

DEPARTMENT OF ENVIRONMENTAL QUALITY  
AIR QUALITY DIVISION  
ACTIVITY REPORT: On-site Inspection

N625166679

<b>FACILITY:</b> CABOT CORPORATION		<b>SRN / ID:</b> N6251
<b>LOCATION:</b> 3603 S SAGINAW ROAD, MIDLAND		<b>DISTRICT:</b> Bay City
<b>CITY:</b> MIDLAND		<b>COUNTY:</b> MIDLAND
<b>CONTACT:</b> Kevin Musser , Safety, Health, & Env Specialist		<b>ACTIVITY DATE:</b> 03/08/2023
<b>STAFF:</b> Gina McCann	<b>COMPLIANCE STATUS:</b> Compliance	<b>SOURCE CLASS:</b> MAJOR
<b>SUBJECT:</b> Inspection of MI-ROP-N6251-2020.		
<b>RESOLVED COMPLAINTS:</b>		

I (glm) met with Mr. Kevin Musser, SHE Manager, for the Midland Cabot facility. Mr. Musser provided a tour of the process and related monitoring records. Cabot Corporation (Cabot) operates an amorphous fumed silica manufacturing facility in Midland Michigan. It is located on the eastern side of Midland County at 3603 South Saginaw Road inside the Dow ipark stationary source on property owned by Cabot. The facility employs approximately 25 employees. The process consists of a chlorosilane vapor reactor with associated chlorine abatement technology, product collection filters, product calciner, product conveying and storage. The purpose of this inspection was to determine compliance with the requirements in MI-ROP-N6251-2020. At the time of the inspection the facility was in compliance with MI-ROP-N6251-2020.

Trichlorosilane and Silicon tetrachloride (commonly referred to as sil-tet in conversation) are fed to the plant from the Cabot Mix Tank operation located at Dow Silicones (A4043), produces in the 502-01 emission unit. Emissions from the Cabot Mix Tank are vented to the 337 scrubber system or the dry vent tank of the THROX system. Both controls are owned and operated by Dow Silicones.

Cabot introduces the feedstock from the Cabot Mix Tank into their flame technology with hydrogen supplied from Air Products and Chemicals, Inc. and nitrogen supplied by Dow to create a reaction that produces amorphous silica. Post reaction a chlorine abatement technology exists and results in CO emissions. An additional byproduct is HCl gasses. Cabot captures the approximately 5% HCl and through an absorption/desorption process raises the concentration to 32% HCl. Cabot raises the concentration because Dow Silicones wants a usable material. The 32% HCl is sent to the 340 building. The 340 building consists of the HCl production plant and chloride recovery.

Dow supplies Cabot with utilities such as water, steam, electricity, nitrogen, and instrument air. When Dow has their annual turn around for maintenance, Cabot is forced to shut down their processes also.

Approximately 30% of the silica produced is returned to the ipark residents with the remaining 70% sent off-site. The amorphous silica is used as an anti-caking agent in powdered products, i.e. cake mixes, dry creamer, beauty products.

In addition, as part of this inspection, the AQD, determined based on AQD Policy AQD-011 that Cabot Corporation (N6251) and Dow Silicones Corporation (A4043) constitute a single stationary source. A separate letter follows this inspection report.

#### Source-Wide Conditions

The plant has taken permit restrictions to limit the source from being a major source of hazardous air pollutants (HAPs). Individual HAPs are limited to 8.9 ton per year (tpy) based on a 12-month rolling time period as determined at the end of each calendar month and aggregated, those HAPs cannot exceed 22.4 tpy based on a 12-month rolling time period as determined at the end of each calendar month. The plant emits several HAPs including some metals. The aggregate emissions for the 12-month rolling time period

as determined at the end of February 2023 were 5.00 tpy, therefore individual HAP emissions were below 8.9 tpy.

### FG-SILICA-MFTING-PROCESS

This flexible group is comprised of equipment related to manufacturing amorphous fumed silica.

