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February 16, 2016

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Bureau Veritas Project No. 11016-000010.00

Subject: EU-LINE138
Air Emissions Compliance Test Report
Avon Automotive
603 West Seventh Street
Cadillac, Michigan
Renewable Operating Permit MI-ROP-A9365-2012
SRN: A9365


A9365 - TEST - 20160121

Dear Ms. Kajiya-Mills and Ms. Radulski:

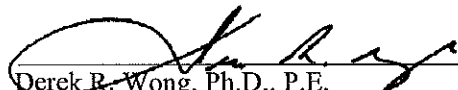
On behalf of Avon Automotive, Bureau Veritas North America, Inc. submits the enclosed air emission compliance test report for the EU-LINE138 source at the Avon Automotive facility in Cadillac, Michigan. The report summarizes the results of the testing performed on January 21 and 22, 2016.

If you have any questions regarding this report, please contact us.

Sincerely,


Thomas R. Schmelter, QSTI
Senior Project Manager
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EU-LINE138
Air Emission Test Report
at
Avon Automotive
Cadillac, Michigan

Renewable Operating Permit MI-ROP-A9365-2012
SRN: A9365

Prepared for

Avon Automotive
603 West Seventh Street
Cadillac, Michigan



Bureau Veritas Project No. 11016-000010.00
February 16, 2016



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Move Forward with Confidence

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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 (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 Avon Automotive County Wexford

Source Address 603 West Seventh Street City Cadillac

AQD Source ID (SRN) A9365 RO Permit No. MI-ROP-A9365-2012 RO Permit Section No. C and D

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 na To na

Additional monitoring reports or other applicable documents required by the RO Permit are attached as described:
Emissions test report to evaluate VOC CE of the EU-LINE138 solvent applicator.

This form shall certify that the testing was conducted in accordance with the
approved test plan and that the facility operating conditions were in compliance with
permit requirements.

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, and that any observed, documented or known instances of noncompliance have been reported as deviations, including situations where a different or no monitoring method is specified by the RO Permit.

CORAZA SPENCER GENERAL MGR. 231-876-1315
Name of Responsible Official (print or type) Title Phone Number

[Signature] 2-15-16.
Signature of Responsible Official Date



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- B Sample Calculations
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Executive Summary

Avon Automotive retained Bureau Veritas North America, Inc. to test air emissions at its rubber hose manufacturing facility in Cadillac, Michigan. The testing was performed to measure the volatile organic compound (VOC) capture efficiency of the EU-LINE138 solvent applicator and VOC emissions factors for material use as required in:

- Michigan Department of Environmental Quality (MDEQ) Renewable Operating Permit (ROP) MI-ROP-A9365-2012.

In the air permit, there are no emission limits for this source that can be directly compared to the measured emission rate; however, the results will be used to evaluate compliance with monthly and annual VOC emission limits based on a 12-month rolling period.

On January 21 and 22, 2016, Bureau Veritas measured VOC concentrations and mass emission rates from the source and completed a minimum of three ≥ 180 -minute test runs following United States Environmental Protection Agency (USEPA) Methods 1 through 4, 25A, 204A, 204B, 204F, and 205.

The following table summarizes the results of the testing. Detailed results are presented in Table 1 after the Tables Tab of this report.

**EU-Line138
Toluene Capture Efficiency Results**

Toluene Used (lb/hr)	Captured Toluene Emissions (lb/hr)	Average Capture Efficiency (%)
17.9	16.5	92.1

lb/hr: pound per hour



1.0 Introduction

1.1 Summary of Test Program

Avon Automotive retained Bureau Veritas North America, Inc. to test compliance air emissions at its rubber hose manufacturing facility in Cadillac, Michigan. The testing was performed to measure the volatile organic compound (VOC) capture efficiency of the EU-LINE138 solvent applicator and VOC emissions factors for material use as required in:

- Michigan Department of Environmental Quality (MDEQ) Renewable Operating Permit (ROP) MI-ROP-A9365-2012.

In the air permit, there are no emission limits for this source that can be directly compared to the measured emission rate; however, the results will be used to evaluate compliance with monthly and annual VOC emission limits based on a 12-month rolling period.

