BTEC Inc.

VOC Destruction Efficiency Emissions Test Summary Report

Prepared for:

Denso Manufacturing Michigan, Inc.

Denso Manufacturing Michigan, Inc.
One Denso Road
Battle Creek, Michigan 49037

Project No. 14-4721.00
September 2, 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 Denso Manufacturing Michigan, Inc. (Denso) to evaluate Volatile Organic Compounds (VOC) Destruction Efficiency (DE) from the H751 Thermal Oxidizer (TO) at the Denso facility located in Battle Creek, Michigan. The emissions test program was conducted on August 11, 2015.

Testing of the H751 TO consist of triplicate 60-minute test runs. The emissions test program was required by MDEQ Air Quality Division Permit To Install (PTI) No. 19-04B. The results of the emission test program are summarized by Table I.

Table I
H751 TO Overall Emission Summary
Test Date: August 11, 2015

Pollutant	Test Result	Emission Limit
VOC	99.9% DE 0.00 pph	95% DE or 0.29 pph

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1. Introduction

BT Environmental Consulting, Inc. (BTEC) was retained by Denso Manufacturing Michigan, Inc. (Denso) to evaluate Volatile Organic Compounds (VOC) Destruction Efficiency (DE) from the H751 Thermal Oxidizer (TO) at the Denso facility located in Battle Creek, Michigan. The emissions test program was conducted on August 11, 2015. The purpose of this report is to document the results of the test program.

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 August 11, 2015 at the Denso facility located in Battle Creek, Michigan. The test program included evaluation of VOC DE emissions from H751 TO.

1.b Purpose of Testing

AQD issued Permit To Install No. 19-04B to Denso. This permit limits emissions from the oxidizer as summarized by Table 1.

Table 1
VOC DE Emission Limitations
Denso Manufacturing Michigan, Inc.

Pollutant	Emission Limit
VOC	95% DE or 0.29 pph

1.c Source Description

The oven degreaser is used to remove machining oils (containing VOCs) from assembled heater cores. The cores consist of aluminum tubes, fins, and other small parts which have been assembled to make the core. The machining oils are used in the stamping of small aluminum pieces and to facilitate the formation of fins from strips of aluminum. Therefore, the main raw material used in making the cores is aluminum.

1.d Test Program Contacts

The contact for the source and test report is:

Ms. Jody Smith, P.E.
Advanced Environmental Engineering
Denso Manufacturing Michigan, Inc.
One Denso Road
Battle Creek, Michigan 49037
(269) 565-8562

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

Table 2
Test Personnel

Name and Title	Affiliation	Telephone
Mr. Barry Boulianne Senior Project Manager	BTEC 4949 Fernlee Royal Oak, MI 48073	(248) 548-8070
Mr. Steve Smith Project Manager	BTEC 4949 Fernlee Royal Oak, MI 48073	(248) 548-8070
Mr. Paul Diven Environmental Technician	BTEC 4949 Fernlee Royal Oak, MI 48073	(248) 548-8070

2. Summary of Results

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

2.a Operating Data

H751 TO

- Temperature- Minimum 1400 degrees F; setpoint = 780+/- 20 degrees C
- Minimum of 0.5 second gas retention time
- 95% DE or maximum VOC emission rate of 0.29 pph.

2.b Applicable Permit

The applicable permit for this emissions test program is Permit To Install (PTI) No. 19-04B.

2.c Results

The overall results of the emission test program are summarized by Table 3 (see Section 5.a). The VOC DE was above the permit level of 95%. The VOC DE was 99.9%.

3. Source Description

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

3.a Process Description

Oily cores are transported into the oven degreaser on a conveyor, which moves at a continuous speed through the degreaser. Therefore, the VOC load to the TOs from the degreasers will be constant as long as cores are loaded onto the entrance conveyor.

The operating parameter used to regulate the oven degreaser is the temperature. Oven degreaser H751 operates at 185 degrees C in all the zones.

The oven degreaser is equipped with a thermal oxidizer as pollution control.

