21/2013	0915	1015	184.2	319.9	6.3	497.9	34.6	21.0	13.6	38.8	1.085	0.887	721.1	
		3	3/21/2013	1035	1135	183.7	320.3	6.3	502.9	36.1	22.4	13.7	37.3	1.085	0.887	729.1	
					Avg	183.8	320.0	6.3	500.6	35.6	22.4	13.2	36.5	1.087	0.912	720.1	
M-29/5	2	1	3/19/2013	0854	1007	184.2	320.1	6.2	489.6	31.5	21.5	10.0	31.1	1.108	1.130	674.6	All times based on DCS time
		2	3/19/2013	1035	1248	183.6	319.9	6.2	479.7	29.3	19.2	10.2	34.0	1.105	1.100	669.9	
Metals		3	3/19/2013	1325	1537	183.7	320.2	6.2	488.0	31.4	18.0	13.4	41.8	1.087	0.909	728.9	
PM		4 (Hg)	3/21/2013	1205	1426	183.9	320.1	6.3	499.5	34.5	20.8	13.8	39.5	1.084	0.876	722.9	
					Avg	183.8	320.1	6.2	489.2	31.7	19.9	11.8	36.6	1.096	1.004	699.1	
M-23	2	1	3/19/2013	1016	1438	184.0	320.0	6.2	483.0	30.2	18.9	11.2	36.5	1.099	1.039	700.8	All times based on DCS time
dioxins		2	3/20/2013	0740	1159	184.2	320.0	6.3	503.8	37.1	26.1	11.0	29.6	1.097	1.017	673.2	
		3	3/20/2013	1221	1640	183.7	320.1	6.3	508.8	39.1	25.0	14.1	27.8	1.098	1.028	869.2	
					Avg	183.9	320.0	6.3	498.5	35.4	23.3	12.1	31.3	1.098	1.028	747.8	

Table 3-3:
Unit 3 Compliance Test Process Data

PLANT NAME: NORTH BROWARD 2013						Data From DCS Printouts						Calculated		Lime Feed Rate			
Test	Unit No.	Run No.	Date	Time Start	Time Stop	Steam Flow klbs/hr	FF Inlet Temp deg F	Fabric Filter Delta In. H2O	SDA Inlet Temp deg F	Total SDA Flow gpm	Diluton H2O flow gpm	Slurry Flow gpm	Slurry Conc. %	Slurry Specific Gravity	Slurry CaO Density lb/gal	CaO Flow lbs/hr	Test Run Comments
M-26A	3	1	3/20/2013	0813	0913	185.6	319.5	6.3	493.5	35.0	21.8	13.2	32.2	1.096	1.006	795.3	All times based on DCS time
HCl		2	3/20/2013	.939	1039	182.8	320.6	6.4	501.4	38.1	26.5	11.6	28.8	1.097	1.017	707.4	
		3	3/20/2013	1100	1200	182.8	320.9	6.3	505.3	39.0	28.1	10.9	27.1	1.099	1.039	682.1	
					Avg	183.8	320.3	6.3	500.1	37.4	25.5	11.9	29.4	1.097	1.021	728.3	
M-29/5	3	1	3/20/2013	1235	1450	183.4	320.3	6.4	516.4	43.5	31.3	12.2	24.8	1.098	1.028	749.6	All times based on DCS time
		2	3/21/2013	0742	0954	184.3	319.6	6.5	506.8	40.1	27.3	12.8	31.5	1.089	0.930	713.3	
Metals		3	3/21/2013	1015	1227	184.3	319.8	6.2	502.1	37.5	23.8	13.7	36.0	1.085	0.887	728.0	
PM		4 (Hg)	3/21/2013	1241	1452	183.9	320.1	6.4	504.3	38.1	23.8	14.2	35.9	1.084	0.876	747.0	
					Avg	184.0	319.9	6.4	507.4	39.8	26.6	13.2	32.0	1.089	0.930	734.5	

DESCRIPTION OF SAMPLING LOCATIONS

Sampling point locations were determined according to EPA Method 1.

