



Particulate Matter and Visible Emissions Emissions Test Report

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Prepared for:

General Motors

Saginaw, Michigan

GM SMCO
1629 N. Washington St.
Saginaw, Michigan

Project No. 15-4690.00
July 17, 2015

BT Environmental Consulting, Inc.
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MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION

**RENEWABLE OPERATING PERMIT
REPORT CERTIFICATION**

Authorized by 1994 P.A. 451, as amended. Failure to provide this information may result in civil and/or criminal penalties.

Reports submitted pursuant to R 336.1213 (Rule 213), subrules (3)(c) and/or (4)(c), of Michigan's Renewable Operating Permit (ROP) program must be certified by a responsible official. Additional information regarding the reports and documentation listed below must be kept on file for at least 5 years, as specified in Rule 213(3)(b)(ii), and be made available to the Department of Environmental Quality, Air Quality Division upon request.

Source Name GM LLC Saginaw Metal Casting Operations County Saginaw

Source Address 1629 N. Washington City Saginaw

AQD Source ID (SRN) B1991 ROP No. PTI 36-12C ROP Section No. 1

Please check the appropriate box(es):

Annual Compliance Certification (Pursuant to Rule 213(4)(c))

Reporting period (provide inclusive dates): From _____ To _____

- 1. During the entire reporting period, this source was in compliance with ALL terms and conditions contained in the ROP, each term and condition of which is identified and included by this reference. The method(s) used to determine compliance is/are the method(s) specified in the ROP.
- 2. During the entire reporting period this source was in compliance with all terms and conditions contained in the ROP, each term and condition of which is identified and included by this reference, EXCEPT for the deviations identified on the enclosed deviation report(s). The method used to determine compliance for each term and condition is the method specified in the ROP, unless otherwise indicated and described on the enclosed deviation report(s).

Semi-Annual (or More Frequent) Report Certification (Pursuant to Rule 213(3)(c))

Reporting period (provide inclusive dates): From _____ To _____

- 1. During the entire reporting period, ALL monitoring and associated recordkeeping requirements in the ROP were met and no deviations from these requirements or any other terms or conditions occurred.
- 2. During the entire reporting period, all monitoring and associated recordkeeping requirements in the ROP were met and no deviations from these requirements or any other terms or conditions occurred, EXCEPT for the deviations identified on the enclosed deviation report(s).

Other Report Certification

Reporting period (provide inclusive dates): From 5-28-2015 To 5-28-2015

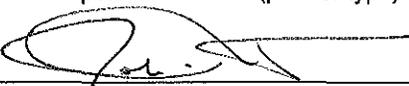
Additional monitoring reports or other applicable documents required by the ROP are attached as described:

PTI 36-12C / D, SC EU-PSANDPROCESS(Z02-BH-04), V.1 & 40 CFR Part 60 Subpart UUU

Stack Test Report: Testing was conducted in accordance with the approved test plan, the
facility operating conditions were in compliance with permit requirements and were at
maximum routine operating conditions for the facility.

I certify that, based on information and belief formed after reasonable inquiry, the statements and information in this report and the supporting enclosures are true, accurate and complete

John Lancaster Plant Manager 989-757-1432
Name of Responsible Official (print or type) Title Phone Number

 7/23/15
Signature of Responsible Official Date

Executive Summary

BT Environmental Consulting, Inc. (BTEC) was retained by General Motors LLC (GM) to conduct a compliance emissions test program on one source associated with the Thermal Sand Reclaim (TSR) system at the Saginaw Metal Casting Operations (SMCO) facility in Saginaw, Michigan. This emissions testing program included evaluation of particulate matter (PM) and visual emissions (VE) from SV-Z02-BH-4. Sampling was conducted on May 28th, 2015.

Testing consisted of triplicate 120-minute test runs for PM, and triplicate 60-minute test runs for opacity. Sampling was performed utilizing United States Environmental Protection Agency (USEPA) test methods. The results of the emissions test program are highlighted by Table E-I.