Trichlorosilane and Silicon tetrachloride (commonly referred to as sil-tet in conversation) are fed to the flame technology along with nitrogen and hydrogen to create a reaction that produces silica. Post reaction a chlorine abatement technology exists, which includes cooling the gas stream that is sent to a gas:solid separation unit. The chlorine abatement process results in CO emissions and HCl gas. A bag filter (EU-FILTERVENT) is used to control particulate emissions during separation of residual fumed silica product from conveying air. Sodium hydroxide is used to scrub out chlorine and HCl prior to discharge to atmosphere in the caustic scrubber (CD-SCRUB). The plant is also permitted to utilize a backup water scrubber for control (CDE-TFSCRUBBER), which was used for off gassing of HCl from the storage tanks. Scrubber water was then pushed to Dow wastewater. In September 2021 the plant re-routed piping to capture HCl into process. The scrubber has been idle since and are they looking to demo in the future.

The chlorine abatement process results in CO emissions requiring the permit to restrict them to 4,000 ppmv continuously based on a 15-minute rolling average. Special condition (SC) VI.1. requires the plant to monitor and record the carbon monoxide (ppm) emissions from FG-SILICA-MFTING-PROCESS and CD-SCRUB, specifically from SV-7, on a continuous basis using a CO CEMS. SC IV.3. requires the plant to install, install, calibrate, maintain and operate in a satisfactory manner, a device to monitor and record the CO emissions from FG SILICA MFTING PROCESS vent SV-7 on a continuous basis. The plant has two (2) CO analyzers set up to be redundant. The most recent relative accuracy test audit (RATA) was performed December 20, 2022. The relative accuracy was determined to be 2.31% of the mean of the reference method. During the inspection the CO concentration from the top analyzer (4428) read 1,712 ppmv and the bottom analyzer read 1,648 ppmv.

SC I.2. restricts CO emissions to 432 tpy based on a 12-month rolling time period as determined at the end of each calendar month. SC VI.6 is the associated monitoring and recordkeeping requirement that requires the plant to calculate the CO emission rate from FG-SILICA-MFTING-PROCESS monthly, for the preceding 12-month rolling time period, using a method acceptable to the AQD District Supervisor. I reviewed emissions from January 2022 through February 2023. In general, CO emissions are around 100 tpy. In March 2022 the plant emitted 97.86 tpy and in February 2023 they emitted 111.96 tpy.

SC I.3. restricts total chloromethanes to 21 ppmv on an hourly basis. A relationship between process operating parameters and the CO CEMS may be used to demonstrate compliance with the chloromethane emission rate limit (tons per year). SC V.1. requires verification of total chloromethanes emission rates from CD-SCRUB (SV-7) no later than 36 months after the last test. The most recent verifications of total chloromethane emission rates from CD-SCRUB (SV-7) occurred on December 1-2, 2020, and May 16, 2017.

SC I.4. restricts total chloromethanes to 8.9 ton per year (tpy) based on a 12-month rolling time period as determined at the end of each calendar month. SC VI.6 is the associated monitoring and recordkeeping requirement that requires the plant to calculate the total chloromethane emission rate from FG-SILICA-MFTING-PROCESS monthly, for the preceding 12-month rolling time period. I reviewed emissions from January 2022 through February 2023. For the 12-month rolling time period ending February 2023, chloromethane emissions were 0.24 tpy.

SC I.5. restricts PM emissions to 0.10 pound per 1,000 pounds of exhaust gases, calculated on a dry gas basis. Compliance with this limit is determined through proper operation of EU-FILTERVENT and monitoring the pressure drop for EU-FILTERVENT. Specifically, filter bag inspections and replacements and

calibration of the pressure drop indicator. I requested the last two (2) dates and associated maintenance performed on EU-FILTERVENT. Bags are inspected and changed annually. Additional maintenance was performed which included replacement of diaphragm on leaking pulsars. Calibrations on the pressure differential transmitter was performed in April 2021 and September 2020.