Table 3-4 outlines the sampling point configurations. Figures 3-3 through 3-5 (on pages 3-7 through 3-9) illustrate the sampling points and orientation of sampling ports for each of the sources that were tested in the program.

Table 3-4:
Sampling Points

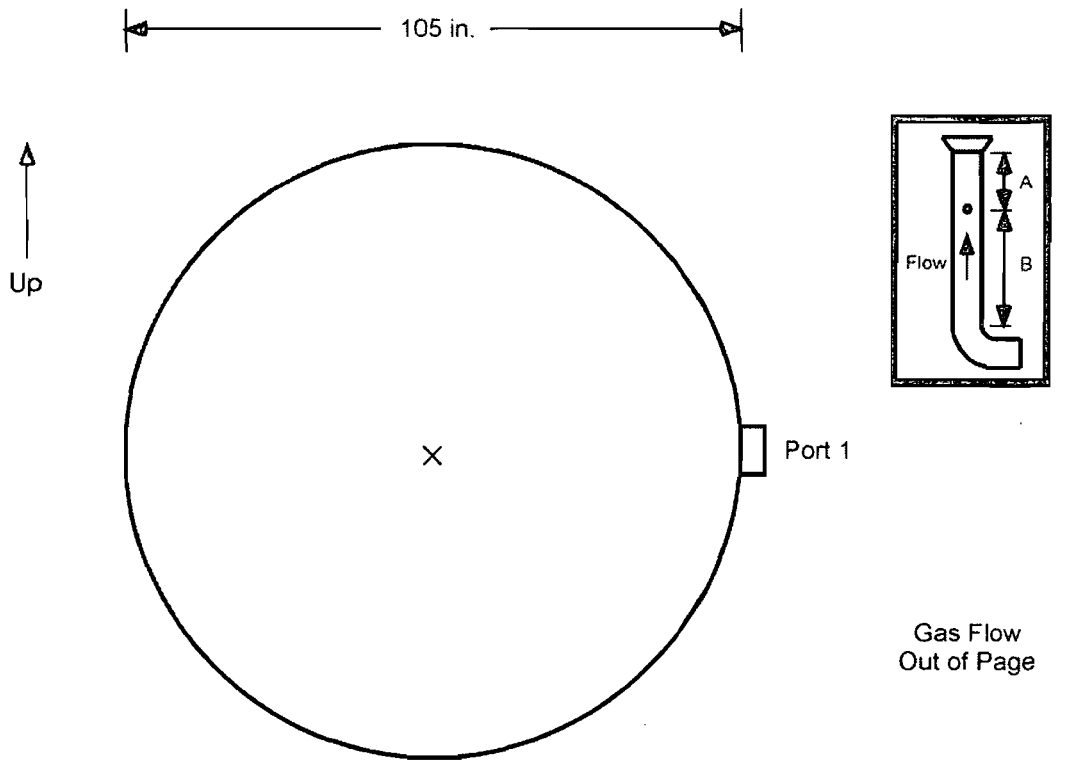
Location	Constituent	Method	Run No.	Ports	Points per Port	Minutes per Point	Total Minutes	Figure
Units 1, 2 and 3 SDA Inlets								
	Hydrogen Chloride	26A[1]	1-3	1	1	60	60	3-3
Units 1, 2 and 3 FF Outlets								
	Particulate, Cd, Pb and Hg	5/29[2]	1-3/4[3]	5	5	5	125	3-4
	PCDDs/PCDFs (Unit 1 only)	23	1-3	5	5	10	250	3-4
	Hydrogen Chloride	26A[1]	1-3	1	1	60	60	3-5

[1] Hydrogen chloride inlet testing utilized a modification of EPA Method 26A (single point constant sampling rate).

[2] Metals testing was done in conjunction with EPA Method 5 particulate sampling.