3.b Process Flow Diagram

Due to the simplicity of the thermal oxidizer, a process flow diagram is not necessary.

3.c Raw and Finished Materials

The raw material used by the process is aluminum and VOC.

3.d Process Capacity

The maximum possible production capacity of H751 oven degreaser is 800 cores/hour.

3.e Process Instrumentation

Section 3.d provides summary.

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

Measurement of exhaust gas velocity, molecular weight, and moisture content were conducted using the following reference test methods codified at 40 CFR 60, Appendix A:

- Method 1 -"Location of the Sampling Site and Sampling Points"
- Method 2 -"Determination of Stack Gas Velocity and Volumetric Flow rate"
- Method 3 -"Determination of Molecular Weight of Dry Stack Gas" (Fyrite)

- Method 4 - "Determination of Moisture Content in Stack Gases"
- Method 25A -"Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer"

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

A cyclonic flow check was 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 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 3. The O2 /CO2 content of the gas stream was measured using an O2 /CO2 Fyrite gas analyzer.

Exhaust gas moisture content was evaluated using Method 4. Exhaust gas was extracted as part of the moisture sampling (see Section 3.2) and passed through (i) two impingers, each with 100 ml glycol diluted water, (ii) an empty impinger, and (iii) an impinger filled with silica gel. Exhaust gas moisture content is then determined gravimetrically.

The accuracy of the gas dilution system was verified using the procedures detailed by Method 205.

Volatile Organic Compounds (USEPA Method 25A)

Volatile Organic compound (VOC) concentrations were measured according to 40 CFR 60, Appendix A, Method 25A. 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 to prevent the condensation of any moisture from the sample before it enters the analyzer. Data was recorded at 4-second intervals on a PC equipped with Labview® II data acquisition software. BTEC used a VIG Model 20 THC hydrocarbon analyzer and JUM 109A to determine the VOC concentrations at the inlet and outlet. The VIG and JUM THC hydrocarbon analyzers channels a fraction of the gas sample through a capillary tube that directs the sample to the flame ionization detector (FID), where the hydrocarbons present in the sample are ionized into carbon. The carbon concentration is then determined by the detector in parts per million (ppm). This concentration is transmitted to the data acquisition system (DAS) at 4-second intervals in the form of an analog signal, specifically voltage, to produce data that can be averaged over the duration of the testing program. This data is then used to determine the average ppm for total hydrocarbons (THC) using the equivalent units of propane (calibration gas).

The JUM analyzer was calibrated for a range of 0 to 100 ppm. The VIG analyzer was calibrated for a range of 0 to 1,000 ppm.

In accordance with Method 25A, a 3-point (zero, mid, and high) calibration check was performed on the THC analyzer. Calibration drift checks were performed at the completion of each run.

4.b Recovery and Analytical Procedures

This test program did not include laboratory samples, consequently, sample recovery and analysis is not applicable to this test program.

4.c Sampling Ports

A diagram of the stack showing sampling ports in relation to upstream and downstream disturbances is included as Figure 2 and 3.

4.d Traverse Points

A diagram of the stack indicating traverse point locations and stack dimensions is included as Figure 2 and 3.

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 3. Detailed results for the emissions test program are summarized by Table 4.

Table 3
H751 TO Overall Emission Summary
Test Date: August 11, 2015

Pollutant	Test Result	Emission Limit
VOC	99.9%	95% DE or 0.29 pph

5.b Discussion of Results

VOC DE test result was 99.9%, which is higher than the 95% emission limit.

5.c Sampling Procedure Variations

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

5.d Process or Control Device Upsets

During Run 2 the process had to shut down for lunch. BTEC paused Run 2 for 20 minutes and resumed after lunch.

5.e Control Device Maintenance

H751 has had the following maintenance activities within the last 3 months:

- Replacement of the thermocouples in the oven degreaser.
- Fixed a conveyor that would not start.
- Fixed preheat burners in oven degreaser.
- Quarterly preventative maintenance and low temp alarm check.

5.f Re-Test

The emissions test program was not a re-test.

