WEST COUNTY POWER PARTNERS, LLC

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Florida Power & Light Company
West County Energy Center – Unit 3
Permit No. – PSD-FL-396
DEP File No. – 0990646-002-AC

WCPP Project 161354
WCPP Files 14.0100/32.0440
WCPP3-2011-TP-368
May 31, 2011

E-mail, Express Mail

Ms. Elizabeth Walker
Florida Department of Environmental Protection
Division of Air Resource Management
Bureau of Air Regulation
2600 Blair Stone Road, MS 5500
Tallahassee, FL 32399-2400

Subject: **West County Unit 3A Fuel Oil Emissions Test Report**

Dear Ms. Walker:

On behalf of Florida Power & Light Company (FPL) and its Designated Representative, Christian Kiernan, the West County Power Partners, LLC (WCPP), EPC Contractor for construction of the new combined cycle generating Unit 3 at the FPL West County Energy Center, is submitting the Unit 3A Fuel Oil Emissions Test Report per the requirements of 40 CFR Part 60 and West County's Air Permit, Records and Reports, #31 (Permit No. PSD-FL-396).

If you have any questions about this notification or the attachment, please contact Terry Apple at (913) 458-7220 or John Rachal at (561) 784-8048.

Very truly yours,

WEST COUNTY POWER PARTNERS, LLC

for Mike Perkins
Project Executive

WS:hs

enclosure: 1 hard copy, 1 CD

cc: w/enclosures as indicated:
Dave McNeal, USEPA Air, Pesticides and Toxics Management, w/1 hard copy, 1 CD
Carlos Martinez, USEPA Clean Air Markets Division
Leigh Pell, FDEP Air Resource Management
Lennon Anderson, FDEP Southeast District, w/1 hard copy, 1 CD
Lee Hoefert, FDEP Southeast District

Mike Halpin, FDEP Division of Air Resources Management, Director
Cindy Mulkey, FDEP Sitting, Program Administrator
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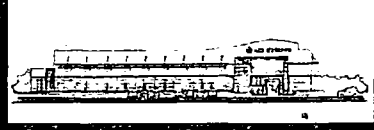
Jim Stormer, PBC Health Department
Tom Tittle, PBC Health Department
Tom Young, FPL Construction Project General Manager
Carine Bullock, FPL Plant General Manager
David Fawcett, FPL West County Environmental Leader, w/1 hard copy, 1 CD
Rachel Godino, FPL Environmental Project Manager
Matthew Wetmore, FPL PGD Technical Services Specialist
Audrey Rotrock, FPL Environmental Services, w/1 hard copy, 5 CD's
Robert Bennett, FPL Project Engineer
Mike Perkins, WCPP Project Executive
John Rachal, WCPP Senior Project Manger
Greg Hines, WCPP Site Environmental Manager
Terry Apple, WCPP Project Manager/ Project File, w/1 CD
William Stevenson, WCPP Environmental Specialist, w/1 CD


Air Hygiene International, Inc.
Fuel Oil
Emission
Compliance
Test
Mitsubishi
Model 501G
Unit 3A
Florida Power and Light
West County Energy Center
Loxahatchee, Florida
April 26, 2011

AIR HYGIENE, INC.

Testing Solutions for a Better World

EMISSION COMPLIANCE TEST
FOR THE
MITSUBISHI, MODEL 501G, UNIT 3A
PREPARED FOR
FLORIDA POWER AND LIGHT
AT THE
WEST COUNTY ENERGY CENTER
LOXAHATCHEE, FLORIDA
APRIL 26, 2011



Corporate Headquarters
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www.airhygiene.com

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Shreveport, LA 71115
Miami, FL 33101
Philadelphia, PA 19136

EMISSION COMPLIANCE TEST
FOR THE
MITSUBISHI, MODEL 501G, UNIT 3A
PREPARED FOR
FLORIDA POWER AND LIGHT
AT THE
WEST COUNTY ENERGY CENTER
LOXAHATCHEE, FLORIDA
APRIL 26, 2011

Prepared and Reviewed by:

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Project Manager

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Director of Quality Assurance

Table of Contents

APPENDICES

Emissions Compliance Test
Mitsubishi, Model 501G, Unit 3A
Florida Power and Light
West County Energy Center
Loxahatchee, Florida
April 26, 2011

1.0 INTRODUCTION

Air Hygiene International, Inc. (Air Hygiene) has completed the emissions testing study for nitrogen oxides (NOx), carbon monoxide (CO), volatile organic compounds (VOC), ammonia (NH_3), opacity, carbon dioxide (CO_2), and oxygen (O_2) from the exhaust of the Mitsubishi, Model 501G, Unit 3A for Florida Power and Light at the West County Energy Center near Loxahatchee, Florida. This report details the background, results, process description, and the sampling/analysis methodology of the stack sampling survey conducted on April 26, 2011.

1.1 TEST PURPOSE AND OBJECTIVES

The purpose of the test was to conduct an initial compliance emission test to document levels of selected pollutants at one test load (Fuel Oil). The information will be used to confirm compliance with the operating permit issued by the Florida Department of Environmental Protection (FDEP). The specific objective was to determine the emission concentration of NOx, CO, VOC, NH_3, opacity, CO_2, and O_2 from the exhaust of Florida Power and Light's Mitsubishi, Model 501G, Unit 3A firing Fuel Oil of total capacity.

1.2 SUMMARY OF TEST PROGRAM

The following list details pertinent information related to this specific project:

1.2.1 Participating Organizations
- Florida Department of Environmental Protection (FDEP)
- Florida Power and Light
- Black and Veatch
- Air Hygiene

1.2.2 Industry
- Electric Utility / Electric Services

1.2.3 Air Permit and Federal Requirements
- Permit Number: PSD-FL-396
- Emission Unit Identification (ID): 013

1.2.4 Plant Location
- West County Energy Center near Loxahatchee, Florida

1.2.5 Equipment Tested
- Mitsubishi, Model 501G, Unit 3A

1.2.6 Emission Points

- Exhaust from the Mitsubishi, Model 501G, Unit 3A
- For all gases, 12 sample points in the exhaust duct from the Mitsubishi, Model 501G, Unit 3A, determined after conducting a stratification test (refer to Appendix F)
- For all NH_3 testing, 24 sampling points in the exhaust duct from the Mitsubishi, Model 501G, Unit 3A (refer to Appendix A)
- For opacity, one sample visual observation point from the exit of the exhaust duct to the atmosphere from the Mitsubishi, Model 501G, Unit 3A

1.2.7 Pollutants Measured

- NOx
- CO
- VOC
- NH_3
- Opacity
- CO_2
- O_2

1.2.8 Date of Emission Test

- April 26, 2011

1.3 KEY PERSONNEL

Florida Power and Light:	John Mirino	305-242-3895
Florida Power and Light:	David Fawcett	561-904-4907
Black and Veatch:	Bill Stevenson	913-458-8549
Air Hygiene:	Jake Fahlenkamp	918-307-8865
Air Hygiene:	Pandu Sattvika	918-307-8865

2.0 SUMMARY OF TEST RESULTS

Results from the sampling conducted on Florida Power and Light's Mitsubishi, Model 501G, Unit 3A located at the West County Energy Center on April 26, 2011 are summarized in the following table.

TABLE 2.1
SUMMARY OF MITSUBISHI, 501G, UNIT 3A RESULTS

Parameter	Fuel Oil Load	Permit Limits
Date (mm/dd/yy)	04/26/11	--
Start Time (hh:mm:ss)	10:08:07	--
End Time (hh:mm:ss)	14:57:37	--
Run Duration (min / run)	71	--
Bar. Pressure (in. Hg)	29.96	--
Amb. Temp. (°F)	87	--
Rel. Humidity (%)	59	--
Spec. Humidity (lb water / lb air)	0.016375	--
Ammonia Injection Rate (lb/hr)	372.3	--
Turbine Fuel Flow (gal/hr)	15,002	--
Total Fuel Flow (SCFH)	2,006	--
Stack Flow (RM19) (SCFH)	53,495,644	--
Stack Moisture (% Method 4)	9.0	--
Heat Input (MMBtu/hr)	1,989.4	2,117
Power Output (megawatts)	208.4	--
NOx (ppmvd)	8.56	--
NOx (ppm@15%O_2)	6.91	8.0
NOx (ppm@15%O_2&ISO)	7.71	--
NOx (lb/hr)	54.67	82.4
NOx (ton/year) at 500 hr/year	13.67	--
NOx (lb/MMBtu)	0.027	--
CO (ppmvd)	6.33	--
CO (ppm@15%O_2)	5.12	8
CO (ppm@15%O_2&ISO)	5.71	--
CO (lb/hr)	24.63	42.0
CO (ton/year) at 500 hr/year	6.16	--
CO (lb/MMBtu)	0.012	--
VOC (ppmvd)	0.48	--
VOC (ppm@15%O_2)	0.39	6
VOC (ppm@15%O_2&ISO)	0.43	--
VOC (lb/hr)	1.06	19.6
VOC (ton/year) at 500 hr/year	0.27	--
VOC (lb/MMBtu)	0.000	--
Sulfur (wt%)	0.0008	0.0015
NH_3 (ppmvd)	0.70	--
NH_3 (ppm@15%O_2)	0.57	5
Opacity (%)	0	10
CO_2 (%)	5.42	--
O_2 (%)	13.60	--

The results of all measured pollutant emissions were below the required limits. All testing was performed without any real or apparent errors. All testing was conducted according to the approved testing protocol. Total hydrocarbons (THC) were reported as VOC.

3.0 SOURCE OPERATION

3.1 PROCESS DESCRIPTION

Florida Power and Light (FPL) owns and operates the West County Energy Center (West County) located at 20505 State Road 80 in Loxahatchee, Florida. West County is a nominal 3,750 megawatt (MW) greenfield power plant and consists of three combined cycle units (Unit 1, 2 and 3). Each combined cycle unit consists of: three nominal 250 MW Mitsubishi Model 501G combustion turbine-electrical generator (CTGs) sets with evaporative inlet cooling systems; three supplementary-fired heat recovery steam generators (HRSGs) with selective catalytic reduction (SCR) reactors; one nominal 428 million British thermal units per hour (MMBtu/hour) based on low heat value (LHV) natural gas-fired duct burner (DB) located within each of the three HRSG's; and a common nominal 500 MW steam turbine-electrical generator (STG). The total nominal generating capacity of each of the "3 on 1" combined cycle unit is approximately 1,250 MW.

Each CTG has a nominal heat input rate of 2,333 MMBtu/hr when firing natural gas and 2,117 MMBtu/hr when firing distillate fuel oil (based on a compressor inlet air temperature of 59 degrees Fahrenheit (°F), the lower heating value (LHV) of each fuel, and 100 percent load), includes an automated gas turbine control system, and has dual-fuel capability of firing natural gas as the primary fuel or ultra-low sulfur distillate (ULSD) fuel oil as a restricted alternate fuel. Each HRSG recovers exhaust, heat energy from each of the CTGs. Each Unit delivers steam to each STG. The efficient combustion of natural gas and restricted firing of ULSD fuel oil minimizes the emissions of carbon monoxide (CO), particulate matter (PM), sulfuric acid mist (H_2SO_4), sulfur dioxide (SO_2) and volatile organic compounds (VOCs). Dry Low-NOx (DLN) combustors for gas firing and water injection for oil firing reduce nitrogen oxides (NOx) emissions. A selective catalyst reduction (SCR) system further reduces NOx emissions.

3.2 SAMPLING LOCATION

The 501G stack is circular and measures 21.9 feet (ft) (263 inches) in diameter at the test ports which are approximately 138 ft above grade level with an exit elevation of approximately 150 ft above grade level. The test ports are located approximately 44.3 ft (531 inches) downstream and approximately 12 ft (144 inches) upstream from the nearest disturbances. All exhaust samples for gaseous emissions were continuously drawn from the exhaust system at the sample ports from 12 points (three points per port) determined after conducting a stratification test (Appendix F). During the stratification test three points were traversed from each of the four ports. The probe was allowed to remain at a point for two times the system response time. For NH_3 testing, an initial velocity traverse was performed across the stack at base load from 24 total points. All NH_3 sampling occurred from the same 24 points by leaving the probe at each for an equal amount of time. All opacity observations were made by viewing the point where the exhaust system exited to the atmosphere at the top of the exhaust stack.

4.0 SAMPLING AND ANALYTICAL PROCEDURES

4.1 TEST METHODS

The emission test on the Mitsubishi, Model 501G, Unit 3A at the West County Energy Center was performed following United States Environmental Protection Agency (EPA) methods described by the Code of Federal Regulations (CFR). Table 4.1 outlines the specific methods performed on April 26, 2011.

TABLE 4.1
SUMMARY OF SAMPLING METHODS

Pollutant or Parameter	Sampling Method	Analysis Method
Sample Point Location	EPA Method 1	Equal Area Method
Stack Flow Rate	EPA Method 2	Pitot
Oxygen	EPA Method 3a	Paramagnetic Cell
Carbon Dioxide	EPA Method 3a	Nondispersive Infrared Analyzer
Nitrogen Oxides	EPA Method 7e	Chemiluminescent Analyzer
Opacity	EPA Method 9	Visual Observation
Carbon Monoxide	EPA Method 10	Nondispersive Infrared Analyzer
Stack Flow Rate	EPA Method 19	Dry Oxygen F Factor
Total Hydrocarbons	EPA Method 25a	Flame Ionization Detector
Ammonia Slip	EPA CTM-027	Ion Chromatography M350.3
Sulfur Content Analysis	ASTM D 5453	Fuel Gas Sample and Laboratory Analysis

4.2 INSTRUMENT CONFIGURATION AND OPERATIONS FOR GAS ANALYSIS

The sampling and analysis procedures used during these tests conform with the methods outlined in the Code of Federal Regulations (CFR), Title 40, Part 60, Appendix A, Methods 1, 2, 3a, 7e, 9, 10, 19, 25a, and Conditional Test Method (CTM)-027.

Figure 4.1 depicts the sample system used for the NOx, CO, THC, CO_2, and O_2 tests. A stainless steel probe was inserted into the sample ports of the stack to extract gas measurements from the emission stream at twelve points in the stack. The gas sample was continuously pulled through the probe and transported, via heat-traced Teflon® tubing, to a stainless steel minimum-contact condenser designed to dry the sample. Transportation of the sample, through Teflon® tubing, continued into the sample manifold within the mobile laboratory via a stainless steel/Teflon® diaphragm pump. From the manifold, the sample was partitioned to the NOx, CO, CO_2, and O_2 analyzers through rotameters that controlled the flow rate of the sample. Exhaust samples were routed to the THC analyzer prior to gas conditioning.

Figure 4.1 shows that the sample system was also equipped with a separate path through which a calibration gas could be delivered to the probe and back through the entire sampling system. This allowed for convenient performance of system bias checks as required by the testing methods.

All instruments were housed in an air-conditioned, trailer-mounted mobile laboratory. Gaseous calibration standards were provided in aluminum cylinders with the concentrations certified by the vendor. EPA Protocol No. 1 was used to determine the cylinder concentrations where applicable (i.e. NOx calibration gases).

Table 4.2 provides a description of the analyzers used for the instrument portion of the tests. All data from the continuous monitoring instruments were recorded on a Logic Beach Portable Data Logging System Hyperlogger which retrieves calibrated electronic data from each instrument every one second and reports an average of the collected data every 30 seconds. Data records can be found in Appendix A and B of this report.

Figure 4.2 represents the sample system used for the wet chemistry tests (NH_3). A heated stainless steel probe with an inconel liner and stainless steel nozzle was inserted into the sample ports of the stack to extract gas measurements from the emission stream through a filter and glass impinger train. Flow rates are monitored with oil filled manometers and total sample volumes are measured with a dry gas meter.

Three test runs of approximately 75 minutes each were conducted on the Mitsubishi, Model 501G, Unit 3A at the maximum test load for NOx, CO, THC, CO_2, NH_3, opacity, and O_2.

The stack gas analysis for O_2 and CO_2 concentrations was performed in accordance with procedures set forth in EPA Method 3a. The O_2 analyzer uses a paramagnetic cell detector and the CO_2 analyzer uses a continuous nondispersive infrared analyzer.

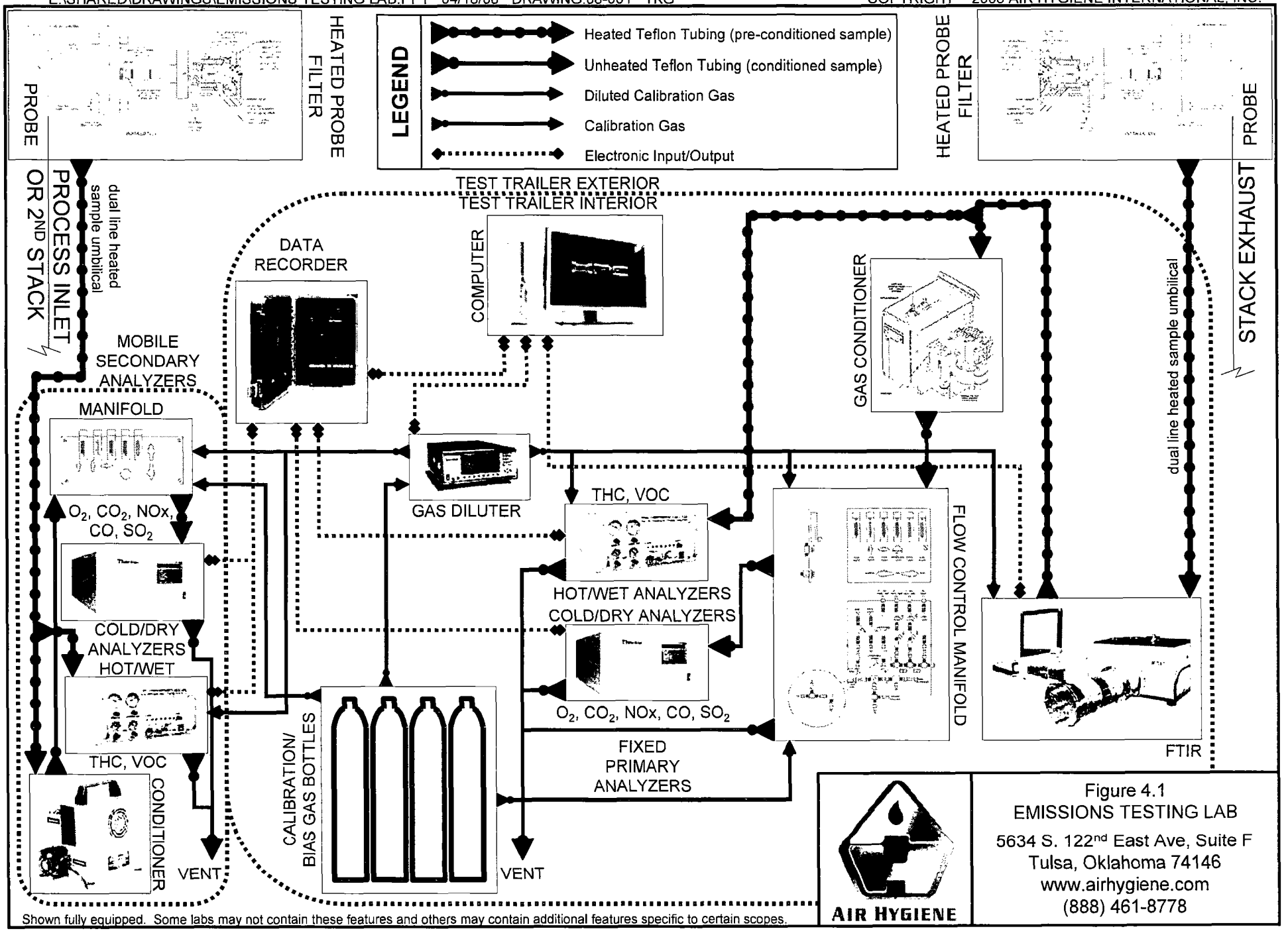
EPA Method 7e was used to determine concentrations of NOx. A chemiluminescent analyzer was used to determine the nitrogen oxides concentration in the gas stream. A NO_2 in nitrogen certified gas cylinder was used to verify at least a 90 percent NO_2 conversion on the day of the test.

CO emission concentrations were quantified in accordance with procedures set forth in EPA Method 10. A continuous nondispersive infrared (NDIR) analyzer was used for this purpose.

THC emission concentrations were quantified in accordance with procedures set forth in EPA Method 25a. A continuous flame ionization (FID) analyzer was used for this purpose. THC emission concentrations were reported as VOC.

TABLE 4.2
ANALYTICAL INSTRUMENTATION

Parameter	Model and Manufacturer	Range	Sensitivity	Detection Principle
NOx	THERMO 42i-HL	User may select up to 5,000 ppm	0.1 ppm	Thermal reduction of NO_2 to NO. Chemiluminescence of reaction of NO with O_3. Detection by PMT. Inherently linear for listed ranges.
CO	THERMO 48i	User may select up to 5,000 ppm	0.1 ppm	Infrared absorption, gas filter correlation detector, microprocessor based linearization.
CO_2	THERMO 410i	0-20%	0.1%	Non-dispersive infrared.
THC	THERMO 51C	User may select up to 10,000 ppm	0.1 ppm	Flame Ionization Detector.
O_2	THERMO 42i-HL	0-25%	0.1%	Paramagnetic cell, inherently linear.



Shown fully equipped. Some labs may not contain these features and others may contain additional features specific to certain scopes.

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Figure 4.1
EMISSIONS TESTING LAB

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Tulsa, Oklahoma 74146
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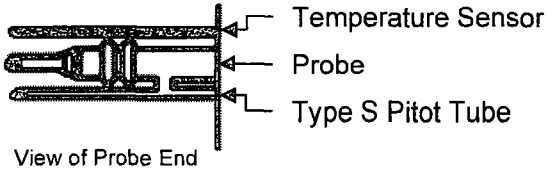

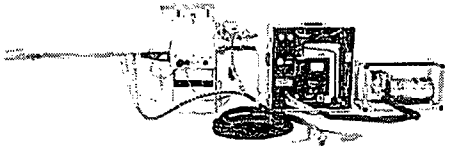
Wet Chemistry Assembly
(photo)

Temperature Sensor
Temperature Sensor
Stack Wall
Liner (glass, stainless steel, or inconel)
Probe Housing (heated opt.)
could add more impingers or other components to system
Temperature Sensor
Impingers
Nozzle
Glass Filter Holder
Heated Area
Ice Water Bath
Vacuum Line
Type S Pitot Tube
Oil-Filler Manometer
Hot Box
Cold Box
Filled with water or other various chemicals to cause capture of condensed liquid or reaction with target compounds
Vacuum Gauge
Temperature Sensor
Temperature Sensor
Orifice
By-pass Valve
Main Valve
Dry Gas Meter
Air-Tight Pump
Oil-Filler Manometer

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Figure 4.2
WET CHEMISTRY ASSEMBLY

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APPENDIX A

TEST RESULTS AND CALCULATIONS

TABLE A.1:
EMISSIONS TESTING SCHEDULE

Unit	Load	Test Type	Run	Date	Start	Stop	Time Sync
3A	Fuel Oil	Stratification Test	1	04/26/11	8:45:37	9:35:07	DAHS
3A	Fuel Oil	Compliance	1	04/26/11	10:08:07	11:13:37	DAHS
3A	Fuel Oil	Compliance	2	04/26/11	11:50:37	13:05:07	DAHS
3A	Fuel Oil	Compliance	3	04/26/11	13:45:07	14:57:37	DAHS
3A	Fuel Oil	Preliminaries	Fuel Oil-V1	04/26/11	9:25:00	10:00:00	DAHS
3A	Fuel Oil	Ammonia	Fuel Oil-1	04/26/11	10:14:00	11:39:00	DAHS
3A	Fuel Oil	Ammonia	Fuel Oil-2	04/26/11	12:09:00	13:37:00	DAHS
3A	Fuel Oil	Ammonia	Fuel Oil-3	04/26/11	13:46:00	15:02:00	DAHS
3A	Fuel Oil	Opacity	1	04/26/11	9:40:00	10:40:00	EST
3A	Fuel Oil	Opacity	2	04/26/11	10:50:00	11:50:00	EST
3A	Fuel Oil	Opacity	3	04/26/11	11:55:00	12:55:00	EST

Note: DAHS Time (EST minus 1hr)

TABLE A.2
MITSUBISHI, 501G, UNIT 3A FUEL OIL LOAD DATA SUMMARY

Parameter	Fuel Oil Load, Run - 1	Fuel Oil Load, Run - 2	Fuel Oil Load, Run - 3	Average
Date (mm/dd/yy)	04/26/11	04/26/11	04/26/11	04/26/11
Start Time (hh:mm:ss)	10:08:07	11:50:37	13:45:07	10:08:07
End Time (hh:mm:ss)	11:13:37	13:05:07	14:57:37	14:57:37
Run Duration (min / run)	66	75	73	71
Bar. Pressure (in. Hg)	29.96	29.97	29.94	29.96
Amb. Temp. (°F)	84	88	90	87
Rel. Humidity (%)	66	58	53	59
Spec. Humidity (lb water / lb air)	0.016543	0.016509	0.016072	0.016375
Ammonia Injection Rate (lb/hr)	361.3	369.5	386.0	372.3
Turbine Fuel Flow (gal/hr)	15,139	15,006	14,862	15,002
Total Fuel Flow (SCFH)	2,024	2,006	1,987	2,006
Stack Flow (RM19) (SCFH)	53,689,658	53,592,114	53,205,160	53,495,644
Stack Moisture (% Method 4)	9.2	9.0	8.9	9.0
Heat Input (MMBtu/hr)	2,040.8	1,973.2	1,954.3	1,989.4
Power Output (megawatts)	210.9	208.4	205.8	208.4
NOx (ppmvd)	8.41	8.79	8.47	8.56
NOx (ppm@15%O_2)	6.76	7.12	6.87	6.91
NOx (ppm@15%O_2&ISO)	7.63	7.94	7.56	7.71
NOx (lb/hr)	53.94	56.29	53.79	54.67
NOx (ton/year) at 500 hr/year	13.48	14.07	13.45	13.67
NOx (lb/MMBtu)	0.026	0.028	0.027	0.027
CO (ppmvd)	6.59	6.48	5.93	6.33
CO (ppm@15%O_2)	5.30	5.25	4.81	5.12
CO (ppm@15%O_2&ISO)	5.98	5.85	5.29	5.71
CO (lb/hr)	25.73	25.25	22.92	24.63
CO (ton/year) at 500 hr/year	6.43	6.31	5.73	6.16
CO (lb/MMBtu)	0.013	0.012	0.011	0.012
VOC (ppmvd)	0.60	0.41	0.43	0.48
VOC (ppm@15%O_2)	0.49	0.33	0.35	0.39
VOC (ppm@15%O_2&ISO)	0.55	0.37	0.38	0.43
VOC (lb/hr)	1.35	0.90	0.94	1.06
VOC (ton/year) at 500 hr/year	0.34	0.23	0.24	0.27
VOC (lb/MMBtu)	0.001	0.000	0.000	0.00
Sulfur (wt%)	0.0008	0.0008	0.0008	0.0008
NH_3 (ppmvd)	0.68	0.70	0.72	0.70
NH_3 (ppm@15%O_2)	0.55	0.57	0.59	0.57
Opacity (%)	0	0	0	0
CO_2 (%)	5.45	5.36	5.44	5.42
O_2 (%)	13.56	13.61	13.63	13.60

TEST RESULTS

NOx, CO, VOC, CO_2, and O_2 Emissions
Fuel Oil Load

Florida Power and Light
April 26, 2011
Mitsubishi, 501G, Unit 3A
West County Energy Center

Fuel Data

Fuel Fd factor	9,241	SCF exh/MMBtu
Fuel Heating Value (LHV)	1,008,409	Btu/SCF fuel
Turbine Fuel Flow	15,139	gal/hr

Weather Data

Barometric Pressure	29.96
Relative Humidity	66
Ambient Temperature	84
Specific Humidity	0.016543

Unit Data

Unit Load	210.9	megawatts
Heat Input	2,041	MMBtu/hr
Combustor Inlet Pressure	256	psig
Ammonia Injection Rate	361	lb/hr
Meas. Stack Moisture	9.2	%
Stack Exhaust Flow (M19)	53,689,658	SCFH

Data from: Run 1 NH3

Fuel Oil Load, Run - 1

Date/Time (mm/dd/yy hh:mm:ss)	Elapsed Time (seconds)	O_2 (%)	NOx (ppmvd)	CO (ppmvd)	VOC (ppmvw)	CO_2 (%)
04/26/11 10:08:07	6180	13.60	9.17	6.00	0.73	5.62
04/26/11 10:08:37	6210	13.59	8.76	5.78	0.72	5.63
04/26/11 10:09:07	6240	13.60	8.77	5.56	0.73	5.64
04/26/11 10:09:37	6270	13.63	8.86	5.78	0.71	5.62
04/26/11 10:10:07	6300	13.60	8.79	6.29	0.72	5.65
04/26/11 10:10:37	6330	13.62	8.73	6.10	0.74	5.63
04/26/11 10:11:07	6360	13.63	8.74	6.47	0.72	5.64
04/26/11 10:11:37	6390	13.58	8.76	6.60	0.71	5.66
04/26/11 10:12:07	6420	13.57	8.95	5.47	0.72	5.70
04/26/11 10:12:37	6450	13.64	9.38	5.44	0.71	5.64
04/26/11 10:13:07	6480	13.70	9.54	7.12	0.71	5.61
04/26/11 10:13:37	6510	13.69	8.75	9.06	0.72	5.57
04/26/11 10:14:07	6540	13.70	7.94	9.39	0.70	5.59
04/26/11 10:14:37	6570	13.68	7.98	8.34	0.69	5.59
04/26/11 10:15:07	6600	13.67	8.74	7.35	0.70	5.61
04/26/11 10:15:37	6630	13.67	9.43	6.78	0.68	5.61
04/26/11 10:16:07	6660	13.65	9.89	6.27	0.68	5.62
04/26/11 10:16:37	6690	13.64	9.85	5.86	0.70	5.63
04/26/11 10:17:07	6720	13.63	9.62	5.37	0.68	5.63
04/26/11 10:17:37	6750	13.64	9.34	5.09	0.67	5.64
04/26/11 10:18:07	6780	13.66	9.15	5.10	0.68	5.62
04/26/11 10:18:37	6810	13.67	8.64	5.79	0.65	5.61
04/26/11 10:19:07	6840	13.68	8.08	6.22	0.65	5.60
04/26/11 10:19:37	6870	13.67	7.81	5.87	0.66	5.63
04/26/11 10:20:07	6900	13.66	8.07	5.40	0.66	5.62
04/26/11 10:20:37	6930	13.68	8.47	5.27	0.64	5.62
04/26/11 10:21:07	6960	13.69	8.53	5.81	0.66	5.60
04/26/11 10:21:37	6990	13.69	8.40	6.25	0.65	5.62
04/26/11 10:22:07	7020	13.69	8.27	6.04	0.66	5.61
04/26/11 10:22:37	7050	13.70	8.42	6.03	0.68	5.62
04/26/11 10:27:37	7350	13.70	7.84	5.97	0.65	5.61
04/26/11 10:28:07	7380	13.70	8.51	6.29	0.65	5.63
04/26/11 10:28:37	7410	13.71	8.48	6.71	0.66	5.61
04/26/11 10:29:07	7440	13.70	8.37	7.10	0.64	5.63
04/26/11 10:29:37	7470	13.69	8.49	6.75	0.66	5.63
04/26/11 10:30:07	7500	13.71	9.08	6.45	0.66	5.64
04/26/11 10:30:37	7530	13.71	9.63	6.70	0.65	5.62
04/26/11 10:31:07	7560	13.71	9.32	7.18	0.66	5.63
04/26/11 10:31:37	7590	13.71	8.42	7.12	0.65	5.63
04/26/11 10:32:07	7620	13.69	8.22	6.61	0.64	5.65
04/26/11 10:32:37	7650	13.68	8.39	6.03	0.64	5.66
04/26/11 10:33:07	7680	13.70	8.62	5.93	0.64	5.66
04/26/11 10:33:37	7710	13.70	8.33	6.53	0.62	5.66
04/26/11 10:34:07	7740	13.70	8.14	6.36	0.63	5.66
04/26/11 10:34:37	7770	13.72	7.98	6.39	0.62	5.65
04/26/11 10:35:07	7800	13.72	7.83	6.70	0.61	5.64
04/26/11 10:35:37	7830	13.71	7.84	6.59	0.62	5.66
04/26/11 10:36:07	7860	13.72	8.02	6.36	0.62	5.65
04/26/11 10:36:37	7890	13.73	8.18	6.38	0.61	5.66
04/26/11 10:37:07	7920	13.73	7.86	6.76	0.62	5.64
04/26/11 10:37:37	7950	13.72	7.65	6.98	0.61	5.66
04/26/11 10:38:07	7980	13.72	7.61	6.74	0.59	5.66
04/26/11 10:38:37	8010	13.72	7.82	6.60	0.61	5.68
04/26/11 10:39:07	8040	13.72	8.05	6.52	0.61	5.68
04/26/11 10:39:37	8070	13.69	8.07	6.26	0.60	5.68
04/26/11 10:40:07	8100	13.60	7.93	6.01	0.60	5.64

Florida Power and Light
April 26, 2011
Mitsubishi, 501G, Unit 3A
West County Energy Center

Fuel Data

Fuel Fd factor	9,241	SCF exh/MMBtu
Fuel Heating Value (LHV)	1,008,409	Btu/SCF fuel
Turbine Fuel Flow	15,139	gal/hr

Weather Data

Barometric Pressure	29.96
Relative Humidity	66
Ambient Temperature	84
Specific Humidity	0.016543

Unit Data

Unit Load	210.9	megawatts
Heat Input	2,041	MMBtu/hr
Combustor Inlet Pressure	256	psig
Ammonia Injection Rate	361	lb/hr
Meas. Stack Moisture	9.2	%
Stack Exhaust Flow (M19)	53,689,658	SCFH

Data from: Run 1 NH3

Fuel Oil Load, Run - 1

Date/Time (mm/dd/yy hh:mm:ss)	Elapsed Time (seconds)	O_2 (%)	NOx (ppmvd)	CO (ppmvd)	VOC (ppmvw)	CO_2 (%)
04/26/11 10:40:37	8130	13.78	8.21	6.56	0.60	5.69
04/26/11 10:41:07	8160	13.78	7.90	6.27	0.60	5.70
04/26/11 10:41:37	8190	13.73	7.69	5.93	0.61	5.67
04/26/11 10:42:07	8220	13.76	7.59	6.79	0.66	5.64
04/26/11 10:42:07	8220	13.76	7.59	6.79	0.66	5.64
04/26/11 10:42:37	8250	13.60	7.93	6.01	0.60	5.64
04/26/11 10:43:07	8280	13.78	8.21	6.56	0.60	5.69
04/26/11 10:43:37	8310	14.07	1.23	2.43	0.78	4.55
04/26/11 10:44:07	8340	13.76	8.51	6.39	0.63	5.65
04/26/11 10:44:37	8370	13.75	9.80	6.83	0.65	5.65
04/26/11 10:45:07	8400	13.74	9.52	7.18	0.64	5.68
04/26/11 10:45:37	8430	13.73	9.17	7.18	0.63	5.67
04/26/11 10:46:07	8460	13.72	9.08	6.81	0.64	5.70
04/26/11 10:46:37	8490	13.66	9.27	6.35	0.64	5.72
04/26/11 10:47:07	8520	13.67	9.53	5.27	0.63	5.74
04/26/11 10:47:37	8550	13.73	9.26	5.84	0.62	5.69
04/26/11 10:48:07	8580	13.77	8.50	7.58	0.64	5.67
04/26/11 10:48:37	8610	13.75	7.93	8.10	0.63	5.67
04/26/11 10:49:07	8640	13.74	7.71	7.41	0.62	5.69
04/26/11 10:49:37	8670	13.74	8.39	6.66	0.63	5.70
04/26/11 10:50:07	8700	13.76	9.08	6.80	0.63	5.68
04/26/11 10:50:37	8730	13.77	9.07	7.63	0.62	5.68
04/26/11 10:51:07	8760	13.77	8.58	8.03	0.62	5.66
04/26/11 10:51:37	8790	13.77	8.17	7.58	0.63	5.68
04/26/11 10:52:07	8820	13.75	7.93	7.08	0.62	5.68
04/26/11 10:52:37	8850	13.73	8.24	6.42	0.61	5.71
04/26/11 10:53:07	8880	13.69	8.54	5.78	0.61	5.73
04/26/11 10:53:37	8910	13.73	8.53	5.60	0.60	5.73
04/26/11 10:54:07	8940	13.77	8.18	6.55	0.60	5.69
04/26/11 10:54:37	8970	13.80	7.59	7.77	0.62	5.68
04/26/11 10:55:07	9000	13.81	7.13	8.72	0.63	5.67
04/26/11 10:55:37	9030	13.79	6.82	8.78	0.60	5.67
04/26/11 10:56:07	9060	13.77	7.21	7.79	0.61	5.71
04/26/11 10:56:37	9090	13.83	8.10	6.75	0.73	5.66
04/26/11 10:59:07	9240	13.82	4.81	5.54	0.67	5.63
04/26/11 10:59:37	9270	13.82	4.81	5.54	0.67	5.63
04/26/11 11:00:07	9300	13.80	7.51	7.00	0.64	5.68
04/26/11 11:00:37	9330	13.78	8.19	6.61	0.63	5.69
04/26/11 11:01:07	9360	13.77	8.82	6.40	0.65	5.70
04/26/11 11:01:37	9390	13.77	9.07	6.44	0.62	5.70
04/26/11 11:02:07	9420	13.80	8.95	6.83	0.62	5.69
04/26/11 11:02:37	9450	13.80	8.63	7.08	0.63	5.70
04/26/11 11:03:07	9480	13.79	8.39	7.22	0.62	5.70
04/26/11 11:03:37	9510	13.78	8.37	7.14	0.62	5.72
04/26/11 11:04:07	9540	13.76	8.57	6.70	0.63	5.72
04/26/11 11:04:37	9570	13.75	8.88	6.27	0.62	5.75
04/26/11 11:05:07	9600	13.74	9.17	6.03	0.61	5.74
04/26/11 11:05:37	9630	13.74	8.77	5.95	0.63	5.77
04/26/11 11:06:07	9660	13.76	8.30	5.94	0.61	5.74
04/26/11 11:06:37	9690	13.80	7.89	6.89	0.60	5.73
04/26/11 11:07:07	9720	13.80	7.49	7.85	0.62	5.72
04/26/11 11:07:37	9750	13.79	7.41	7.54	0.61	5.73
04/26/11 11:08:07	9780	13.76	7.91	6.60	0.61	5.77
04/26/11 11:08:37	9810	13.74	8.63	5.96	0.63	5.76
04/26/11 11:09:07	9840	13.78	9.09	6.03	0.66	5.75
04/26/11 11:09:37	9870	13.78	8.94	6.84	0.66	5.74

Florida Power and Light
April 26, 2011
Mitsubishi, 501G, Unit 3A
West County Energy Center

Fuel Data

Fuel Fd factor	9,241	SCF exh/MMBtu
Fuel Heating Value (LHV)	1,008,409	Btu/SCF fuel
Turbine Fuel Flow	15,139	gal/hr

Weather Data

Barometric Pressure	29.96
Relative Humidity	66
Ambient Temperature	84
Specific Humidity	0.016543

Unit Data

Unit Load	210.9	megawatts
Heat Input	2,041	MMBtu/hr
Combustor Inlet Pressure	256	psig
Ammonia Injection Rate	361	lb/hr
Meas. Stack Moisture	9.2	%
Stack Exhaust Flow (M19)	53,689,658	SCFH

