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Methanol Emissions Test Report

Prepared for:

Dow Corning Corporation

Dow Corning Corporation
3901 S. Saginaw Rd.
Midland, MI 48640

Project No. 13-4426.00
November 8, 2013

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



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EXECUTIVE SUMMARY

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BT Environmental Consulting, Inc. (BTEC) was retained by Dow Corning Corporation (Dow) to measure methanol emission rates at the inlet and outlet of the Building 601 scrubber (No. 24683) at the Dow facility in Midland, Michigan. The emissions test program included triplicate test runs. Field sampling for this emission test program was conducted on August 7, 2013. The purpose of this report is to document the results of the emissions compliance test program.

The purpose the emissions test program was to demonstrate compliance with the emission limitations for continuous process vents codified at Title 40, Part 63, Subpart FFFF of the Code of Federal Regulations. The methanol removal efficiency of the scrubber was 99.9%.

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1. Introduction

BT Environmental Consulting, Inc. (BTEC) was retained by Dow Corning Corporation (Dow) to measure methanol emission rates at the inlet and outlet of the Building 601 scrubber (No. 24683) at the Dow facility in Midland, Michigan. The emissions test program included triplicate test runs. Field sampling for this emission test program was conducted on August 7, 2013. The purpose of this report is to document the results of the emissions compliance test program.

The Air Quality Division (AQD) of Michigan's Department of Natural Resources and Environment 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

Field sampling for this emission test program was conducted on August 7, 2013 at the Dow facility in Midland, Michigan. The purpose of this report is to document the results of the emissions determined during compliance test program.

The emissions test program included the evaluation of methanol emission rates at the inlet and outlet of the Building 601, scrubber (No. 24683).

1.b Purpose of Testing

The purpose the emissions test program was to demonstrate compliance with the emission limitations for wastewater treatment codified at Title 40, Part 63, Subpart FFFF of the Code of Federal Regulations (40 CFR 63, Subpart FFFF).

1.c Source Description

601Building:

The equipment being tested and the product(s) being made during the test are listed as follows:

22580 Alkoxylation Column and 22600 Alcohol Distillation Column while making product Z-6697 and filling TEOS filling trailers

22570 Alkoxylation Column and 22590 Alcohol Distillation Column while making product Z-2306 and 2306 filling trailers

Product Z-2376 transfer to trailers from rail car

5320 Batch Kettle: Quenching Z-6700 waste

5300 Alkoxylation Column will be making product Q1-2579 and filling Q1-2579 storage tank



Note: the above processes will be running at maximum rates during Miscellaneous Organic NESHAP (MON) testing while operating the MACT group 1 scrubbers 5360 and 24683 which are in parallel.

1.d Test Program Contact

The contact for the source and test report is:

Mr. Michael Gruber, II
Environmental Manager
Dow Corning Corporation
P.O. Box 995, Mail#065
Midland, Michigan 48686
(989) 496-5539

1.e Testing Personnel

Names and affiliations for personnel who were present during the test 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

See Section 1c. above for information on how the process was operating during the stack test. See below table for how the 24683 scrubber was operated during the stack test.

Run 1		
Start	11:05	
End	11:53	
FT-32270	10.0321	gpm
FT-32271	6.9257	gpm

Run 1		
Start	12:11	
End	12:23	
FT-32270	9.9511	gpm
FT-32271	6.9319	gpm

Run 2		
Start	12:24	
End	13:24	
FT-32270	9.9516	gpm
FT-32271	6.9605	gpm

Run 3		
Start	13:25	
End	14:25	
FT-32270	9.9793	gpm
FT-32271	7.0126	gpm

2.b Applicable Permit

The applicable permit for this emissions test program is MI-ROP-A4043-2008.

2.c Results

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

2.d Emission Regulation Comparison

40 CFR 63, Subpart FFFF, Tables 1 and 2 require an OHAP removal efficiency of 98% or a outlet coccentration of equal to or less than 20 PPM OHAP. The scrubber 24683 achieved the required 98% OHAP removal efficiency.

3. Source Description

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

3.a Process Description**601Building:**

The equipment being tested and the product(s) being made during the test are listed as follows:

22580 Alkoxylation Column and 22600 Alcohol Distillation Column while making product Z-6697 and filling TEOS filling trailers

22570 Alkoxylation Column and 22590 Alcohol Distillation Column while making product Z-2306 and 2306 filling trailers

Product Z-2376 transfer to trailers from rail car

5320 Batch Kettle: Quenching Z-6700 waste

5300 Alkoxylation Column will be making product Q1-2579 and filing Q1-2579 storage tank

Note: the above processes will be running at maximum rates during Miscellaneous Organic NESHAP (MON) testing while operating the MACT group 1 scrubbers 5360 and 24683 which are in parallel.

3.b Raw and Finished Materials

The raw and finished materials for the emissions test program were consistent with the process operating at its maximum production rate.

3.c Process Capacity



The process was operating at its maximum production rate during the emissions test program.

3.d Process Instrumentation

2 Yokogawa Magnetic Meter are utilized to measure the water flow rates in GPM to the 24638 Scrubber. One flow meter measures the water flow to the venturi section of the scrubber and second meter measures the water flow rate to the trayed section of the scrubber.

4. Sampling and Analytical Procedures

Sections 4.a through 4.d provide a summary of the sampling and analytical procedures used to verify inlet and outlet emission rates.