On January 21 and 22, 2016, Bureau Veritas measured VOC concentrations and mass emission rates from the sources and completed a minimum of three ≥ 180 -minute test runs following United States Environmental Protection Agency (USEPA) Methods 1 through 4, 25A, 204A, 204B, 204F, and 205.

Table 1-1 summarizes the source description.

**Table 1-1
Identification of Source**

Emission Unit ID	Emission Unit Description	Flexible Group ID
EU-LINE138	Rubber parts process center including two rubber extruders and one surface preparation adhesion promoter/solvent applicator controlled by a catalytic oxidizer.	—



1.2 Key Personnel

The key personnel involved in this test program are listed in Table 1-2. Mr. Brian Young, Senior Project Manager with Bureau Veritas, led the emission testing. Mr. Greg Shay, HSE Engineer with Avon Automotive, provided process coordination and recorded operating parameters. Mr. Jeremy Howe, Environmental Quality Analyst with MDEQ, and Ms. Becky Radulski, Environmental Engineer with MDEQ, witnessed the testing.

**Table 1-2
Key Personnel**

Facility Contact	Emission Testing Project Manager
Greg Shay HSE Engineer Avon Automotive 603 West Seventh Street Cadillac, Michigan 49707 Telephone: 231-876-1496 gshay@avonauto.com	Brian Young Senior Project Manager Bureau Veritas North America, Inc. 22345 Roethel Drive Novi, Michigan 48375 Telephone: 248.344.3020 Facsimile: 248.344.2656 brian.young@us.bureauveritas.com
MDEQ Regulatory Agency	
Jeremy Howe Environmental Quality Analyst Michigan Department of Environmental Quality Air Quality Division-Cadillac District Office 120 West Chapin Street Cadillac, Michigan 49601 Telephone: 231.876.4416 Facsimile: 231.775.4050 howej1@michigan.gov	Becky Radulski Environmental Engineer Michigan Department of Environmental Quality Air Quality Division- Gaylord District Office 2100 West M-32 Gaylord, Michigan 49735 Telephone: 989.705.3404 Facsimile: 989-731-6181 radulskir@michigan.gov

2.0 Source and Sampling Locations

2.1 Process Description

The Avon Automotive facility in Cadillac, Michigan, manufactures rubber parts for a variety of end users. Typical products include air, coolant, and fuel line hoses for the automotive and small engine market. The air emission source tested is associated with a surface preparation adhesion promoter/solvent applicator that is controlled by a catalytic oxidizer. There are multiple hose manufacturing lines. Each of the applicator lines operates similarly.

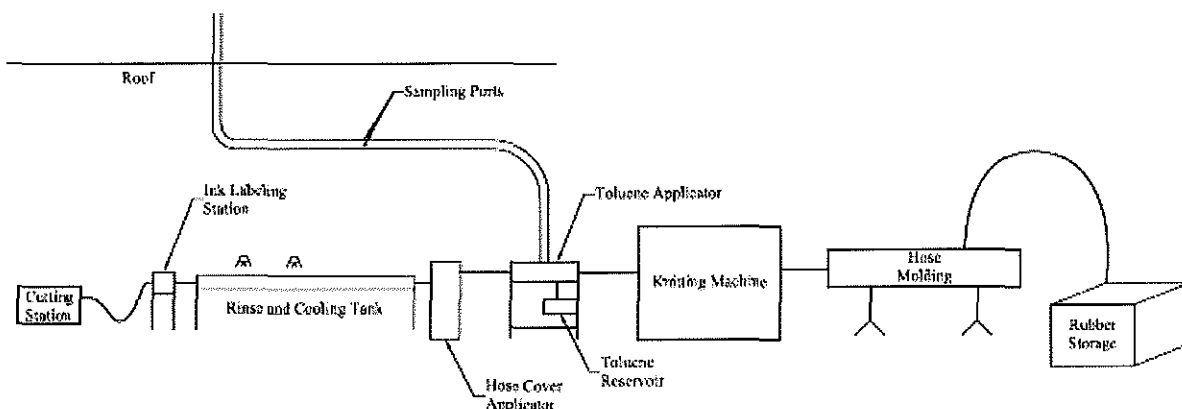
At the EU-CADBAR line, raw rubber is extruded into the shape of hose. The inner and exterior diameters of the hose are based on product specifications. A thin layer of plastic (~0.008 inch) is applied, which limits hose degradation and permeation.