Data from: Run 1 NH3

Fuel Oil Load, Run - 1

Date/Time (mm/dd/yy hh:mm:ss)	Elapsed Time (seconds)	O_2 (%)	NOx (ppmvd)	CO (ppmvd)	VOC (ppmvw)	CO_2 (%)
04/26/11 11:10:07	9900	13.77	8.40	6.97	0.68	5.75
04/26/11 11:10:37	9930	13.78	8.04	6.68	0.67	5.74
04/26/11 11:11:07	9960	13.78	8.09	6.43	0.67	5.75
04/26/11 11:11:37	9990	13.78	8.31	6.54	0.68	5.74
04/26/11 11:12:07	10020	13.79	8.42	6.54	0.68	5.74
04/26/11 11:12:37	10050	13.78	8.33	6.84	0.67	5.74
04/26/11 11:13:07	10080	13.77	8.13	6.62	0.69	5.75
04/26/11 11:13:37	10110	13.79	8.13	6.40	0.68	5.76
RAW AVERAGE		**13.72**	**8.33**	**6.55**	**0.65**	**5.66**

		O_2	NOx	CO	VOC	CO_2
	Serial Number:	INST-N2-0001	INST-N2-0001	INST-CO-0015	INST-TH-0012	INST-C2-0009
		(%)	(ppmvd)	(ppmvd)	(ppmvw)	(%)
Bias	**Initial Zero**	0.09	0.12	0.11	0.00	0.29
Bias	**Final Zero**	0.23	0.21	-0.18	0.20	0.38
Bias	**Avg. Zero**	0.16	0.17	-0.04	0.10	0.34
Bias	**Initial UpScale**	12.19	11.90	12.00	2.98	8.96
Bias	**Final UpScale**	12.34	11.91	12.09	3.10	9.12
Bias	**Avg. UpScale**	12.27	11.91	12.05	3.04	9.04
Upscale Cal Gas		12.10	12.10	12.10	2.89	8.91

EMISSIONS DATA	O_2	NOx	CO	VOC	CO_2
Corrected Raw Average (ppm/% dry basis)	13.56	8.41	6.59	0.60	5.45
Concentration (ppm@ 15%O_2)	N/A	6.76	5.30	0.49	N/A
Concentration (ppm@ 15%O_2 &ISO)	N/A	7.63	5.98	0.55	N/A
Emission Rate (lb/hr)	N/A	53.94	25.73	1.35	N/A
Emission Rate (tons/year) at 500 hr/yr	N/A	13.48	6.43	0.34	N/A
Emission Rate (lb/MMBtu)	N/A	0.026	0.013	0.001	N/A

Florida Power and Light
April 26, 2011
Mitsubishi, 501G, Unit 3A
West County Energy Center

Fuel Data

Fuel Fd factor	9,241	SCF exh/MMBtu
Fuel Heating Value (LHV)	1,008,409	Btu/SCF fuel
Turbine Fuel Flow	15,006	gal/hr

Weather Data

Barometric Pressure	29.97
Relative Humidity	58
Ambient Temperature	88
Specific Humidity	0.016509

Unit Data

Unit Load	208.4	megawatts
Heat Input	1,973	MMBtu/hr
Combustor Inlet Pressure	254	psig
Ammonia Injection Rate	370	lb/hr
Meas. Stack Moisture	9.0	%
Stack Exhaust Flow (M19)	53,592,114	SCFH

Data from: Run 2 NH3

Fuel Oil Load, Run - 2

Date/Time (mm/dd/yy hh:mm:ss)	Elapsed Time (seconds)	O_2 (%)	NOx (ppmvd)	CO (ppmvd)	VOC (ppmvw)	CO_2 (%)
04/26/11 11:52:07	12420	13.79	9.15	4.97	0.64	5.60
04/26/11 11:52:37	12450	13.80	8.12	5.33	0.66	5.58
04/26/11 11:53:07	12480	13.82	7.35	5.58	0.65	5.59
04/26/11 11:53:37	12510	13.83	7.27	5.89	0.65	5.57
04/26/11 11:54:07	12540	13.79	7.52	6.04	0.66	5.61
04/26/11 11:54:37	12570	13.77	8.11	5.34	0.65	5.62
04/26/11 11:55:07	12600	13.82	8.85	5.12	0.65	5.60
04/26/11 11:55:37	12630	13.85	9.15	6.03	0.65	5.56
04/26/11 11:56:07	12660	13.87	8.97	6.96	0.64	5.55
04/26/11 11:56:37	12690	13.87	8.45	7.43	0.62	5.56
04/26/11 11:57:07	12720	13.85	8.29	7.05	0.63	5.56
04/26/11 11:57:37	12750	13.84	8.71	6.28	0.63	5.59
04/26/11 11:58:07	12780	13.83	9.12	5.87	0.62	5.58
04/26/11 11:58:37	12810	13.84	9.28	6.03	0.62	5.60
04/26/11 11:59:07	12840	13.84	9.10	6.32	0.62	5.58
04/26/11 11:59:37	12870	13.85	8.71	6.61	0.61	5.60
04/26/11 12:00:07	12900	13.84	8.41	6.41	0.61	5.60
04/26/11 12:00:37	12930	13.83	8.40	6.11	0.63	5.61
04/26/11 12:01:07	12960	13.85	8.67	6.09	0.62	5.61
04/26/11 12:01:37	12990	13.85	8.77	6.27	0.62	5.61
04/26/11 12:02:07	13020	13.85	8.60	6.59	0.63	5.62
04/26/11 12:02:37	13050	13.85	8.40	6.74	0.61	5.61
04/26/11 12:03:07	13080	13.84	8.47	6.59	0.60	5.64
04/26/11 12:03:37	13110	13.82	8.70	6.12	0.62	5.64
04/26/11 12:04:07	13140	13.82	9.04	5.55	0.60	5.66
04/26/11 12:04:37	13170	13.83	9.20	5.22	0.59	5.64
04/26/11 12:05:07	13200	13.86	9.07	5.98	0.61	5.63
04/26/11 12:05:37	13230	13.84	8.53	6.57	0.60	5.62
04/26/11 12:06:07	13260	13.82	8.42	6.06	0.59	5.63
04/26/11 12:06:37	13290	13.84	8.80	5.41	0.59	5.62
04/26/11 12:08:37	13410	13.86	8.31	6.01	0.63	5.57
04/26/11 12:09:07	13440	13.84	9.04	6.41	0.62	5.59
04/26/11 12:09:37	13470	13.85	9.18	6.58	0.61	5.61
04/26/11 12:10:07	13500	13.86	9.23	6.65	0.61	5.59
04/26/11 12:10:37	13530	13.84	9.26	6.63	0.63	5.61
04/26/11 12:11:07	13560	13.83	9.41	6.41	0.60	5.61
04/26/11 12:11:37	13590	13.84	9.58	6.37	0.61	5.60
04/26/11 12:12:07	13620	13.84	9.51	6.45	0.61	5.61
04/26/11 12:12:37	13650	13.83	9.50	6.33	0.60	5.61
04/26/11 12:13:07	13680	13.83	9.46	6.38	0.60	5.63
04/26/11 12:13:37	13710	13.84	9.45	6.43	0.62	5.60
04/26/11 12:14:07	13740	13.85	9.36	6.73	0.62	5.61
04/26/11 12:14:37	13770	13.83	9.24	6.80	0.61	5.60
04/26/11 12:15:07	13800	13.82	9.41	6.35	0.62	5.62
04/26/11 12:15:37	13830	13.81	9.54	6.32	0.61	5.63
04/26/11 12:16:07	13860	13.82	9.51	6.27	0.61	5.62
04/26/11 12:16:37	13890	13.83	9.32	6.40	0.62	5.64
04/26/11 12:17:07	13920	13.82	9.24	6.52	0.61	5.62
04/26/11 12:17:37	13950	13.82	9.18	6.59	0.59	5.63
04/26/11 12:18:07	13980	13.83	9.19	6.81	0.60	5.62
04/26/11 12:18:37	14010	13.83	9.18	6.92	0.60	5.64
04/26/11 12:19:07	14040	13.81	8.85	6.63	0.58	5.63
04/26/11 12:19:37	14070	13.79	8.26	6.08	0.59	5.65
04/26/11 12:20:07	14100	13.78	8.34	5.43	0.61	5.66
04/26/11 12:20:37	14130	13.83	8.66	5.23	0.60	5.65
04/26/11 12:21:07	14160	13.84	8.57	6.00	0.59	5.62

Florida Power and Light
April 26, 2011
Mitsubishi, 501G, Unit 3A
West County Energy Center

Fuel Data

Fuel Fd factor	9,241	SCF exh/MMBtu
Fuel Heating Value (LHV)	1,008,409	Btu/SCF fuel
Turbine Fuel Flow	15,006	gal/hr

Weather Data

Barometric Pressure	29.97
Relative Humidity	58
Ambient Temperature	88
Specific Humidity	0.016509

Unit Data

Unit Load	208.4	megawatts
Heat Input	1,973	MMBtu/hr
Combustor Inlet Pressure	254	psig
Ammonia Injection Rate	370	lb/hr
Meas. Stack Moisture	9.0	%
Stack Exhaust Flow (M19)	53,592,114	SCFH

Data from: Run 2 NH3

Fuel Oil Load, Run - 2

Date/Time (mm/dd/yy hh:mm:ss)	Elapsed Time (seconds)	O_2 (%)	NOx (ppmvd)	CO (ppmvd)	VOC (ppmvw)	CO_2 (%)
04/26/11 12:21:37	14190	13.84	8.12	6.70	0.61	5.61
04/26/11 12:22:07	14220	13.83	7.99	6.67	0.60	5.63
04/26/11 12:22:37	14250	13.80	8.01	6.09	0.60	5.62
04/26/11 12:23:07	14280	13.83	8.22	5.79	0.62	5.64
04/26/11 12:31:37	14790	13.89	8.36	7.20	0.64	5.57
04/26/11 12:32:07	14820	13.88	8.42	6.36	0.63	5.60
04/26/11 12:32:37	14850	13.89	9.02	5.99	0.62	5.59
04/26/11 12:33:07	14880	13.89	9.57	6.10	0.64	5.60
04/26/11 12:33:37	14910	13.89	9.57	6.28	0.64	5.61
04/26/11 12:34:07	14940	13.89	9.36	6.31	0.62	5.60
04/26/11 12:34:37	14970	13.90	9.13	6.56	0.61	5.60
04/26/11 12:35:07	15000	13.90	8.80	7.02	0.63	5.59
04/26/11 12:35:37	15030	13.88	8.55	7.27	0.63	5.62
04/26/11 12:36:07	15060	13.87	8.73	6.59	0.62	5.62
04/26/11 12:36:37	15090	13.87	9.41	6.18	0.63	5.64
04/26/11 12:37:07	15120	13.88	9.91	6.26	0.64	5.63
04/26/11 12:37:37	15150	13.88	9.71	6.67	0.62	5.63
04/26/11 12:38:07	15180	13.87	9.01	6.61	0.62	5.64
04/26/11 12:38:37	15210	13.89	8.35	6.49	0.63	5.62
04/26/11 12:39:07	15240	13.89	8.31	6.64	0.62	5.64
04/26/11 12:39:37	15270	13.88	8.22	6.79	0.61	5.63
04/26/11 12:40:07	15300	13.87	8.13	6.77	0.62	5.65
04/26/11 12:40:37	15330	13.87	8.15	6.64	0.63	5.64
04/26/11 12:41:07	15360	13.87	8.37	6.61	0.61	5.64
04/26/11 12:41:37	15390	13.88	8.54	6.78	0.61	5.64
04/26/11 12:42:07	15420	13.89	8.50	7.22	0.61	5.63
04/26/11 12:42:37	15450	13.88	8.22	7.60	0.61	5.64
04/26/11 12:43:07	15480	13.88	7.89	7.27	0.60	5.63
04/26/11 12:43:37	15510	13.86	7.91	6.85	0.61	5.67
04/26/11 12:44:07	15540	13.85	8.47	6.08	0.61	5.67
04/26/11 12:44:37	15570	13.85	8.90	5.81	0.60	5.68
04/26/11 12:45:07	15600	13.85	8.66	6.32	0.61	5.66
04/26/11 12:45:37	15630	13.86	7.93	6.65	0.62	5.67
04/26/11 12:46:07	15660	13.86	7.41	6.49	0.61	5.66
04/26/11 12:50:37	15930	13.86	7.93	6.65	0.62	5.67
04/26/11 12:51:07	15960	13.92	8.62	7.40	0.65	5.60
04/26/11 12:51:37	15990	13.93	8.15	6.11	0.64	5.61
04/26/11 12:52:07	16020	13.94	8.45	6.59	0.64	5.61
04/26/11 12:52:37	16050	13.90	8.40	6.84	0.65	5.63
04/26/11 12:53:07	16080	13.89	8.57	6.48	0.67	5.62
04/26/11 12:53:37	16110	13.90	8.97	6.16	0.65	5.65
04/26/11 12:54:07	16140	13.91	9.25	6.11	0.64	5.64
04/26/11 12:54:37	16170	13.92	9.13	6.23	0.65	5.64
04/26/11 12:55:07	16200	13.92	8.66	6.62	0.65	5.64
04/26/11 12:55:37	16230	13.92	8.14	6.79	0.64	5.63
04/26/11 12:56:07	16260	13.91	8.01	6.77	0.65	5.65
04/26/11 12:56:37	16290	13.91	8.30	6.56	0.65	5.65
04/26/11 12:57:07	16320	13.90	8.83	6.35	0.68	5.67
04/26/11 12:57:37	16350	13.90	9.25	6.37	0.66	5.65
04/26/11 12:58:07	16380	13.90	9.21	6.36	0.67	5.66
04/26/11 12:58:37	16410	13.90	8.84	6.33	0.68	5.67
04/26/11 12:59:07	16440	13.89	8.65	6.14	0.68	5.68
04/26/11 12:59:37	16470	13.88	8.66	5.74	0.69	5.69
04/26/11 13:00:07	16500	13.87	8.90	5.40	0.68	5.69
04/26/11 13:00:37	16530	13.85	8.91	5.32	0.67	5.72
04/26/11 13:01:07	16560	13.88	8.79	5.22	0.69	5.68

Florida Power and Light
April 26, 2011
Mitsubishi, 501G, Unit 3A
West County Energy Center

Fuel Data

Fuel Fd factor	9,241	SCF exh/MMBtu
Fuel Heating Value (LHV)	1,008,409	Btu/SCF fuel
Turbine Fuel Flow	15,006	gal/hr

Weather Data

Barometric Pressure	29.97
Relative Humidity	58
Ambient Temperature	88
Specific Humidity	0.016509

Unit Data

Unit Load	208.4	megawatts
Heat Input	1,973	MMBtu/hr
Combustor Inlet Pressure	254	psig
Ammonia Injection Rate	370	lb/hr
Meas. Stack Moisture	9.0	%
Stack Exhaust Flow (M19)	53,592,114	SCFH

Data from: Run 2 NH3

Fuel Oil Load, Run - 2

Date/Time (mm/dd/yy hh:mm:ss)	Elapsed Time (seconds)	O_2 (%)	NOx (ppmvd)	CO (ppmvd)	VOC (ppmvw)	CO_2 (%)
04/26/11 13:01:37	16590	13.92	8.38	6.14	0.69	5.68
04/26/11 13:02:07	16620	13.91	7.64	7.46	0.67	5.65
04/26/11 13:02:37	16650	13.89	7.33	7.24	0.68	5.68
04/26/11 13:03:07	16680	13.86	7.92	6.16	0.68	5.71
04/26/11 13:03:37	16710	13.85	9.10	5.41	0.67	5.71
04/26/11 13:04:07	16740	13.85	10.16	5.28	0.68	5.72
04/26/11 13:04:37	16770	13.89	10.07	5.93	0.69	5.69
04/26/11 13:05:07	16800	13.95	9.07	6.89	1.10	5.69
RAW AVERAGE		**13.86**	**8.73**	**6.34**	**0.63**	**5.63**

		O_2	NOx	CO	VOC	CO_2
	Serial Number:	INST-N2-0001	INST-N2-0001	INST-CO-0015	INST-TH-0012	INST-C2-0009
		(%)	(ppmvd)	(ppmvd)	(ppmvw)	(%)
Bias	Initial Zero	0.23	0.21	-0.18	0.20	0.38
Bias	*Final Zero*	0.29	0.15	-0.18	0.40	0.24
Bias	Avg. Zero	0.26	0.18	-0.18	0.30	0.31
Bias	Initial UpScale	12.34	11.91	12.09	3.10	9.12
Bias	Final UpScale	12.36	11.98	11.90	3.13	9.18
Bias	Avg. UpScale	12.35	11.95	12.00	3.12	9.15
Upscale Cal Gas		12.10	12.10	12.10	2.89	8.91

EMISSIONS DATA	O_2	NOx	CO	VOC	CO_2
Corrected Raw Average (ppm/% dry basis)	13.61	8.79	6.48	0.41	5.36
Concentration (ppm@ 15%O_2)	N/A	7.12	5.25	0.33	N/A
Concentration (ppm@ 15%O_2 &ISO)	N/A	7.94	5.85	0.37	N/A
Emission Rate (lb/hr)	N/A	56.29	25.25	0.90	N/A
Emission Rate (tons/year) at 500 hr/yr	N/A	14.07	6.31	0.23	N/A
Emission Rate (lb/MMBtu)	N/A	0.028	0.012	0.000	N/A

Florida Power and Light
April 26, 2011
Mitsubishi, 501G, Unit 3A
West County Energy Center

Fuel Data

Fuel Fd factor	9,241	SCF exh/MMBtu
Fuel Heating Value (LHV)	1,008,409	Btu/SCF fuel
Turbine Fuel Flow	14,862	gal/hr

Weather Data

Barometric Pressure	29.94
Relative Humidity	53
Ambient Temperature	90
Specific Humidity	0.016072

Unit Data

Unit Load	205.8	megawatts
Heat Input	1,954	MMBtu/hr
Combustor Inlet Pressure	252	psig
Ammonia Injection Rate	386	lb/hr
Meas. Stack Moisture	8.9	%
Stack Exhaust Flow (M19)	53,205,160	SCFH

Data from: Run 3 NH3

Fuel Oil Load, Run - 3

Date/Time (mm/dd/yy hh:mm:ss)	Elapsed Time (seconds)	O_2 (%)	NOx (ppmvd)	CO (ppmvd)	VOC (ppmvw)	CO_2 (%)
04/26/11 13:45:37	19230	13.90	8.91	5.21	0.64	5.75
04/26/11 13:46:07	19260	13.92	8.75	5.62	0.61	5.75
04/26/11 13:46:37	19290	13.93	8.30	6.21	0.61	5.73
04/26/11 13:47:07	19320	13.91	7.94	6.15	0.62	5.76
04/26/11 13:47:37	19350	13.91	8.32	5.30	0.62	5.75
04/26/11 13:48:07	19380	13.91	8.85	5.25	0.60	5.76
04/26/11 13:48:37	19410	13.90	9.28	5.09	0.62	5.77
04/26/11 13:49:07	19440	13.90	9.16	5.09	0.62	5.75
04/26/11 13:49:37	19470	13.92	8.66	5.43	0.61	5.77
04/26/11 13:50:07	19500	13.92	8.01	5.86	0.61	5.75
04/26/11 13:50:37	19530	13.92	7.84	6.03	0.62	5.77
04/26/11 13:51:07	19560	13.91	8.03	6.04	0.60	5.76
04/26/11 13:51:37	19590	13.92	8.27	5.97	0.60	5.77
04/26/11 13:52:07	19620	13.90	8.63	5.79	0.61	5.78
04/26/11 13:52:37	19650	13.88	9.00	5.31	0.59	5.78
04/26/11 13:53:07	19680	13.88	9.45	4.85	0.59	5.81
04/26/11 13:53:37	19710	13.89	9.44	4.78	0.62	5.78
04/26/11 13:54:07	19740	13.93	8.85	5.04	0.60	5.78
04/26/11 13:54:37	19770	13.97	7.95	6.40	0.60	5.74
04/26/11 13:55:07	19800	13.95	6.94	7.37	0.60	5.76
04/26/11 13:55:37	19830	13.93	6.92	6.54	0.60	5.76
04/26/11 13:56:07	19860	13.91	7.64	6.04	0.60	5.77
04/26/11 13:56:37	19890	13.90	9.11	5.47	0.61	5.80
04/26/11 13:57:07	19920	13.90	10.10	5.53	0.60	5.78
04/26/11 13:57:37	19950	13.90	9.92	5.53	0.59	5.81
04/26/11 13:58:07	19980	13.89	9.09	5.45	0.59	5.79
04/26/11 13:58:37	20010	13.91	8.51	5.32	0.60	5.79
04/26/11 13:59:07	20040	13.92	8.46	5.51	0.59	5.78
04/26/11 13:59:37	20070	13.92	8.33	5.75	0.59	5.77
04/26/11 14:00:07	20100	13.90	8.35	5.60	0.61	5.79
04/26/11 14:04:07	20340	13.90	8.87	5.50	0.60	5.79
04/26/11 14:04:37	20370	13.91	9.04	5.54	0.60	5.82
04/26/11 14:05:07	20400	13.90	9.22	5.53	0.62	5.81
04/26/11 14:05:37	20430	13.90	9.04	5.65	0.61	5.82
04/26/11 14:06:07	20460	13.91	8.92	5.85	0.60	5.82
04/26/11 14:06:37	20490	13.91	8.80	6.16	0.63	5.81
04/26/11 14:07:07	20520	13.90	8.77	6.09	0.61	5.83
04/26/11 14:07:37	20550	13.88	9.00	5.69	0.59	5.83
04/26/11 14:08:07	20580	13.84	9.55	5.09	0.60	5.85
04/26/11 14:08:37	20610	13.90	10.10	5.00	0.61	5.82
04/26/11 14:09:07	20640	13.94	9.73	5.93	0.59	5.81
04/26/11 14:09:37	20670	13.96	8.45	6.97	0.60	5.78
04/26/11 14:10:07	20700	13.94	6.75	7.15	0.61	5.79
04/26/11 14:10:37	20730	13.91	6.77	6.12	0.59	5.83
04/26/11 14:11:07	20760	13.90	7.75	5.41	0.58	5.82
04/26/11 14:11:37	20790	13.89	8.98	5.13	0.59	5.84
04/26/11 14:12:07	20820	13.88	9.36	5.13	0.60	5.82
04/26/11 14:12:37	20850	13.93	8.85	5.52	0.59	5.82
04/26/11 14:13:07	20880	13.92	8.00	5.78	0.61	5.82
04/26/11 14:13:37	20910	13.91	7.47	5.73	0.61	5.82
04/26/11 14:14:07	20940	13.89	7.34	5.26	0.59	5.85
04/26/11 14:14:37	20970	13.89	7.58	4.99	0.60	5.85
04/26/11 14:15:07	21000	13.90	7.91	5.05	0.61	5.86
04/26/11 14:15:37	21030	13.87	7.79	5.09	0.59	5.85
04/26/11 14:16:07	21060	13.84	7.65	4.69	0.59	5.89
04/26/11 14:16:37	21090	13.83	7.47	4.47	0.59	5.90

Florida Power and Light
April 26, 2011
Mitsubishi, 501G, Unit 3A
West County Energy Center

Fuel Data

Fuel Fd factor	9,241	SCF exh/MMBtu
Fuel Heating Value (LHV)	1,008,409	Btu/SCF fuel
Turbine Fuel Flow	14,862	gal/hr

Weather Data

Barometric Pressure	29.94
Relative Humidity	53
Ambient Temperature	90
Specific Humidity	0.016072

Unit Data

Unit Load	205.8	megawatts
Heat Input	1,954	MMBtu/hr
Combustor Inlet Pressure	252	psig
Ammonia Injection Rate	386	lb/hr
Meas. Stack Moisture	8.9	%
Stack Exhaust Flow (M19)	53,205,160	SCFH

Data from: Run 3 NH3

Fuel Oil Load, Run - 3

Date/Time (mm/dd/yy hh:mm:ss)	Elapsed Time (seconds)	O_2 (%)	NOx (ppmvd)	CO (ppmvd)	VOC (ppmvw)	CO_2 (%)
04/26/11 14:17:07	21120	13.88	7.04	5.54	0.58	5.87
04/26/11 14:17:37	21150	13.91	6.34	6.48	0.59	5.86
04/26/11 14:18:07	21180	13.97	6.41	7.42	0.60	5.81
04/26/11 14:18:37	21210	13.96	6.80	8.41	0.60	5.82
04/26/11 14:23:07	21480	13.94	8.57	6.32	0.63	5.84
04/26/11 14:23:37	21510	13.93	7.69	6.93	0.62	5.83
04/26/11 14:24:07	21540	13.91	7.72	6.36	0.60	5.85
04/26/11 14:24:37	21570	13.89	8.22	6.02	0.60	5.86
04/26/11 14:25:07	21600	13.88	9.16	5.27	0.59	5.88
04/26/11 14:25:37	21630	13.88	10.01	5.26	0.59	5.88
04/26/11 14:26:07	21660	13.90	10.16	5.70	0.60	5.86
04/26/11 14:26:37	21690	13.89	9.68	6.14	0.59	5.88
04/26/11 14:27:07	21720	13.88	9.07	5.98	0.57	5.87
04/26/11 14:27:37	21750	13.89	8.90	5.86	0.58	5.88
04/26/11 14:28:07	21780	13.89	8.93	6.03	0.58	5.87
04/26/11 14:28:37	21810	13.88	8.91	5.82	0.57	5.89
04/26/11 14:29:07	21840	13.89	8.66	5.64	0.59	5.87
04/26/11 14:29:37	21870	13.90	8.59	6.03	0.58	5.87
04/26/11 14:30:07	21900	13.88	8.46	6.04	0.57	5.90
04/26/11 14:30:37	21930	13.87	8.50	5.47	0.58	5.90
04/26/11 14:31:07	21960	13.89	8.72	5.23	0.59	5.90
04/26/11 14:31:37	21990	13.93	8.81	5.78	0.57	5.86
04/26/11 14:32:07	22020	13.92	8.46	6.67	0.57	5.86
04/26/11 14:32:37	22050	13.90	7.95	6.52	0.57	5.88
04/26/11 14:33:07	22080	13.90	8.21	5.47	0.56	5.88
04/26/11 14:33:37	22110	13.93	8.36	5.30	0.56	5.88
04/26/11 14:34:07	22140	13.94	8.31	5.90	0.58	5.86
04/26/11 14:34:37	22170	13.91	7.96	6.10	0.57	5.89
04/26/11 14:35:07	22200	13.89	7.73	5.41	0.56	5.89
04/26/11 14:35:37	22230	13.90	7.83	5.05	0.60	5.91
04/26/11 14:36:07	22260	13.91	7.81	5.47	0.61	5.89
04/26/11 14:36:37	22290	13.91	7.48	6.12	0.59	5.89
04/26/11 14:37:07	22320	13.89	7.25	6.07	0.58	5.90
04/26/11 14:37:37	22350	13.90	7.50	5.40	0.58	5.90
04/26/11 14:43:07	22680	13.94	8.47	6.07	0.60	5.86
04/26/11 14:43:37	22710	13.91	8.21	5.73	0.59	5.89
04/26/11 14:44:07	22740	13.89	8.32	5.21	0.61	5.90
04/26/11 14:44:37	22770	13.91	8.81	4.95	0.61	5.90
04/26/11 14:45:07	22800	13.91	9.02	5.28	0.60	5.91
04/26/11 14:45:37	22830	13.90	8.81	5.44	0.62	5.90
04/26/11 14:46:07	22860	13.91	8.51	5.67	0.61	5.92
04/26/11 14:46:37	22890	13.90	8.37	5.60	0.64	5.91
04/26/11 14:47:07	22920	13.89	8.45	5.04	0.64	5.93
04/26/11 14:47:37	22950	13.91	8.55	4.95	0.65	5.92
04/26/11 14:48:07	22980	13.91	8.38	5.32	0.62	5.91
04/26/11 14:48:37	23010	13.92	8.12	5.56	0.63	5.91
04/26/11 14:49:07	23040	13.91	7.89	5.71	0.64	5.91
04/26/11 14:49:37	23070	13.93	7.84	5.59	0.64	5.91
04/26/11 14:50:07	23100	13.95	7.96	5.81	0.65	5.89
04/26/11 14:50:37	23130	13.95	7.97	6.08	0.64	5.90
04/26/11 14:51:07	23160	13.93	8.10	6.00	0.64	5.90
04/26/11 14:51:37	23190	13.92	8.41	5.55	0.65	5.92
04/26/11 14:52:07	23220	13.92	8.80	5.51	0.65	5.90
04/26/11 14:52:37	23250	13.94	8.80	5.80	0.65	5.91
04/26/11 14:53:07	23280	13.93	8.38	5.98	0.65	5.92
04/26/11 14:53:37	23310	13.93	8.07	5.57	0.66	5.91

Florida Power and Light
April 26, 2011
Mitsubishi, 501G, Unit 3A
West County Energy Center

Fuel Data

Fuel Fd factor	9,241	SCF exh/MMBtu
Fuel Heating Value (LHV)	1,008,409	Btu/SCF fuel
Turbine Fuel Flow	14,862	gal/hr

Weather Data

Barometric Pressure	29.94
Relative Humidity	53
Ambient Temperature	90
Specific Humidity	0.016072

Unit Data

Unit Load	205.8	megawatts
Heat Input	1,954	MMBtu/hr
Combustor Inlet Pressure	252	psig
Ammonia Injection Rate	386	lb/hr
Meas. Stack Moisture	8.9	%
Stack Exhaust Flow (M19)	53,205,160	SCFH

Data from: Run 3 NH3

Fuel Oil Load, Run - 3

Date/Time (mm/dd/yy hh:mm:ss)	Elapsed Time (seconds)	O_2 (%)	NOx (ppmvd)	CO (ppmvd)	VOC (ppmvw)	CO_2 (%)
04/26/11 14:54:07	23340	13.94	7.99	5.58	0.65	5.92
04/26/11 14:54:37	23370	13.94	7.96	5.80	0.64	5.90
04/26/11 14:55:07	23400	13.92	7.84	5.96	0.67	5.93
04/26/11 14:55:37	23430	13.93	7.89	5.61	0.67	5.91
04/26/11 14:56:07	23460	13.93	8.11	5.49	0.65	5.93
04/26/11 14:56:37	23490	13.93	8.28	5.69	0.66	5.91
04/26/11 14:57:07	23520	13.94	8.22	6.12	0.65	5.92
04/26/11 14:57:37	23550	13.93	8.04	6.08	0.65	5.92
RAW AVERAGE		**13.91**	**8.37**	**5.72**	**0.61**	**5.85**

		O_2	NOx	CO	VOC	CO_2
	Serial Number:	INST-N2-0001	INST-N2-0001	INST-CO-0015	INST-TH-0012	INST-C2-0009
		(%)	(ppmvd)	(ppmvd)	(ppmvw)	(%)
Bias	Initial Zero	0.29	0.15	-0.18	0.40	0.24
	Final Zero	0.33	0.18	-0.15	0.10	0.43
	Avg. Zero	0.31	0.17	-0.17	0.25	0.34
	Initial UpScale	12.36	11.98	11.90	3.13	9.18
	Final UpScale	12.41	11.82	11.79	3.01	9.54
	Avg. UpScale	12.39	11.90	11.85	3.07	9.36
Upscale Cal Gas		12.10	12.10	12.10	2.89	8.91

EMISSIONS DATA	O_2	NOx	CO	VOC	CO_2
Corrected Raw Average (ppm/% dry basis)	13.63	8.47	5.93	0.43	5.44
Concentration (ppm@ 15%O_2)	N/A	6.87	4.81	0.35	N/A
Concentration (ppm@ 15%O_2 &ISO)	N/A	7.56	5.29	0.38	N/A
Emission Rate (lb/hr)	N/A	53.79	22.92	0.94	N/A
Emission Rate (tons/year) at 500 hr/yr	N/A	13.45	5.73	0.24	N/A
Emission Rate (lb/MMBtu)	N/A	0.027	0.011	0.000	N/A

TEST RESULTS

NH_3 Emissions
Fuel Oil Load

CTM 027 (AMMONIA) SOURCE SAMPLING TITLE PAGE

Source Information	
Plant Name	West County Energy Center
Sampling Location	Unit 3A
Fuel Type	Oil, Distillate

Test Information			
Project #		bv-10-westcounty.fl-comp#2	
Operator		NA	
Date for Preliminary Run	(mm/dd/yy)	04/26/11	
Standard Temperature		68	°F
Standard Pressure		29.92	in Hg
Required Sample Vol.	indust. spec.	35	scf
Run Duration	chk Subpart	60	minutes
Unit Number		3A	
Base Run Number		Fuel Oil	
Number of Ports Available		4	
Number of Ports Used		4	
Port Inside Diameter		6.00	in
Stack Shape		Circular	

Test Equipment Information					
Run		**1**	**2**	**3**	
Test Date	(mm/dd/yy)	04/26/11	04/26/11	04/26/11	
Load	% or w/DB	Fuel Oil	Fuel Oil	Fuel Oil	
Fuel F-Factor		9241.06	9241.06	9241.06	dscf/MMBtu
Meter Box Number	from ACS	SAMP-CP-0010	SAMP-CP-0010	SAMP-CP-0010	
Meter Calibration Factor	(Y)	0.991	0.991	0.991	
Orifice Meter Coefficient	($\Delta H_@$)	1.745	1.745	1.745	in H_2O
Pitot Identification	from ACS	SAMP-HP-0001	SAMP-HP-0001	SAMP-HP-0001	
Pitot Tube Coefficient	(C_p)	0.840	0.840	0.840	
Nozzle Number	from ACS	I8	I8	I8	
Nozzle Diameter	(D_n)	0.204	0.204	0.204	in
Probe Number	from ACS	SAMP-HP-0001	SAMP-HP-0001	SAMP-HP-0001	
Probe Length		120.0	120.0	120.0	in
(SS, Glass ....) Liner Material	from list	inconel	inconel	inconel	
Sample Case / Oven Number	from ACS	SAMP-BH-0025	SAMP-BH-0025	SAMP-BH-0025	
Impinger Case Number	from ACS	SAMP-BC-0021	SAMP-BC-0020	SAMP-BC-0021	

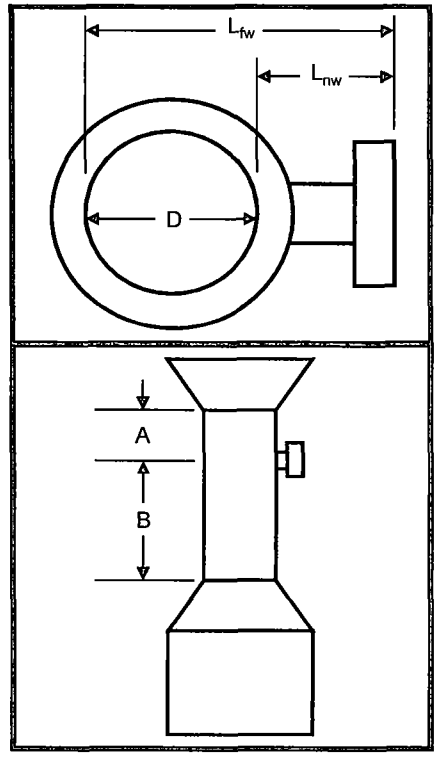
Testing Company Information	
Company Name	Air Hygiene International, Inc. (Tulsa, Oklahoma)
Address	5634 S. 122nd East Avenue, Suite F
City, State Zip	Tulsa, Oklahoma 74146
Project Manager	Jake Fahlenkamp
Phone Number	(918) 307-8865
Fax Number	(918) 307-9131

METHOD 1 - SAMPLE AND VELOCITY TRAVERSES FOR CIRCULAR SOURCES

Plant Name	West County Energy Center	**Date**	04/26/11
Sampling Location	Unit 3A	**Stack Type**	Circular
Operator	NA	**Ports Available**	4
Project #	bv-10-westcounty.fl-comp#2	**Ports Used**	4
Stack Size	Large (>24 inch diameter)	**Port ID (inches)**	6.00

Circular Stack or Duct Diameter			
Distance to Far Wall of Stack	(L_{fw})	282.38	in
Distance to Near Wall of Stack	(L_{nw})	19.00	in
Diameter of Stack	(D)	263.38	in
Area of Stack	(A_s)	378.35	ft²

Distance from Port to Disturbances			
Distance Upstream	(A)	144.00	in
Diameters Upstream	(A_D)	0.55	diameters
Distance Downstream	(B)	531.75	in
Diameters Downstream	(B_D)	2.02	diameters



Number of Traverse Points Required			
Diameters to Flow Disturbance		**Minimum Number of[1] Traverse Points**	
Down Stream	**Up Stream**	**Particulate Points**	**Velocity Points**
2.00-4.99	0.50-1.24	24	16
5.00-5.99	1.25-1.49	20	16
6.00-6.99	1.50-1.74	16	12
7.00-7.99	1.75-1.99	12	12
>= 8.00	>=2.00	8 or 12[2]	8 or 12[2]
Upstream Spec		24	16
Downstream Spec		24	16
Traverse Pts Required		24	16

[1] Check Minimum Number of Points for the Upstream and Downstream conditions, then use the largest.

[2] 8 for Circular Stacks 12 to 24 inches
12 for Circular Stacks over 24 inches

Number of Traverse Points Used			
4	**Ports by**	6	**Across**
24	**Pts Used**	24	**Required**
(•) Method 1 Trav	( ) 12 Point PM Trav	( ) Veloci	

Location of Traverse Points in Circular Stacks									
Traverse Point Number	(Fraction of Stack Dimension from Inside Wall to Traverse Point) Number of Traverse Points Across the Stack								
	2	4	6	8	10	12	14	16	18
1	.146	.067	.044	.032	.026	.021	.018	.016	.014
2	.854	.250	.146	.105	.082	.067	.057	.049	.044
3		.750	.296	.194	.146	.118	.099	.085	.075
4		.933	.704	.323	.226	.177	.146	.125	.109
5			.854	.677	.342	.250	.201	.169	.146
6			.956	.806	.658	.356	.269	.220	.188
7				.895	.774	.644	.366	.283	.236
8				.968	.854	.750	.634	.375	.296
9					.918	.823	.731	.625	.382
10					.974	.862	.799	.717	.618
11						.933	.854	.780	.704
12						.979	.901	.831	.764

Traverse Point Locations			
Traverse Point Number	**Fraction of Stack Diameter**	**Distance from Inside Wall**	**Distance Including Reference Length**
		in	in
1	0.021	5 4/8	24 4/8
2	0.067	17 5/8	36 5/8
3	0.118	31 1/8	50 1/8
4	0.177	46 5/8	65 5/8
5	0.250	65 7/8	84 7/8
6	0.356	93 6/8	112 6/8
7			
8			
9			

METHOD 2 - DETERMINATION OF STACK GAS VELOCITY AND VOLUMETRIC FLOW RATE

Plant Name	West County Energy Center			
Sampling Location	Unit 3A			
Operator	NA			
Project #	bv-10-westcounty.fl-comp#2			
Pitot Leak Check	x	PreTest	x	PostTest

Date	04/26/11		
Stack Type	Circular		
Ports Available	4		
Pitot Identification	SAMP-HP-0001		
Pitot Coefficient	0.840		

Stack Dimensions			
Area of Stack	(A_s)	378.35	ft²
Diameter of Stack	(D)	263.38	in

Pressures			
Barometric Pressure	(P_b)	29.96	in Hg
Static Pressure	(P_{static})	-1.00	in H_2O
Absolute Stack Pressure	(P_s)	29.89	in Hg

Stack Gas Composition			
Composition Data:	Actual Composition		
Carbon Dioxide Concentration	(%CO_2)	5.42	%vd
Oxygen Concentration	(%O_2)	13.60	%vd
Carbon Monoxide Concentration	(ppmCO)	6.33	ppmvd
Nitrogen Concentration	(%N_2)	80.98	%vd
Stack Moisture Content	(B_{ws})	9.02	%
Stack Dry Molecular Weight	(M_d)	29.41	lb/lb-mole
Stack Wet Molecular Weight	(M_w)	28.38	lb/lb-mole

Results			
Avg Stack Gas Velocity	(v_s)	66.48	ft/sec
Avg Stack Dry Std Flow Rate	(Q_{sd})	60,862,519	dscf/hr
Avg Stack Dry Std Flow Rate	(Q_{sd})	1,014,375	dscf/min
Avg Stack Wet Flow Rate	(Q_{aw})	1,509,046	acf/min
Avg Stack Wet Std Flow Rate	(Q_{sw})	66,896,591	ascf/hr

40 CFR 60, Method 2G, Section 8.11.1 (but applies to all Method 2 type static pressure measurements):
If a Type S probe is used for this measurement, position the probe at or between any traverse point(s) and rotate the probe until a null differential pressure reading is obtained. Disconnect the tubing from one of the pressure ports; read and record the ΔP. For pressure devices with one-directional scales, if a deflection in the positive direction is noted with the negative side disconnected, then the static pressure is positive. Likewise, if a deflection in the positive direction is noted with the positive side disconnected, then the static pressure is negative.