4.a Sampling Train and Field Procedures

Exhaust gas velocity pressure was measured and recorded at 10-second intervals throughout the emissions test program using small stationary, S-type pitot tubes located in the center of the pipe at the scrubber outlet sampling location. Exhaust gas velocity pressure was measured using a 0 to 0.25" H₂O pressure transmitter and datalogger assembly.

The following assumptions were made in order to calculate a molecular weight of the gas stream:

1. Methanol, Ethanol, and Alkoxies have been removed and their concentrations are essentially zero at the outlet.
2. N₂ and H₂ mass flowrates remain unaffected and are the same at the outlet as at the inlet (50.76 lb/hr and 10.74 lb/hr, respectively)
3. Oxygen and moisture content are each 0%.

Oxygen concentration was measured by filling Tedlar bags from the exhaust of the FTIR. The bag samples were then injected into an M&C oxygen analyzer. Measured oxygen values were approximately 1%. After discussion with Dow personnel it was decided that the oxygen concentration should be 0%. The 1% oxygen concentration was most likely due to ambient air leaking into either the bag or the analyzer during sample transfer. An oxygen concentration of 0% has been assumed for all calculations.

FTIR data was collected using an MKS MultiGas 2030 FTIR spectrometer, serial # 016630515. A heated, 3 ft., 3/8 inch diameter, stainless steel probe, maintained at 191°C, will be used to direct effluent gas from the exhaust vent to the FTIR. A heated filter box (191°C) contains the connection from the probe to the filter assembly to a 100 ft., heated, 3/8 inch, Teflon transfer line. A 0.1µ glass filter was used for particulate matter removal.

The heated transfer line(s), held at 191°C, connect the probe/filter assembly to the FTIR. The FTIR was equipped with a temperature-controlled, 5.11 meter multipass gas cell maintained at 191°C. Gas flows and sampling system pressures were monitored using a rotometer and pressure transducer. All data was collected at 0.5cm⁻¹ resolution. Each spectrum was derived from the coaddition of 64 scans, with a new data point generated approximately every one minute. A more detailed write up of the FTIR sampling train can be found in Prism's FTIR report included as Appendix E.

4.b Recovery and Analytical Procedures

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

4.c Sampling Ports

Single point sampling was used for flowrate measurements at the outlet location and for sample extraction at both the inlet and outlet sampling locations.

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

Results show compliance with MON 40 CFR Subpart 63 Subpart FFFF.

5.c Sampling Procedure Variations

Exhaust gas velocity pressure data was measured using a pitot tube, pressure transmitter, and datalogger assembly and monitoring velocity pressure values at 10-second intervals throughout the test program.

5.d Process or Control Device Upsets

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

5.e Control Device Maintenance

Control device maintenance is conducted in accordance with the standard plant preventive maintenance schedule.

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

5.g Calibration Sheets

All relevant equipment calibration documents are provided in 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 D.

5.j Laboratory Data

There are no laboratory results for this test program. Prism FTIR results are available in Appendix E.

Table 1
Test Personnel

Name and Title	Affiliation	Telephone
Mr. Michael Gruber, II Environmental Manager	Dow Corning Corporation P.O. Box 995, Mail#065 Midland, Michigan 48686	(989) 496-5539
Mr. Jeffrey Peitzsch Project Manager	BTEC 4949 Fernlee Royal Oak, MI 48073	(248) 548-8070
Mr. Kenneth Felder Environmental Technician	BTEC 4949 Fernlee Royal Oak, MI 48073	(248) 548-8070

Table 2
Building 601 - Scrubber 24683 Methanol Emission Rates
Dow Corning
Midland, Michigan
BTEC Project No. 13-4426.00
Sampling Dates: August 7, 2013

Parameter	Run 1	Run 2	Run 3	Average
Test Run Date	8/7/2013	8/7/2013	8/7/2013	
Test Run Time	11:05-11:53 12:11-12:23	12:24-13:24	13:25-14:25	
Outlet Flowrate (scfm)	37.8	36.9	36.6	37.1
Inlet Flowrate (scfm)*	37.8	36.9	36.6	37.1
Inlet Methanol (% wet)	2.16	4.20	4.32	3.56
Inlet Methanol Emission Rate (lb/hr)	4.1	7.7	7.9	6.5
Outlet Methanol Concentration (ppmv, wet)	36.1	9.1	8.9	18.0
Outlet Methanol Emission Rate (lb/hr)	0.0068	0.0017	0.0016	0.0034
Removal Efficiency (%)	99.8	100.0	100.0	99.9

*Inlet flowrate assumed to be same as exhaust. Inlet should be slightly higher than exhaust due to presence of methanol and other organics that were scrubbed out of gas stream. A higher inlet flowrate will increase removal efficiency, therefore the inlet flowrate used is the most conservative.

scfm = standard cubic feet per minute

dscfm = dry standard cubic feet per minute

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

lb/hr = pounds per hour

MW = molecular weight (Methanol=32.04)

24.14 = molar volume of air at standard conditions (70°F, 29.92" Hg)

35.31 = ft³ per m³

453600 = mg per lb

Equations

ppmv = % * 10,000

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

Removal Efficiency = (Inlet emission rate - outlet emission rate) / Inlet emission rate * 100

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