[3] A fourth run for mercury only was performed on all three (3) units.

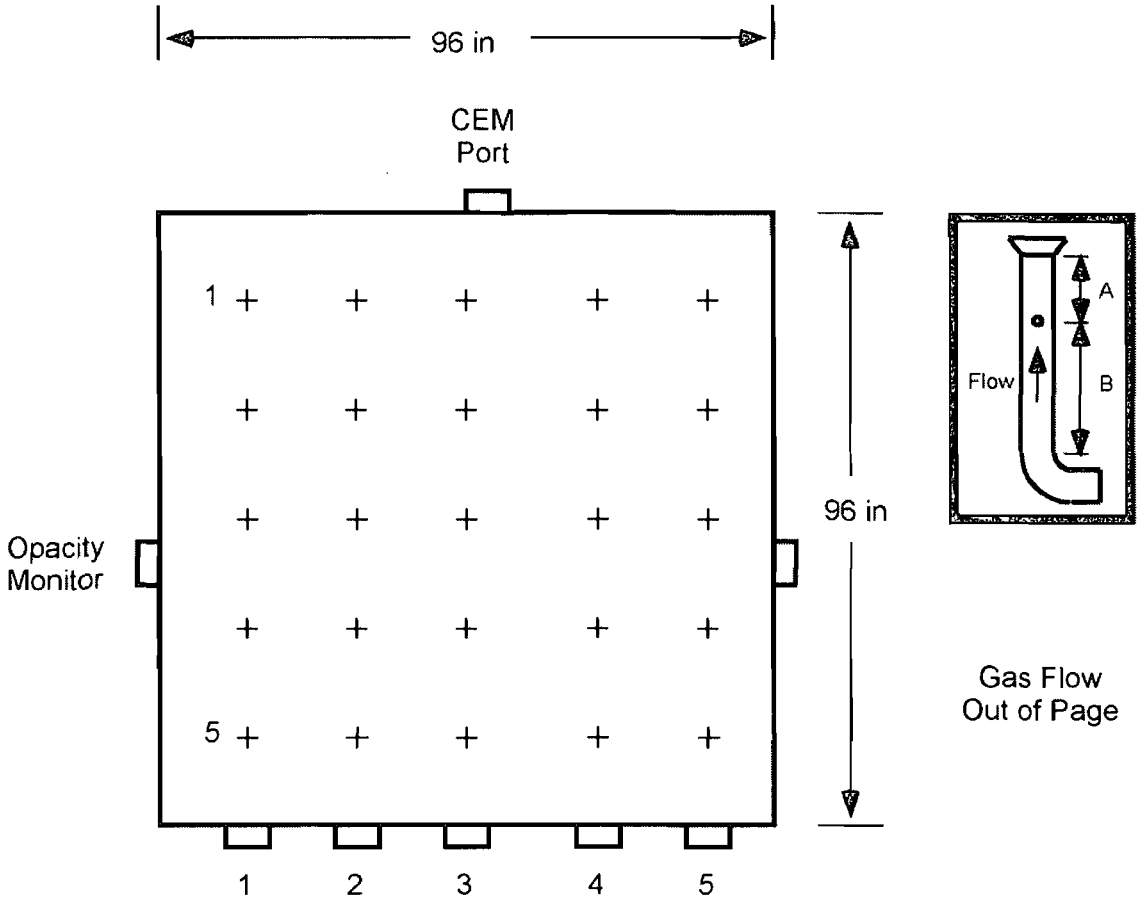
DESCRIPTION OF INSTALLATION



Sampling Point	Port to Point Distance (in.) approximate center
1	

Diameters upstream from flow disturbance (A):	>0.5	Limit: 0.5
Diameters downstream from flow disturbance (B):	>2.0	Limit: 2.0