**Table E-I
Overall Results Summary
Sampling Dates: May 28, 2015**

Source	Pollutant*	Average Test Result	Emission Limit
SV-Z02-BH-4	PM	0.126 lbs/hr	0.19 lbs/hr
		0.0006 gr/dscf	0.040 grain per dry standard cubic foot (gr/dscf)
	Opacity	0%	10%



1. Introduction

BT Environmental Consulting, Inc. (BTEC) was retained by General Motors LLC (GM) to conduct a compliance emissions test program on one source associated with the Thermal Sand Reclaim (TSR) system at the Saginaw Metal Casting Operations (SMCO) facility in Saginaw, Michigan. This emissions testing program included evaluation of particulate matter (PM) and visual emissions (VE) from SV-Z02-BH-4. Sampling was conducted on May 28th, 2015.

The Air Quality Division (AQD) of Michigan's Department of Environmental Quality 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

The source tested is located at the GM Saginaw Metal Casting Operations located in Saginaw, Michigan. Testing on all sources was conducted May 28th, 2015.

1.b Purpose of Testing

The purpose of the testing is to demonstrate compliance with Michigan Permit to Install No. 36-12C.

1.c Source Description

EU-SPMPROCESSAND

Sand Processing – 120 ton new sand storage silo with bin vent filter receives sand via blower truck and a 30 ton pre-reclaim sand silo receives process sand recovered in the facility. Sand from both silos is transported to the natural gas fired fluidized bed sand reclaim process system (sand reclaim furnace, sand cooler, sand screen, and deduster) (design heat input rate is 4 MMBtu/hr, sand throughput rate of 3 tons per hour) for cleaning and preparation of sand. From there, sand is transferred to the prepared sand silo.

Top core, scrap cores, broken cores and process sand collected from EU SPMCASTLINE and scrap cores and process sand from EU SPMCOREROOM are collected in a bin/hopper and taken to a Sand Load Out Station for reclaim or returned to the process by the receiving dump chute of EU SPMPROCESSAND for transport by conveyor to the hopper/storage silo of EU SPMPROCESSAND.



1.d Test Program Contact

The contact for information regarding the test program as well as the test report is:

Jennifer Tegen
GECS - Facility Air Compliance & Permit
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Saginaw, Michigan 48605
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renee.mietz@gm.com

1.e Test Personnel

Names and affiliations for personnel who were present during the testing program are summarized by Table 2.

**Table 2
Test Personnel**

Name	Affiliation
Jennifer Tegen	GM-WTC
Renee Mietz	GM-SMCO
Matt Young	BTEC
Paul Molenda	BTEC
Tom Gasloli	MDEQ

2. Summary of Results

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

2.a Operating Data

Process and control equipment operating data relevant to the emissions test program is provided in Appendix A.



2.b Applicable Permit

The emission units tested for the TSR are included in Michigan Permit to install No. 36-12C.

2.c Results

The results of the emissions test program are summarized by Table 1. Detailed results for the test runs are summarized in Table 4.

2.d Emission Regulation Comparison

The Emission regulations are summarized by the following table.

Table 3
MI PTI No. 36-12C Limitations

Emission Unit ID	Pollutant	Permit Limit	40 CFR 60, Subpart UUU
SV-Z02-BH-4	Particulate Matter (PM)	0.19 lb /hr	0.040 grain per dry standard cubic foot (gr/dscf)
	Opacity	10%	

3. Source Description

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

3.a Process Description

EU-SPMPROCESSAND

Sand Processing – 120 ton new sand storage silo with bin vent filter receives sand via blower truck and a 30 ton pre-reclaim sand silo receives process sand recovered in the facility. Sand from both silos is transported to the natural gas fired fluidized bed sand reclaim process system (sand reclaim furnace, sand cooler, sand screen, and deduster) (design heat input rate is 4 MMBtu/hr, sand throughput rate 3 tons per hour) for cleaning and preparation of sand. From there, sand is transferred to the prepared sand silo.

