



RCO Outlet Concentration Monitoring Summary Report

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MAY 03 2016
AIR QUALITY DIV.

Prepared for:
Ford Motor Company
Flat Rock Assembly Plant
Flat Rock, Michigan

Flat Rock Assembly Plant
1 International Drive
Flat Rock, MI 48134
Test Date: March 30, 2016

Project No. 16-4824.00
April 19, 2016

BT Environmental Consulting, Inc.
4949 Fernlee Avenue
Royal Oak, MI 48073

EXECUTIVE SUMMARY**AIR QUALITY DIV.**

BT Environmental Consulting, Inc. (BTEC) was retained by Ford Motor Company (Ford) to evaluate volatile organic compound (VOC) concentrations at the outlet of three (3) regenerative catalytic oxidizers (RCOs) at the Flat Rock Assembly Plant (FRAP) located in Flat Rock, Michigan. Sampling and analysis for this emission test program was conducted on March 30, 2016.

Testing consisted of a single 30-minute test run at the exhaust from each RCO. The emissions test program is required by Michigan Department of Environmental Quality Air Quality Division Permit No. MI-ROP-N0929-2011a. The results of the emission test program are summarized by Table E-I.

Table E-I
Test Program Emission Summary

Exhaust Location	Average VOC Concentration (ppmv, minus methane)
RCO A	5.6
RCO B	6.6
RCO C	2.7
Average	5.0



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 (RO) Permit 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 described in General Condition No. 22 in the RO Permit and be made available to the Department of Environmental Quality, Air Quality Division upon request.

Source Name Flat Rock Assembly Plant County Wayne

Source Address 1 International Drive City Flat Rock

AQD Source ID (SRN) N0929 RO Permit No. MI-ROP-N0929-2011a RO Permit Section No. 1

Please check the appropriate box(es):

Annual Compliance Certification (General Condition No. 28 and No. 29 of the RO Permit)

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 RO Permit, 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 RO Permit.

2. During the entire reporting period this source was in compliance with all terms and conditions contained in the RO Permit, 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 RO Permit, unless otherwise indicated and described on the enclosed deviation report(s).

Semi-Annual (or More Frequent) Report Certification (General Condition No. 23 of the RO Permit)

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

1. During the entire reporting period, ALL monitoring and associated recordkeeping requirements in the RO Permit 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 RO Permit 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 _____ To _____

Additional monitoring reports or other applicable documents required by the RO Permit are attached as described:
Air Emissions Test Report Submission for Outlet Concentration Monitoring March 2016

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.

<u>Jeffrey Carrier</u>	<u>Plant Manager</u>	<u>734-782-7482</u>
Name of Responsible Official (print or type)	Title	Phone Number

<u>Jeffrey Carrier</u>	<u>4/27/16</u>
Signature of Responsible Official	Date



1. Introduction

BT Environmental Consulting, Inc. (BTEC) was retained by Ford Motor Company (Ford) to evaluate volatile organic compound (VOC) concentrations at the outlet of three (3) regenerative catalytic oxidizers (RCOs) at the Flat Rock Assembly Plant (FRAP) located in Flat Rock, Michigan. Sampling and analysis for this emission test program was conducted on March 30, 2016. The purpose of this report is to document the results of the test program.

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" (February 2008, see Appendix A). The following is a summary of the emissions test program and results in the format outlined by the AQD document.

1.a Identification, Location, and Dates of Test

Sampling and analysis for the emission test program was conducted on March 30, 2016 at the FRAP facility located in Flat Rock, Michigan. The test program included monitoring VOC (as propane) and methane concentrations at the outlet of three (3) RCO units.

1.b Purpose of Testing

The FRAP Outlet Concentration Monitoring Plan (required for FG-Controls by AQD Permit No. MI-ROP-N0929-2011a) requires periodic monitoring of the VOC concentration of exhaust from each of the three (3) RCO units.

