

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

A980573035

FACILITY: MACDERMID INC	SRN / ID: A9805
LOCATION: 1221 FARROW AVE, FERNDAL	DISTRICT: Warren
CITY: FERNDAL	COUNTY: OAKLAND
CONTACT:	ACTIVITY DATE: 06/18/2024
STAFF: Iranna Konanahalli	COMPLIANCE STATUS: Compliance
SUBJECT: FY 2024 annual scheduled inspection of MacDermid, Inc. ("MacDermid"), also known as MacDermid Enthone, located at 1221 Farrow St., Ferndale, Michigan 48220-1959.	SOURCE CLASS: MINOR
RESOLVED COMPLAINTS:	

MacDermid, Inc. (A9805)
MacDermid Enthone
1221 Farrow St.
Ferndale, Michigan 48220-1959

Web: www.macdermid.com

Contacts:

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PTI Nos.: **614-86A** dated July 09, 1992 (Main Mezz scrubbers (2)); **614-86F** (Mod: 614-86E 4 614-86F electroless nickel (EN) products line) dated July 20, 2023; **73-02A** dated February 19, 2003 (Palladium (Pd) scrubber); **62-04** dated July 01, 2004 (Chrome Mezzanine or Chromium (Cr) scrubber); **614-86B** dated July 09, 1992 (Dry mix process and bulk-loading / bagger scrubbers); **61-04** dated July 01, 2004 (Tank farm and tank farm scrubber, which operates only during loading of the acid tanks).

The permits have NOT been numbered correctly. A-F are not modifications but different permits altogether. Coincidentally, the most recent PTI numbering (Mod: 614-86E 4 614-86F electroless nickel (EN) products line), unlike the previous numbers, follows well-established AQD convention.

614-86E to 614-86F Mod dated July 20, 2023: Via this permit modification, MacDermid added up to 9 more permanent mixing tanks for electroless nickel (EN) products line. As of today (July 2024), only six (6) permanent mixing tanks have been installed. To handle the change, MacDermid replaced the existing scrubber with a new (July 2023) 16,000-cfm scrubber (vertically packed bed scrubber, counter-current flow with liquid flow by gravity

downward and gas flow upward). Previous scrubber (1986) had 7,500 cfm capacity (horizontal packed bed scrubber, gravity flow liquid vertically downward and gas flow horizontal). The mixing tanks emission unit is known as EU-WETMIX. The scrubber is expected to provide >80% removal efficiency. Three (3) more mixing tanks are part of future project and hence not installed yet (July 2024). The tanks produce ammonia (NH₃) emissions and hence the scrubber liquid is maintained acidic (pH ≈ 2). Both scrubber and stack have been moved (about 60 feet southeast of the existing scrubber exhaust stack).

Void PTI Nos.: 73-02 (Palladium Activator Batch Process; voided on Feb 19, 2003) and **614-86D** (Chemical Mfg.; voided on Feb 22, 2002)

Void PTI Application Nos.: 614-86C (Fume Scrubbers; voided on Oct 23, 1996), **614-86** (Fume Scrubbers; voided on May 10, 1990) and **89-79I** (Plibrico 600 lbs. / hr. Type 0 waste with afterburner; voided on June 27, 1988)

Subject to: Area NESHAP / MACT 7B, 40 CFR Part 63, Subpart BBBBBBB (7B), National Emission Standards for Hazardous Air Pollutants for Area Sources: Chemical Preparations Industry; Page 69194 Federal Register / Vol. 74, No. 249 / Wednesday, December 30, 2009 / Rules and Regulations / Final Rule. The NESHAP / MACT 7B is for chemical preparations area source category. AQD has no delegation of this area source MACT standards; therefore, comprehensive evaluation of MacDermid's compliance with NESHAP / MACT 7B has not been made. To some extent, the AQD's permits, and the MACT 7B are intertwined. Chemical preparations facilities are those that conduct the mixing, milling, blending, or extruding of industrial chemicals, not to be confused with non-industrial mixing or blending that occurs at a pharmacy, in a laboratory or in similar non-industrial circumstances. The MACT 7B standards limit emissions of particulate matter (PM) that contain chromium (Cr), lead (Pb), manganese (Mn) or nickel (Ni) compounds. MacDermid performed stack tests to show compliance with MACT 7B and submitted the Sec. 114 letter information to US EPA.

