

# *Environmental Compression Services, Inc.*

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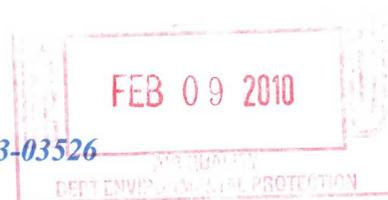
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Environmental Laboratory Registration 63-03526



**Date:** January 26, 2010

**Customer:** Laurel Mountain Midstream, LLC  
Westpointe Corporate Center One  
1550 Coraopolis Heights Road, 2<sup>nd</sup> Fl  
Moon Township, PA 15108

EXISTING STATION

NEW INSTALLATION

**Facility & Permit No:** Springhill Station GP5-26-00587A

**Test Date:** LMM will provide the required Two (2) weeks notice prior to scheduling the test.

**Contact:** Ms. Katie Maley, Phone No 412-865-2174

**Technician:** William M. Monroe

## Emission Testing Protocol

### Test Equipment Information

Manufacturer ECOM America, LTD  
Model ECOM A-Plus  
Serial Number 9648  
Sensor Type Electrochemical Cells  
Pollutants Measured NO, NO2, CO, NMHC(VOC'S)\*\*\* & O2  
ECOM Data Acquisition Software (DAS) Program  
Factory (O.E.M.) Calibration Performed by ECOM October 2009 [Factory Calibrated every Six (6) Months]  
On-Site Pre & Post Test Calibration performed with N.I.S.T. Traceable Certified Gases the day of the Test

### Facility and Engine Data Obtained

Area (Springhill Township, Fayette County) and Springhill Station  
GP5-26-00587A Issued December 9, 2009 Expires December 9, 2014  
Engine Manufacturer: Caterpillar  
Model # G3516TALE  
Serial # 4EK04913  
Aspiration (Four Cycle, Lean Burn)  
Unit # 3  
Permitted Emission Levels Nox <= 2.00 Grams/bhp-hr CO <= 2.00 grams/bhp-hr VOC <= 1.00 Grams/bhp-hr

### Actual Operating Conditions

BHP Load Site Rating: Supplied w/ report BHP (Calculated on-site w/ Ariel OEM 7.6.0.1 Performance Software)  
Actual Running Speed (RPM) – Supplied w/ report RPM – 1400 RPM Max rating for Engine on Tachometer  
Engine Exhaust Temperature: 873 Deg F @ 100% Load – Will be measured with Analyzer day of the test  
Name Plate Max Rates BHP: 1340 BHP – Will use Site or Loaded BHP for Test  
Intake Manifold Pressure: 70.9 in Hg (abs) @ 100% load, Intake Manifold Temp: 139 Deg F (Recorded from Control Panel)  
Ignition Timing: 33 Degrees Below Top Dead Center (Operator / Mechanic Verified / Engine Control Panel)  
Fuel Gas Composition provided by Source Owner (Fuel Sample taken prior to Test Date & provided in Final Report)  
Measured Stack Height: Will Measure at Site, Stack Flow: 7646 cfm @ 100% Load, Calculated day of Test  
Specific Fuel Gas Consumption: Measured at Site with Orifice Type Fuel Meter (scf/hr), OEM rating is 7547 BTU/bhp-hr

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### **Exhaust Emissions Measured**

NO (ppm)  
 NO<sub>2</sub> (ppm)  
 CO (ppm)  
 O<sub>2</sub> (percentage)  
 NMHC (grams/bhp-hr)

The Test Procedure will be as follows:

