AIR HYGIENE, INC.

Testing Solutions for a Better World

EMISSION COMPLIANCE TEST
FOR THE
MITSUBISHI, MODEL 501G, UNIT 3B
PREPARED FOR
FLORIDA POWER AND LIGHT
AT THE
WEST COUNTY ENERGY CENTER
LOXAHATCHEE, FLORIDA
APRIL 9, 2011

Corporate Headquarters
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AIR HYGIENE, INC.

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Emissions Compliance Test
Mitsubishi, Model 501G, Unit 3B
Florida Power and Light
West County Energy Center
Loxahatchee, Florida
April 9, 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 3B 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 9, 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 3B 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): 014

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

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

1.2.6 Emission Points

- Exhaust from the Mitsubishi, Model 501G, Unit 3B
- For all gases, 12 sample points in the exhaust duct from the Mitsubishi, Model 501G, Unit 3B, 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 3B (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 3B

1.2.7 Pollutants Measured

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

1.2.8 Date of Emission Test

- April 9, 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:	Mukund Venkitachalam	918-307-8865

2.0 SUMMARY OF TEST RESULTS

Results from the sampling conducted on Florida Power and Light's Mitsubishi, Model 501G, Unit 3B located at the West County Energy Center on April 9, 2011 are summarized in the following table.

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

Parameter	Fuel Oil Load	Permit Limits
Date (mm/dd/yy)	04/09/11	–
Start Time (hh:mm:ss)	11:00:29	–
End Time (hh:mm:ss)	15:44:59	–
Run Duration (min / run)	82	–
Bar. Pressure (in. Hg)	30.13	–
Amb. Temp. (°F)	89	–
Rel. Humidity (%)	41	–
Spec. Humidity (lb water / lb air)	0.011862	–
Ammonia Injection Rate (lb/hr)	439.8	–
Turbine Fuel Flow (gal/hr)	15,532	–
Total Fuel Flow (SCFH)	2,076	2,117
Stack Flow (RM19) (SCFH)	54,610,928	–
Stack Moisture (% Method 4)	8.6	–
Heat Input (MMBtu/hr)	2,042.4	–
Power Output (megawatts)	208.7	–
NOx (ppmvd)	8.67	–
NOx (ppm@15%O_2)	7.03	8.0
NOx (ppm@15%O_2&ISO)	7.17	–
NOx (lb/hr)	56.58	82.4
NOx (ton/year) at 500 hr/year	14.15	–
NOx (lb/MMBtu)	0.027	–
CO (ppmvd)	5.91	–
CO (ppm@15%O_2)	4.79	8
CO (ppm@15%O_2&ISO)	4.89	–
CO (lb/hr)	23.46	42.0
CO (ton/year) at 500 hr/year	5.86	–
CO (lb/MMBtu)	0.011	–
VOC (ppmvd)	0.48	–
VOC (ppm@15%O_2)	0.39	6
VOC (ppm@15%O_2&ISO)	0.39	–
VOC (lb/hr)	1.09	19.6
VOC (ton/year) at 500 hr/year	0.27	–
VOC (lb/MMBtu)	0.000	–
Sulfur (wt%)	0.0007	0.0015
NH_3 (ppmvd)	0.92	–
NH_3 (ppm@15%O_2)	0.74	5
Opacity (%)	0	10
CO_2 (%)	5.36	–
O_2 (%)	13.62	–

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 report 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 3B 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 9, 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 3B 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.

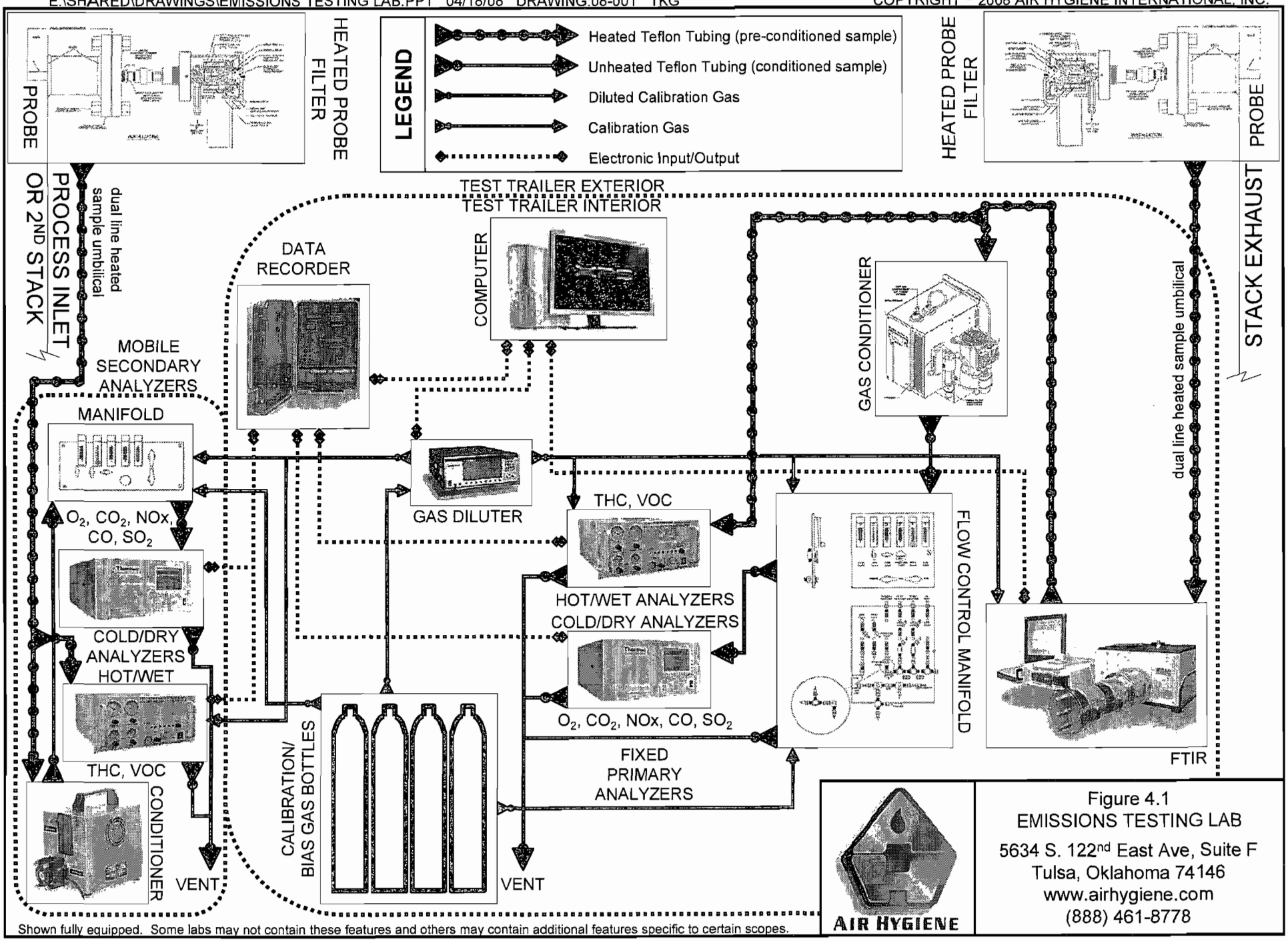
EPA Method 7e was used to determine concentrations of NOx. A chemiluminescent analyzer was used to determine the nitrogen oxides concentration in the gas stream. A NO_2 in nitrogen certified gas cylinder was used to verify at least a 90 percent NO_2 conversion on the day of the test.

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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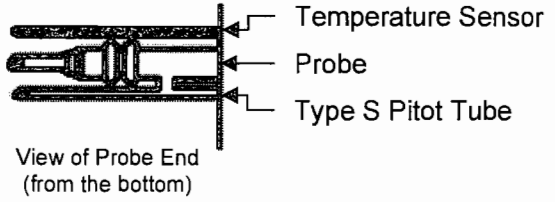

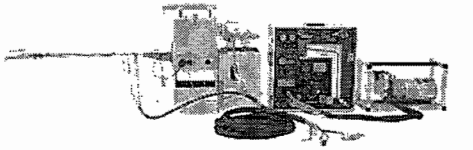
Wet Chemistry Assembly
(photo)

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
Type S Pitot Tube
Glass Filter Holder
Heated Area
Ice Water Bath
Vacuum Line
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
3B	Fuel Oil	Stratification Test	1	04/09/11	9:40:29	10:35:59	DAHS
3B	Fuel Oil	Compliance	1	04/09/11	11:00:29	12:12:29	DAHS
3B	Fuel Oil	Compliance	2	04/09/11	12:37:29	14:13:59	DAHS
3B	Fuel Oil	Compliance	3	04/09/11	14:30:29	15:44:59	DAHS
3B	Fuel Oil	Preliminaries	Fuel Oil-V1	04/09/11	9:05:00	9:25:00	DAHS
3B	Fuel Oil	Ammonia	Fuel Oil-1	04/09/11	11:00:00	12:13:00	DAHS
3B	Fuel Oil	Ammonia	Fuel Oil-2	04/09/11	12:37:00	14:15:00	DAHS
3B	Fuel Oil	Ammonia	Fuel Oil-3	04/09/11	14:30:00	15:47:00	DAHS
3B	Fuel Oil	Opacity	1	04/09/11	12:00:00	13:00:00	EST
3B	Fuel Oil	Opacity	2	04/09/11	13:00:00	14:00:00	EST
3B	Fuel Oil	Opacity	3	04/09/11	14:00:00	15:00:00	EST

Note: DAHS Time (EST minus 1hr)

TABLE A.2
MITSUBISHI, 501G, UNIT 3B 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)	04/09/11	04/09/11	04/09/11	04/09/11
Start Time (hh:mm:ss)	11:00:29	12:37:29	14:30:29	11:00:29
End Time (hh:mm:ss)	12:12:29	14:13:59	15:44:59	15:44:59
Run Duration (min / run)	72	97	75	82
Bar. Pressure (in. Hg)	30.15	30.14	30.11	30.13
Amb. Temp. (°F)	86	90	90	89
Rel. Humidity (%)	43	39	42	41
Spec. Humidity (lb water / lb air)	0.011325	0.011667	0.012595	0.011862
Ammonia Injection Rate (lb/hr)	444.2	438.2	437.0	439.8
Turbine Fuel Flow (gal/hr)	15,691	15,509	15,395	15,532
Total Fuel Flow (SCFH)	2,098	2,073	2,058	2,076
Stack Flow (RM19) (SCFH)	55,245,283	54,658,489	53,929,012	54,610,928
Stack Moisture (% Method 4)	8.4	8.7	8.7	8.6
Heat Input (MMBtu/hr)	2,063.3	2,039.4	2,024.4	2,042.4
Power Output (megawatts)	211.5	208.3	206.3	208.7
NOx (ppmvd)	8.58	9.20	8.24	8.67
NOx (ppm@15%O_2)	6.97	7.48	6.66	7.03
NOx (ppm@15%O_2&ISO)	7.08	7.56	6.85	7.17
NOx (lb/hr)	56.62	60.05	53.07	56.58
NOx (ton/year) at 500 hr/year	14.16	15.01	13.27	14.15
NOx (lb/MMBtu)	0.027	0.029	0.026	0.027
CO (ppmvd)	5.79	5.81	6.14	5.91
CO (ppm@15%O_2)	4.70	4.72	4.96	4.79
CO (ppm@15%O_2&ISO)	4.78	4.77	5.11	4.89
CO (lb/hr)	23.25	23.06	24.05	23.46
CO (ton/year) at 500 hr/year	5.81	5.77	6.01	5.86
CO (lb/MMBtu)	0.011	0.011	0.012	0.011
VOC (ppmvd)	0.40	0.70	0.33	0.48
VOC (ppm@15%O_2)	0.32	0.57	0.27	0.39
VOC (ppm@15%O_2&ISO)	0.33	0.58	0.28	0.39
VOC (lb/hr)	0.92	1.59	0.75	1.09
VOC (ton/year) at 500 hr/year	0.23	0.40	0.19	0.27
VOC (lb/MMBtu)	0.000	0.001	0.000	0.00
Sulfur (wt%)	0.0007	0.0007	0.0007	0.0007
NH_3 (ppmvd)	1.28	0.72	0.75	0.92
NH_3 (ppm@15%O_2)	1.04	0.59	0.61	0.74
Opacity (%)	0	0	0	0
CO_2 (%)	5.37	5.37	5.36	5.36
O_2 (%)	13.63	13.64	13.60	13.62

TEST RESULTS

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

Florida Power and Light
April 9, 2011
Mitsubishi, 501G, Unit 3B
West County Energy Center

Fuel Data

Fuel Fd factor	9,308	SCF exh/MMBtu
Fuel Heating Value (LHV)	983,660	Btu/SCF fuel
Turbine Fuel Flow	15,691	gal/hr

Weather Data

Barometric Pressure	30.15
Relative Humidity	43
Ambient Temperature	86
Specific Humidity	0.011325

Unit Data

Unit Load	211.5	megawatts
Heat Input	2,063	MMBtu/hr
Combustor Inlet Pressure	260	psig
Ammonia Injection Rate	444	lb/hr
Meas. Stack Moisture	8.4	%
Stack Exhaust Flow (M19)	55,245,283	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 (%)
04/09/11 11:00:29	13650	13.63	9.38	5.81	0.24	5.40
04/09/11 11:00:59	13680	13.63	9.02	6.09	0.21	5.41
04/09/11 11:01:29	13710	13.61	8.76	6.12	0.20	5.41
04/09/11 11:01:59	13740	13.61	8.72	5.89	0.26	5.40
04/09/11 11:02:29	13770	13.61	8.79	5.74	0.20	5.42
04/09/11 11:02:59	13800	13.61	8.90	5.69	0.14	5.43
04/09/11 11:03:29	13830	13.62	8.84	5.62	0.19	5.42
04/09/11 11:03:59	13860	13.62	8.83	5.55	0.17	5.43
04/09/11 11:04:29	13890	13.64	8.80	5.80	0.18	5.43
04/09/11 11:04:59	13920	13.63	8.67	6.28	0.18	5.41
04/09/11 11:05:29	13950	13.64	8.40	6.60	0.23	5.43
04/09/11 11:05:59	13980	13.64	8.45	6.19	0.19	5.45
04/09/11 11:06:29	14010	13.62	7.88	5.48	0.15	5.44
04/09/11 11:06:59	14040	13.62	7.35	5.19	0.09	5.45
04/09/11 11:07:29	14070	13.63	7.27	5.37	0.12	5.45
04/09/11 11:07:59	14100	13.65	7.09	5.83	0.18	5.43
04/09/11 11:08:29	14130	13.64	6.81	6.36	0.15	5.44
04/09/11 11:08:59	14160	13.62	6.65	6.18	0.10	5.46
04/09/11 11:09:29	14190	13.63	6.77	5.57	0.10	5.47
04/09/11 11:09:59	14220	13.63	7.12	5.14	0.06	5.47
04/09/11 11:10:29	14250	13.65	7.23	5.65	0.03	5.47
04/09/11 11:10:59	14280	13.66	6.87	6.40	0.07	5.45
04/09/11 11:11:29	14310	13.65	6.44	6.41	0.07	5.47
04/09/11 11:11:59	14340	13.64	6.35	5.62	0.06	5.49
04/09/11 11:12:29	14370	13.64	6.63	5.16	0.10	5.47
04/09/11 11:12:59	14400	13.66	6.69	5.63	0.10	5.46
04/09/11 11:13:29	14430	13.68	6.42	6.40	0.05	5.46
04/09/11 11:13:59	14460	13.67	6.18	6.41	0.04	5.46
04/09/11 11:14:29	14490	13.67	6.26	6.11	0.04	5.47
04/09/11 11:14:59	14520	13.65	6.24	6.10	0.04	5.50
04/09/11 11:20:59	14880	13.65	7.59	5.14	0.03	5.51
04/09/11 11:21:29	14910	13.67	7.69	5.44	0.04	5.49
04/09/11 11:21:59	14940	13.68	7.61	6.07	0.05	5.48
04/09/11 11:22:29	14970	13.70	7.22	6.67	0.01	5.48
04/09/11 11:22:59	15000	13.68	6.98	6.87	0.03	5.49
04/09/11 11:23:29	15030	13.64	7.15	6.16	0.03	5.50
04/09/11 11:23:59	15060	13.63	7.59	5.12	0.00	5.54
04/09/11 11:24:29	15090	13.63	7.84	4.72	0.01	5.55
04/09/11 11:24:59	15120	13.66	7.85	5.12	0.02	5.51
04/09/11 11:25:29	15150	13.69	7.57	5.99	-0.01	5.50
04/09/11 11:25:59	15180	13.69	7.13	6.98	0.01	5.50
04/09/11 11:26:29	15210	13.67	6.93	6.95	-0.03	5.50
04/09/11 11:26:59	15240	13.66	7.17	6.27	-0.04	5.53
04/09/11 11:27:29	15270	13.65	7.26	5.56	-0.01	5.54
04/09/11 11:27:59	15300	13.65	7.02	5.24	-0.01	5.52
04/09/11 11:28:29	15330	13.67	7.04	5.57	0.00	5.52
04/09/11 11:28:59	15360	13.67	7.38	5.88	0.03	5.53
04/09/11 11:29:29	15390	13.66	7.68	5.87	0.03	5.52
04/09/11 11:29:59	15420	13.66	7.78	5.95	0.03	5.53
04/09/11 11:30:29	15450	13.65	8.09	5.82	0.01	5.55
04/09/11 11:30:59	15480	13.66	8.43	5.34	-0.01	5.54
04/09/11 11:31:29	15510	13.66	8.43	5.51	0.00	5.53
04/09/11 11:31:59	15540	13.68	8.35	5.84	0.02	5.53
04/09/11 11:32:29	15570	13.70	7.85	6.25	0.02	5.51
04/09/11 11:32:59	15600	13.68	7.22	6.19	0.03	5.53
04/09/11 11:33:29	15630	13.66	7.06	5.68	0.06	5.54

Florida Power and Light
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Mitsubishi, 501G, Unit 3B
West County Energy Center

Fuel Data

Fuel Fd factor	9,308	SCF exh/MMBtu
Fuel Heating Value (LHV)	983,660	Btu/SCF fuel
Turbine Fuel Flow	15,691	gal/hr

Weather Data

Barometric Pressure	30.15
Relative Humidity	43
Ambient Temperature	86
Specific Humidity	0.011325

Unit Data

Unit Load	211.5	megawatts
Heat Input	2,063	MMBtu/hr
Combustor Inlet Pressure	260	psig
Ammonia Injection Rate	444	lb/hr
Meas. Stack Moisture	8.4	%
Stack Exhaust Flow (M19)	55,245,283	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 (%)
04/09/11 11:33:59	15660	13.67	7.34	5.24	0.07	5.53
04/09/11 11:34:29	15690	13.69	7.63	5.51	0.05	5.52
04/09/11 11:34:59	15720	13.70	7.52	6.13	0.06	5.52
04/09/11 11:35:29	15750	13.70	7.39	6.32	0.05	5.50
04/09/11 11:38:59	15960	13.71	9.03	5.20	0.08	5.50
04/09/11 11:39:29	15990	13.70	8.80	5.37	0.07	5.51
04/09/11 11:39:59	16020	13.70	8.94	5.69	0.05	5.52
04/09/11 11:40:29	16050	13.70	9.12	5.48	0.05	5.51
04/09/11 11:40:59	16080	13.70	8.22	5.28	0.05	5.54
04/09/11 11:41:29	16110	13.70	7.69	5.21	0.04	5.53
04/09/11 11:41:59	16140	13.72	8.23	5.64	0.10	5.50
04/09/11 11:42:29	16170	13.73	9.02	6.09	0.09	5.51
04/09/11 11:42:59	16200	13.71	9.75	6.11	0.08	5.53
04/09/11 11:43:29	16230	13.68	10.64	5.62	0.05	5.54
04/09/11 11:43:59	16260	13.68	11.92	4.68	0.03	5.55
04/09/11 11:44:29	16290	13.68	13.69	4.90	0.05	5.56
04/09/11 11:44:59	16320	13.71	14.51	5.00	0.08	5.52
04/09/11 11:45:29	16350	13.73	12.39	5.40	0.09	5.51
04/09/11 11:45:59	16380	13.72	10.35	5.79	0.06	5.53
04/09/11 11:46:29	16410	13.71	9.52	5.66	0.08	5.53
04/09/11 11:46:59	16440	13.69	9.69	5.44	0.08	5.54
04/09/11 11:47:29	16470	13.68	10.31	4.86	0.04	5.57
04/09/11 11:47:59	16500	13.67	11.05	4.31	0.04	5.57
04/09/11 11:48:29	16530	13.68	11.35	4.41	0.07	5.56
04/09/11 11:48:59	16560	13.72	10.89	5.12	0.05	5.54
04/09/11 11:49:29	16590	13.75	9.78	6.03	0.04	5.51
04/09/11 11:49:59	16620	13.75	8.54	6.86	0.02	5.50
04/09/11 11:50:29	16650	13.73	7.95	6.59	0.00	5.53
04/09/11 11:50:59	16680	13.72	8.18	5.65	0.00	5.54
04/09/11 11:51:29	16710	13.70	8.95	4.91	0.03	5.54
04/09/11 11:51:59	16740	13.71	9.79	4.72	0.03	5.56
04/09/11 11:52:29	16770	13.73	10.25	4.84	0.06	5.54
04/09/11 11:52:59	16800	13.73	9.99	5.32	0.04	5.53
04/09/11 11:53:29	16830	13.72	9.52	5.28	0.03	5.56
04/09/11 11:57:59	17100	13.70	10.36	5.15	0.10	5.55
04/09/11 11:58:29	17130	13.73	10.49	5.44	0.08	5.55
04/09/11 11:58:59	17160	13.73	10.06	5.75	0.08	5.54
04/09/11 11:59:29	17190	13.70	9.65	5.98	0.06	5.56
04/09/11 11:59:59	17220	13.69	9.44	5.75	0.13	5.59
04/09/11 12:00:29	17250	13.68	9.63	5.34	0.18	5.58
04/09/11 12:00:59	17280	13.68	10.10	4.86	0.15	5.60
04/09/11 12:01:29	17310	13.67	10.48	4.96	0.14	5.61
04/09/11 12:01:59	17340	13.68	9.67	5.09	0.17	5.60
04/09/11 12:02:29	17370	13.68	8.58	5.31	0.14	5.62
04/09/11 12:02:59	17400	13.67	8.04	5.29	0.15	5.63
04/09/11 12:03:29	17430	13.68	8.34	5.20	0.17	5.62
04/09/11 12:03:59	17460	13.70	9.18	5.00	0.12	5.61
04/09/11 12:04:29	17490	13.73	9.07	5.58	0.13	5.59
04/09/11 12:04:59	17520	13.75	8.75	6.65	0.17	5.56
04/09/11 12:05:29	17550	13.73	8.79	6.89	0.14	5.56
04/09/11 12:05:59	17580	13.71	9.03	6.34	0.13	5.59
04/09/11 12:06:29	17610	13.71	10.14	5.74	0.15	5.60
04/09/11 12:06:59	17640	13.71	11.13	5.16	0.10	5.61
04/09/11 12:07:29	17670	13.71	12.25	4.96	0.11	5.61
04/09/11 12:07:59	17700	13.72	12.48	5.61	0.15	5.59
04/09/11 12:08:29	17730	13.74	11.78	6.14	0.13	5.58