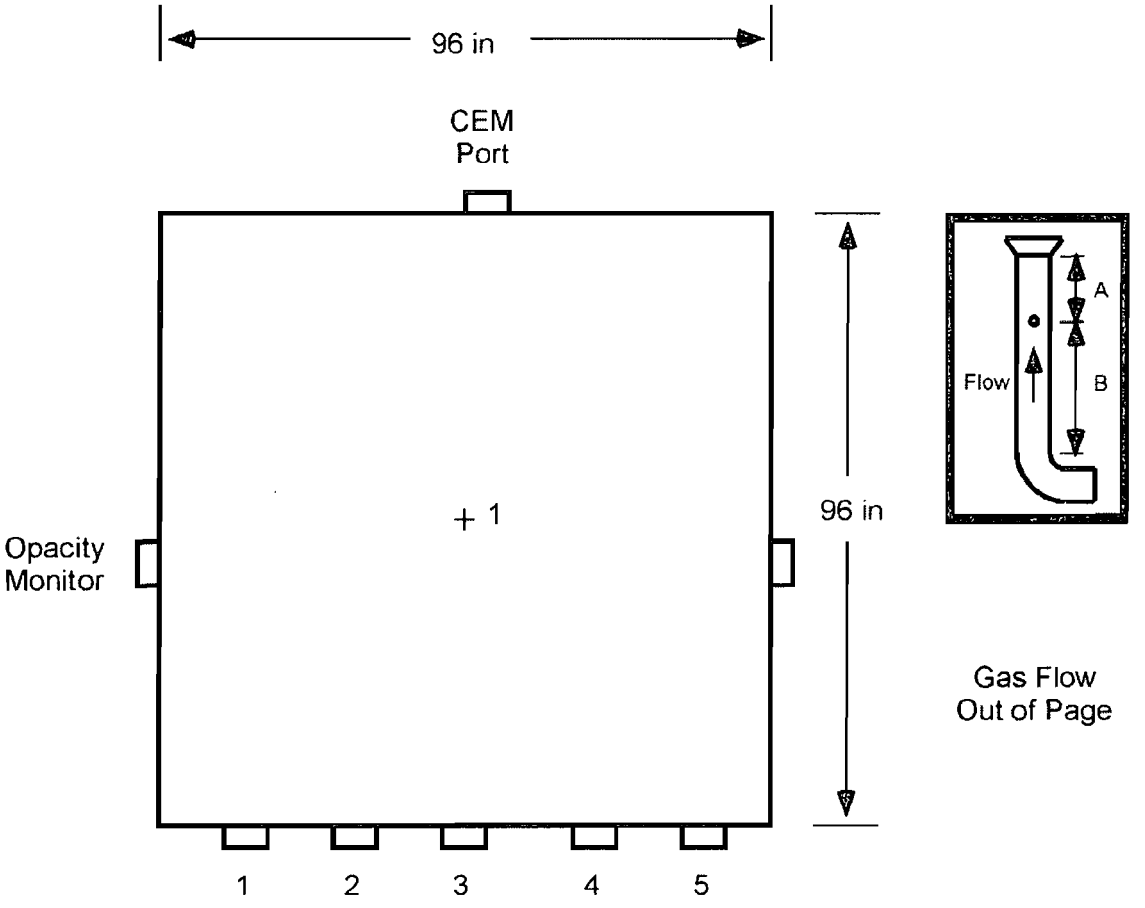
Figure 3-3: SDA Inlets – Sampling Point Determination – HCl Sampling (Units 1, 2 and 3 are identical)



Traverse Point	Port to Point Distance (in.)
1	86.4
2	67.2
3	48.0
4	28.8
5	9.6

Equivalent Duct diameters upstream from flow disturbance (A):	>0.5	Limit: 0.5
Equivalent Duct diameters downstream from flow disturbance (B):	>2.0	Limit: 2.0

Figure 3-4: FF Outlet Isokinetic Sampling Point Determination (EPA Method 1)
(Units 1, 2 and 3 are identical)