Top core, scrap cores, broken cores and process sand collected from EU SPMCASTLINE and scrap cores and process sand from EU SPMCORERROOM are collected in a bin/hopper and taken to a Sand Load Out Station for reclaim or returned to the process by the receiving dump chute of EU SPMPROCESSAND for transport by conveyor to the hopper/storage silo of EU SPMPROCESSAND.

3.b Process Flow Diagram

Due to the simplicity of the TSR operations, a process flow diagram is not necessary.

3.c Raw and Finished Materials

The raw material used in the TSR system is sand.

3.d Process Capacity

The total heat input rate of the natural gas fired fluidized bed sand reclaim process unit under EU-SPMPROCESSAND is 4 MMBtu/hr and a sand process rate of 3 tons per hour.

3.e Process Instrumentation

The Sand throughput, hood temperature and natural gas usage of the fluidized bed sand reclaim systems, along with the pressure drop across the control devices were recorded for every run. This information is provided in appendix A.

4. Sampling and Analytical Procedures

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

4.a Sampling Train and Field Procedures

Sampling and analytical methodologies for the emissions test program can be separated into three categories as follows:

- (1) Measurement of exhaust gas velocity, molecular weight, and moisture content;
- (2) Measurement of exhaust gas filterable PM concentration;

Sampling and analytical methodologies by category are summarized below.

Exhaust Gas Velocity, Molecular Weight, and Moisture Content

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. A diagram of the sample points is provided in Figure 1.

Cyclonic flow checks were performed at each 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 20 degrees at each sampling point.

The Molecular Weight of the gas stream was evaluated according to procedures outlined in Title 40, Part 60, Appendix A, Method 3A. The O₂/CO₂ content of the gas stream was measured using a Fyrite combustion analyzer.

Exhaust gas was extracted as part of the sampling train. Exhaust gas moisture content was then determined gravimetrically.

Filterable Particulate Matter – Method 5

40 CFR 60, Appendix A, Method 5, “Determination of Particulate Emissions from Stationary Sources” was used to measure PM concentrations and calculate appropriate emission rates (see Figure 2 for a schematic of the sampling train).

BTEC’s Nutech® Model 2010 modular isokinetic stack sampling system consisted of (1) a stainless steel nozzle, (2) a glass probe, (3) a set of four Greenburg-Smith (GS) impingers with the first two with 100 ml of H₂O (ii) an empty impinger, (iii) and an impinger filled with approximately 300 grams of silica gel, (4) a length of sample line, and (5) a Nutech® control case equipped with a pump, dry gas meter, and calibrated orifice.

Upon completion of the final leak test for each test run, the filter was recovered, and the nozzle, probe, and the front half of the filter holder assembly were brushed and triple rinsed with 100 ml of acetone which was collected in a pre-cleaned sample container.

BTEC labeled each container with the test number, test location, and test date, and marked the level of liquid on the outside of the container. In addition, blank samples of the acetone and filter were collected. BTEC personnel carried all samples to BTEC's laboratory (for filter and acetone gravimetric analysis) in Royal Oak, Michigan.

4.b Recovery and Analytical Procedures

Descriptions of the recovery procedures are provided in section 4.a for each sampling method.

4.c Sampling Ports

A diagram of the stack showing sampling ports are included as Figure 1.



4.d Traverse Points

A diagram of the stack showing sampling ports are included as Figure 1.

5. Test Results and Discussion

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

5.a Results Tabulation

The overall results of the emissions test program are summarized by Table 1. Emission limits are summarized by Table 3. Detailed results for the emissions test program are summarized by Table 4.

5.b Discussion of Results

The average results of the particulate matter emissions of SV-Z02-BH-4 are below the corresponding limits.