5.g Audit Sample Analyses

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

5.h Calibration Sheets

Relevant equipment calibration documents are provided in Appendix B.

5.i Sample Calculations

Sample calculations are provided in Appendix C.

5.j Field Data Sheets

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

5.k Laboratory Data

There are no laboratory results for this test program. Raw CEM data is provided electronically in Appendix D.

Table 4
H751 TO Destruction Efficiency Summary
Denso Manufacturing Michigan, Inc.
Battle Creek, Michigan

Parameter	Run 1	Run 2	Run 3	Average
Sampling Date	8/11/2015	8/11/2015	8/11/2015	
Sampling Time	8:28-9:28	10:24-11:15/11:35-11:45	12:07-13:07	
Inlet Flowrate (scfm)	499	449	460	469
Outlet Flowrate (scfm)	915	898	888	901
Inlet VOC Concentration (ppmv propane)	732.1	504.0	607.4	614.5
Inlet VOC Concentration (ppmv, corrected as per USEPA 7E)	716.0	508.2	601.9	608.7
Inlet VOC Mass Flowrate (lb/hr)	2.45	1.57	1.90	1.97
Outlet VOC Concentration (ppmv propane)	0.0	0.0	0.0	0.0
Outlet VOC Concentration (ppmv, corrected as per USEPA 7E)	0.5	0.3	0.2	0.3
Outlet VOC Mass Emission Rate (lb/hr)	0.00	0.00	0.00	0.00
VOC Destruction Efficiency (%)	**99.9**	**99.9**	**99.9**	**99.9**

Inlet VOC Correction			
Co	9.94	0.61	3.29
Cma	749.4	794.5	795
Cm	765.77	787.56	801.25

Outlet VOC Correction			
Co	-0.48	-0.27	-0.22
Cma	29.4	29.4	29.4
Cm	29.75	28.97	28.70

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

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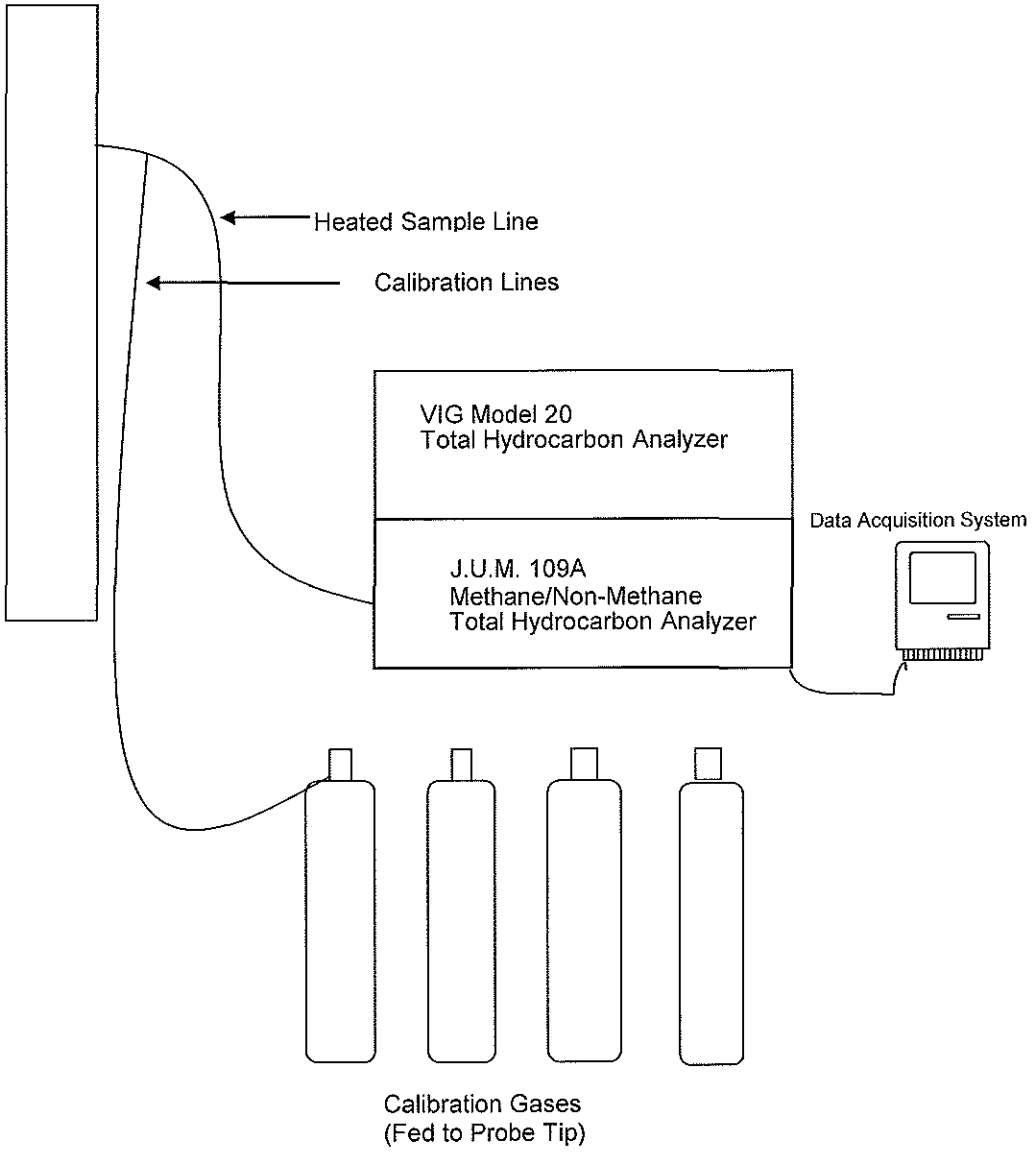