1.c Source Description

The FRAP coating operations are controlled by three (3) RCOs (identified as RCO A, RCO B, and RCO C) and one (1) regenerative thermal oxidizer (RTO) as pollution control equipment. All three (3) RCO units share a common inlet duct. The RTO exhaust combines with RCO C exhaust before it is exhausted from the RCO C stack.

1.d Test Program Contact

The contact for the source and test program is:

Mr. Terence Filipiak, QEP, CHMM
Environmental Manager
Flat Rock Assembly Plant
1 International Dr.
Flatrock, Michigan 48134
(734) 782-7797

1.e Testing Personnel

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

**Table 1
Test Personnel**

Name and Title	Affiliation	Telephone
Mr. Terence Filipiak, Environmental Manager	Flat Rock Assembly Plant 1 International Dr. Flatrock, MI 48134	(734) 782-7797
Ms. Susan Hicks Environmental Engineer	Ford Motor Company Fairlane Plaza North, Suite 800 290 Town Center Drive Dearborn, MI 48126	(313) 594-3185
Mr. Barry Boulianne Project Manager	BTEC 4949 Fernlee Avenue Royal Oak, MI 48073	(313) 449-2361
Mr. Paul Molenda Environmental Technician	BTEC 4949 Fernlee Avenue Royal Oak, MI 48073	(248) 506-0107
Mr. Tom Maza	MDEQ Air Quality Division	(313) 456-4709

2. Summary of Results

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

2.a Operating Data

Operational data collected during the testing includes the number of vehicles produced during each test run and RCO operating temperature for each test run. In addition, operating data collected includes the RTO temperature for the period during which RCO C was being tested. See Appendix E for this information.

2.b Applicable Permit

The applicable permit for this emissions test program is Permit No. MI-ROP-N0929-2011a.

2.c Results

The overall results of the emission test program are summarized by Table 2 (see Section 5.a).

3. Source Description

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

3.a Process Description

FRAP is an automotive assembly plant located in Flat Rock, Michigan. Vehicle body panels are stamped and assembled on site from sheet metal components. The bodies are cleaned, treated, and prepared for painting in the phosphate system. Drawing compounds, mill oils, and dirt are removed from the vehicle bodies utilizing both high pressure spray and immersion cleaning/rinsing techniques. Vehicle bodies then are dip coated in electro deposition corrosion primer paint for protection. The electro primer (e-coat) is heat-cured to the vehicle body in a high-temperature bake oven. After completing the e-coat operation, vehicle bodies are conveyed to the sealer area for application of various sealants to body seams and joints. Vehicle bodies are then conveyed to an oven to cure the sealers.

After the sealer oven, the vehicles are routed to one of the two identical 3-Wet paint system. In the booth, the vehicle is painted with primer, a color basecoat and a protective clearcoat layer using automatic bells on robot spray applicators. The vehicle then passes through an oven to cure the 3-Wet applications. The 3-Wet booths allow for paint application of one layer after the other without an intermediate drying stage.

The vehicle paint process includes the e-coat priming (guidecoat) surface priming, base/clearcoat and vehicle sealing operations. The majority of the process emissions associated with these coating activities are oxidized at elevated temperatures by the RCO and RTO emission control equipment that is part of this test program.

3.b Process Flow Sheet or Diagram

Each RCO controls VOC emissions from the corresponding equipment by oxidizing organics present in the exhaust gas at elevated temperatures.

3.c Raw and Finished Materials

The raw materials include various automotive coatings that are used in the following emission units: EGECOAT, EGGUIDECOAT/EGTOPCOAT, and EGCOAT. They include body sealing agents, electro deposition primer, surface primers, top/base coat color paints, and a clear protective final coating.

3.d Process Capacity

FRAP operates under a process limitation of 4.8 pounds of VOC per unit.

3.e Process Instrumentation

The only process operating parameters relevant to the emissions test program are RCO and RTO operating temperatures.