Stack Cross Section Schematic

Velocity Traverse Data				
Run Number	Fuel Oil-V1			
Run Time	09:25	Start	10:00	End
Traverse Point	Velocity Head (Δp)	Null Angle (N_a)	Stack Temp (t_s)	Local Velocity ($v_{s(l)}$)
	in H_2O	deg	°F	ft/sec
A-1	0.88	0	253	61.76
A-2	0.94	0	255	63.92
A-3	0.94	0	255	63.92
A-4	0.90	0	254	62.50
A-5	0.85	0	254	60.74
A-6	0.65	0	252	53.04
B-1	0.85	0	253	60.70
B-2	0.88	0	255	61.85
B-3	0.87	0	255	61.50
B-4	0.84	0	254	60.38
B-5	0.75	0	254	57.06
B-6	0.55	0	252	48.79
C-1	1.00	0	253	65.84
C-2	1.20	0	255	72.22
C-3	1.30	0	255	75.17
C-4	1.30	0	254	75.12
C-5	1.30	0	254	75.12
C-6	1.10	0	252	69.00
D-1	1.00	0	253	65.84
D-2	1.20	0	255	72.22
D-3	1.40	0	255	78.01
D-4	1.40	0	254	77.96
D-5	1.50	0	254	80.69
D-6	1.20	0	252	72.07
Average	1.03	0	254	
	1.01	= Square roots of Δp		

METHOD 3a - DETERMINATION OF DRY MOLECULAR WEIGHT BY ANALYZER

Plant Name	West County Energy Center	**Date**	04/26/11		
Sampling Location	Unit 3A	**Operator**	NA		
Project #	bv-10-westcounty.fl-comp#2	**# of Ports Used**	1 (gas probe)		
Fuel Type	Oil, Distillate	**Min. Fuel Factor**	1.260	**Max. Fuel Factor**	1.413

Gas Analysis Data

Run Number	Fuel Oil-1		**Run Start Time**		10:14	**Run Stop Time**	11:39	
Sample Analysis Time	**CO_2 Conc.**	**O_2 Conc.**	**CO Conc.**	**N_2 Conc.**	**Dry Molecular Weight**	**Calculated Fuel Factor**	**Excess Air**	**Fuel Factor in Range**
	($\%CO_2$)	($\%O_2$)	(ppmCO)	($\%N_2$)	(M_d)	$(F_o)_{avg}$	$(\%EA)_{avg}$	
hh:mm	%	%	ppm	%	lb/lb-mole		%	
01:25	5.5	13.6	6.6	81.0	29.41	1.347	173.4	YES

Gas Analysis Data

Run Number	Fuel Oil-2		**Run Start Time**		12:09	**Run Stop Time**	13:37	
Sample Analysis Time	**CO_2 Conc.**	**O_2 Conc.**	**CO Conc.**	**N_2 Conc.**	**Dry Molecular Weight**	**Calculated Fuel Factor**	**Excess Air**	**Fuel Factor in Range**
	($\%CO_2$)	($\%O_2$)	(ppmCO)	($\%N_2$)	(M_d)	$(F_o)_{avg}$	$(\%EA)_{avg}$	
hh:mm	%	%	ppm	%	lb/lb-mole		%	
01:28	5.4	13.6	6.5	81.0	29.40	1.360	174.9	YES

Gas Analysis Data

Run Number	Fuel Oil-3		**Run Start Time**		13:46	**Run Stop Time**	15:02	
Sample Analysis Time	**CO_2 Conc.**	**O_2 Conc.**	**CO Conc.**	**N_2 Conc.**	**Dry Molecular Weight**	**Calculated Fuel Factor**	**Excess Air**	**Fuel Factor in Range**
	($\%CO_2$)	($\%O_2$)	(ppmCO)	($\%N_2$)	(M_d)	$(F_o)_{avg}$	$(\%EA)_{avg}$	
hh:mm	%	%	ppm	%	lb/lb-mole		%	
01:16	5.4	13.6	5.9	80.9	29.42	1.336	176.2	YES

METHOD 4 - DETERMINATION OF MOISTURE CONTENT IN STACK GASES

Plant Name	West County Energy Center	**Date**	04/26/11
Sampling Location	Unit 3A	**Operator**	NA
Project #	bv-10-westcounty.fl-comp#2	**Ports Used**	4

Moisture Content Data									
Run Number		Fuel Oil-1		**Run Start Time**	10:14		**Run Stop Time**	11:39	
Meter Box Number		SAMP-CP-0010			**Meter Cal Factor**	(Y)	0.991		
Total Meter Volume		(V_m)	38.031	dcf	**Barometric Pressure**	(P_b)	29.96	in Hg	
Average Stack Temp		$(t_s)_{avg}$	247	°F	**Stack Static Pressure**	(P_{static})	-1.00	in H_2O	
Average Meter Temp		$(t_m)_{avg}$	98	°F	**Avg Orifice Pressure**	$(\Delta H)_{avg}$	1.20	in H_2O	
		Impinger 1	**Impinger 2**	**Impinger 3**	**Impinger 4**	**Impinger 5**	**Impinger 6**	**Impinger 7**	**Impinger 8**
		(g)	(g)	(g)	(g)				
Contents		H_2SO_4	H_2SO_4	-	Sil Gel				
Final Value	$(V_f),(W_f)$	814.10	773.60	614.60	870.00				
Initial Value	$(V_i),(W_i)$	754.80	764.90	612.90	862.90				
Net Value	$(V_n),(W_n)$	59.3	8.7	1.7	7.1				
Results									
Total Weight	(W_t)	76.80	g	**Water Vol Weighed**	$(V_{wsg(std)})$	3.621	scf		
Std Meter Volume	$(V_{m(std)})$	35.814	dscf	**Sat. Moisture Content**	$(B_{ws(svp)})$	100.00	%		
Calc Moisture Content	$(B_{ws(calc)})$	9.18	%	**Final Moisture Content**	(B_{ws})	9.18	%		

Moisture Content Data									
Run Number		Fuel Oil-2		**Run Start Time**	12:09		**Run Stop Time**	13:37	
Meter Box Number		SAMP-CP-0010			**Meter Cal Factor**	(Y)	0.991		
Total Meter Volume		(V_m)	39.709	dcf	**Barometric Pressure**	(P_b)	29.97	in Hg	
Average Stack Temp		$(t_s)_{avg}$	247	°F	**Stack Static Pressure**	(P_{static})	-1.00	in H_2O	
Average Meter Temp		$(t_m)_{avg}$	101	°F	**Avg Orifice Pressure**	$(\Delta H)_{avg}$	1.25	in H_2O	
		Impinger 1	**Impinger 2**	**Impinger 3**	**Impinger 4**	**Impinger 5**	**Impinger 6**	**Impinger 7**	**Impinger 8**
		(g)	(g)	(g)	(g)				
Contents		H_2SO_4	H_2SO_4	-	Sil Gel				
Final Value	$(V_f),(W_f)$	793.70	759.90	611.00	835.60				
Initial Value	$(V_i),(W_i)$	736.80	751.10	608.30	825.80				
Net Value	$(V_n),(W_n)$	56.9	8.8	2.7	9.8				
Results									
Total Weight	(W_t)	78.20	g	**Water Vol Weighed**	$(V_{wsg(std)})$	3.687	scf		
Std Meter Volume	$(V_{m(std)})$	37.232	dscf	**Sat. Moisture Content**	$(B_{ws(svp)})$	100.00	%		
Calc Moisture Content	$(B_{ws(calc)})$	9.01	%	**Final Moisture Content**	(B_{ws})	9.01	%		

Moisture Content Data									
Run Number		Fuel Oil-3		**Run Start Time**	13:46		**Run Stop Time**	15:02	
Meter Box Number		SAMP-CP-0010			**Meter Cal Factor**	(Y)	0.991		
Total Meter Volume		(V_m)	39.019	dcf	**Barometric Pressure**	(P_b)	29.94	in Hg	
Average Stack Temp		$(t_s)_{avg}$	246	°F	**Stack Static Pressure**	(P_{static})	-1.00	in H_2O	
Average Meter Temp		$(t_m)_{avg}$	101	°F	**Avg Orifice Pressure**	$(\Delta H)_{avg}$	1.28	in H_2O	
		Impinger 1	**Impinger 2**	**Impinger 3**	**Impinger 4**	**Impinger 5**	**Impinger 6**	**Impinger 7**	**Impinger 8**
		(g)	(g)	(g)	(g)				
Contents		H_2SO_4	H_2SO_4	-	Sil Gel				
Final Value	$(V_f),(W_f)$	812.80	774.30	615.80	875.20				
Initial Value	$(V_i),(W_i)$	757.00	766.00	612.80	867.00				
Net Value	$(V_n),(W_n)$	55.8	8.3	3.0	8.2				
Results									
Total Weight	(W_t)	75.30	g	**Water Vol Weighed**	$(V_{wsg(std)})$	3.550	scf		
Std Meter Volume	$(V_{m(std)})$	36.550	dscf	**Sat. Moisture Content**	$(B_{ws(svp)})$	100.00	%		
Calc Moisture Content	$(B_{ws(calc)})$	8.85	%	**Final Moisture Content**	(B_{ws})	8.85	%		

CTM 027 (AMMONIA) SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

Plant Name	West County Energy Center
Sampling Location	Unit 3A
Project #	bv-10-westcounty.fl-comp#2

Date	04/26/11
Operator	NA
Run Number	Fuel Oil-1

Ideal Nozzle Diameter and IsoKinetic Factor Setup			
Pitot Coefficient	(C_p)	0.840	
Average Stack Temp	(t_s)	247.4	°F
Average Meter Temp	(t_m)	98.0	
Orifice Meter Coefficient	($\Delta H@$)	1.745	in H_2O
Square Root ΔP	($\Delta p^{1/2}_{avg}$)	1.01	in H_2O
Stack Moisture Content	(B_{ws})	9.18	%
Stack Dry Molecular Weight	(M_d)	29.41	lb/lb-mole
Estimated Orifice Flow Rate	(Q_m)	0.75	acfm
ΔP to ΔH Isokinetic Factor	(K)	1.22	

Leak Checks					
Train	Pre	0.000	ft³/min@	15.0	in Hg
PASS	Post	0.000	ft³/min@	10.0	in Hg
Pitot	Pre (+)	6.5	in H_2O for	30.0	sec
PASS	Pre (-)	5.8	in H_2O for	30.0	sec
	Post (+)	6.0	in H_2O for	30.0	sec
	Post (-)	5.4	in H_2O for	30.0	sec

Sampling Equipment			
Meter Box Number	SAMP-CP-0010		
Meter Cal Factor	(Y)	0.991	
Nozzle Number	I8		
Average Nozzle Diameter	(D_{na})	0.2043	in
Suggested Nozzle Diameter	(D_{ns})	0.2108	in
Probe Number	SAMP-HP-0001		in
Probe Length	120		in
Liner Material	inconel		
Sample Case / Oven Number	SAMP-BH-0025		
Impinger Case Number	SAMP-BC-0021		

Pressures			
Barometric Pressure	(P_b)	29.96	in Hg
Stack Static Pressure	(P_{static})	-1.00	in H_2O
Absolute Stack Pressure	(P_s)	29.89	in Hg
Absolute Meter Pressure	(P_m)	30.09	in Hg

Nozzle Measurements				
Pre	0.205	0.205	0.203	PASS
Post	0.205	0.205	0.203	PASS

Run Time			
Start	10:14	End	11:39

Weights	Imp 1	Imp 2	Imp 3	Imp 4	Imp 5	Imp 6	Imp 7	Imp 8
Pre	754.8	764.9	612.9	862.9				
Post	814.1	773.6	614.6	870.0				

Wash Volumes					
					ml
					ml

Traverse Point #	Sampling Time (Θ)	Timer Time	Dry Gas Meter Reading (V_m)	Velocity Head (Δp)	Desired Orifice ΔH (ΔH_d)	Actual Orifice ΔH (ΔH_a)	Stack Temp (t_s)	Probe Temp (248±25°F)	Filter Temp (248±25°F)	Impinger Exit Temp (≤68°F)	Cond. Temp (≤--°F)	CPM Filter Temp (--±--°F)	Meter Inlet Temp (t_{mi})	Meter Outlet Temp (t_{mo})	Pump Vacuum	Square Root ΔP ($\Delta p^{1/2}$)	Local Stack Velocity (v_s)l	Cumul. Meter Volume $(V_m)_{std}$	Cumul. Percent IsoKinetic (I)	Est-Run Meter Volume $(V_m)_{std}$
	min	hh:mm:ss	ft³	in H_2O	in H_2O	in H_2O	°F	°F	°F	°F	°F	°F	°F	°F	in Hg	√(in H_2O)	ft/sec	dscf	%	dscf
A-1	0.0	00:00:00	400.824	0.85	1.039	1.00	250	242	258	78			99	98	1.5	0.92	60.59	1.360	97.5	32.637
A-2	2.5	00:02:30	402.270	0.91	1.112	1.10	251	243	259	68			98	98	1.5	0.95	62.74	2.838	100.1	34.056
A-3	5.0	00:05:00	403.840	0.90	1.100	1.10	254	243	258	65			96	96	1.5	0.95	62.52	4.307	100.9	34.459
A-4	7.5	00:07:30	405.395	0.88	1.076	1.00	252	240	252	63			99	98	1.5	0.94	61.74	5.709	100.4	34.252
A-5	10.0	00:10:00	406.885	0.80	0.978	0.93	251	233	246	62			100	98	1.5	0.89	58.82	7.005	99.6	33.624
A-6	12.5	00:12:30	408.265	0.70	0.856	0.82	249	242	260	63			98	98	1.0	0.84	54.95	8.261	99.5	33.044
B-1	15.0	00:15:00	409.600	0.85	1.039	1.00	247	239	251	69			100	97	1.5	0.92	60.46	9.625	99.2	32.999
B-2	17.5	00:17:30	411.050	0.88	1.076	1.00	246	243	256	68			101	97	1.5	0.94	61.48	11.034	99.2	33.102
B-3	20.0	00:20:00	412.550	0.87	1.063	1.00	243	246	258	68			99	97	1.5	0.93	60.99	12.493	99.6	33.315
B-4	22.5	00:22:30	414.100	0.84	1.027	0.98	242	248	259	68			100	97	1.5	0.92	59.89	13.763	98.8	33.030
B-5	25.0	00:25:00	415.450	0.75	0.917	0.87	242	243	255	67			100	97	1.0	0.87	56.59	15.055	98.8	32.848
B-6	27.5	00:27:30	416.825	0.55	0.672	0.64	240	249	251	67			99	97	1.0	0.74	48.39	16.225	99.1	32.450
C-1	30.0	00:30:00	418.069	1.00	1.222	1.20	247	246	251	67			98	96	1.5	1.00	65.58	17.721	99.1	32.717
C-2	32.5	00:32:30	419.655	1.20	1.467	1.40	248	249	261	63			99	96	2.0	1.10	71.89	19.367	99.1	33.201
C-3	35.0	00:35:00	421.400	1.30	1.589	1.50	245	251	254	60			99	96	2.0	1.14	74.67	21.183	99.6	33.893
C-4	37.5	00:37:30	423.325	1.30	1.589	1.50	244	250	258	59			98	96	2.0	1.14	74.61	22.698	98.8	34.047
C-5	40.0	00:40:00	424.930	1.30	1.589	1.50	244	250	253	60			98	96	2.0	1.14	74.61	24.308	98.4	34.317
C-6	42.5	00:42:30	426.635	1.10	1.345	1.30	240	251	257	60			98	95	1.5	1.05	68.44	25.913	98.5	34.550
D-1	45.0	00:45:00	428.334	1.00	1.222	1.20	251	249	267	66			99	96	1.5	1.00	65.76	27.389	98.4	34.596
D-2	47.5	00:47:30	429.900	1.20	1.467	1.40	252	247	260	62			102	96	2.0	1.10	72.09	29.011	98.4	34.813
D-3	50.0	00:50:00	431.625	1.40	1.711	1.60	252	236	233	60			101	96	2.0	1.18	77.87	30.518	97.7	34.878
D-4	52.5	00:52:30	433.225	1.40	1.711	1.60	251	249	257	61			101	96	2.0	1.18	77.81	32.355	98.0	35.296
D-5	55.0	00:55:00	435.175	1.50	1.834	1.70	249	247	253	61			100	96	2.5	1.22	80.43	34.146	97.9	35.631
D-6	57.5	00:57:30	437.075	1.20	1.467	1.40	247	249	264	60			103	97	2.0	1.10	71.84	35.817	98.0	35.817
Last Pt	60.0	01:00:00	438.855																	
Final Val	60.0	01:00:00	438.855											Max Vac	2.5	Final Values		35.817	98.0	
Average Values				1.03		1.20	247	245	255	64			99	97		1.01	66.03			
													98							

CTM 027 (AMMONIA) SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

Plant Name	West County Energy Center
Sampling Location	Unit 3A
Project #	bv-10-westcounty.fl-comp#2

Date	04/26/11
Operator	NA
Run Number	Fuel Oil-2

Ideal Nozzle Diameter and IsoKinetic Factor Setup			
Pitot Coefficient	(C_p)	0.840	
Average Stack Temp	(t_s)	246.9	°F
Average Meter Temp	(t_m)	100.7	
Orifice Meter Coefficient	($\Delta H@$)	1.745	in H_2O
Square Root ΔP	($\Delta p^{1/2}_{avg}$)	1.01	in H_2O
Stack Moisture Content	(B_{ws})	9.01	%
Stack Dry Molecular Weight	(M_d)	29.40	lb/lb-mole
Estimated Orifice Flow Rate	(Q_m)	0.60	acfm
ΔP to ΔH Isokinetic Factor	(K)	1.23	

Leak Checks					
Train	Pre	0.000	ft³/min@	15.0	in Hg
PASS	Post	0.000	ft³/min@	10.0	in Hg
Pitot	Pre (+)	5.3	in H_2O for	30.0	sec
PASS	Pre (-)	6.8	in H_2O for	30.0	sec
	Post (+)	5.0	in H_2O for	30.0	sec
	Post (-)	6.8	in H_2O for	30.0	sec

Sampling Equipment			
Meter Box Number	SAMP-CP-0010		
Meter Cal Factor	(Y)	0.991	
Nozzle Number	I8		
Average Nozzle Diameter	(D_{na})	0.2043	in
Suggested Nozzle Diameter	(D_{ns})	0.1875	in
Probe Number	SAMP-HP-0001		in
Probe Length	120		In
Liner Material	inconel		
Sample Case / Oven Number	SAMP-BH-0025		
Impinger Case Number	SAMP-BC-0020		

Pressures			
Barometric Pressure	(P_b)	29.97	in Hg
Stack Static Pressure	(P_{static})	-1.00	in H_2O
Absolute Stack Pressure	(P_s)	29.90	in Hg
Absolute Meter Pressure	(P_m)	30.10	in Hg

Nozzle Measurements				
Pre	0.205	0.205	0.203	PASS
Post	0.205	0.205	0.203	PASS

Run Time			
Start	12:09	End	13:37

Weights	Imp 1	Imp 2	Imp 3	Imp 4	Imp 5	Imp 6	Imp 7	Imp 8
Pre	736.8	751.1	608.3	825.8				
Post	793.7	759.9	611.0	835.6		.		

Wash Volumes					ml
					ml

Traverse Point #	Sampling Time (Θ)	Timer Time	Reading (V_m)	Velocity Head (Δp)	Desired Orifice ΔH (ΔH_d)	Actual Orifice ΔH (ΔH_a)	Stack Temp (t_s)	Probe Temp (248±25°F)	Filter Temp (248±25°F)	Impinger Exit Temp (≤68°F)	Cond. Temp (≤--°F)	CPM Filter Temp (--±--°F)	Meter Inlet Temp (t_{mi})	Meter Outlet Temp (t_{mo})	Pump Vacuum	Square Root ΔP ($\Delta p^{1/2}$)	Local Stack Velocity (v_s)$_l$	Cumul. Meter Volume (V_m)$_{std}$	Cumul. Percent IsoKinetic (I)	Est-Run Meter Volume (V_m)$_{std}$
	min	hh:mm:ss	ft³	in H_2O	in H_2O	in H_2O	°F	°F	°F	°F	°F	°F	°F	°F	in Hg	√(in H_2O)	ft/sec	dscf	%	dscf
A-1	0.0	00:00:00	439.060	1.00	1.233	1.20	251	247	256	66			99	98	1.5	1.00	65.74	1.487	98.1	35.691
A-2	2.5	00:02:30	440.640	1.20	1.479	1.40	254	246	264	65			102	98	2.0	1.10	72.17	3.121	98.4	37.455
A-3	5.0	00:05:00	442.380	1.40	1.726	1.70	253	244	252	63			102	98	2.0	1.18	77.90	4.879	98.3	39.030
A-4	7.5	00:07:30	444.250	1.40	1.726	1.70	253	246	261	61			101	98	2.0	1.18	77.90	6.581	97.5	39.488
A-5	10.0	00:10:00	446.060	1.50	1.849	1.80	251	245	260	61			103	98	2.0	1.22	80.52	8.356	97.1	40.111
A-6	12.5	00:12:30	447.950	1.30	1.603	1.60	248	231	247	64			104	98	2.0	1.14	74.80	10.073	97.4	40.292
B-1	15.0	00:15:00	449.780	1.00	1.233	1.20	251	224	252	68			101	99	2.0	1.00	65.74	11.582	97.7	39.711
B-2	17.5	00:17:30	451.388	1.30	1.603	1.60	251	228	252	68			104	99	2.0	1.14	74.96	13.299	97.9	39.897
B-3	20.0	00:20:00	453.220	1.30	1.603	1.60	246	226	249	67			102	99	2.0	1.14	74.70	15.045	98.3	40.120
B-4	22.5	00:22:30	455.080	1.30	1.603	1.60	243	223	251	67			102	99	2.0	1.14	74.54	16.801	98.5	40.322
B-5	25.0	00:25:00	456.950	1.40	1.726	1.70	240	242	251	67			104	99	2.0	1.18	77.18	18.783	99.7	40.981
B-6	27.5	00:27:30	459.065	1.10	1.356	1.30	236	243	248	68			105	100	1.5	1.05	68.22	20.335	99.5	40.670
C-1	30.0	00:30:00	460.725	0.85	1.048	1.00	245	240	231	68			100	99	1.5	0.92	60.36	21.776	99.7	40.202
C-2	32.5	00:32:30	462.260	0.88	1.085	1.10	241	245	251	70			102	99	1.5	0.94	61.24	23.314	100.2	39.967
C-3	35.0	00:35:00	463.900	0.84	1.036	1.00	243	246	242	68			104	99	1.5	0.92	59.92	24.886	101.0	39.818
C-4	37.5	00:37:30	465.580	0.80	0.986	0.98	243	249	260	67			104	99	1.5	0.89	58.47	26.336	101.3	39.504
C-5	40.0	00:40:00	467.130	0.70	0.863	0.86	242	254	257	66			102	99	1.0	0.84	54.66	27.620	101.3	38.993
C-6	42.5	00:42:30	468.500	0.50	0.616	0.61	232	252	255	66			103	99	1.0	0.71	45.86	28.792	101.5	38.389
D-1	45.0	00:45:00	469.752	0.84	1.036	1.00	249	237	251	68			102	99	1.5	0.92	60.17	30.243	101.7	38.201
D-2	47.5	00:47:30	471.300	0.94	1.159	1.10	252	239	252	66			103	99	1.5	0.97	63.79	31.770	101.8	38.123
D-3	50.0	00:50:00	472.930	0.94	1.159	1.10	252	248	257	65			103	99	1.5	0.97	63.79	33.193	101.6	37.935
D-4	52.5	00:52:30	474.450	0.85	1.048	1.00	252	236	246	65			104	99	1.5	0.92	60.66	35.533	105.9	38.763
D-5	55.0	00:55:00	476.950	0.80	0.986	0.98	249	224	242	66			103	100	1.5	0.89	58.72	35.954	105.0	37.517
D-6	57.5	00:57:30	477.400	0.73	0.900	0.89	248	224	244	66			102	100	1.0	0.85	56.05	37.236	104.8	37.236
Last Pt	60.0	01:00:00	478.769																	
Final Val	60.0	01:00:00	478.769											Max Vac	2.0	Final Values		37.236	104.8	
Average Values				1.04		1.25	247	239	251	66			103	99		1.01	66.17			
													101							

CTM 027 (AMMONIA) SOURCE SAMPLING TITLE PAGE ISOKINETIC SAMPLING DATA

Plant Name	West County Energy Center
Sampling Location	Unit 3A
Project #	bv-10-westcounty.fl-comp#2

Date	04/26/11
Operator	NA
Run Number	Fuel Oil-3

Ideal Nozzle Diameter and IsoKinetic Factor Setup			
Pitot Coefficient	(C_p)	0.840	
Average Stack Temp	(t_s)	245.7	°F
Average Meter Temp	(t_m)	100.7	
Orifice Meter Coefficient	($\Delta H@$)	1.745	in H_2O
Square Root ΔP	($\Delta p^{1/2}_{avg}$)	1.01	in H_2O
Stack Moisture Content	(B_{ws})	8.85	%
Stack Dry Molecular Weight	(M_d)	29.42	lb/lb-mole
Estimated Orifice Flow Rate	(Q_m)	0.62	acfm
ΔP to ΔH Isokinetic Factor	(K)	1.24	

Leak Checks					
Train	Pre	0.000	ft³/min@	15.0	in Hg
PASS	Post	0.000	ft³/min@	10.0	in Hg
Pitot	Pre (+)	7.0	in H_2O for	30.0	sec
PASS	Pre (-)	5.4	in H_2O for	30.0	sec
	Post (+)	6.3	in H_2O for	30.0	sec
	Post (-)	6.0	in H_2O for	30.0	sec

Sampling Equipment			
Meter Box Number	SAMP-CP-0010		
Meter Cal Factor	(Y)	0.991	
Nozzle Number	I8		
Average Nozzle Diameter	(D_{ns})	0.2043	in
Suggested Nozzle Diameter	(D_n)	0.1909	in
Probe Number	SAMP-HP-0001		in
Probe Length	120		in
Liner Material	inconel		
Sample Case / Oven Number	SAMP-BH-0025		
Impinger Case Number	SAMP-BC-0021		

Pressures			
Barometric Pressure	(P_b)	29.94	in Hg
Stack Static Pressure	(P_{static})	-1.00	in H_2O
Absolute Stack Pressure	(P_s)	29.87	in Hg
Absolute Meter Pressure	(P_m)	30.07	in Hg

Nozzle Measurements				
Pre	0.205	0.205	0.203	PASS
Post	0.205	0.205	0.203	PASS

Run Time			
Start	13:46	End	15:02

Weights	Imp 1	Imp 2	Imp 3	Imp 4	Imp 5	Imp 6	Imp 7	Imp 8
Pre	757.0	766.0	612.8	867.0				
Post	812.8	774.3	615.8	875.2				

Wash Volumes					
					ml
					ml

Traverse Point #	Sampling Time (Θ)	Timer Time	Dry Gas Meter Reading (V_m)	Velocity Head (Δp)	Desired Orifice ΔH (ΔH_d)	Actual Orifice ΔH (ΔH_a)	Stack Temp (t_s)	Probe Temp (248±25°F)	Filter Temp (248±25°F)	Impinger Exit Temp (≤68°F)	Cond. Temp (≤--°F)	CPM Filter Temp (--±--°F)	Meter Inlet Temp (t_{mi})	Meter Outlet Temp (t_{mo})	Pump Vacuum	Square Root ΔP ($\Delta p^{1/2}$)	Local Stack Velocity (v_s)$_l$	Cumul. Meter Volume (V_m)$_{std}$	Cumul. Percent IsoKinetic (I)	Est-Run Meter Volume (V_m)$_{std}$
	min	hh:mm:ss	ft³	in H_2O	in H_2O	in H_2O	°F	°F	°F	°F	°F	°F	°F	°F	in Hg	√(in H_2O)	ft/sec	dscf	%	dscf
A-1	0.0	00:00:00	479.050	0.85	1.053	1.10	250	232	246	73			101	100	1.5	0.92	60.57	1.531	109.5	36.756
A-2	2.5	00:02:30	480.685	0.90	1.115	1.10	252	230	256	70			101	99	1.5	0.95	62.41	2.896	102.6	34.747
A-3	5.0	00:05:00	482.140	0.92	1.139	1.10	253	244	259	69			102	99	1.5	0.96	63.15	4.333	101.4	34.667
A-4	7.5	00:07:30	483.675	0.88	1.090	1.10	250	246	263	68			102	99	1.5	0.94	61.63	5.762	101.1	34.571
A-5	10.0	00:10:00	485.200	0.81	1.003	1.00	248	239	252	68			104	99	1.5	0.90	59.04	7.155	101.3	34.342
A-6	12.5	00:12:30	486.690	0.75	0.929	0.93	249	244	248	68			104	100	1.0	0.87	56.85	8.464	101.0	33.855
B-1	15.0	00:15:00	488.092	0.84	1.040	1.00	246	239	232	70			101	100	1.5	0.92	60.04	9.843	100.7	33.748
B-2	17.5	00:17:30	489.565	0.84	1.040	1.00	242	251	252	68			102	100	1.5	0.92	59.87	11.209	100.3	33.628
B-3	20.0	00:20:00	491.025	0.83	1.028	1.00	239	246	237	67			101	100	1.5	0.91	59.39	12.572	100.1	33.525
B-4	22.5	00:22:30	492.480	0.77	0.954	0.95	236	239	252	66			99	99	1.5	0.88	57.08	13.933	100.2	33.440
B-5	25.0	00:25:00	493.930	0.73	0.904	0.90	233	243	258	66			99	98	1.5	0.85	55.45	15.305	100.6	33.393
B-6	27.5	00:27:30	495.390	0.65	0.805	0.80	230	252	261	68			101	99	1.0	0.81	52.21	16.479	100.1	32.958
C-1	30.0	00:30:00	496.643	0.99	1.226	1.20	244	249	256	67			99	99	1.5	0.99	65.09	17.993	100.1	33.218
C-2	32.5	00:32:30	498.255	1.20	1.486	1.50	242	250	264	66			101	98	2.0	1.10	71.56	19.609	99.8	33.615
C-3	35.0	00:35:00	499.975	1.30	1.610	1.60	241	248	258	65			101	98	2.0	1.14	74.43	21.286	99.6	34.057
C-4	37.5	00:37:30	501.760	1.30	1.610	1.60	237	252	270	65			102	99	2.0	1.14	74.22	22.964	99.3	34.447
C-5	40.0	00:40:00	503.550	1.30	1.610	1.60	237	249	242	64			104	99	2.0	1.14	74.22	24.650	99.1	34.799
C-6	42.5	00:42:30	505.350	1.20	1.486	1.50	237	246	243	65			102	99	2.0	1.10	71.30	26.270	99.0	35.026
D-1	45.0	00:45:00	507.078	1.10	1.362	1.40	258	243	246	68			102	99	2.0	1.05	69.29	27.856	99.0	35.186
D-2	47.5	00:47:30	508.770	1.30	1.610	1.60	255	243	244	67			104	99	2.0	1.14	75.17	29.494	98.8	35.393
D-3	50.0	00:50:00	510.520	1.30	1.610	1.60	257	232	251	67			105	100	2.0	1.14	75.27	31.184	98.8	35.638
D-4	52.5	00:52:30	512.328	1.40	1.734	1.70	255	238	241	66			104	100	2.0	1.18	78.01	32.935	98.7	35.929
D-5	55.0	00:55:00	514.200	1.50	1.858	1.90	254	239	251	67			105	101	2.5	1.22	80.69	34.790	98.8	36.302
D-6	57.5	00:57:30	516.185	1.40	1.734	1.50	252	245	251	66			105	101	2.0	1.18	77.84	36.548	98.8	36.548
Last Pt	60.0	01:00:00	518.069																	
Final Val	60.0		518.069											Max Vac	2.5	Final Values		36.548	98.8	
Average Values				1.04		1.28	246	243	251	67			102	99		1.01	66.45			
													101							

SAMPLE RECOVERY AND INTEGRITY DATA SHEET

Plant Name	West County Energy Center	**Date**	04/26/11
Sampling Location	Unit 3A	**Operator**	NA
Project #	bv-10-westcounty.fl-comp#2		

Run History Data				
Run Number	Fuel Oil-1	Fuel Oil-2	Fuel Oil-3	
Run Start Time	10:14	12:09	13:46	(hh:mm)
Run Stop Time	11:39	13:37	15:02	(hh:mm)
Train Prepared By	PS	PS	PS	
Train Recovered By	PS	PS	PS	
Recovery Date	04/26/11	04/26/11	04/26/11	(mm/dd/yy)
Relinquished By	PS	PS	PS	
Received By	PS	PS	PS	
Relinquished Date	04/26/11	04/26/11	04/26/11	(mm/dd/yy)
Relinquished Time	11:39	13:37	15:02	(hh:mm)

Equipment Identification Numbers			
Impinger Case	SAMP-BH-0025	SAMP-BH-0025	SAMP-BH-0025
Sample Box	SAMP-BC-0021	SAMP-BC-0020	SAMP-BC-0021

Sample Blank Taken	YES

Moisture Content Data					
Impingers 1, 2, and 3 - Liquid Weight					
Final Weight	(W_f)	2202.3	2164.6	2202.9	g
Initial Weight	(W_i)	2132.6	2096.2	2135.8	g
Net Weight	(W_n)	69.7	68.4	67.1	g
Comments	N/A				
Impinger 4 - Silica Gel Weight					
Final Weight	(W_f)	870.0	835.6	875.2	g
Initial Weight	(W_i)	862.9	825.8	867.0	g
Net Weight	(W_n)	7.1	9.8	8.2	g
Comments	N/A				
Total Water Collected					
Total Weight	(W_{lc})	76.8	78.2	75.3	g
Total Volume	(V_{lc})	76.9	78.3	75.4	ml

CTM 027 (AMMONIA) - RESULTS

Plant Name	West County Energy Center
Sampling Location	Unit 3A
Project #	bv-10-westcounty.fl-comp#2

Historical Data	**Fuel Oil-1**	**Fuel Oil-2**	**Fuel Oil-3**	**Average**	**Units**
Run Start Time	10:14	12:09	13:46		hh:mm
Run Stop Time	11:39	13:37	15:02		hh:mm
Test Date	04/26/11	04/26/11	04/26/11		mm/dd/yy
Meter Calibration Factor	0.991	0.991	0.991		
Pitot Tube Coefficient	0.840	0.840	0.840		
Average Nozzle Diameter	0.204	0.204	0.204		in
Stack Test Data	**Fuel Oil-1**	**Fuel Oil-2**	**Fuel Oil-3**	**Average**	**Units**
Initial Meter Volume	400.824	439.060	479.050		ft^3
Final Meter Volume	438.855	478.769	518.069		ft^3
Total Meter Volume	38.031	39.709	39.019	38.920	ft^3
Total Sampling Time	60.00	60.00	60.00	60.00	min
Average Meter Temperature	98.02	100.71	100.73	99.82	°F
Average Stack Temperature	247.38	246.88	245.71	246.65	°F
Barometric Pressure	29.96	29.97	29.94	29.96	in Hg
Stack Static Pressure	-1.00	-1.00	-1.00	-1.00	in H_2O
Absolute Stack Pressure	29.89	29.90	29.87	29.88	in Hg
Average Orifice Pressure Drop	1.20	1.25	1.28	1.24	in H_2O
Absolute Meter Pressure	30.09	30.10	30.07	30.08	in Hg
Avg Square Root Pitot Pressure	1.01	1.01	1.01	1.01	$\sqrt{(in\ H_2O)}$
Moisture Content Data	**Fuel Oil-1**	**Fuel Oil-2**	**Fuel Oil-3**	**Average**	**Units**
Impinger Water Weight Gain	69.70	68.40	67.10	68.40	g
Silica Gel Weight Gain	7.10	9.80	8.20	8.37	g
Total Water Volume Collected	76.94	78.34	75.44	76.91	ml
Standard Water Vapor Volume	3.62	3.69	3.55	3.62	scf
Standard Meter Volume	35.8	37.2	36.5	36.5	dscf
Calculated Stack Moisture	9.18	9.01	8.85	9.02	%
Saturated Stack Moisture	100.00	100.00	100.00	100.00	%
Reported Stack Moisture Content	9.18	9.01	8.85	9.02	%

CTM 027 (AMMONIA) - RESULTS

Plant Name	West County Energy Center
Sampling Location	Unit 3A
Project #	bv-10-westcounty.fl-comp#2

Gas Analysis Data	**Fuel Oil-1**	**Fuel Oil-2**	**Fuel Oil-3**	**Average**	**Units**
Carbon Dioxide Content	5.5	5.4	5.4	5.4	%
Oxygen Content	13.6	13.6	13.6	13.6	%
Carbon Monoxide Content	6.6	6.5	5.9	6.3	ppm
Nitrogen Content	81.0	81.0	80.9	81.0	%
Stack Dry Molecular Weight	29.41	29.40	29.42	29.41	lb/lb-mole
Stack Wet Molecular Weight	28.37	28.37	28.40	28.38	lb/lb-mole
Calculated Fuel Factor	1.347	1.360	1.336	1.348	
Fuel F-Factor	9241.06	9241.06	9241.06	9241.06	dscf/MMBtu
Percent Excess Air	173.4	174.9	176.2	174.8	%
Volumetric Flow Rate Data	**Fuel Oil-1**	**Fuel Oil-2**	**Fuel Oil-3**	**Average**	**Units**
Average Stack Gas Velocity	66.03	66.17	66.45	66.22	ft/sec
Stack Cross-Sectional Area	378.35	378.35	378.35	378.35	ft^2
Actual Stack Flow Rate	1,498,984	1,502,087	1,508,447	1,503,173	acfm
Wet Standard Stack Flow Rate	67,057	67,266	67,595	67,306	wkscfh
Dry Standard Stack Flow Rate	60,899,680	61,204,869	61,609,904	61,238,151	dscfh
Percent of Isokinetic Rate	98.0	104.8	98.8	100.5	%
Ammonia Analysis (CTM-027)	**Fuel Oil-1**	**Fuel Oil-2**	**Fuel Oil-3**	**Average**	**Units**
Sample Number (Front Half)	FO-3A-R1-FH	FO-3A-R2-FH	FO-3A-R2-FH		
Sample Number (Back Half)	FO-3A-R1-BH	FO-3A-R2-BH	FO-3A-R2-BH		
Lab Log Number (Front Half)	04262011-1-FH	04262011-2-FH	04262011-3-FH		
Lab Log Number (Back Half)	04262011-1-BH	04262011-2-BH	04262011-3-BH		
Front Half Results (C_f)	2.6130	2.2080	1.9500	2.2570	mg/l
Back Half Results (C_b)	0.1000	0.0500	0.0200	0.0567	mg/l
Practical Quantitation Limit	0.0500	0.0500	0.0500	0.0500	mg/l
Blank Results	0.0000	0.0000	0.0000	0.0000	mg/l
Front Half Sample Volume	194	250	290	245	ml
Back Half Sample Volume	164	180	228	191	ml
Volume of NH_3	0.00069	0.00074	0.00075	0.00073	L
NH_3 Concentration	0.68	0.70	0.72	0.70	ppmvd
NH_3 Concentration	0.55	0.57	0.59	0.57	ppm@15%O_2