Sampling Point	Port to Point Distance (in.)
1	Approximate center

Equivalent Duct diameters upstream from flow disturbance (A):	>0.5	Limit: 0.5
Equivalent Duct diameters downstream from flow disturbance (B):	>2.0	Limit: 2.0

Figure 3-5: FF Outlet HCl Sampling Point Determination (EPA Method 1)
(Units 1, 2 and 3 are identical)

End of Section 3 – Description of Installation

METHODOLOGY

Clean Air Engineering followed procedures as detailed in EPA Methods 1, 2, 3, 3A, 3B, 4, 5, 9, 22, 23, modified 26A and 29. The following table summarizes the methods and their respective sources.

Table 4-1:
Summary of Sampling Procedures

Title 40 CFR Part 60 Appendix A	
Method 1	"Sample and Velocity Traverses for Stationary Sources"
Method 2	"Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)"
Method 3	"Gas Analysis for the Determination of Dry Molecular Weight"
Method 3A	"Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure)"
Method 3B	"Gas Analysis for the Determination of Emission Rate Correction Factor or Excess Air"
Method 4	"Determination of Moisture Content in Stack Gases"
Method 5	"Determination of Particulate Matter Emissions from Stationary Sources"
Method 9	"Visual Determination of the Opacity of Emissions from Stationary Sources"
Method 23	"Determination of Polychlorinated Dibenzo-p-Dioxins and Polychlorinated Dibenzofurans from Municipal Waste Conductors"
Method 22	"Visual Determination of Fugitive Emissions from Material Sources and Smoke Emissions from Flares"
Mod.Method 26A[1]	"Determination of Hydrogen Halide and Halogen Emissions from Stationary Sources Isokinetic Method"
Method 29	"Determination of Metals Emissions from Stationary Sources"

[1] Hydrogen chloride testing utilized a modification of EPA Method 26A (single point constant sampling rate) at the inlet and outlet sampling locations.

These methods appear in detail in Title 40 of the Code of Federal Regulations (CFR) and are located on the internet at http://ecfr.gpoaccess.gov.

Diagrams of the sampling apparatus and major specifications of the sampling, recovery and analytical procedures are summarized for each method in Appendix A of this report.

CleanAir followed specific quality assurance and quality control (QA/QC) procedures as outlined in the individual methods and as prescribed in CleanAir's internal Quality Manual. Results of all QA/QC activities performed by CleanAir are summarized in Appendix F of this report.

End of Section 4 – Methodology

APPENDIX

ASTM D 6866-08 AND 7459-08 CO_2 SAMPLING/ANALYSIS RESULTS

A

I herby certify that all pages contained within this Appendix have been reviewed and, to the best of my ability, verified as accurate.

QA/QC Initials: SB

Date: 4/30

CleanAir.

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Run Number	Run Date	Run Time	Steam Flow Klbs/hour	Flue Gas Temp Deg F	Air Flow ACFM	O_2 %	CO_2 %	CO_2 Sample Rate (lpm)[1]	Stack Flow 2RSD (%)	Air Flow, DSCFM	Air Flow, DSCFM@ 7%O_2
2-O-M23-2	3/20/2013	07:40-11:59	184.2	304	164,491	8.0	11.2	0.2	16.1%	84,090	78,162
2-O-M23-3	3/20/2013	12:21-16:40	183.7	305	166,414	8.0	10.9	0.2	17.9%	85,585	79,520
		Average	**183.9**	**305**	**165,452**	**8.0**	**11.0**	**0.2**	**17.0%**	**84,837**	**78,841**

[1] CO_2 gas sample flow rate was within 10% of initial flow rate throughout all test runs.