4. Sampling and Analytical Procedures

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

4.a Sampling Train and Field Procedures

Measurement of exhaust gas VOC and methane concentrations was conducted using the following reference test methods codified at 40 CFR 60, Appendix A:

- Method 25A- *“Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer”*

VOC concentrations were measured using the procedures found in 40 CFR 60, Appendix A, Method 25A, “Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer.”

The RCO outlet VOC concentrations were measured using a JUM 109A Methane/Non-Methane Analyzer. For each sampling location, 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 Laptop PC equipped with data acquisition software.

The J.U.M. Model 109A utilizes two flame ionization detectors (FID) to determine the average concentration (ppm) for THC (as propane) and the average concentration for methane. Upon entry, the gas stream is split by the analyzer. One FID ionizes all of the hydrocarbons in the gas stream sample into carbon, which is then detected as a concentration of total hydrocarbons. Using an analog signal, specifically voltage, the concentration of THC is then sent to a data acquisition system (DAS), where 4-second interval data points are recorded to produce an average based on the overall duration of the test. This average is then used to determine the average concentration for THC reported as the calibration gas, propane, in equivalent units.

The analyzer's response factor is obtained by introducing a methane calibration gas to the calibrated J.U.M. 109A. The response of the analyzer's THC FID to the methane calibration gas, in ppm, as propane, is divided by the methane analyzer's response to the methane calibration gas, in ppm as methane.

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 was 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 drawing of the Method 25A sampling train used for the testing program is presented as Figure 2. Protocol 1 gas certification sheets for the calibration gases used for this testing program are presented in Appendix B.

4.b Recovery and Analytical Procedures

Because all measurements were conducted using on-line analyzers, no samples were recovered during the test program.

4.c Sampling Ports

The THC sampling probes for each RCO were placed at a single fixed position for the duration of each test run.

4.d Traverse Points

No traverse points were used for this testing.

5. Test Results and Discussion

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

5.a Results Tabulation

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

Table 2
Test Program Emission Summary

Exhaust Location	Average VOC Concentration (ppmv, minus methane)
RCO A	5.6
RCO B	6.6
RCO C	2.7
Average	5.0

Detailed emissions test results are summarized by Table 3.

5.b Sampling Procedure Variations

Testing on RCO B was performed for 20 minutes, and then stopped for the lunch break in production. Testing equipment was moved to RCO A where a 30-minute test run was conducted. Testing equipment was then moved back to RCO B and testing was resumed for an additional 10 minutes of data. Both runs on RCO B were combined into a single 30-minute run, with time-weighted averages.

5.c Process or Control Device Upsets

See section 5.b.

5.d Control Device Maintenance

Only routine control device maintenance was performed prior to the testing.

5.e Re-test

This emissions test program was not a re-test.

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 D.

5.i Field Data Sheets

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

5.j Laboratory Data

There are no laboratory results for this test program.



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Prepared for:
Ford Motor Company
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Flat Rock, Michigan

Flat Rock Assembly Plant
1 International Drive
Flat Rock, MI 48134
Test Date: March 30, 2016

Project No. 16-4824.00
April 19, 2016

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4949 Fernlee Avenue
Royal Oak, MI 48073

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Testing consisted of a single 30-minute test run at the exhaust from each RCO. The emissions test program is required by Michigan Department of Environmental Quality Air Quality Division Permit No. MI-ROP-N0929-2011a. The results of the emission test program are summarized by Table E-I.

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Source Address 1 International Drive City Flat Rock

AQD Source ID (SRN) N0929 RO Permit No. MI-ROP-N0929-2011a RO Permit Section No. 1

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<u>Jeffrey Carrier</u>	<u>Plant Manager</u>	<u>734-782-7482</u>
Name of Responsible Official (print or type)	Title	Phone Number
<u>Jeffrey Carrier</u>		<u>4/27/16</u>
Signature of Responsible Official		Date



1. Introduction

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1.a Identification, Location, and Dates of Test

Sampling and analysis for the emission test program was conducted on March 30, 2016 at the FRAP facility located in Flat Rock, Michigan. The test program included monitoring VOC (as propane) and methane concentrations at the outlet of three (3) RCO units.