TEST RESULTS

Opacity
Fuel Oil Load

Company:	Florida Power and Light
Equipment:	Mitsubishi 501G, Unit U3A Fuel Oil
Location:	West County Energy Center
Date:	April 26, 2011
Project #:	bv-10-westcounty.fl-comp#2

Run 1

Average Opacity:	0.00 %
Maximum Opacity:	0 %
6 Minute Average:	0.00 %
6 Minute Maximum:	0.00 %
Max Time w/ Opacity:	0.00 minutes

TIME (min)	OPACITY (%)	6 MIN AVG.	TIME (min)	OPACITY (%)	6 MIN AVG.	TIME (min)	OPACITY (%)	6 MIN AVG.	TIME (min)	OPACITY (%)	6 MIN AVG.
0.00	0	N/A	15.00	0	0.00	30.00	0	0.00	45.00	0	0.00
0.25	0	N/A	15.25	0	0.00	30.25	0	0.00	45.25	0	0.00
0.50	0	N/A	15.50	0	0.00	30.50	0	0.00	45.50	0	0.00
0.75	0	N/A	15.75	0	0.00	30.75	0	0.00	45.75	0	0.00
1.00	0	N/A	16.00	0	0.00	31.00	0	0.00	46.00	0	0.00
1.25	0	N/A	16.25	0	0.00	31.25	0	0.00	46.25	0	0.00
1.50	0	N/A	16.50	0	0.00	31.50	0	0.00	46.50	0	0.00
1.75	0	N/A	16.75	0	0.00	31.75	0	0.00	46.75	0	0.00
2.00	0	N/A	17.00	0	0.00	32.00	0	0.00	47.00	0	0.00
2.25	0	N/A	17.25	0	0.00	32.25	0	0.00	47.25	0	0.00
2.50	0	N/A	17.50	0	0.00	32.50	0	0.00	47.50	0	0.00
2.75	0	N/A	17.75	0	0.00	32.75	0	0.00	47.75	0	0.00
3.00	0	N/A	18.00	0	0.00	33.00	0	0.00	48.00	0	0.00
3.25	0	N/A	18.25	0	0.00	33.25	0	0.00	48.25	0	0.00
3.50	0	N/A	18.50	0	0.00	33.50	0	0.00	48.50	0	0.00
3.75	0	N/A	18.75	0	0.00	33.75	0	0.00	48.75	0	0.00
4.00	0	N/A	19.00	0	0.00	34.00	0	0.00	49.00	0	0.00
4.25	0	N/A	19.25	0	0.00	34.25	0	0.00	49.25	0	0.00
4.50	0	N/A	19.50	0	0.00	34.50	0	0.00	49.50	0	0.00
4.75	0	N/A	19.75	0	0.00	34.75	0	0.00	49.75	0	0.00
5.00	0	N/A	20.00	0	0.00	35.00	0	0.00	50.00	0	0.00
5.25	0	N/A	20.25	0	0.00	35.25	0	0.00	50.25	0	0.00
5.50	0	N/A	20.50	0	0.00	35.50	0	0.00	50.50	0	0.00
5.75	0	0.00	20.75	0	0.00	35.75	0	0.00	50.75	0	0.00
6.00	0	0.00	21.00	0	0.00	36.00	0	0.00	51.00	0	0.00
6.25	0	0.00	21.25	0	0.00	36.25	0	0.00	51.25	0	0.00
6.50	0	0.00	21.50	0	0.00	36.50	0	0.00	51.50	0	0.00
6.75	0	0.00	21.75	0	0.00	36.75	0	0.00	51.75	0	0.00
7.00	0	0.00	22.00	0	0.00	37.00	0	0.00	52.00	0	0.00
7.25	0	0.00	22.25	0	0.00	37.25	0	0.00	52.25	0	0.00
7.50	0	0.00	22.50	0	0.00	37.50	0	0.00	52.50	0	0.00
7.75	0	0.00	22.75	0	0.00	37.75	0	0.00	52.75	0	0.00
8.00	0	0.00	23.00	0	0.00	38.00	0	0.00	53.00	0	0.00
8.25	0	0.00	23.25	0	0.00	38.25	0	0.00	53.25	0	0.00
8.50	0	0.00	23.50	0	0.00	38.50	0	0.00	53.50	0	0.00
8.75	0	0.00	23.75	0	0.00	38.75	0	0.00	53.75	0	0.00
9.00	0	0.00	24.00	0	0.00	39.00	0	0.00	54.00	0	0.00
9.25	0	0.00	24.25	0	0.00	39.25	0	0.00	54.25	0	0.00
9.50	0	0.00	24.50	0	0.00	39.50	0	0.00	54.50	0	0.00
9.75	0	0.00	24.75	0	0.00	39.75	0	0.00	54.75	0	0.00
10.00	0	0.00	25.00	0	0.00	40.00	0	0.00	55.00	0	0.00
10.25	0	0.00	25.25	0	0.00	40.25	0	0.00	55.25	0	0.00
10.50	0	0.00	25.50	0	0.00	40.50	0	0.00	55.50	0	0.00
10.75	0	0.00	25.75	0	0.00	40.75	0	0.00	55.75	0	0.00
11.00	0	0.00	26.00	0	0.00	41.00	0	0.00	56.00	0	0.00
11.25	0	0.00	26.25	0	0.00	41.25	0	0.00	56.25	0	0.00
11.50	0	0.00	26.50	0	0.00	41.50	0	0.00	56.50	0	0.00
11.75	0	0.00	26.75	0	0.00	41.75	0	0.00	56.75	0	0.00
12.00	0	0.00	27.00	0	0.00	42.00	0	0.00	57.00	0	0.00
12.25	0	0.00	27.25	0	0.00	42.25	0	0.00	57.25	0	0.00
12.50	0	0.00	27.50	0	0.00	42.50	0	0.00	57.50	0	0.00
12.75	0	0.00	27.75	0	0.00	42.75	0	0.00	57.75	0	0.00
13.00	0	0.00	28.00	0	0.00	43.00	0	0.00	58.00	0	0.00
13.25	0	0.00	28.25	0	0.00	43.25	0	0.00	58.25	0	0.00
13.50	0	0.00	28.50	0	0.00	43.50	0	0.00	58.50	0	0.00
13.75	0	0.00	28.75	0	0.00	43.75	0	0.00	58.75	0	0.00
14.00	0	0.00	29.00	0	0.00	44.00	0	0.00	59.00	0	0.00
14.25	0	0.00	29.25	0	0.00	44.25	0	0.00	59.25	0	0.00
14.50	0	0.00	29.50	0	0.00	44.50	0	0.00	59.50	0	0.00
14.75	0	0.00	29.75	0	0.00	44.75	0	0.00	59.75	0	0.00

Company: Florida Power and Light
Equipment: Mitsubishi 501G, Unit U3A Fuel Oil
Location: West County Energy Center
Date: April 26, 2011
Project #: bv-10-westcounty.fl-comp#2

Run 2

Average Opacity:	0.00 %
Maximum Opacity:	0 %
6 Minute Average:	0.00 %
6 Minute Maximum:	0.00 %
Max Time w/ Opacity:	0.00 minutes

TIME (min)	OPACITY (%)	6 MIN AVG.	TIME (min)	OPACITY (%)	6 MIN AVG.	TIME (min)	OPACITY (%)	6 MIN AVG.	TIME (min)	OPACITY (%)	6 MIN AVG.
0.00	0	N/A	15.00	0	0.00	30.00	0	0.00	45.00	0	0.00
0.25	0	N/A	15.25	0	0.00	30.25	0	0.00	45.25	0	0.00
0.50	0	N/A	15.50	0	0.00	30.50	0	0.00	45.50	0	0.00
0.75	0	N/A	15.75	0	0.00	30.75	0	0.00	45.75	0	0.00
1.00	0	N/A	16.00	0	0.00	31.00	0	0.00	46.00	0	0.00
1.25	0	N/A	16.25	0	0.00	31.25	0	0.00	46.25	0	0.00
1.50	0	N/A	16.50	0	0.00	31.50	0	0.00	46.50	0	0.00
1.75	0	N/A	16.75	0	0.00	31.75	0	0.00	46.75	0	0.00
2.00	0	N/A	17.00	0	0.00	32.00	0	0.00	47.00	0	0.00
2.25	0	N/A	17.25	0	0.00	32.25	0	0.00	47.25	0	0.00
2.50	0	N/A	17.50	0	0.00	32.50	0	0.00	47.50	0	0.00
2.75	0	N/A	17.75	0	0.00	32.75	0	0.00	47.75	0	0.00
3.00	0	N/A	18.00	0	0.00	33.00	0	0.00	48.00	0	0.00
3.25	0	N/A	18.25	0	0.00	33.25	0	0.00	48.25	0	0.00
3.50	0	N/A	18.50	0	0.00	33.50	0	0.00	48.50	0	0.00
3.75	0	N/A	18.75	0	0.00	33.75	0	0.00	48.75	0	0.00
4.00	0	N/A	19.00	0	0.00	34.00	0	0.00	49.00	0	0.00
4.25	0	N/A	19.25	0	0.00	34.25	0	0.00	49.25	0	0.00
4.50	0	N/A	19.50	0	0.00	34.50	0	0.00	49.50	0	0.00
4.75	0	N/A	19.75	0	0.00	34.75	0	0.00	49.75	0	0.00
5.00	0	N/A	20.00	0	0.00	35.00	0	0.00	50.00	0	0.00
5.25	0	N/A	20.25	0	0.00	35.25	0	0.00	50.25	0	0.00
5.50	0	N/A	20.50	0	0.00	35.50	0	0.00	50.50	0	0.00
5.75	0	0.00	20.75	0	0.00	35.75	0	0.00	50.75	0	0.00
6.00	0	0.00	21.00	0	0.00	36.00	0	0.00	51.00	0	0.00
6.25	0	0.00	21.25	0	0.00	36.25	0	0.00	51.25	0	0.00
6.50	0	0.00	21.50	0	0.00	36.50	0	0.00	51.50	0	0.00
6.75	0	0.00	21.75	0	0.00	36.75	0	0.00	51.75	0	0.00
7.00	0	0.00	22.00	0	0.00	37.00	0	0.00	52.00	0	0.00
7.25	0	0.00	22.25	0	0.00	37.25	0	0.00	52.25	0	0.00
7.50	0	0.00	22.50	0	0.00	37.50	0	0.00	52.50	0	0.00
7.75	0	0.00	22.75	0	0.00	37.75	0	0.00	52.75	0	0.00
8.00	0	0.00	23.00	0	0.00	38.00	0	0.00	53.00	0	0.00
8.25	0	0.00	23.25	0	0.00	38.25	0	0.00	53.25	0	0.00
8.50	0	0.00	23.50	0	0.00	38.50	0	0.00	53.50	0	0.00
8.75	0	0.00	23.75	0	0.00	38.75	0	0.00	53.75	0	0.00
9.00	0	0.00	24.00	0	0.00	39.00	0	0.00	54.00	0	0.00
9.25	0	0.00	24.25	0	0.00	39.25	0	0.00	54.25	0	0.00
9.50	0	0.00	24.50	0	0.00	39.50	0	0.00	54.50	0	0.00
9.75	0	0.00	24.75	0	0.00	39.75	0	0.00	54.75	0	0.00
10.00	0	0.00	25.00	0	0.00	40.00	0	0.00	55.00	0	0.00
10.25	0	0.00	25.25	0	0.00	40.25	0	0.00	55.25	0	0.00
10.50	0	0.00	25.50	0	0.00	40.50	0	0.00	55.50	0	0.00
10.75	0	0.00	25.75	0	0.00	40.75	0	0.00	55.75	0	0.00
11.00	0	0.00	26.00	0	0.00	41.00	0	0.00	56.00	0	0.00
11.25	0	0.00	26.25	0	0.00	41.25	0	0.00	56.25	0	0.00
11.50	0	0.00	26.50	0	0.00	41.50	0	0.00	56.50	0	0.00
11.75	0	0.00	26.75	0	0.00	41.75	0	0.00	56.75	0	0.00
12.00	0	0.00	27.00	0	0.00	42.00	0	0.00	57.00	0	0.00
12.25	0	0.00	27.25	0	0.00	42.25	0	0.00	57.25	0	0.00
12.50	0	0.00	27.50	0	0.00	42.50	0	0.00	57.50	0	0.00
12.75	0	0.00	27.75	0	0.00	42.75	0	0.00	57.75	0	0.00
13.00	0	0.00	28.00	0	0.00	43.00	0	0.00	58.00	0	0.00
13.25	0	0.00	28.25	0	0.00	43.25	0	0.00	58.25	0	0.00
13.50	0	0.00	28.50	0	0.00	43.50	0	0.00	58.50	0	0.00
13.75	0	0.00	28.75	0	0.00	43.75	0	0.00	58.75	0	0.00
14.00	0	0.00	29.00	0	0.00	44.00	0	0.00	59.00	0	0.00
14.25	0	0.00	29.25	0	0.00	44.25	0	0.00	59.25	0	0.00
14.50	0	0.00	29.50	0	0.00	44.50	0	0.00	59.50	0	0.00
14.75	0	0.00	29.75	0	0.00	44.75	0	0.00	59.75	0	0.00

Company:	Florida Power and Light
Equipment:	Mitsubishi 501G, Unit U3A Fuel Oil
Location:	West County Energy Center
Date:	April 26, 2011
Project #:	bv-10-westcounty.fl-comp#2

Run 3

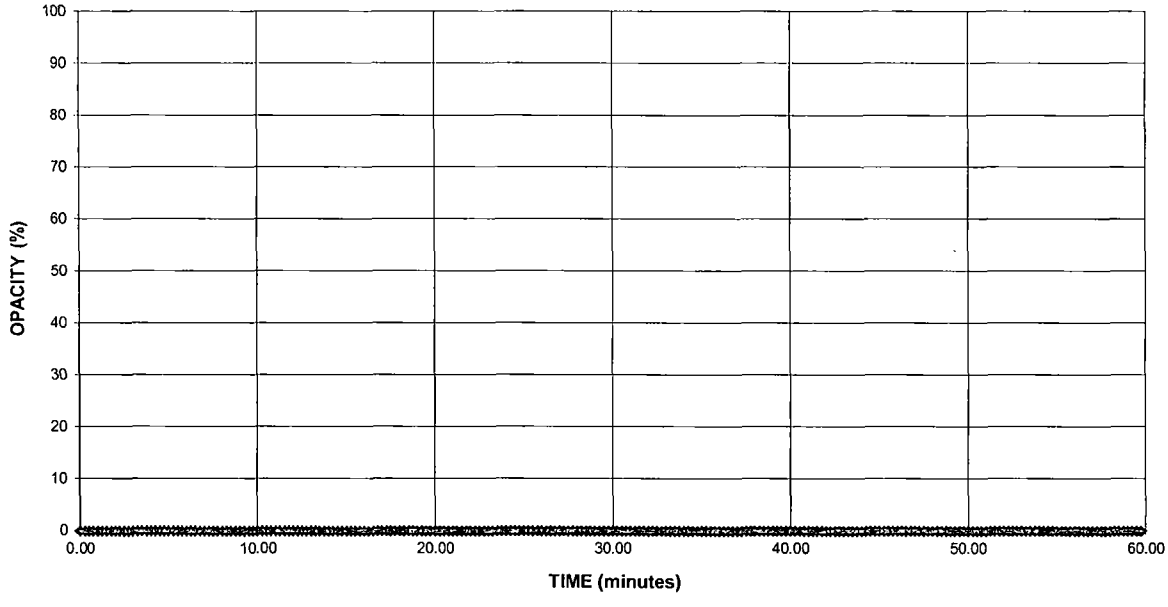
Average Opacity:	0.00 %
Maximum Opacity:	0 %
6 Minute Average:	0.00 %
6 Minute Maximum:	0.00 %
Max Time w/ Opacity:	0.00 minutes

TIME (min)	OPACITY (%)	6 MIN AVG.	TIME (min)	OPACITY (%)	6 MIN AVG.	TIME (min)	OPACITY (%)	6 MIN AVG.	TIME (min)	OPACITY (%)	6 MIN AVG.
0.00	0	N/A	15.00	0	0.00	30.00	0	0.00	45.00	0	0.00
0.25	0	N/A	15.25	0	0.00	30.25	0	0.00	45.25	0	0.00
0.50	0	N/A	15.50	0	0.00	30.50	0	0.00	45.50	0	0.00
0.75	0	N/A	15.75	0	0.00	30.75	0	0.00	45.75	0	0.00
1.00	0	N/A	16.00	0	0.00	31.00	0	0.00	46.00	0	0.00
1.25	0	N/A	16.25	0	0.00	31.25	0	0.00	46.25	0	0.00
1.50	0	N/A	16.50	0	0.00	31.50	0	0.00	46.50	0	0.00
1.75	0	N/A	16.75	0	0.00	31.75	0	0.00	46.75	0	0.00
2.00	0	N/A	17.00	0	0.00	32.00	0	0.00	47.00	0	0.00
2.25	0	N/A	17.25	0	0.00	32.25	0	0.00	47.25	0	0.00
2.50	0	N/A	17.50	0	0.00	32.50	0	0.00	47.50	0	0.00
2.75	0	N/A	17.75	0	0.00	32.75	0	0.00	47.75	0	0.00
3.00	0	N/A	18.00	0	0.00	33.00	0	0.00	48.00	0	0.00
3.25	0	N/A	18.25	0	0.00	33.25	0	0.00	48.25	0	0.00
3.50	0	N/A	18.50	0	0.00	33.50	0	0.00	48.50	0	0.00
3.75	0	N/A	18.75	0	0.00	33.75	0	0.00	48.75	0	0.00
4.00	0	N/A	19.00	0	0.00	34.00	0	0.00	49.00	0	0.00
4.25	0	N/A	19.25	0	0.00	34.25	0	0.00	49.25	0	0.00
4.50	0	N/A	19.50	0	0.00	34.50	0	0.00	49.50	0	0.00
4.75	0	N/A	19.75	0	0.00	34.75	0	0.00	49.75	0	0.00
5.00	0	N/A	20.00	0	0.00	35.00	0	0.00	50.00	0	0.00
5.25	0	N/A	20.25	0	0.00	35.25	0	0.00	50.25	0	0.00
5.50	0	N/A	20.50	0	0.00	35.50	0	0.00	50.50	0	0.00
5.75	0	0.00	20.75	0	0.00	35.75	0	0.00	50.75	0	0.00
6.00	0	0.00	21.00	0	0.00	36.00	0	0.00	51.00	0	0.00
6.25	0	0.00	21.25	0	0.00	36.25	0	0.00	51.25	0	0.00
6.50	0	0.00	21.50	0	0.00	36.50	0	0.00	51.50	0	0.00
6.75	0	0.00	21.75	0	0.00	36.75	0	0.00	51.75	0	0.00
7.00	0	0.00	22.00	0	0.00	37.00	0	0.00	52.00	0	0.00
7.25	0	0.00	22.25	0	0.00	37.25	0	0.00	52.25	0	0.00
7.50	0	0.00	22.50	0	0.00	37.50	0	0.00	52.50	0	0.00
7.75	0	0.00	22.75	0	0.00	37.75	0	0.00	52.75	0	0.00
8.00	0	0.00	23.00	0	0.00	38.00	0	0.00	53.00	0	0.00
8.25	0	0.00	23.25	0	0.00	38.25	0	0.00	53.25	0	0.00
8.50	0	0.00	23.50	0	0.00	38.50	0	0.00	53.50	0	0.00
8.75	0	0.00	23.75	0	0.00	38.75	0	0.00	53.75	0	0.00
9.00	0	0.00	24.00	0	0.00	39.00	0	0.00	54.00	0	0.00
9.25	0	0.00	24.25	0	0.00	39.25	0	0.00	54.25	0	0.00
9.50	0	0.00	24.50	0	0.00	39.50	0	0.00	54.50	0	0.00
9.75	0	0.00	24.75	0	0.00	39.75	0	0.00	54.75	0	0.00
10.00	0	0.00	25.00	0	0.00	40.00	0	0.00	55.00	0	0.00
10.25	0	0.00	25.25	0	0.00	40.25	0	0.00	55.25	0	0.00
10.50	0	0.00	25.50	0	0.00	40.50	0	0.00	55.50	0	0.00
10.75	0	0.00	25.75	0	0.00	40.75	0	0.00	55.75	0	0.00
11.00	0	0.00	26.00	0	0.00	41.00	0	0.00	56.00	0	0.00
11.25	0	0.00	26.25	0	0.00	41.25	0	0.00	56.25	0	0.00
11.50	0	0.00	26.50	0	0.00	41.50	0	0.00	56.50	0	0.00
11.75	0	0.00	26.75	0	0.00	41.75	0	0.00	56.75	0	0.00
12.00	0	0.00	27.00	0	0.00	42.00	0	0.00	57.00	0	0.00
12.25	0	0.00	27.25	0	0.00	42.25	0	0.00	57.25	0	0.00
12.50	0	0.00	27.50	0	0.00	42.50	0	0.00	57.50	0	0.00
12.75	0	0.00	27.75	0	0.00	42.75	0	0.00	57.75	0	0.00
13.00	0	0.00	28.00	0	0.00	43.00	0	0.00	58.00	0	0.00
13.25	0	0.00	28.25	0	0.00	43.25	0	0.00	58.25	0	0.00
13.50	0	0.00	28.50	0	0.00	43.50	0	0.00	58.50	0	0.00
13.75	0	0.00	28.75	0	0.00	43.75	0	0.00	58.75	0	0.00
14.00	0	0.00	29.00	0	0.00	44.00	0	0.00	59.00	0	0.00
14.25	0	0.00	29.25	0	0.00	44.25	0	0.00	59.25	0	0.00
14.50	0	0.00	29.50	0	0.00	44.50	0	0.00	59.50	0	0.00
14.75	0	0.00	29.75	0	0.00	44.75	0	0.00	59.75	0	0.00

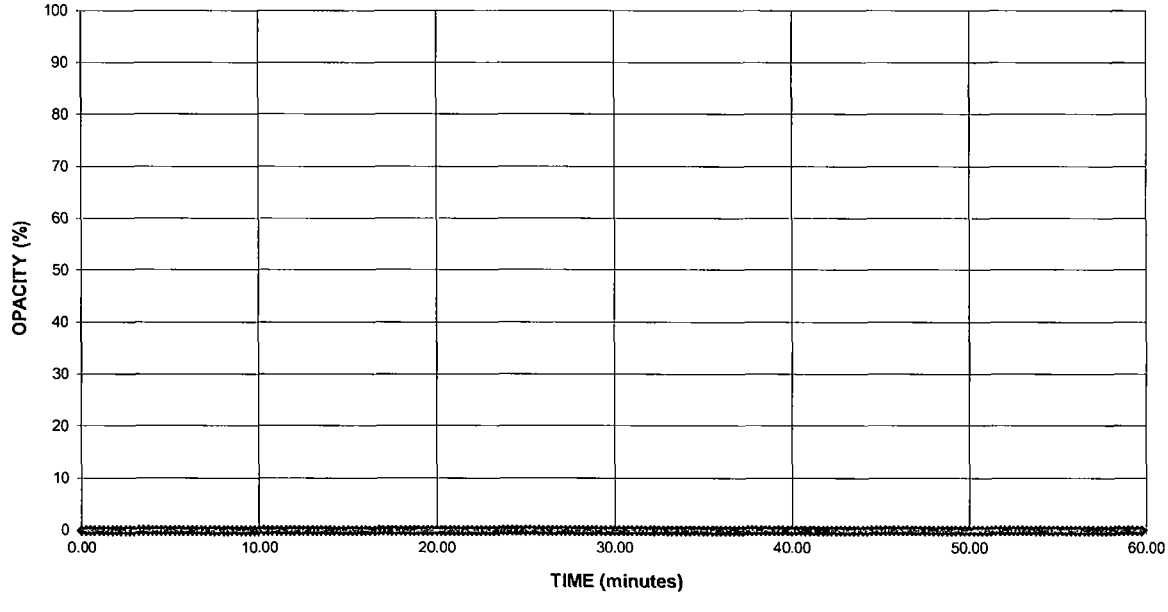
Company:	Florida Power and Light
Equipment:	Mitsubishi 501G, Unit U3A Fuel Oil
Location:	West County Energy Center
Date:	April 26, 2011
Project #:	bv-10-westcounty.fl-comp#2

Run 1	**Average Opacity:**	0.00 %
	Maximum Opacity:	0 %
	6 Minute Average:	0.00 %
	6 Minute Maximum:	0.00 %
	Max Time w/ Opacity:	0.00 minutes

OPACITY READINGS
(15 second intervals)

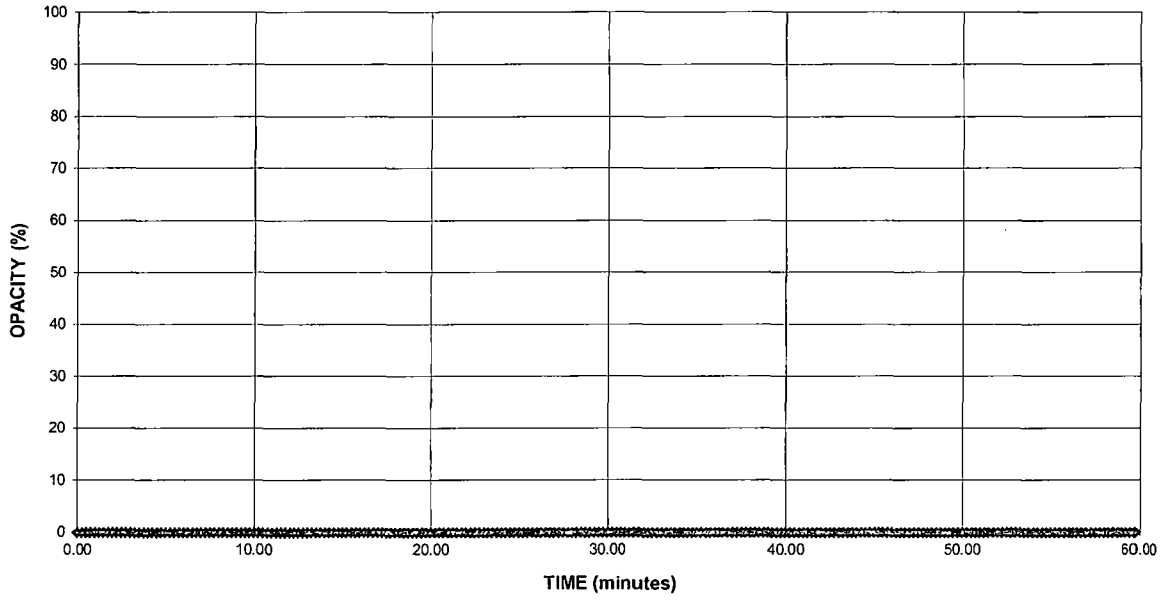


OPACITY RESULTS
(6 minute averages)

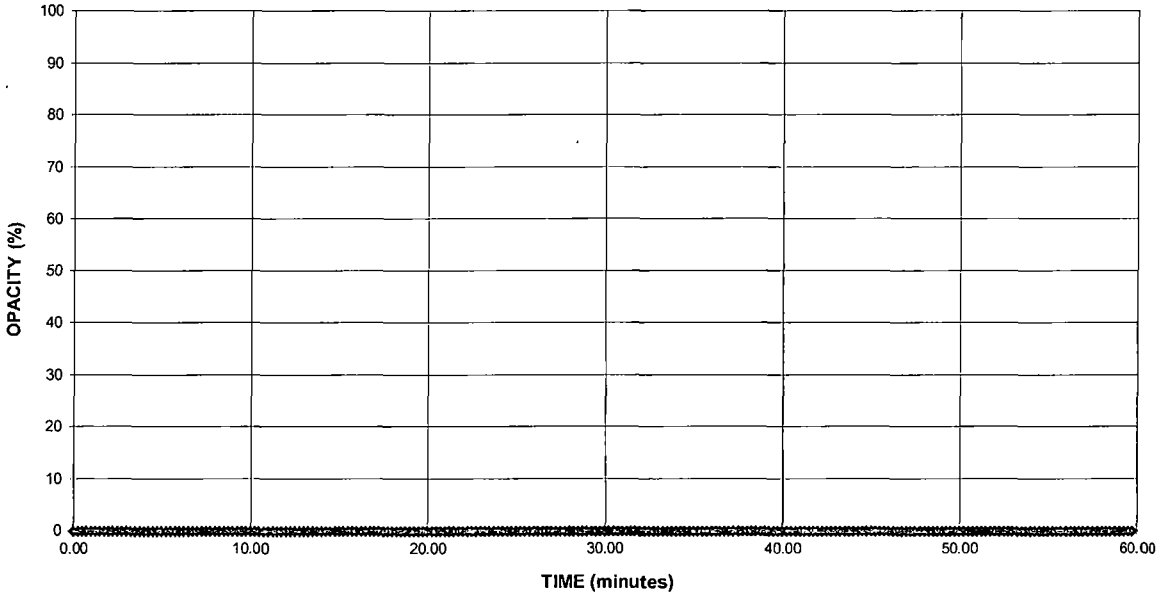


Company: Florida Power and Light		**Average Opacity:**	0.00 %
Equipment: Mitsubishi 501G, Unit U3A Fuel Oil		**Maximum Opacity:**	0 %
Location: West County Energy Center	Run 2	**6 Minute Average:**	0.00 %
Date: April 26, 2011		**6 Minute Maximum:**	0.00 %
Project #: bv-10-westcounty.fl-comp#2		**Max Time w/ Opacity:**	0.00 minutes

OPACITY READINGS
(15 second intervals)



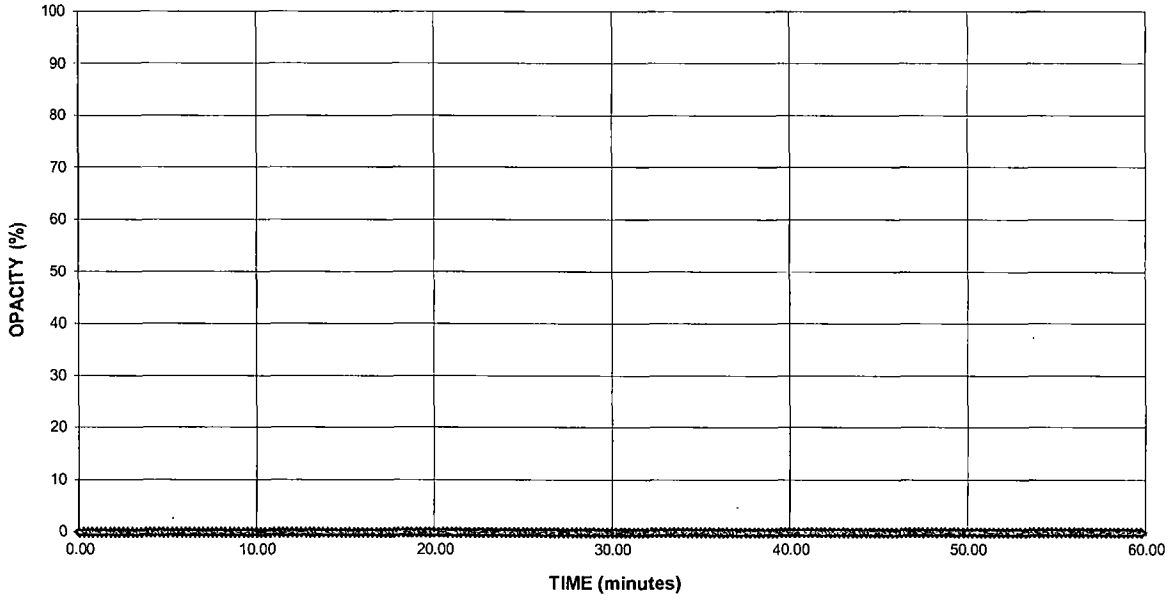
OPACITY RESULTS
(6 minute averages)



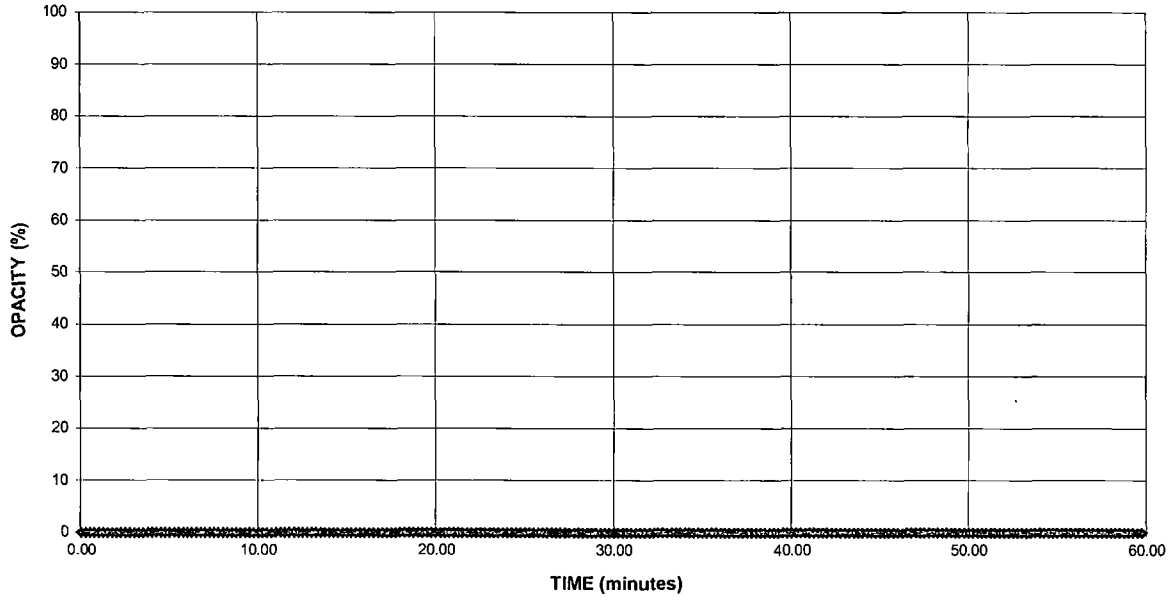
Company:	Florida Power and Light
Equipment:	Mitsubishi 501G, Unit U3A Fuel Oil
Location:	West County Energy Center
Date:	April 26, 2011
Project #:	bv-10-westcounty.fl-comp#2

Run 3	**Average Opacity:**	0.00 %
	Maximum Opacity:	0 %
	6 Minute Average:	0.00 %
	6 Minute Maximum:	0.00 %
	Max Time w/ Opacity:	0.00 minutes

OPACITY READINGS
(15 second intervals)



OPACITY RESULTS
(6 minute averages)



EPA
VISIBLE EMISSION OBSERVATION FORM 1

Form Number	0 0 0 0 1	Page 1	Of 6
Continued on VEO Form Number	0 0 0 0 2		

Method Used (Circle One): (Method 9) 203A 203B Other: _____

Company Name: FLORIDA POWER AND LIGHT		
Facility Name: WEST COUNTY ENERGY CENTER		
Street Address: 20505 STATE RD 80		
City: LOXAHATCHEE	State: FL	Zip: 33470

Process: COMBUSTION TURBINE	Unit #: 3A	Operating Mode: FUEL OIL
Control Equipment: HRSG/SCR/OXIDATION CATALYST		Operating Mode:

Describe Emission Point: GREY STACK WITH UNIT NUMBER '3A' WRITTEN IN YELLOW ON THE STACK WALL

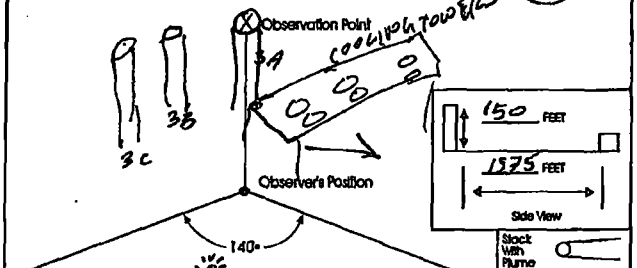
Height of Emiss. Pt. Start: 150 FT End: SAME	Height of Emiss. Pt. Rel. to Observer Start: 150 FT End: SAME
Distance to Emiss. Pt. Start: 1575 FT End: SAME	Direction to Emiss. Pt. (Degrees) Start: N 328 NW End: SAME
Vertical Angle to Obs. Pt. Start: 5.4° End: N 5.4°	Direction to Obs. Pt. (Degrees) Start: N 328 NW End: SAME
Distance and Direction to Observation Point from Emission Point Start: N 1575 FT @ 5.4° End: SAME	

Describe Emissions Start: NOT VISIBLE / NONE End: SAME	
Emission Color Start: NONE End: SAME	Water Droplet Plume: Attached ☐ Detached ☐ None ☑

Describe Plume Background Start: SKY		End: SAME	
Background Color Start: BLUE	End: BLUE	Sky Conditions Start: PARTLY CLOUDY	End: SAME
Wind Speed Start: 9 MPH	End: 6 MPH	Wind Direction Start: SOUTH	End: SOUTH
Ambient Temp. Start: 84°F	End: 85°F	Wet Bulb Temp.: 24-96	RH Percent: 66%

Source Layout Sketch

Draw North Arrow: ☐ TN ☑ MN



Longitude: 26 41'N	Latitude: 80 22'W	Declination

Additional Information:

Observation Date: 4/26/11	Time Zone: EDT	Start Time: 9:40 AM	End Time: 10:40AM

Min \ Sec	0	15	30	45	Comments
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	
5	0	0	0	0	
6	0	0	0	0	
7	0	0	0	0	
8	0	0	0	0	
9	0	0	0	0	
10	0	0	0	0	
11	0	0	0	0	
12	0	0	0	0	
13	0	0	0	0	
14	0	0	0	0	
15	0	0	0	0	
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25	0	0	0	0	
26	0	0	0	0	
27	0	0	0	0	
28	0	0	0	0	
29	0	0	0	0	
30	0	0	0	0	

Observer's Name (Print): GIRIDHAR JAYARAMAN	
Observer's Signature:	Date: 4/26/11
Organization: AIR HYGIENE	
Certified By: ETA	Date: 3/23/2011

EPA
VISIBLE EMISSION OBSERVATION FORM 1

Form Number	Page	Of
0 0 0 0 4	2	6
Continued on VEO Form Number	0 0 0 0 3	

Method Used (Circle One): Method 9 | 203A | 203B | Other: _____

Company Name: FLORIDA POWER AND LIGHT
Facility Name: WEST COUNTY ENERGY CENTER
Street Address: 20505 STATE RD 80
City: LOXAHATCHEE | State: FL | Zip: 33470

Process: COMBUSTION TURBINE | Unit #: 3A | Operating Mode: FUEL OIL
Control Equipment: HRSG SCR/OXIDATION CATALYST | Operating Mode:

Describe Emission Point: GREY COLOR STACK WITH UNIT NUMBER '3A' WRITTEN IN YELLOW ON AT THE STACK WALL
Height of Emiss. Pt.: Start 150 FT End SAME | Height of Emiss. Pt. Rel. to Observer: Start 150 FT End SAME
Distance to Emiss. Pt.: Start 1575 FT End SAME | Direction to Emiss. Pt. (Degrees): Start S28W End SAME