Florida Power and Light
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Mitsubishi, 501G, Unit 3B
West County Energy Center

Fuel Data

Fuel Fd factor	9,308	SCF exh/MMBtu
Fuel Heating Value (LHV)	983,660	Btu/SCF fuel
Turbine Fuel Flow	15,691	gal/hr

Weather Data

Barometric Pressure	30.15
Relative Humidity	43
Ambient Temperature	86
Specific Humidity	0.011325

Unit Data

Unit Load	211.5	megawatts
Heat Input	2,063	MMBtu/hr
Combustor Inlet Pressure	260	psig
Ammonia Injection Rate	444	lb/hr
Meas. Stack Moisture	8.4	%
Stack Exhaust Flow (M19)	55,245,283	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 (%)
04/09/11 12:08:59	17760	13.72	10.89	5.72	0.12	5.61
04/09/11 12:09:29	17790	13.69	10.09	4.97	0.13	5.62
04/09/11 12:09:59	17820	13.71	9.69	4.88	0.10	5.60
04/09/11 12:10:29	17850	13.71	8.90	5.24	0.06	5.62
04/09/11 12:10:59	17880	13.73	7.74	5.28	0.10	5.60
04/09/11 12:11:29	17910	13.74	6.82	5.82	0.10	5.58
04/09/11 12:11:59	17940	13.74	6.42	6.54	0.08	5.58
04/09/11 12:12:29	17970	13.72	6.52	6.28	0.10	5.60
RAW AVERAGE		**13.68**	**8.63**	**5.67**	**0.08**	**5.52**

		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	0.03	0.11	-0.08	-0.40	0.00
	Final Zero	0.13	0.11	-0.16	-0.24	0.26
	Avg. Zero	0.08	0.11	-0.12	-0.32	0.13
	Initial UpScale	12.12	12.21	12.06	2.80	8.96
	Final UpScale	12.18	12.05	11.89	2.92	9.19
	Avg. UpScale	12.15	12.13	11.98	2.86	9.08
Upscale Cal Gas		12.10	12.10	12.10	3.10	8.91

EMISSIONS DATA	O_2	NOx	CO	VOC	CO_2
Corrected Raw Average (ppm/% dry basis)	13.63	8.58	5.79	0.40	5.37
Concentration (ppm@ 15%O_2)	N/A	6.97	4.70	0.32	N/A
Concentration (ppm@ 15%O_2 &ISO)	N/A	7.08	4.78	0.33	N/A
Emission Rate (lb/hr)	N/A	56.62	23.25	0.92	N/A
Emission Rate (tons/year) at 500 hr/yr	N/A	14.16	5.81	0.23	N/A
Emission Rate (lb/MMBtu)	N/A	0.027	0.011	0.000	N/A

Florida Power and Light
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Fuel Data

Fuel Fd factor	9,308	SCF exh/MMBtu
Fuel Heating Value (LHV)	983,660	Btu/SCF fuel
Turbine Fuel Flow	15,509	gal/hr

Weather Data

Barometric Pressure	30.14
Relative Humidity	39
Ambient Temperature	90
Specific Humidity	0.011667

Unit Data

Unit Load	208.3	megawatts
Heat Input	2,039	MMBtu/hr
Combustor Inlet Pressure	258	psig
Ammonia Injection Rate	438	lb/hr
Meas. Stack Moisture	8.7	%
Stack Exhaust Flow (M19)	54,658,489	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 (%)
04/09/11 12:37:29	19470	13.70	10.00	5.61	0.26	5.66
04/09/11 12:37:59	19500	13.70	10.75	5.37	0.28	5.65
04/09/11 12:38:29	19530	13.70	11.36	5.17	0.30	5.67
04/09/11 12:38:59	19560	13.72	11.63	5.26	0.30	5.66
04/09/11 12:39:29	19590	13.72	11.01	6.01	0.33	5.65
04/09/11 12:39:59	19620	13.70	10.21	6.13	0.35	5.66
04/09/11 12:40:29	19650	13.69	9.88	5.60	0.33	5.69
04/09/11 12:40:59	19680	13.68	10.23	4.95	0.37	5.70
04/09/11 12:41:29	19710	13.69	10.68	5.00	0.35	5.69
04/09/11 12:41:59	19740	13.72	10.39	5.92	0.33	5.68
04/09/11 12:42:29	19770	13.72	9.71	6.39	0.35	5.68
04/09/11 12:42:59	19800	13.70	9.32	6.14	0.34	5.68
04/09/11 12:43:29	19830	13.70	9.55	5.76	0.38	5.70
04/09/11 12:43:59	19860	13.69	9.53	5.40	0.40	5.69
04/09/11 12:44:29	19890	13.70	8.25	5.25	0.38	5.67
04/09/11 12:44:59	19920	13.71	7.12	5.30	0.35	5.68
04/09/11 12:45:29	19950	13.71	6.87	5.64	0.36	5.67
04/09/11 12:45:59	19980	13.72	6.76	5.66	0.33	5.66
04/09/11 12:46:29	20010	13.72	7.15	5.54	0.33	5.67
04/09/11 12:46:59	20040	13.71	7.94	5.47	0.36	5.68
04/09/11 12:47:29	20070	13.72	8.72	5.46	0.35	5.66
04/09/11 12:47:59	20100	13.72	9.48	5.49	0.37	5.67
04/09/11 12:48:29	20130	13.72	9.88	5.73	0.36	5.68
04/09/11 12:48:59	20160	13.73	9.91	5.91	0.35	5.67
04/09/11 12:49:29	20190	13.72	9.28	5.77	0.35	5.69
04/09/11 12:49:59	20220	13.71	8.82	5.31	0.35	5.71
04/09/11 12:50:29	20250	13.71	8.73	5.14	0.34	5.70
04/09/11 12:50:59	20280	13.71	8.59	5.20	0.33	5.70
04/09/11 12:51:29	20310	13.71	8.32	5.19	0.34	5.71
04/09/11 12:51:59	20340	13.71	7.86	5.23	0.32	5.69
04/09/11 12:55:59	20580	13.71	10.68	4.59	0.44	5.74
04/09/11 12:56:29	20610	13.71	10.68	4.75	0.41	5.73
04/09/11 12:56:59	20640	13.73	10.16	5.05	0.44	5.72
04/09/11 12:57:29	20670	13.73	9.63	5.62	0.42	5.72
04/09/11 12:57:59	20700	13.72	12.42	5.88	0.47	5.72
04/09/11 12:58:29	20730	13.73	19.33	5.61	0.49	5.72
04/09/11 12:58:59	20760	13.73	23.88	5.96	0.47	5.74
04/09/11 12:59:29	20790	13.73	22.67	5.86	0.44	5.73
04/09/11 12:59:59	20820	13.73	16.48	5.80	0.46	5.73
04/09/11 13:00:29	20850	13.71	11.57	5.54	0.42	5.76
04/09/11 13:00:59	20880	13.70	9.36	5.17	0.43	5.76
04/09/11 13:01:29	20910	13.69	8.09	5.02	0.46	5.76
04/09/11 13:01:59	20940	13.67	7.42	4.84	0.47	5.78
04/09/11 13:02:29	20970	13.73	7.78	5.25	0.41	5.75
04/09/11 13:02:59	21000	13.75	8.13	6.11	0.39	5.73
04/09/11 13:03:29	21030	13.74	8.43	6.54	0.42	5.73
04/09/11 13:03:59	21060	13.73	8.41	5.97	0.41	5.74
04/09/11 13:04:29	21090	13.69	9.08	5.25	0.42	5.75
04/09/11 13:04:59	21120	13.69	10.33	4.81	0.41	5.77
04/09/11 13:05:29	21150	13.69	11.11	4.81	0.38	5.77
04/09/11 13:05:59	21180	13.70	11.23	4.90	0.37	5.75
04/09/11 13:06:29	21210	13.72	10.48	5.28	0.37	5.75
04/09/11 13:06:59	21240	13.73	9.47	5.70	0.36	5.73
04/09/11 13:07:29	21270	13.73	8.68	6.17	0.40	5.72
04/09/11 13:07:59	21300	13.72	8.19	6.06	0.40	5.75
04/09/11 13:08:29	21330	13.71	8.27	5.71	0.41	5.75

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Fuel Data

Fuel Fd factor	9,308	SCF exh/MMBtu
Fuel Heating Value (LHV)	983,660	Btu/SCF fuel
Turbine Fuel Flow	15,509	gal/hr

Weather Data

Barometric Pressure	30.14
Relative Humidity	39
Ambient Temperature	90
Specific Humidity	0.011667

Unit Data

Unit Load	208.3	megawatts
Heat Input	2,039	MMBtu/hr
Combustor Inlet Pressure	258	psig
Ammonia Injection Rate	438	lb/hr
Meas. Stack Moisture	8.7	%
Stack Exhaust Flow (M19)	54,658,489	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 (%)
04/09/11 13:08:59	21360	13.72	8.82	5.62	0.41	5.74
04/09/11 13:09:29	21390	13.73	9.32	5.81	0.40	5.75
04/09/11 13:09:59	21420	13.72	9.53	5.99	0.39	5.75
04/09/11 13:10:29	21450	13.71	9.69	5.62	0.37	5.75
04/09/11 13:17:29	21870	13.67	8.60	5.23	0.54	5.85
04/09/11 13:17:59	21900	13.68	8.75	5.27	0.52	5.86
04/09/11 13:18:29	21930	13.69	8.63	5.73	0.57	5.86
04/09/11 13:18:59	21960	13.68	8.36	6.27	0.59	5.84
04/09/11 13:19:29	21990	13.68	8.09	6.21	0.57	5.86
04/09/11 13:19:59	22020	13.68	7.72	5.85	0.59	5.86
04/09/11 13:20:29	22050	13.68	6.63	5.79	0.60	5.84
04/09/11 13:20:59	22080	13.65	5.87	5.75	0.55	5.87
04/09/11 13:21:29	22110	13.65	6.11	5.49	0.52	5.86
04/09/11 13:21:59	22140	13.67	6.70	5.53	0.54	5.83
04/09/11 13:22:29	22170	13.66	7.63	5.66	0.52	5.84
04/09/11 13:22:59	22200	13.67	8.46	5.79	0.53	5.83
04/09/11 13:23:29	22230	13.68	8.91	6.08	0.56	5.80
04/09/11 13:23:59	22260	13.68	9.19	6.08	0.54	5.82
04/09/11 13:24:29	22290	13.66	9.22	5.98	0.53	5.84
04/09/11 13:24:59	22320	13.65	9.03	5.65	0.59	5.84
04/09/11 13:25:29	22350	13.69	8.58	5.48	0.50	5.83
04/09/11 13:25:59	22380	13.68	7.98	6.34	0.53	5.83
04/09/11 13:26:29	22410	13.65	7.10	6.71	0.54	5.83
04/09/11 13:26:59	22440	13.62	6.70	6.58	0.50	5.86
04/09/11 13:27:29	22470	13.65	6.64	6.42	0.50	5.86
04/09/11 13:27:59	22500	13.65	6.91	6.21	0.50	5.84
04/09/11 13:28:29	22530	13.66	7.27	6.44	0.50	5.85
04/09/11 13:28:59	22560	13.66	7.90	6.29	0.54	5.86
04/09/11 13:29:29	22590	13.69	8.47	6.51	0.54	5.84
04/09/11 13:29:59	22620	13.69	8.46	6.85	0.52	5.85
04/09/11 13:30:29	22650	13.66	8.36	6.54	0.53	5.87
04/09/11 13:30:59	22680	13.64	8.43	5.69	0.52	5.88
04/09/11 13:31:29	22710	13.65	8.44	5.11	0.48	5.89
04/09/11 13:31:59	22740	13.67	7.36	5.47	0.52	5.88
04/09/11 13:59:29	24390	13.66	9.42	6.04	0.91	5.74
04/09/11 13:59:59	24420	13.65	8.40	5.78	0.90	5.76
04/09/11 14:00:29	24450	13.63	8.24	5.17	0.86	5.77
04/09/11 14:00:59	24480	13.64	8.52	5.03	0.84	5.79
04/09/11 14:01:29	24510	13.64	8.69	5.25	0.84	5.80
04/09/11 14:01:59	24540	13.66	8.76	5.92	0.82	5.78
04/09/11 14:02:29	24570	13.67	9.18	6.09	0.78	5.80
04/09/11 14:02:59	24600	13.65	10.29	5.95	0.80	5.81
04/09/11 14:03:29	24630	13.64	10.90	5.59	0.77	5.82
04/09/11 14:03:59	24660	13.64	11.71	5.41	0.74	5.85
04/09/11 14:04:29	24690	13.65	12.65	5.58	0.75	5.82
04/09/11 14:04:59	24720	13.67	12.57	6.03	0.73	5.81
04/09/11 14:05:29	24750	13.66	11.58	6.29	0.71	5.83
04/09/11 14:05:59	24780	13.64	10.21	5.67	0.71	5.84
04/09/11 14:06:29	24810	13.63	8.81	5.10	0.67	5.84
04/09/11 14:06:59	24840	13.65	8.49	5.00	0.64	5.85
04/09/11 14:07:29	24870	13.67	7.89	5.73	0.66	5.84
04/09/11 14:07:59	24900	13.67	7.16	6.14	0.64	5.84
04/09/11 14:08:29	24930	13.65	6.67	6.08	0.67	5.87
04/09/11 14:08:59	24960	13.64	6.68	5.52	0.69	5.87
04/09/11 14:09:29	24990	13.63	6.96	4.97	0.67	5.89
04/09/11 14:09:59	25020	13.64	7.38	4.96	0.65	5.89

Florida Power and Light
April 9, 2011
Mitsubishi, 501G, Unit 3B
West County Energy Center

Fuel Data

Fuel Fd factor	9,308	SCF exh/MMBtu
Fuel Heating Value (LHV)	983,660	Btu/SCF fuel
Turbine Fuel Flow	15,509	gal/hr

Weather Data

Barometric Pressure	30.14
Relative Humidity	39
Ambient Temperature	90
Specific Humidity	0.011667

Unit Data

Unit Load	208.3	megawatts
Heat Input	2,039	MMBtu/hr
Combustor Inlet Pressure	258	psig
Ammonia Injection Rate	438	lb/hr
Meas. Stack Moisture	8.7	%
Stack Exhaust Flow (M19)	54,658,489	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 (%)
04/09/11 14:10:29	25050	13.65	7.53	5.19	0.66	5.88
04/09/11 14:10:59	25080	13.66	7.48	5.47	0.66	5.88
04/09/11 14:11:29	25110	13.66	6.97	5.86	0.61	5.89
04/09/11 14:11:59	25140	13.66	6.58	6.01	0.62	5.88
04/09/11 14:12:29	25170	13.67	6.57	5.81	0.62	5.89
04/09/11 14:12:59	25200	13.66	6.84	5.48	0.60	5.91
04/09/11 14:13:29	25230	13.64	7.24	5.14	0.61	5.92
04/09/11 14:13:59	25260	13.63	7.66	4.83	0.59	5.93
RAW AVERAGE		**13.69**	**9.18**	**5.64**	**0.50**	**5.78**

		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	0.13	0.11	-0.16	-0.24	0.26
	Final Zero	0.06	0.09	-0.06	-0.12	0.52
	Avg. Zero	0.10	0.10	-0.11	-0.18	0.39
	Initial UpScale	12.18	12.05	11.89	2.92	9.19
	Final UpScale	12.12	12.04	11.88	3.18	9.48
	Avg. UpScale	12.15	12.05	11.89	3.05	9.34
Upscale Cal Gas		12.10	12.10	12.10	3.10	8.91

EMISSIONS DATA	O_2	NOx	CO	VOC	CO_2
Corrected Raw Average (ppm/% dry basis)	13.64	9.20	5.81	0.70	5.37
Concentration (ppm@ 15%O_2)	N/A	7.48	4.72	0.57	N/A
Concentration (ppm@ 15%O_2 &ISO)	N/A	7.56	4.77	0.58	N/A
Emission Rate (lb/hr)	N/A	60.05	23.06	1.59	N/A
Emission Rate (tons/year) at 500 hr/yr	N/A	15.01	5.77	0.40	N/A
Emission Rate (lb/MMBtu)	N/A	0.029	0.011	0.001	N/A

Florida Power and Light
April 9, 2011
Mitsubishi, 501G, Unit 3B
West County Energy Center

Fuel Data

Fuel Fd factor	9,308	SCF exh/MMBtu
Fuel Heating Value (LHV)	983,660	Btu/SCF fuel
Turbine Fuel Flow	15,395	gal/hr

Weather Data

Barometric Pressure	30.11
Relative Humidity	42
Ambient Temperature	90
Specific Humidity	0.012595

Unit Data

Unit Load	206.3	megawatts
Heat Input	2,024	MMBtu/hr
Combustor Inlet Pressure	256	psig
Ammonia Injection Rate	437	lb/hr
Meas. Stack Moisture	8.7	%
Stack Exhaust Flow (M19)	53,929,012	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 (%)
04/09/11 14:30:29	26250	13.63	7.69	5.62	0.33	5.84
04/09/11 14:30:59	26280	13.64	7.94	6.16	0.33	5.87
04/09/11 14:31:29	26310	13.63	8.66	6.16	0.30	5.87
04/09/11 14:31:59	26340	13.63	8.79	5.80	0.29	5.88
04/09/11 14:32:29	26370	13.62	8.77	5.65	0.32	5.91
04/09/11 14:32:59	26400	13.63	8.76	5.79	0.28	5.90
04/09/11 14:33:29	26430	13.62	8.55	5.79	0.28	5.91
04/09/11 14:33:59	26460	13.62	8.84	5.65	0.27	5.92
04/09/11 14:34:29	26490	13.64	9.30	5.59	0.24	5.90
04/09/11 14:34:59	26520	13.63	9.70	5.78	0.28	5.90
04/09/11 14:35:29	26550	13.63	9.85	5.89	0.27	5.92
04/09/11 14:35:59	26580	13.64	9.82	5.93	0.28	5.90
04/09/11 14:36:29	26610	13.65	8.58	5.99	0.31	5.91
04/09/11 14:36:59	26640	13.64	7.59	5.97	0.29	5.92
04/09/11 14:37:29	26670	13.64	6.71	5.87	0.27	5.91
04/09/11 14:37:59	26700	13.63	6.28	5.57	0.24	5.93
04/09/11 14:38:29	26730	13.62	6.26	5.28	0.22	5.94
04/09/11 14:38:59	26760	13.63	6.55	5.32	0.23	5.92
04/09/11 14:39:29	26790	13.62	6.79	5.36	0.24	5.95
04/09/11 14:39:59	26820	13.62	6.48	5.45	0.23	5.95
04/09/11 14:40:29	26850	13.63	6.31	5.43	0.23	5.95
04/09/11 14:40:59	26880	13.63	6.33	5.44	0.26	5.97
04/09/11 14:41:29	26910	13.63	6.42	5.50	0.23	5.96
04/09/11 14:41:59	26940	13.63	6.23	5.44	0.22	5.96
04/09/11 14:42:29	26970	13.63	5.90	5.31	0.23	5.97
04/09/11 14:42:59	27000	13.63	5.93	5.36	0.22	5.95
04/09/11 14:43:29	27030	13.63	6.34	5.48	0.22	5.95
04/09/11 14:43:59	27060	13.62	6.99	5.39	0.22	5.97
04/09/11 14:44:29	27090	13.64	7.78	5.36	0.20	5.96
04/09/11 14:44:59	27120	13.65	8.32	5.74	0.19	5.94
04/09/11 14:49:29	27390	13.62	7.43	5.24	0.23	5.91
04/09/11 14:49:59	27420	13.62	8.02	5.14	0.28	5.91
04/09/11 14:50:29	27450	13.63	8.08	5.28	0.26	5.89
04/09/11 14:50:59	27480	13.64	8.02	5.66	0.24	5.89
04/09/11 14:51:29	27510	13.64	7.69	5.78	0.27	5.88
04/09/11 14:51:59	27540	13.63	7.37	5.93	0.24	5.86
04/09/11 14:52:29	27570	13.61	7.37	5.91	0.21	5.89
04/09/11 14:52:59	27600	13.58	7.53	5.29	0.22	5.91
04/09/11 14:53:29	27630	13.62	7.47	5.39	0.19	5.87
04/09/11 14:53:59	27660	13.64	6.95	6.38	0.17	5.86
04/09/11 14:54:29	27690	13.65	6.67	6.77	0.19	5.85
04/09/11 14:54:59	27720	13.62	6.32	6.28	0.13	5.88
04/09/11 14:55:29	27750	13.60	6.11	5.38	0.14	5.89
04/09/11 14:55:59	27780	13.60	6.12	5.28	0.18	5.88
04/09/11 14:56:29	27810	13.58	6.27	5.53	0.15	5.90
04/09/11 14:56:59	27840	13.57	6.48	5.42	0.15	5.92
04/09/11 14:57:29	27870	13.63	6.40	6.18	0.15	5.88
04/09/11 14:57:59	27900	13.62	6.30	6.92	0.14	5.89
04/09/11 14:58:29	27930	13.59	6.87	6.51	0.11	5.90
04/09/11 14:58:59	27960	13.58	7.91	5.91	0.12	5.92
04/09/11 14:59:29	27990	13.56	8.62	5.86	0.11	5.92
04/09/11 14:59:59	28020	13.58	8.82	5.91	0.10	5.89
04/09/11 15:00:29	28050	13.59	8.70	6.01	0.09	5.93
04/09/11 15:00:59	28080	13.58	7.78	5.77	0.08	5.91
04/09/11 15:01:29	28110	13.56	7.22	5.63	0.08	5.92
04/09/11 15:01:59	28140	13.55	6.88	5.42	0.06	5.94

Florida Power and Light
April 9, 2011
Mitsubishi, 501G, Unit 3B
West County Energy Center

Fuel Data

Fuel Fd factor	9,308	SCF exh/MMBtu
Fuel Heating Value (LHV)	983,660	Btu/SCF fuel
Turbine Fuel Flow	15,395	gal/hr

Weather Data

Barometric Pressure	30.11
Relative Humidity	42
Ambient Temperature	90
Specific Humidity	0.012595