**Table 1
Overall Results Summary
Sampling Dates: May 28, 2015**

Source	Pollutant*	Average Test Result	Emission Limit
SV-Z02-BH-4	PM	0.126 lbs/hr	0.19 lbs/hr
		0.0006 gr/dscf	0.040 grain per dry standard cubic foot (gr/dscf)
	Opacity	0%	10%

5.c Sampling Procedure Variations

There were no sampling variations used during the emission compliance test program.

5.d Process or Control Device Upsets

No process or control device upsets occurred during the emissions test program.



5.e Control Device Maintenance

There was no control equipment maintenance performed during the emissions test program.

5.f Audit Sample Analyses

Audit samples were not analyzed as part of this emissions test program.

5.g Calibration Sheets

Calibration documents are provided as Appendix B.

5.h Sample Calculations

Sample calculations are provided as Appendix C.

5.i Field Data Sheets

Field data sheets are provided in Appendix D.

5.j Laboratory Data

Laboratory analysis is provided in Appendix E.

Tables

Table 4
SV-Z02-BH-4 Particulate Matter Emission Rates

Company	GM SMCO			
Source Designation	TSR BH 4			
Test Date	5/28/2015	5/28/2015	5/28/2015	
Meter/Nozzle Information				
	P-1	P-2	P-3	Average
Meter Temperature Tm (F)	86.5	100.3	102.3	96.4
Meter Pressure - Pm (in. Hg)	29.6	29.6	29.6	29.6
Measured Sample Volume (Vm)	75.8	91.7	100.0	89.2
Sample Volume (Vm-Std ft3)	72.9	86.1	93.6	84.2
Sample Volume (Vm-Std m3)	2.06	2.44	2.65	2.38
Condensate Volume (Vw-std)	1.084	1.697	2.310	1.697
Gas Density (Ps(std) lbs/ft3) (wet)	0.0741	0.0740	0.0739	0.0740
Gas Density (Ps(std) lbs/ft3) (dry)	0.0745	0.0745	0.0745	0.0745
Total weight of sampled gas (m g lbs) (wet)	5.48	6.49	7.08	6.35
Total weight of sampled gas (m g lbs) (dry)	5.43	6.41	6.97	6.27
Nozzle Size - An (sq. ft.)	0.000317	0.000383	0.000415	0.000372
Isokinetic Variation - I	99.4	98.7	100.1	99.4
Stack Data				
Average Stack Temperature - Ts (F)	136.3	141.0	142.9	140.1
Molecular Weight Stack Gas- dry (Md)	28.8	28.8	28.8	28.8
Molecular Weight Stack Gas-wet (Ms)	28.7	28.6	28.6	28.6
Stack Gas Specific Gravity (Gs)	0.990	0.988	0.987	0.988
Percent Moisture (Bws)	1.47	1.93	2.41	1.94
Water Vapor Volume (fraction)	0.0147	0.0193	0.0241	0.0194
Pressure - Ps ("Hg)	29.5	29.5	29.5	29.5
Average Stack Velocity - Vs (ft/sec)	37.4	37.3	37.1	37.3
Area of Stack (ft2)	13.6	13.6	13.6	13.6
Exhaust Gas Flowrate				
Flowrate ft ³ (Actual)	30,591	30,475	30,350	30,472
Flowrate ft ³ (Standard Wet)	26,674	26,365	26,175	26,405
Flowrate ft ³ (Standard Dry)	26,283	25,855	25,544	25,894
Flowrate m ³ (standard dry)	744	732	723	733
Total Particulate Weights (mg)				
Nozzle/Probe/Filter	0.5	4.7	4.6	3.3
Total Particulate Concentration				
lb/1000 lb (wet)	0.000	0.002	0.001	0.001
lb/1000 lb (dry)	0.000	0.002	0.001	0.001
mg/dscm (dry)	0.2	1.9	1.7	1.3
gr/dscf	0.0001	0.0008	0.0008	0.0006
Total Particulate Emission Rate				
lb/ hr	0.024	0.187	0.167	0.126