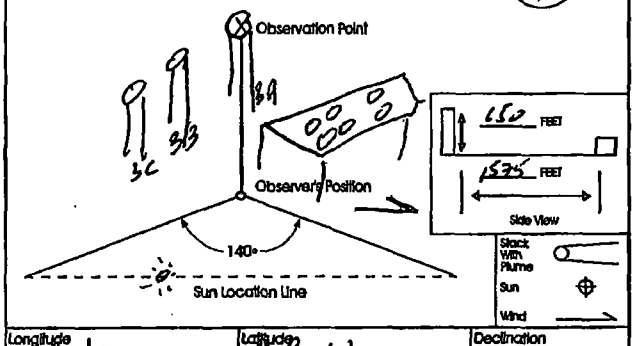
Vertical Angle to Obs. Pt.: Start 5.4° End SAME | Direction to Obs. Pt. (Degrees): Start N28W End SAME
Distance and Direction to Observation Point from Emission Point: Start 1575 FT @ 5.4° End N SAME

Describe Emissions: Start NOT VISIBLE / NONE End SAME
Emission Color: Start NONE End SAME | Water Droplet Plume: Attached ☐ Detached ☐ None ☑

Describe Plume Background: Start SKY End SAME
Background Color: Start BLUE End BLUE | Sky Conditions: Start PARTLY CLOUDY End SAME
Wind Speed: Start 9 MPH End 6 MPH | Wind Direction: Start SOUTH End SOUTH
Ambient Temp.: Start 84 °F End 85 °F | Wet Bulb Temp.: 29.9 | RH Percent: 66%

Source Layout Sketch

Draw North Arrow: ☐ TN ☑ MN



Longitude: 26 41' N | Latitude: 80 22' W | Declination:

Additional Information:

Observation Date	Time Zone	Start Time	End Time
	EDT	9:40 AM	10:40 AM

Sec / Min	0	15	30	45	Comments
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	
5	0	0	0	0	
6	0	0	0	0	
7	0	0	0	0	
8	0	0	0	0	
9	0	0	0	0	
10	0	0	0	0	
11	0	0	0	0	
12	0	0	0	0	
13	0	0	0	0	
14	0	0	0	0	
15	0	0	0	0	
16	0	0	0	0	
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18	0	0	0	0	
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22	0	0	0	0	
23	0	0	0	0	
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25	0	0	0	0	
26	0	0	0	0	
27	0	0	0	0	
28	0	0	0	0	
29	0	0	0	0	
30	0	0	0	0	

Observer's Name (Print): GIRIDHAR JAYARAMAN
Observer's Signature: _____ | Date: 4/26/11
Organization: AIR HYGIENE
Certified By: ETA | Date: 3/23/11

EPA
VISIBLE EMISSION OBSERVATION FORM 1

Form Number	0 0 0 3	Page 3	Of 6
Continued on VEO Form Number	0 0 0 4		

Method Used (Circle One): Method 9 | 203A | 203B | Other: _____

Company Name: FLORIDA POWER AND LIGHT		
Facility Name: WEST COUNTY ENERGY CENTER		
Street Address: 20505 STATE RD 80		
City: LOXAHATCHEE	State: FL	Zip: 33470

Process: COMBUSTION TURBINE	Unit #: 3A	Operating Mode: FUEL OIL
Control Equipment: ~~HAS~~ SCR/OXIDATION CATALYST		Operating Mode

Describe Emission Point: GREY STACK WITH UNIT NUMBER '3A' WRITTEN IN YELLOW ON THE STACK WALL

Height of Emiss. Pt. Start: 150 FT	End: SAME	Height of Emiss. Pt. Rel. to Observer Start: 150 FT	End: SAME
Distance to Emiss. Pt. Start: 1510 FT	End: SAME	Direction to Emiss. Pt. (Degrees) Start: 346° N	End: SAME

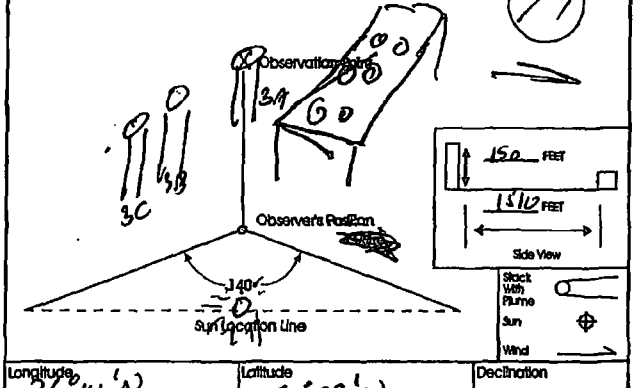
Vertical Angle to Obs. Pt. Start: 5.67°	End: SAME	Direction to Obs. Pt. (Degrees) Start: 346° N	End: SAME
Distance and Direction to Observation Point from Emission Point Start: 1510 FT @ 346° N		End: SAME	

Describe Emissions Start: NOT VISIBLE		End: SAME	
Emission Color Start: NONE	End: NONE	Water Droplet Plume: Attached ☐ Detached ☐ None ☑	

Describe Plume Background Start: SKY		End: SAME	
Background Color Start: BLUE	End: SAME	Sky Conditions Start: SCATTERED	End: SAME
Wind Speed Start: 12 MPH	End: SAME	Wind Direction Start: SSE	End: SAME
Ambient Temp. Start: 69°F	End: 52°F	Wet Bulb Temp.: 29.97	RH Percent: 56%

Source Layout Sketch

Draw North Arrow: ☐ TN ☑ MN



Longitude	Latitude	Declination
26° 41' N	80° 22' W	

Additional Information:

Observation Date	Time Zone	Start Time	End Time
4/26/11	EDT	10:50AM	11:50AM

Sec / Min	0	15	30	45	Comments
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	
5	0	0	0	0	
6	0	0	0	0	
7	0	0	0	0	
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25	0	0	0	0	
26	0	0	0	0	
27	0	0	0	0	
28	0	0	0	0	
29	0	0	0	0	
30	0	0	0	0	

Observer's Name (Print): GIRIDHAR JAYARAMAN	
Observer's Signature	Date: 4/26/11
Organization: AIR HYGIENE	
Certified By: ETA	Date: 3/23/11

EPA
VISIBLE EMISSION OBSERVATION FORM 1

Form Number	0004	Page	4	Of	6
Continued on VEO Form Number	0000S				

Method Used (Circle One): Method 9 | 203A | 203B | Other: _____

Company Name: FLORIDA POWER AND LIGHT		
Facility Name: WEST COUNTY ENERGY CENTER		
Street Address: 20505 STATE RD 80		
City: LOXAHATCHEE	State: FL	Zip: 33470

Process: COMBUSTION TURBINE	Unit #: 3A	Operating Mode: FUEL OIL
Control Equipment: ~~NOx~~ SCR/OXIDATION CATALYST		Operating Mode

Describe Emission Point: GREY COLOR STACK WITH UNIT NUMBER '3A' WRITTEN IN YELLOW ON THE STACK WALL

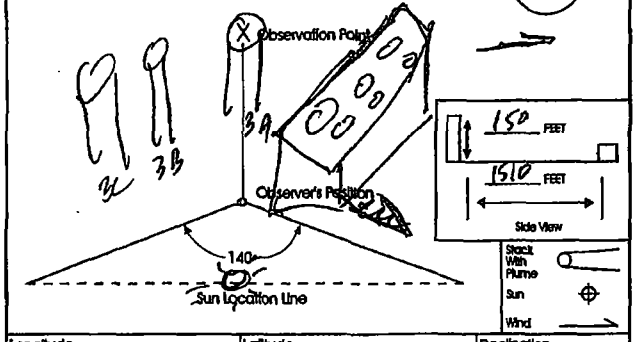
Height of Emiss. Pt. Start: 150 FT	End: SAME	Height of Emiss. Pt. Rel. to Observer Start: 150 FT	End: SAME
Distance to Emiss. Pt. Start: N1510 FT	End: SAME	Direction to Emiss. Pt. (Degrees) Start: N346°W	End: SAME
Vertical Angle to Obs. Pt. Start: N9.69°	End: SAME	Direction to Obs. Pt. (Degrees) Start: N346°W	End: SAME
Distance and Direction to Observation Point from Emission Point Start: N1510 FT 346°		End: SAME	

Describe Emissions Start: NOT VISIBLE		End: SAME	
Emission Color Start: NONE	End: NONE	Water Droplet Plume: Attached ☐ Detached ☐ None ☑	

Describe Plume Background Start: SKY		End: SAME	
Background Color Start: BLUE	End: SAME	Sky Conditions Start: SCATTERED	End: SAME
Wind Speed Start: 12MPH	End: SAME	Wind Direction Start: SSE	End: SAME
Ambient Temp. Start: 89°F	End: 89°F	Wet Bulb Temp. 20.97	RH Percent 58%

Source Layout Sketch

Draw North Arrow: ☐ TN ☑ MN



Longitude	Latitude	Declination
26° 41' N	80° 22' W	

Additional Information:

Observation Date	Time Zone	Start Time	End Time
4/26/11	EDT	10:50 AM	11:50 AM

Min \ Sec	0	15	30	45	Comments
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	
5	0	0	0	0	
6	0	0	0	0	
7	0	0	0	0	
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25	0	0	0	0	
26	0	0	0	0	
27	0	0	0	0	
28	0	0	0	0	
29	0	0	0	0	
30	0	0	0	0	

Observer's Name (Print): GURDHAR JAMARMAN	
Observer's Signature:	Date: 4/26/11
Organization: AIR HYGIENE	
Certified By: ETA	Date: 4/26/11 3/23/11

VEOF1.1

EPA
VISIBLE EMISSION OBSERVATION FORM 1

Form Number	Page	Of
00015	3	6
Continued on VEO Form Number	0006	

Method Used (Circle One): (Method 9) 203A 203B Other: _____

Company Name	FLORIDA POWER AND LIGHT
Facility Name	WEST COUNTY ENERGY CENTER
Street Address	20505 STATE RD 80
City	LOXAHATCHEE
State	FL
Zip	33470

Process	Unit #	Operating Mode
COMBUSTION TURBINE	3A	FUEL OIL
Control Equipment		Operating Mode
SCR/OXIDATION CATALYST		

Describe Emission Point: GREY COLOR STACK WITH UNIT NUMBER '3A' WRITTEN IN YELLOW ON THE STACK WALL

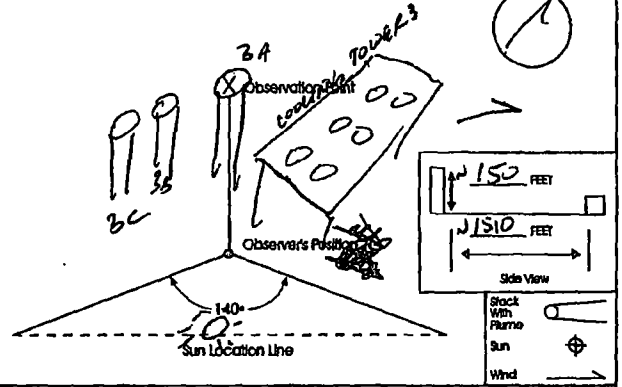
Height of Emiss. Pt.	Height of Emiss. Pt. Rel. to Observer
Start 150 FT End SAME	Start 150FT End SAME
Distance to Emiss. Pt.	Direction to Emiss. Pt. (Degrees)
Start N1510 FT End SAME	Start N346°N End SAME
Vertical Angle to Obs. Pt.	Direction to Obs. Pt. (Degrees)
Start 5.67° End SAME	Start N346°N End SAME
Distance and Direction to Observation Point from Emission Point	
Start N1610 FT @ 346°N End SAME	

Describe Emissions	
Start NOT VISIBLE	End SAME
Emission Color	Water Droplet Plume
Start NONE End NONE	Attached ☐ Detached ☐ None ☒

Describe Plume Background			
Start SKY		End SAME	
Background Color		Sky Conditions	
Start BLUE	End SAME	Start SCATTERED	End SAME
Wind Speed		Wind Direction	
Start 10 MPH	End N 10 MPH	Start SOUTH	End SAME
Ambient Temp.		Wet Bulb Temp.	RH Percent
Start 89°F	End 90°F	29.46	52%

Source Layout Sketch

Draw North Arrow: ☐ TN ☒ MN



Longitude	Latitude	Declination
26°41'N	90° 22' W	

Additional Information:

Observation Date	Time Zone	Start Time	End Time
4/26/11	EDT	11:56 AM	12:56 PM

Min \ Sec	0	15	30	45	Comments
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	
5	0	0	0	0	
6	0	0	0	0	
7	0	0	0	0	
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25	0	0	0	0	
26	0	0	0	0	
27	0	0	0	0	
28	0	0	0	0	
29	0	0	0	0	
30	0	0	0	0	

Observer's Name (Print)	GIRIDHAR JAYARAMAN
Observer's Signature	
Date	4/26/11
Organization	AIR HYGIENE
Certified By	ETA
Date	3/23/11

VEOF1.1

EPA
VISIBLE EMISSION OBSERVATION FORM 1

Form Number	Page	Of
0006	6	6
Continued on VEO Form Number		

Method Used (Circle One): Method 9 | 203A | 203B | Other: _____

Company Name: FLORIDA POWER AND LIGHT		
Facility Name: WEST COUNTY ENERGY CENTER		
Street Address: 20505 STATE RD80		
City: LOXAHATCHEE	State: FL	Zip: 33470

Process: COMBUSTION TURBINE	Unit #: 3A	Operating Mode: FUEL OIL
Control Equipment: ~~HRSG~~ SCR/OXIDATION CATALYST		Operating Mode:

Describe Emission Point: GREY STACK WITH UNIT NUMBER '3A' WRITTEN IN YELLOW ON THE STACK WALL

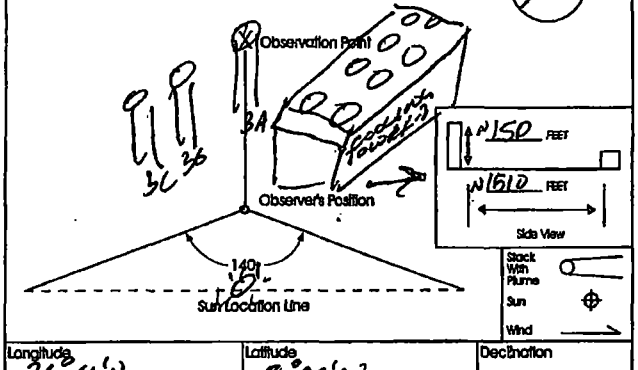
Height of Emiss. Pt. Start: 150 FT End: SAME	Height of Emiss. Pt. Rel. to Observer Start: 150FT End: SAME
Distance to Emiss. Pt. Start: N1610 FT End: SAME	Direction to Emiss. Pt. (Degrees) Start: N346° P End: SAME

Vertical Angle to Obs. Pt. Start: 5.67° End: SAME	Direction to Obs. Pt. (Degrees) Start: N346°N End: SAME
Distance and Direction to Observation Point from Emission Point Start: N15P FT & 346°N	End: SAME

Describe Emissions Start: NOT VISIBLE	End: SAME
Emission Color Start: NON E End: SAME	Water Droplet Plume: Attached ☐ Detached ☐ None ☑

Describe Plume Background Start: SKY		End: SAME	
Background Color Start: BLUE	End: SAME	Sky Conditions Start: SCATTERED	End: SAME
Wind Speed Start: 10 MPH	End: 10 MPH	Wind Direction Start: SOUTH, E	End: SAME
Ambient Temp. Start: 89°F	End:	Wet Bulb Temp. 29.96	RH Percent 52%

Source Layout Sketch — Draw North Arrow: ☐ TN ☑ MN



Longitude	Latitude	Declination
26 41'N	80°22'W	

Additional Information:

Observation Date	Time Zone	Start Time	End Time
4/26/11	EDT	11:55AM	12:55PM

Min \ Sec	0	15	30	45	Comments
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	
5	0	0	0	0	
6	0	0	0	0	
7	0	0	0	0	
8	0	0	0	0	
9	0	0	0	0	
10	0	0	0	0	
11	0	0	0	0	
12	0	0	0	0	
13	0	0	0	0	
14	0	0	0	0	
15	0	0	0	0	
16	0	0	0	0	
17	0	0	0	0	
18	0	0	0	0	
19	0	0	0	0	
20	0	0	0	0	
21	0	0	0	0	
22	0	0	0	0	
23	0	0	0	0	
24	0	0	0	0	
25	0	0	0	0	
26	0	0	0	0	
27	0	0	0	0	
28	0	0	0	0	
29	0	0	0	0	
30	0	0	0	0	

Observer's Name (Print): GIRIDHAR JAYARAMAN	
Observer's Signature: G. C. L	Date: 4/26/11
Organization: AIR HYGIENE	
Certified By: ETA	Date: 3/23/11

CALCULATIONS

EXAMPLE CALCULATIONS (INFORMATION)

Specific Humidity (RH_{sp})

Note: RHsp (gr/lb) calculated using temperature, relative humidity, and barometric pressure with psychrometric chart, psychrometric calculator, or built in psychrometric algorithm.

$$RH_{sp}(lb/lb) = \left[\left(\frac{gr}{lb}\right) \times \frac{lb}{7000\ gr}\right]$$

$$RH_{sp} = \frac{115.80\ gr}{lb} \times \frac{1\ lb}{7000\ gr} = 0.016543 \frac{lb\ H_2O}{lb\ Air}$$

Combustor Inlet Pressure / Compressor Discharge Pressure (CIP / CDP)
(corrected from gauge to atmospheric pres. and conv. to mm Hg.)

Note: CIP / CDP (psig) is a value obtained from the source operator.

$$CIP/CDP = \left[(psig + P) \times \frac{51.71493\ mmHg}{1\ psi}\right]$$

$$CIP/CDP = \left[255.9\ psig + 14.7150\right] \times \frac{51.71493\ mmHg}{1\ psia} = 13{,}996\ mmHg\ (abs)$$

Heat Rate (MMBtu/hr)

$$HR = \frac{LHV_{DRY} \times Q_f}{1{,}000{,}000}$$

$$\text{Heat Rate} = \frac{1{,}008{,}408.51\ Btu}{SCF} \times \frac{2{,}023.83\ SCF}{hr} \times \frac{MMBtu}{10^6\ Btu} = \frac{2{,}040.85\ MMBtu}{hr}$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

EXAMPLE CALCULATIONS (CALIBRATION)

Analyzer Calibration Error

RM 7E, (12-17-09), 12.2 Analyzer Calibration Error. For non-dilution systems, use Equation 7E-1 to calculate the analyzer calibration error for the low-, mid-, and high-level calibration gases. (calc for NOx analyzer mid gas, if applicable)

$$ACE = \left(\frac{C_{Dir} - C_V}{CS}\right) \times 100 \qquad \text{Eq. 7E-1}$$

$$ACE = \frac{12.40\ ppm - 12.10\ ppm}{23.60\ ppm} \times 100 = 1.27\ \%$$

Calibration Error and Estimated Point, RM 25A, THC Analyzer

RM 25A, (12-17-09), 8.4 Calibration Error Test. Immediately prior to the test series (within 2 hours of the start of the test), introduce zero gas and high-level calibration gas at the calibration valve assembly. Adjust the analyzer output to the appropriate levels, if necessary. Calculate the predicted response for the low-level and mid-level gases based on a linear response line between the zero and high-level response. Then introduce low-level and mid-level calibration gases successively to the measurement system. ... These differences must be less than 5 percent of the respective calibration gas value. (calc for THC analyzer mid gas, if applicable)

$$E_p = \frac{C_{Dir(H)} - C_{Dir(L)}}{C_{V(H)} - C_{V(L)}} \times C_{Dir(M)} + C_{Dir(Z)}$$

Eq. of a line
y=mx+b

$$E_p = \frac{8.60\ ppm - 0.00\ ppm}{8.46\ ppm - 0.00\ ppm} \times 4.76\ ppm + 0.00 = 4.84\ ppm$$

$$ACE = \left(\frac{C_{Dir} - C_V}{CS}\right) \times 100 \qquad \text{Eq. 7E-1}$$

$$ACE_{THC} = \frac{4.92\ ppm - 4.84\ ppm}{4.76\ ppm} \times 100 = 1.71\ \%$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

EXAMPLE CALCULATIONS (BIAS, DRIFT, AND CORRECTED RAW AVERAGE)

System Bias

RM 7E, (12-17-09), 12.3 System Bias. For non-dilution systems, use Equation 7E-2 to calculate the system bias separately for the low-level and upscale calibration gases. *(calc for NOx analyzer upscale gas, Run 1 initial bias, if applicable)*

$$SB = \left(\frac{C_S - C_{Dir}}{CS}\right) \times 100$$ Eq. 7E-2

$$SB = \frac{11.90 \text{ ppm} - 12.40 \text{ ppm}}{23.60 \text{ ppm}} \times 100 = -2.12 \%$$

Drift Assessment

RM 7E, (12-17-09), 12.5 Drift Assessment. Use Equation 7E-4 to separately calculate the low-level and upscale drift over each test run. (calc for NOx analyzer upscale drift, Run 1, if applicable)

$$D = \left|SB_{final} - SB_i\right|$$ Eq. 7E-4

$$D = |-2.08 \% - -2.12 \%| = 0.04 \%$$

Alternative Drift and Bias

RM 7E, (12-17-09), 13.2 / 13.3 System Bias and Drift. Alternatively, the results are acceptable if |Cs – Cdir| is ≤ 0.5 ppmv or if |Cs – Cv| is ≤ 0.5 ppmv (as applicable). (calc for NOx analyzer initial upscale, Run 1, if applicable)

$$SB\ /\ D_{Alt} = \left|C_S - C_{Dir}\right|$$ Eq. Section 13.2 and 13.3

$$SB\ /\ D_{Alt} = |11.90 \text{ ppm} - 12.40 \text{ ppm}| = 0.50 \text{ ppm}$$

Bias Adjusted Average

RM 7E, (12-17-09), 12.6 Effluent Gas Concentration. For each test run, calculate Cavg, the arithmetic average of all valid NOx concentration values (e.g., 1-minute averages). Then adjust the value of Cavg for bias, using Equation 7E-5b. (calc for NOx analyzer, Run 1, if applicable)

$$C_{Gas} = \left(C_{Avg} - C_O\right) \times \left(\frac{C_{SA}}{C_{SA} - C_O}\right)$$ Eq. 7E-5b

$$C_{Gas} = \left(8.33 \text{ ppm} - 0.17 \text{ ppm}\right) \times \left(\frac{12.10 \text{ ppm}}{11.91 \text{ ppm} - 0.17 \text{ ppm}}\right) = 8.41 \text{ ppm}$$

EXAMPLE CALCULATIONS (RUNS)

Stack Exhaust Flow (Q_S) - RM19

$$Q_S = \left(\frac{FFactor \times Q_f \times LHV}{1{,}000{,}000}\right) \times \left(\frac{20.9\%}{20.9\% - C_{Gas(O2)}}\right)$$

$$Q_S = \frac{9{,}241.06 \text{ SCF}}{\text{MMBtu}} \times \frac{2{,}023.83 \text{ SCF}}{\text{hr}} \times \frac{1{,}008{,}408.51 \text{ Btu}}{\text{SCF}} \times \frac{\text{MMBtu}}{10^6 \text{ Btu}} \times \left[\frac{20.90\%}{20.9\% - 13.6 \%}\right] = 53{,}689{,}658.24 \text{ SCFH}$$

Diluent-Corrected Pollutant Concentration, O_2 Based

RM 20, (11-26-02), 7.3.1 Correction of Pollutant Concentration Using O_2 Concentration. Calculate the O_2 corrected pollutant concentration, as follows: (calc for NOx gas, Run 1, if applicable)

$$C_{adj} = C_{Gas(Trig\ cc)} \times \left(\frac{20.9\% - AdjFactor}{20.9\% - C_{Gas(O2)}}\right)$$ Eq. 20-4

$$C_{adj} = 8.41 \text{ ppm} \times \left(\frac{20.9\% - 15.00 \%}{20.9\% - 13.56 \%}\right) = 6.76 \text{ ppm@15\%O}_2$$

Diluent-Corrected Pollutant Concentration Corrected to ISO Conditions

40CFR60.335(b)(1), Conversion for conc. at ISO Conditions (68°F, 1 atm). Calculate, as follows: (calc for NOx@15% with Run 1 data, if applicable)

$$C_{ISO} = C_{Adj} \times \sqrt{\frac{P_r}{P_a}} \times e^{(19 \times (H_a - 0.00633))} \times \left(\frac{288}{T_a}\right)^{1.53}$$

$$C_{ISO} = 6.76 \text{ ppm@15\%O}_2 \times \sqrt{\frac{255.9 \text{ psig} + 14.69232 \text{ psi}}{0.01933677 \text{ psi/mm Hg.}} \times \frac{255.9 \text{ psig} + 14.7150 \text{ psi}}{0.01933677 \text{ psi/mm Hg.}}} \times 2.718^{(19 \times (0.016543 \text{ lb/lb} - 0.00633))} \times \left(\frac{288 \text{ K}}{302 \text{ K}}\right)^{1.53} = 7.63 \text{ ppm@15\% and ISO}$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

EXAMPLE CALCULATIONS (RUNS)

Emissions Rate (lb/hr)

Calculation for pound per hour emission rate. Calculate, as follows: (calc for NOx gas Run 1, if applicable)

$$E_{lb/hr} = \frac{C_{Gas}}{10^6} \times \frac{Q_S \times MW}{G}$$

$$E_{lb/hr} = \frac{8.41 \text{ ppm}}{10^6 \text{ ppm/part}} \times \frac{53{,}689{,}658 \text{ SCFH} \times 46.01 \text{ lb/lb-mol}}{385.23 \text{ SCF/lb-mol}} = \frac{53.94 \text{ lb}}{\text{hr}}$$

Emissions Rate (ton/year)

Calculation for tons per year emission rate based on 500 hours per year. Calculate, as follows: (calc for NOx gas Run 1, if applicable)

$$E_{ton/yr} = \frac{E_{lb/hr} \times hr_{year}}{2000}$$

$$E_{ton/yr} = \frac{53.94 \text{ lb}}{\text{hr}} \times \frac{500 \text{ hr}}{\text{year}} \times \frac{\text{ton}}{2000 \text{ lb}} = \frac{13.48 \text{ ton}}{\text{year}}$$

Emissions Rate (lb/MMBtu)

RM 19, (12-17-09), 12.2 Emission Rates of PM, SO_2, and NOx. Select from the following sections the applicable procedure to compute the PM, SO_2, or NOx emission rate (E) in ng/J (lb/million Btu). (calc for NOx gas Run 1, if applicable)

Oxygen Based

12.2.1 Oxygen-Based F Factor, Dry Basis. When measurements are on a dry basis for both O_2 ($\%O_2d$) and pollutant (Cd) concentrations, use the following equation:

$$E_{lb/MMBtu} = \frac{C_{Gas} \times F_d Factor \times Conv_c \times 20.9\%}{20.9\% - C_{Gas(O2)}} \qquad \text{Eq. 19-1}$$

$$E_{lb/MMBtu} = \frac{8.41 \text{ ppm} \times 9{,}241.06 \text{ SCF/MMBtu} \times 0.0000001194 \text{ lb/ppm*ft}^3 \times 20.9\%}{20.9\% - 13.56 \%} = \frac{0.026 \text{ lb}}{\text{MMBtu}}$$

Conversion Constant

Convc for NOx

$$Conv_c(lb / ppm \cdot ft^3) = \frac{\frac{MW}{G}}{10^6}$$

$$Conv_c = \frac{\frac{46.01 \text{ lb}}{\text{lb•mole}} \times \frac{\text{lb•mole}}{385.23 \text{ SCF}}}{10^6} = \frac{0.0000001194 \text{ lb}}{\text{ppm-ft}^3}$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

RM 7E, (08-15-06), 12.1 Nomenclature. The terms used in the equations are defined as follows:

ACE = Analyzer calibration error, percent of calibration span.
B_{WS} = Moisture content of sample gas as measured by Method 4 or other approved method, percent/100.
C_{Avg} = Average unadjusted gas concentration indicated by data recorder for the test run.
C_D = Pollutant concentration adjusted to dry conditions.
C_{Dir} = Measured concentration of a calibration gas (low, mid, or high) when introduced in direct calibration mode.
C_{Gas} = Average effluent gas concentration adjusted for bias.
C_M = Average of initial and final system calibration bias (or 2-point system calibration error) check responses for the upscale calibration gas.
C_{MA} = Actual concentration of the upscale calibration gas, ppmv.
C_O = Average of the initial and final system calibration bias (or 2-point system calibration error) check responses from the low-level (or zero) calibration gas.
C_S = Measured concentration of a calibration gas (low, mid, or high) when introduced in system calibration mode.
C_{SS} = Concentration of NOx measured in the spiked sample.
C_{Spike} = Concentration of NOx in the undiluted spike gas.
C_{Calc} = Calculated concentration of NOx in the spike gas diluted in the sample.
C_V = Manufacturer certified concentration of a calibration gas (low, mid, or high).
C_W = Pollutant concentration measured under moist sample conditions, wet basis.
CS = Calibration span.
D = Drift assessment, percent of calibration span.
E_p = The predicted response for the low-level and mid-level gases based on a linear response line between the zero and high-level response.
Eff_{NO2} = *NO_2 to NO converter efficiency, percent.*
H = High calibration gas, designator.
L = Low calibration gas, designator.
M = Mid calibration gas, designator.
NOFinal = The average NO concentration observed with the analyzer in the NO mode during the converter efficiency test in Section 16.2.2.
NOxCorr = The NOx concentration corrected for the converter efficiency.
NOxFinal = The final NOx concentration observed during the converter efficiency test in Section 16.2.2.
NOxPeak = The highest NOx concentration observed during the converter efficiency test in Section 16.2.2.
Q_{Spike} = Flow rate of spike gas introduced in system calibration mode, L/min.
Q_{Total} = Total sample flow rate during the spike test, L/min.
R = Spike recovery, percent.
SB = System bias, percent of calibration span.
SB_I = Pre-run system bias, percent of calibration span.
SB_f = Post-run system bias, percent of calibration span.
SB / D_{Alt} = Alternative absolute difference criteria to pass bias and/or drift checks.
SCE = System calibration error, percent of calibration span.
SCE_I = Pre-run system calibration error, percent of calibration span.
SCE_{final} = Post-run system calibration error, percent of calibration span.
Z = Zero calibration gas, designator.

40CFR60.355(b)(1), (09-20-06), Nomenclature. The terms used in the equations are defined as follows:

P_r = reference combustor inlet absolute pressure at 101.3 kilopascals ambient pressure, mm Hg
P_o = observed combustor inlet absolute pressure at test, mm Hg
H_o = observed humidity of ambient air, g H_2O/g air
e = transcendental constant, 2.718
T_a = ambient temperature, K

Small Engine and FTIR Nomenclature. The terms used in the equations are defined as follows:

bhp = brake horsepower
hp = horsepower
Q_{sys} = system flow (lpm)
Q_m = matrix spike flow (lpm)

RM 19, (07-29-06), 12.1 Nomenclature. The terms used in the equations are defined as follows:

AdjFactor = Percent oxygen or carbon dioxide adjustment applied to a target pollutant
B_{wa} = Moisture fraction of ambient air, percent.
Btu = British thermal unit
$\%_C$ = Concentration of carbon from an ultimate analysis of fuel, weight percent.
$\%_{CO2d}$,$\%_{CO2w}$ = Concentration of carbon dioxide on a dry and wet basis, respectively, percent.
CIP / CDP = Combustor inlet pressure / compressor discharge pressure (mm Hg); note, some manufactures reference as PCD.
E = Pollutant emission rate, ng/J (lb/million Btu).
E_a = Average pollutant rate for the specified performance test period, ng/J (lb/million Btu).
E_{ao}, E_{ai} = Average pollutant rate of the control device, outlet and inlet, respectively, for the performance test period, ng/J (lb/million Btu).
E_{bi} = Pollutant rate from the steam generating unit, ng/J (lb/million Btu).
E_{bo} = Pollutant emission rate from the steam generating unit, ng/J (lb/million Btu).
E_{ci} = Pollutant rate in combined effluent, ng/J (lb/million Btu).
E_{co} = Pollutant emission rate in combined effluent, ng/J (lb/million Btu).
E_d = Average pollutant rate for each sampling period (e.g.,24-hr Method 6B sample or 24-hr fuel sample) or for each fuel lot (e.g., amount of fuel bunkered), ng/J (lb/million Btu).
E_{di} = Average inlet SO_2 rate for each sampling period d, ng/J (lb/million Btu).
E_g = Pollutant rate from gas turbine, ng/J (lb/million Btu).
E_{ga} = Daily geometric average pollutant rate, ng/J (lbs/million Btu) or ppm corrected to 7 percent O_2.
E_{jo},E_{ji} = Matched pair hourly arithmetic average pollutant rate, outlet and inlet, respectively, ng/J (lb/million Btu) or ppm corrected to 7 percent O_2.
E_h = Hourly average pollutant, ng/J (lb/million Btu).
E_{hj} = Hourly arithmetic average pollutant rate for hour "j," ng/J (lb/million Btu) or ppm corrected to 7 percent O_2.
EXP = Natural logarithmic base (2.718) raised to the value enclosed by brackets.
Fc = Ratio of the volume of carbon dioxide produced to the gross calorific value of the fuel from Method 19
F_d, F_w, F_c = Volumes of combustion components per unit of heat content, scm/J (scf/million Btu).
ft^3 = cubic feet
G = ideal gas conversion factor
(385.23 SCF/lb-mol at 68 deg F & 14.696 psia)
GCM = gross Btu per SCF (constant, compound based)
GCV = Gross calorific value of the fuel consistent with the ultimate analysis, kJ/kg (Btu/lb).
GCV_p, GCV_r = Gross calorific value for the product and raw fuel lots, respectively, dry basis, kJ/kg (Btu/lb).
$\%_H$ = Concentration of hydrogen from an ultimate analysis of fuel, weight percent.
H_b = Heat input rate to the steam generating unit from fuels fired in the steam generating unit, J/hr (million Btu/hr).
H_g = Heat input rate to gas turbine from all fuels fired in the gas turbine, J/hr (million Btu/hr).
$\%_{H2O}$ = Concentration of water from an ultimate analysis of fuel, weight percent.
H_t = Total numbers of hours in the performance test period (e.g., 720 hours for 30-day performance test period).
K = volume of combustion component per pound of component (constant)
K = Conversion factor, 10^{-6} (kJ/J)/(%) [10^6 Btu/million Btu].
K_c = (9.57 scm/kg)/% [(1.53 scf/lb)/%].
K_{cc} = (2.0 scm/kg)/% [(0.321 scf/lb)/%].
K_{hd} = (22.7 scm/kg)/% [(3.64 scf/lb)/%].
K_{hw} = (34.74 scm/kg)/% [(5.57 scf/lb)/%].
K_n = (0.86 scm/kg)/% [(0.14 scf/lb)/%].
K_o = (2.85 scm/kg)/% [(0.46 scf/lb)/%].
K_s = (3.54 scm/kg)/% [(0.57 scf/lb)/%].
K_{sulfur} = $2x10^4$ Btu/wt%-MMBtu
K_w = (1.30 scm/kg)/% [(0.21 scf/lb)/%].
lb = pound
ln = Natural log of indicated value.
L_p,L_r = Weight of the product and raw fuel lots, respectively, metric ton (ton).
$\%_N$ = Concentration of nitrogen from an ultimate analysis of fuel, weight percent.
$M_\%$ = mole percent
mol = mole
MW = molecular weight (lb/lb-mol)
MW_{AIR} = molecular weight of air (28.9625 lb/lb-mole)[1]
NCM = net Btu per SCF (constant based on compound)
$\%_O$ = Concentration of oxygen from an ultimate analysis of fuel, weight percent.
$\%_{O2d}$, $\%_{O2w}$ = Concentration of oxygen on a dry and wet basis, respectively, percent.
P_B = barometirc pressure, in Hg
P_s = Potential SO2 emissions, percent.
$\%_S$ = Sulfur content of as-fired fuel lot, dry basis, weight percent.
S_e = Standard deviation of the hourly average pollutant rates for each performance test period, ng/J (lb/million Btu).
$\%_{Sf}$ = Concentration of sulfur from an ultimate analysis of fuel, weight percent.
S(wt%) = weight percent of sulfur, per lab analysis by appropriate ASTM standard
S_i = Standard deviation of the hourly average inlet pollutant rates for each performance test period, ng/J (lb/million Btu).
S_o = Standard deviation of the hourly average emission rates for each performance test period, ng/J (lb/million Btu).
$\%S_p$, $\%S_r$ = Sulfur content of the product and raw fuel lots respectively, dry basis, weight percent.
SCF = standard cubic feet
SH = specific humidity, pounds of water per pound of air
$t_{0.95}$ = Values shown in Table 19-3 for the indicated number of data points n.
T_{amb} = ambient temperature, °F
W/D Factor = 1.0236 = conv. at 14.696 psia and
68 deg F (ref. Civil Eng. Ref. Manual, 7th Ed.)
X_{CO2}=CO_2 Correction factor, percent.
X_k = Fraction of total heat input from each type of fuel k.

Calculations, Formulas, and Constants

The following information supports the spreadsheets for this testing project.

Given Data:

Ideal Gas Conversion Factor = 385.23 SCF/lb-mol at 68 deg F & 14.696 psia

Fuel Heating Value is based upon Air Hygiene's fuel gas calculation sheet. All calculations are based upon a correction to 68 deg F & 14.696 psia

High Heating Values (HHV) are used for the Fuel Heating Value, F-Factor, and Fuel Flow Data per EPA requirements.