As the hose moves along the manufacturing line, a waterfall curtain applicator cascades a thin layer of cyclohexanone (solvent) on the surface of the plastic. The cyclohexanone is an adhesion promoter that etches the surface of the plastic and allows it to bond to a second layer of rubber that is extruded over the plastic. The hose advances through a knitting machine that adds fabric for rigidity and strength. The fabric-covered hose is conveyed through a toluene or Avon Blend #2 waterfall curtain solvent applicator. Toluene and Avon Blend #2 solvents promote adhesion of the fabric to the hose.

After the solvent is applied, a covering extruder adds a third layer of rubber to the hose. Next, product specifications are ink-printed on the outermost rubber. The hose is cooled in a slurry of water and calcium carbonate. The hose is cut to size, rolled, and placed on 4- to 5-foot-diameter pans. The pans are stacked onto a cart and placed into an autoclave, which uses steam and heat to finalize the vulcanization process. The curing process duration is approximately 20 minutes. After exiting the autoclave, the hose is packaged for shipment.

The figure below depicts a representative application line similar to the EU-LINE138.



The significant differences between the EU-CADBAR161 and EU-LINE138 are:

- EU-CADBAR161 has a plastic layer and two solvent applicators: cyclohexanone and Avon Blend #2. Avon Blend #2 is a solvent blend of approximately 52.1% toluene and 48.9% ethanol.
- EU-LINE138 has only one applicator (100% toluene) and moves approximately one-half the line speed as EU-CADBAR161.

The emissions generated through the application of cyclohexanone, toluene, and Avon Blend #2 (VOCs) are captured using negative-pressure hoods. The hood vents through vertical ducts that are connected to common horizontal header ducts. The horizontal ducts are connected throughout the building and exhaust to a catalytic oxidizer for pollution control.

Sampling of Gaseous Emissions. Toluene captured from the applicator enclosure was measured as total VOC concentrations as propane.

Bureau Veritas calculated the mass emission rate of toluene by using the total VOC concentrations and volumetric flowrate measured at the sampling point.

Measurement of Solvent Used. Avon Automotive measured the weight of toluene used during each measurement of gaseous emissions.

Response Factors. Samples of the coatings applied were used to develop analyzer-specific response factors to convert the measured total VOC concentrations to toluene concentrations.

Collection Efficiency. The various measurements described above were used to calculate applicator's hood collection efficiency and mass emission rate to the catalytic oxidizer.



2.2 Process Operating Parameters

Mr. Shay with Avon Automotive recorded operating parameters during the emissions testing. Ms. Radulski and Mr. Howe verified that the operating parameters were recorded appropriately.

Line speed, solvent use, and product specification were recorded for the solvent applicator line tests. The emission source was operating at maximum routine conditions during testing.

The recorded operating parameters are included in Appendix E and summarized in Table 2-1

Table 2-1
EU-Line 138 Toluene Applicator Operating Parameters

Test Date (2016)	Run	Product Specification	Toluene Used During Test (lb/hr)	Line Speed (ft/minute)	Maximum Rated Line Speed (ft/minute)
Jan. 21	1	69-439201	17.2	43.5	45
Jan. 21	2	69-482400	18.0	23.5	45
Jan. 21-22	3	69-482400	18.4	23.5	45
	Average		17.9	30.2	

2.3 Control Equipment

A catalytic oxidizer controls air emissions from the rubber extrusion, surface preparation and adhesion promoter/solvent applicator lines. The oxidizer is equipped with an automated control system that optimizes performance with operation of the various applicator lines. The oxidizer was manufactured by Catalytic Products International in Lake Zurich, Illinois, and is a Vector 3 model that uses Pro-Pel 1418® as the catalyst and natural gas for fuel. The maximum amount of natural gas required to operate the unit is 3,000 cubic feet per minute or 1,150,000 British thermal units (BTU) per hour.

Air emissions from the applicator lines pass through a pre-filter designed to remove particulates and compounds that may interfere with the catalyst bed. A variable-frequency-drive fan and fresh air damper ensures operation of the oxidizer under various applicator line operating scenarios. The emissions enter a high-velocity mixing chamber at the burner, which enhances flame impingement and turbulence, providing mixing of the VOCs.

