BTEC Inc.

EU356-01 HCl Scrubber
HCl Emissions Test Report

A4043

Prepared for:

Dow Corning Corporation

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

Project No. 13-4447.00
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EXECUTIVE SUMMARY

BT Environmental Consulting, Inc. (BTEC) was retained by Dow Corning Corporation (Dow) to measure hydrogen chloride (HCl) and chlorine (Cl_2) emission rates from the EU356-01 packed bed scrubber at the Dow facility in Midland, Michigan. Testing for HCl emission rates was conducted on October 21, 2013. Testing consisted of triplicate 60-minute test runs. The results of the emission test program are summarized by Table E-I.

Table E-I
Test Program Emission Rate Summary

Source	Pollutant	Results
EU356-01 Scrubber	HCl	0.004 lb/hr
		11 ppmv
	Cl_2	0.001 lb/hr
		1 ppmv

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1. Introduction

BT Environmental Consulting, Inc. (BTEC) was retained by Dow Corning Corporation (Dow) to measure hydrogen chloride (HCl) and chlorine (Cl_2) emission rates from the EU356-01 packed bed scrubber at the Dow facility in Midland, Michigan. Testing for HCl emission rates was conducted on October 21, 2013. Testing consisted of triplicate 60-minute test runs.

AQD has published a guidance document entitled "Format for Submittal of Source Emission Test Plans and Reports" (February 2008). This document is provided as Appendix A. 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 for the emission test program was conducted on October 21, 2013 at the Dow Corning facility in Midland, Michigan. The test program included evaluation of HCl and Cl_2 emission rates from the the EU356-01 packed bed scrubber exhaust stack.

1.b Purpose of Testing

The Dow facility is covered by Permit No. MI-ROP-A4043-2008. The objective of the emissions test program was to demonstrate compliance with the HCl and Cl_2 emission limitations included in the National Emission Standards for Hazardous Air Pollutants: Hydrochloric Acid Production codified at Title 40, Part 63, Subpart NNNNN of the Code of Federal Regulations (40 CFR 63, Subpart NNNNN). As listed in Table 1 of 40 CFR 63, Subpart NNNNN, the emission limitations for an emission stream from an HCl process vent at a new source is 12 ppmv HCl and 20 ppmv Cl_2.

1.c Source Description

Dow manufactures anhydrous HCl in Building 356. A portion of this anhydrous HCl is then vented through a process scrubber with the effluent from the process scrubber being the product, aqueous HCl. Any HCl or water vapor that exits the process scrubber is then further removed by an air emissions scrubber (No. 24388).

The aqueous manufacturing process begins at the hand valve where the highline that supplies anhydrous HCl to other processes in the plant splits off to supply the aqueous HCl production process. The anhydrous HCl will go through HX-25139 prior to being absorbed in absorber 24387. The vent stream from 24387 is sent to scrubber 24388. The aqueous HCl from 24387 is piped over to storage tanks 24345 and 24346.

1.d Test Program Contact

The contact for the source and test plan is:

Mr. James Peck
Environmental Engineer
Dow Corning Corporation
3901 South Saginaw
Midland, Michigan 48686
(989) 496-5348

1.e Test Personnel

Names and affiliations for personnel who were present during the emissions 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

Process data monitored during the emissions test program is summarized in Appendix B.

2.b Applicable Permit

The Dow facility is covered by Permit No. MI-ROP-A4043-2008. The objective of the emissions test program was to demonstrate compliance with the HCl and Cl_2 emission limitations included in the National Emission Standards for Hazardous Air Pollutants: Hydrochloric Acid Production codified at Title 40, Part 63, Subpart NNNNN of the Code of Federal Regulations (40 CFR 63, Subpart NNNNN). As listed in Table 1 of 40 CFR 63, Subpart NNNNN, the emission limitations for an emission stream from an HCl process vent at a new source is 12 ppmv HCl and 20 ppmv Cl_2.

2.c Results

The overall results of the emission test program are summarized by Table 2. Detailed emissions test results can be found in Table 3.

2.d Emission Regulation Comparison

As listed in Table 1 of 40 CFR 63, Subpart NNNNN, the emission limitations for an emission stream from an HCl process vent at a new source is 12 ppmv HCl and 20 ppmv Cl_2. As summarized by Table 2, the test results were 11 ppmv HCl and 1 ppmv Cl_2.

3. Source Description

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

3.a Process Description

Dow manufactures anhydrous HCl in Building 356. A portion of this anhydrous HCl is then vented through a process scrubber with the effluent from the process scrubber being the product, aqueous HCl. Any HCl or water vapor that exits the process scrubber is then further removed by an air emissions scrubber (No. 24388).