Figure 1

Site: **USEPA Method 25A** **Denso** **Battle Creek, MI**	**Sampling Date:** **August 11, 2015**	**BT Environmental Consulting, Inc.** **4949 Fernlee Avenue** **Royal Oak, Michigan 48073**

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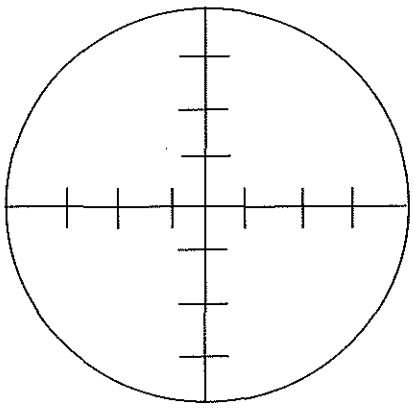
diameter = 10 inches

Points	Distance "
1	0.44
2	1.46
3	2.96
4	7.04
5	8.54
6	9.56



Not to Scale

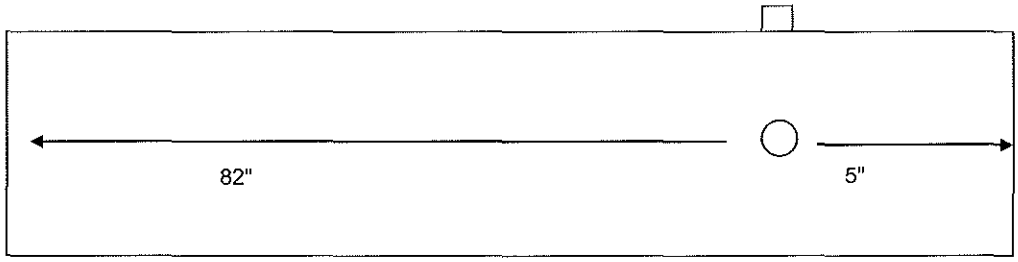


Figure No. 2

Site: **H751 Inlet** **Denso** **Battle Creek, MI**	**Sampling Date:** **August 11, 2015**	**BT Environmental Consulting, Inc.** **4949 Fernlee** **Royal Oak, Michigan**