Unit Data

Unit Load	206.3	megawatts
Heat Input	2,024	MMBtu/hr
Combustor Inlet Pressure	256	psig
Ammonia Injection Rate	437	lb/hr
Meas. Stack Moisture	8.7	%
Stack Exhaust Flow (M19)	53,929,012	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 (%)
04/09/11 15:02:29	28170	13.57	6.52	5.47	0.04	5.91
04/09/11 15:02:59	28200	13.60	6.83	5.75	0.05	5.91
04/09/11 15:03:29	28230	13.61	7.15	6.32	0.05	5.89
04/09/11 15:03:59	28260	13.58	7.55	6.43	0.02	5.91
04/09/11 15:11:59	28740	13.57	8.57	5.22	0.02	5.95
04/09/11 15:12:29	28770	13.55	8.90	5.44	0.02	5.93
04/09/11 15:12:59	28800	13.53	9.25	5.21	0.04	5.96
04/09/11 15:13:29	28830	13.53	9.16	5.22	0.03	5.96
04/09/11 15:13:59	28860	13.54	8.99	5.75	0.01	5.95
04/09/11 15:14:29	28890	13.56	9.12	6.02	0.01	5.95
04/09/11 15:14:59	28920	13.56	9.60	6.47	0.00	5.93
04/09/11 15:15:29	28950	13.54	10.36	6.52	0.00	5.96
04/09/11 15:15:59	28980	13.54	10.88	5.96	0.01	5.97
04/09/11 15:16:29	29010	13.56	10.08	6.02	0.04	5.94
04/09/11 15:16:59	29040	13.55	9.23	6.11	0.01	5.95
04/09/11 15:17:29	29070	13.49	8.99	5.72	-0.01	5.97
04/09/11 15:17:59	29100	13.51	8.88	5.72	-0.01	5.98
04/09/11 15:18:29	29130	13.50	8.77	6.01	-0.03	5.97
04/09/11 15:18:59	29160	13.49	8.71	5.94	-0.03	5.99
04/09/11 15:19:29	29190	13.50	8.93	6.11	-0.03	6.00
04/09/11 15:19:59	29220	13.49	9.28	6.22	-0.03	6.00
04/09/11 15:20:29	29250	13.54	9.75	6.17	-0.01	5.99
04/09/11 15:20:59	29280	13.57	10.06	6.99	0.00	5.95
04/09/11 15:21:29	29310	13.55	9.84	7.69	-0.01	5.97
04/09/11 15:21:59	29340	13.54	9.79	7.11	-0.02	5.98
04/09/11 15:22:29	29370	13.62	9.84	6.57	0.01	6.00
04/09/11 15:22:59	29400	13.61	9.37	6.39	0.00	6.02
04/09/11 15:23:29	29430	13.50	8.91	5.64	0.00	5.99
04/09/11 15:23:59	29460	13.52	8.59	5.58	0.01	5.99
04/09/11 15:24:29	29490	13.55	8.40	6.13	0.01	5.99
04/09/11 15:24:59	29520	13.56	8.54	6.71	0.01	5.97
04/09/11 15:25:29	29550	13.51	8.51	6.34	0.01	6.03
04/09/11 15:25:59	29580	13.49	7.96	5.78	0.01	6.05
04/09/11 15:26:29	29610	13.50	7.18	5.71	0.01	6.06
04/09/11 15:30:29	29850	13.49	8.91	6.81	-0.03	6.07
04/09/11 15:30:59	29880	13.51	9.64	7.05	-0.02	6.06
04/09/11 15:31:29	29910	13.51	9.77	7.48	-0.03	6.05
04/09/11 15:31:59	29940	13.53	10.46	7.41	-0.04	6.05
04/09/11 15:32:29	29970	13.52	10.89	7.28	0.00	6.05
04/09/11 15:32:59	30000	13.55	11.08	6.95	0.00	6.04
04/09/11 15:33:29	30030	13.57	11.48	7.40	0.00	6.03
04/09/11 15:33:59	30060	13.55	11.57	7.21	0.00	6.03
04/09/11 15:34:29	30090	13.55	11.58	6.37	0.00	6.06
04/09/11 15:34:59	30120	13.55	11.53	6.05	-0.04	6.05
04/09/11 15:35:29	30150	13.57	11.01	5.95	-0.06	6.02
04/09/11 15:35:59	30180	13.58	10.23	6.15	-0.06	6.03
04/09/11 15:36:29	30210	13.59	9.17	6.27	-0.04	6.01
04/09/11 15:36:59	30240	13.57	7.62	6.12	-0.03	6.03
04/09/11 15:37:29	30270	13.57	7.07	5.89	-0.03	6.04
04/09/11 15:37:59	30300	13.57	6.83	5.62	-0.06	6.04
04/09/11 15:38:29	30330	13.55	6.87	5.55	-0.08	6.09
04/09/11 15:38:59	30360	13.55	6.25	5.39	-0.11	6.10
04/09/11 15:39:29	30390	13.53	5.51	5.51	-0.10	6.12
04/09/11 15:39:59	30420	13.53	5.11	5.42	-0.08	6.16
04/09/11 15:40:29	30450	13.58	5.06	6.39	-0.06	6.10
04/09/11 15:40:59	30480	13.57	5.47	7.66	-0.04	6.13

Florida Power and Light
April 9, 2011
Mitsubishi, 501G, Unit 3B
West County Energy Center

Fuel Data

Fuel Fd factor	9,308	SCF exh/MMBtu
Fuel Heating Value (LHV)	983,660	Btu/SCF fuel
Turbine Fuel Flow	15,395	gal/hr

Weather Data

Barometric Pressure	30.11
Relative Humidity	42
Ambient Temperature	90
Specific Humidity	0.012595

Unit Data

Unit Load	206.3	megawatts
Heat Input	2,024	MMBtu/hr
Combustor Inlet Pressure	256	psig
Ammonia Injection Rate	437	lb/hr
Meas. Stack Moisture	8.7	%
Stack Exhaust Flow (M19)	53,929,012	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 (%)
04/09/11 15:41:29	30510	13.56	6.45	7.27	-0.01	6.16
04/09/11 15:41:59	30540	13.61	7.59	6.94	-0.02	6.12
04/09/11 15:42:29	30570	13.62	8.31	7.12	-0.04	6.13
04/09/11 15:42:59	30600	13.60	9.55	6.94	-0.06	6.13
04/09/11 15:43:29	30630	13.57	11.06	6.00	-0.06	6.12
04/09/11 15:43:59	30660	13.55	12.32	5.20	-0.09	6.14
04/09/11 15:44:29	30690	13.58	11.84	5.15	-0.09	6.10
04/09/11 15:44:59	30720	13.54	9.29	5.22	-0.07	6.10
RAW AVERAGE		**13.58**	**8.25**	**5.98**	**0.09**	**5.97**

		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	0.06	0.09	-0.06	-0.12	0.52
	Final Zero	0.02	0.09	-0.13	-0.41	0.63
	Avg. Zero	0.04	0.09	-0.10	-0.27	0.58
	Initial UpScale	12.12	12.04	11.88	3.18	9.48
	Final UpScale	12.06	12.10	11.90	3.05	9.62
	Avg. UpScale	12.09	12.07	11.89	3.12	9.55
Upscale Cal Gas		12.10	12.10	12.10	3.10	8.91

EMISSIONS DATA	O_2	NOx	CO	VOC	CO_2
Corrected Raw Average (ppm/% dry basis)	13.60	8.24	6.14	0.33	5.36
Concentration (ppm@ 15%O_2)	N/A	6.66	4.96	0.27	N/A
Concentration (ppm@ 15%O_2 &ISO)	N/A	6.85	5.11	0.28	N/A
Emission Rate (lb/hr)	N/A	53.07	24.05	0.75	N/A
Emission Rate (tons/year) at 500 hr/yr	N/A	13.27	6.01	0.19	N/A
Emission Rate (lb/MMBtu)	N/A	0.026	0.012	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 3B
Fuel Type	Oil, Distillate

Test Information			
Project #		bv-10-westcounty.fl-comp#2	
Operator		MV	
Date for Preliminary Run	(mm/dd/yy)	04/09/11	
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		3B	
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)	04/09/11	04/09/11	04/09/11	
Load	% or w/DB	Fuel Oil	Fuel Oil	Fuel Oil	
Fuel F-Factor		9308.23	9308.23	9308.23	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)	0.230	0.230	0.230	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	

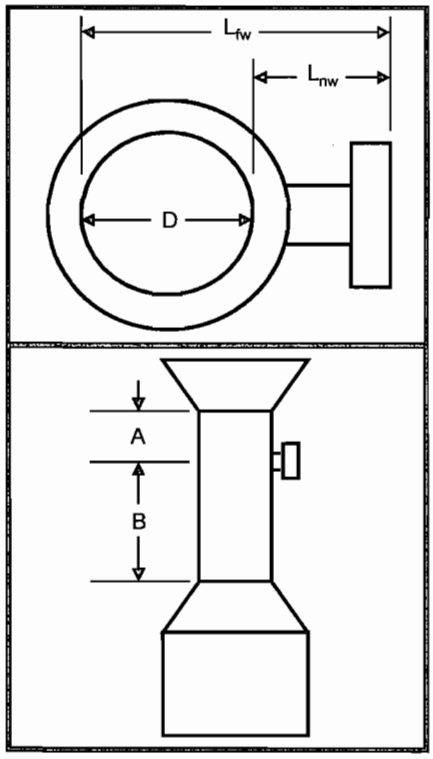
Testing Company Information	
Company Name	Air Hygiene International, Inc. (Tulsa, Oklahoma)
Address	5634 S. 122nd East Avenue, Suite F
City, State Zip	Tulsa, Oklahoma 74146
Project Manager	Jake Fahlenkamp
Phone Number	(918) 307-8865
Fax Number	(918) 307-9131

METHOD 1 - SAMPLE AND VELOCITY TRAVERSES FOR CIRCULAR SOURCES

Plant Name	West County Energy Center	**Date**	04/09/11
Sampling Location	Unit 3B	**Stack Type**	Circular
Operator	MV	**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	.882	.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 3B			
Operator	MV			
Project #	bv-10-westcounty.fl-comp#2			
Pitot Leak Check	x	**PreTest**	x	**PostTest**

Date	04/09/11		
Stack Type	Circular		
Ports Available	4		
Pitot Identification	SAMP-HP-0001		
Pitot Coefficient	0.840		

Stack Dimensions			
Area of Stack	(A_s)	378.35	ft^2
Diameter of Stack	(D)	263.38	in

Pressures			
Barometric Pressure	(P_b)	30.15	in Hg
Static Pressure	(P_{static})	0.75	in H_2O
Absolute Stack Pressure	(P_s)	30.21	in Hg

Stack Gas Composition			
Composition Data:	**Actual Composition**		
Carbon Dioxide Concentration	($\%CO_2$)	5.36	%vd
Oxygen Concentration	($\%O_2$)	13.62	%vd
Carbon Monoxide Concentration	(ppmCO)	5.91	ppmvd
Nitrogen Concentration	($\%N_2$)	81.02	%vd
Stack Moisture Content	(B_{ws})	8.60	%
Stack Dry Molecular Weight	(M_d)	29.40	lb/lb-mole
Stack Wet Molecular Weight	(M_w)	28.42	lb/lb-mole

Results			
Avg Stack Gas Velocity	(v_s)	68.86	ft/sec
Avg Stack Dry Std Flow Rate	(Q_{sd})	61,971,653	dscf/hr
Avg Stack Dry Std Flow Rate	(Q_{sd})	1,032,861	dscf/min
Avg Stack Wet Flow Rate	(Q_{sw})	1,563,170	acf/min
Avg Stack Wet Std Flow Rate	(Q_{sw})	67,802,684	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	09:05	**Start**	09:25	**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	0.77	0	271	58.15
A-2	0.85	0	275	61.26
A-3	0.91	0	274	63.34
A-4	0.89	0	270	62.47
A-5	0.77	0	268	58.03
A-6	0.62	0	269	52.11
B-1	0.85	0	280	61.47
B-2	0.98	0	283	66.14
B-3	0.98	0	281	66.05
B-4	0.95	0	282	65.07
B-5	0.88	0	284	62.71
B-6	0.85	0	282	61.55
C-1	1.10	0	282	70.02
C-2	1.30	0	283	76.17
C-3	1.40	0	284	79.10
C-4	1.40	0	281	78.94
C-5	1.40	0	280	78.89
C-6	1.00	0	282	66.76
D-1	1.10	0	274	69.64
D-2	1.40	0	275	78.62
D-3	1.50	0	272	81.21
D-4	1.50	0	276	81.44
D-5	1.60	0	277	84.16
D-6	1.10	0	271	69.50
Average	1.09	0	277	
	1.03	= Square roots of Δp		

METHOD 3a - DETERMINATION OF DRY MOLECULAR WEIGHT BY ANALYZER

Plant Name	West County Energy Center	**Date**	04/09/11		
Sampling Location	Unit 3B	**Operator**	MV		
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**		11:00	**Run Stop Time**	12:13	
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		%	
01:13	5.4	13.6	5.8	81.0	29.40	1.354	175.8	YES

Gas Analysis Data

Run Number	Fuel Oil-2		**Run Start Time**		12:37	**Run Stop Time**	14:15	
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		%	
01:38	5.4	13.6	5.8	81.0	29.40	1.352	176.2	YES

Gas Analysis Data

Run Number	Fuel Oil-3		**Run Start Time**		14:30	**Run Stop Time**	15:47	
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		%	
01:17	5.4	13.6	6.1	81.0	29.40	1.362	174.5	YES

METHOD 4 - DETERMINATION OF MOISTURE CONTENT IN STACK GASES

Plant Name	West County Energy Center	**Date**	04/09/11
Sampling Location	Unit 3B	**Operator**	MV
Project #	bv-10-westcounty.fl-comp#2	**Ports Used**	4

Moisture Content Data									
Run Number		Fuel Oil-1		**Run Start Time**	11:00		**Run Stop Time**	12:13	
Meter Box Number		SAMP-CP-0010			**Meter Cal Factor**		(Y)	0.991	
Total Meter Volume		(V_m)	42.960	dcf	**Barometric Pressure**		(P_b)	30.15	in Hg
Average Stack Temp		(t_s)$_{avg}$	237	°F	**Stack Static Pressure**		(P_{static})	0.76	in H_2O
Average Meter Temp		(t_m)$_{avg}$	83	°F	**Avg Orifice Pressure**		(ΔH)$_{avg}$	1.68	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)	801.40	792.70	617.50	856.20				
Initial Value	(V_i),(W_i)	751.60	775.90	612.80	845.60				
Net Value	(V_n),(W_n)	49.8	16.8	4.7	10.6				
Results									
Total Weight	(W_t)	81.90	g	**Water Vol Weighed**	($V_{wsg(std)}$)	3.862	scf		
Std Meter Volume	($V_{m(std)}$)	41.876	dscf	**Sat. Moisture Content**	($B_{ws(svp)}$)	100.00	%		
Calc Moisture Content	($B_{ws(calc)}$)	8.44	%	**Final Moisture Content**	(B_{ws})	8.44	%		

Moisture Content Data									
Run Number		Fuel Oil-2		**Run Start Time**	12:37		**Run Stop Time**	14:15	
Meter Box Number		SAMP-CP-0010			**Meter Cal Factor**		(Y)	0.991	
Total Meter Volume		(V_m)	44.960	dcf	**Barometric Pressure**		(P_b)	30.14	in Hg
Average Stack Temp		(t_s)$_{avg}$	241	°F	**Stack Static Pressure**		(P_{static})	0.74	in H_2O
Average Meter Temp		(t_m)$_{avg}$	84	°F	**Avg Orifice Pressure**		(ΔH)$_{avg}$	1.74	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)	808.40	757.80	610.50	814.90				
Initial Value	(V_i),(W_i)	746.20	743.80	606.30	806.80				
Net Value	(V_n),(W_n)	62.2	14.0	4.2	8.1				
Results									
Total Weight	(W_t)	88.50	g	**Water Vol Weighed**	($V_{wsg(std)}$)	4.173	scf		
Std Meter Volume	($V_{m(std)}$)	43.720	dscf	**Sat. Moisture Content**	($B_{ws(svp)}$)	100.00	%		
Calc Moisture Content	($B_{ws(calc)}$)	8.71	%	**Final Moisture Content**	(B_{ws})	8.71	%		

Moisture Content Data									
Run Number		Fuel Oil-3		**Run Start Time**	14:30		**Run Stop Time**	15:47	
Meter Box Number		SAMP-CP-0010			**Meter Cal Factor**		(Y)	0.991	
Total Meter Volume		(V_m)	44.920	dcf	**Barometric Pressure**		(P_b)	30.11	in Hg
Average Stack Temp		(t_s)$_{avg}$	238	°F	**Stack Static Pressure**		(P_{static})	0.75	in H_2O
Average Meter Temp		(t_m)$_{avg}$	86	°F	**Avg Orifice Pressure**		(ΔH)$_{avg}$	1.81	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)	813.00	787.60	616.20	854.40				
Initial Value	(V_i),(W_i)	749.80	774.40	613.30	846.30				
Net Value	(V_n),(W_n)	63.2	13.2	2.9	8.1				
Results									
Total Weight	(W_t)	87.40	g	**Water Vol Weighed**	($V_{wsg(std)}$)	4.121	scf		
Std Meter Volume	($V_{m(std)}$)	43.495	dscf	**Sat. Moisture Content**	($B_{ws(svp)}$)	100.00	%		
Calc Moisture Content	($B_{ws(calc)}$)	8.65	%	**Final Moisture Content**	(B_{ws})	8.65	%		

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

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

Date	04/09/11
Operator	MV
Run Number	Fuel Oil-1

Ideal Nozzle Diameter and IsoKinetic Factor Setup			
Pitot Coefficient	(C_p)	0.840	
Average Stack Temp	(t_s)	238.9	°F
Average Meter Temp	(t_m)	83.1	
Orifice Meter Coefficient	($\Delta H@$)	1.745	in H_2O
Square Root ΔP	($\Delta p^{1/2}_{avg}$)	0.94	in H_2O
Stack Moisture Content	(B_{ws})	8.44	%
Stack Dry Molecular Weight	(M_d)	29.40	lb/lb-mole
Estimated Orifice Flow Rate	(Q_m)	0.75	acfm
ΔP to ΔH Isokinetic Factor	(K)	1.97	

Leak Checks					
Train	Pre	0.000	ft³/min@	15.0	in Hg
PASS	Post	0.000	ft³/min@	15.0	in Hg
Pitot	Pre (+)	5.0	in H_2O for	30.0	sec
PASS	Pre (-)	5.0	in H_2O for	30.0	sec
	Post (+)	5.0	in H_2O for	30.0	sec
	Post (-)	5.0	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})	0.2300	in
Suggested Nozzle Diameter	(D_n)	0.2170	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)	30.15	in Hg
Stack Static Pressure	(P_{static})	0.76	in H_2O
Absolute Stack Pressure	(P_s)	30.21	in Hg
Absolute Meter Pressure	(P_m)	30.28	in Hg

Nozzle Measurements				
Pre	0.230	0.230	0.230	PASS
Post	0.230	0.230	0.230	PASS

Run Time			
Start	11:00	End	12:13

Weights	Imp 1	Imp 2	Imp 3	Imp 4	Imp 5	Imp 6	Imp 7	Imp 8
Pre	751.6	775.9	612.8	845.8				
Post	801.4	792.7	617.5	856.2				

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	265.150	0.82	1.618	1.50	236	248	260	68			77	74	5.0	0.91	58.53	1.611	90.7	38.660
A-2	2.5	00:02:30	266.780	0.83	1.638	1.60	235	240	258	68			80	75	5.0	0.91	58.84	3.393	95.5	40.720
A-3	5.0	00:05:00	268.590	0.86	1.697	1.60	237	245	255	65			81	76	5.0	0.93	59.98	5.094	94.8	40.751
A-4	7.5	00:07:30	270.320	0.85	1.677	1.60	238	242	260	64			82	77	5.5	0.92	59.68	6.723	93.7	40.335
A-5	10.0	00:10:00	271.980	0.76	1.499	1.50	233	255	261	64			81	76	5.5	0.87	56.23	8.334	93.8	40.004
A-6	12.5	00:12:30	273.620	0.77	1.519	1.50	232	252	260	65			89	76	5.5	0.88	56.55	9.895	93.3	39.580
B-1	15.0	00:15:00	275.220	0.94	1.855	1.80	239	260	262	66			88	77	6.0	0.97	62.80	11.681	93.4	40.051
B-2	17.5	00:17:30	277.050	0.93	1.835	1.80	238	261	263	64			87	76	6.0	0.96	62.42	13.442	93.4	40.325
B-3	20.0	00:20:00	278.850	0.94	1.855	1.80	239	247	260	66			88	77	6.0	0.97	62.80	15.199	93.3	40.531
B-4	22.5	00:22:30	280.650	0.97	1.914	1.80	235	255	263	67			87	78	6.5	0.98	63.61	16.976	93.2	40.742
B-5	25.0	00:25:00	282.470	0.94	1.855	1.80	236	254	261	66			86	78	6.0	0.97	62.67	18.695	92.9	40.790
B-6	27.5	00:27:30	284.230	0.93	1.835	1.80	232	255	262	67			84	77	6.0	0.96	62.15	20.410	92.7	40.820
C-1	30.0	00:30:00	285.980	0.95	1.874	1.80	240	248	260	68			89	80	6.5	0.97	63.18	22.248	93.0	41.074
C-2	32.5	00:32:30	287.870	0.96	1.894	1.80	239	248	259	67			92	80	6.5	0.98	63.47	24.004	92.9	41.149
C-3	35.0	00:35:00	289.680	0.95	1.874	1.80	241	252	257	65			90	80	6.5	0.97	63.23	25.850	93.2	41.360
C-4	37.5	00:37:30	291.580	1.10	2.170	2.10	243	258	259	64			91	82	6.5	1.05	68.13	27.722	93.1	41.583
C-5	40.0	00:40:00	293.510	1.00	1.973	1.90	242	257	259	65			92	83	7.0	1.00	64.91	29.521	93.0	41.677
C-6	42.5	00:42:30	295.370	1.10	2.170	2.10	233	259	258	68			93	82	7.0	1.05	67.64	31.496	93.2	41.995
D-1	45.0	00:45:00	297.410	0.80	1.578	1.50	235	263	258	67			89	81	7.0	0.89	57.77	33.360	93.9	42.139
D-2	47.5	00:47:30	299.330	0.78	1.539	1.50	240	261	259	68			88	81	5.5	0.88	57.25	35.149	94.4	42.178
D-3	50.0	00:50:00	301.170	0.79	1.559	1.50	241	260	258	67			87	80	6.0	0.89	57.66	36.862	94.6	42.128
D-4	52.5	00:52:30	302.930	0.76	1.499	1.40	233	257	259	66			93	82	5.5	0.87	56.23	38.486	94.6	41.984
D-5	55.0	00:55:00	304.610	0.74	1.460	1.40	237	255	257	67			92	81	5.5	0.86	55.64	40.170	94.9	41.917
D-6	57.5	00:57:30	306.350	0.70	1.381	1.30	232	255	258	66			93	82	5.0	0.84	53.92	41.871	95.2	41.871
Last Pt	60.0	01:00:00	308.110																	
Final Val	60.0	01:00:00	308.110											Max Vac	7.0	Final Values		41.871	95.2	
Average Values				0.88		1.68	237	254	259	66			87	79		0.94	60.64			
													83							

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

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

Date	04/09/11
Operator	MV
Run Number	Fuel Oil-2

Ideal Nozzle Diameter and IsoKinetic Factor Setup			
Pitot Coefficient	(C_p)	0.840	
Average Stack Temp	(t_s)	240.6	°F
Average Meter Temp	(t_m)	84.4	
Orifice Meter Coefficient	($\Delta H@$)	1.745	in H_2O
Square Root ΔP	($\Delta p^{1/2}_{avg}$)	0.94	in H_2O
Stack Moisture Content	(B_{ws})	8.71	%
Stack Dry Molecular Weight	(M_d)	29.40	lb/lb-mole
Estimated Orifice Flow Rate	(Q_m)	0.70	acfm
ΔP to ΔH Isokinetic Factor	(K)	1.96	

Leak Checks					
Train	Pre	0.000	ft³/min@	15.0	in Hg
PASS	Post	0.000	ft³/min@	15.0	in Hg
Pitot	*Pre (+)*	5.0	*in H_2O for*	30.0	sec
PASS	Pre (-)	5.0	in H_2O for	30.0	sec
	Post (+)	5.0	in H_2O for	30.0	sec
	Post (-)	5.0	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_{na})	0.2300	in
Suggested Nozzle Diameter	(D_{ns})	0.2092	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)	30.14	in Hg
Stack Static Pressure	(P_{static})	0.74	in H_2O
Absolute Stack Pressure	(P_s)	30.19	in Hg
Absolute Meter Pressure	(P_m)	30.27	in Hg