ISO-17025 Accredited Testing Laboratory

PJLA ISO/IEC 17025:2005 Testing Accreditation# 59423

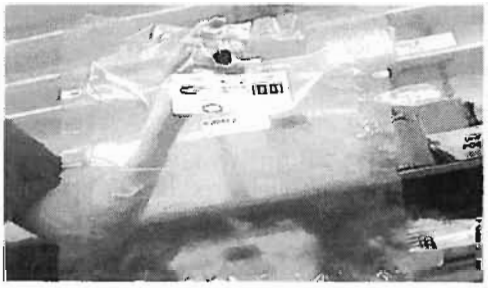
Beta Analytic Inc.
4985 SW 74 Court
Miami, Florida 33155 USA
Tel: 305-667-5167
Fax: 305-663-0964
info@betalabservices.com
www.betalabservices.com

Summary of Results : Biogenic CO2 Determination using ASTM-D6866-08

Submitter:	Mr. Scott A. Brown	**Date Received**	March 22, 2013
Company:	Clean Air Engineering	**Date Reported**	March 25, 2013

Laboratory Number	Submitter Label	Material	Mean Biogenic CO2 Content*
Beta-345173	Wheelabrator North Broward 3/20/13	Biogenic CO2	64 %

Package received -labeling COC



View of content

* ASTM-D6866 cites precision on the Mean Biogenic CO2 Content as +/- 3% (absolute). This is the most conservative estimate of error in the measurement of complex biomass containing solids and liquids based on empirical results. Real precision for readily combustible and homogenous materials (e.g. gasoline) and especially samples recieved as CO2 (e.g. flue gas or CEMS exhaust) can be as low as +/- 0.5-2%. The result only applies to the analyzed material. Fluctuations in carbon content within a batch of product, gasoline or flue gas must be determined separately (e.g. averaged measurements of multiple solids or liquids, and single measurement of the combination of gas aliquots collected over time). The accuracy of the result as it applies to the analyzed product, fuel, or flue gas relies upon all the carbon in the analyzed material originating from either recently respired atmospheric carbon dioxide (within the last decade) or fossil carbon (more than 50,000 years old). "Percent biomass" specifically relates % renewable (or fossil) carbon to total carbon, not to total mass or molecular weight. Mean Biogenic CO2 estimates greater than 100% are assigned a value of 100% for simplification.

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Summary of Results : Biogenic CO2 Determination using ASTM-D6866-08

Submitter: Mr. Scott A. Brown **Date received** March 22, 2013

Company: Clean Air Engineering **Date reported** March 25, 2013

Submitter label	Material	Laboratory Number	Percent modern carbon (pmc)	Atmospheric correction factor
Wheelabrator North Broward 3/20/13	Biogenic CO2	Beta-345173	68.3 +/- 0.2 pMC	x 0.93

* ASTM-D6866 cites precision on the Mean Biogenic CO2 Content as +/- 3% (absolute). This is the most conservative estimate of error in the measurement of complex biomass containing solids and liquids based on empirical results. Real precision for readily combustible and homogenous materials (e.g. gasoline) and especially samples recieved as CO2 (e.g. flue gas or CEMS exhaust) can be as low as +/- 0.5-2%. The result only applies to the analyzed material. Fluctuations in carbon content within a batch of product, gasoline or flue gas must be determined separately (e.g. averaged measurements of multiple solids or liquids, and single measurement of the combination of gas aliquots collected over time). The accuracy of the result as it applies to the analyzed product, fuel, or flue gas relies upon all the carbon in the analyzed material originating from either recently respired atmospheric carbon dioxide (within the last decade) or fossil carbon (more than 50,000 years old). "Percent biomass" specifically relates % renewable (or fossil) carbon to total carbon, not to total mass or molecular weight. Mean Biogenic CO2 estimates greater than 100% are assigned a value of 100% for simplification.