1.b Purpose of Testing

The FRAP Outlet Concentration Monitoring Plan (required for FG-Controls by AQD Permit No. MI-ROP-N0929-2011a) requires periodic monitoring of the VOC concentration of exhaust from each of the three (3) RCO units.

1.c Source Description

The FRAP coating operations are controlled by three (3) RCOs (identified as RCO A, RCO B, and RCO C) and one (1) regenerative thermal oxidizer (RTO) as pollution control equipment. All three (3) RCO units share a common inlet duct. The RTO exhaust combines with RCO C exhaust before it is exhausted from the RCO C stack.

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2. Summary of Results

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

2.a Operating Data

Operational data collected during the testing includes the number of vehicles produced during each test run and RCO operating temperature for each test run. In addition, operating data collected includes the RTO temperature for the period during which RCO C was being tested. See Appendix E for this information.

2.b Applicable Permit

The applicable permit for this emissions test program is Permit No. MI-ROP-N0929-2011a.

2.c Results

The overall results of the emission test program are summarized by Table 2 (see Section 5.a).

3. Source Description

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

3.a Process Description

FRAP is an automotive assembly plant located in Flat Rock, Michigan. Vehicle body panels are stamped and assembled on site from sheet metal components. The bodies are cleaned, treated, and prepared for painting in the phosphate system. Drawing compounds, mill oils, and dirt are removed from the vehicle bodies utilizing both high pressure spray and immersion cleaning/rinsing techniques. Vehicle bodies then are dip coated in electro deposition corrosion primer paint for protection. The electro primer (e-coat) is heat-cured to the vehicle body in a high-temperature bake oven. After completing the e-coat operation, vehicle bodies are conveyed to the sealer area for application of various sealants to body seams and joints. Vehicle bodies are then conveyed to an oven to cure the sealers.

After the sealer oven, the vehicles are routed to one of the two identical 3-Wet paint system. In the booth, the vehicle is painted with primer, a color basecoat and a protective clearcoat layer using automatic bells on robot spray applicators. The vehicle then passes through an oven to cure the 3-Wet applications. The 3-Wet booths allow for paint application of one layer after the other without an intermediate drying stage.

The vehicle paint process includes the e-coat priming (guidecoat) surface priming, base/clearcoat and vehicle sealing operations. The majority of the process emissions associated with these coating activities are oxidized at elevated temperatures by the RCO and RTO emission control equipment that is part of this test program.

3.b Process Flow Sheet or Diagram

Each RCO controls VOC emissions from the corresponding equipment by oxidizing organics present in the exhaust gas at elevated temperatures.

3.c Raw and Finished Materials

The raw materials include various automotive coatings that are used in the following emission units: EGECOAT, EGGUIDECOAT/EGTOPCOAT, and EGCOAT. They include body sealing agents, electro deposition primer, surface primers, top/base coat color paints, and a clear protective final coating.

3.d Process Capacity

FRAP operates under a process limitation of 4.8 pounds of VOC per unit.

3.e Process Instrumentation

The only process operating parameters relevant to the emissions test program are RCO and RTO operating temperatures.

4. Sampling and Analytical Procedures

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

4.a Sampling Train and Field Procedures

Measurement of exhaust gas VOC and methane concentrations was conducted using the following reference test methods codified at 40 CFR 60, Appendix A:

- Method 25A- *“Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer”*

VOC concentrations were measured using the procedures found in 40 CFR 60, Appendix A, Method 25A, “Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer.”

The RCO outlet VOC concentrations were measured using a JUM 109A Methane/Non-Methane Analyzer. For each sampling location, 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 Laptop PC equipped with data acquisition software.