Nozzle Measurements				
Pre	0.230	0.230	0.230	PASS
Post	0.230	0.230	0.230	PASS

Run Time			
Start	12:37	End	14:15

Weights	Imp 1	Imp 2	Imp 3	Imp 4	Imp 5	Imp 6	Imp 7	Imp 8
Pre	746.2	743.8	606.3	806.8				
Post	808.4	757.8	610.5	814.9				

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	309.130	0.79	1.546	1.60	235	265	266	68			88	80	6.0	0.89	57.45	1.712	98.4	41.087
A-2	2.5	00:02:30	310.890	0.76	1.488	1.50	236	264	268	65			87	81	6.0	0.87	56.39	3.521	102.4	42.249
A-3	5.0	00:05:00	312.750	0.77	1.507	1.50	237	266	264	61			88	82	5.5	0.88	56.80	5.384	104.6	43.076
A-4	7.5	00:07:30	314.670	0.75	1.468	1.50	238	265	267	60			87	81	5.0	0.87	56.10	7.193	105.2	43.160
A-5	10.0	00:10:00	316.530	0.69	1.351	1.40	239	260	262	60			88	80	5.0	0.83	53.85	8.807	104.1	42.274
A-6	12.5	00:12:30	318.190	0.68	1.331	1.40	241	260	258	60			89	80	5.0	0.82	53.53	10.439	103.7	41.756
B-1	15.0	00:15:00	319.870	1.00	1.957	2.00	238	261	259	58			88	83	6.0	1.00	64.78	12.420	103.4	42.582
B-2	17.5	00:17:30	321.910	1.00	1.957	2.00	239	256	254	57			87	81	6.0	1.00	64.82	14.387	103.0	43.160
B-3	20.0	00:20:00	323.930	1.10	2.153	2.10	241	255	257	58			88	80	6.5	1.05	68.08	16.315	102.0	43.506
B-4	22.5	00:22:30	325.910	1.10	2.153	2.10	233	248	253	57			87	81	6.5	1.05	67.69	18.419	102.0	44.204
B-5	25.0	00:25:00	328.070	1.10	2.153	2.10	238	247	251	58			88	83	6.5	1.05	67.94	20.429	101.7	44.572
B-6	27.5	00:27:30	330.140	1.10	2.153	2.10	239	247	252	58			88	82	6.5	1.05	67.99	22.451	101.4	44.902
C-1	30.0	00:30:00	332.220	0.90	1.762	1.80	241	245	251	61			87	80	6.0	0.95	61.58	24.253	101.1	44.775
C-2	32.5	00:32:30	334.070	0.95	1.859	1.90	242	252	256	62			88	81	6.0	0.97	63.32	26.072	100.7	44.694
C-3	35.0	00:35:00	335.940	0.97	1.899	1.90	239	251	256	62			88	80	6.0	0.98	63.84	27.989	100.7	44.783
C-4	37.5	00:37:30	337.910	1.00	1.957	1.90	241	255	253	59			88	81	6.0	1.00	64.92	29.866	100.4	44.799
C-5	40.0	00:40:00	339.840	1.00	1.957	1.90	240	255	252	58			87	80	6.5	1.00	64.87	31.708	100.1	44.764
C-6	42.5	00:42:30	341.730	1.10	2.153	2.10	244	257	258	57			88	79	6.5	1.05	68.23	33.764	100.1	45.019
D-1	45.0	00:45:00	343.840	0.78	1.527	1.50	243	248	261	64			87	81	6.0	0.88	57.41	35.369	99.8	44.677
D-2	47.5	00:47:30	345.490	0.80	1.566	1.60	241	247	260	65			88	82	6.5	0.89	58.06	37.010	99.6	44.412
D-3	50.0	00:50:00	347.180	0.81	1.585	1.60	246	261	264	63			89	83	6.5	0.90	58.63	38.686	99.4	44.213
D-4	52.5	00:52:30	348.910	0.78	1.527	1.50	248	260	263	64			88	81	6.0	0.88	57.62	40.406	99.4	44.079
D-5	55.0	00:55:00	350.680	0.71	1.390	1.40	248	261	262	62			87	80	6.0	0.84	54.97	42.022	99.4	43.849
D-6	57.5	00:57:30	352.340	0.69	1.351	1.40	248	265	264	64			88	81	6.0	0.83	54.19	43.721	99.7	43.721
Last Pt	60.0	01:00:00	354.090																	
Final Val	60.0	01:00:00	354.090											Max Vac	6.5	Final Values		43.721	99.7	
Average Values				0.89		1.74	241	256	259	61			88	81		0.94	60.96			
													84							

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

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

Date	04/09/11
Operator	MV
Run Number	Fuel Oil-3

Ideal Nozzle Diameter and IsoKinetic Factor Setup			
Pitot Coefficient	(C_p)	0.840	
Average Stack Temp	(t_s)	238.2	°F
Average Meter Temp	(t_m)	86.2	
Orifice Meter Coefficient	($\Delta H@$)	1.745	in H_2O
Square Root ΔP	($\Delta p^{1/2}_{avg}$)	0.96	in H_2O
Stack Moisture Content	(B_{ws})	8.65	%
Stack Dry Molecular Weight	(M_d)	29.40	lb/lb-mole
Estimated Orifice Flow Rate	(Q_m)	0.73	acfm
ΔP to ΔH Isokinetic Factor	(K)	1.97	

Leak Checks					
Train	Pre	0.000	ft³/min@	15.0	in Hg
PASS	Post	0.000	ft³/min@	15.0	in Hg
Pitot	Pre (+)	5.0	in H_2O for	30.0	sec
PASS	Pre (-)	5.0	in H_2O for	30.0	sec
	Post (+)	5.0	in H_2O for	30.0	sec
	Post (-)	5.0	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})	0.2300	in
Suggested Nozzle Diameter	(D_n)	0.2118	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)	30.11	in Hg
Stack Static Pressure	(P_{static})	0.75	in H_2O
Absolute Stack Pressure	(P_s)	30.17	in Hg
Absolute Meter Pressure	(P_m)	30.24	in Hg

Nozzle Measurements				
Pre	0.230	0.230	0.230	PASS
Post	0.230	0.230	0.230	PASS

Run Time			
Start	14:30	End	15:47

Weights	Imp 1	Imp 2	Imp 3	Imp 4	Imp 5	Imp 6	Imp 7	Imp 8
Pre	749.8	774.4	613.3	846.3				
Post	813.0	787.6	616.2	854.4				

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)i	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	354.640	0.81	1.598	1.60	234	227	255	67			88	84	6.0	0.90	58.16	1.714	97.2	41.128
A-2	2.5	00:02:30	356.410	0.85	1.677	1.70	238	234	250	66			87	81	6.0	0.92	59.75	3.463	97.2	41.559
A-3	5.0	00:05:00	358.210	0.84	1.657	1.70	239	250	258	62			88	80	6.0	0.92	59.44	5.310	99.3	42.480
A-4	7.5	00:07:30	360.110	0.85	1.677	1.70	240	252	257	63			87	80	6.0	0.92	59.83	7.051	98.7	42.309
A-5	10.0	00:10:00	361.900	0.78	1.539	1.50	242	255	256	60			88	81	6.0	0.88	57.40	8.750	98.7	42.000
A-6	12.5	00:12:30	363.650	0.75	1.480	1.40	245	257	254	60			89	83	6.0	0.87	56.40	10.347	98.1	41.387
B-1	15.0	00:15:00	365.300	0.95	1.874	1.80	244	257	252	65			88	81	6.5	0.97	63.43	12.173	97.9	41.735
B-2	17.5	00:17:30	367.180	0.98	1.934	1.90	245	251	259	61			89	84	6.5	0.99	64.47	14.080	98.0	42.239
B-3	20.0	00:20:00	369.150	0.99	1.953	1.90	248	255	258	60			88	81	6.5	0.99	64.94	16.013	96.3	42.702
B-4	22.5	00:22:30	371.140	1.00	1.973	1.90	250	254	251	61			87	80	6.5	1.00	65.36	17.931	98.4	43.034
B-5	25.0	00:25:00	373.110	1.10	2.170	2.10	230	251	258	62			93	84	7.5	1.05	67.58	19.648	97.1	42.869
B-6	27.5	00:27:30	374.890	1.10	2.170	2.10	233	252	260	62			92	83	7.5	1.05	67.72	21.456	96.3	42.912
C-1	30.0	00:30:00	376.760	0.95	1.874	1.90	237	245	283	64			91	84	7.5	0.97	63.12	23.292	96.3	43.000
C-2	32.5	00:32:30	378.660	1.00	1.973	2.00	238	244	264	63			92	84	7.5	1.00	64.80	25.204	96.4	43.206
C-3	35.0	00:35:00	380.640	1.10	2.170	2.10	234	246	256	61			93	84	7.5	1.05	67.77	27.105	96.2	43.368
C-4	37.5	00:37:30	382.610	1.10	2.170	2.10	232	244	251	62			93	84	7.5	1.05	67.67	29.025	96.0	43.537
C-5	40.0	00:40:00	384.600	1.20	2.368	2.30	236	247	252	63			91	82	8.0	1.10	70.89	30.943	95.6	43.685
C-6	42.5	00:42:30	386.580	1.20	2.368	2.30	230	243	249	61			90	80	8.0	1.10	70.58	33.110	95.9	44.147
D-1	45.0	00:45:00	388.810	0.75	1.480	1.40	234	241	263	68			90	82	6.5	0.87	55.96	34.613	96.1	43.975
D-2	47.5	00:47:30	390.570	0.85	1.677	1.70	237	242	267	63			91	84	6.0	0.92	59.70	36.697	96.6	44.036
D-3	50.0	00:50:00	392.520	0.88	1.736	1.70	236	240	260	64			90	85	6.0	0.94	60.70	38.290	96.2	43.760
D-4	52.5	00:52:30	394.170	0.80	1.578	1.60	238	241	267	62			91	82	6.5	0.89	57.96	39.944	96.1	43.575
D-5	55.0	00:55:00	395.860	0.80	1.578	1.60	238	240	263	61			90	83	6.5	0.89	57.96	41.666	96.2	43.477
D-6	57.5	00:57:30	397.660	0.75	1.480	1.50	239	241	265	60			92	85	6.5	0.87	56.16	43.497	96.7	43.497
Last Pt	60.0	01:00:00	399.560																	
Final Val	60.0		399.560											Max Vac	8.0	Final Values		43.497	96.7	
Average Values				0.93		1.81	238	246	258	63			90	83		0.96	62.41			
													86							

SAMPLE RECOVERY AND INTEGRITY DATA SHEET

Plant Name	West County Energy Center	**Date**	04/09/11
Sampling Location	Unit 3B	**Operator**	MV
Project #	bv-10-westcounty.fl-comp#2		

Run History Data				
Run Number	Fuel Oil-1	Fuel Oil-2	Fuel Oil-3	
Run Start Time	11:00	12:37	14:30	(hh:mm)
Run Stop Time	12:13	14:15	15:47	(hh:mm)
Train Prepared By	MV	MV	MV	
Train Recovered By	MV	MV	MV	
Recovery Date	04/09/11	04/09/11	04/09/11	(mm/dd/yy)
Relinquished By	MV	MV	MV	
Received By	MV	MV	MV	
Relinquished Date	04/09/11	04/09/11	04/09/11	(mm/dd/yy)
Relinquished Time	12:13	14:15	15:47	(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)	2211.6	2176.7	2216.8	g
Initial Weight	(W_i)	2140.3	2096.3	2137.5	g
Net Weight	(W_n)	71.3	80.4	79.3	g
Comments					
Impinger 4 - Silica Gel Weight					
Final Weight	(W_f)	856.2	814.9	854.4	g
Initial Weight	(W_i)	845.6	806.8	846.3	g
Net Weight	(W_n)	10.6	8.1	8.1	g
Comments					
Total Water Collected					
Total Weight	(W_{lc})	81.9	88.5	87.4	g
Total Volume	(V_{lc})	82.0	88.7	87.6	ml

CTM 027 (AMMONIA) - RESULTS

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

Historical Data	**Fuel Oil-1**	**Fuel Oil-2**	**Fuel Oil-3**	**Average**	**Units**
Run Start Time	11:00	12:37	14:30		hh:mm
Run Stop Time	12:13	14:15	15:47		hh:mm
Test Date	04/09/11	04/09/11	04/09/11		mm/dd/yy
Meter Calibration Factor	0.991	0.991	0.991		
Pitot Tube Coefficient	0.840	0.840	0.840		
Average Nozzle Diameter	0.230	0.230	0.230		in
Stack Test Data	**Fuel Oil-1**	**Fuel Oil-2**	**Fuel Oil-3**	**Average**	**Units**
Initial Meter Volume	265.150	309.130	354.640		ft^3
Final Meter Volume	308.110	354.090	399.560		ft^3
Total Meter Volume	42.960	44.960	44.920	44.280	ft^3
Total Sampling Time	60.00	60.00	60.00	60.00	min
Average Meter Temperature	83.13	84.35	86.23	84.57	°F
Average Stack Temperature	236.92	240.63	238.21	238.58	°F
Barometric Pressure	30.15	30.14	30.11	30.13	in Hg
Stack Static Pressure	0.76	0.74	0.75	0.75	in H_2O
Absolute Stack Pressure	30.21	30.19	30.17	30.19	in Hg
Average Orifice Pressure Drop	1.68	1.74	1.81	1.74	in H_2O
Absolute Meter Pressure	30.28	30.27	30.24	30.26	in Hg
Avg Square Root Pitot Pressure	0.94	0.94	0.96	0.95	$\sqrt{(in\ H_2O)}$
Moisture Content Data	**Fuel Oil-1**	**Fuel Oil-2**	**Fuel Oil-3**	**Average**	**Units**
Impinger Water Weight Gain	71.30	80.40	79.30	77.00	g
Silica Gel Weight Gain	10.60	8.10	8.10	8.93	g
Total Water Volume Collected	82.05	88.66	87.56	86.09	ml
Standard Water Vapor Volume	3.86	4.17	4.12	4.05	scf
Standard Meter Volume	41.9	43.7	43.5	43.0	dscf
Calculated Stack Moisture	8.44	8.71	8.65	8.60	%
Saturated Stack Moisture	100.00	100.00	100.00	100.00	%
Reported Stack Moisture Content	8.44	8.71	8.65	8.60	%

CTM 027 (AMMONIA) - RESULTS

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

Gas Analysis Data	**Fuel Oil-1**	**Fuel Oil-2**	**Fuel Oil-3**	**Average**	**Units**
Carbon Dioxide Content	5.4	5.4	5.4	5.4	%
Oxygen Content	13.6	13.6	13.6	13.6	%
Carbon Monoxide Content	5.8	5.8	6.1	5.9	ppm
Nitrogen Content	81.0	81.0	81.0	81.0	%
Stack Dry Molecular Weight	29.40	29.40	29.40	29.40	lb/lb-mole
Stack Wet Molecular Weight	28.44	28.41	28.41	28.42	lb/lb-mole
Calculated Fuel Factor	1.354	1.352	1.362	1.356	
Fuel F-Factor	9308.23	9308.23	9308.23	9308.23	dscf/MMBtu
Percent Excess Air	175.8	176.2	174.5	175.5	%
Volumetric Flow Rate Data	**Fuel Oil-1**	**Fuel Oil-2**	**Fuel Oil-3**	**Average**	**Units**
Average Stack Gas Velocity	60.64	60.96	62.41	61.33	ft/sec
Stack Cross-Sectional Area	378.35	378.35	378.35	378.35	ft^2
Actual Stack Flow Rate	1,376,541	1,383,866	1,416,683	1,392,363	acfm
Wet Standard Stack Flow Rate	63,172	63,148	64,806	63,709	wkscfh
Dry Standard Stack Flow Rate	57,838,311	57,645,887	59,197,585	58,227,261	dscfh
Percent of Isokinetic Rate	95.2	99.7	96.7	97.2	%
Ammonia Analysis (CTM-027)	**Fuel Oil-1**	**Fuel Oil-2**	**Fuel Oil-3**	**Average**	**Units**
Sample Number (Front Half)	02	04	06		
Sample Number (Back Half)	03	05	07		
Lab Log Number (Front Half)	U3B-R1-1	U3B-R2-1	U3B-R3-1		
Lab Log Number (Back Half)	U3B-R1-2	U3B-R2-2	U3B-R3-2		
Front Half Results (C_f)	7.6760	4.5180	4.6900	5.6280	mg/l
Back Half Results (C_b)	0.0000	0.0000	0.0000	0.0000	mg/l
Practical Quantitation Limit	0.1000	0.1000	0.1000	0.1000	mg/l
Blank Results	0.0000	0.0000	0.0000	0.0000	mg/l
Front Half Sample Volume	150	150	150	150	ml
Back Half Sample Volume	150	150	150	150	ml
Volume of NH_3	0.00151	0.00089	0.00093	0.00111	L
NH_3 Concentration	1.28	0.72	0.75	0.92	ppmvd
NH_3 Concentration	1.04	0.59	0.61	0.74	ppm@15%O_2

TEST RESULTS

Opacity
Fuel Oil Load

Company:	Florida Power and Light
Equipment:	Mitsubishi 501G, Unit U3B Fuel Oil
Location:	West County Energy Center
Date:	April 9, 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 U3B Fuel Oil
Location:	West County Energy Center
Date:	April 9, 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 U3B Fuel Oil
Location: West County Energy Center
Date: April 9, 2011
Project #: bv-10-westcounty.fl-comp#2

Run 3

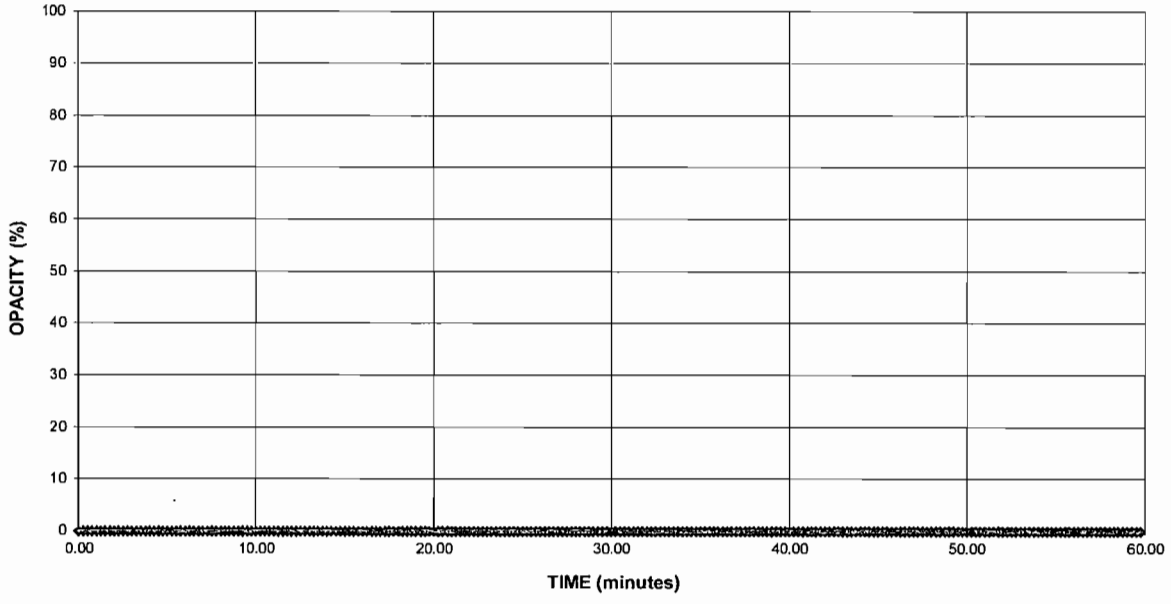
Average Opacity:	0.00 %
Maximum Opacity:	0 %
6 Minute Average:	0.00 %
6 Minute Maximum:	0.00 %
Max Time w/ Opacity:	0.00 minutes

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

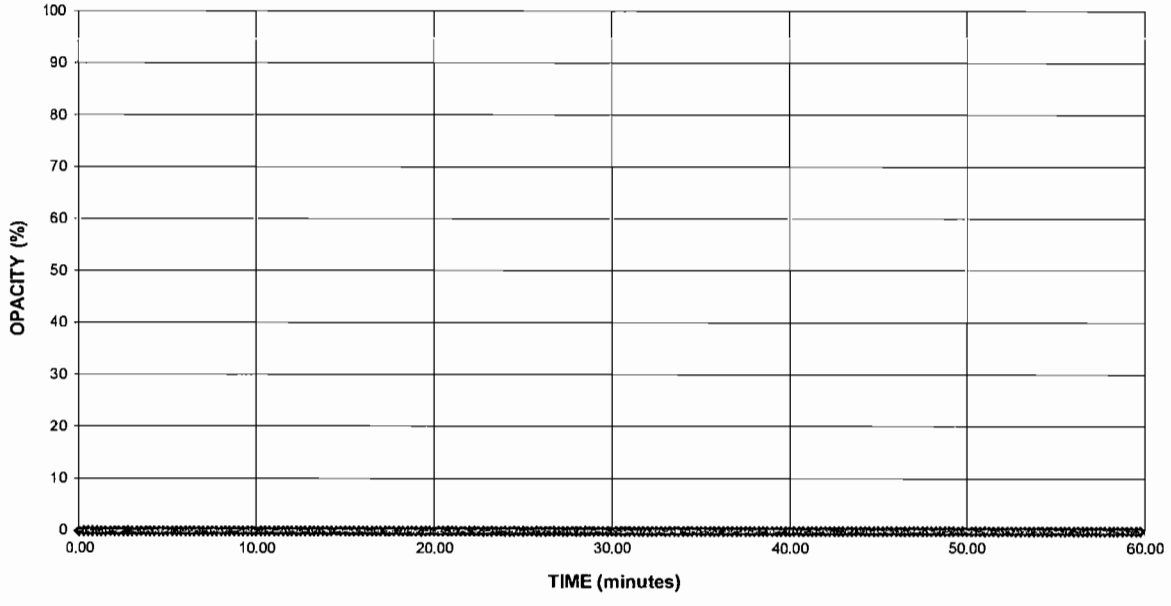
Company:	Florida Power and Light
Equipment:	Mitsubishi 501G, Unit U3B Fuel Oil
Location:	West County Energy Center
Date:	April 9, 2011
Project #:	bv-10-westcounty.fl-comp#2

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)