ASTM D 3588

Molecular Weight of NOx (lb/lb-mole) = 46.01
Molecular Weight of CO (lb/lb-mole) = 28.00
Molecular Weight of SO_2 (lb/lb-mole) = 64.00
Molecular Weight of THC (propane) (lb/lb-mole) = 44.00
Molecular Weight of VOC (methane) (lb/lb-mole) = 16.00
Molecular Weight of NH_3 (lb/lb-mole) = 17.03
Molecular Weight of HCHO (lb/lb-mole) = 30.03

40CFR60, App. A., RM 19, Table 19-1

Conversion Constant for NOx = 0.0000001194351
Conversion Constant for CO = 0.0000000726839
Conversion Constant for SO_2 = 0.0000001661345
Conversion Constant for THC = 0.0000001142175
Conversion Constant for VOC (methane) = 0.0000000415336
Conversion Constant for NH_3 = 0.0000000442074
Conversion Constant for HCHO = 0.0000000779534
NOTE: units are lb/ppm*ft^3

Formulas:

1. Corrected Raw Average (C_{Gas}), 40CFR60, App. A, RM 7E, Eq. 7E-5 (08/15/06)

$$C_{Gas} = (C_{Avg} - C_O) \times \left(\frac{C_M}{C_M - C_O} \right)$$

2. Correction to % O_2, 40CFR60, App. A, RM 20, Eq. 20-5 (11/26/02)

$$C_{adj} = C_{Gas(Targ\,et)} \times \left(\frac{20.9\% - AdjFactor}{20.9\% - C_{Gas(O2)}} \right)$$

3. Correction to % O_2 and ISO Conditions

$$C_{ISO} = C_{Adj} \times \sqrt{\frac{P_r}{P_a}} \times e^{(19 \times (H_a - 0.00633))} \times \left(\frac{288}{T_a} \right)^{1.53}$$

4. Method 19 stack exhaust flow (scfh)

$$Q_S = \left(\frac{FFactor \times Q_f \times HHV}{1{,}000{,}000} \right) \times \left(\frac{20.9\%}{20.9\% - C_{Gas(O2)}} \right)$$

5. Emission Rate in lb/hr

$$E_{lb/hr} = \frac{C_{Gas}}{10^6} \times \frac{Q_S \times MW}{G}$$

6. Emission Rate in tons per year

$$E_{ton/yr} = \frac{E_{lb/hr} \times hr_{year}}{2000}$$

7. Emission Concentration in lb/MMBtu (O_2 based)

$$E_{lb/MMBtu} = \frac{C_{Gas} \times F_d Factor \times Conv_C \times 20.9\%}{20.9\% - C_{Gas(O2)}}$$

8. Emission Concentration in g/hp*hr

$$E_{g/hp\cdot hr} = \frac{E_{lb/hr} \times 453.6}{mw \times 1314.022} \; or \; \frac{E_{lb/hr} \times 453.6}{hp}$$

RATA SHEET CALCULATIONS

d = Reference Method Data - CEMS Data
S_d = Standard Deviation
CC = Confident Coefficient
n = number of runs
$t_{0.025}$ = 2.5 percent confidence coefficent T-values
RA = relative accuracy
ARA = alternative relative accuracy
BAF = Bias adjustment factor

n	t	n	t	n	t
2	12.706	7	2.447	12	2.201
3	4.303	8	2.365	13	2.179
4	3.182	9	2.306	14	2.160
5	2.776	10	2.262	15	2.145
6	2.571	11	2.228	16	2.131

1. Difference

$$d = \sum_{i=1}^{n} d_i$$

2. Standard Deviation

$$S_d = \sqrt{\frac{\sum_{i=1}^{n} d_i^2 - \left[\frac{\left(\sum_{i=1}^{n} d_i \right)^2}{n} \right]}{n-1}}$$

3. Confident Coefficient

$$CC = t_{0.025} \times \frac{S_d}{\sqrt{n}}$$

4. Relative Accuracy

$$RA = \frac{|d_{AVG}| + |CC|}{RM_{AVG}} \times 100$$

5. Alternative Relative Accuracy

$$ARA = \frac{|d_{AVG}| + |CC|}{AS} \times 100$$

5. Bias Adjustment Factor

$$BAF = 1 + \left(\frac{|d_{AVG}|}{CEM_{AVG}} \right)$$

EXAMPLE CALCULATIONS (Reference Method 1 - Circular Stack)

Diameter of Stack (in.)

$$D(in.) = L_{fw} - L_{mw}$$

D (in.) = 282.38 in. - 19.00 in. = 263.38 in.

Area of Stack (ft^2)

$$A_s(ft^2) = \pi \times \left(\frac{D}{2 \times 12}\right)^2$$

A_s (ft^2) = 3.14 x ($\frac{263.38 \text{ in.}}{2 \text{ x } 12 \text{in./ft}}$)^2 = 378.35 ft^2

Stack Diameters Downstream

$$B_D(dia.) = \frac{B}{D}$$

B_D (dia.) = $\frac{531.75 \text{ in.}}{263.38 \text{ in.}}$ = 2.02 diameters

Stack Diameters Upstream

$$A_D(dia.) = \frac{A}{D}$$

A_D (dia.) = $\frac{144.00 \text{ in.}}{263.38 \text{ in.}}$ = 0.55 diameters

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

EXAMPLE CALCULATIONS (Reference Method 3a) [Values from Run 1 test]

Carbon Monoxide Concentration (%)

$$\%CO = \frac{ppmCO}{10{,}000}$$

$$\%CO\ (\%) = \frac{6.59 \quad ppm}{10{,}000\ ppm/\%} = 0.0000\ \%$$

Nitrogen Concentration (%)

$$\%N_2 = 100 - \%CO_2 - \%O_2 - \%CO$$

$\%N_2$ (%) = 100 - 5.45 % - 13.56 % - 6.59 / 10,000 % = 80.99 %

Stack Dry Molecular Weight (lb/lb-mole)

$$M_d\,(lb/lb-mol) = \sum\left(\frac{MW_{comp}}{100} \times \%component\right)$$

M_d (lb/lb-mol) = ($\frac{44\ lb/lb\text{-}mol}{100}$ x 5.45 %) +

($\frac{32\ lb/lb\text{-}mol}{100}$ x 13.56 %) + ($\frac{28\ lb/lb\text{-}mol}{100}$ x [$\frac{6.59}{10{,}000}$ + 80.99]) = $\frac{29.41\ lb}{lb\text{-}mol}$

Stack Wet Molecular Weight (lb/lb-mole)

$$M_S\,(lb/lb-mol) = \left[M_d \times \left(1 - \frac{B_{WS}}{100}\right)\right] + \left[MW_{H_2O} \times \frac{B_{WS}}{100}\right]$$

M_S (lb/lb-mol) = { $\frac{29.41\ lb}{lb\text{-}mol}$ x (1 - $\frac{9.18\ \%}{100}$) } + { $\frac{18\ lb}{lb\text{-}mol}$ x $\frac{9.18\ \%}{100}$ } = $\frac{28.37\ lb}{lb\text{-}mol}$

Average Calculated Fuel Factor (F_o)

$$F_{o(avg)} = \frac{\left[20.9 - (\%O_2)_{avg} - (0.5 \times (\%CO)_{avg})\right]}{(\%CO_2)_{avg} + (\%CO)_{avg}}$$

$F_{o(avg)}$ = $\frac{20.9\% - 13.56\ \% - (0.5 \times 0.001\ \%)}{5.45\ \% + 0.001\ \%}$ = 1.350

Average Excess Air (%)

$$\%EA_{avg}(\%) = \frac{100 \times \left[(\%O_2)_{avg} - (0.5 \times (\%CO)_{avg})\right]}{(0.264 \times (N_2)_{avg}) - \left[(\%O_2)_{avg} - (0.5 \times (\%CO)_{avg})\right]}$$

$(\%EA)_{AVG}$ = $\frac{100 \times \{\ 13.56\ \% - (0.5 \times 0.001\ \%)\ \}}{(\ 0.264 \times 80.99\ \%) - \{\ 13.56\ \% - (0.5 \times 0.001\ \%)\}}$ = 173.38 %

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

EXAMPLE CALCULATIONS (Reference Method 2) [Values from Run 1 test]

Absolute Stack Pressure (in. Hg)

$$P_s\,(in.Hg) = P_b + \frac{P_{static}}{13.6}$$

$$P_s \text{ (in. Hg)} = 29.96 \text{ in. Hg} + \frac{-1.00 \text{ in. } H_2O}{13.6 \text{ in. } H_2O/\text{in. Hg}} = 29.89 \text{ in. Hg}$$

Average Stack Gas Velocity (ft/sec)

$$v_s\,(ft/\sec) = K_p \times C_p \times \left(\sqrt{\Delta p}\right)_{avg} \times \sqrt{\frac{(t_s)_{avg} + T_u}{P_s \times M_s}}$$

v_{sl} (ft/sec) =

$$\left(\frac{85.49 \text{ ft (lb/lb-mol)(in. Hg)}}{\sec \quad (^\circ R)(\text{in. } H_2O)}\right)^{1/2} \times 0.84 \times 1.01 \text{ in.} H_2O^{1/2} \times \sqrt{\frac{247.38 + 460\ ^\circ R}{29.89 \text{ in. Hg} \times 28.37 \text{ lb/lb-mol}}} = \frac{66.0 \text{ ft}}{\sec}$$

Average Stack Dry Standard Flow Rate (dscfh)

$$Q_{sd}\,(dscfh) = \frac{60 \times 60 \times \left(1 - \frac{B_{ws}}{100}\right) \times v_s \times A_s \times T_{std} \times P_s}{(t_s + T_u) \times P_{std}}$$

$$Q_{sd} \text{ (dscf/hr)} = \frac{3600 \text{ sec}}{\text{hr}} \times \left(1 - \frac{9.18\ \%}{100}\right) \times \frac{66.03 \text{ ft}}{\sec} \times 378.35 \text{ ft}^2 \times \frac{68.00 + 460\ ^\circ R}{247.38 + 460\ ^\circ R} \times \frac{29.89 \text{ in. Hg}}{29.92 \text{ in. Hg}} = \frac{60{,}899{,}680.02 \text{ dscf}}{\text{hr}}$$

Average Stack Wet Flow Rate (acfm)

$$Q_{aw}\,(acfm) = 60 \times v_s \times A_s$$

$$Q_{aw} \text{ (acf/min)} = \frac{60 \text{ sec}}{\text{min}} \times \frac{66.03 \text{ ft}}{\sec} \times 378.35 \text{ ft}^2 = \frac{1{,}498{,}984.47 \text{ acf}}{\text{min}}$$

Average Stack Wet Standard Flow Rate (ascfh)

$$Q_{sw}\,(ascfh) = \frac{60 \times Q_{aw} \times T_{std} \times P_s}{(t_s + T_u) \times P_{std}}$$

$$Q_{sw} \text{ (ascf/hr)} = \frac{60 \text{ min}}{\text{hr}} \times \frac{1{,}498{,}984.47 \text{ acf}}{\text{min}} \times \frac{68.00 + 460\ ^\circ R}{247.38 + 460\ ^\circ R} \times \frac{29.89 \text{ in. Hg}}{29.92 \text{ in. Hg}} = \frac{67{,}057{,}234.93 \text{ ascf}}{\text{hr}}$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

EXAMPLE CALCULATIONS (Reference Method 4) [Values from Run 1 test]

Water Volume Weighed (scf)

$$V_{wsg\,(std)}(scf) = W_t \times K_5$$

$V_{wsg(std)}$ = 76.80 g x 0.04715 ft^3/g = 3.620 scf

Standard Meter Volume (dscf)

$$V_{m(std)}(dscf) = \frac{K_1 \times Y \times V_m \times \left(P_b + \frac{\Delta H_{avg}}{13.6}\right)}{(t_m)_{avg} + T_u}$$

$$V_{m(std)} = \frac{\frac{17.65\ ^\circ R}{in.\ Hg} \times 0.99 \times 38.03\ dcf \times \left(29.96\ in.\ Hg + \frac{1.20\ in.\ H_2O}{13.6\ in.\ H_2O / in.\ Hg}\right)}{98.02\ ^\circ F + 460\ ^\circ R} = 35.81\ dscf$$

Calculated Moisture Content (%)

$$B_{ws(calc)}(\%) = 100 \times \frac{V_{wsg(std)}}{V_{wsg(std)} + V_{m(std)}}$$

$$B_{ws(calc)} = 100 \times \frac{3.62\ dscf}{3.62\ dscf + 35.81\ dscf} = 9.18\ \%$$

Saturated Moisture Content (%)

$$B_{ws(svp)}(\%) = 100 \times \frac{10^{\left(6.691 - \frac{3144}{t_{s(avg)} + 390.86}\right)}}{P_b + \frac{P_{static}}{13.6}} \leq 100$$

$$B_{ws(svp)} = 100 \times \frac{10^{\left(6.691 - \frac{3144}{247.38\ ^\circ F + 390.86}\right)}}{29.96\ in.\ Hg + \frac{-1.00\ in.\ H_2O}{13.6\ in.\ H_2O / in.\ Hg}} \leq 100 = 100.00\ \%$$

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

EXAMPLE CALCULATIONS (Isokinetic Sampling) [Values from Run 1 test]

Desired Orifice (in. H_2O) (first point)

$$\Delta H_d(in.H_2O) = K \times \Delta p$$

ΔH_d (in. H_2O) = 1.22 x 0.85 in. H_2O = 1.04 in. H_2O

Absolute Meter Pressure (in. Hg)

$$P_m(in.Hg) = P_b + \frac{\Delta H@}{13.6}$$

P_m (in. Hg) = 29.96 in. Hg + $\frac{1.75 \text{ in. } H_2O}{13.6 \text{ in. } H_2O/\text{in. Hg}}$ = 30.09 in. Hg

Recommended Nozzle Diameter (in.)

$$D_{ni}(in.) = \sqrt{\frac{C_n \times Q_m \times P_m}{(t_m + T_u) \times C_p} \times \left(\frac{1 - \frac{B_{wm}}{100}}{1 - \frac{B_{ws}}{100}}\right) \times \sqrt{(t_s + T_u) \times \left[\frac{M_d \times \left(1 - \frac{B_{ws}}{100}\right) + \left(18 \times \frac{B_{ws}}{100}\right)}{P_s \times \Delta p_{avg}}\right]}}$$

D_{ni} (in.) = $\sqrt{\frac{0.03575 \text{ (lb-mole•°R•in. } H_2O)^{1/2} \text{•min•in.}^2}{\text{acf•in. Hg}^{3/4} \text{•lb}^{1/2}} \text{ x } 0.75 \text{ acf x } 30.09 \text{ in. Hg } \left(1 - \frac{0.00\ \%}{100}\right) \text{ x } \left(\frac{1}{1 - \frac{9.18\ \%}{100}}\right) \text{ x } \left[\frac{(98.02\ ^\circ\text{F} + 460^\circ\text{R}) \text{ x } 0.84}{(247.38\ ^\circ\text{F} + 460^\circ\text{R}) \text{ x } \frac{\frac{29.41 \text{ lb}}{\text{lb-mole}} \text{ x } \left(1 - \frac{9.18\ \%}{100}\right) + \left(\frac{18 \text{ lb}}{\text{lb-mol}} \text{ x } \frac{9.18\ \%}{100}\right)}{29.89 \text{ in. Hg x } 1.01 \text{ in. } H_2O}}\right]}$ = 0.210 in.

ΔP to ΔH Isokinetic Factor

$$K = C_k \times C_p^2 \times \Delta H@ \times D_{ni}^4 \times \left[\frac{M_d \times \left(1 - \frac{B_{wm}}{100}\right) + \left(18 \times \frac{B_{wm}}{100}\right)}{M_d \times \left(1 - \frac{B_{ws}}{100}\right) + \left(18 \times \frac{B_{ws}}{100}\right)}\right] \times \left(\frac{1 - \frac{B_{ws}}{100}}{1 - \frac{B_{wm}}{100}}\right)^2 \times \left(\frac{t_m + T_u}{ts + T_u}\right) \times \frac{P_s}{P_m}$$

K = $\frac{849.8}{\text{in. } H_2O\text{•in.}^4}$ x 0.84 ^{2} x 1.75 in. H_2O x 0.20 ^{4} x $\left(\frac{1 - \frac{9.18\ \%}{100}}{1 - \frac{0.00\ \%}{100}}\right)^2$ x $\frac{98.02\ ^\circ\text{F} + 460^\circ\text{R}}{247.38\ ^\circ\text{F} + 460^\circ\text{R}}$) x

$\left(\frac{\frac{29.41 \text{ lb}}{\text{lb/mole}} \text{ x } \left(1 - \frac{0.00\ \%}{100}\right) + \left(\frac{18 \text{ lb}}{\text{lb-mol}} \text{ x } \frac{0.00\ \%}{100}\right)}{\frac{29.41 \text{ lb}}{\text{lb/mole}} \text{ x } \left(1 - \frac{9.18\ \%}{100}\right) + \left(\frac{18 \text{ lb}}{\text{lb-mol}} \text{ x } \frac{9.18\ \%}{100}\right)}\right)$ x $\frac{29.89 \text{ in. Hg}}{30.09 \text{ in. Hg}}$ = 1.22

Cumulative Percent Isokinetic (%) (first point)

$$I(\%) = \frac{K_4 \times \left((t_s)_{avg} + T_u\right) \times V_{m(std)}}{\left(\Theta \times (v_{s(1)})_{avg} \times P_s \times \pi \times \left(\frac{D_{ni}}{2} \times \frac{1}{12}\right)^2\right) \times \left(1 - \frac{B_{ws}}{100}\right)}$$

I (%) = $\frac{\frac{0.0945 \text{ min•in. Hg}}{\text{sec•°R}} \text{ x } (250.00\ ^\circ\text{F} + 460\ ^\circ\text{R}) \text{ x } 1.36 \text{ dscf}}{2.50 \text{ min x } \frac{60.59 \text{ ft}}{\text{sec}} \text{ x } 29.89 \text{ in. Hg x } 3.14 \text{ x } \left(\frac{0.20 \text{ in.}}{2} \text{ x } \frac{\text{ft.}}{12 \text{ in.}}\right)^2 \text{x } \left(1 - \frac{9.18\ \%}{100}\right)}$ = 97.45 %

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

EXAMPLE CALCULATIONS (CTM-027 Ammonia Analysis) [Values from Run 1 test]

Dry Gas Meter Volume (L)

$$(V_m)_{dstdL}(L_{dstd}) = (V_m)_{dscf} \times 28.31685$$

V_m (L) = 35.81 dscf x 28.31685 L/dscf = 1014.13 L

Volume of NH_3 (L)

$$V_a(L) = \frac{\frac{N \times S}{1000} \times 22.4}{MW \times 1000}$$

V_a (L) =

(2.61 mg/L x 194.00 ml/1 x L/1000 ml x 22.4 L ideal gas/g-mol substance x g-mol NH_3/17.03 g x g/1000 mg) +

(0.10 mg/L x 164.00 ml/1 x L/1000 ml x 22.4 L ideal gas/g-mol substance x g-mol NH_3/17.03 g x g/1000 mg = 0.00069 L

NH_3 Concentration (ppmvd)

$$C_{NH_3}(ppmvd) = \frac{V_{a(front)} + V_{a(back)}}{(V_m)_{dstdL}} \times 10^6$$

C_{NH3} (ppmvd) = 0.00 L / 1014.13 L x 10^6 = 0.68 ppmvd

NH_3 Concentration (ppmvd@15%O_2)

$$C_{adj} = C_{Gas(Target)} \times \left(\frac{20.9\% - AdjFactor}{20.9\% - C_{Gas(O2)}} \right)$$

C_{adj} = 0.68 ppmvd x (20.9% - 15.00 % / 20.9% - 13.6 %) = 0.55 ppmvd@15%O_2

Note: Lack of significant figures may cause rounding errors between actual calculations and example calculations.

Nomenclature

- %CO = carbon monoxide concentration (%)
- $\%CO_2$ = carbon dioxide concentration (%)
- $\%N_2$ = nitrogen concentration (%)
- $\%O_2$ = oxygen concentration (%)
- $\%O_{2,wet}$ = Oxygen content of gas stream, % by volume of wet gas. (Note: The oxygen percentage used in Method 201A, Equation 3 is on a wet gas basis. That means that since oxygen is typically measured on a dry gas basis, the measured percent O2 must be multiplied by the quantity $(1 - B_{ws})$ to convert to the actual volume fraction. Therefore, $\%O_{2,wet} = (1 - B_{ws}) * \%O_{2,dry}$)
- $(\%EA)_{avg}$ = average excess air (%)
- $(F_o)_{avg}$ = average calculated fuel factor
- $[(\Delta p)^{0.5}]_{avg}$ = Average of square roots of the velocity pressures measured during the preliminary traverse, inches W.C.
- μ = Gas viscosity, micropoise
- 12.0 = Constant calculated as 60 percent of 20.5 square inch cross-sectional area of combined cyclone head, square inches
- 17.03 = mg/milliequivalents for ammonium ion
- 22.4 = liters of ideal gas per mol of substance at 0°C and 1 atm (ref. Civil Engineering Reference Manual, 7th ed. - Michael R. Lindeburg)
- 5.02×10^4 = constant derived from the molecular weight and correcting standard temperature and pressure (ref. Bay Area Air Quality Management District, Source Test Procedure ST-1B, Ammonia Integrated Sampling, Adopted January 20, 1982, Regulation 7-303)
- A = distance upstream (in.)
- A_D = stack diameters upstream (dia.)
- An = Area of nozzle, square feet
- A_s = area of stack (ft^2)
- B = distance downstream (in.)
- B_D = stack diameters downstream (dia.)
- b_f = Average blockage factor calculated in Equation 26, dimensionless
- B_{wm} = meter moisture content (%)
- B_{ws} = stack moisture content (%)
- C = Cunningham correction factor for particle diameter, Dp, and calculated using the actual stack gas temperature, dimensionless
- C_1 = -150.3162 (micropoise)
- C_2 = 18.0614 (micropoise/$K^{0.5}$) = 13.4622 (micropoise/$R^{0.5}$)
- C_3 = 1.19183×10^6 (micropoise/K^2) = 3.86153×10^6 (micropoise/R^2)
- C_4 = 0.591123 (micropoise)
- C_5 = 91.9723 (micropoise)
- C_6 = 4.91705×10^{-5} (micropoise/K^2) = 1.51761×10^{-5} (micropoise/R^2)
- C_a = Acetone blank concentration, mg/mg
- C_b = Concentration of NH3 ion in the back half of train (breakthrough)
- C_f = Concentration of NH3 ion in the front half of train (main catch)
- C_{fPM10} = Conc. of filterable PM_{10}, gr/dscf
- $C_{fPM2.5}$ = Conc. of filterable $PM_{2.5}$, gr/dscf
- C_k = K Factor Constant, 849.8

Nomenclature

- C_n = nozzle diameter constant, 0.03575
- C_p' = Coefficient for the pitot used in the preliminary traverse, dimensionless
- C_p = Pitot coefficient for the combined cyclone pitot, dimensionless
- C_{cpm} = Concentration of the condensable PM in the stack gas, dry basis, corrected to standard conditions, milligrams/dry standard cubic foot.
- C_r = Re-estimated Cunningham correction factor for particle diameter equivalent to the actual cut size diameter and calculated using the actual stack gas temperature, dimensionless
- D_{50} = Particle cut diameter, micrometers
- $D_{50(N+1)}$ = D_{50} value for cyclone IV calculated during the N+1 iterative step, micrometers
- D_{50-1} = Re-calculated particle cut diameters based on re-estimated C_r, micrometers
- D_{50LL} = Cut diameter for cyclone I corresponding to the 2.25 micrometer cut diameter for cyclone IV, micrometer
- D_{50N} = D_{50} value for cyclone IV calculated during the Nth iterative step, micrometers
- D_{50T} = Cyclone I cut diameter corresponding to the middle of the overlap zone shown in Method 201A, Figure 10 of Section 17, micrometers
- D_e = equivalent stack diameter (in.)
- ΔH@ = ΔH @ 0.75 scfm (in. H2O)
- ΔH_{avg} = average orifice pressure (in. H_2O)
- D_n = Inner diameter of sampling nozzle mounted on Cyclone I, inches
- D_{na} = actual nozzle diameter (in.)
- D_p = Physical particle size, micrometers
- Δp = velocity head (in. H_2O)
- Δp_1 = velocity head at first current traverse point (in. H_2O)
- $\Delta p'_1$ = velocity head at first preliminary traverse point (in. H_2O)
- Δp_{avg} = average pitot tube differential pressure (in. H_2O)
- Δp_n = velocity head at subsequent current traverse point (in. H_2O)
- Δp_{RM2} = method 2 velocity head (in. H_2O)
- D_s = diameter of stack (in.)
- F_d = fuel f-factor (dscf/MMBtu)
- f_{O2} = stack gas fraction of O_2, by volume, dry basis
- I = Percent isokinetic sampling, dimensionless
- K_1 = standard volume correction, 17.65°R/in. Hg
- K_4 = isokinetic conversion constant, 0.0945min•in.Hg/sec•°R
- K_5 = water mass to std water vapor, 0.04715 ft^3/g
- K_p = 85.49, ((ft/sec)/(pounds/mole -°R))
- L = length of stack (in.)
- L_{fw} = distance to far wall of stack (in.)
- L_{nw} = distance to near wall of stack (in.) [reference]
- $m_{\#x}$ = weight measurements (g)
- M_1 = Milligrams of PM collected on the filter, less than or equal to 2.5 micrometers
- M_2 = Milligrams of PM recovered from Container #2 (acetone blank corrected), greater than 10 micrometers
- M_3 = Milligrams of PM recovered from Container #3 (acetone blank corrected), less than or equal to 10 and greater than 2.5 micrometers

Nomenclature

- M_4 = Milligrams of PM recovered from Container #4 (acetone blank corrected), less than or equal to 2.5 micrometers
- m_a = Mass of residue of acetone after evaporation, mg
- m_c = Mass of the NH4+ added to sample to form ammonium sulfate, mg
- m_{cpm} = Mass of the total condensable PM, mg
- M_d = Molecular weight of dry gas, pounds/pound mole
- m_{fb} = Mass of total CPM in field train recovery blank, mg
- m_{fx} = final weight, avg of last two measurements (g)
- mg = Milligram
- mg/L = Milligram per liter
- m_i = Mass of inorganic CPM, mg
- m_{ib} = Mass of inorganic CPM in field train recovery blank, mg
- M_n = total particulates (mg)
- m_o = Mass of organic CPM, mg
- m_{ob} = Mass of organic CPM in field train blank, mg
- m_r = Mass of dried sample from inorganic fraction, mg
- m_{tx} = tare weight (g)
- MW = molecular weight (lb/lb-mole)
- M_w = Molecular weight of wet gas, pounds/pound mole
- N = Normality of ammonium hydroxide titrant
- N_a = null angle (deg.)
- N_{re} = Reynolds number, dimensionless
- N_{tp} = Number of iterative steps or total traverse points
- $P_b = P_{bar}$ = barometric pressure (in. Hg)
- P_{bar} = barometric pressure (in. Hg)
- ppmCO = carbon monoxide concentration (ppm)
- ppmv = Parts per million by volume
- ppmw = Parts per million by weight
- P_s = absolute stack pressure (in. Hg)
- P_{static} = static pressure (in. H_2O)
- P_{std} = standard pressure, 29.92 in. Hg
- Θ = total sampling time (min)
- Q_{aw} = average stack wet flow rate (ascf/min)
- Q_I = Sampling rate for cyclone I to achieve specified D_{50}
- Q_m = estimated orifice flow rate, 0.750 acfm, else Vm/Q from previous run
- Q_s = Sampling rate for cyclone I to achieve specified D_{50}
- $Q_{s(std)}$ = total cyclone flow rate at standard conditions (dscf/min)
- Q_{sd} = dry standard stack flow rate (dscfm)
- Q_{sST} = Dry gas sampling rate through the sampling assembly, dscfm
- Q_{sw} = wet standard stack flow rate (ascfm)
- R_{max} = Nozzle/stack velocity ratio parameter, dimensionless
- R_{min} = Nozzle/stack velocity ratio parameter, dimensionless
- t_1 = Sampling time at point 1, min
- t_m = average gas meter temperature (^oF)

Nomenclature

- t_m = average meter temperature (°F)
- T_m = Meter box and orifice gas temperature, °R
- t_n = Sampling time at point n, min
- t_r = Total projected run time, min
- T_s = Absolute stack gas temperature, °R
- T_{std} = standard temperature, 68°F, 528°R
- T_u = absolute temperature offset, 460°R
- V_a = Volume of acetone blank, ml
- V_{aw} = Volume of acetone used in sample recovery wash, ml
- V_b = Volume of aliquot taken for IC analysis, ml
- V_c = Quantity of water captured in impingers and silica gel, ml
- V_f = final impinger volume (ml)
- V_i = initial impinger volume (ml)
- V_{ic} = Volume of impinger contents sample, ml
- V_m = Dry gas meter volume sampled, acf
- $V_{m(std)}$ = standard meter volume (dscf)
- v_{max} = Maximum gas velocity calculated from Equations 18 or 19, ft/sec
- v_{max} = maximum nozzle velocity (ft/sec)
- V_{mf} = final dry gas meter reading (dcf)
- V_{mi} = initial dry gas meter reading (dcf)
- v_{min} = Minimum gas velocity calculated from Method 201A, Equations 16 or 17, ft/sec
- V_{ms} = Dry gas meter volume sampled, corrected to standard conditions, dscf
- v_n = Sample gas velocity in the nozzle, ft/sec
- v_{org} = organics wash volume (ml)
- V_p = Volume of water added during train purge
- v_s = average stack gas velocity (ft/sec)
- v_{sl} = local velocity (ft/sec)
- V_t = total impinger volume (ml) = ;(V_f-V_i)
- V_t = Volume of NH4OH titrant, ml
- $V_{w(std)}$ = volume of water vapor in gas sample at standard conditions (scf)
- v_x = blank volume (ml)
- W = width of stack (in.)
- $W_{2,3,4}$ = Weight of PM recovered from Containers #2, #3, and #4, mg
- W_a = Weight of blank residue in acetone used to recover samples, mg
- W_f = final impinger weight (g)
- W_i = initial impinger weight (g)
- W_t = total impinger weight (g) = ;(W_f-W_i)
- w_x = blank weight of solids (g)
- Y = meter calibration factor (a.k.a gamma)
- Z = Ratio between estimated cyclone IV D_{50} values, dimensionless
- γ = Dry gas meter gamma value, dimensionless
- ΔH = Meter box orifice pressure drop, inches W.C.
- ΔH@ = Pressure drop across orifice at flow rate of 0.75 scfm at standard conditions, inches W.C. (Note: Specific to each orifice and meter box.)

Nomenclature

- Δp_1 = Velocity pressure measured at point 1, inches W.C.
- Δp_{avg} = Average velocity pressure, inches W.C.
- Δp_m = Observed velocity pressure using S-type pitot tube in preliminary traverse, inches W.C.
- Δp_{max} = Maximum velocity pressure, inches W.C.
- Δp_{min} = Minimum velocity pressure, inches W.C.
- Δp_n = Velocity pressure measured at point n during the test run, inches W.C.
- Δp_s = Velocity pressure calculated in Method 201a, Equation 25, inches W.C.
- Δp_{s1} = Velocity pressure adjusted for combined cyclone pitot tube, inches W.C.
- Δp_{s2} = Velocity pressure corrected for blockage, inches W.C.
- θ = Total run time, min
- ρ_a = Density of acetone, mg/ml (see label on bottle)
- Σ_n = total number of sampling points

APPENDIX B

UNIT OPERATION PARAMETERS

Florida Power and Light

Air Permit # :	PSD-FL-396
Plant Name or Location:	West County Energy Center
Date:	April 26, 2011
Project Number:	bv-10-westcounty.fl-comp#2
Manufacturer & Equipment:	Mitsubishi
Model:	501G
Unit Number:	3A
Test Load:	Fuel Oil
Tester(s) / Test Unit(s):	PS/GJ/TP/NA

		RUN		
	UNITS	**1**	**2**	**3**
Start Time	hh:mm:ss	10:08:07	11:50:37	13:45:07
End Time	hh:mm:ss	11:13:37	13:05:07	14:57:37
Bar. Pressure	in. Hg	29.96	29.97	29.94
Amb. Temp.	°F	84	88	90
Rel. Humidity	%	66	58	53
Spec. Humidity	lb water / lb air	0.016543	0.016509	0.016072
Comb. Inlet Pres.	psig	255.9	254.2	252.3
Ammonia Injection Rate	lb/hr	361.3	369.5	386.0
Turbine Fuel Flow	gal/hr	15,139	15,006	14,862
Total Fuel Flow	SCFH	2,024	2,006	1,987
Stack Moisture	% Method 4	9.2	9.0	8.9
Heat Input	MMBtu/hr	2040.8	1973.2	1954.3
Power Output	megawatts	210.9	208.4	205.8

UNIT OPERATION PARAMETERS

Fuel Oil Load

Unit 3 Emissions Testing

	Combustor Inlet Pressure A psig	CT A Load MW	Ammonia Mass Flow CT A PPH	CT A Fuel Oil Flow lb/hr
26-Apr-11 10:08:00	255.93	212.43	330.84	111453.36
26-Apr-11 10:09:00	256.32	210.73	358.72	110534.60
26-Apr-11 10:10:00	256.44	210.67	350.28	110479.84
26-Apr-11 10:11:00	257.05	211.74	313.89	111128.27
26-Apr-11 10:12:00	257.13	212.58	356.31	111470.75
26-Apr-11 10:13:00	257.17	213.20	378.85	111753.86
26-Apr-11 10:14:00	257.11	212.55	386.48	111535.28
26-Apr-11 10:15:00	256.55	212.10	385.80	111178.54
26-Apr-11 10:16:00	256.49	212.47	363.33	111301.85
26-Apr-11 10:17:00	256.30	211.55	378.22	111013.74
26-Apr-11 10:18:00	256.17	211.52	364.12	110907.66
26-Apr-11 10:19:00	256.23	211.04	366.00	110693.52
26-Apr-11 10:20:00	256.55	211.20	352.65	110776.73
26-Apr-11 10:21:00	256.87	212.39	346.79	111214.11
26-Apr-11 10:22:00	256.78	212.69	370.79	111464.14
26-Apr-11 10:23:00	256.32	211.98	392.47	111193.68
26-Apr-11 10:24:00	256.07	210.85	377.55	110853.83
26-Apr-11 10:25:00	255.82	210.21	357.07	110646.73
26-Apr-11 10:26:00	256.24	211.40	334.22	110852.27
26-Apr-11 10:27:00	256.35	210.94	365.65	110648.23
26-Apr-11 10:28:00	256.46	211.64	359.11	111016.08
26-Apr-11 10:29:00	256.52	211.58	370.17	111031.70
26-Apr-11 10:30:00	256.39	211.86	376.75	110981.09
26-Apr-11 10:31:00	256.27	211.77	375.93	110821.85
26-Apr-11 10:32:00	256.26	211.61	355.49	110934.80
26-Apr-11 10:33:00	256.24	211.04	370.49	110841.60
26-Apr-11 10:34:00	256.21	211.04	362.42	110876.68
26-Apr-11 10:35:00	256.15	211.37	363.48	110996.85
26-Apr-11 10:36:00	256.13	211.25	373.17	110895.73
26-Apr-11 10:37:00	255.56	211.31	379.87	110985.04
26-Apr-11 10:38:00	255.64	209.81	366.30	110418.73
26-Apr-11 10:39:00	255.76	210.32	350.32	110489.52
26-Apr-11 10:40:00	255.89	210.55	351.78	110645.20
26-Apr-11 10:41:00	256.05	210.84	379.83	110602.20
26-Apr-11 10:42:00	256.06	211.21	364.68	110889.72
26-Apr-11 10:43:00	255.23	211.14	362.65	110935.02
26-Apr-11 10:44:00	255.38	209.42	370.99	110217.13
26-Apr-11 10:45:00	255.23	210.06	346.18	110418.79
26-Apr-11 10:46:00	255.66	209.92	346.50	110444.51
26-Apr-11 10:47:00	255.64	209.91	365.65	110370.02
26-Apr-11 10:48:00	255.66	210.58	347.67	110632.57
26-Apr-11 10:49:00	254.97	210.78	364.71	110934.39
26-Apr-11 10:50:00	255.18	209.61	365.30	110362.59
26-Apr-11 10:51:00	255.15	208.62	363.65	109704.33
26-Apr-11 10:52:00	255.66	211.13	329.28	110417.05
26-Apr-11 10:53:00	255.80	210.79	352.72	110873.66
26-Apr-11 10:54:00	255.69	210.56	391.23	110686.89
26-Apr-11 10:55:00	255.80	210.12	382.33	110384.91
26-Apr-11 10:56:00	255.91	210.70	342.66	110630.08
26-Apr-11 10:57:00	256.06	211.00	346.73	110874.40
26-Apr-11 10:58:00	256.10	211.00	368.00	110589.27
26-Apr-11 10:59:00	256.04	210.85	363.27	110672.61
26-Apr-11 11:00:00	255.97	211.27	351.26	110782.16
26-Apr-11 11:01:00	255.68	211.13	359.42	110819.98
26-Apr-11 11:02:00	255.36	210.00	376.28	110597.86
26-Apr-11 11:03:00	255.08	209.37	353.02	110019.69
26-Apr-11 11:04:00	255.04	210.32	325.53	110603.74
26-Apr-11 11:05:00	255.34	209.94	350.14	110472.95
26-Apr-11 11:06:00	255.01	209.48	372.38	110258.12
26-Apr-11 11:07:00	255.03	210.03	350.67	110418.93
26-Apr-11 11:08:00	255.08	209.77	361.07	110338.52
26-Apr-11 11:09:00	255.17	210.10	369.41	110529.77
26-Apr-11 11:10:00	255.33	210.30	363.59	110419.20
26-Apr-11 11:11:00	255.24	209.63	357.40	110360.05
26-Apr-11 11:12:00	255.29	209.81	356.01	110369.41
26-Apr-11 11:13:00	255.35	209.72	362.59	110241.80
Average	255.92	210.89	361.33	110741.03

Unit 3 Emissions Testing

	Combustor Inlet Pressure A psig	CT A Load MW	Ammonia Mass Flow CT A PPH	CT A Fuel Oil Flow lb/hr
26-Apr-11 11:50:00	253.99	208.61	348.38	109957.80
26-Apr-11 11:51:00	254.25	209.02	332.22	110006.34
26-Apr-11 11:52:00	254.18	207.31	362.24	109432.03
26-Apr-11 11:53:00	254.48	208.87	347.26	109832.71
26-Apr-11 11:54:00	254.83	209.27	352.93	110081.34
26-Apr-11 11:55:00	254.87	209.20	376.52	109985.81
26-Apr-11 11:56:00	254.96	209.67	365.12	110164.30
26-Apr-11 11:57:00	255.04	209.33	357.51	110103.14
26-Apr-11 11:58:00	254.99	209.23	368.51	110040.75
26-Apr-11 11:59:00	255.15	209.23	353.31	110077.34
26-Apr-11 12:00:00	255.15	210.33	358.19	110468.52
26-Apr-11 12:01:00	255.09	209.30	366.59	110110.87
26-Apr-11 12:02:00	255.12	210.21	368.29	110488.59
26-Apr-11 12:03:00	255.07	209.23	367.25	110233.48
26-Apr-11 12:04:00	255.04	209.48	367.71	110258.57
26-Apr-11 12:05:00	255.05	209.30	366.34	110183.35
26-Apr-11 12:06:00	254.94	209.33	367.24	110077.72
26-Apr-11 12:07:00	254.92	209.69	367.18	110154.46
26-Apr-11 12:08:00	254.91	209.42	367.79	110106.63
26-Apr-11 12:09:00	254.88	209.60	368.00	110129.66
26-Apr-11 12:10:00	254.78	208.69	365.49	109838.30
26-Apr-11 12:11:00	254.79	209.54	366.00	110174.87
26-Apr-11 12:12:00	254.74	208.90	366.59	110020.85
26-Apr-11 12:13:00	254.68	209.42	366.82	110064.36
26-Apr-11 12:14:00	254.82	208.87	365.94	109946.29
26-Apr-11 12:15:00	254.84	209.60	364.00	110182.63
26-Apr-11 12:16:00	254.70	210.18	364.18	110512.73
26-Apr-11 12:17:00	254.39	208.38	368.12	109983.28
26-Apr-11 12:18:00	254.17	207.74	366.35	109837.77
26-Apr-11 12:19:00	254.31	208.96	366.30	109931.94
26-Apr-11 12:20:00	254.05	208.23	366.12	109648.02
26-Apr-11 12:21:00	253.88	208.23	369.82	109743.66
26-Apr-11 12:22:00	253.68	207.37	365.94	109547.21
26-Apr-11 12:23:00	253.75	207.46	365.00	109543.23
26-Apr-11 12:24:00	253.77	206.93	364.71	109094.82
26-Apr-11 12:25:00	253.76	208.49	367.47	109754.96
26-Apr-11 12:26:00	253.87	208.64	364.77	109935.06
26-Apr-11 12:27:00	253.43	206.72	394.61	109192.52
26-Apr-11 12:28:00	253.68	208.01	364.30	109549.20
26-Apr-11 12:29:00	253.82	207.54	370.98	109553.73
26-Apr-11 12:30:00	253.79	207.22	382.80	109501.26
26-Apr-11 12:31:00	253.86	207.16	380.28	109354.44
26-Apr-11 12:32:00	254.07	208.96	355.54	109718.35
26-Apr-11 12:33:00	254.33	208.14	370.00	109691.61
26-Apr-11 12:34:00	254.11	208.36	385.92	109692.82
26-Apr-11 12:35:00	254.06	208.27	375.26	109641.30
26-Apr-11 12:36:00	254.04	207.89	368.06	109598.09
26-Apr-11 12:37:00	254.01	208.14	365.30	109608.43
26-Apr-11 12:38:00	254.15	207.62	370.41	109536.65
26-Apr-11 12:39:00	254.31	208.14	361.18	109650.53
26-Apr-11 12:40:00	254.37	209.63	361.01	110133.33
26-Apr-11 12:41:00	254.15	208.23	397.61	109805.39
26-Apr-11 12:42:00	254.17	208.29	378.34	109757.73
26-Apr-11 12:43:00	254.18	208.26	366.77	109571.81
26-Apr-11 12:44:00	254.10	207.98	372.58	109723.95
26-Apr-11 12:45:00	254.02	208.59	385.27	109854.48
26-Apr-11 12:46:00	253.68	207.75	416.58	109396.95
26-Apr-11 12:47:00	253.60	207.85	370.58	109485.74
26-Apr-11 12:48:00	253.66	207.01	375.05	109186.45
26-Apr-11 12:49:00	253.65	207.98	359.83	109461.34
26-Apr-11 12:50:00	253.74	207.25	376.11	109446.42
26-Apr-11 12:51:00	253.72	207.16	391.40	109286.14
26-Apr-11 12:52:00	253.88	207.40	366.16	109409.91
26-Apr-11 12:53:00	254.05	208.53	357.37	109577.00
26-Apr-11 12:54:00	254.14	207.89	381.10	109520.42
26-Apr-11 12:55:00	254.03	208.36	381.92	109629.42
26-Apr-11 12:56:00	253.93	208.93	382.51	109878.70
26-Apr-11 12:57:00	253.56	208.23	393.23	109655.41
26-Apr-11 12:58:00	253.52	206.64	386.71	109052.66
26-Apr-11 12:59:00	253.65	208.35	330.37	109670.49
26-Apr-11 13:00:00	253.80	208.72	354.96	109683.88
26-Apr-11 13:01:00	253.68	206.84	393.91	109161.45
26-Apr-11 13:02:00	253.81	207.45	353.92	109360.61
26-Apr-11 13:03:00	253.88	208.07	355.52	109658.50
26-Apr-11 13:04:00	253.83	208.09	388.15	109530.20
26-Apr-11 13:05:00	253.66	207.53	409.24	109261.47
Average	254.24	208.43	369.51	109764.50

