Michigan Automotive Compressor, Inc.

2400 N. Dearing Road • Parma, MI 49269 • Tel: (517) 622-7000

December 22, 2015

Mr. Thomas Gasloli
Technical Programs Unit
Michigan Department of Environmental Quality
Air Quality Division
Constitutional Hall
PO Box 30473
Lansing MI, 48909

Subject: Stack Testing Results for performance of EUHubLine-06 for Permit to Install (PTI) No. 47-14.

Dear Mr. Gasloli,

Enclosed please find our Hub Line RTO 6 Destruction Efficiency Emissions Test Report from the stack test administered on June 9, 2015. I apologize for the delay. There was a miscommunication between the testing company, BTEC, Inc and MACI, Inc. Both companies thought the other had sent the results.

If you have any further questions or need additional information, please contact me at 517-796-3257.

Sincerely,

Jill Yoxheimer
Supervisor Environmental Engineering

BTEC Inc.

Hub Line RTO 6
Destruction Efficiency
Emissions Test Report

Prepared for:

Michigan Automotive Compressor, Inc.

2400 North Dearing Road
Jackson, Michigan

Project No. 15-4683.00
August 3, 2015

BT Environmental Consulting, Inc.
4949 Fernlee Avenue
Royal Oak, Michigan 48073
(248) 548-8070

EXECUTIVE SUMMARY

BT Environmental Consulting, Inc. (BTEC) was retained by Michigan Automotive Compressor, Inc. (MACI) to conduct a volatile organic compound (VOC) destruction efficiency (DE) emissions test program at the MACI facility in Jackson, Michigan. The purpose of the test program was to evaluate the performance of the Hub Line 6 regenerative thermal oxidizer (RTO) for comparison to AQD Permit No. 47-14 limitations. The emissions test program was conducted on June 9, 2015.

Sampling for VOC emissions consisted of triplicate 60-minute test runs utilizing USEPA Method 25A. The results of the emission test program are summarized by Table E-I.

Table E-I
VOC Emission Rate Summary

Parameter	Value
Average RTO Inlet VOC Emission Rate	1.27 lbs/hr
Average RTO Outlet VOC Emission Rate	0.015 lbs/hr
Average RTO VOC Destruction Efficiency	98.8%

BTEC Inc.

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BTEC Inc.

1. Introduction

BT Environmental Consulting, Inc. (BTEC) was retained by Michigan Automotive Compressor, Inc. (MACI) to conduct a volatile organic compound (VOC) destruction efficiency (DE) emissions test program at the MACI facility in Jackson, Michigan. The purpose of the test program was to evaluate the performance of the Hub Line 6 regenerative thermal oxidizer (RTO) for comparison to AQD Permit No. 47-14 limitations. The emissions test program was conducted on June 9, 2015.

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AQD has published a guidance document entitled "Format for Submittal of Source Emission Test Plans and Reports" (December 2013). The following is a summary of the emissions test program and results in the format suggested by the aforementioned document.

1.a Identification, Location, and Dates of Test

Sampling and analysis for the emission test program was conducted on June 9, 2015 at the MACI facility in Jackson, Michigan. The test program included evaluation of exhaust gas flowrates and VOC concentrations at the inlet and outlet of the new Hub Line 6 RTO.

1.b Purpose of Testing

The purpose of the test program was to evaluate the performance of the Hub Line 6 regenerative thermal oxidizer (RTO) for comparison to AQD Permit No. 47-14 limitations.

1.c Source Description

The emission unit is designated "EUHubLine-06" by AQD Permit to Install (PTI) No. 47-14. EUHubLine-06 is a hub spray adhesive and rubber vulcanization process with volatile organic compound (VOC) emissions captured by a permanent total enclosure and controlled by a single regenerative thermal oxidizer (RTO). Both EUHubLine-06 and the associated RTO are new process equipment installations.

The basic hub line process sequence is as follows:

Stage 1: The exterior of the inner hub and interior of the hub plate is spray coated with Chemlok 205HC primer and conveyed through a drying oven. This process is exhausted through a manifolded duct to the new RTO.

Stage 2: The inner hub and hub plate is spray coated with Chemlok 6125 adhesive and conveyed through a drying oven. This process is exhausted through a manifolded duct to the RTO.

Stage 3: The two hub pieces are staged together on a jig, preheated and injected with rubber. There is no external exhaust from this booth.

Stage 4: The sub-assembly is loaded into the rubber spray coat booth and sprayed with rubber coating. This process exhausts to the RTO.

Stage 5: The rubber spray-coated parts are transported by conveyor to the 2^{nd} vulcanizer where the rubber is processed through a curing oven. This process is exhausted to the RTO.

Coatings are thinned and equipment cleaned using either xylene or n-butyl acetate. Equipment cleaning is performed manually by wiping the applicators with solvent, however, this operation is performed infrequently.