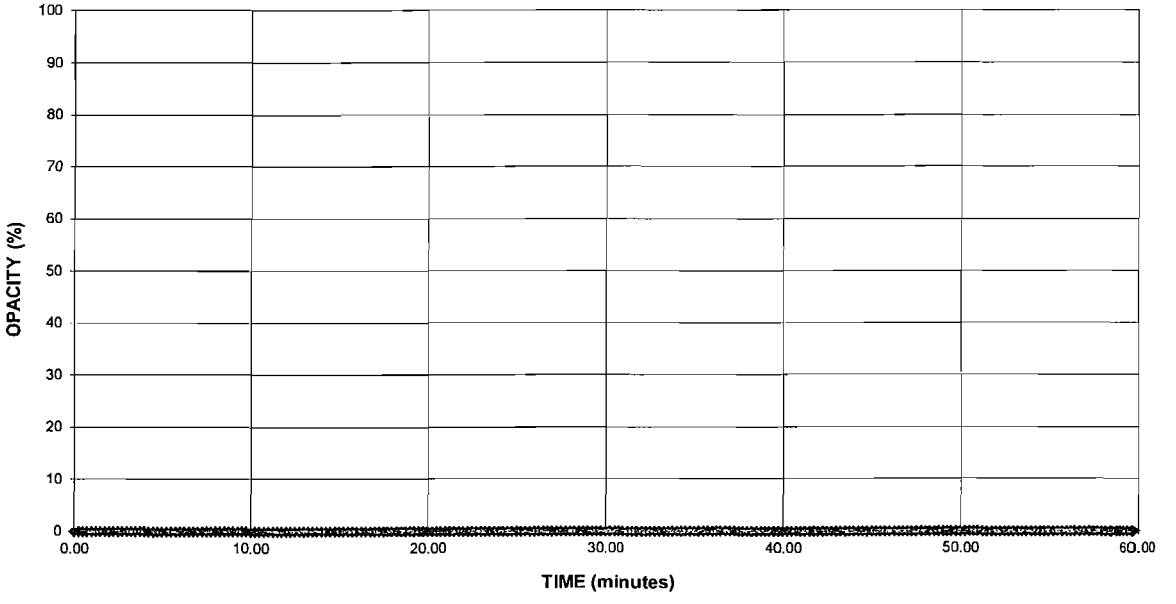
OPACITY RESULTS
(6 minute averages)



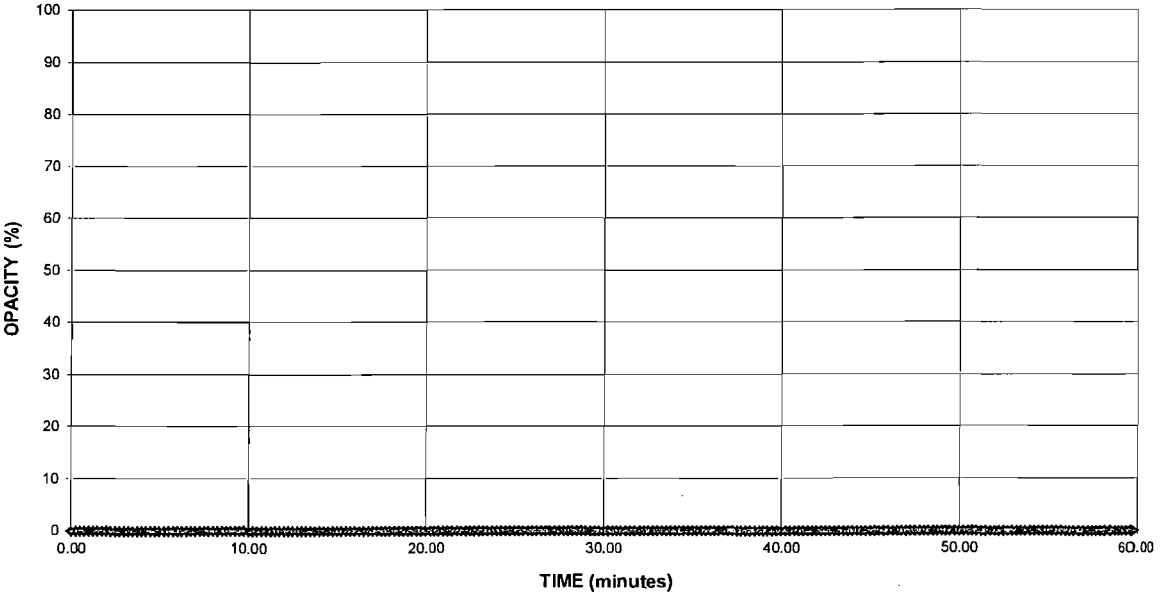
Company:	Florida Power and Light
Equipment:	Mitsubishi 501G, Unit U3B Fuel Oil
Location:	West County Energy Center
Date:	April 9, 2011
Project #:	bv-10-westcounty.fl-comp#2

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

OPACITY READINGS
(15 second intervals)



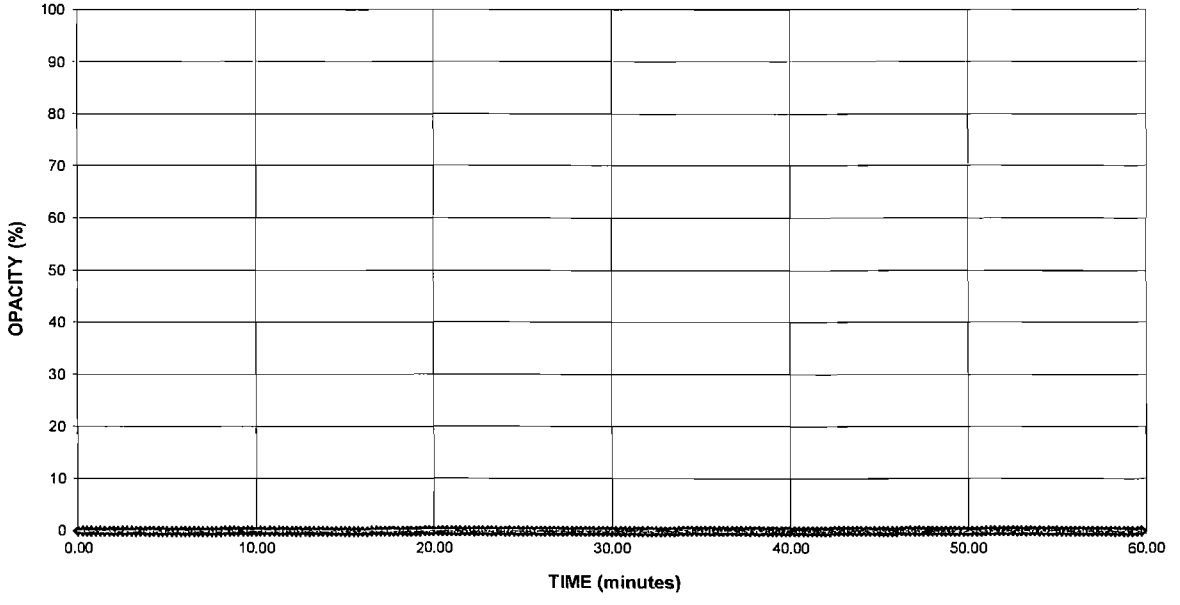
OPACITY RESULTS
(6 minute averages)



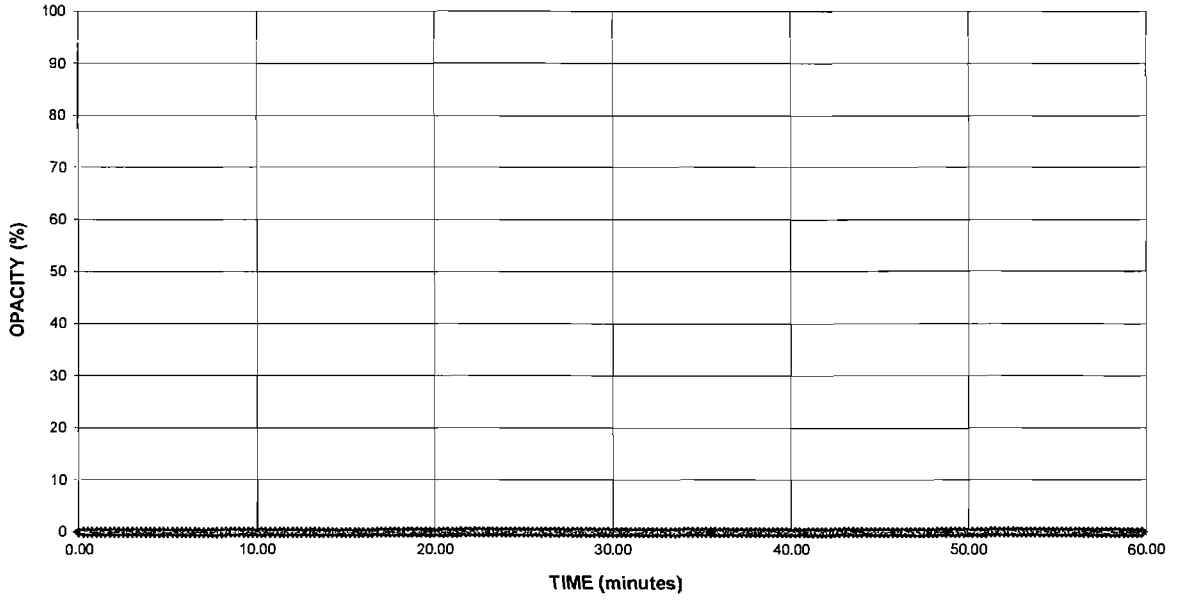
Company:	Florida Power and Light
Equipment:	Mitsubishi 501G, Unit U3B Fuel Oil
Location:	West County Energy Center
Date:	April 9, 2011
Project #:	bv-10-westcounty.fl-comp#2

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)



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 ROAD 80
City: LOXAHATCHEE State: FL Zip: 33470

Process: FUEL OIL Unit #: 3B Operating Mode: BASE
Control Equipment: HRSG Operating Mode: BASE

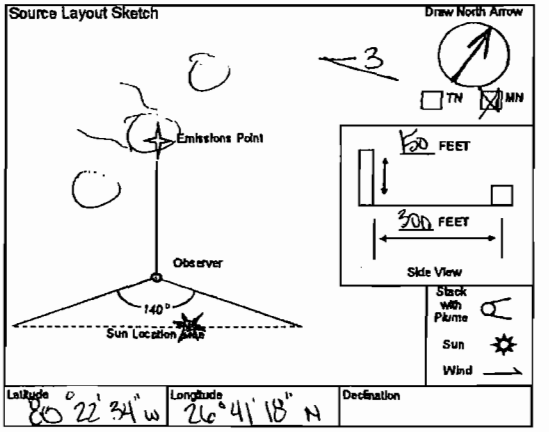
Describe Emissions Point: MIDDLE STACK IN GROUP OF 3 ON BLOCK 3 (3B)
Height of Emiss. Pt. Start 150 ft End SAME
Height of Emiss. Pt. Rel. to Observer Start 150 ft End SAME
Distance to Emiss. Pt. Start 300 ft End SAME
Direction to Emiss. Pt. (Degrees) Start 335° End SAME

Vertical Angle to Obs. Pt. Start 17° End SAME
Direction to Obs. Pt. (Degrees) Start 335° End SAME
Distance and Direction to Observation Point from Emission Point Start 0'0" End SAME

Describe Emissions Start N/A End SAME
Emission Color Start N/A End SAME
Water Droplet Plume Start NONE End —

Describe Plume Background Start CLOUDY SKY End SAME
Background Color Start BLUE/WHITE End SAME
Sky Conditions Start SCATTERED End SAME
Wind Speed Start 3 mph End 6 mph
Wind Direction Start ENE End SAME
Ambient Temp. Start 82° End 83°
Wet Bulb Temp. 69°
RH Percent 61%

Source Layout Sketch



Latitude 80° 22' 34" W | Longitude 26° 41' 18" N | Declination

Additional Information

VISUAL EMISSIONS OBSERVATION FORM

Form Number | Page 1 of 2
Continued on Form Number

Observation Date 4-9-11 | Time Zone EDT | Start Time 12:00 | End Time 13:00

Min \ Sec	0	15	30	45	Comments
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27	0	0	0	0	
28	0	0	0	0	
29	0	0	0	0	
30	0	0	0	0	

Observer's Name (Print): SIDNEY GASTON
Observer's Signature: [signature] Date: 4-9-11
Organization: AIR HYGIENE
Certified By: ETA Date: 10-19-10

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 ROAD 80
City: LOXAHATCHEE State: FL Zip: 33470

Process: FUEL OIL Unit #: 3B Operating Mode: BASE
Control Equipment: HRSG Operating Mode: BASE

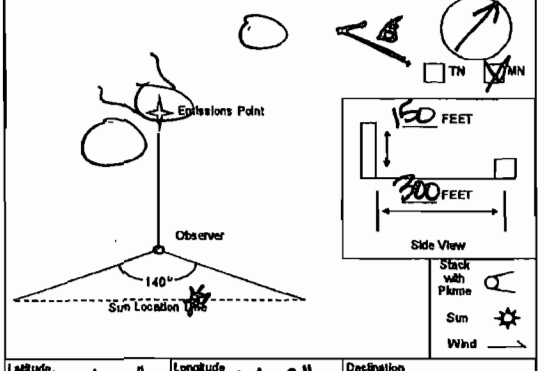
Describe Emissions Point: MIDDLE STACK IN GROUP OF 3 ON BLOCK 3 (3B)
Height of Emiss. Pt. Start: 150 ft End: SAME Height of Emiss. Pt. Rel. to Observer Start: 150 ft End: SAME
Distance to Emiss. Pt. Start: 300 ft End: SAME Direction to Emiss. Pt. (Degrees) Start: 335° End: SAME

Vertical Angle to Obs. Pt. Start: 17° End: SAME Direction to Obs. Pt. (Degrees) Start: 335° End: SAME
Distance and Direction to Observation Point from Emission Point Start: 0' 0° End: SAME

Describe Emissions Start: N/A End: SAME
Emission Color Start: N/A End: SAME Water Droplet Plume Start: NONE End: —

Describe Plume Background Start: CLOUDY SKY End: SAME
Background Color Start: BLUE/WHITE End: SAME Sky Conditions Start: SCATTERED End: SAME
Wind Speed Start: 5 mph End: 6 mph Wind Direction Start: ENE End: SAME
Ambient Temp. Start: 86° End: 83° Wet Bulb Temp. 68° RH Percent 61%

Source Layout Sketch



Latitude: 80° 22' 34" W Longitude: 26° 41' 18" N Declination:

Additional Information:

VISUAL EMISSIONS OBSERVATION FORM

Form Number: Page 2 of 2
Continued on Form Number:
Observation Date: 4-9-11 Time Zone: EDT Start Time: 12:00 End Time: 13:00

Min \ Sec	0	15	30	45	Comments
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27	0	0	0	0	
28	0	0	0	0	
29	0	0	0	0	
30	0	0	0	0	

Observer's Name (Print): SIDNEY GASTON
Observer's Signature: [signature] Date: 4-9-11
Organization: AIR HYGIENE
Certified By: ETA Date: 10-19-10

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 ROAD 80
City: LOXAHATCHEE State: FL Zip: 33470

Process: FUEL OIL Unit # 3B Operating Mode: BASE
Control Equipment: HRSG Operating Mode: BASE

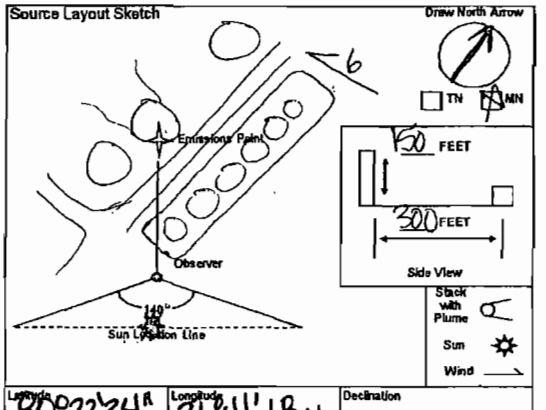
Describe Emissions Point: MIDDLE STACK IN GROUP OF 3 ON BLOCK 3 (B)
Height of Emiss. Pt. Start 150 End SAME
Height of Emiss. Pt. Rel. to Observer Start 150 ft End SAME
Distance to Emiss. Pt. Start 300 End SAME
Direction to Emiss. Pt. (Degrees) Start 335° End SAME

Vertical Angle to Obs. Pt. Start 17° End SAME
Direction to Obs. Pt. (Degrees) Start 335° End SAME
Distance and Direction to Observation Point from Emission Point Start 0 0 3 End SAME

Describe Emissions
Start N/A End SAME
Emission Color Start N/A End SAME
Water Droplet Plume Start NONE End —

Describe Plume Background Start CLOUDY SKY End SAME
Background Color Start BLUE/WHITE End SAME
Sky Conditions Start SCATTERED End SAME
Wind Speed Start 6 mph End
Wind Direction Start ENE End SAME
Ambient Temp. Start 83° End
Wet Bulb Temp. 71
RH Percent 67%

Source Layout Sketch



Latitude: 26°41'18"N Longitude: 80°22'34"W Declination

Additional Information

VISUAL EMISSIONS OBSERVATION FORM

Form Number | Page 1 of 2
Continued on Form Number

Observation Date: 4-9-11 Time Zone: EDT Start Time: 13:00 End Time: 14:00

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28	0	0	0	0	
29	0	0	0	0	
30	0	0	0	0	

Observer's Name (Print): SIDNEY GRAYSTON
Observer's Signature: [signature] Date: 4-9-11
Organization: AIR HYGIENE
Certified By: EPA Date: 10-19-10

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

VISUAL EMISSIONS OBSERVATION FORM

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

Process: FUEL OIL Unit: 3B Operating Mode: BASE
Control Equipment: HRSG Operating Mode: BASE

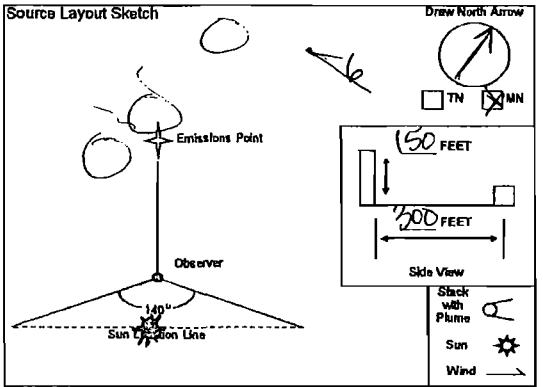
Describe Emissions Point: MIDDLE STACK IN GROUP OF 3 ON BLOCK 3 (B)
Height of Emiss. Pt. Start: 150 FT End: SAME Height of Emiss. Pt. Rel. to Observer Start: 150 FT End: SAME
Distance to Emiss. Pt. Start: 300 FT End: SAME Direction to Emiss. Pt. (Degrees) Start: 335° End: SAME

Vertical Angle to Obs. Pt. Start: 7 End: SAME Direction to Obs. Pt. (Degrees) Start: 335° End: SAME
Distance and Direction to Observation Point from Emission Point Start: 0'0" End: SAME

Describe Emissions Start: N/A End: SAME
Emission Color Start: N/A End: SAME Water Droplet Plume Start: NONE End: —

Describe Plume Background Start: CLOUDY SKY SAME
Background Color: SAME/WHITE End: SAME Sky Conditions Start: SCATTERED SAME
Wind Speed Start: 6 mph End: 6 mph Wind Direction Start: ENE End: SAME
Ambient Temp. Start: 83° End: 83° Wet Bulb Temp.: 71° RH Percent: 67%

Source Layout Sketch



Latitude: 26°22'34" Longitude: 80°41'18" Declination:

Additional Information:

Form Number: Page 2 of 2
Continued on Form Number:

Observation Date: 4-9-11 Time Zone: EDT Start Time: 13:00 End Time: 14:00

Min \ Sec.	0	15	30	45	Comments
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29	0	0	0	0	
30	0	0	0	0	

Observer's Name (Print): SIDNEY GRAYSTON
Observer's Signature: [signature] Date: 4-9-11
Organization: AIR HYGIENE
Certified By: ETA Date: 10-Feb-10

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 ROAD 80
City: LOXAHATCHEE State: FL Zip: 33470

Process: FUEL OIL Unit # 3B Operating Mode: BASE
Control Equipment: HRSG Operating Mode: BASE

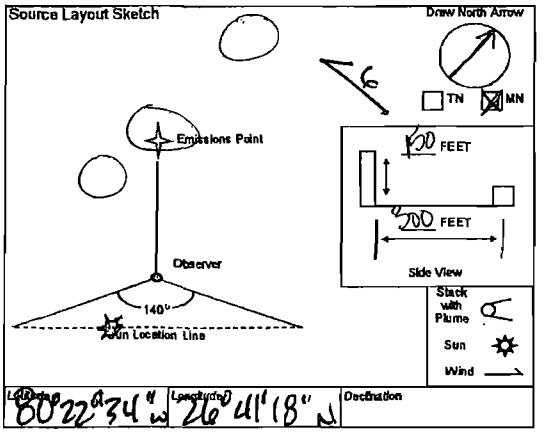
Describe Emissions Point: MIDDLE STACK IN GROUP OF 3 ON BLOCK 3 (B)
Height of Emiss. Pt. Start 150 FT End SAME
Height of Emiss. Pt. Rel. to Observer Start 150 FT End SAME
Distance to Emiss. Pt. Start 300 FT End SAME
Direction to Emiss. Pt. (Degrees) Start 335° End SAME

Vertical Angle to Obs. Pt. Start 0° End SAME
Directing to Obs. Pt. (Degrees) Start 335° End SAME
Distance and Direction to Observation Point from Emission Point Start 0 0 End SAME

Describe Emissions Start N/A End SAME
Emission Color Start N/A End SAME
Water Droplet Plume Start NONE End SAME

Describe Plume Background Start CLOUDY SKY End SAME
Background Color Start WHITE End SAME
Sky Conditions Start SCATTERED End SAME
Wind Speed Start 12 mph End 12 mph
Wind Direction Start ENE End SAME
Ambient Temp. Start 85° End 85°
Wet Bulb Temp. 70°
RH Percent 66%

Source Layout Sketch



Longitude: 80° 22' 34" W Latitude: 26° 41' 18" N Destination:

Additional Information:

VISUAL EMISSIONS OBSERVATION FORM

Form Number: Page 1 of 2
Continued on Form Number:

Observation Date: 4-9-11 Time Zone: EDT Start Time: 14:00 End Time: 15:00

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27	0	0	0	0	
28	0	0	0	0	
29	0	0	0	0	
30	0	0	0	0	

Observer's Name (Print): SIDNEY GRAYSTON
Observer's Signature: [signature] Date: 4-9-11
Organization: AIR HYGIENE
Certified By: EPA Date: 10-19-10

VISUAL EMISSIONS OBSERVATION FORM

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 ROAD 80
City: LOXAHATCHEE State: FL Zip: 33470

Process: FUEL OIL Unit #: 3B Operating Mode: BASE
Control Equipment: HRSG Operating Mode: BASE

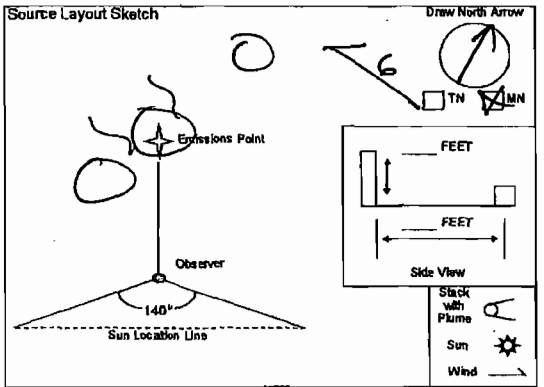
Describe Emissions Point: MIDDLE STACK IN GROUP OF 3 ON BLOCK 3 (B)
Height of Emiss. Pt. Start: 150 FT End: SAME Height of Emiss. Pt. Rel. to Observer Start: 150 FT End: SAME
Distance to Emiss. Pt. Start: 300 FT End: SAME Direction to Emiss. Pt. (Degrees) Start: 335° End: SAME

Vertical Angle to Obs. Pt. Start: 0° End: SAME Direction to Obs. Pt. (Degrees) Start: 335° End: SAME
Distance and Direction to Observation Point from Emission Point Start: 0' 0" End: SAME

Describe Emissions Start: N/A End: SAME
Emission Color Start: N/A End: SAME Water Droplet Plume Start: NONE End: —

Describe Plume Background Start: CLOUDY SKY End: SAME
Background Color Start: BLUE/WHITE End: SAME Sky Conditions Start: SCATTERED End: SAME
Wind Speed Start: 6mph End: 6mph Wind Direction Start: ENE End: SAME
Ambient Temp Start: 83° End: 83° Wet Bulb Temp: 70° RH Percent: 66%

Source Layout Sketch



Latitude: 80° 22' 34" W Longitude: 26° 41' 18" N Declination:

Additional Information:

Form Number: Page 2 of 2
Continued on Form Number:

Observation Date: Time Zone: Start Time: End Time:

Min. \ Sec.	0	15	30	45	Comments
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2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	
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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): SIDNEY GRAYDON
Observer's Signature: Date: 4-9-11
Organization: AIR HYGIENE
Certified By: ETA Date: 10-11-10

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.