SC IV.2 requires the plant to equip and maintain EU-FILTERVENT with a pressure drop indicator. During the inspection we viewed the filter vent and location of the pressure drop indicator. Additionally, the plant has DPT 3039 installed as a backup to DPT 3027. During the inspection I observed the following parameters in the control room:

Process Parameter	Instrument Equipment Number	Instrument Range	Normal Operating Range	Alarm Setpoint	Instantaneous Value Observed During Inspection
Differential Pressure	DPT 3027 DPT 3039 (used as backup)	0 to 24.88 mbar	0 - 14 mbar	High = 13.90 mbar High/High = 14.0 mbar	7.37 mbar

SC I.6. restricts PM emissions to 3.4 tpy based on a 12-month rolling time period as determined at the end of each calendar month. I reviewed emissions from January 2022 through February 2023. For the 12-month rolling time period ending February 2023, PM emissions were 0.83 tpy.

SC I.7. and I.8 restricts HCL emissions to 0.95 pounds per hour (pph) when venting from SV-2 and 0.61 pph when venting through CD-SCRUB or SV-7. Based on stack test results from December 1-2, 2020, the HCL emission rate is 0.334 pph when venting through SV-2 and 0.0051 pph when venting through SV-7.

To ensure HCL emissions are controlled, SC III.1. requires the plan to install, maintain, and operate CD-SCRUB in a satisfactory manner, which includes maintaining the minimum pH level and recirculation flow rate specified in the Malfunction Abatement Plan (MAP). SC VI.4 is the associated monitoring and recordkeeping requirement that requires the plant to monitor and record the liquid flow rate, liquid level, and pH for CD-SCRUB on a continuous basis. For the purpose of this condition, “on a continuous basis” is defined as an instantaneous data point recorded at least once every 15 minutes for at least 90 percent of the operating time during an operating calendar day. I reviewed data from January 1, 2022 through February 1, 2023. The plant appeared to be operating CD-SCRUB according to the MAP.

During the inspection I observed the following parameters in the control room:

Process Parameter	Instrument Equipment Number	Instrument Range	Setpoint or Normal Operating Range	Alarm Setpoint	Instantaneous Value Observed During Inspection
pH	AE-4412 A&B	0 – 14 pH		Low 8.0	8.40

			Minimum 7.8 pH	High 10.00	
Tower Level	LT-4419	0 – 100%	25 – 55%	Low 17% High 60%	35 %
Recirculation Flow	FT-4405 or FT-4452	0 – 600 gpm (140000 kg/hr)	50,000 Kg/hr	Low 50,000 Kg/hr High 140,000 kg/hr	91,158 kg/hr

SC III.2. restricts operation of FG-SILICA-MFTING-PROCESS unless a post reaction peak temperature range of 1300°F - 1600°F, as measured in the staged methane/hydrogen injection process, is maintained. I reviewed data from January 1, 2022 through February 1, 2023. In general, the temperature appears to operate between 1300-1400. There were a few occasions when the temperature either rose too high or dropped to low. During these events, the plant-initiated shutdown and maintained shutdown until the temperature was able to be operated within the required range.

SC III.4. restricts operation of FG-SILICA-MFTING-PROCESS unless the approved MAP for satisfactory operation of EU-FILTERVENT and EU-HCL-RECOVERY is implemented and maintained. The most recent MAP is from May 2021.

SC IV.1. requires the plant to equip and maintain CD-SCRUB with a liquid flowrate indicator. I requested the last two (2) dates and associated maintenance and calibrations performed on the scrubber. The plant appears to be calibrating the flow transmitter annually. Calibrations on the liquid level indicator and pH indicator were last performed February 2023.

SC V.1. requires verification of total chloromethanes emission rates from CD-SCRUB (SV-7) no later than 36 months after the last test. Cabot last verified these emissions on December 1-2, 2020, and May 16, 2017. It seems more than 36 months had passed between tests. However, due to the Covid-19 pandemic testing may have been delayed due to procurement of testing firms.