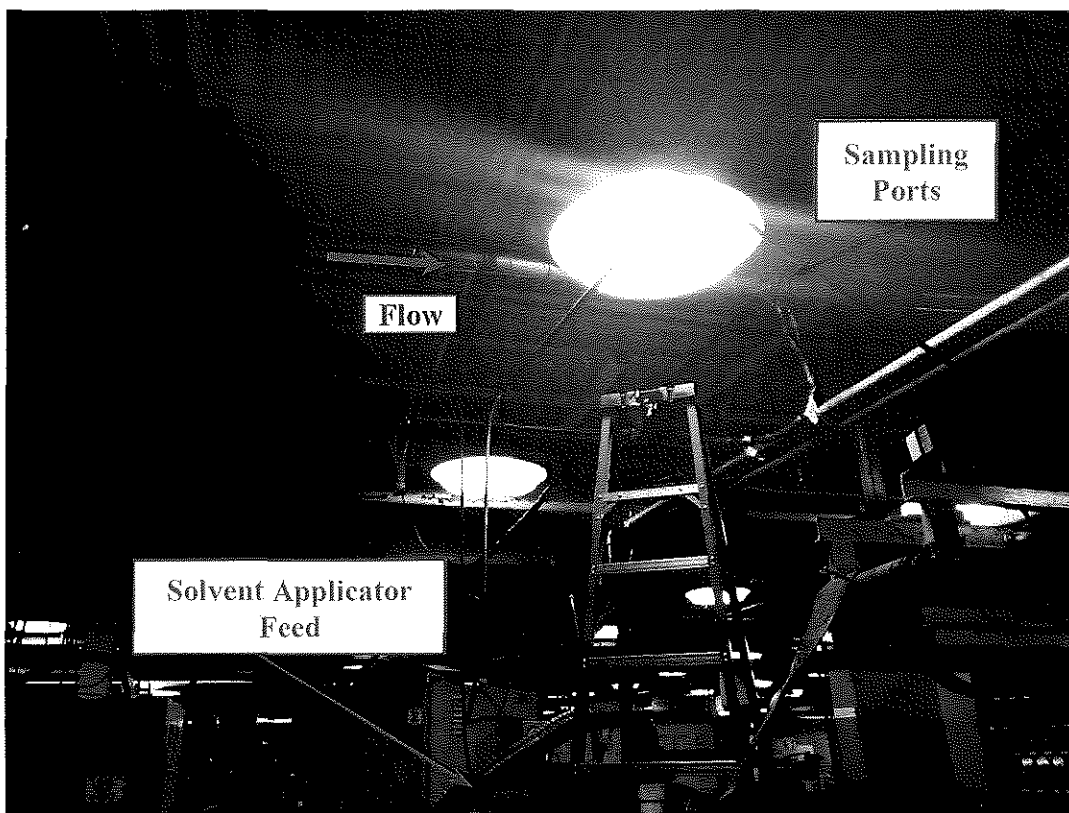


The high-temperature VOC mixture is oxidized using the catalyst bed. The catalytic reaction is the ionization of oxygen in the air and the hydrogen and carbon molecules in hydrocarbons (VOCs). The reaction is the reformation of water (H₂O) and carbon dioxide (CO₂). The catalytic-induced ionization level for the specific VOCs used at the facility occurs at temperatures between 550 and 750 degrees Fahrenheit.

2.4 Flue Gas Sampling Locations

Figure 1 in the Appendix depicts the source sampled, sampling ports, and traverse point locations. A photograph of the sampling location is presented below.

Figure 2-1. EU-LINE138 Toluene Applicator Sampling Ports





2.5 Process Sampling Locations

A process sample is a sample that is analyzed for operational parameters, such as, calorific value of a fuel (e.g., natural gas, coal), organic compound content (e.g., paint coatings), or composition (e.g., polymers).

Bureau Veritas collected process samples of the coatings as applied during the testing. The coatings were collected following procedures in USEPA's "Standard Procedure for Collection of Coating and Ink Samples for Analysis by Methods 24 and 24A."