Unit 3 Emissions Testing

	Combustor Inlet Pressure A psig	CT A Load MW	Ammonia Mass Flow CT A PPH	CT A Fuel Oil Flow lb/hr
26-Apr-11 13:45:00	252.96	206.30	404.10	109071.95
26-Apr-11 13:46:00	252.90	206.41	398.72	108911.92
26-Apr-11 13:47:00	252.99	206.43	370.17	108923.49
26-Apr-11 13:48:00	253.07	207.04	355.25	109136.17
26-Apr-11 13:49:00	252.66	206.64	376.28	109267.39
26-Apr-11 13:50:00	252.42	206.40	413.29	108772.59
26-Apr-11 13:51:00	252.48	205.21	392.20	108537.80
26-Apr-11 13:52:00	252.90	206.91	330.05	108991.92
26-Apr-11 13:53:00	253.11	206.79	366.71	109176.33
26-Apr-11 13:54:00	253.14	207.04	397.37	109195.63
26-Apr-11 13:55:00	253.21	206.75	390.26	109060.18
26-Apr-11 13:56:00	253.30	207.04	391.03	109180.51
26-Apr-11 13:57:00	253.16	207.56	391.44	109374.55
26-Apr-11 13:58:00	252.97	206.64	421.28	108995.34
26-Apr-11 13:59:00	252.90	206.67	391.38	109033.77
26-Apr-11 14:00:00	252.81	206.24	378.04	108948.80
26-Apr-11 14:01:00	252.68	206.53	386.80	108934.95
26-Apr-11 14:02:00	252.55	205.88	386.86	108753.37
26-Apr-11 14:03:00	252.53	206.43	375.11	108784.65
26-Apr-11 14:04:00	252.41	206.27	366.30	109058.27
26-Apr-11 14:05:00	252.34	204.99	415.17	108467.95
26-Apr-11 14:06:00	252.42	205.45	397.20	108450.49
26-Apr-11 14:07:00	252.73	206.15	346.67	109023.96
26-Apr-11 14:08:00	252.71	206.24	401.84	108846.05
26-Apr-11 14:09:00	252.66	205.90	413.88	108672.42
26-Apr-11 14:10:00	252.62	206.47	391.06	109029.45
26-Apr-11 14:11:00	252.36	206.15	395.14	108906.77
26-Apr-11 14:12:00	251.84	206.49	399.37	108915.92
26-Apr-11 14:13:00	251.19	204.44	385.86	108070.38
26-Apr-11 14:14:00	251.85	203.71	328.40	107784.57
26-Apr-11 14:15:00	251.79	204.53	315.01	108129.04
26-Apr-11 14:16:00	252.28	204.93	359.54	108535.79
26-Apr-11 14:17:00	252.43	206.06	416.05	108853.59
26-Apr-11 14:18:00	252.56	207.04	427.10	109104.34
26-Apr-11 14:19:00	252.36	205.15	438.44	108456.55
26-Apr-11 14:20:00	252.46	206.03	373.34	108636.04
26-Apr-11 14:21:00	252.40	206.63	354.31	109070.66
26-Apr-11 14:22:00	252.17	205.82	391.65	108692.08
26-Apr-11 14:23:00	252.01	206.03	397.31	108725.29
26-Apr-11 14:24:00	251.97	205.79	379.98	108606.49
26-Apr-11 14:25:00	251.98	205.42	362.71	108779.19
26-Apr-11 14:26:00	251.84	205.60	383.39	108752.15
26-Apr-11 14:27:00	251.95	205.97	368.94	108768.75
26-Apr-11 14:28:00	251.91	204.44	402.98	108136.89
26-Apr-11 14:29:00	252.21	206.21	372.64	108762.70
26-Apr-11 14:30:00	252.34	205.57	408.48	108586.43
26-Apr-11 14:31:00	252.22	206.14	400.72	108858.73
26-Apr-11 14:32:00	252.28	205.30	402.42	108607.70
26-Apr-11 14:33:00	252.09	204.96	385.77	108581.46
26-Apr-11 14:34:00	251.94	205.59	376.16	108606.75
26-Apr-11 14:35:00	251.49	205.17	389.97	108525.15
26-Apr-11 14:36:00	251.61	203.78	388.50	108016.36
26-Apr-11 14:37:00	251.81	206.12	351.73	108608.19
26-Apr-11 14:38:00	251.86	204.84	394.55	108562.41
26-Apr-11 14:39:00	251.95	205.25	411.35	108414.39
26-Apr-11 14:40:00	251.99	205.48	382.42	108749.31
26-Apr-11 14:41:00	252.04	205.76	391.03	108601.32
26-Apr-11 14:42:00	252.00	205.33	390.91	108530.61
26-Apr-11 14:43:00	251.90	206.24	374.34	108803.00
26-Apr-11 14:44:00	251.78	205.54	392.50	108504.51
26-Apr-11 14:45:00	251.63	204.96	382.61	108421.43
26-Apr-11 14:46:00	251.77	204.44	368.29	108345.39
26-Apr-11 14:47:00	251.80	205.27	366.75	108476.96
26-Apr-11 14:48:00	251.81	204.72	378.81	108517.27
26-Apr-11 14:49:00	251.83	205.08	406.48	108434.70
26-Apr-11 14:50:00	251.85	204.95	388.77	108506.56
26-Apr-11 14:51:00	251.88	205.18	387.50	108553.18
26-Apr-11 14:52:00	251.87	205.92	373.93	108618.14
26-Apr-11 14:53:00	252.09	205.36	390.09	108394.96
26-Apr-11 14:54:00	252.25	205.48	376.25	108743.73
26-Apr-11 14:55:00	252.22	205.88	380.45	108965.79
26-Apr-11 14:56:00	251.94	205.59	430.15	108654.92
26-Apr-11 14:57:00	251.66	204.63	407.59	108454.39
Average	252.28	205.77	386.02	108711.38

APPENDIX C

CALIBRATION GAS CERTIFICATIONS

AIR LIQUIDE Air Liquide America Specialty Gases LLC

Scott™

RATA CLASS

Dual-Analyzed Calibration Standard

1290 COMBERMERE STREET, TROY, MI 48083 Phone: 248-589-2950 Fax: 248-589-2134

CERTIFICATE OF ACCURACY: EPA Protocol Gas

Assay Laboratory

AIR LIQUIDE AMERICA SPECIALTY GASES LLC
1290 COMBERMERE STREET
TROY, MI 48083

P.O. No.: ALAS-55510
Project No.: 05-86523-002

Customer

AIR LIQUIDE AMERICA L.P.
AIR HYGIENE
1319 NORTH PEORIA AVE
TULSA OK 74106

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1; September, 1997.

Cylinder Number: ALM019345 **Certification Date:** 05Apr2010 **Exp. Date:** 04Apr2013
Cylinder Pressure*:** 2000 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)		ANALYTICAL ACCURACY**	TRACEABILITY
CARBON DIOXIDE	8.91	%	+/- 1%	Direct NIST and VSL
OXYGEN	12.1	%	+/- 1%	Direct NIST and VSL
NITROGEN		BALANCE		

*** Do not use when cylinder pressure is below 150 psig.

** Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 2300	01Nov2010	1D002807	23.04 %	CARBON DIOXIDE
NTRM 2350	01Dec2011	K016398	23.20 %	OXYGEN

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
PIR/2000/609015	01Apr2010	NDIR
CAI/110P/V03018	17Mar2010	PARAMAGNETIC

ANALYZER READINGS

(Z = Zero Gas R = Reference Gas T = Test Gas r = Correlation Coefficient)

First Triad Analysis | **Second Triad Analysis** | **Calibration Curve**

CARBON DIOXIDE

First Triad Analysis		
Date: 09Apr2010	Response Unit:MV	
Z1 = 0.00000	R1 = 100.0000	T1 = 56.20000
R2 = 100.0000	Z2 = 0.00000	T2 = 56.16000
Z3 = 0.00000	T3 = 56.24000	R3 = 100.1500
Avg. Concentration:	8.916	%

Calibration Curve	
Concentration = A + Bx + Cx2 + Dx3 + Ex4	
r = 0.999989193	
Constants:	A = -0.00227705
B = 0.142642211	C = -0.0004657
D = 0.0000133988	E = 0

OXYGEN

First Triad Analysis		
Date: 09Apr2010	Response Unit:%	
Z1 = 0.00000	R1 = 23.20000	T1 = 12.11000
R2 = 23.20000	Z2 = 0.00000	T2 = 12.10000
Z3 = 0.00000	T3 = 12.09000	R3 = 23.19000
Avg. Concentration:	12.08	%

Calibration Curve	
Concentration = A + Bx + Cx2 + Dx3 + Ex4	
r = 0.9999996852	
Constants:	A = -0.0380151
B = 1.001181065	C = 0
D = 0	E = 0

APPROVED BY: _____

AIR LIQUIDE Air Liquide America Specialty Gases LLC | Scott™

RATA CLASS

Dual-Analyzed Calibration Standard

1290 COMBERMERE STREET, TROY, MI 48083 Phone: 248-589-2950 Fax: 248-589-2134

CERTIFICATE OF ACCURACY: EPA Protocol Gas

Assay Laboratory

AIR LIQUIDE AMERICA SPECIALTY GASES LLC
1290 COMBERMERE STREET
TROY, MI 48083

P.O. No.: ALAS-56936
Project No.: 05-88735-006

Customer

AIR LIQUIDE AMERICA L.P.
AIR HYGIENE
1319 NORTH PEORIA AVE
TULSA OK 74106

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1; September, 1997.

Cylinder Number: ALM004185 **Certification Date:** 21Jun2010 **Exp. Date:** 20Jun2013
Cylinder Pressure*:** 2000 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)		ANALYTICAL ACCURACY**	TRACEABILITY
CARBON DIOXIDE	19.1	%	+/- 1%	Direct NIST and VSL
OXYGEN	21.1	%	+/- 1%	Direct NIST and VSL
NITROGEN		BALANCE		

*** Do not use when cylinder pressure is below 150 psig.

** Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 2300	01Nov2010	1D002807	23.04 %	CARBON DIOXIDE
NTRM 2350	01Dec2011	K016398	23.20 %	OXYGEN

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
PIR/2000/609015	07Jun2010	NDIR
CAI/110P/V03018	11Jun2010	PARAMAGNETIC

ANALYZER READINGS

(Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

First Triad Analysis | **Second Triad Analysis** | **Calibration Curve**

CARBON DIOXIDE

Date: 21Jun2010	Response Unit:MV	
Z1=0.00000	R1=100.0000	T1=90.42000
R2=100.0000	Z2=0.00000	T2=90.60000
Z3=0.00000	T3=90.60000	R3=100.0000
Avg. Concentration:	19.07	%

Concentration = A+Bx+Cx2+Dx3+Ex4
r=0.999986
Constants: A=-0.00585731
B=0.131065552 C=-0.0001375
D=1.12705E-05 E=0

OXYGEN

Date: 21Jun2010	Response Unit:%	
Z1=0.00000	R1=23.20000	T1=21.15000
R2=23.20000	Z2=0.00000	T2=21.15000
Z3=0.00000	T3=21.15000	R3=23.20000
Avg. Concentration:	21.14	%

Concentration = A+Bx+Cx2+Dx3+Ex4
r=0.999999
Constants: A=-0.00484606
B=0.999830474 C=0
D=0 E=0

Special Notes: PART# AH095

APPROVED BY: _____
JEFF CROTEAU

AIR LIQUIDE Air Liquide America Specialty Gases LLC Scott™

RATA CLASS

Dual-Analyzed Calibration Standard

1290 COMBERMERE STREET, TROY, MI 48083 Phone: 248-589-2950 Fax: 248-589-2134

CERTIFICATE OF ACCURACY: Interference Free™ Multi-Component EPA Protocol Gas

Assay Laboratory

AIR LIQUIDE AMERICA SPECIALTY GASES LLC
1290 COMBERMERE STREET
TROY, MI 48083

P.O. No.: ALASG-55510
Project No.: 05-86916-005

Customer

AIR LIQUIDE AMERICA L.P.
AIR HYGIENE
1319 NORTH PEORIA AVE
TULSA OK 74106

P

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1; September, 1997.

Cylinder Number: AAL13310 **Certification Date:** 22Apr2010 **Exp. Date:** 21Apr2012
Cylinder Pressure*:** 2015 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)		ACCURACY**	TRACEABILITY
CARBON MONOXIDE	12.1	PPM	+/- 1%	Direct NIST and VSL
NITRIC OXIDE	12.1	PPM	+/- 1%	Direct NIST and VSL
NITROGEN - OXYGEN FREE		BALANCE		
TOTAL OXIDES OF NITROGEN	12.1	PPM		Reference Value Only

*** Do not use when cylinder pressure is below 150 psig.
** Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
	02Oct2010	KAL003166	25.21 PPM	CARBON MONOXIDE
NTRM 2629	01Jun2010	KAL004325	20.36 PPM	NITRIC OXIDE

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
FTIR//0928621	02Apr2010	FTIR
ECO PHYSICS/CLD 84M/84M0359	19Apr2010	CHEMI

ANALYZER READINGS

(Z = Zero Gas R = Reference Gas T = Test Gas r = Correlation Coefficient)

First Triad Analysis

CARBON MONOXIDE
Date: 14Apr2010 Response Unit:PPM
Z1 = -0.05307 R1 = 25.30663 T1 = 12.10338
R2 = 25.31267 Z2 = -0.05306 T2 = 12.12388
Z3 = -0.03830 T3 = 12.14423 R3 = 25.34334
Avg. Concentration: 12.09 PPM

NITRIC OXIDE
Date: 14Apr2010 Response Unit:MV
Z1 = 0.00000 R1 = 20.33000 T1 = 12.05000
R2 = 20.35000 Z2 = 0.00000 T2 = 12.05000
Z3 = 0.00000 T3 = 12.05000 R3 = 20.34000
Avg. Concentration: 12.11 PPM

Second Triad Analysis

CARBON MONOXIDE
Date: 21Apr2010 Response Unit: PPM
Z1 = -0.06291 R1 = 25.26965 T1 = 12.17129
R2 = 25.30621 Z2 = -0.02751 T2 = 12.19590
Z3 = 0.02191 T3 = 12.19939 R3 = 25.34779
Avg. Concentration: 12.15 PPM

NITRIC OXIDE
Date: 21Apr2010 Response Unit: MV
Z1 = 0.00000 R1 = 20.29000 T1 = 11.96000
R2 = 20.28000 Z2 = 0.00000 T2 = 11.96000
Z3 = 0.00000 T3 = 11.96000 R3 = 20.29000
Avg. Concentration: 12.04 PPM

Calibration Curve

CARBON MONOXIDE
Concentration = A + Bx + Cx2 + Dx3 + Ex4
r = 9.99986E-1
Constants: A = 0.00000E+0
B = 8.81389E-1 C = 5.84000E-4
D = 1.00000E-6 E = 0.00000E+0

NITRIC OXIDE
Concentration = A + Bx + Cx2 + Dx3 + Ex4
r = 0.999989
Constants: A = 0.052499
B = 0.998591 C = 0.000000
D = 0.000000 E = 0.000000

Special Notes: AH072 Lot Number: 0586916005

APPROVED BY: _____
Rob. McCrandall

AIR LIQUIDE Air Liquide America Specialty Gases LLC

Scott™

RATA CLASS

Dual-Analyzed Calibration Standard

1290 COMBERMERE STREET, TROY, MI 48083 Phone: 248-589-2950 Fax: 248-589-2134

CERTIFICATE OF ACCURACY: Interference Free™ Multi-Component EPA Protocol Gas

Assay Laboratory

AIR LIQUIDE AMERICA SPECIALTY GASES LLC
1290 COMBERMERE STREET
TROY, MI 48083

P.O. No.: ALAS-56465
Project No.: 05-87288-002

Customer

AIR LIQUIDE AMERICA L.P.
AIR HYGIENE
1319 NORTH PEORIA AVE
TULSA OK 74106

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1; September, 1997.

Cylinder Number: CC173507 **Certification Date:** 07May2010 **Exp. Date:** 06May2012
Cylinder Pressure*:** 2015 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)		ACCURACY**	TRACEABILITY
CARBON MONOXIDE	23.2	PPM	+/- 1%	Direct NIST and VSL
NITRIC OXIDE	23.4	PPM	+/- 1%	Direct NIST and VSL
NITROGEN - OXYGEN FREE		BALANCE		
TOTAL OXIDES OF NITROGEN	23.6	PPM		Reference Value Only

*** Do not use when cylinder pressure is below 150 psig.
** Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 2636	02Oct2011	KAL003744	240.8 PPM	CARBON MONOXIDE
NTRM 1684 1	15Oct2012	KAL004434	95.84 PPM	NITRIC OXIDE

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
FTIR//0928621	30Apr2010	FTIR
FTIR//0928621	09Apr2010	FTIR

ANALYZER READINGS

(Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

First Triad Analysis

CARBON MONOXIDE
Date: 30Apr2010 Response Unit:PPM
Z1=-0.00481 R1=241.9239 T1=23.39141
R2=242.0561 Z2=-0.00195 T2=23.42998
Z3=0.23106 T3=23.44974 R3=242.2529
Avg. Concentration: 23.23 PPM

NITRIC OXIDE
Date: 30Apr2010 Response Unit:PPM
Z1=-0.03952 R1=95.90178 T1=23.28269
R2=95.91071 Z2=-0.02811 T2=23.36449
Z3=-0.00286 T3=23.37331 R3=96.05732
Avg. Concentration: 23.33 PPM

Second Triad Analysis

Date: 07May2010 Response Unit: PPM
Z1=-0.00417 R1=240.9105 T1=23.18030
R2=241.2416 Z2=0.00845 T2=23.21160
Z3=0.28117 T3=23.35798 R3=241.2466
Avg. Concentration: 23.13 PPM

Date: 07May2010 Response Unit: PPM
Z1=-0.13287 R1=94.53774 T1=23.24871
R2=95.07222 Z2=-0.00119 T2=23.38911
Z3=0.07275 T3=23.45024 R3=95.38034
Avg. Concentration: 23.53 PPM

Calibration Curve

Concentration=A+Bx+Cx2+Dx3+Ex4
r=9.99985E-1
Constants: A=0.00000E+0
B=5.06495E-1 C=1.93000E-4
D=0.00000E+0 E=0.00000E+0

Concentration=A+Bx+Cx2+Dx3+Ex4
r=9.99985E-1
Constants: A=0.00000E+0
B=9.98166E-1 C=2.95000E-4
D=0.00000E+0 E=0.00000E+0

Special Notes: AH074 Lot Number: 0587288002

APPROVED BY: _____
Rob McCrandall

AIR LIQUIDE™

CERTIFICATION OF ANALYSIS

Interference Free Multi-Component EPA Protocol Gases

Note: Analytical uncertainty and NIST traceability are in compliance with EPA-600/R-97/121
Section 2.2, Procedure G-1

Cylinder S/N: CC103445

Customer: AIR HYGIENE
Location: TULSA, OK

P.O. Number: 9041201
Item Number: SGZCAH001

Assay Date: 30-Apr-2009 **Expiration Date: 30-Apr-2012**

Shipping Order Number: 33223677
Transfer Number: 33223677
Lot Number: SFS131505
Valve: CGA 350
Cylinder Pressure*: 2000 PSIG
*Cylinder should not be used when gas pressure is below 150 psig

Components	Requested Concentration	Assay Concentration
Nitrogen	Balance	Balance
Methane	3 ppm	2.89 ± 0.03 ppm

Reference Standard(s) Employed For Analysis

Certified Concentration and Uncertainty			Component	Balance	Cyl. No.	SRM/PRM/Mix No.	Exp. Date	Sample No.	Type
10.06	± 0.04	ppm	Methane	Air	CC204838	SFS103876	18-Mar-2010	NI	GMIS

Analytical Data

Component:	Methane		FIRST TRIAD ANALYSIS 30-Apr-2009			
Analyzer Information			Trial 1	Trial 2	Trial 3	Units
Analyzer Type:	Gas Chromatograph	Zero	0.000	0.000	0.000	Area
Manufacturer:	Hewlett Packard	Reference	97.31	97.29	97.20	Area
Model Number:	G1540A	Candidate	27.99	27.97	27.96	Area
Serial Number:	US00003390/Meth	Result	2.894	2.892	2.894	ppm
MPR Last Calibrated:	23-Apr-2009	Evaluation	Valid	Valid	Valid	
Analytical Principle:	FID & TCD			Mean Analytical Result:	2.893	ppm

Analyst: _____ Eric Barron

Approved by: _____ Thuan Tran

AIR LIQUIDE AMERICA, L.P. Region Office • 8832 Dice Road, Santa Fe Springs, CA 90670-2516
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AIR LIQUIDE™

CERTIFICATION OF ANALYSIS

Interference Free Multi-Component EPA Protocol Gases

Note: Analytical uncertainty and NIST traceability are in compliance with EPA-600/R-97/121
Section 2.2, Procedure G-1

Cylinder S/N: CC113394

Customer: AIR HYGIENE
Location: TULSA, OK

P.O. Number: 9032901
Item Number: SGZCAH002

Assay Date: 24-Apr-2009 **Expiration Date:** 24-Apr-2012

Shipping Order Number: 33119767
Transfer Number: 33119767
Lot Number: SFS131210
Valve: CGA 350
Cylinder Pressure*: 2000 PSIG
*Cylinder should not be used when gas pressure is below 150 psig

Components	Requested Concentration	Assay Concentration
Nitrogen	Balance	Balance
Methane	5 ppm	4.76 ± 0.05 ppm

Reference Standard(s) Employed For Analysis

Certified Concentration and Uncertainty	Component	Balance	Cyl. No.	SRM/PRM/Mix No.	Exp. Date	Sample No.	Type
10.06 ± 0.04 ppm	Methane	Air	CC204838	SFS103876	18-Mar-2010	NI	GMIS

Analytical Data

Component:	Methane		FIRST TRIAD ANALYSIS 24-Apr-2009			
Analyzer Information			Trial 1	Trial 2	Trial 3	Units
Analyzer Type:	Gas Chromatograph	Zero	0.000	0.000	0.000	Area
Manufacturer:	Hewlett Packard	Reference	97.22	97.24	97.24	Area
Model Number:	G1540A	Candidate	45.95	45.92	46.03	Area
Serial Number:	US00003390/Meth	Result	4.765	4.751	4.762	ppm
MPR Last Calibrated:	23-Apr-2009	Evaluation	Valid	Valid	Valid	
Analytical Principle:	FID & TCD			Mean Analytical Result:	4.756	ppm

Analyst: _____ Eric Barron

Approved by: _____ Jason Unger

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Air Liquide America Specialty Gases LLC

Scott™

RATA CLASS

Dual-Analyzed Calibration Standard

1290 COMBERMERE STREET, TROY, MI 48083 Phone: 248-589-2950 Fax: 248-589-2134

CERTIFICATE OF ACCURACY: EPA Protocol Gas

Assay Laboratory

AIR LIQUIDE AMERICA SPECIALTY GASES LLC
1290 COMBERMERE STREET
TROY, MI 48083

P.O. No.: 9081310
Project No.: 05-79607-014

Customer

AIR LIQUIDE AMERICA L.P.
AIR HYGIENE
1319 NORTH PEORIA AVE
TULSA OK 74106

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1; September, 1997.

Cylinder Number: ALM004952 **Certification Date:** 08Sep2009 **Exp. Date:** 07Sep2012
Cylinder Pressure*:** 1875 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)		ANALYTICAL ACCURACY**	TRACEABILITY
METHANE	8.46	PPM	+/- 1%	Direct NIST and VSL
NITROGEN		BALANCE		

*** Do not use when cylinder pressure is below 150 psig.

** Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 2751	01Nov2010	K022940	100.2 PPM	METHANE

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
VARIAN/3400/7506	17Aug2009	TCD/FID

ANALYZER READINGS

(Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

First Triad Analysis

METHANE

Date: 08Sep2009 Response Unit:AREA
Z1=0.00000 R1=900184.0 T1=74841.00
R2=899931.0 Z2=0.00000 T2=74878.00
Z3=0.00000 T3=75055.00 R3=898275.0
Avg. Concentration: 8.460 PPM

Second Triad Analysis

Calibration Curve

Concentration=A+Bx+Cx2+Dx3+Ex4
r=0.999995113
Constants: A=0.11264489
B=0.000109556 C=0
D=0 E=0

APPROVED BY:

ROBERT LESNIAK

AIR LIQUIDE™

RECERTIFICATION OF ANALYSIS

Interference Free Multi-Component EPA Protocol Gases

Note: Analytical uncertainty and NIST traceability are in compliance with EPA-600/R-97/121
Section 2.2, Procedure G-1

Cylinder S/N: CC124363

Customer: AIR HYGIENE
Location: TULSA, OK

P.O. Number: 9032901
Item Number: SGZCAH032

Assay Date: 29-Apr-2009

Expiration Date: 29-Apr-2011

Shipping Order Number: 33119767
Transfer Number: 33119767
Lot Number: SFS131619
Valve: CGA 660
Cylinder Pressure*: 2000 PSIG
*Cylinder should not be used when gas pressure is below 150 psig

Components	Requested Concentration	Assay Concentration
Nitrogen	**Balance**	**Balance**
Nitrogen Dioxide	**45-50 ppm**	**47.6 ± 1.2 ppm**

Reference Standard(s) Employed For Analysis

Certified Concentration and Uncertainty				Component	Balance	Cyl. No.	SRM/PRM/Mix No.	Exp. Date	Sample No.	Type
51.4	±	1.2	ppm	Nitrogen Dioxide	Nitrogen	EB0009973	SFS119543	12-Jul-2010	BI	GMIS

Analytical Data

Component:	Nitrogen Dioxide		FIRST TRIAD ANALYSIS 29-Jan-2009					SECOND TRIAD ANALYSIS 29-Apr-2009			
Analyzer Information								Trial 1	Trial 2	Trial 3	Units
Analyzer Type:	Fourier Transform IR					Zero		0.007	0.002	0.025	ppm
Manufacturer:	MKS Instruments			INITIAL		Reference		51.223	51.246	51.247	ppm
Model Number:	2031			ASSAY		Candidate		47.290	47.394	47.422	ppm
Serial Number:	10387278					Result		47.45	47.54	47.56	ppm
MPR Last Calibrated:	29-Apr-2009	Evaluation	Valid	Valid	Valid	Evaluation		Valid	Valid	Valid	
Analytical Principle:	FTIR			Mean Analytical Result:	47.76	ppm			Mean Analytical Result:	47.52	ppm

Analyst: _____ Tan Ngo

Approved by: _____ Thuan Tran

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Phone: (562) 945-1383 • Fax: (562) 693-1156

APPENDIX D

QUALITY ASSURANCE AND QUALITY CONTROL DATA

QA/QC PROGRAM

Air Hygiene ensures the quality and validity of its emission measurement and reporting procedures through a rigorous quality assurance (QA) program. The program is developed and administered by an internal QA team and encompasses five major areas:

1. QA reviews of reports, laboratory work, and field testing
2. Equipment calibration and maintenance
3. Chain-of-custody
4. Training
5. Knowledge of current test methods

Each of these areas is discussed individually below.

QA Reviews

Air Hygiene's review procedure includes review of each source test report, along with laboratory and fieldwork, by the QA Team. The most important review is the one that takes place before a test program begins. The QA Team works closely with technical division personnel to prepare and review test protocols. Test protocol review includes selection of appropriate test procedures, evaluation of interferences or other restrictions that might preclude use of standard test procedures, and evaluation and/or development of alternate procedures.

Equipment Calibration and Maintenance

The equipment used to conduct the emission measurements is maintained according to the manufacturer's instructions to ensure proper operation. In addition to the maintenance program, calibrations are carried out on each measurement device according to the schedule outlined by the Environmental Protection Agency. Quality control checks are also conducted in the field for each test program.

Chain-of-Custody

Air Hygiene maintains full chain-of-custody documentation on all samples and data sheets. In addition to normal documentation of changes between field sample custodians, laboratory personnel, and field test personnel, Air Hygiene documents every individual who handles any test component in the field (e.g., probe wash, impinger loading and recovery, filter loading and recovery, etc.). Samples are stored in a locked area to which only Air Hygiene personnel have access. Field data sheets are secured at Air Hygiene's offices upon return from the field.

Training

Personnel's training is essential to ensure quality testing. Air Hygiene has formal and informal training programs, which include:

1. Attendance at EPA-sponsored training courses
2. Enrollment in EPA correspondence courses
3 A requirement for all technicians to read and understand Air Hygiene's QA manual
4. In-house training and QA meetings on a regular basis
5. Maintenance of training records

Knowledge of Current Test Methods

With the constant updating of standard test methods and the wide variety of emerging test procedures, it is essential that any qualified source tester keep abreast of new developments. Air Hygiene subscribes to services, which provide updates on EPA reference methods, rules, and regulations. Additionally, source test personnel regularly attend and present papers at testing and emission-related seminars and conferences. Air Hygiene personnel maintain membership in the Air and Waste Management Association and the American Industrial Hygiene Association.

COMBUSTION TESTING QUALITY ASSURANCE ACTIVITIES

A number of quality assurance activities were undertaken before, during, and after this testing project. This section of the report combined with the documentation in Appendix C describes each of those activities.

Each instrument's response was checked and adjusted in the field prior to the collection of data via multi-point calibration. The instrument's linearity was checked by adjusting its zero and span responses to zero nitrogen and an upscale calibration gas in the range of the expected concentrations. The instrument response was then challenged with other calibration gases of known concentration and accepted as being linear if the response of the other calibration gases agreed within plus or minus two percent of the range of predicted values. NO_2 to NO conversion was checked via direct connect with an EPA Protocol certified concentration of NO_2 in a balance of nitrogen. Conversion was verified to be between 90 and 110 percent.

After each test run, the analyzers were checked for zero and span drift. This allowed each test run to be bracketed by calibrations and documents the precision of the data just collected. The criterion for acceptable data is that the instrument drift is no more than three percent of the full-scale response. The quality assurance worksheets in the following pages summarize all multipoint calibration checks and zero to span checks performed during the tests. These worksheets (as prepared from the data records of Appendix A) show that no drifts in excess of three percent occurred in the zero to span checks following each test run.

The sampling systems were leak checked by demonstrating that a vacuum greater than 10 in Hg could be held for at least one minute with a decline of less than one inch of Hg. A leak test was conducted after the sample system was set up and before the system was dismantled. This test was conducted to ensure that ambient air had not diluted the sample. Any leakage detected prior to the tests would be repaired and another leak check conducted before testing commenced. No leaks were found during the pre or post-test leak checks.

The absence of leaks in the sampling system was also verified by a sampling system bias check. The sampling system's integrity was tested by comparing the responses of the analyzers to the calibration gases introduced via two paths. The first path was directly into the analyzer and the second path via the sample system at the sample probe. Any difference in the instrument responses by these two methods was attributed to sampling system bias or leakage. The criterion for acceptance is agreement within five percent of the span of the analyzer.

The control gases used to calibrate the instruments were analyzed and certified by the compressed gas vendors to plus or minus one percent accuracy for all gases. EPA Protocol No. 1 was used, where applicable to assign the concentration values traceable to the National Institute of Standards and Technology (NIST), Standard Reference Materials (SRM's). The gas calibration sheets as prepared by the vendor are contained in Appendix C.

Air Hygiene collected and reported the enclosed test data in accordance with the procedures and quality assurance activities described in this test report. Air Hygiene makes no warranty as to the suitability of the test methods. Air Hygiene also assumes no liability relating to the interpretation and use of the test data.

INSTRUMENTAL ANALYSIS
QUALITY ASSURANCE DATA

Date: April 26, 2011
Company: Florida Power and Light
Location: Loxahatchee, Florida
Techs: PS/NA

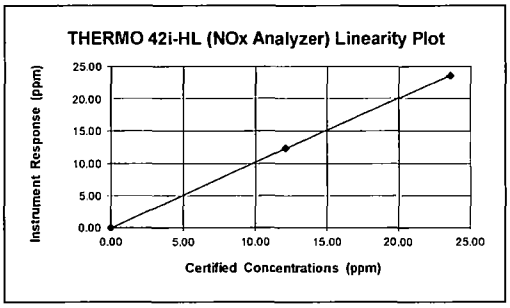
Sample System Leak Check

Date	Sample System	Leak Rate (l/min)
April 26, 2011	1	0

Calibration Date: April 26, 2011
Client: Florida Power and Light

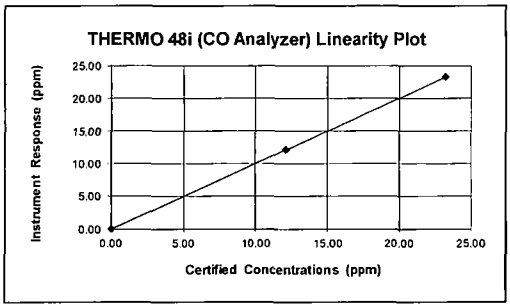
NOx Span (ppm) = 23.60

THERMO 42i-HL (NOx Analyzer)				
Certified Concentration (ppm)	Instrument Response (ppm)	Calibration Error (%)	Absolute Conc. (ppm)	Pass or Fail (±2%, ≤0.5ppm)
0.00	0.03	0.13	0.03	YES (%)
12.10	12.40	1.27	0.30	YES (%)
23.60	23.60	0.00	0.00	YES (%)
Linearity = 1.001				



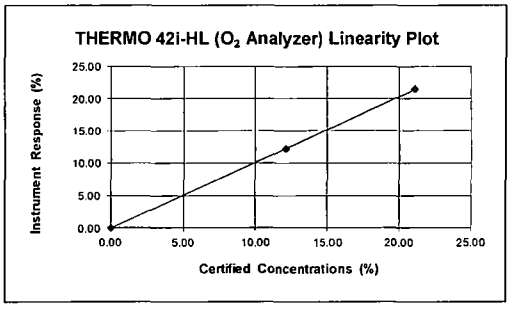
CO Span (ppm) = 23.20

THERMO 48i (CO Analyzer)				
Certified Concentration (ppm)	Instrument Response (ppm)	Calibration Error (%)	Absolute Conc. (ppm)	Pass or Fail (±2%, ≤0.5ppm)
0.00	0.05	0.22	0.05	YES (%)
12.10	12.15	0.22	0.05	YES (%)
23.20	23.30	0.43	0.10	YES (%)
Linearity = 0.998				



O_2 Span (%) = 21.10

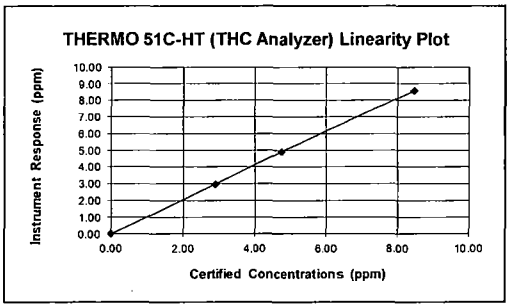
THERMO 42i-HL (O_2 Analyzer)				
Certified Concentration (%)	Instrument Response (%)	Calibration Error (%)	Absolute Conc. (%)	Pass or Fail (±2%, ≤0.5%)
0.00	0.02	0.09	0.02	YES (%)
12.10	12.25	0.71	0.15	YES (%)
21.10	21.50	1.90	0.40	YES (%)
Linearity = 0.983				



THC Range (ppm) = 10

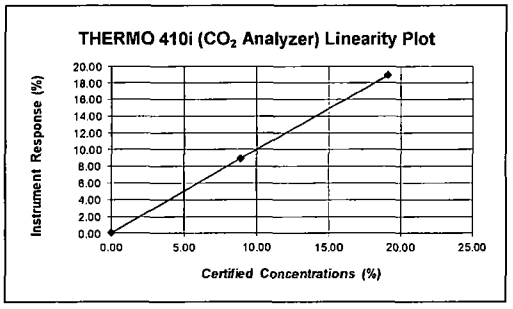
THERMO 51C-HT (THC Analyzer)				
Certified Concentration (ppm)	Instrument Response (ppm)	Calibration Error (%)	Estimated Point (ppm)	Pass or Fail (±2,5%)[1]
0.00	0.00	0.00	N/A	YES
2.89	2.98	1.46	2.94	YES
4.76	4.92	1.71	4.84	YES
8.46	8.60	1.40	N/A	YES
Linearity = 0.993				

[1]-zero/high based on 2% of span,low/mid based on 5% of concentration



CO_2 Span (%) = 19.10

THERMO 410i (CO_2 Analyzer)				
Certified Concentration (%)	Instrument Response (%)	Calibration Error (%)	Absolute Conc. (%)	Pass or Fail (±2%, ≤0.5%)
0.00	0.08	0.42	0.08	YES (%)
8.91	8.99	0.42	0.08	YES (%)
19.10	18.94	-0.84	0.16	YES (%)
Linearity = 1.013				



NOx Converter Efficiency

Date: April 26, 2011

Analyzer: INST-N2-0001

RM 7E, (12-17-09), Sections 7.1.4; 8.2.4.1; 12.7; and 13.5 Introduce NO_2 to the analyzer and record the NOx concentration displayed. ... Calculate the converter efficiency using Equation 7E-7. The specification for converter efficiency must be met. ... Air Hygiene also references ALT-0013 for specific NO_2 concentration (40-60 ppm) and EPA Traceability Protocol requirements (±2%).

