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**VOLATILE ORGANIC COMPOUND ADSORPTION  
REMOVAL EFFICIENCY TEST PROGRAM**

*Performed For*  
**Flint Group**

*Performed At The*  
**Three Rivers Facility  
FG-PTECONTROL  
Three Rivers, Michigan**

*Test Date*  
**September 23, 2015**

*Report No.*  
**TRC Environmental Corporation Report 240521A**

*Report Submittal Date*  
**October 22, 2015**

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**1.0 INTRODUCTION**

TRC Environmental Corporation (TRC) performed an emission compliance test program to determine the volatile organic compound (VOC) removal efficiency of the FG-PTECONTROL Carbon Adsorption System at Flint Group in Three Rivers, Michigan. The tests were authorized by and performed for Flint Group.

The purpose of this test program was to determine the VOC removal efficiency of the FG-PTECONTROL Carbon Adsorption System during normal operating conditions. This test program was performed concurrently with the relative accuracy test audit (RATA) of the VOC continuous emission monitors (CEMs) located at the inlet duct and outlet stack of the FG-PTECONTROL Carbon Adsorption System.

This test program was performed on September 23, 2015 to demonstrate compliance with Michigan Department of Environmental Quality (MDEQ) Renewable Operating Permit (ROP) No. MI-ROP-B2014-2011b. The test program was conducted according to the TRC Test Protocol 240521 dated August 18, 2015.

**1.1 Project Contact Information**

<b>Participants</b>		
Test Facility	Flint Group 111 Day Drive Three Rivers, Michigan 49093	Mr. Joe Doornbos Site Manager 269-279-5161 ext 226 (phone) joe.doornbos@flintgrp.com
Air Emissions Testing Body (AETB)	TRC Environmental Corporation 7521 Brush Hill Road Burr Ridge, Illinois 60527	Mr. Paul Coleman Project Manager 312-533-2023 (phone) 312-533-2070 (fax) pcoleman@tresolutions.com

The tests were conducted by Ben Cacao, Dave Wells and Paul Coleman of TRC. Documentation of the on-site ASTM D7036-04 Qualified Individuals (QI) can be located in the appendix to this report. Mr. Tom Gasloli of the Michigan Department of Environmental Quality (MDEQ) observed the test program.



## 2.0 SUMMARY OF RESULTS

The results of this test program are summarized in the table below. Detailed individual run results are presented in Section 6.0.

Parameter	Units	FG-PTECONTROL		Emission Limit
		Inlet	Outlet	
VOC	lb/hr as C <sub>3</sub> H <sub>8</sub>	635.34	2.30	----
	Removal Efficiency (%)	99.6 %		> 95% Removal Efficiency

The table below summarizes the test methods used, as well as the number and duration of each at each test location:

Unit ID/ Sample Locations	Parameter Measured	Test Method	No. of Runs	Run Duration
FG-PTECONTROL	Volumetric flow, VOC	USEPA Methods 1, 2, 3 Alt-008, 25A	3	63 min

## 3.0 DISCUSSION OF RESULTS

No problems were encountered with the testing equipment during the test program. No changes or problems were encountered that required modification of any procedures presented in the test plan. No adverse test or environmental conditions were encountered during the conduct of this test program.

This test program was performed concurrently with the VOC CEMS RATA, with VOC mass emissions determined simultaneously at the FG-PTECONTROL inlet and outlet locations in order to determine VOC removal efficiency. Three (3) twenty-one minute RATA test runs were combined to form one (1) sixty-three minute carbon removal efficiency test run.

## 4.0 SAMPLING AND ANALYSIS PROCEDURES

All testing, sampling, analytical, and calibration procedures used for this test program were performed in accordance with the methods presented in the following sections. Where applicable, the Quality Assurance Handbook for Air Pollution



Measurement Systems, Volume III, Stationary Source Specific Methods, USEPA 600/R-94/038c, September 1994 was used to supplement procedures.