The coatings as applied were collected from the portable solvent cans, used to re-fill the solvent applicator reservoir, into 1-pint metal containers with minimal headspace.

The coatings as applied samples were used to develop analyzer-specific response factors to convert the VOC concentrations measured as propane to concentrations as toluene. Refer to Appendix B for the response factor data.



3.0 Summary and Discussion of Results

3.1 Objectives and Test Matrix

The objective of the testing was to measure the VOC capture efficiency of the solvent applicator lines, and emissions factors for material usage as required in:

- MDEQ ROP: MI-ROP-A9365-2012.

Testing at the EU-LINE138 applicator line was conducted to measure toluene emissions. There are no permitted emission limits for this source that can be directly compared to the measured emission rate; however, the results will be used to evaluate compliance with monthly and annual VOC emission limits based on a 12-month rolling period.

Table 3-1 summarizes the permit conditions, and Table 3-2 summarizes the sampling and analytical test matrix.

**Table 3-1
Permit Conditions**

Emissions Unit ID	Pollutant	Emission Limit
EU-LINE138	VOC Toluene	VOC = 8.4 tons/12-month rolling time period [†]

[†] Indirect emission limit to be calculated using emission results by Avon Automotive for continual emission reporting.

**Table 3-2
Sampling and Analytical Matrix**

Sampling Location	Sample/ Type of Pollutant	Sample Method	Date (2016)	Run	Start Time	End Time	Analytical Method	Analytical Laboratory	Comment
EU-LINE138 Toluene	Flowrate, molecular weight, moisture content, VOC, toluene, mass emission rates, liquid input, and capture efficiency	EPA 1A, 2C, 3, 4, 25A, 204A, 204B, 204F, 205	Jan. 21 and 22	1	13:00	16:15	Pitot tube, chemical absorption analyzer, flame ionization analyzer	Bureau Veritas	Calibration checks performed during Runs 1, 2, and 3
				2	20:00	23:20			
				3	23:30	3:00			



3.2 Field Test Changes and Issues

The testing was performed in accordance with USEPA procedures, during maximum routine operating conditions, as outlined in the Intent-to-Test Plan submitted to MDEQ on December 22, 2015, and approved on January 7, 2016.

No field test changes or issues were encountered during the test program.

3.3 Summary of Results

Detailed results are presented in Table 1 after the Tables Tab of this report. The results of the testing are summarized in Table 3-3. Graphs of measured VOC concentrations are provided after the Graphs Tab in the Appendix of this report. Sample calculations are presented in Appendix B.

Table 3-3
EU-Line138 Toluene Capture Efficiency Results

Toluene Used (lb/hr)	Captured Toluene Emissions (lb/hr)	Average Capture Efficiency (%)
17.9	16.5	92.1

lb/hr: pound per hour



4.0 Sampling and Analytical Procedures

Bureau Veritas measured emissions following the guidelines and procedures specified in 40 CFR 51, Appendix M, "Recommended Test Methods for State Implementation Plans," 40 CFR 60, Appendix A, "Standards of Performance for New Stationary Sources," 40 CFR 63, Appendix A, "Test Methods Pollutant Measurement Methods from Various Waste Media," and State of Michigan Part 10 Rules, "Intermittent Testing and Sampling." The sampling and analytical methods are presented in Table 4-1.

**Table 4-1
Emission Test Methods**

Method	Parameter	Analysis
EPA 1A	Sampling and velocity traverses	Field measurement
EPA 2C	Gas stream volumetric flowrate	Field measurement, S-type Pitot tube
EPA 3	Molecular weight	Fyrite® chemical absorption
EPA 4	Moisture content	psychrometric
EPA 25A/204B	Volatile organic compounds, toluene, gas emissions	Flame ionization detector
EPA 204A	Toluene liquid input	Field measurement
EPA 204F	Toluene response factors	Flame ionization detector
EPA 205	Gas dilution calibration	Field verification

4.1 Emission Test Methods

Table 4-2 outlines the test methods for the test parameters, including ancillary measurements required by the USEPA methods (i.e., traverse point selection, velocity, molecular weight, and moisture content).