The J.U.M. Model 109A utilizes two flame ionization detectors (FID) to determine the average concentration (ppm) for THC (as propane) and the average concentration for methane. Upon entry, the gas stream is split by the analyzer. One FID ionizes all of the hydrocarbons in the gas stream sample into carbon, which is then detected as a concentration of total hydrocarbons. Using an analog signal, specifically voltage, the concentration of THC is then sent to a data acquisition system (DAS), where 4-second interval data points are recorded to produce an average based on the overall duration of the test. This average is then used to determine the average concentration for THC reported as the calibration gas, propane, in equivalent units.

The analyzer's response factor is obtained by introducing a methane calibration gas to the calibrated J.U.M. 109A. The response of the analyzer's THC FID to the methane calibration gas, in ppm, as propane, is divided by the methane analyzer's response to the methane calibration gas, in ppm as methane.

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 was 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 drawing of the Method 25A sampling train used for the testing program is presented as Figure 2. Protocol 1 gas certification sheets for the calibration gases used for this testing program are presented in Appendix B.

4.b Recovery and Analytical Procedures

Because all measurements were conducted using on-line analyzers, no samples were recovered during the test program.

4.c Sampling Ports

The THC sampling probes for each RCO were placed at a single fixed position for the duration of each test run.

4.d Traverse Points

No traverse points were used for this testing.

5. Test Results and Discussion

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

5.a Results Tabulation

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

Table 2
Test Program Emission Summary

Exhaust Location	Average VOC Concentration (ppmv, minus methane)
RCO A	5.6
RCO B	6.6
RCO C	2.7
Average	5.0

Detailed emissions test results are summarized by Table 3.

5.b Sampling Procedure Variations

Testing on RCO B was performed for 20 minutes, and then stopped for the lunch break in production. Testing equipment was moved to RCO A where a 30-minute test run was conducted. Testing equipment was then moved back to RCO B and testing was resumed for an additional 10 minutes of data. Both runs on RCO B were combined into a single 30-minute run, with time-weighted averages.

5.c Process or Control Device Upsets

See section 5.b.

5.d Control Device Maintenance

Only routine control device maintenance was performed prior to the testing.

5.e Re-test

This emissions test program was not a re-test.

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 D.

5.i Field Data Sheets

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

5.j Laboratory Data

There are no laboratory results for this test program.

Table 3
VOC Emissions
Ford
Flat Rock, MI
BTEC Project No. 16-4824.00
Sampling Dates: 3/30/2016

Parameter	RCO A	RCO B	RCO C	Average
Test Run Date	3/30/2016	3/30/2016	3/30/2016	
Test Run Time	12:00-12:30	10:50-11:10 13:05-13:15	10:00-10:30	
Total Run Time (minutes)	30	30	30	30.0
Outlet VOC Concentration (ppmv as propane)	31.6	12.1	11.4	18.4
Outlet Methane Concentration (ppmv as methane)	62.2	13.5	21.0	32.2
Outlet VOC Concentration (ppmv, corrected as per USEPA 7E)	32.3	12.3	11.5	18.7
Outlet Methane Concentration (ppmv, corrected as per USEPA 7E)	64.2	13.7	21.1	33.0
Outlet VOC Concentration (ppmv propane, -Methane)	5.8	6.5	2.7	5.0
Outlet VOC Concentration (ppmv propane, -Methane, corrected as per USEPA 7E)	5.6	6.6	2.7	5.0

ppmv = parts per million on a volume-to-volume basis

ppm as propane (-Methane) = ppm propane - (ppm Methane)/Response factor

Response factor obtained from introducing propane into methane analyzer:

2.41

Figures



diameter = 107"