#### **4.1 Determination of Sample Point Locations by USEPA Method 1**

This method is applicable to gas streams flowing in ducts, stacks, and flues and is designed to aid in the representative measurement of pollutant emissions and/or total volumetric flow rates from stationary sources. In order to qualify as an acceptable sample location, it must be located at a position at least two stack or duct equivalent diameters downstream and a half equivalent diameter upstream from any flow disturbance.

The cross-section of the measurement site was divided into a number of equal areas, and the traverse points were then located in the center of these areas. The minimum number of points were determined from Figure 1-2 (non-particulate) of USEPA Method 1. A check for cyclonic flow was performed at each test location. Both locations met method requirements.

#### **4.2 Volumetric Flow Rate Determination by USEPA Method 2**

This method is applicable for the determination of the average velocity and the volumetric flow rate of a gas stream.

The gas velocity head ( $\Delta P$ ) and temperature were measured at traverse points defined by USEPA Method 1. The velocity head was measured with a Type S (Stausscheibe or reverse type) pitot tube and oil-filled manometer; and the gas temperature was measured with a Type K thermocouple. The average gas velocity in the flue was calculated based on: the gas density (as determined by USEPA Methods 3 and 4); the flue gas pressure; the average of the square roots of the velocity heads at each traverse point, and the average flue gas temperature. Volumetric flow rates were determined before and after each test run.

#### **4.3 CO<sub>2</sub> and O<sub>2</sub> Determination by USEPA Method 3**

This method is applicable for the determination of CO<sub>2</sub> and O<sub>2</sub> concentrations and dry molecular weight of a sample from an effluent gas stream of a fossil-fuel combustion process or other process.

A gas sample was extracted from a stack by single-point, grab sampling and the gas sample was analyzed for percent CO<sub>2</sub> and percent O<sub>2</sub> using a Fyrite.

#### **4.4 Moisture Determination by USEPA Method ALT-008**

This method is an approved alternative to USEPA Method 4 for the determination of stack gas moisture content using midget impingers. Gas samples were extracted at a constant rate from each source. Moisture was removed from the sample stream by a series of pre-weighed impingers immersed in an ice bath.



#### **4.5 Total Organic Concentration Determination by USEPA Method 25A**

This method is applicable for the determination of total gaseous organic concentration of vapors consisting primarily of alkanes, alkenes, and/or arenes (aromatic hydrocarbons).

Gas samples were extracted from the FG-PTECONTROL inlet duct and exhaust stack locations through heated sample lines and glass fiber filters to separate flame ionization analyzers (FIAs). VOC concentrations are expressed in terms of propane.

### **5.0 QUALITY ASSURANCE PROCEDURES**

TRC integrates our Quality Management System (QMS) into every aspect of our testing service. We follow the procedures specified in current published versions of the test Method(s) referenced in this report. Any modifications or deviations are specifically identified in the body of the report. We routinely participate in independent, third party audits of our activities, and maintain:

- Louisiana Environmental Lab Accreditation Program (LELAP) accreditation;
- Accreditation from the Stack Testing Accreditation Council (STAC) and the American Association for Laboratory Accreditation (A2LA) that our operations conform with the requirements of ASTM D 7036 as an Air Emission Testing Body (AETB).

These accreditations demonstrate that our systems for training, equipment maintenance and calibration, document control and project management will fully ensure that project objectives are achieved in a timely and efficient manner with a strict commitment to quality.

All calibrations are performed in accordance with the test Method(s) identified in this report. If a Method allows for more than one calibration approach, or if approved alternatives are available, the calibration documentation in the appendices specifies which approach was used. All measurement devices are calibrated or verified at set intervals against standards traceable to the National Institute of Standards and Technology (NIST). NIST traceability information is available upon request.

ASTM D7036-04 specifies that: *“AETBs shall have and shall apply procedures for estimating the uncertainty of measurement. Conformance with this section may be demonstrated by the use of approved test protocols for all tests. When such protocols are used, reference shall be made to published literature, when available, where estimates of uncertainty for test methods may be found.”* TRC conforms with this section by using approved test protocols for all tests.