**Table 4-2
Emission Test Parameters**

Parameter	EU-LINE138	EPA Method	Title
Sampling ports and traverse points	●	1A	Sample and Velocity Traverses for Stationary Sources with Small Stacks or Ducts
Velocity and flowrate	●	2C	Determination of Gas Velocity and Volumetric Flow Rate in Small Stacks or Ducts (Standard Pitot Tube)
Molecular weight	●	3	Gas Analysis for the Determination of Dry Molecular Weight
Moisture content	●	4	Determination of Moisture Content in Stack Gases
VOC toluene gas emissions	●	25A	Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer
Toluene liquid input	●	204A	Volatile Organic Compounds Content in Liquid Input Stream
Toluene gas emissions	●	204B	Volatile Organic Compounds Emissions in Captured Stream
Toluene response factors	●	204F	Volatile Organic Compounds Content in Liquid Input Stream (Distillation Approach)
Gas dilution	●	205	Verification of Gas Dilution Systems for Field Instrument Calibrations

4.1.1 Volumetric Flowrate (USEPA Methods 1A and 2C)

USEPA Method 1A, "Sample and Velocity Traverses for Stationary Sources with Small Stacks or Ducts" from the Code of Federal Regulations, Title 40, Part 60 (40 CFR 60), Appendix A, was used to select the sampling location and determine the number of traverse points at the solvent applicator lines. When practical the sampling location is selected at a location eight duct diameters downstream and two duct diameters upstream of a flow disturbance.

USEPA Method 2C "Determination of Gas Velocity and Volumetric Flow Rate in Small Stacks or Ducts (Standard Pitot Tube)" was used to measure velocity profiles and calculate volumetric flowrate.



Figure 2-3 is a photograph depicting the sampling location at the EU-LINE138 source. Appendix Figure 2 presents a drawing of the EU-LINE138 sampling ports and traverse point locations.

A standard-type Pitot tube meeting the specification of Section 6.7 of Method 2 and with a baseline Pitot tube coefficient of 0.99 was used to measure volumetric flowrates. Flowrate was measured before and after each test run. The averages of the pre- and post-test flowrates were used to calculate emission rates for the test run.

Cyclonic flow evaluations have previously been conducted at the sampling location and the evaluations indicated the average of the measured traverse point flue gas velocity angles was less than 20° from the direction of flow, indicating the absence of cyclonic flow.

Details of the solvent applicator line sampling locations and number of velocity traverse points are presented in Table 4-3.

**Table 4-3
Sampling Locations and Number of Traverse Points – Applicator Line**

Sampling Locations	Duct Diameter (inch)	Duct Diameters Downstream to Flow Disturbance (diameter)	Duct Diameters Upstream to Flow Disturbances (diameter)	Number of Ports	Traverse Points per Port	Total Points
EU-LINE138 toluene outlet	4	6	18	2	4	8

4.1.2 Molecular Weight (USEPA Method 3)

Molecular weight was measured following USEPA Method 3, “Gas Analysis for the Determination of Dry Molecular Weight” procedure. Flue gas was extracted from the stack through a probe positioned near the centroid of the duct and directed into a Fyrite® gas analyzer. The concentrations of carbon dioxide (CO₂) and oxygen (O₂) were measured by chemical absorption to within ±0.5%. The average CO₂ and O₂ results of the grab samples were used to calculate molecular weight.



4.1.3 Moisture Content (USEPA Method 4)

Moisture content of the flue gas was estimated using psychrometric charts and/or saturation vapor pressure tables following procedure in USEPA Method 4, “Determination of Moisture Content in Stack Gases.”

4.1.4 VOCs in Liquid Input Stream (USEPA Method 204A)

The input of VOCs in the process was measured following USEPA Method 204A, “Volatile Organic Compounds Content in Liquid Input Stream” guidelines. The amount of VOCs introduced to the process was measured using the weight difference technique described in Section 9.1.1 of the method.

Solvent use was measured by marking the solvent level on a sight gauge of the solvent reservoir at the start of testing, and then adding solvent to the reservoir up to the level of the starting mark at the conclusion of testing. The mass of solvent added was measured by subtracting the post-test container weight from the pre-test container weight. Solvent use data were recorded by Avon Automotive as described in Section 2.0.