*Single point used for sampling

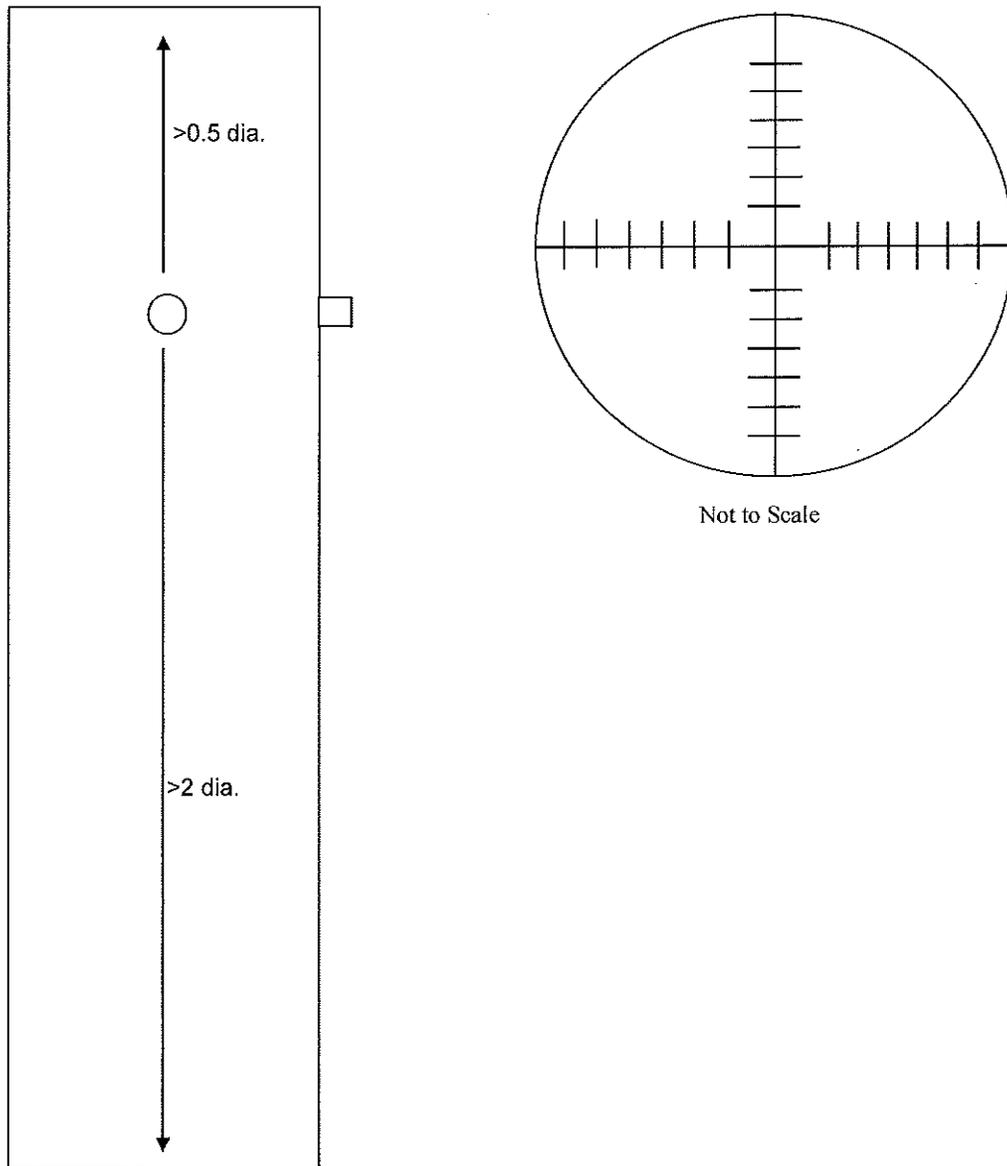


Figure 1

Site:
RCO A,B, and C
Ford Motor Company
Flat Rock Assembly Plant
Flat Rock, Michigan