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Report of Biogenic CO2 Content Analysis using ASTM-D6866-08

Submitter: Clean Air Engineering

Submitter Label: Wheelabrator North Broward 3/20/13

Laboratory Number: Beta-345173

Material: Biogenic CO2

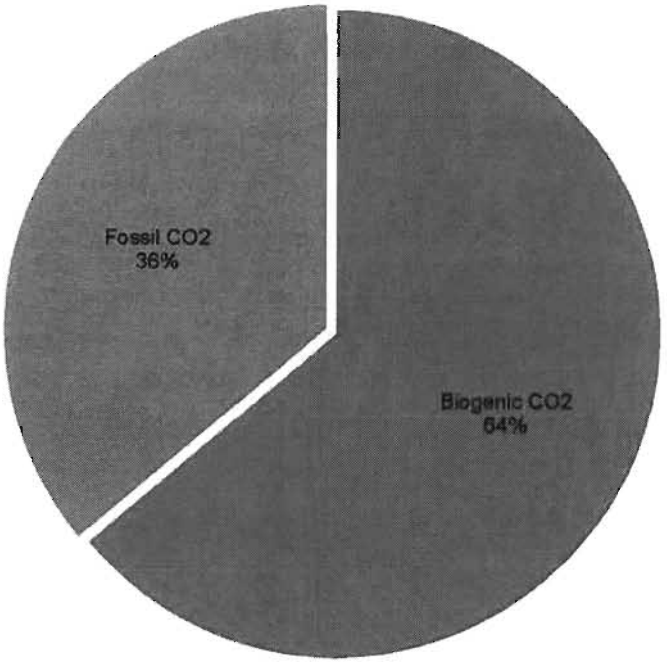
Date Received: March 22, 2013

Date Reported: March 25, 2013

Biogenic CO2 : 64 % *

(carbon-neutral CO2) (renewable carbon to total carbon)

Proportions Biogenic CO2 vs. Fossil CO2 indicated by C14 content



* ASTM-D6866 cites precision on the Mean Biogenic CO2 Content as +/- 3% (absolute). This is the most conservative estimate of error in the measurement of complex biomass containing solids and liquids based on empirical results. Real precision for readily combustible and homogenous materials (e.g. gasoline) and especially samples recieved as CO2 (e.g. flue gas or CEMS exhaust) can be as low as +/- 0.5-2%. The result only applies to the analyzed material. Fluctuations in carbon content within a batch of product, gasoline or flue gas must be determined separately (e.g. averaged measurements of multiple solids or liquids, and single measurement of the combination of gas aliquots collected over time). The accuracy of the result as it applies to the analyzed product, fuel, or flue gas relies upon all the carbon in the analyzed material originating from either recently respired atmospheric carbon dioxide (within the last decade) or fossil carbon (more than 50,000 years old). "Percent biomass" specifically relates % renewable (or fossil) carbon to total carbon, not to total mass or molecular weight. Mean Biogenic CO2 estimates greater than 100% are assigned a value of 100% for simplification.

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Explanation of Results

Biomass Analysis using ASTM-D6866

The application of ASTM-D6866 to derive a "Biogenic CO2 content" for carbon dioxide effluents is built upon the same concepts as those used by the US Department of Agriculture to derive the biobased content of manufactured products containing biomass carbon. It is done by comparing a relative amount of radiocarbon (C14) in an unknown sample to that of a modern reference standard. The ratio in contemporary biomass will be 100% and the ratio in fossil materials will be zero. Carbon dioxide derived from combustion of a mixture of present day biomass and fossil carbon will yield an ASTM-D6866 result that directly correlates to the amount of biomass carbon combusted and carbon-neutral CO2 generated.

The modern reference standard is a National Institute of Standards and Technology (NIST) standard with a defined radiocarbon content of 100% contemporary carbon for the year AD 1950. AD 1950 was chosen since it represented a time prior to thermo-nuclear weapons testing which introduced large amounts of excess radiocarbon into the atmosphere with each explosion (termed "bomb carbon"). This was a logical point in time to use as a reference since this excess bomb carbon would change with increased or decreased weapons testing. A fixed correction for this effect is applied per the ASTM-D6866 requirements, applying specifically to carbon removed from the atmospheric CO2 reservoir since about 1996. Carbon removed prior to about 1996 will contain elevated radiocarbon signatures, not directly applicable to the ASTM-D6866 correction. Typical areas to which the correction may not apply are landfills more than 5-10 years old and to trees which began to grow more than 10 years ago.