1.d Test Program Contact

Ms. Jill Yoxheimer
Michigan Automotive Compressor, Inc.
2400 North Dearing Road
Jackson, Michigan 48755
(517) 796-3257

Mr. Randal J. Tysar
BT Environmental Consulting, Inc.
4949 Fernlee Avenue
Royal Oak, Michigan 48073
(248) 548-8070

1.e Test Personnel

Names and affiliations for personnel who were present during the testing program are summarized by Table 1.

2. Summary of Results

Sections 2.a through 2.d summarize the results of the emissions compliance test program.

2.a Operating Data

Operating data is included in Appendix D.

2.b Applicable Permit

Permit to Install No. 47-14.

2.c Results

The overall results of the emission test program are summarized by Table 2

2.d Emission Regulation Comparison

Permit No. 47-14 requires a minimum VOC destruction efficiency of 95%. The average VOC destruction efficiency was 98.8%.

3. Source Description

Sections 3.a through 3.e provide a detailed description of the process.

3.a Process Description

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3.b Raw and Finished Materials

Raw materials for the hub line process include metal parts as well as primer, adhesive, and rubber coatings. During the emissions test program, the Hub Line 6 process operated at a production rate of 405 parts per hour. The primer application rate for the process line was approximately 2.2 pounds per hour, the adhesive application rate for the process line was approximately 2.2 pounds per hour, and the rubber coating application rate for the process line was approximately 0.5 pounds per hour.

3.c Process Capacity

The process has the capacity to produce 405 parts per hour.

3.d Process Instrumentation

The relevant control device for this emissions test program is a RTO abatement system. The primary operating parameter relevant to operation of the RTO is operating temperature. The RTO operating temperature is required to be maintained at a minimum of 1,550°F as a 3-hour rolling average.

4. Sampling and Analytical Procedures

Sections 4.a through 4.d provide a summary of the sampling and analytical procedures used.

4.a Sampling Train and Field Procedures

Sampling train types used for the emissions test program can be separated into two categories as follows:

(1) Measurement of exhaust gas flowrates, and
(2) Measurement of exhaust gas VOC concentration as propane

Sampling and analysis procedures followed the requirements codified at Title 40, Part 60, Appendix A of the Code of Federal Regulations (40 CFR 60, Appendix A):

Method 1	"Sample and Velocity Traverses for Stationary Sources"
Method 2	"Determination of Stack Gas Velocity and Volumetric Flowrate"
Method 3	"Gas Analysis for the Determination of Dry Molecular Weight (Fyrite Analysis)"
Method 4	"Determination of Moisture Content in Stack Gases"
Method 25A	"Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer"

Measurement of Exhaust Gas Flowrate

Stack gas velocity traverses were conducted in accordance with the procedures outlined in Method 1 and Method 2. S-type pitot tubes with thermocouple assemblies, calibrated in accordance with Method 2, Section 4.1.1, were used to measure exhaust gas velocity pressures (using a manometer) and temperatures during testing. The s-type pitot tube dimensions outlined in Sections 2-6 through 2-8 were within specified limits, therefore, a baseline pitot tube coefficient of 0.84 (dimensionless) was assigned.

Cyclonic flow checks were performed at the sampling location. The existence of cyclonic flow is determined by measuring the flow angle at each sample point. The flow angle is the angle between the direction of flow and the axis of the stack. If the average of the absolute values of the flow angles is greater than 20 degrees, cyclonic flow exists. The null angle was determined to be less than 10 degrees at each sampling point.

Molecular weight determinations were evaluated according to USEPA Method 3, "Gas Analysis for the Determination of Dry Molecular Weight." The equipment used for this evaluation consisted of a one-way squeeze bulb with connecting tubing and a set of Fyrite® combustion gas analyzers. Carbon dioxide and oxygen content were analyzed using the Fyrite® procedure.

Exhaust gas moisture content for Runs 1-3 and inlet gas moisture content for Run 1 was measured using USEPA Method 4. Exhaust gas moisture content was evaluated using Method 4. Exhaust gas was extracted as part of the moisture sampling and passed through (i) two impingers, each with 100 ml deionized water, (ii) an empty impinger, and (iii) an impinger filled with silica gel. Exhaust gas moisture content is then determined gravimetrically. Inlet gas moisture content for Run 2 and Run 3 was measured using the wet bulb/dry bulb technique.

Measurement of VOC Concentration

The VOC concentration of the exhaust gas at the RTO inlet was measured using a VIG Model 20 total hydrocarbon gas analyzer (or equivalent). A sample of the gas stream was drawn through a stainless-steel probe with an in-line glass fiber filter to remove any particulate, and a heated Teflon® sample line before it enters the analyzer. Exhaust gas hydrocarbon concentration data was recorded at 4-second intervals on an IBM PC equipped with data acquisition software.