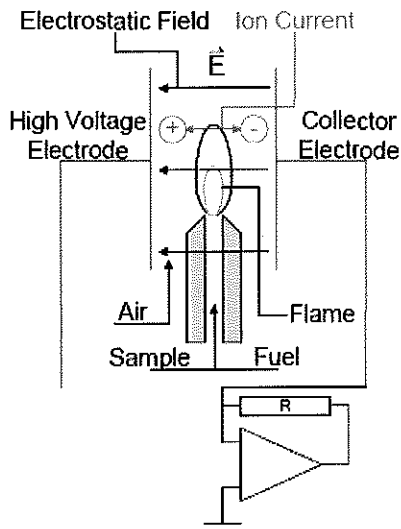
4.1.5 VOCs in Captured Gas Stream (USEPA Method 204B/25A)

The concentration of VOCs captured by the applicator hood and exhausted through ductwork directed to the catalytic oxidizer was measured following USEPA Methods 204B/25A guidelines. Measurements by USEPA 204B, “Volatile Organic Compounds Emissions in Captured Stream” and USEPA Method 25A, “Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer” provide real-time data and information on applicator emissions variations with respect to time. Figure 2 in the Appendix depicts the USEPA Methods 204B/25A sampling train.

Samples were collected using a stainless steel probe positioned near the centroid of the stack and heated sample line connected to the analyzer. Bureau Veritas used a flame ionization detector (FID) based hydrocarbon analyzer. The FID measures the hydrocarbon concentration in part per million by volume (ppmv) as the calibration gas propane.

The FID was fueled by 100% hydrogen, which generates a flame with a negligible number of ions. Flue gas was introduced into the FID flame chamber via a heated sample line. The combustion of flue gas generates electrically charged ions. The analyzer applies a polarizing voltage between two electrodes around the flame, producing an electrostatic field. Negatively charged ions, anions, migrate to a collector electrode, while positive charged ions, cations, migrate to a high-voltage electrode. The current between the electrodes is directly proportional to the hydrocarbon concentration in the sample. Figure 4-1 depicts the flame chamber.

Figure 4-1 FID Flame Chamber



Using the voltage analog signal the concentration of VOCs was recorded by a data acquisition system (DAS). Measured VOC concentrations are presented in Appendix D as 1-minute averages.

Before testing, the FID analyzer was calibrated by introducing zero- (<1% of span value) and high- (80-90% span value) range calibration gases to the tip of the sampling probe. Low- (25-35% of span value) and mid- (45-55% of span value) range calibration gases were then introduced. The analyzer was calibrated to $\pm 5\%$ of the calibration gases introduced.

At the conclusion of a test run a calibration drift test was performed by introducing the zero- and mid-calibration gases to the tip of the sampling probe. The test run was considered valid if the calibration drift test demonstrated that the analyzer was responding within $\pm 3\%$ from pre-test to post-test values.

4.1.6 VOCs in Liquid Input Stream (USEPA Method 204F/25A)

Samples of the solvents as applied were collected to measure FID response factors following USEPA Method 204F, "Volatile Organic Compounds Content in Liquid Input Stream (Distillation Approach)" and Method 25A, "Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer guidelines."

The solvent was used to measure a response factor for the FID used during field measurements. The response factor is used to convert the measured VOC concentration from ppmv as propane to ppmv as VOC applied (i.e., as an actual solvent basis, toluene). Figure 3 depicts the USEPA Methods 204F/25A sampling train.



To develop the FID response factors, a measured mass of the liquid solvent was volatilized while passing a measured volume of hydrocarbon-free air through the volatilization vessel. The solvent-laden air was collected in a Tedlar bag to generate a reference concentration. The concentrations of the standards were developed to approximate the concentrations measured by the FIDs at the sampling locations.

The Tedlar bag was connected to the specific FID used in the field, and the VOC concentration was measured as the calibration gas, propane. The response factor was calculated as the concentration of the Tedlar bag standard divided by the concentration measured by the FID. Multiple standards were developed. The average response factor was used to calculate the emissions as applied.

Refer to Appendix A for the FID response factor data sheets and Appendix B for sample calculations. Field data sheets are presented in Appendix C. Computer-generated data sheets are presented in Appendix D.