Sampling Date:
March 30, 2016

BT Environmental Consulting,
Inc.
4949 Fernlee Avenue
Royal Oak, Michigan 48073

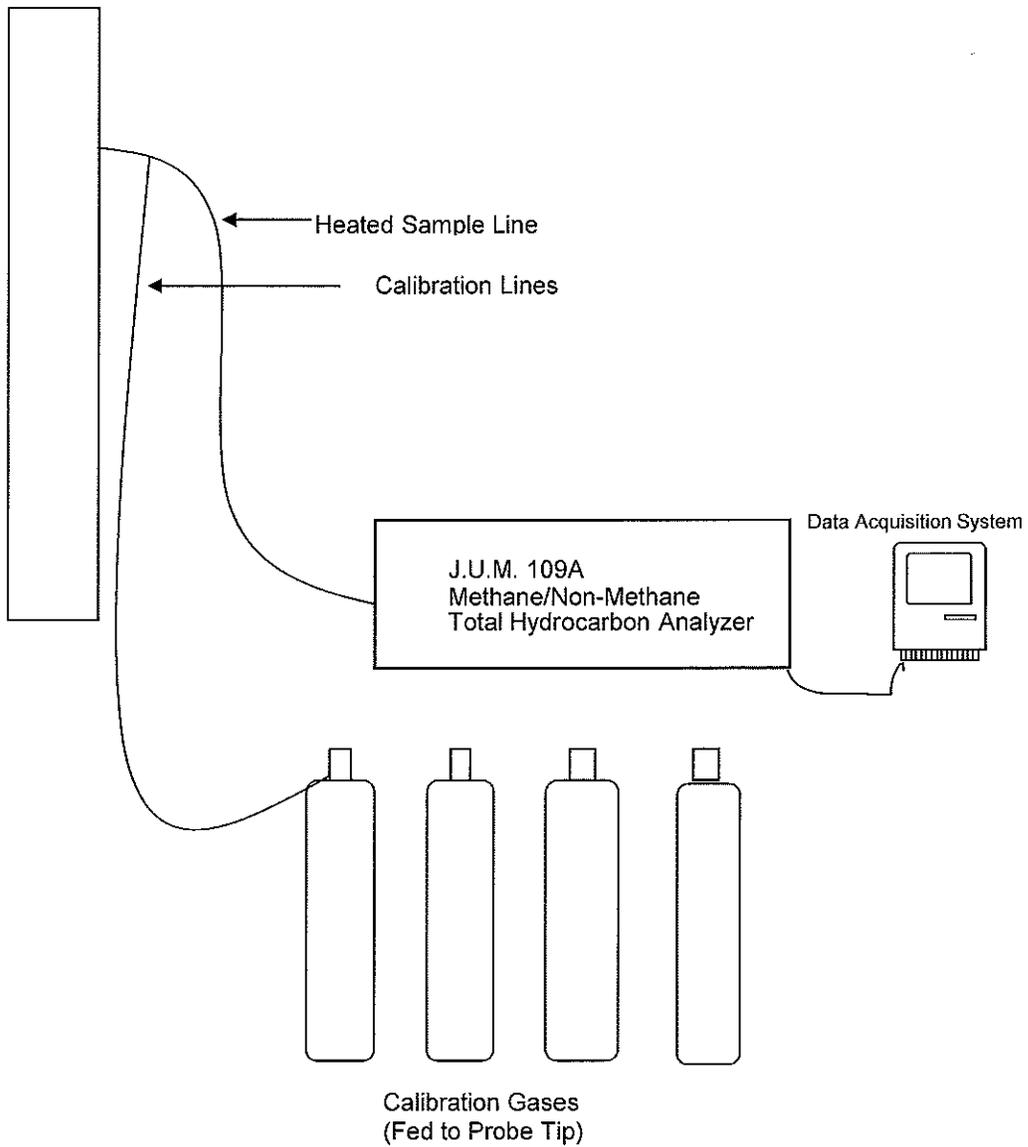


Figure 2

Site: USEPA Method 25A
Ford Motor Company
Flat Rock Assembly Plant
Flat Rock, Michigan

Sampling Date:
March 30, 2016

BT Environmental Consulting, Inc.
4949 Fernlee Avenue
Royal Oak, Michigan 48073