For analyzer calibrations, calibration gases were mixed to desired concentrations using an Environics Series 4040 Computerized Gas Dilution System. The Series 4040 consists of a single chassis with four mass flow controllers. The mass flow controllers are factory-calibrated using a primary flow standard traceable to the United States National Institute of Standards and Technology (NIST). Each flow controller utilizes an 11 point calibration table with linear interpolation, to increase accuracy and reduce flow controller nonlinearity. A field quality assurance check of the system will be performed pursuant to Method 205 by setting the diluted concentration to a value identical to a Protocol 1 calibration gas and then verifying that the analyzer response is the same with the diluted gas as with the Protocol 1 gas.

A schematic drawing of the VOC emissions sampling train is provided as Figure 3.

4.b Recovery and Analytical Procedures

Recovery and analytical procedures were described in Section 4.a.

4.c Sampling Ports

Sampling ports are located at the RTO inlet and outlet sampling locations as illustrated by Figures 1 and 2.

4.d Traverse Points

Traverse points are located at the RTO inlet and outlet sampling locations as illustrated by Figures 1 and 2.

5. Test Results and Discussion

Sections 5.a through 5.k provide a summary of the test results.

5.a Results Tabulation

The results of the emissions test program are summarized by Table 2.

5.b Discussion of Results

The results of the emissions test program are summarized by Table 2

5.c Sampling Procedure Variations

No sampling procedure variations occurred during testing.

5.d Process or Control Device Upsets

Run 1 outlet flow was measured to be less than the inlet flow due to fan speed decreasing between the flow measurements. Run 2 outlet flow was measured to be greater than the inlet flow out due to fan speed increasing between flow measurements. Run 3 had no fan speed changes.

5.e Control Device Maintenance

No maintenance was performed during the test program.

5.f Audit Sample Analyses

No audit samples were collected as part of the test program.

5.g Calibration Sheets

Relevant equipment calibration documents are provided as Appendix B.

5.h Sample Calculations

Sample calculations are provided in Appendix C.

5.i Field Data Sheets

Field documents relevant to the emissions test program are presented in Appendix A.

5.j Laboratory Data

No laboratory results are presented in this test program.

Table 1
Test Personnel

Name and Title	Affiliation	Telephone
Mr. Randal Tysar Senior Project Manager	BTEC 4949 Fernlee Avenue Royal Oak, MI 48073	(269) 342-1100
Ms. Jill Yoxheimer Senior Environmental Engineer	Michigan Automotive Compressor, Inc. 2400 North Dearing Road Parma, MI 49269	(517) 796-3257
Mr. Ken Lievense Project Manager	BTEC 4949 Fernlee Avenue Royal Oak, MI 48073	(248) 548-8070
Mr. Paul Molenda Environmental Technician	BTEC 4949 Fernlee Avenue Royal Oak, MI 48073	(248) 548-8070

Table 2
RTO Destruction Efficiency Summary
Michigan Auto Compressor, Inc.
Jackson, MI

Parameter	Run 1	Run 2	Run 3	Average
Sampling Date	6/9/2015	6/9/2015	6/9/2015	
Sampling Time	8:45-9:45	10:00-11:00	11:15-12:15	
Inlet Flowrate (scfm)	5,074	3,895	4,361	4,443
Outlet Flowrate (scfm)	4,688	5,203	4,770	4,887
Inlet VOC Concentration (ppmv propane)	40.5	48.6	38.9	42.7
Inlet VOC Concentration (ppmv, corrected as per USEPA 7E)	39.7	47.5	38.1	41.8
Inlet VOC Mass Flowrate (lb/hr)	1.38	1.27	1.14	1.27
Outlet VOC Concentration (ppmv propane)	0.57	0.52	0.38	0.49
Outlet VOC Concentration (ppmv, corrected as per USEPA 7E)	0.54	0.47	0.35	0.45
Outlet VOC Mass Emission Rate (lb/hr)	0.017	0.017	0.011	0.015
VOC Destruction Efficiency (%)	**98.7**	**98.7**	**99.0**	**98.8**

scfm: standard cubic feet per minute
ppmv: parts per million on a volume to volume basis
lb/hr: pounds per hour
VOC: volatile organic compound
MW = molecular weight (C_3H_8 = 44.10)
24.14: molar volume of air at standard conditions (70°F, 29.92" Hg)
35.31: ft^3 per m^3
453600: mg per lb

Equations

lb/hr = ppmv * MW/24.14 * 1/35.31 * 1/453,600 * scfm* 60

Inlet VOC Correction			
Co	0.37	0.71	0.60
Cma	49.7	49.7	49.7
Cm	50.55	50.82	50.46

Outlet VOC Correction			
Co	0.04	0.05	0.04
Cma	4.99	4.99	4.99
Cm	4.99	5.05	5.01