4.1.7 Gas Dilution (USEPA Method 205)

A gas dilution system was used to introduce known values of calibration gases into the FID analyzer. The gas dilution system consists of calibrated orifices or mass flow controllers. The system diluted a high-level calibration gas to within $\pm 2\%$ of predicted values. This gas divider was capable of diluting gases at various increments.

Before the start of testing, the gas divider dilutions were verified to be within $\pm 2\%$ of predicted values. Two sets of dilutions of the high-level calibration gas were performed. Subsequently, a certified mid-level calibration gas was introduced into the analyzer; the calibration gas concentrations were within $\pm 10\%$ of a dilution.

The field calibrations verified the accuracy of the gas dilution system. Refer to Appendix A for the calibration gas certifications and gas dilution field calibrations.

**Table 4-4
Gas Dilution Field Verification**

Expected Concentration (ppmv)	Acceptable Range [†] (ppmv)		Actual Concentration 1 (ppmv)	Actual Concentration 2 (ppmv)	Actual Concentration 3 (ppmv)	Acceptable Yes/No
	Low	High				
3000	2940	3060	2966	2955	2949	Yes
5000	4900	5100	5090	5070	5079	Yes

[†] Acceptable range is $\pm 2\%$ of the expected concentration



4.2 Procedures for Obtaining Process Data

Process data were recorded by Avon Automotive personnel during testing. Refer to Section 2.1 and 2.2 for discussions of process and control device data and Appendix E for the operating parameters recorded during testing.



5.0 QA/QC Activities

5.1 Pretest QA/QC Activities

Before testing, the sampling equipment was cleaned, inspected, and calibrated according to procedures outlined in the applicable USEPA sampling method and USEPA's "Quality Assurance Handbook for Air Pollution Measurement Systems, Volume and Principles" and, Volume III, "Stationary Source Specific Methods." Refer to Appendix A for inspection and calibration sheets.

5.2 QA/QC Audits

The results of select sampling and equipment quality assurance/quality control (QA/QC) audits and the acceptable USEPA tolerance are presented in the following sections.

5.2.1 Instrument Analyzer QA/QC Audits

The FID analyzer met the QA/QC requirements of USEPA Method 25A. The analyzer was calibrated using USEPA Traceability Protocol or Certified Standard calibration gases with an uncertainty $\pm 2\%$ of the certified value. FID calibration error tests for the valid test runs indicated the analyzers were responding to $\pm 5\%$ of the cylinder concentration and did not drift more than $\pm 3\%$ after each test run.

Refer to Appendix A for the calibration gas certificates and analyzer calibration data.

5.3 QA/QC Problems

QA/QC problems were not encountered during this test program.



Limitations

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Table



Table 1

EU-LINE138 Toluene Capture Efficiency Results

Avon Automotive
Cadillac, Michigan

Bureau Veritas Project No. 11016-000010.00

Sampling Date: January 21 and 22, 2016

Parameter	Run 1	Run 2	Run 3	Average
Sampling Start Time (hh:mm)	13:00	20:00	23:30	
Sampling Stop Time (hh:mm)	16:15	23:20	3:00	
Duration of Test (min)	195	200	210	202
Line Speed (feet per minute)	43.5	23.5	23.5	30.2
Process Toluene Use (lb/test run)	55.9	60.0	64.6	60.1
Process Toluene Use (gal/test run)	7.7	8.3	8.9	8.3
Process Toluene Use (lb/hr)	17.2	18.0	18.4	17.9
Process Toluene Use (gal/hr)	2.4	2.5	2.5	2.5
Flowrate (scfm)	98	94	93	95
Captured Toluene (ppmv, as propane)	16,872	17,003	17,852	17,242
Captured Toluene (ppmv, as Toluene)	11,810	11,902	12,497	12,070
Captured Toluene (lb/hr)	16.6	16.1	16.7	16.5
Capture Efficiency (%)	96.4	89.4	90.5	92.1

hh:mm hour:minute

min minute

lb/test run pound of toluene per test period

scfm standard cubic foot per minute

ppmv, as propane part per million by volume, as the calibration gas propane

ppmv, as toluene concentration as propane converted to toluene using response factor

% Capture Efficiency = [Captured Solvent (lb/hr)]/[Process Solvent Use (lb/hr)] x 100