SC V.2. required verification of HCl emission rates from FG-SILICA-MFTING-PROCESS when venting to SV-2 and SV-7 within 180 days after commencement of permanent use of the changed raw material feed with the new adiabatic tower. SC VII.1. is the associated monitoring and recordkeeping requirement that requires Cabot to notify the AQD District Supervisor and the AQD Permit Section manager, within 30 days, after the commencement of permanent use of the changed raw material feed with the new adiabatic tower. Cabot sent commencement notification on September 15, 2020. Testing was performed within 180 days. Results from the December 1-2, 2020 test are shown in the table below.

Stack Vent	Pollutant	Emission Rate (pph)	Emission Limit	% of Limit
	HCl	0.01	0.61 pph	1.0%

SV-7 (caustic tower)	Chloromethane	1.51	21 ppmv	7.0%
SV-2 (product filter vent)	HCl	0.34	0.95 pph	36.0

Section VII of the ROP is dedicated to reporting. SC VII.2 requires Cabot to submit records of the annual emission of CO from FG-SILICA-MFTING-PROCESS described in Appendix 4-1 in tons per calendar year, to the AQD Permit Section Supervisor within 60 days following the end of each reporting year if both the following occur: The calendar year actual emissions of CO exceed the baseline actual emissions (BAE) by a significant amount, and the calendar year actual emissions differ from the pre-construction projection. The table below compares actual CO emissions to the baseline actual. Cabot has not met the criteria to submit reporting.

Emissions (tpy)

Emission Unit/Flexible Group ID	Pollutant	Baseline Actual	Project Total	March 2022	February 2023
FG-SILICA-MFTING-PROCESS and all hydrogen plants	CO	157.4	280.9	97.86	111.96

**FG-COLDCLEANERS**

This flexible group contains any cold cleaner that is grandfathered or exempt from Rule 201 pursuant to Rule 278 and Rule 281(h) or Rule 285(r)(iv). Existing cold cleaners were placed into operation prior to July 1, 1979. New cold cleaners were placed into operation on or after July 1, 1979.

The plant has one cold cleaner on-site. I viewed the cold cleaner during the tour of the plant. The top was closed and the appropriate written procedures were in place. The plant did not use the cold cleaner in 2022.

**FG-RICEMACT**

This flexible group contains stationary reciprocating internal combustion engines (RICE), any existing emergency reciprocating internal combustion engine (RICE) subject to the RICE NESHAP found in 40 CFR Part 63, Subpart ZZZZ. The plant operates one emergency engine. A preventative maintenance check on the engine is performed each month by Cabot and records were provided. Cummins performed annual maintenance on July 29, 2022. It included a full-service check including the battery, coolant, oil change, load test etc. The engine run time is due to maintenance and checks.

Section 2-Air Products and Chemicals Inc.

As described above, Cabot introduces feedstock into their flame technology with hydrogen supplied from Air Products and Chemicals, Inc. to create a reaction that produces amorphous silica.

The plant has taken permit restrictions to limit the source from being a major source of hazardous air pollutants (HAPs). Individual HAPs are limited to 8.9 ton per year (tpy) based on a 12-month rolling time period as determined at the end of each calendar month and aggregated, those HAPs cannot exceed 22.4 tpy based on a 12-month rolling time period as determined at the end of each calendar month. The plant emits several HAPs. From the Air Products plant, several HAPs are emitted associated with the combustion of natural gas and methanol from the deaerator vent. Methanol is the individual HAP with the greatest emissions and for the 12-month rolling time period ending February 2023 methanol emissions were 0.0466 tpy. The aggregate emissions for the 12-month rolling time period as determined at the end of February 2023 were 0.0829 tpy.

Air Products and Chemicals, Inc. Carbon monoxide, methanol, ethanol, and ammonia are the emissions of concern under rule 290. The highest monthly total was less than 39.87 pounds in comparison to the 1,000 pounds allowed.

At the time of the inspection the facility was in compliance with MI-ROP-N6251-2020.

NAME



DATE

4/21/2023

SUPERVISOR