- 1.) The PA-DEP Harrisburg, PA Approved Protocol is reviewed with the On-Site DEP Inspector.
- 2.) A document is signed by the testing company and the client that verifies the actual test recordings.
- 3.) All data is inputted into the laptop that corresponds to this particular site and engine.
- 4.) The actual load of the engine is calculated using the OEM compressor performance software with site conditions and recorded into DAS Software. The fuel gas analysis and fuel consumption is entered into the DAS software program.
- 5.) Fuel Consumption is determined using an Orifice coefficient and converted to standard conditions.
- 6.) Engine will be tested at while running at normal operating conditions.
- 7.) The Analyzer and Sensors are allowed to acclimate with Ambient Conditions (15-20 Minutes)
- 8.) An On-Site Pre-Test Calibration is performed on the Analyzer with Spectra Gases, Inc. (Certified according to EPA Traceability Protocol) calibration gas mixtures manufactured and N.I.S.T. Traceable Certified. Certifications of Each calibration Gas Bottle (NO, NO<sub>2</sub> and CO) and the Pre-Test Calibration Performance Specifications will be Included in the Final Test Report. Part of the Calibration test is performed with one of the Nitrogen based Calibration gases (NO or NO<sub>2</sub>) that will serve as a check for leaks throughout the heated sampling line and analyzer.
- 9.) First Tedlar Bag for NMHC Testing filled using heated sample line and pump from analyzer (if required)
- 10.) The heated sample line with test probe will be inserted into the exhaust stream and the sensor readings are allowed to stabilize (5 – 10 minutes) before recording commences.
- 11.) Readings for O<sub>2</sub>, NO, NO<sub>2</sub> & CO are taken once every 30 seconds for 20 minutes. (41 Samples are Recorded)
- 12.) The probe is removed from the exhaust stream and the analyzer is purged with fresh air for approximately 15 minutes until the NO, NO<sub>2</sub> and CO sensors zero out and O<sub>2</sub> returns to 20.9%.
- 13.) Second Tedlar Bag for NMHC Testing filled using same method as # 9
- 14.) The probe is re-inserted into the engine exhaust stream and a second 20-minute test begins. (41 Samples Recorded)
- 15.) The heated sample line probe is removed and the Analyzer is purged again.
- 16.) Third Tedlar Bag is filled for NMHC Test
- 17.) Probe re-inserted and the third set of readings are taken for 20 minutes. (41 samples) This completes a One (1) hour Test. This test duration was recommended by PA-DEP Harrisburg, PA Source Testing Section.  
**(A Total of 123 Samples are Recorded during the Test)**
- 18.) The Fourth and Final Tedlar Bag is filled for the NMHC Test.
- 19.) An On-Site Post-Test Calibration of the Analyzer is then performed with the same calibration gases used in the Pre-Test Calibration. The response levels are recorded into the Data Acquisition Software and are used to interpret the final emission results. The Post Test Calibration performance specifications are also provided in the final report.
- 20.) Analyzer and Calibration meets General Performance Specifications of ASTM D6522.

### **Mass Emission Calculations and Equations are presented on Page (3) of this Protocol Submission**

The Final Report will be presented to the appropriate PA-DEP region (in Triplicate) in a similar fashion to the Information suggested in the Source Testing Manual November 2000 Revision 3.3 New Millennium Edition.

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**MASS EMISSION CALCULATIONS ARE AS FOLLOWS:**

$$E \text{ (LB/HR)} = F_d \text{ (dscf/MMBTU)} \times [20.9/(20.9-O_2d\%)] \times F_c \text{ (lb/scf)} \times C_d \text{ (ppm)} \times \text{Fuel Consumption (scf/hr)} \times \text{Heat Value (BTU/scf)} \times 0.0000001 \text{ (MMBTU/BTU)}$$

$$E \text{ (TPY)} = E \text{ (lb/hr)} \times 24 \text{ (hr/day)} \times 365 \text{ (days/yr)} \times 1/2000 \text{ (ton/lb)}$$

$$E \text{ (g/hp-hr)} = F_d \text{ [dscf/MMBTU]} \times [20.9/(20.9-O_2d\%)] \times F_c \text{ [lb/scf]} \times C_d \text{ [ppm]} \times \text{Fuel Consumption [scf/hr]} \times \text{Heat Value [BTU/scf]} \times (1/HP) \times 453.5924 \text{ [g/lb]} \times 0.0000001 \text{ [MMBTU/BTU]}$$

Where:

$F_d$  = dscf/MMBTU (Calculated from entered fuel consumption)  
 Average Measured  $O_2d\%$  = % (Corrected value used if Post-Calibration performed)  
 $F_c$  (CO) =  $7.268e-8$  lb/dscf  
 $F_c$  (Nox) =  $1.194e-7$  lb/dscf  
 Average Measured CO  $C_d$  = ppm (Corrected value used if Post-Calibration performed)  
 Average Measured Nox  $C_d$  = ppm (Corrected value used if Post-Calibration performed)  
 Fuel Heat Content = BTU/scf (Calculated from fuel composition)  
 Fuel Flow Rate = scf/hr  
 HP = HP (HP at time of test)

Conversion factors were calculated at 68 F and 14.696 PSI

Assumptions:

1. Ambient  $O_2$  concentrations 20.9%
2. NMHC or (VOC's) will be determined and submitted as part of the final report through having the Four Exhaust Gas Filled Tedlar Bags sent to a Analytical lab and having a fractional analysis performed. The fractional analysis is received and will accompany the end resulting calculations. The final or average NMHC number is provided in the report as grams/bhp-hr and checked by a Professional Engineer. It is also stamped with a P.E. seal for accuracy. The NMHC values (C2-C8 less the Methane) are converted to standard conditions of 68 F and 14.696 PSI. The molecular weight of the criteria pollutant, the exhaust flow rate and temperature, along with utilized BHP are used in the NMHC calculations.

If any questions or concerns arise please contact Environmental Compression at 724-899-4175.