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

$$RH_{sp} = \frac{79.28\ gr}{lb} \times \frac{1\ lb}{7000\ gr} = 0.011325 \frac{lb\ H_2O}{lb\ Air}$$

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.

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

$$CIP/CDP = \left[260.4\ psig + 14.8083\right] \times \frac{51.71493\ mmHg}{1\ psia} = 14{,}230\ mmHg\ (abs)$$

Heat Rate (MMBtu/hr)

$$\text{Heat Rate} = \frac{983{,}660.32\ Btu}{SCF} \times \frac{2{,}097.57\ SCF}{hr} \times \frac{MMBtu}{10^6\ Btu} = \frac{2{,}063.29\ MMBtu}{hr}$$

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)

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

$$ACE = \frac{12.35\ ppm - 12.10\ ppm}{23.60\ ppm} \times 100 = 1.06\ \%$$

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)

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

Eq. of a line y=mx+b

$$E_p = \frac{8.63\ ppm - 0.11\ ppm}{8.46\ ppm - 0.00\ ppm} \times 4.76\ ppm + 0.11 = 4.90\ ppm$$

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

$$ACE_{THC} = \frac{4.79\ ppm - 4.90\ ppm}{4.76\ ppm} \times 100 = -2.39\ \%$$

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 = $\frac{12.21 \text{ ppm} - 12.35 \text{ ppm}}{23.60 \text{ ppm}}$ x 100 = -0.59 %

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 = | -1.27 % - -0.59 % | = 0.68 %

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} = | 12.21 ppm - 12.35 ppm | = 0.14 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)

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

C_{Gas} = $\left(8.63 \text{ ppm} - 0.11 \text{ ppm} \right) \times \left(\frac{12.10 \text{ ppm}}{12.13 \text{ ppm} - 0.11 \text{ ppm}} \right)$ = 8.58 ppm

EXAMPLE CALCULATIONS (RUNS)

Stack Exhaust Flow (Q_S) - RM19

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

Q_S = $\frac{9{,}308.23 \text{ SCF}}{\text{MMBtu}}$ x $\frac{2{,}097.57 \text{ SCF}}{\text{hr}}$ x $\frac{983{,}660.32 \text{ Btu}}{\text{SCF}}$ x $\frac{\text{MMBtu}}{10^6 \text{ Btu}}$ x $\left[\frac{20.90\%}{20.9\% - 13.6\ \%} \right]$ = 55,245,283.07 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)

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

C_{adj} = 8.58 ppm x $\left(\frac{20.9\% - 15.00\ \%}{20.9\% - 13.63\ \%} \right)$ = 6.97 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} = 6.97 ppm@15%O_2 x $\sqrt{\frac{260.4 \text{ psig} + 14.69232 \text{ psi}}{0.01933677 \text{ psi/mm Hg.}} \times \frac{260.4 \text{ psig} + 14.8083 \text{ psi}}{0.01933677 \text{ psi/mm Hg.}}}$ x $2.718^{(19 \times (0.011325 \text{ lb/lb} - 0.00633))}$ x $\left(\frac{288 \text{ K}}{303 \text{ K}} \right)^{1.53}$ = 7.08 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)

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

$$E_{lb/hr} = \frac{8.58 \text{ ppm}}{10^6 \text{ ppm/part}} \times \frac{55{,}245{,}283 \text{ SCFH} \times 46.01 \text{ lb/lb-mol}}{385.23 \text{ SCF/lb-mol}} = \frac{56.62 \text{ lb}}{\text{hr}}$$

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)

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

$$E_{ton/yr} = \frac{56.62 \text{ lb}}{\text{hr}} \times \frac{500 \text{ hr}}{\text{year}} \times \frac{\text{ton}}{2000 \text{ lb}} = \frac{14.16 \text{ ton}}{\text{year}}$$

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:

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

$$E_{lb/MMBtu} = \frac{8.58 \text{ ppm} \times 9{,}308.23 \text{ SCF/MMBtu} \times 0.0000001194 \text{ lb/ppm*ft}^3 \times 20.9\%}{20.9\% - 13.63 \%} = \frac{0.027 \text{ lb}}{\text{MMBtu}}$$

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 *kilo*pascals ambient pressure, mm Hg
P_a = 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_r = 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^{-5} (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 feat
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)

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

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

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

3. Correction to % O_2 and ISO Conditions

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

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

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

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 (%)

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

$$\%CO\ (\%) = \frac{5.79 \quad ppm}{10{,}000\ ppm/\%} = 0.0000\ \%$$

Nitrogen Concentration (%)

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

$\%N_2$ (%) = 100 - 5.37 % - 13.63 % - 5.79 / 10,000 % = 81 %

Stack Dry Molecular Weight (lb/lb-mole)

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

$$M_d\ (lb/lb\text{-}mol) = \left(\frac{44\ lb/lb\text{-}mol}{100} \times 5.37\ \%\right) +$$

$$\left(\frac{32\ lb/lb\text{-}mol}{100} \times 13.63\ \%\right) + \left(\frac{28\ lb/lb\text{-}mol}{100} \times \left[\frac{5.79}{10{,}000} + 81.00\ \right]\right) = \frac{29.40\ lb}{lb\text{-}mol}$$

Stack Wet Molecular Weight (lb/lb-mole)

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

$$M_S\ (lb/lb\text{-}mol) = \left\{\frac{29.40\ lb}{lb\text{-}mol} \times \left(1 - \frac{8.44\ \%}{100}\right)\right\} + \left\{\frac{18\ lb}{lb\text{-}mol} \times \frac{8.44\ \%}{100}\right\} = \frac{28.44\ lb}{lb\text{-}mol}$$

Average Calculated Fuel Factor (F_o)

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

$$F_{o(avg)} = \frac{20.9\% - 13.63\ \% - (0.5 \times 0.001\ \%)}{5.37\ \% + 0.001\ \%} = 1.350$$

Average Excess Air (%)

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

$$(\%EA)_{AVG} = \frac{100 \times \{\ 13.63\ \% - (0.5 \times 0.001\ \%)\}}{(0.264 \times 81.00\ \%) - \{\ 13.63\ \% - (0.5 \times 0.001\ \%)\}} = 175.79\ \%$$

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 (in. Hg) = 30.15 in. Hg + $\frac{0.76 \text{ in. } H_2O}{13.6 \text{ in. } H_2O/\text{in. Hg}}$ = 30.21 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) =

$$\left(\frac{85.49 \text{ ft (lb/lb-mol)(in. Hg)}}{\sec \quad (^\circ R)(\text{in. } H_2O)}\right)^{1/2} \times 0.84 \times 0.94 \text{ in.}H_2O^{1/2} \times \sqrt{\frac{236.92 + 460\ ^\circ R}{30.21 \text{ in. Hg} \times 28.44 \text{ lb/lb-mol}}} = \frac{60.6 \text{ ft}}{\sec}$$

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} (dscf/hr) = $\frac{3600 \text{ sec}}{\text{hr}}$ x (1 - $\frac{8.44\ \%}{100}$) x $\frac{60.64 \text{ ft}}{\sec}$ x 378.35 ft^2 x $\frac{68.00 + 460\ ^\circ R}{236.92 + 460\ ^\circ R}$ x $\frac{30.21 \text{ in. Hg}}{29.92 \text{ in. Hg}}$ = $\frac{57{,}838{,}311.26 \text{ dscf}}{\text{hr}}$

Average Stack Wet Flow Rate (acfm)

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

Q_{aw} (acf/min) = $\frac{60 \text{ sec}}{\text{min}}$ x $\frac{60.64 \text{ ft}}{\sec}$ x 378.35 ft^2 = $\frac{1{,}376{,}540.92 \text{ acf}}{\text{min}}$

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} (ascf/hr) = $\frac{60 \text{ min}}{\text{hr}}$ x $\frac{1{,}376{,}540.92 \text{ acf}}{\text{min}}$ x $\frac{68.00 + 460\ ^\circ R}{236.92 + 460\ ^\circ R}$ x $\frac{30.21 \text{ in. Hg}}{29.92 \text{ in. Hg}}$ = $\frac{63{,}171{,}819.31 \text{ ascf}}{\text{hr}}$

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)

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

$V_{wsg(std)}$ = 81.90 g x 0.04715 ft^3/g = 3.860 scf

Standard Meter Volume (dscf)

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

$$V_{m(std)} = \frac{\frac{17.65\ ^\circ R}{in.\ Hg} \times 0.99 \times 42.96\ dcf \times \left(30.15\ in.\ Hg + \frac{1.68\ in.\ H_2O}{13.6\ in.\ H_2O / in.\ Hg}\right)}{83.13\ ^\circ F + 460\ ^\circ R} = 41.88\ dscf$$

Calculated Moisture Content (%)

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

$$B_{ws(calc)} = 100 \times \frac{3.86\ dscf}{3.86\ dscf + 41.88\ dscf} = 8.44\ \%$$

Saturated Moisture Content (%)

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

$$B_{ws(svp)} = 100 \times \frac{10^{\left(6.691 - \frac{3144}{236.92\ ^\circ F + 390.86}\right)}}{30.15\ in.\ Hg + \frac{0.76\ in.\ H_2O}{13.6\ in.\ H_2O / in.\ Hg}} \leq 100 = 100.00\ \%$$

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) = 1.97 x 0.82 in. H_2O = 1.62 in. H_2O

Absolute Meter Pressure (in. Hg)

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

P_m (in. Hg) = 30.15 in. Hg + $\frac{1.75 \text{ in. } H_2O}{13.6 \text{ in. } H_2O/\text{in. Hg}}$ = 30.28 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.) = $\sqrt{\frac{0.03575 \text{ (lb-mole•°R•in. } H_2O)^{1/2} \text{•min•in.}^2}{\text{acf•in. Hg}^{3/4} \text{•lb}^{1/2}} \text{ x } 0.75 \text{ acf x } 30.28 \text{ in. Hg } \left(1 - \frac{0.00\ \%}{100}\right) \text{ x } \left(\frac{1}{1 - \frac{8.44\ \%}{100}}\right) \text{ x } \sqrt{(236.92 \text{ °F} + 460\text{°R}) \text{ x } \frac{\frac{29.40 \text{ lb}}{\text{lb-mole}} \text{ x } \left(1 - \frac{8.44\ \%}{100}\right) + \left(\frac{18 \text{ lb}}{\text{lb-mol}} \text{ x } \frac{8.44\ \%}{100}\right)}{30.21 \text{ in. Hg x } 0.94 \text{ in. } H_2O}}}$ = 0.220 in.

ΔP to ΔH Isokinetic Factor

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

K = $\frac{849.8}{\text{in. } H_2O\text{•in.}^4}$ x 0.84 ^{2} x 1.75 in. H_2O x 0.23 ^{4} x $\left(\frac{1 - \frac{8.44\ \%}{100}}{1 - \frac{0.00\ \%}{100}}\right)^2$ x $\frac{83.13 \text{ °F} + 460\text{°R}}{236.92 \text{ °F} + 460\text{°R}}$) x

$\left(\frac{\frac{29.40 \text{ lb}}{\text{lb/mole}} \text{ x } \left(1 - \frac{0.00\ \%}{100}\right) + \left(\frac{18 \text{ lb}}{\text{lb-mol}} \text{ x } \frac{0.00\ \%}{100}\right)}{\frac{29.40 \text{ lb}}{\text{lb/mole}} \text{ x } \left(1 - \frac{8.44\ \%}{100}\right) + \left(\frac{18 \text{ lb}}{\text{lb-mol}} \text{ x } \frac{8.44\ \%}{100}\right)}\right) \text{ x } \frac{30.21 \text{ in. Hg}}{30.28 \text{ in. Hg}}$ = 1.97

Cumulative Percent Isokinetic (%) (first point)

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

I (%) = $\frac{\frac{0.0945 \text{ min•in. Hg}}{\text{sec•°R}} \text{ x } (236.00 \text{ °F} + 460 \text{ °R}) \text{ x } 1.61 \text{ dscf}}{2.50 \text{ min x } \frac{58.53 \text{ ft}}{\text{sec}} \text{ x } 30.21 \text{ in. Hg x } 3.14 \text{ x } \left(\frac{0.23 \text{ in.}}{2} \text{ x } \frac{\text{ft.}}{12 \text{ in.}}\right)^2 \text{x } \left(1 - \frac{8.44\ \%}{100}\right)}$ = 90.74 %

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) = 41.88 dscf x 28.31685 L/dscf = 1185.80 L

Volume of NH_3 (L)

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

V_a (L) =

(7.68 mg / L x 150.00 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) +

(0.00 mg / L x 150.00 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 = 0.00151 L

NH_3 Concentration (ppmvd)

$$C_{NH3}(ppmvd) = \frac{V_{a(front)} + V_{a(back)}}{(V_m)_{dstdL}} \times 10^6$$

C_{NH3} (ppmvd) = $\frac{0.00 \text{ L}}{1185.80 \text{ L}} \times 10^6$ = 1.28 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} = 1.28 ppmvd x ($\frac{20.9\% - 15.00\ \%}{20.9\% - 13.6\ \%}$) = 1.04 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/$R^{0.5}$)
- $C_3 = 1.19183 \times 10^6$ (micropoise/K^2) = 3.86153×10^6 (micropoise/R^2)
- C_4 = 0.591123 (micropoise)
- C_5 = 91.9723 (micropoise)
- $C_6 = 4.91705 \times 10^{-5}$ (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 (^oF)
- T_m = Meter box and orifice gas temperature, ^oR
- t_n = Sampling time at point n, min
- t_r = Total projected run time, min
- T_s = Absolute stack gas temperature, ^oR
- T_{std} = standard temperature, 68^oF, 528^oR
- T_u = absolute temperature offset, 460^oR
- 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 9, 2011
Project Number:	bv-10-westcounty.fl-comp#2
Manufacturer & Equipment:	Mitsubishi
Model:	501G
Unit Number:	3B
Test Load:	Fuel Oil
Tester(s) / Test Unit(s):	JF/MV/SG/TS/CM/206

		RUN		
	UNITS	**1**	**2**	**3**
Start Time	hh:mm:ss	11:00:29	12:37:29	14:30:29
End Time	hh:mm:ss	12:12:29	14:13:59	15:44:59
Bar. Pressure	in. Hg	30.15	30.14	30.11
Amb. Temp.	°F	86	90	90
Rel. Humidity	%	43	39	42
Spec. Humidity	lb water / lb air	0.011325	0.011667	0.012595
Comb. Inlet Pres.	psig	260.4	258.0	256.3
Ammonia Injection Rate	lb/hr	444.2	438.2	437.0
Turbine Fuel Flow	gal/hr	15,691	15,509	15,395
Total Fuel Flow	SCFH	2,098	2,073	2,058
Stack Moisture	% Method 4	8.4	8.7	8.7
Heat Input	MMBtu/hr	2063.3	2039.4	2024.4
Power Output	megawatts	211.5	208.3	206.3

UNIT OPERATION PARAMETERS

Fuel Oil Load

Unit 3 Emissions Testing

	Combustor Inlet Pressure B psig	CT B Load MW	Ammonia Mass Flow CT B PPH	CT B Fuel Oil Flow lb/hr
09-Apr-11 11:00:00	261.63	213.37	431.44	112598.46
09-Apr-11 11:01:00	261.30	213.69	451.36	112579.63
09-Apr-11 11:02:00	261.48	212.01	458.59	112167.63
09-Apr-11 11:03:00	261.43	212.90	457.23	112224.97
09-Apr-11 11:04:00	261.74	214.15	426.98	112850.16
09-Apr-11 11:05:00	261.41	212.99	468.28	112534.88
09-Apr-11 11:06:00	260.98	211.68	498.71	111919.98
09-Apr-11 11:07:00	261.22	213.14	444.02	112485.73
09-Apr-11 11:08:00	261.07	212.13	452.89	112144.39
09-Apr-11 11:09:00	261.00	212.47	437.79	111987.59
09-Apr-11 11:10:00	261.21	212.56	424.45	112304.79
09-Apr-11 11:11:00	261.23	213.06	455.47	112339.44
09-Apr-11 11:12:00	261.26	212.13	469.57	112027.02
09-Apr-11 11:13:00	261.10	212.82	470.10	112251.59
09-Apr-11 11:14:00	260.91	212.47	470.39	112377.97
09-Apr-11 11:15:00	260.77	212.10	493.77	111866.58
09-Apr-11 11:16:00	260.80	211.50	471.13	111825.86
09-Apr-11 11:17:00	261.06	213.03	431.27	112297.83
09-Apr-11 11:18:00	260.97	212.07	461.11	111951.81
09-Apr-11 11:19:00	260.92	212.10	460.11	111895.58
09-Apr-11 11:20:00	260.98	213.38	430.45	112397.26
09-Apr-11 11:21:00	260.72	212.47	466.63	112007.73
09-Apr-11 11:22:00	260.40	211.58	20.40	111740.65
09-Apr-11 11:23:00	260.48	211.90	-0.34	111861.15
09-Apr-11 11:24:00	260.57	211.10	327.70	111743.80
09-Apr-11 11:25:00	260.66	211.49	565.62	111858.98
09-Apr-11 11:26:00	260.74	212.13	484.85	112073.89
09-Apr-11 11:27:00	260.60	211.95	450.24	111913.58
09-Apr-11 11:28:00	260.51	211.40	437.20	111730.08
09-Apr-11 11:29:00	260.58	211.68	456.47	111762.80
09-Apr-11 11:30:00	260.66	212.41	454.53	111990.80
09-Apr-11 11:31:00	260.53	212.23	468.98	112033.42
09-Apr-11 11:32:00	260.34	210.88	495.30	111577.29
09-Apr-11 11:33:00	260.34	211.49	481.38	111806.89
09-Apr-11 11:34:00	260.18	211.81	454.53	111894.49
09-Apr-11 11:35:00	260.01	211.07	534.19	111430.70
09-Apr-11 11:36:00	260.20	210.46	471.27	111523.59
09-Apr-11 11:37:00	260.35	211.87	399.49	111889.37
09-Apr-11 11:38:00	260.15	211.34	404.89	111816.81
09-Apr-11 11:39:00	260.02	210.73	441.96	111534.09
09-Apr-11 11:40:00	259.87	211.04	520.33	111610.54
09-Apr-11 11:41:00	259.84	211.20	448.54	111736.47
09-Apr-11 11:42:00	259.72	210.32	453.53	111364.02
09-Apr-11 11:43:00	259.76	210.68	426.51	111423.74
09-Apr-11 11:44:00	259.93	210.57	452.42	111440.60
09-Apr-11 11:45:00	260.17	210.94	459.20	111467.45
09-Apr-11 11:46:00	260.41	211.04	416.52	111806.41
09-Apr-11 11:47:00	260.47	211.46	409.47	111938.75
09-Apr-11 11:48:00	260.17	211.15	471.69	111653.42
09-Apr-11 11:49:00	260.05	211.25	470.22	111507.04
09-Apr-11 11:50:00	259.98	211.22	470.57	111584.62
09-Apr-11 11:51:00	259.92	210.55	464.17	111477.64
09-Apr-11 11:52:00	259.88	210.58	461.29	111446.71
09-Apr-11 11:53:00	259.85	211.00	439.96	111574.43
09-Apr-11 11:54:00	259.89	210.70	461.11	111327.98
09-Apr-11 11:55:00	260.01	210.91	417.87	111575.45
09-Apr-11 11:56:00	260.18	211.16	416.52	111912.45
09-Apr-11 11:57:00	259.87	210.30	466.46	111177.27
09-Apr-11 11:58:00	259.83	211.04	460.70	111492.92
09-Apr-11 11:59:00	259.94	211.28	447.72	111751.94
09-Apr-11 12:00:00	259.68	210.33	474.89	111326.82
09-Apr-11 12:01:00	259.55	209.97	459.23	111211.34
09-Apr-11 12:02:00	259.62	210.89	460.32	111423.90
09-Apr-11 12:03:00	259.56	210.33	460.47	111393.47
09-Apr-11 12:04:00	259.52	210.15	460.35	111335.91
09-Apr-11 12:05:00	259.65	210.21	460.00	111183.71
09-Apr-11 12:06:00	259.69	210.91	460.76	111596.32
09-Apr-11 12:07:00	259.70	210.52	462.87	111406.82
09-Apr-11 12:08:00	259.51	209.60	463.10	111092.66
09-Apr-11 12:09:00	259.46	210.46	460.70	111422.42
09-Apr-11 12:10:00	259.54	210.15	462.29	111286.16
09-Apr-11 12:11:00	259.20	209.70	461.76	111017.56
09-Apr-11 12:12:00	259.40	210.76	462.40	111540.27
Average	260.36	211.48	444.17	111777.08