The aqueous manufacturing process begins at the hand valve where the highline that supplies anhydrous HCl to other processes in the plant splits off to supply the aqueous HCl production process. The anhydrous HCl will go through HX-25139 prior to being absorbed in absorber 24387. The vent stream from 24387 is sent to scrubber 24388. The aqueous HCl from 24387 is piped over to storage tanks 24345 and 24346.

3.b Raw and Finished Materials

Numerous raw and finished materials are used in Building 356.

3.c Process Capacity

The EU356-01 scrubber capacity is commensurate with the maximum flowrate of the EU356-01 vent stream.

3.d Process Instrumentation

Process instrumentation for the EU356-01 scrubber includes scrubber water flowrate and effluent water pH.

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

Sampling and analytical procedures followed the guidelines of the following reference test methods codified at Title 40, Part 60, Appendix A of the Code of Federal Regulations (40 CFR 60, Appendix A):

- Method 1A - *"Sample and Velocity Traverses for Stationary Sources with small stacks or ducts"* was used to determine the sampling locations and the stack traverse points.

- Method 2 - *"Determination of Stack Gas Velocity and Volumetric Flowrate"* was used to determine average exhaust gas velocity.
- Method 3 - *"Gas Analysis for Determination of Dry Molecular Weight"* was used to evaluate the molecular weight of the exhaust gas (Fyrite Analysis).
- Method 4 - *"Determination of Moisture Content in Stack Gases"* was used to determine the moisture content of the exhaust gas.
- Method 26 - *"Determination of Hydrogen Halide and Halogen Emissions from Stationary Sources"* was used to determine the concentration of HCl and Cl_2 in the exhaust gas.

Stack gas velocity traverses were conducted in accordance with the procedures outlined in Method 1A and Method 2. An S-type pitot tube with thermocouple assembly, constructed in accordance with the baseline pitot tube coefficient (0.84) specifications of Method 2, Section 10, was used to measure exhaust gas velocity pressures (using a manometer) and temperatures during testing. Because of the small diameter of the duct and the availability of only one test port, exhaust gas velocity pressure was measured upstream of the concentration sampling point before and after each test run and the average exhaust gas flowrate used to determine the mass emission rate. A single velocity traverse was conducted at six points across the 4" diameter duct.

40 CFR 60, Appendix A, Method 26, *"Determination of Hydrogen Halide and Halogen Emissions from Stationary Sources (nonisokinetic method)"* was used to evaluate HCl and Cl_2 concentrations. With the exception that the Method 26A sampling train was assembled using midget impingers and a Method 30B meter.

After completion of the final leak test for each test run, the impinger train was carefully disassembled. The filter was recovered and placed in its original Petri dish. The liquid volume of each impinger was measured gravimetrically and any mass increase was noted on field sheets. The impinger catch solutions were then transferred to pre-cleaned sample containers. The impingers were then triple rinsed with deionized water (DI H_2O), and the rinses added to the H_2SO_4 or NaOH sample containers. Also, the back-half of the filter holder was rinsed and added to the H_2SO_4 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 DI water, the H_2SO_4 solution, the NaOH solution, and the filter were collected. Samples were picked up by Maxxam Analytics for analysis.

4.b Recovery and Analytical Procedures

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

4.c Sampling Ports

Sampling ports consisted of a single flow measurement port and a single sample collection port with the flow measurement port located upstream of the sample collection port.

4.d Traverse Points

Because of the small diameter of the duct and the availability of only one test port, exhaust gas velocity pressure was measured upstream of the concentration sampling point before and after each test run and the average exhaust gas flowrate used to determine the mass emission rate. A single velocity traverse was conducted at six points across the 4" diameter duct.

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. Detailed data for each test run can be found in Table 3.

5.b Discussion of Results

The Dow facility is covered by Permit No. MI-ROP-A4043-2008. The objective of the emissions test program was to demonstrate compliance with the HCl and Cl_2 emission limitations included in the National Emission Standards for Hazardous Air Pollutants: Hydrochloric Acid Production codified at Title 40, Part 63, Subpart NNNNN of the Code of Federal Regulations (40 CFR 63, Subpart NNNNN). As listed in Table 1 of 40 CFR 63, Subpart NNNNN, the emission limitations for an emission stream from an HCl process vent at a new source is 12 ppmv HCl and 20 ppmv Cl_2. HCl and Cl2 test results were below the corresponding limitations.