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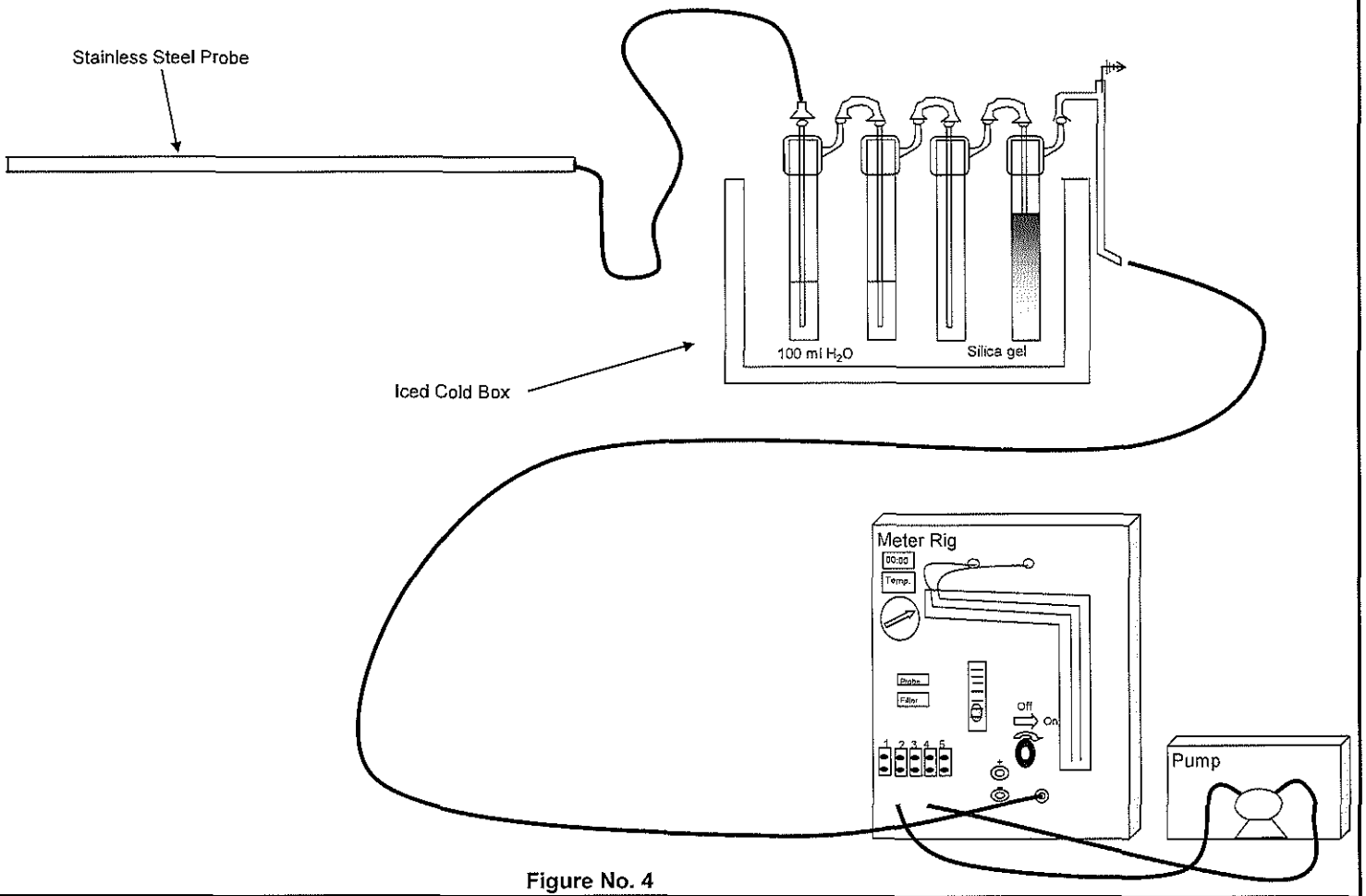

Figure No. 4

Site:	Sampling Date:	
USEPA Method 4 Denso Battle Creek, MI	August 11, 2015	BT Environmental Consulting, Inc. 4949 Fernlee Avenue Royal Oak, Michigan