Unit 3 Emissions Testing

	Combustor Inlet Pressure B psig	CT B Load MW	Ammonia Mass Flow CT B PPH	CT B Fuel Oil Flow lb/hr
09-Apr-11 12:37:00	258.34	210.08	449.13	111241.14
09-Apr-11 12:38:00	259.24	209.69	445.13	111250.41
09-Apr-11 12:39:00	258.97	209.94	442.25	110936.99
09-Apr-11 12:40:00	258.94	210.06	549.05	110992.78
09-Apr-11 12:41:00	258.94	209.63	439.38	111183.90
09-Apr-11 12:42:00	258.96	209.72	394.38	110763.99
09-Apr-11 12:43:00	259.06	210.06	387.74	111140.39
09-Apr-11 12:44:00	258.92	210.25	333.40	111353.37
09-Apr-11 12:45:00	258.77	208.59	450.30	110748.80
09-Apr-11 12:46:00	258.76	208.93	433.03	110840.02
09-Apr-11 12:47:00	258.73	209.75	409.41	111085.47
09-Apr-11 12:48:00	258.38	209.20	439.90	111032.98
09-Apr-11 12:49:00	258.16	207.25	482.44	110291.42
09-Apr-11 12:50:00	258.33	207.80	451.95	110444.10
09-Apr-11 12:51:00	258.75	209.43	413.47	111009.91
09-Apr-11 12:52:00	258.76	209.33	433.56	110847.86
09-Apr-11 12:53:00	258.59	208.90	467.57	110752.41
09-Apr-11 12:54:00	258.55	209.30	452.95	110865.09
09-Apr-11 12:55:00	258.44	208.47	468.04	110663.50
09-Apr-11 12:56:00	258.43	209.05	437.55	110627.52
09-Apr-11 12:57:00	258.55	209.17	435.20	110895.77
09-Apr-11 12:58:00	258.52	208.92	448.54	110731.84
09-Apr-11 12:59:00	258.54	208.75	469.34	110601.89
09-Apr-11 13:00:00	258.56	209.08	431.15	110960.06
09-Apr-11 13:01:00	258.54	209.27	517.51	110999.58
09-Apr-11 13:02:00	257.95	208.04	514.75	110516.63
09-Apr-11 13:03:00	257.68	208.70	425.28	110673.77
09-Apr-11 13:04:00	257.66	207.98	394.85	110189.56
09-Apr-11 13:05:00	257.75	206.67	407.65	109870.95
09-Apr-11 13:06:00	258.24	208.11	371.46	110580.08
09-Apr-11 13:07:00	258.02	208.53	366.71	110688.41
09-Apr-11 13:08:00	257.92	207.39	414.58	110158.53
09-Apr-11 13:09:00	257.99	208.76	435.97	110667.23
09-Apr-11 13:10:00	257.92	208.26	527.20	110551.03
09-Apr-11 13:11:00	257.82	207.89	506.41	110170.56
09-Apr-11 13:12:00	257.94	208.20	433.56	110275.45
09-Apr-11 13:13:00	258.35	209.12	378.56	110788.77
09-Apr-11 13:14:00	258.01	208.23	419.58	110551.81
09-Apr-11 13:15:00	257.98	207.83	502.70	110385.42
09-Apr-11 13:16:00	257.89	209.14	472.92	110701.38
09-Apr-11 13:17:00	257.74	207.94	439.26	110397.72
09-Apr-11 13:18:00	257.51	207.11	428.80	110081.52
09-Apr-11 13:19:00	257.55	207.95	407.95	110516.75
09-Apr-11 13:20:00	257.62	207.53	433.27	110168.91
09-Apr-11 13:21:00	257.30	207.01	452.53	110155.31
09-Apr-11 13:22:00	257.15	207.53	422.75	110291.94
09-Apr-11 13:23:00	257.43	206.95	438.38	109865.87
09-Apr-11 13:24:00	256.99	207.25	426.45	110269.23
09-Apr-11 13:25:00	257.19	207.65	486.37	110290.11
09-Apr-11 13:26:00	257.36	207.59	425.81	110228.94
09-Apr-11 13:27:00	257.01	206.30	394.55	109929.33
09-Apr-11 13:28:00	257.37	207.71	390.03	110026.23
09-Apr-11 13:29:00	257.37	206.85	484.07	109889.30
09-Apr-11 13:30:00	257.88	208.14	463.40	110296.78
09-Apr-11 13:31:00	258.12	208.29	457.70	110631.78
09-Apr-11 13:32:00	257.93	208.56	439.49	110539.02
09-Apr-11 13:33:00	257.74	207.91	471.74	110371.48
09-Apr-11 13:34:00	257.74	207.89	462.23	110305.30
09-Apr-11 13:35:00	257.85	208.17	514.57	110402.95
09-Apr-11 13:36:00	257.85	207.48	432.85	110214.80
09-Apr-11 13:37:00	257.83	207.86	401.90	110346.65
09-Apr-11 13:38:00	257.88	208.47	406.30	110494.95
09-Apr-11 13:39:00	257.85	207.68	446.66	110133.19
09-Apr-11 13:40:00	257.71	207.92	453.00	110439.34
09-Apr-11 13:41:00	257.71	207.83	436.67	110509.40
09-Apr-11 13:42:00	257.56	207.07	465.52	110015.95
09-Apr-11 13:43:00	257.77	208.39	471.69	110472.90
09-Apr-11 13:44:00	257.91	208.47	534.54	110463.25
09-Apr-11 13:45:00	257.79	207.92	487.72	110352.03
09-Apr-11 13:46:00	257.83	207.80	407.89	110288.73
09-Apr-11 13:47:00	257.89	207.95	384.74	110393.42
09-Apr-11 13:48:00	257.94	208.35	404.48	110354.18
09-Apr-11 13:49:00	258.11	208.62	444.78	110474.60
09-Apr-11 13:50:00	258.13	208.94	442.37	110653.98
09-Apr-11 13:51:00	258.07	208.41	483.08	110549.51
09-Apr-11 13:52:00	257.96	208.27	452.12	110479.55
09-Apr-11 13:53:00	257.93	207.83	453.77	110406.44
09-Apr-11 13:54:00	258.03	208.09	427.57	110336.27
09-Apr-11 13:55:00	257.96	209.11	413.23	110854.95
09-Apr-11 13:56:00	257.58	208.19	456.12	110506.23
09-Apr-11 13:57:00	257.37	207.14	218.20	110058.24
09-Apr-11 13:58:00	257.66	207.53	108.28	110135.77
09-Apr-11 13:59:00	257.81	208.87	512.04	110215.49
09-Apr-11 14:00:00	257.84	208.40	535.54	110390.23
09-Apr-11 14:01:00	257.76	207.83	503.35	110550.20
09-Apr-11 14:02:00	257.55	207.95	439.32	110327.42
09-Apr-11 14:03:00	257.52	206.55	475.68	109857.48
09-Apr-11 14:04:00	257.79	208.69	382.98	110573.08
09-Apr-11 14:05:00	257.45	208.35	402.95	110522.20
09-Apr-11 14:06:00	257.07	206.92	459.29	110111.38
09-Apr-11 14:07:00	257.09	207.08	461.05	109832.68
09-Apr-11 14:08:00	257.23	207.54	424.63	110178.27
09-Apr-11 14:09:00	257.61	207.40	414.41	110148.38
09-Apr-11 14:10:00	257.64	207.92	427.86	110332.23
09-Apr-11 14:11:00	257.82	208.11	439.26	110441.59
09-Apr-11 14:12:00	257.85	208.23	449.95	110363.13
09-Apr-11 14:13:00	258.02	208.11	436.26	110576.95
Average	257.98	208.26	438.16	110485.18

Unit 3 Emissions Testing

	Combustor Inlet Pressure B psig	CT B Load MW	Ammonia Mass Flow CT B PPH	CT B Fuel Oil Flow lb/hr
09-Apr-11 14:30:00	257.07	206.64	428.51	109934.91
09-Apr-11 14:31:00	257.01	207.07	499.36	110171.73
09-Apr-11 14:32:00	256.80	206.88	422.60	110025.44
09-Apr-11 14:33:00	256.52	206.55	396.37	109813.48
09-Apr-11 14:34:00	256.52	206.49	409.47	109715.06
09-Apr-11 14:35:00	256.55	206.34	447.42	109871.19
09-Apr-11 14:36:00	256.58	206.69	443.31	109842.71
09-Apr-11 14:37:00	256.58	206.88	432.85	109762.41
09-Apr-11 14:38:00	256.53	206.48	426.63	109699.93
09-Apr-11 14:39:00	256.68	206.09	451.42	109561.51
09-Apr-11 14:40:00	256.86	206.30	421.63	109977.29
09-Apr-11 14:41:00	257.03	206.92	414.94	110080.24
09-Apr-11 14:42:00	256.74	206.27	447.01	109747.91
09-Apr-11 14:43:00	256.76	207.25	440.90	110094.31
09-Apr-11 14:44:00	256.74	206.72	477.38	109840.88
09-Apr-11 14:45:00	256.60	206.46	447.48	109606.35
09-Apr-11 14:46:00	256.64	207.62	432.50	110157.83
09-Apr-11 14:47:00	256.64	206.35	470.33	109743.86
09-Apr-11 14:48:00	256.55	205.94	504.53	109599.49
09-Apr-11 14:49:00	256.90	207.01	461.88	110023.41
09-Apr-11 14:50:00	256.90	206.95	408.42	109836.01
09-Apr-11 14:51:00	256.67	206.37	386.21	109807.34
09-Apr-11 14:52:00	256.60	207.28	386.50	110144.88
09-Apr-11 14:53:00	256.36	206.85	437.97	109772.28
09-Apr-11 14:54:00	255.48	206.46	527.91	109800.38
09-Apr-11 14:55:00	255.95	205.62	427.98	109219.98
09-Apr-11 14:56:00	256.12	206.02	362.24	109505.51
09-Apr-11 14:57:00	256.45	206.79	356.19	109890.69
09-Apr-11 14:58:00	256.24	206.52	430.92	109701.04
09-Apr-11 14:59:00	256.15	205.45	495.83	109407.91
09-Apr-11 15:00:00	256.13	206.49	453.42	109761.77
09-Apr-11 15:01:00	256.22	206.18	443.02	109577.48
09-Apr-11 15:02:00	255.99	205.60	350.90	109213.55
09-Apr-11 15:03:00	256.23	206.11	376.69	109674.93
09-Apr-11 15:04:00	256.47	206.43	364.42	109694.22
09-Apr-11 15:05:00	256.17	205.74	438.44	109348.62
09-Apr-11 15:06:00	256.53	206.96	443.55	109916.11
09-Apr-11 15:07:00	256.60	206.12	480.20	109554.42
09-Apr-11 15:08:00	256.43	206.21	475.03	109622.76
09-Apr-11 15:09:00	256.58	207.43	435.97	109961.42
09-Apr-11 15:10:00	256.18	206.12	451.95	109798.73
09-Apr-11 15:11:00	256.13	205.60	449.42	109311.63
09-Apr-11 15:12:00	256.25	205.76	434.97	109504.41
09-Apr-11 15:13:00	256.35	206.40	425.16	109738.42
09-Apr-11 15:14:00	255.97	205.82	447.19	109647.06
09-Apr-11 15:15:00	255.60	204.99	465.05	109368.53
09-Apr-11 15:16:00	254.97	204.70	436.73	109213.89
09-Apr-11 15:17:00	255.74	204.82	402.84	109001.37
09-Apr-11 15:18:00	255.78	205.51	366.78	109314.58
09-Apr-11 15:19:00	256.39	206.15	498.77	109718.76
09-Apr-11 15:20:00	256.08	206.21	600.28	109612.09
09-Apr-11 15:21:00	255.82	205.73	417.35	109538.86
09-Apr-11 15:22:00	255.71	205.27	542.48	109193.53
09-Apr-11 15:23:00	255.83	205.82	422.40	109336.09
09-Apr-11 15:24:00	256.01	206.27	350.37	109750.26
09-Apr-11 15:25:00	256.08	206.12	431.21	109562.25
09-Apr-11 15:26:00	256.01	205.53	471.27	109387.23
09-Apr-11 15:27:00	256.22	205.95	426.39	109518.87
09-Apr-11 15:28:00	256.32	206.98	418.64	109676.70
09-Apr-11 15:29:00	256.23	206.88	428.35	109823.04
09-Apr-11 15:30:00	256.13	206.24	455.18	109648.83
09-Apr-11 15:31:00	255.86	206.18	455.24	109476.84
09-Apr-11 15:32:00	256.18	206.52	433.03	109680.04
09-Apr-11 15:33:00	256.29	206.15	432.62	109614.40
09-Apr-11 15:34:00	256.32	206.23	414.47	109662.23
09-Apr-11 15:35:00	256.37	206.46	424.60	109665.05
09-Apr-11 15:36:00	256.45	206.65	425.98	109690.27
09-Apr-11 15:37:00	256.53	206.03	479.15	109751.27
09-Apr-11 15:38:00	256.55	207.25	433.65	109982.31
09-Apr-11 15:39:00	256.36	206.62	518.51	109780.31
09-Apr-11 15:40:00	256.15	205.99	437.32	109685.12
09-Apr-11 15:41:00	256.03	206.13	428.92	109524.91
09-Apr-11 15:42:00	255.91	205.95	431.62	109490.55
09-Apr-11 15:43:00	255.78	205.65	385.15	109425.36
09-Apr-11 15:44:00	255.62	205.76	375.34	109463.73
Average	256.30	206.28	437.02	109669.85

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

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 = 100.1600
Avg. Concentration:	8.916	%

Concentration = A + Bx + Cx2 + Dx3 + Ex4
r = 0.999989193

Constants:	A = -0.00227706
B = 0.142642211	C = -0.0004667
D = 0.0000133988	E = 0

OXYGEN

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	%

Concentration = A + Bx + Cx2 + Dx3 + Ex4
r = 0.9999996862

Constants:	A = -0.0380161
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=90.50000
Z3=0.00000	T3=90.50000	R3=100.0000
Avg. Concentration:	19.07	%

Concentration = A+Bx+Cx2+Dx3+Ex4
r=0.999986

Constants:	A=-0.00585731
B=0.131065652	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 | **Second Triad Analysis** | **Calibration Curve**

CARBON MONOXIDE

First Triad Analysis	Second Triad Analysis	Calibration Curve
Date: 30Apr2010 Response Unit:PPM	Date: 07May2010 Response Unit: PPM	Concentration = A + Bx + Cx2 + Dx3 + Ex4
Z1 = -0.00481 R1 = 241.9239 T1 = 23.39141	Z1 = -0.00417 R1 = 240.9105 T1 = 23.18030	r = 9.99985E-1
R2 = 242.0561 Z2 = -0.00195 T2 = 23.42998	R2 = 241.2416 Z2 = 0.00845 T2 = 23.21160	Constants: A = 0.00000E+0
Z3 = 0.23106 T3 = 23.44974 R3 = 242.2529	Z3 = 0.28117 T3 = 23.35798 R3 = 241.2466	B = 5.06495E-1 C = 1.93000E-4
Avg. Concentration: 23.23 PPM	Avg. Concentration: 23.13 PPM	D = 0.00000E+0 E = 0.00000E+0

NITRIC OXIDE

First Triad Analysis	Second Triad Analysis	Calibration Curve
Date: 30Apr2010 Response Unit:PPM	Date: 07May2010 Response Unit: PPM	Concentration = A + Bx + Cx2 + Dx3 + Ex4
Z1 = -0.03952 R1 = 95.90178 T1 = 23.28269	Z1 = -0.13287 R1 = 94.53774 T1 = 23.24871	r = 9.99985E-1
R2 = 95.91071 Z2 = -0.02811 T2 = 23.36449	R2 = 95.07222 Z2 = -0.00119 T2 = 23.38911	Constants: A = 0.00000E+0
Z3 = -0.00286 T3 = 23.37331 R3 = 96.05732	Z3 = 0.07275 T3 = 23.45024 R3 = 95.38034	B = 9.98166E-1 C = 2.95000E-4
Avg. Concentration: 23.33 PPM	Avg. Concentration: 23.53 PPM	D = 0.00000E+0 E = 0.00000E+0

Special Notes: AH074 Lot Number: 0587288002

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: EPA Protocol Gas

Assay Laboratory

P.O. No.: 9092010

AIR LIQUIDE AMERICA SPECIALTY GASES LLC Project No.: 05-80747-007
1290 COMBERMERE STREET
TROY, MI 48083

Customer

AIR LIQUIDE AMERICA L.P.

801 W NORTH CARRIER PKWY
GRAND PRAIRIE TX 75050-1003

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: AAL687 **Certification Date:** 12Oct2009 **Exp. Date:** 11Oct2012
Cylinder Pressure*:** 2000 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)		ANALYTICAL ACCURACY**	TRACEABILITY
METHANE	3.10	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 1659 10	02Oct2013	ALM058053	9.920 PPM	METHANE

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
VARIAN/3400/7506	17Sep2009	TCD/FID

ANALYZER READINGS

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

First Triad Analysis

METHANE

Date: 12Oct2009 Response Unit:AREA
Z1=0.00000 R1=91476.00 T1=28119.00
R2=91405.00 Z2=0.00000 T2=28109.00
Z3=0.00000 T3=28107.00 R3=91478.00
Avg. Concentration: 3.100 PPM

Second Triad Analysis

Calibration Curve

Concentration=A+Bx+Cx2+Dx3+Ex4
r=0.99999124
Constants: A=0.04550378
B=0.000107911 C=0
D=0 E=0

APPROVED BY:

ROBERT LESNIAK

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

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

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

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	4.755	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

AIR LIQUIDE AMERICA, L.P. · Region Office • 8832 Dice Road, Santa Fe Springs, CA 90670-2516
Phone: (562) 945-1383 • Fax: (562) 693-1156

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	0.302	0.025	ppm
Manufacturer:	MKS Instruments			INITIAL			Reference	51.223	51.248	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

AIR LIQUIDE AMERICA, L.P. Region Office • 8832 Dice Road, Santa Fe Springs, CA 90670-2516
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 9, 2011
Company: Florida Power and Light
Location: Loxahatchee, Florida
Techs: JRF/MV

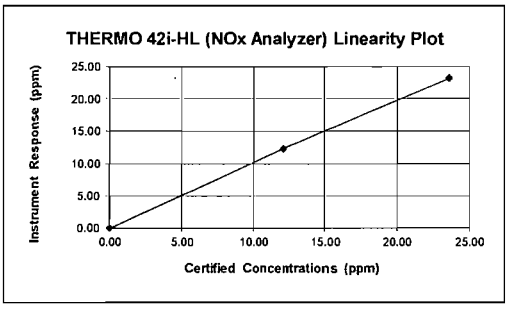
Sample System Leak Check

Date	Sample System	Leak Rate (l/min)
April 9, 2011	1	0

Calibration Date: April 9, 2011
Client: Florida Power and Light

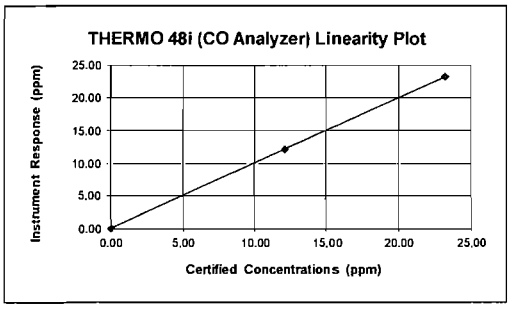
NOx Span (ppm) = 23.60

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	12.35	1.06	0.25	YES (%)
23.60	23.17	-1.82	0.43	YES (%)
Linearity = 1.019				



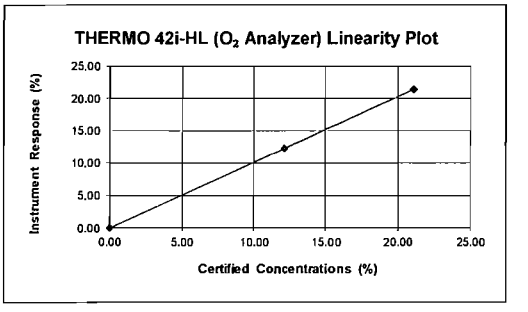
CO Span (ppm) = 23.20

THERMO 48i (CO Analyzer)				
Certified Concentration (ppm)	Instrument Response (ppm)	Calibration Error (%)	Absolute Conc. (ppm)	Pass or Fail (±2%, ≤0.5ppm)
0.00	0.10	0.43	0.10	YES (%)
12.10	12.20	0.43	0.10	YES (%)
23.20	23.19	-0.04	0.01	YES (%)
Linearity = 1.005				



O_2 Span (%) = 21.10

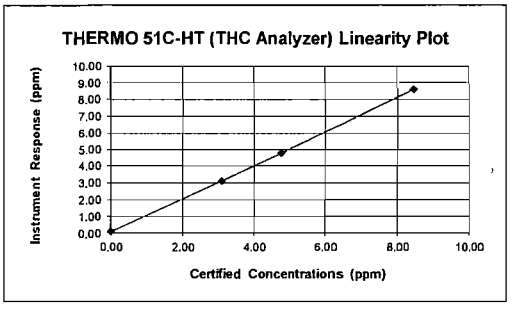
THERMO 42i-HL (O_2 Analyzer)				
Certified Concentration (%)	Instrument Response (%)	Calibration Error (%)	Absolute Conc. (%)	Pass or Fail (±2%, ≤0.5%)
0.00	0.01	0.05	0.01	YES (%)
12.10	12.28	0.85	0.18	YES (%)
21.10	21.47	1.75	0.37	YES (%)
Linearity = 0.983				



THC Range (ppm) = 10.5

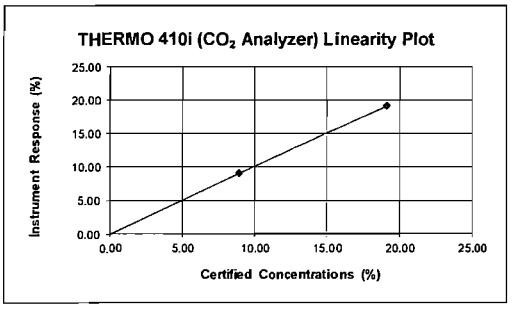
THERMO 51C-HT (THC Analyzer)				
Certified Concentration (ppm)	Instrument Response (ppm)	Calibration Error (%)	Estimated Point (ppm)	Pass or Fail (±2,5%)[1]
0.00	0.11	1.05	N/A	YES
3.10	3.13	-3.29	3.23	YES
4.76	4.79	-2.39	4.90	YES
8.46	8.63	1.62	N/A	YES
Linearity = 0.973				

[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	-0.01	-0.05	0.01	YES (%)
8.91	9.12	1.10	0.21	YES (%)
19.10	19.17	0.37	0.07	YES (%)
Linearity = 0.996				



NOx Converter Efficiency

Date: April 9, 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	**1.83**
	Analyzer Reading, NOx Channel, ppmvd	**48.37**
	Analyzer Reading, NO_2 Channel ($C_{Dir(NO2)}$), ppmvd	**46.54**
	Converter Efficiency, %	**97.77**

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 = $\frac{46.54 \text{ ppmvd}}{47.60 \text{ ppmvd}}$ x 100 = 97.77%

Date/Time	Elapsed Time	NOx	NO
mm/dd/yy hh:mm:ss	Seconds	ppmvd	ppmvd
04/09/11 07:55:29	2550	48.20	1.88
04/09/11 07:55:59	2580	48.23	1.87
04/09/11 07:56:29	2610	48.24	1.87
04/09/11 07:56:59	2640	48.26	1.87
04/09/11 07:57:29	2670	48.31	1.85
04/09/11 07:57:59	2700	48.34	1.84
04/09/11 07:58:29	2730	48.36	1.82
04/09/11 07:58:59	***2760***	***48.37***	***1.83***
04/09/11 07:59:29	2790	48.36	1.82
04/09/11 07:59:59	2820	48.36	1.82

DRIFT AND BIAS CHECK			
Strat Test Pre and Post QA/QC Check	O2	CO	NOx
Initial Zero	0.25	-0.06	0.09
Final Zero	0.47	-0.14	0.09
Avg. Zero	0.36	-0.10	0.09
Initial UpScale	12.38	12.15	12.01
Final UpScale	12.55	12.03	11.83
Avg. UpScale	12.47	12.09	11.92
Sys Resp (Zero)	0.01	0.10	0.03
Sys Resp (Upscale)	12.28	12.20	12.35
Upscale Cal Gas	12.10	12.10	12.10
Initial Zero Bias	1.14%	-0.69%	0.25%
Final Zero Bias	2.18%	-1.03%	0.25%
Zero Drift	1.04%	0.34%	0.00%
Initial Upscale Bias	0.47%	-0.22%	-1.44%
Final Upscale Bias	1.28%	-0.73%	-2.20%
Upscale Drift	0.81%	0.52%	0.76%
Alternative Specification Abs Diff: Initial Zero	0.24	0.16	0.06
Alternative Specification Abs Diff: Final Zero	0.46	0.24	0.06
Alternative Specification Abs Diff: Initial Upscale	0.10	0.05	0.34
Alternative Specification Abs Diff: Final Upscale	0.27	0.17	0.52
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)	0.8	1.7	1.7
Sys. Response (min)		1.7	