Carbon dioxide effluent derived from combustion of 100% present day biomass will yield results of 100% renewable content. Carbon dioxide effluent derived from the combustion of 100% fossil fuel will yield results of 0% renewable content. Carbon dioxide produced from mixed fuels (biomass plus fossil fuel) will yield a percentage result in direct proportion to the biomass carbon consumed vs. fossil carbon consumed in the combustion. The final result is referred to as the MEAN BIOMASS CO2 CONTENT and assumes all the carbon in the carbon dioxide was derived from either present day living or fossil sources.

The results provided in this report involved materials provided without any source information. This situation is highly probable in a real life situation. The MEAN VALUE quoted in this report encompasses an absolute range of 6% (plus and minus 3% on either side of the MEAN BIOGENIC CO2 CONTENT to account for variations in end component radiocarbon signatures (a conservative approximation). It is presumed that all materials are present day or fossil in origin and that the desired result is the amount of biomass component "present" in the material, not the amount of biomass material "used" in the manufacturing process. The most conservative interpretation of the reported percentages is as maximum values.

ASTM-D6866 results relate directly to the percentage carbon-neutral CO2 in an incineration effluent. A value of 71% renewable content measured on CO2 effluent would indicate that 71% of the exhausted CO2 was from biomass (29% from fossil fuel). It does not represent the weight of biomass combusted or the weight of fossil fuel combusted. This is advantageous since the weight of the fuels only indirectly relate to the up-take of carbon dioxide from the atmosphere. The respiration uptake compound was carbon dioxide and the combustion effluent was carbon dioxide. The ASTM-D6866 result directly and specifically relates to the amount of carbon-neutral CO2 consumed and expelled.

ASTM-D6866 results presume all the carbon in the analyte was either present day or fossil. This assumption does not apply well to landfills older than 5-10 years since they will include excess bomb carbon from perhaps 20-40 years ago, or to older trees that began growing more than 20 years ago. The "present day" end-component is ambiguous in such cases. The method best applies to high concentration CO2 effluents from combustion sources. Results obtained which are greater than 100 % are reported as 100% for simplification.

CLIENT Wheelabrator

PLANT North Broward

PROJECT MANAGER S. Brown

PROJECT 12218NB

DEPT. 66

66-12218NB-

ANALYTICAL METHOD	CONTAINER NUMBER	SAMPLE FRACTION
ASTM-D6866	1	Tedlar Bag

CleanAir ENGINEERING
500 West Wood Street
Palatine, IL 60067
800-627-0033 (phone)
847-991-3385 (fax)

LAB ID NUMBER	RUN NUMBER	TEST LOCATION	DATE (2013)	SAMPLE MATRIX	NUMBER OF CONTAINERS	CONTAINER SEALED? LIQUID LEVEL MARKED?	ANALYSIS REQUESTED: ASTM-D6866			Archive	ADDITIONAL INFORMATION
	1	Wheelabrator North Broward	3/20	Tedlar Bag	1		X				

FORWARDING LAB
Beta Analytic, Inc.
4985 SW 74 Court
Miami, FL 33155
305-667-5167

Please return Tedlar Bag to:
CleanAir
500 West Wood Street
Palatine, IL 60067
Attn: Scott Brown

Relinquished By: (signature)	Date / Time	Relinquished By: (signature)	Date / Time	Relinquished By: (signature)	Date / Time
S. Brown	3/21/13 14:00				
Received By: (signature)	Date / Time	Received By: (signature)	Date / Time	Relinquished By: (signature)	Date / Time
	3/22/13 10:00 am				

This form completed by:
S. Brown
Signature Date