5.c Sampling Procedure Variations

Sampling procedure variations included:

- The use of a single test port for the velocity traverse (see Section 4.a), and
- The use of midget impingers and a Method 30B meter for Method 26.

5.d Process or Control Device Upsets

The emissions test program did not include process or control device upsets.

5.e Control Device Maintenance

No maintenance was performed during the test program.

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 C.

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 E.

5.j Laboratory Data

Analytical reports relevant to the emissions test program are provided in Appendix F.

TABLES

Table 1
Test Personnel

Name and Title	Affiliation	Telephone
Mr. James Peck Environmental Engineer	Dow Corning Corporation 3901 South Saginaw Midland, Michigan 48686	(989) 496-5348
Mr. Ken Felder Environmental Technician	BTEC 4949 Fernlee Avenue Royal Oak, Michigan	(248) 548-7980
Mr. Jeff Peitzsch Staff Environmental Engineer	BTEC 2615 Wolcott Street Ferndale, MI 48220	(248) 548-8072
Mr. Tom Gasloli Air Quality Division	SE Michigan District Office 27700 Donald Court Warren, MI 48092-2793	(517) 335-4861

Table 2
Test Program Emission Rate Summary

Source	Pollutant	Results
EU356-01 Scrubber	HCl	0.004 lb/hr
		11 ppmv
	Cl_2	0.001 lb/hr
		1 ppmv

Table 3
EU356-01 Scrubber
HCl and Cl2 Emission Rates

Company	Dow			
Source Designation	EU356-01			
Test Date	10/21/2013	10/21/2013	10/21/2013	
Meter/Nozzle Information	P-1	P-2	P-3	Average
Meter Temperature Tm (F)	54.0	56.0	56.0	55.3
Meter Pressure - Pm (in. Hg)	29.1	29.1	29.1	29.1
Measured Sample Volume (Vm)	04.2	04.3	04.3	04.3
Sample Volume (Vm-Std ft3)	04.2	04.2	04.2	04.2
Sample Volume (Vm-Std m3)	0.12	0.12	0.12	0.12
Condensate Volume (Vw-std)	0.424	0.377	0.330	0.377
Gas Density (Ps(std) lbs/ft3) (wet)	0.0719	0.0721	0.0724	0.0721
Gas Density (Ps(std) lbs/ft3) (dry)	0.0744	0.0744	0.0744	0.0744
Total weight of sampled gas (m g lbs) (wet)	0.33	0.33	0.33	0.33
Total weight of sampled gas (m g lbs) (dry)	0.31	0.31	0.31	0.31
Stack Data				
Molecular Weight Stack Gas- dry (Md)	28.8	28.8	28.8	28.8
Molecular Weight Stack Gas-wet (Ms)	27.8	27.9	28.0	27.9
Stack Gas Specific Gravity (Gs)	0.960	0.964	0.967	0.964
Percent Moisture (Bws)	9.15	8.22	7.25	8.21
Water Vapor Volume (fraction)	0.0915	0.0822	0.0725	0.0821
Pressure - Ps ("Hg)	29.1	29.1	29.1	29.1
Exhaust Gas Flowrate				
Flowrate ft^3(Actual)	66	67	66	66
Flowrate ft^3 (Standard Wet)	62	63	64	63
Flowrate ft^3 (Standard Dry)	62	63	64	63
Flowrate m^3 (standard dry)	2	2	2	2
Total HCl Weight (ug)				
Sample Catch	6000.00	320.00	140.00	2153.33
Blank correction	0.00	0.00	0.00	0.00
Total	6000.00	320.00	140.00	2153.33
Total HCl Concentration				
lb/1000 lb (wet)	0.040	0.002	0.001	0.014
lb/1000 lb (dry)	0.042	0.002	0.001	0.015
mg/dscm (dry)	50.3	2.7	1.2	18.1
ppmv (wet)	30.1	1.6	0.7	11
Total HCl Emission Rate				
lb/ hr	0.012	0.001	0.000	0.004
Total Cl2 Weight (ug)				
Sample Catch	320.00	280.00	300.00	300.00
Blank correction	0.00	0.00	0.00	0.00
Total	320.00	280.00	300.00	300.00
Total Cl2 Concentration				
lb/1000 lb (wet)	0.002	0.002	0.002	0.002
lb/1000 lb (dry)	0.002	0.002	0.002	0.002
mg/dscm (dry)	2.7	2.3	2.5	2.5
ppmv (wet)	0.8	0.7	0.8	1
Total Cl2 Emission Rate				
lb/ hr	0.001	0.001	0.001	0.001