Date/Time mm/dd/yy hh:mm:ss	z	O2 %	s	z	CO ppm	s	z	NOx ppm	s	INJECTIONS
04/09/11 09:19:49		13.80			6.42			9.82		x
04/09/11 09:19:59		13.82			6.24			10.08		
04/09/11 09:20:09		13.82			6.11			10.13		
04/09/11 09:20:19		10.07			5.96			10.08		
04/09/11 09:20:29		0.92			6.11			10.13		
04/09/11 09:20:39	x	**0.34**			6.04			10.23		
04/09/11 09:20:49		**0.29**			6.08			8.16		
04/09/11 09:20:59		**0.27**			7.84			5.09		
04/09/11 09:21:09		**0.26**			9.91			6.64		
04/09/11 09:21:19		**0.27**			11.41			10.24		
04/09/11 09:21:29		**0.26**			**12.00**	x		**11.51**	x	
04/09/11 09:21:39		**0.25**			**12.12**			**11.83**		
04/09/11 09:21:49		**0.25**			**12.13**			**11.93**		
04/09/11 09:21:59		**0.25**			**12.03**			**11.94**		
04/09/11 09:22:09		**0.25**			**12.05**			**11.95**		
04/09/11 09:22:19		**0.24**			**12.13**			**11.98**		
04/09/11 09:22:29		**0.25**			**12.17**			**11.98**		
04/09/11 09:22:39		**0.25**			**12.18**			**11.99**		
04/09/11 09:22:49		**0.24**			**12.18**			**11.98**		
04/09/11 09:22:59		**0.24**			**12.08**			**11.98**		
04/09/11 09:23:09		**0.24**			**12.11**			**11.99**		
04/09/11 09:23:19		**0.24**			**12.08**			**12.00**		
04/09/11 09:23:29		**0.24**			**12.09**			**12.00**		
04/09/11 09:23:39		**0.23**			**12.06**			**12.01**		
04/09/11 09:23:49		**0.25**			**12.01**			**12.00**		
04/09/11 09:23:59		**0.25**			**12.10**			**12.00**		
04/09/11 09:24:09		**0.23**			**12.10**			**12.01**		
04/09/11 09:24:19		**0.24**			**12.16**			**12.00**		
04/09/11 09:24:29		**0.24**			**12.13**			**12.01**		
04/09/11 09:24:39		**0.24**			**12.19**			**12.01**		x
04/09/11 09:24:49		**0.24**			**12.12**			**12.02**		
04/09/11 09:24:59		**0.25**			**12.07**			**12.02**		
04/09/11 09:25:09		2.61			**12.16**			**12.02**		
04/09/11 09:25:19		11.34			**12.12**			**12.03**		
04/09/11 09:25:29		**12.26**	x		11.13			**12.02**		
04/09/11 09:25:39		**12.31**			7.99			**12.23**		
04/09/11 09:25:49		**12.34**			4.50			8.94		
04/09/11 09:25:59		**12.34**			2.06			3.90		
04/09/11 09:26:09		**12.34**			0.72			1.64		
04/09/11 09:26:19		**12.35**		x	**0.24**		x	**0.60**		
04/09/11 09:26:29		**12.36**			**0.00**			**0.24**		

DRIFT AND BIAS CHECK					
Fuel Oil Load, Run - 1	O_2	NOx	CO	VOC	CO_2
Raw Average	13.68	8.63	5.67	0.08	5.52
Corrected Average	13.63	8.58	5.79	0.40	5.37
Initial Zero	0.03	0.11	-0.08	-0.40	0.00
Final Zero	0.13	0.11	-0.16	-0.24	0.26
Avg. Zero	0.08	0.11	-0.12	-0.32	0.13
Initial UpScale	12.12	12.21	12.06	2.80	8.96
Final UpScale	12.18	12.05	11.89	2.92	9.19
Avg. UpScale	12.15	12.13	11.98	2.86	9.08
Sys Resp (Zero)	0.01	0.03	0.10	0.11	-0.01
Sys Resp (Upscale)	12.28	12.35	12.20	3.13	9.12
Upscale Cal Gas	12.10	12.10	12.10	3.10	8.91
Initial Zero Bias	0.09%	0.34%	-0.78%	-4.86%	0.05%
Final Zero Bias	0.57%	0.34%	-1.12%	-3.33%	1.41%
Zero Drift	0.47%	0.00%	0.34%	1.52%	1.36%
Initial Upscale Bias	-0.76%	-0.59%	-0.60%	-3.14%	-0.84%
Final Upscale Bias	-0.47%	-1.27%	-1.34%	-2.00%	0.37%
Upscale Drift	0.28%	0.68%	0.73%	1.14%	1.20%
Alternative Specification Abs Diff: Initial Zero	0.02	0.08	0.18	--	0.01
Alternative Specification Abs Diff: Final Zero	0.12	0.08	0.26	--	0.27
Alternative Specification Abs Diff: Initial Upscale	0.16	0.14	0.14	--	0.16
Alternative Specification Abs Diff: Final Upscale	0.10	0.30	0.31	--	0.07
Calibration Span	21.10	23.60	23.20	10.50	19.10
3% of Cal. Span (drift)	0.63	0.71	0.70	0.32	0.57
5% of Cal. Span (bias)	1.06	1.18	1.16	0.53	0.96

DRIFT AND BIAS CHECK					
Fuel Oil Load, Run - 2	O_2	NOx	CO	VOC	CO_2
Raw Average	13.69	9.18	5.64	0.50	5.78
Corrected Average	13.64	9.20	5.81	0.70	5.37
Initial Zero	0.13	0.11	-0.16	-0.24	0.26
Final Zero	0.06	0.09	-0.06	-0.12	0.52
Avg. Zero	0.10	0.10	-0.11	-0.18	0.39
Initial UpScale	12.18	12.05	11.89	2.92	9.19
Final UpScale	12.12	12.04	11.88	3.18	9.48
Avg. UpScale	12.15	12.05	11.89	3.05	9.34
Sys Resp (Zero)	0.01	0.03	0.10	0.11	-0.01
Sys Resp (Upscale)	12.28	12.35	12.20	3.13	9.12
Upscale Cal Gas	12.10	12.10	12.10	3.10	8.91
Initial Zero Bias	0.57%	0.34%	-1.12%	-3.33%	1.41%
Final Zero Bias	0.24%	0.25%	-0.69%	-2.19%	2.77%
Zero Drift	0.33%	0.08%	0.43%	1.14%	1.36%
Initial Upscale Bias	-0.47%	-1.27%	-1.34%	-2.00%	0.37%
Final Upscale Bias	-0.76%	-1.31%	-1.38%	0.48%	1.88%
Upscale Drift	0.28%	0.04%	0.04%	2.48%	1.52%
Alternative Specification Abs Diff: Initial Zero	0.12	0.08	0.26	--	0.27
Alternative Specification Abs Diff: Final Zero	0.05	0.06	0.16	--	0.53
Alternative Specification Abs Diff: Initial Upscale	0.10	0.30	0.31	--	0.07
Alternative Specification Abs Diff: Final Upscale	0.16	0.31	0.32	--	0.36
Calibration Span	21.10	23.60	23.20	10.50	19.10
3% of Cal. Span (drift)	0.63	0.71	0.70	0.32	0.57
5% of Cal. Span (bias)	1.06	1.18	1.16	0.53	0.96

DRIFT AND BIAS CHECK					
Fuel Oil Load, Run - 3	O_2	NOx	CO	VOC	CO_2
Raw Average	13.58	8.25	5.98	0.09	5.97
Corrected Average	13.60	8.24	6.14	0.33	5.36
Initial Zero	0.06	0.09	-0.06	-0.12	0.52
Final Zero	0.02	0.09	-0.13	-0.41	0.63
Avg. Zero	0.04	0.09	-0.10	-0.27	0.58
Initial UpScale	12.12	12.04	11.88	3.18	9.48
Final UpScale	12.06	12.10	11.90	3.05	9.62
Avg. UpScale	12.09	12.07	11.89	3.12	9.55
Sys Resp (Zero)	0.01	0.03	0.10	0.11	-0.01
Sys Resp (Upscale)	12.28	12.35	12.20	3.13	9.12
Upscale Cal Gas	12.10	12.10	12.10	3.10	8.91
Initial Zero Bias	0.24%	0.25%	-0.69%	-2.19%	2.77%
Final Zero Bias	0.05%	0.25%	-0.99%	-4.95%	3.35%
Zero Drift	0.19%	0.00%	0.30%	2.76%	0.58%
Initial Upscale Bias	-0.76%	-1.31%	-1.38%	0.48%	1.88%
Final Upscale Bias	-1.04%	-1.06%	-1.29%	-0.76%	2.62%
Upscale Drift	0.28%	0.25%	0.09%	1.24%	0.73%
Alternative Specification Abs Diff: Initial Zero	0.05	0.06	0.16	--	0.53
Alternative Specification Abs Diff: Final Zero	0.01	0.06	0.23	--	0.64
Alternative Specification Abs Diff: Initial Upscale	0.16	0.31	0.32	--	0.36
Alternative Specification Abs Diff: Final Upscale	0.22	0.25	0.30	--	0.50
Calibration Span	21.10	23.60	23.20	10.50	19.10
3% of Cal. Span (drift)	0.63	0.71	0.70	0.32	0.57
5% of Cal. Span (bias)	1.06	1.18	1.16	0.53	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	Time	Volume			Initial Temperature	
		Initial	Final	Total	Inlet	Outlet
(in. H2O)	(min)	(ft^3)	(ft^3)	(ft^3)	(°F)	(°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		Orifice	K' Orifice	Actual	Ambient Temperature		
Inlet	Outlet	Serial#	Coefficient	Vacuum	Initial	Final	Average
(°F)	(°F)	(number)	(see above)	(in. Hg)	(°F)	(°F)	(°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		ORIFICE		
VOLUME CORRECTED Vm(std) (ft^3)	VOLUME CORRECTED Vm(std) (liters)	VOLUME CORRECTED Vcr(std) (ft^3)	VOLUME CORRECTED Vcr(std) (liters)	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		ORIFICE CALIBRATION FACTOR ΔH@		
Variation (number)	Value (number)	Value (in. H2O)	Value (mm H2O)	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_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: Craig McCarty

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**.

NOZZLE CALIBRATION SHEET

NOZZLE SET IDENTIFICATION: SAMP-NS-000I
CALIBRATION DATE: April 22, 2010
CALIPER NUMBER: SAMP-DC-0011
NAME OF CALIBRATOR: Jake Fahlenkamp

NOZZLE I.D.	DIAMETER	AVERAGE DIAMETER	EPA Method 5, Sec. 10.1 Criteria
I#4	0.109	0.108	PASS
	0.108		
	0.106		
I#6	0.174	0.175	PASS
	0.176		
	0.175		
I8	0.234	0.232	PASS
	0.231		
	0.232		
I#10	0.311	0.309	PASS
	0.309		
	0.308		
I#12	0.357	0.357	PASS
	0.357		
	0.356		
I#14	0.433	0.434	PASS
	0.436		
	0.434		
I#16	0.488	0.489	PASS
	0.491		
	0.489		

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 (ft^3)	Volume Final (ft^3)	Volume Total (ft^3)	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

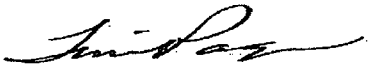
DRY GAS METER VOLUME CORRECTED Vm(std) (ft^3)	DRY GAS METER VOLUME CORRECTED Vm(std) (liters)	ORIFICE VOLUME CORRECTED Vcr(std) (ft^3)	ORIFICE VOLUME CORRECTED Vcr(std) (liters)	ORIFICE VOLUME NOMINAL Vcr (ft^3)
6.650	188.33	6.698	189.7	6.840
6.625	187.63	6.698	189.7	6.839
6.605	187.06	6.699	189.7	6.839

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

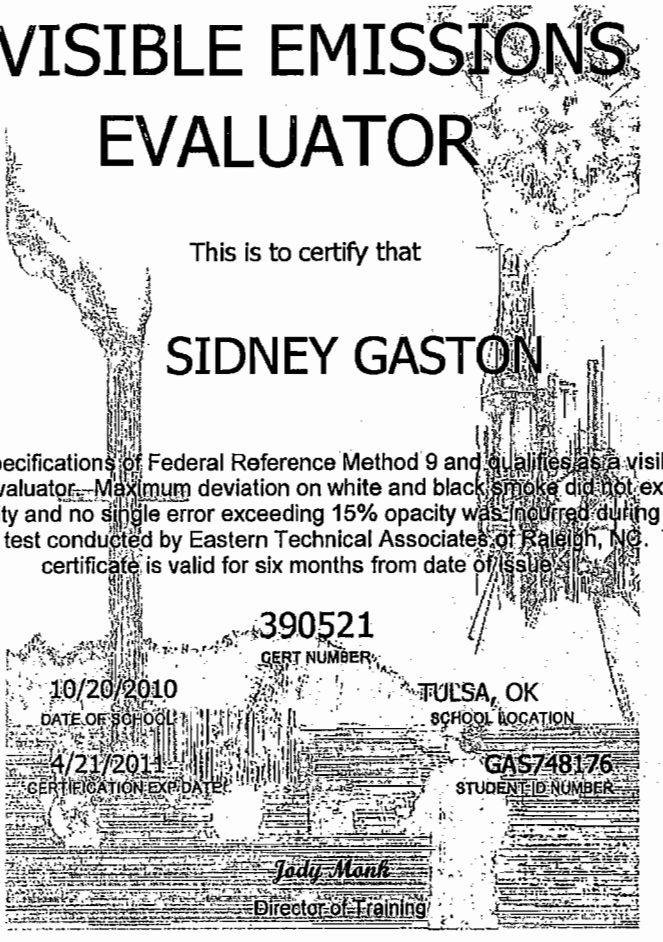
40 CFR - CHAPTER I - PART 60
Appendix A, Method 5
10.3.2 Calibration After Use
After each field use, the calibration of the metering system shall be checked by performing three calibration runs at a single, intermediate orifice setting (based on the previous field test)....Calculate the average value 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

SIDNEY GASTON

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.

390521
CERT NUMBER

10/20/2010
DATE OF SCHOOL

TULSA, OK
SCHOOL LOCATION

4/21/2011
CERTIFICATION EXP DATE

GAS748176
STUDENT ID NUMBER

Jody Monk
Director of Training

EASTERN TECHNICAL ASSOCIATES

SIDNEY GASTON

GAS748176 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.

TULSA, OK	10/20/2010	390521
SCHOOL LOCATION	DATE OF SCHOOL	CERT NUMBER
TULF10	4/21/2011	
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 9, 2011
Project #: bv-10-westcounty.fl-comp#2

Fuel Oil - Fuel Analysis

Characteristics of Fuel Gas		
Molecular Weight of oil =	15.410	lb/lb-mole
Btu per lb. of oil =	19,665.00	gross (HHV)
Btu per lb. of oiil =	18,459.000	net (LHV)
Density of fuel oil[2] =	53.2889	lb/cu. ft
Density of fuel oil[2] =	7.1237	lb/gal
Specific Gravity =	0.8554	@ 68 deg F

Standardized to 68 deg F and 14.696 psia

Component	Wt%
carbon	85.76
oxygen	0.00
hydrogen	14.24
nitrogen	0.00
helium	0.00
sulfur	0.00
Total	**100.00**

Fuel Oil HHV Conv.	
HHV (Btu/lb)	19,665.00
HHV (Btu/SCF)	1,047,927

Fuel Oil LHV Conv.	
LHV (Btu/lb)	18,459.00
LHV (Btu/SCF)	983,660

F-Factor (SCF dry exhaust per MMBtu [HHV]) =	9,308.23
(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
8620 INTERCHANGE DRIVE
HOUSTON, TEXAS 77054
PHONE (713) 660-0901

Certificate of Analysis

Number: 1030-2011040294-002A

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

May 11, 2011

Sample ID:	Unit 3B	Sampled By:	
Project Name :		Sample Of:	Liquid
Project Number :		Sample Date:	04/09/2011
Project 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	19665	Gross BTU / lb		EM	04/26/11
Heat of Combustion	ASTM-D-240	18459	Net BTU/lb		EM	04/26/11
Heat of Combustion	ASTM-D-240	NR	Gross BTU/Gal		EM	04/26/11
Heat of Combustion	ASTM-D-240	NR	Net BTU/Gal		EM	04/26/11
API Gravity @ 60 °F	ASTM-D-5002	36.48	°		BAC	04/15/11
Specific Gravity @ 60/60 °F	ASTM-D-5002	0.8424			BAC	04/15/11
Density @ 60 °F	ASTM-D-5002	0.8415	g/ml		BAC	04/15/11
Sulfur in Liq. Hydrocarbon by UV	ASTM-D-5453	0.0007	wt %		EM	04/26/11

Comments:

NR= No result
Sample On: 04/09/2011

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: 1030-2011040294-002B

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

May 03, 2011

Sample ID:	Unit 3B	Sampled By:	
Project Name :		Sample Of:	
Project Number :		Sample Date:	04/09/2011
Project 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	85.76	wt%	0.30	EM	05/03/11
Wt% of Hydrogen	ASTM-D-5291	14.24	wt%	0.30	EM	05/03/11
Wt% of Nitrogen	ASTM-D-5291	<0.30	wt%	0.30	EM	05/03/11

Comments:

Sample On: 04/09/2011

Hydrocarbon Laboratory Manager

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

LOG08 #157285 6/01 WCS

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:	JRF		

Sample Number	Location	Date	Volume	Analysis Method			
				ASTM D920	ASTM D5002	ASTM D5453-00	
01	Unit 3C	4/8		X	X	X	
02	Unit 3B	4/10		X	X	X	
	email to: jake@airhygiene.com						
	Sulfur reported in gr/100 dscf, wt%, and ppmw						
	Report LHV and HHV						

Relinquished by: (Signature)	Date: 4/14/11	Time: 9:00	Received by: (Signature)	Date: 4/15/11	Time:
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:

Copy of Chain of Custody-AHI v1.1

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	04/09/11
Project #	bv-10-westcounty.fl-comp#2
Unit Number	3B
Load	Fuel Oil
Number of Ports Available	4
Number of Ports Used	4

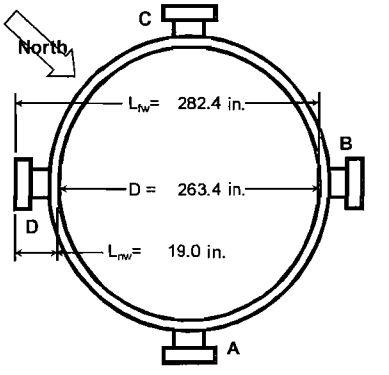
Stack and Test Type		
○	Isokinetic Traverse (Wet Chemistry Testing)	**Circular Stack**
○	Velocity Traverse (Flow and Flow RATA Test)	
◉	**Stratification Traverse (Compliance Test)** ☐ RM 20	
○	Stratification Traverse (RATA) ☐ Part 60 ☐ Part 75	

METHOD 1 - STRATIFICATION TEST FOR A CIRCULAR SOURCE

Company	Florida Power and Light	**Date**	04/09/11
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

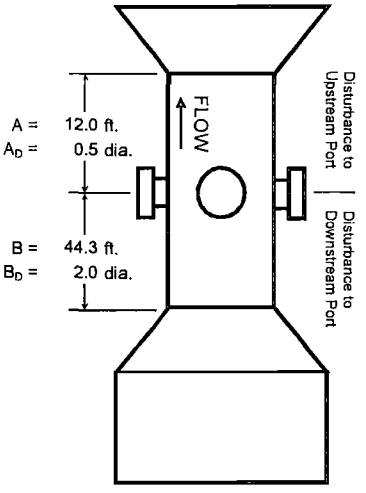


Number of Traverse Points Required

Diameters to Flow Disturbance		Minimum Number of[1] Traverse Points		Minimum Number of Traverse Points Comp Stratification	
Down (B_D)	Up (A_D)	Particulate	Velocity	Criteria	Points
Stream	Stream	Points	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 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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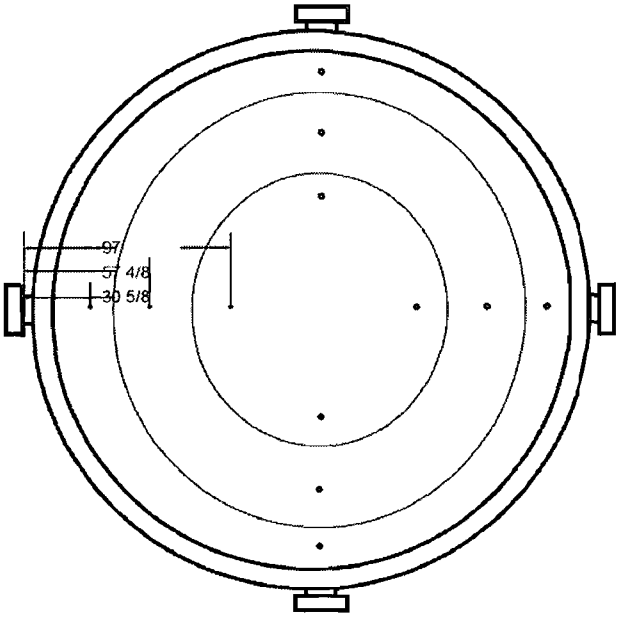

STRATIFICATION TRAVERSE (COMPLIANCE TEST) RESULTS

Company	Florida Power and Light	**Date**	04/09/11
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**	9:40:29	**Run End**	10:35:59

Traverse Point	Time Per Point	Point Start Time	Point Stop Time (Reading)	O2	Percent Difference	CO	Percent Difference	NOx	Percent Difference
	min.	hh:mm:ss	hh:mm:ss	%	%	ppm	%	ppm	%
D-3	3.50	9:40:29	9:43:59	13.89	0.55%	6.35	5.91%	8.48	5.47%
D-2	3.50	9:43:59	9:47:29	13.93	0.27%	6.47	7.91%	7.56	5.97%
D-1	3.50	9:47:29	9:50:59	13.91	0.41%	5.83	2.77%	8.32	3.48%
C-3	6.50	9:50:59	9:57:29	13.95	0.13%	6.01	0.24%	8.93	11.07%
C-2	3.50	9:57:29	10:00:59	13.94	0.20%	5.37	10.44%	9.77	21.52%
C-1	3.50	10:00:59	10:04:29	13.95	0.13%	4.78	**20.28%**	9.59	19.28%
B-3	5.50	10:04:29	10:09:59	13.98	0.09%	6.38	6.41%	7.68	4.48%
B-2	3.50	10:09:59	10:13:29	13.97	0.02%	5.78	3.60%	7.43	7.59%
B-1	3.50	10:13:29	10:16:59	13.99	0.16%	6.03	0.57%	6.64	17.41%
A-3	12.00	10:16:59	10:28:59	14.01	0.30%	6.34	5.74%	8.95	11.32%
A-2	3.50	10:28:59	10:32:29	14.03	0.45%	6.17	2.90%	7.39	8.08%
A-1	3.50	10:32:29	10:35:59	14.06	**0.66%**	6.44	7.41%	5.74	**28.61%**
Average				13.97		6.00		8.04	

STRAT TEST DETERMINED SAMPLE POINTS FOR CIRCULAR STACK

Company	Florida Power and Light	**Date**	04/09/11
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**	9:40:29	**Run End**	10:35:59

40 CFR 60, Appendix A, Method 7E Criteria

Stratification Results	
Maximum Percent Difference	28.61 % for NOx
Maximum Pollutant Conc. Diff.	2.30 ppm for NOx
Maximum Diluent Conc. Diff.	0.09 % 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