Audit Gas:	NO_2 Concentration (C_v), ppmvd	**47.60**
Converter Efficiency Calculations:		
	Analyzer Reading, NO Channel, ppmvd	**1.95**
	Analyzer Reading, NOx Channel, ppmvd	**47.30**
	Analyzer Reading, NO_2 Channel ($C_{Dir(NO2)}$), ppmvd	**45.35**
	Converter Efficiency, %	**95.27**

RM 7E, (08-15-06), 13.5 NO2 to NO Conversion Efficiency Test (as applicable). The NO2 to NO conversion efficiency, calculated according to Equation 7E-7 or Equation 7E-9, must be greater than or equal to 90 percent.

$$Eff_{NO2} = \left(\frac{C_{Dir}}{C_V}\right) \times 100$$ Eq. 7E-7 = $\frac{45.35 \text{ ppmvd}}{47.60 \text{ ppmvd}}$ x 100 = 95.27%

Date/Time mm/dd/yy hh:mm:ss	Elapsed Time Seconds	NOx ppmvd	NO ppmvd
04/26/11 06:41:54	1380	12.41	12.38
04/26/11 06:42:04	1390	12.52	12.52
04/26/11 06:42:14	1400	12.95	7.13
04/26/11 06:42:24	1410	14.37	1.12
04/26/11 06:42:34	1420	15.53	1.10
04/26/11 06:42:44	1430	29.28	1.75
04/26/11 06:42:54	1440	44.51	1.89
04/26/11 06:43:04	1450	46.63	1.95
04/26/11 06:43:14	***1460***	***47.30***	***1.95***

DRIFT AND BIAS CHECK			
Strat Test Pre and Post QA/QC Check	O2	CO	NOx
Initial Zero	0.18	0.08	0.10
Final Zero	0.29	0.11	0.12
Avg. Zero	0.24	0.10	0.11
Initial UpScale	12.25	12.09	11.94
Final UpScale	12.31	12.04	11.90
Avg. UpScale	12.28	12.07	11.92
Sys Resp (Zero)	0.02	0.05	0.03
Sys Resp (Upscale)	12.25	12.15	12.40
Upscale Cal Gas	12.10	12.10	12.10
Initial Zero Bias	0.76%	0.13%	0.30%
Final Zero Bias	1.28%	0.26%	0.38%
Zero Drift	0.52%	0.13%	0.08%
Initial Upscale Bias	0.00%	-0.26%	-1.95%
Final Upscale Bias	0.28%	-0.47%	-2.12%
Upscale Drift	0.28%	0.22%	0.17%
Alternative Specification Abs Diff — Initial Zero	0.16	0.03	0.07
Alternative Specification Abs Diff — Final Zero	0.27	0.06	0.09
Alternative Specification Abs Diff — Initial Upscale	0.00	0.06	0.46
Alternative Specification Abs Diff — Final Upscale	0.06	0.11	0.50
Calibration Span	21.10	23.20	23.60
3% of Range (drift)	0.63	0.70	0.71
5% of Range (bias)	1.06	1.16	1.18

Respone Time (min)	1.0	1.7	1.7
Sys. Response (min)		1.7	

Date/Time mm/dd/yy hh:mm:ss	z	O_2 %	s z	CO ppm	s z	NOx ppm	s	INJECTIONS
04/26/11 08:10:44		13.78		10.51		9.50		
04/26/11 08:10:54		13.76		10.02		9.66		
04/26/11 08:11:04		13.76		9.59		9.81		
04/26/11 08:11:14		13.76		9.16		9.96		x
04/26/11 08:11:24	x	13.74		8.96		10.18		
04/26/11 08:11:34		13.73		8.45		10.42		
04/26/11 08:11:44		13.75		8.35		10.56		
04/26/11 08:11:54		14.81		8.18		10.71		
04/26/11 08:12:04		20.66		7.80		10.73		
04/26/11 08:12:14		**21.18**	x	5.68		10.90		
04/26/11 08:12:24		**21.19**		2.96		6.96		
04/26/11 08:12:34		**21.18**		1.01		2.53		
04/26/11 08:12:44		**21.20**		**0.37**		1.29		
04/26/11 08:12:54		**21.19**		**0.16**		**0.28**		
04/26/11 08:13:04		**21.19**		**0.29**		**0.16**		
04/26/11 08:13:14		**21.19**		**0.27**		**0.16**		
04/26/11 11:16:17		**12.37**		**-0.11**		**0.21**		
04/26/11 11:16:27		**12.36**		**-0.30**		**0.19**		
04/26/11 11:16:37		**12.37**		**-0.14**		**0.23**		x
04/26/11 11:16:47		**12.36**	x	**-0.19**	x	**0.27**		
04/26/11 11:16:57		**12.37**		**-0.15**		**0.26**		
04/26/11 11:17:07		**12.44**		**-0.28**		**0.25**		
04/26/11 11:17:17		11.04		**-0.10**		**0.24**		
04/26/11 11:17:27		1.50		**0.60**		**0.21**		
04/26/11 11:17:37		**0.37**		3.81		1.72		
04/26/11 11:17:47		**0.30**		7.41		3.17		
04/26/11 11:17:57		**0.29**		9.91		6.82		
04/26/11 11:18:07		**0.27**		11.30		11.01		
04/26/11 11:18:17		**0.26**		**11.72**	x	**11.60**	x	
04/26/11 11:18:27		**0.25**		**11.81**		**11.80**		
04/26/11 11:18:37		**0.25**		**11.82**		**11.83**		
04/26/11 11:18:47		**0.25**		**11.94**		**11.86**		

DRIFT AND BIAS CHECK					
Fuel Oil Load, Run - 1	O_2	NOx	CO	VOC	CO_2
Raw Average	13.72	8.33	6.55	0.65	5.66
Corrected Average	13.56	8.41	6.59	0.60	5.45
Initial Zero	0.09	0.12	0.11	0.00	0.29
Final Zero	0.23	0.21	-0.18	0.20	0.38
Avg. Zero	0.16	0.17	-0.04	0.10	0.34
Initial UpScale	12.19	11.90	12.00	2.98	8.96
Final UpScale	12.34	11.91	12.09	3.10	9.12
Avg. UpScale	12.27	11.91	12.05	3.04	9.04
Sys Resp (Zero)	0.02	0.03	0.05	0.00	0.08
Sys Resp (Upscale)	12.25	12.40	12.15	2.98	8.99
Upscale Cal Gas	12.10	12.10	12.10	2.89	8.91
Initial Zero Bias	0.33%	0.38%	0.26%	0.00%	1.10%
Final Zero Bias	1.00%	0.76%	-0.99%	2.00%	1.57%
Zero Drift	0.66%	0.38%	1.25%	2.00%	0.47%
Initial Upscale Bias	-0.28%	-2.12%	-0.65%	0.00%	-0.16%
Final Upscale Bias	0.43%	-2.08%	-0.26%	1.20%	0.68%
Upscale Drift	0.71%	0.04%	0.39%	1.20%	0.84%
Alternative Specification Abs Diff: Initial Zero	0.07	0.09	0.06	--	0.21
Alternative Specification Abs Diff: Final Zero	0.21	0.18	0.23	--	0.30
Alternative Specification Abs Diff: Initial Upscale	0.06	0.50	0.15	--	0.03
Alternative Specification Abs Diff: Final Upscale	0.09	0.49	0.06	--	0.13
Calibration Span	21.10	23.60	23.20	10.00	19.10
3% of Cal. Span (drift)	0.63	0.71	0.70	0.30	0.57
5% of Cal. Span (bias)	1.06	1.18	1.16	0.50	0.96

DRIFT AND BIAS CHECK					
Fuel Oil Load, Run - 2	O_2	NOx	CO	VOC	CO_2
Raw Average	13.86	8.73	6.34	0.63	5.63
Corrected Average	13.61	8.79	6.48	0.41	5.36
Initial Zero	0.23	0.21	-0.18	0.20	0.38
Final Zero	0.29	0.15	-0.18	0.40	0.24
Avg. Zero	0.26	0.18	-0.18	0.30	0.31
Initial UpScale	12.34	11.91	12.09	3.10	9.12
Final UpScale	12.36	11.98	11.90	3.13	9.18
Avg. UpScale	12.35	11.95	12.00	3.12	9.15
Sys Resp (Zero)	0.02	0.03	0.05	0.00	0.08
Sys Resp (Upscale)	12.25	12.40	12.15	2.98	8.99
Upscale Cal Gas	12.10	12.10	12.10	2.89	8.91
Initial Zero Bias	1.00%	0.76%	-0.99%	2.00%	1.57%
Final Zero Bias	1.28%	0.51%	-0.99%	4.00%	0.84%
Zero Drift	0.28%	0.25%	0.00%	2.00%	0.73%
Initial Upscale Bias	0.43%	-2.08%	-0.26%	1.20%	0.68%
Final Upscale Bias	0.52%	-1.78%	-1.08%	1.50%	0.99%
Upscale Drift	0.09%	0.30%	0.82%	0.30%	0.31%
Alternative Specification Abs Diff: Initial Zero	0.21	0.18	0.23	--	0.30
Alternative Specification Abs Diff: Final Zero	0.27	0.12	0.23	--	0.16
Alternative Specification Abs Diff: Initial Upscale	0.09	0.49	0.06	--	0.13
Alternative Specification Abs Diff: Final Upscale	0.11	0.42	0.25	--	0.19
Calibration Span	21.10	23.60	23.20	10.00	19.10
3% of Cal. Span (drift)	0.63	0.71	0.70	0.30	0.57
5% of Cal. Span (bias)	1.06	1.18	1.16	0.50	0.96

DRIFT AND BIAS CHECK					
Fuel Oil Load, Run - 3	O_2	NOx	CO	VOC	CO_2
Raw Average	13.91	8.37	5.72	0.61	5.85
Corrected Average	13.63	8.47	5.93	0.43	5.44
Initial Zero	0.29	0.15	-0.18	0.40	0.24
Final Zero	0.33	0.18	-0.15	0.10	0.43
Avg. Zero	0.31	0.17	-0.17	0.25	0.34
Initial UpScale	12.36	11.98	11.90	3.13	9.18
Final UpScale	12.41	11.82	11.79	3.01	9.54
Avg. UpScale	12.39	11.90	11.85	3.07	9.36
Sys Resp (Zero)	0.02	0.03	0.05	0.00	0.08
Sys Resp (Upscale)	12.25	12.40	12.15	2.98	8.99
Upscale Cal Gas	12.10	12.10	12.10	2.89	8.91
Initial Zero Bias	1.28%	0.51%	-0.99%	4.00%	0.84%
Final Zero Bias	1.47%	0.64%	-0.86%	1.00%	1.83%
Zero Drift	0.19%	0.13%	0.13%	3.00%	0.99%
Initial Upscale Bias	0.52%	-1.78%	-1.08%	1.50%	0.99%
Final Upscale Bias	0.76%	-2.46%	-1.55%	0.30%	2.88%
Upscale Drift	0.24%	0.68%	0.47%	1.20%	1.88%
Alternative Specification Abs Diff: Initial Zero	0.27	0.12	0.23	--	0.16
Alternative Specification Abs Diff: Final Zero	0.31	0.15	0.20	--	0.35
Alternative Specification Abs Diff: Initial Upscale	0.11	0.42	0.25	--	0.19
Alternative Specification Abs Diff: Final Upscale	0.16	0.58	0.36	--	0.55
Calibration Span	21.10	23.60	23.20	10.00	19.10
3% of Cal. Span (drift)	0.63	0.71	0.70	0.30	0.57
5% of Cal. Span (bias)	1.06	1.18	1.16	0.50	0.96

METERING SYSTEM DRY GAS METER CALIBRATION SHEET
EPA Reference Method
Metering System Pre-Test Calibration
Air Hygiene Assett ID: samp-cp-0010

Filename: C:\Users\jfahlenkamp\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.Outlook\5ZODGNTC\[SAMP-CP-0010 Calibration 3-4-11.xls]3-4-11 (5 point)

Make: Thermo Environmental
Model #: MST-C1
Serial #: 90693

Date: 03/04/11
Barometric Pressure: 29.85 (in. Hg)
Theoretical Critical Vacuum: 14.08 (in. Hg)

DRY GAS METER READINGS

ΔH (in. H2O)	Time (min)	Volume Initial (ft^3)	Volume Final (ft^3)	Volume Total (ft^3)	Initial Temperature Inlet (°F)	Initial Temperature Outlet (°F)
0.78	17.00	91.440	100.260	8.820	84.0	79.0
1.10	12.00	100.260	107.390	7.130	77.0	77.0
1.40	10.00	107.390	114.280	6.890	75.0	75.0
2.30	10.00	114.280	123.040	8.760	75.0	75.0
3.50	10.00	123.040	133.620	10.580	75.0	74.0

Final Temperature Inlet (°F)	Final Temperature Outlet (°F)	Orifice Serial# (number)	K' Orifice Coefficient (see above)	Actual Vacuum (in. Hg)	Ambient Temperature Initial (°F)	Ambient Temperature Final (°F)	Ambient Temperature Average (°F)
77.0	77.0	15	0.3865	16.0	69.6	70.0	69.8
75.0	75.0	17	0.4454	16.0	70.0	70.0	70.0
75.0	75.0	19	0.5196	16.0	70.0	70.2	70.1
75.0	74.0	25	0.6642	15.5	70.2	70.2	70.2
77.0	74.0	30	0.8090	14.5	70.0	69.8	69.9

RESULTS

DRY GAS METER VOLUME CORRECTED Vm(std) (ft^3)	DRY GAS METER VOLUME CORRECTED Vm(std) (liters)	ORIFICE VOLUME CORRECTED Vcr(std) (ft^3)	ORIFICE VOLUME CORRECTED Vcr(std) (liters)	ORIFICE VOLUME NOMINAL Vcr (ft^3)
8.629	244.37	8.521	241.3	8.573
7.023	198.90	6.930	196.3	6.975
6.805	192.71	6.737	190.8	6.782
8.675	245.66	8.610	243.8	8.670
10.503	297.44	10.490	297.1	10.557

DRY GAS METER CALIBRATION FACTOR Y Variation (number)	DRY GAS METER CALIBRATION FACTOR Y Value (number)	ORIFICE CALIBRATION FACTOR ΔH@ Value (in. H2O)	ORIFICE CALIBRATION FACTOR ΔH@ Value (mm H2O)	ORIFICE CALIBRATION FACTOR ΔH@ Variation (in. H2O)
-0.004	0.987	1.710	43.43	-0.035
-0.004	0.987	1.823	46.31	0.078
-0.001	0.990	1.709	43.40	-0.037
0.001	0.993	1.720	43.68	-0.025
0.008	0.999	1.765	44.82	0.019
AVERAGE:	**0.991**	**1.745**	44.33	**PASSED**

Notes:

For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter,acceptable tolerance of individual values from the average is +/- 0.02. For Orifice Calibration Factor dH@, the orifice differential pressure in inches of H_2O that equates to 0.75 cfm of air at 68 °F and 29.92 inches of Hg, acceptable tolerance of individual values from the average is +/- 0.2. For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above. The Critical Orifice Coefficient, K', must be entered in English units, (ft)^3*(deg R)^0.5/((in.Hg)*(min)).

SIGNATURE: Craig McCarley

DATE: 03/04/11 03/04/11

METERING SYSTEM THERMOCOUPLE CALIBRATION SHEET
EPA Reference Method
Metering System Pre-Test Calibration
Air Hygiene Assett ID: samp-cp-0010

Filename: C:\Users\jfahlenkamp\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.Outlook\5ZODGNTC\[SAMP-CP-0010 Calibration 3-4-11.xls]3-4-11 (5 point)

Make: Thermo Environmental
Model #: MST-C1
Serial #: 90693

Date:
Barometric Pressure: 29.85 (in. Hg)
Temperature (ASTM cal): 67.90 (°F)

Thermocouple	100 (°F)		600 (°F)		1200 (°F)	
	Reading	% Error	Reading	% Error	Reading	% Error
Stack	99.00	0.50	600.00	0.00	1197.00	0.25
Probe	100.00	0.00	601.00	0.17	1197.00	0.25
Filter	100.00	0.00	601.00	0.17	1197.00	0.25
Dryer	99.00	0.50	600.00	0.00	1197.00	0.25
Aux.	99.00	0.50	600.00	0.00	1197.00	0.25

Note: Calibrated against an ALTEK Thermocouple Source Series 22, direct temperature output calibrated to ASTM and IPTS standards as outlined in ALTEK Data Sheet 22.

Thermocouple	67.90 (°F)	
	Reading	(±°F)
DGM In	68.0	0.10
DGM Out	68.0	0.10

Note: Calibrated against ASTM Reference Thermometer.

SIGNATURE: Craig McCarty DATE: 03/04/11 03/04/11

Standard for Calibration of Console Thermocouple Systems

40 CFR, Part 60
Appendix A, Method 5
10.3.2 The temperature data recorded in the field shall be considered valid. If, during calibration, the absolute temperature measured with the sensor being calibrated and the reference sensor **agree within 1.5 percent**, the temperature data taken in the field shall be considered valid.

Standard for Calibration of Individual Thermocouples

EMC, ALT-011: After each test run series, check the accuracy (and, hence, the calibration) of each thermocouple system at ambient temperature, or any other temperature, within the range specified by the manufacturer, using a reference thermometer (either ASTM reference thermometer or a thermometer that has been calibrated against an ASTM reference thermometer). The temperatures of the thermocouple and reference thermometers shall **agree to within ±2°F**.

PROBE (STACK), HOTBOX (FILTER), AND GOOSENECK (EXIT) THERMOCOUPLE CALIBRATION SHEET
EPA Reference Method
Metering System Pre-Test Calibration

Air Hygiene Assett ID(s): **Probe:** samp-hp-0052 **Hotbox:** samp-bh-0014 **Gooseneck:** samp-ad-0034

Filename: C:\Users\jfahlenkamp\AppData\Local\Microsoft\Windows\Temporary Internet Files\Content.Outlook\5ZODGNTC\[SAMP-CP-0010 Calibration 3-4-11.xls]3-4-11 (5 point)

Barometric Pressure: 29.85

Thermo-couples		Temps (°F)	Signature		Date	
Stack	Ref	68.00	Craig McCarty		03/04/11	03/04/11
	Read	68.00				
	±°F	0.00				
Filter	Ref	68.00	Craig McCarty		03/04/11	03/04/11
	Read	68.00				
	±°F	0.00				
Exit	Ref	68.00	Craig McCarty		03/04/11	03/04/11
	Read	68.00				
	±°F	0.00				

Note: Calibrated against ASTM Reference Thermometer.

Standard for Calibration of Individual Thermocouples

EMC, ALT-011: After each test run series, check the accuracy (and, hence, the calibration) of each thermocouple system at ambient temperature, or any other temperature, within the range specified by the manufacturer, using a reference thermometer (either ASTM reference thermometer or a thermometer that has been calibrated against an ASTM reference thermometer). The temperatures of the thermocouple and reference thermometers shall **agree to within ±2°F**.

METERING SYSTEM DRY GAS METER CALIBRATION SHEET
EPA Reference Method
Metering System Post-Test Calibration
Air Hygiene Assett ID: samp-cp-0010

Filename: C:\Users\Pandu\Desktop\Westcounty 3A finished work\[SAMP-CP-0010 Calibration 3-4-11-PS.xlsm]4-26-2011 3 pts
Make: Thermo Environmental
Model #: MST-C1
Serial #: 90693
Date: 04/26/11
Barometric Pressure: 29.93 (in. Hg)
Theoretical Critical Vacuum: 14.12 (in. Hg)

DRY GAS METER READINGS

ΔH (in. H2O)	Time (min)	Volume Initial (ft³)	Volume Final (ft³)	Volume Total (ft³)	Initial Temperature Inlet (°F)	Initial Temperature Outlet (°F)
1.40	10.00	571.100	577.935	6.835	84.0	84.0
1.40	10.00	577.935	584.760	6.825	86.0	84.0
1.40	10.00	584.760	591.580	6.820	88.0	85.0

Final Temperature Inlet (°F)	Final Temperature Outlet (°F)	Orifice Serial# (number)	K' Orifice Coefficient (see above)	Actual Vacuum (in. Hg)	Ambient Temperature Initial (°F)	Ambient Temperature Final (°F)	Ambient Temperature Average (°F)
86.0	84.0	19	0.5196	16.0	79.2	79.1	79.2
88.0	85.0	19	0.5196	16.0	79.1	79.0	79.1
89.0	86.0	19	0.5196	16.0	79.0	79.0	79.0

RESULTS

DRY GAS METER VOLUME CORRECTED Vm(std) (ft³)	DRY GAS METER VOLUME CORRECTED Vm(std) (liters)	ORIFICE VOLUME CORRECTED Vcr(std) (ft³)	ORIFICE VOLUME CORRECTED Vcr(std) (liters)	ORIFICE VOLUME NOMINAL Vcr (ft³)
6.650	188.33	6.698	189.7	6.840
6.625	187.63	6.698	189.7	6.839
6.605	187.06	6.699	189.7	6.839

DRY GAS METER CALIBRATION FACTOR Y Variation (number)	DRY GAS METER CALIBRATION FACTOR Y Value (number)	ORIFICE CALIBRATION FACTOR ΔH@ Value (in. H2O)	ORIFICE CALIBRATION FACTOR ΔH@ Value (mm H2O)	ORIFICE CALIBRATION FACTOR ΔH@ Variation (in. H2O)
-0.004	1.007	1.704	43.29	0.002
0.000	1.011	1.703	43.24	0.000
0.003	1.014	1.699	43.16	-0.003
AVERAGE:	**1.011**	**1.702**	43.23	**PASSED**
LAST 5-PT:	**0.991**	**1.745**	**PASSED**	5-PT Date:
% DIFF:	**2.0%**	**2.5%**		03/04/11

40 CFR - CHAPTER I - PART 60
Appendix A, Method 5
10.3.2 Calibration After Use
After each field use, the calibration of the metering system shall be checked by performing three calibration runs at a single, intermediate orifice setting (based on the previous field test)....Calculate the average value of the DGM calibration factor. If the value has changed by more than 5 percent, recalibrate the meter over the full range of orifice settings, as detailed in Section 10.3.1.

10.3.3 Acceptable Variation in Calibration
If the DGM coefficient values obtained before and after a test series differ by more than 5 percent, the test series shall either be voided, or calculations for the test series shall be performed using whichever meter coefficient value (i.e., before or after) gives the lower value of total sample volume.

Notes: For Calibration Factor Y, the ratio of the reading of the calibration meter to the dry gas meter,acceptable tolerance of individual values from the average is +/- 0.02. For Orifice Calibration Factor dH@, the orifice differential pressure in inches of H_20 that equates to 0.75 cfm of air at 68 °F and 29.92 inches of Hg, acceptable tolerance of individual values from the average is +/- 0.2. For valid test results, the Actual Vacuum should be 1 to 2 in. Hg greater than the Theoretical Critical Vacuum shown above. The Critical Orifice Coefficient, K', must be entered in English units, (ft)^3*(deg R)^0.5/((in.Hg)*(min)).

SIGNATURE tim page DATE: 04/26/11 04/26/11

VISIBLE EMISSIONS EVALUATOR

This is to certify that

GIRIDHAR JAYARAMAN

STUDENT ID NUMBER JAY401597

met the specifications of Federal Reference Method 9 and qualifies as a visible emissions evaluator. Maximum deviation on white and black smoke did not exceed 7.5% opacity and no single error exceeding 15% opacity was incurred during the certification test conducted by Eastern Technical Associates of Raleigh, NC. This certificate is valid for six months from date of issue.

395074
CERT NUMBER

3/23/2011
DATE OF SCHOOL

OKLAHOMA CITY, OK
SCHOOL LOCATION

9/22/2011
CERTIFICATION EXP DATE

TULF10
LAST LECTURE

Jody Monk
Director of Training

EASTERN TECHNICAL ASSOCIATES

GIRIDHAR JAYARAMAN

JAY401597 STUDENT ID NUMBER

met the specifications of Federal Reference Method 9 and qualifies as a visible emissions evaluator. Maximum deviation on white and black smoke did not exceed 7.5% opacity and no single error exceeding 15% opacity was incurred during the certification test conducted by Eastern Technical Associates of Raleigh, NC. This certificate is valid for six months from date of issue and expires on the date below.

OKLAHOMA CITY, OK	3/23/2011	395074
SCHOOL LOCATION	DATE OF SCHOOL	CERT NUMBER
TULF10	9/22/2011	
LAST LECTURE	CERTIFICATION EXP DATE	BEARER

Customer Support
Debbie Scalise
debbie@smokeschool.com

Want to know when we will be in your area? Join our emailing list at www.smokeschool.com

919-878-3188

APPENDIX E

FUEL ANALYSIS RECORDS

Client: Florida Power and Light
Location: West County Energy Center
Date: April 26, 2011
Project #: bv-10-westcounty.fl-comp#2

Fuel Oil - Fuel Analysis

Characteristics of Fuel Gas		
Molecular Weight of oil =	15.823	lb/lb-mole
Btu per lb. of oil =	19,623.00	gross (HHV)
Btu per lb. of oiil =	18,429.000	net (LHV)
Density of fuel oil[2] =	54.7186	lb/cu. ft
Density of fuel oil[2] =	7.3148	lb/gal
Specific Gravity =	0.8783	@ 68 deg F

Standardized to 68 deg F and 14.696 psia

Component	Wt%
carbon	86.57
oxygen	0.00
hydrogen	13.43
nitrogen	0.00
helium	0.00
sulfur	0.00
Total	**100.00**

Fuel Oil HHV Conv.	
HHV (Btu/lb)	19,623.00
HHV (Btu/SCF)	1,073,742

Fuel Oil LHV Conv.	
LHV (Btu/lb)	18,429.00
LHV (Btu/SCF)	1,008,409

F-Factor (SCF dry exhaust per MMBtu [HHV]) =	9,241.06
(Based on EPA RM-19) at 68 deg F and 14.696 psia	

F-Factor Calculation:

F-Factor = 1,000,000*((3.64*%H)+(1.53*%C)+(0.57*%S)+(0.14*%N)-(0.46*%O))/GCV

GCV = Gross Btu per lb. of gas (HHV)

%H, %C, %S, %N, & %O are percent weight values calculated from fuel analysis and have units of (scf/lb)/%

Density of fuel oil based on lab analysis or specific gravity multiplied by density of water at 68 deg F and 14.696 psia.

References:

[1] ASTM D 3588

[2] Civil Engineering Reference Manual, 7th ed. - Michael R. Lindeburg

[3] Mark's Standard Handbook for Mechanical Engineers, 10th ed. - Eugene A. Avallone, Theodore Baumeister III

[4] Introduction to Fluid Mechanics, 3rd ed. - William S. Janna

[5] GPA Reference Bulletin 181-86, revised 1986, reprinted 1995

HOUSTON LABORATORIES
8820 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901

Certificate of Analysis

Number: 1030-2011050072-001A

Albert Septiano
Air Hygiene
5634 S. 122nd East Ave.
Suite F
Tulsa OK 74146

May 10, 2011

Sample ID:		Sampled By:	
Station Name:	3A-FO	Sample Of:	Liquid
Station Number :	bv-10-westcountry.fl-comp#2	Sample Date:	04/26/2011
Location:	Tulsa, OK	Sample Condition:	
Sample Point:		PO / Ref. No:	

ANALYTICAL DATA

Test	Method	Result	Unit	Detection Limit	Lab Tech.	Date Analyzed
Wt% of Carbon	ASTM-D-5291	86.57	wt%	0.30	EM	05/10/11
Wt% of Hydrogen	ASTM-D-5291	13.43	wt%	0.30	EM	05/10/11
Wt% of Nitrogen	ASTM-D-5291	<0.30	wt%	0.30	EM	05/10/11

Comments:

Sample On: 04/26/2011

Hydrocarbon Laboratory Manager

Quality Assurance: The above analyses are performed in accordance with ASTM, UOP or GPA guidelines for quality assurance, unless otherwise stated.

HOUSTON LABORATORIES
8820 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901

Certificate of Analysis

Number: 1030-2011040557-001A

Albert Septiano
Air Hygiene
5634 S. 122nd East Ave.
Suite F
Tulsa OK 74146

May 11, 2011

Sample ID:		Sampled By:	
Station Name:	3A-FO	Sample Of:	Liquid
Station Number :	bv-10-westcountry.fl-comp#2	Sample Date:	04/26/2011
Location:	Tulsa, OK	Sample Condition:	
Sample Point:		PO / Ref. No:	

ANALYTICAL DATA

Test	Method	Result	Unit	Detection Limit	Lab Tech.	Date Analyzed
Heat of Combustion	ASTM-D-240	19623	Gross BTU / lb		EM	05/03/11
Heat of Combustion	ASTM-D-240	18429	Net BTU/lb		EM	05/03/11
Heat of Combustion	ASTM-D-240	NR	Gross BTU/Gal		EM	05/03/11
Heat of Combustion	ASTM-D-240	NR	Net BTU/Gal		EM	05/03/11
API Gravity @ 60 °F	ASTM-D-5002	35.65	°		KCT	04/28/11
Specific Gravity @ 60/60 °F	ASTM-D-5002	0.8465			KCT	04/28/11
Density @ 60 °F	ASTM-D-5002	0.8457	g/ml		KCT	04/28/11
Sulfur in Liq. Hydrocarbon by UV	ASTM-D-5453	0.0008	wt %		EM	05/03/11

Comments: Sulfur = 0.0008 Wt%
NR = No result
Sample On: 04/26/2011

Hydrocarbon Laboratory Manager

Quality Assurance: The above analyses are performed in accordance with ASTM, UOP or GPA guidelines for quality assurance, unless otherwise stated.

SAMPLE DESCRIPTION AND CHAIN OF CUSTODY RECORD

Air Hygiene International, Inc.
5634 S. 122nd East Ave, Suite F
Tulsa, Oklahoma 74146
(888) 461-8778
www.airhygiene.com

Project Number:	bv-10-westcounty.fl-comp#2	Laboratory Analysis Requested:	
Person Taking Samples:	PS		

Sample Number	Location	Date	Volume	Analysis Method			
				ASTM D420	ASTM D5002	ASTM 5453-00	
3A-FO	Unit 3A	4/26/2011	As marked	X	X	X	
3A-FO Backup	Unit 3A (Analyse this if only necessary)	4/26/2011	As marked	X	X	X	
	report sulfur in wt%						
	email results to jake@airhygiene.com						

Analyse back up sample if only necessary

pandu Sattvika	4/26/2011	19:00		4/26/11	11:15
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:

in of Custody-Unit 3A

APPENDIX F

STRATIFICATION TEST DATA

Source Information	
Company	Florida Power and Light
Plant Name	West County Energy Center
Equipment	Mitsubishi 501G
Location	Loxahatchee, Florida

Test Information	
Date	04/26/11
Project #	bv-10-westcounty.fl-comp#2
Unit Number	3A
Load	Fuel Oil
Number of Ports Available	4
Number of Ports Used	4

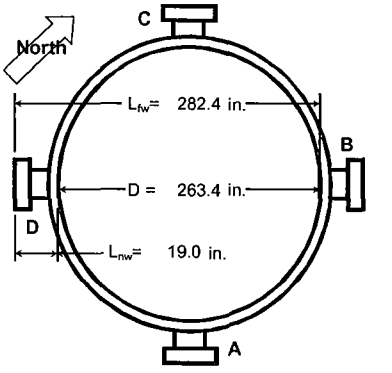
Stack and Test Type				
○	Isokinetic Traverse (Wet Chemistry Testing)			**Circular Stack**
○	Velocity Traverse (Flow and Flow RATA Test)			
◉	**Stratification Traverse (Compliance Test)**	☐ RM 20		
○	Stratification Traverse (RATA)	☐ Part 60	☐ Part 75	

METHOD 1 - STRATIFICATION TEST FOR A CIRCULAR SOURCE

Company	Florida Power and Light	Date	04/26/11
Plant Name	West County Energy Center	Project #	bv-10-westcounty.fl-comp#2
Equipment	Mitsubishi 501G	# of Ports Available	4
Location	Loxahatchee, Florida	# of Ports Used	4

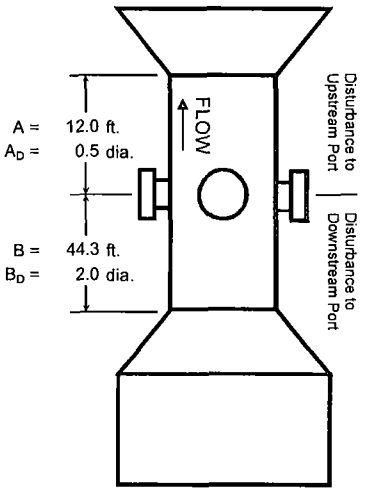
Circular Stack or Duct Diameter			
Distance to Far Wall of Stack	(L_{fw})	282.38	in.
Distance to Near Wall of Stack	(L_{nw})	19.00	in.
Diameter of Stack	(D)	263.38	in.
Area of Stack	(A_s)	378.35	ft^2

Distance from Disturbances to Port			
Distance Upstream	(A)	144.00	in.
Diameters Upstream	(A_D)	0.55	diameters
Distance Downstream	(B)	531.75	in.
Diameters Downstream	(B_D)	2.02	diameters



Number of Traverse Points Required					
Diameters to Flow Disturbance		Minimum Number of[1] Traverse Points		Minimum Number of Traverse Points Comp Stratification	
Down (B_D) Stream	Up (A_D) Stream	Particulate Points	Velocity Points	Criteria	Points
2.00-4.99	0.50-1.24	24	16	◉ RM 7E 8.1.2	12 RM1 pts
5.00-5.99	1.25-1.49	20	16	○ Alt 7E 8.1.2	3 points
6.00-6.99	1.50-1.74	16	12	12 points	
7.00-7.99	1.75-1.99	12	12		
>= 8.00	>=2.00	8 or 12[2]	8 or 12[2]	Minimum Number of Traverse Points RATA Stratification	
Upstream Spec		24	16	Criteria	Points
Downstream Spec		24	16	○ Part75/60	12 RM1 pts
Traverse Pts Required		24	16	○ 75 abrv (a)	3 points
				○ 75 abrv (b)	6 points

[1] Check Minimum Number of Points for the Upstream and Downstream conditions, then use the largest.
[2] 8 for Circular Stacks 12 to 24 inches
12 for Circular Stacks over 24 inches



Number of Traverse Points Used				
4	Ports by	3	Pts / port	Stratification Traverse (Compliance Test)
12	Pts Used	12	Required	

Traverse Point Locations			
Traverse Point Number	Percent of Stack Diameter	Distance from Inside Wall	Distance Including Reference Length
	%	in.	in.
1	4.4%	11 5/8	30 5/8
2	14.6%	38 4/8	57 4/8
3	29.6%	78	97
4			
5			
6			
7			
8			
9			
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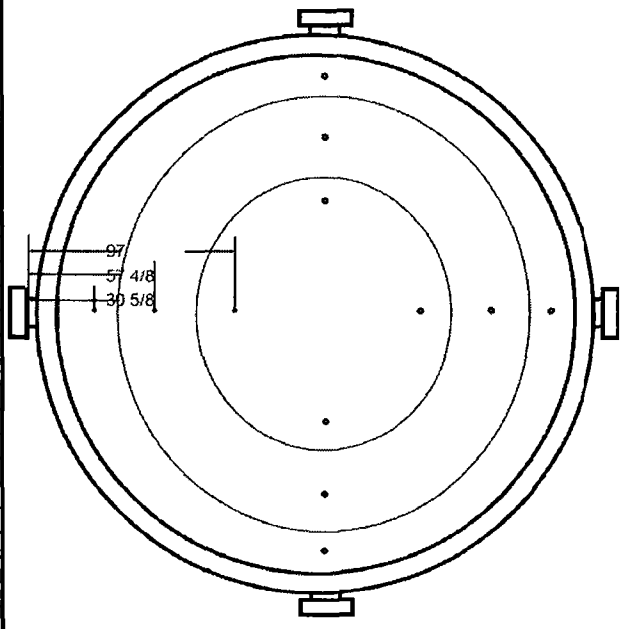

STRATIFICATION TRAVERSE (COMPLIANCE TEST) RESULTS

Company	Florida Power and Light	**Date**	04/26/11
Plant Name	West County Energy Center	**Project #**	bv-10-westcounty.fl-comp#2
Equipment	Mitsubishi 501G	**# of Ports Available**	4
Location	Loxahatchee, Florida	**# of Ports Used**	4

Stack Dimensions				**Traverse Data**			
Diameter or Length of Stack	(D)	263.38	in.	4	**Ports by**	3	**Pts / port**
Width of Stack	(W)		in.	12	**Pts Used**	12	**Required**
Area of Stack	(A_s)	378.35	ft^2	**Run Start**	8:45:37	**Run End**	9:35:07

Traverse Point	Time Per Point	Point Start Time	Point Stop Time (Reading)	O_2	Percent Difference	CO	Percent Difference	NOx	Percent Difference
	min.	hh:mm:ss	hh:mm:ss	%	%	ppm	%	ppm	%
D-3	3.50	8:45:37	8:49:07	13.71	0.45%	8.98	22.73%	9.60	1.06%
D-2	3.50	8:49:07	8:52:37	13.76	0.09%	9.88	**35.03%**	9.25	2.62%
D-1	3.50	8:52:37	8:56:07	13.69	**0.60%**	6.02	17.72%	9.80	3.17%
C-3	6.00	8:56:07	9:02:07	13.76	0.09%	8.10	10.71%	10.31	8.54%
C-2	3.50	9:02:07	9:05:37	13.75	0.16%	7.89	7.84%	9.20	3.15%
C-1	3.50	9:05:37	9:09:07	13.75	0.16%	7.62	4.15%	8.79	7.48%
B-3	6.00	9:09:07	9:15:07	13.75	0.16%	6.13	16.22%	10.33	**8.75%**
B-2	3.50	9:15:07	9:18:37	13.79	0.13%	6.98	4.60%	9.52	0.22%
B-1	3.50	9:18:37	9:22:07	13.82	0.34%	6.62	9.52%	9.21	3.04%
A-3	6.00	9:22:07	9:28:07	13.83	0.42%	6.81	6.92%	9.68	1.91%
A-2	3.50	9:28:07	9:31:37	13.83	0.42%	6.35	13.21%	8.80	7.36%
A-1	3.50	9:31:37	9:35:07	13.83	0.42%	6.42	12.26%	9.50	0.01%
Average				13.77		7.32		9.50	

STRAT TEST DETERMINED SAMPLE POINTS FOR CIRCULAR STACK

Company	Florida Power and Light	**Date**	04/26/11
Plant Name	West County Energy Center	**Project #**	bv-10-westcounty.fl-comp#2
Equipment	Mitsubishi 501G	**# of Ports Available**	4
Location	Loxahatchee, Florida	**# of Ports Used**	4

Stack Dimensions				**Traverse Data**			
Diameter or Length of Stack	(D)	263.38	in.	4	**Ports by**	3	**Pts / port**
Width of Stack	(W)		in.	12	**Pts Used**	12	**Required**
Area of Stack	(A_s)	378.35	ft^2	**Run Start**	8:45:37	**Run End**	9:35:07

40 CFR 60, Appendix A, Method 7E Criteria

Stratification Results	
Maximum Percent Difference	35.03 % for CO
Maximum Pollutant Conc. Diff.	2.56 ppm for CO
Maximum Diluent Conc. Diff.	0.08 % for O2
Stack Diameter	263.38 in.
Stratification Conclusions	
Maximum % Diff.	Percent Diff. >10% Failed Stratification Test
Maximum Conc. Diff.	Conc. Diff. > 0.5%
Stack Diameter	D > 93.6 in.

Use RM 1 Measurement Points and Sample Full Stack

Traverse Point Number	**Percent of Stack Diameter**	**Distance from Inside Wall**	**Distance Including Reference Length**
	%	in.	in.
1			
2			
3			

Test Type
- ☐ Moisture, for MW
- ☐ Moisture, for wet-to-dry
- ☑ Gas
- ☐ 6.5.6(b)(2) alt. points do not apply