US EPA CAA Sec. 114 letter: US EPA issued Sec 114 letter dated May 26, 2016, requesting emissions rates of hexavalent chromium in pounds per hour and tons per year. Mac Dermid responded. AQD received a copy of the response to US EPA. AQD did not review this Area MACT information as AQD has no delegation.

FY 2020 Complaint: Ammonia (NH₃ as NH₄OH) or Sulfur (as H₂S or mercaptan) odor complaint (C-20-04212-2020-08-24 on Farrow Ave.). The odor was never confirmed by AQD during its investigation.

On **June 18, 2024**, I conducted a level 2 **FY 2024 annual scheduled inspection** of MacDermid, Inc. ("MacDermid"), also known as MacDermid Enthone, located at 1221 Farrow St., Ferndale, Michigan 48220-1959. The inspection was conducted to determine compliance with the Federal Clean Air Act; Article II, Part 55, Air Pollution Control, of the Natural Resources and Environmental Protection Act, 1994 PA 451; Michigan Department of Environmental Quality, Air Quality Division (MDEQ-AQD) administrative rules; and the above permits.

During the inspection, **Kevin Budziak** Engineering Manager, and **Tabetha Peebles**, EHS Manager assisted me.

MacDermid is a specialty chemicals company serving the diversified needs of the Electronics, Industrial, Offshore and Printing industries. MacDermid Industrial Solutions has provided technology-based solutions to the surface coating industry such as hexavalent chrome (Cr^{+6}) plating. The special formulations of chemical-based products are used for decorating and protecting metals and plastics in such applications as chrome plating of alloy wheels, high performance fasteners and electroless coating of computer disc drives. The products may be liquid or solid.

MacDermid of Ferndale is in the business of blending chemicals, predominantly inorganic chemicals; chemical reactions are not involved at all but only physical mixing. The products (both dry and liquid) are produced by blending raw materials (predominantly inorganic chemicals) in mix tanks to make a batch. MacDermid blends chemicals for:

1. Decorative Systems
2. Anti Corrosion Systems
3. Engineering Coatings
4. Plating on Plastics
5. Metallurgy
6. Surface Preparation

All chemical preparation processes are **batch processes** (non-continuous) involving no chemical reaction. MacDermid makes dry and liquid products for plating, circuit boards, decorative and protective (e.g., Chrome 6, Zinc plating) industries. Raw materials are stored in a warehouse. Raw materials are charged to a mix tank to make a batch. Upon approval by QC, the products (liquids or solids) are packaged into drums, pales, totes, bags, etc. The products are shipped to other warehouses or customers. Some of the MacDermid's formulations contain PFAS chemicals and Great Lakes Water Authority (GLWA) is monitoring the plant for PFAS chemicals. Most PFAS chemicals, about 2022, are outsourced to toll manufacturer except a couple.

MacDermid Scrubbers and Stack Tests (of total 8 scrubbers, 5 are MACT 7B scrubbers)

Of total eight (8) scrubbers, five (5) are subject to the area source NESHAP / MACT 7B. While two of the MACT scrubbers (dry mix and chrome) were tested in September 2010, three MACT scrubbers were tested in 2005. Unlike 2010 tests, AQD was not involved in the 2005 tests. Eight scrubbers are:

2. **Dry mix process scrubber (Ceilcote) (PTI No. 614-86B).** The **process scrubber (FP201)** uses only water (no caustic solution). The scrubber is used when dry mix products are blended. Particulate matter laden exhaust from three (3) dry mix tanks, packaging and six (6) hoppers goes to this scrubber. Particulate laden air flow is horizontal; and water is sprayed in a counter-current manner. 3-run particulate matter stack test was conducted on September 28, 2010, to show compliance with Area Source NESHAP / MACT 7B. There are two identical scrubbers: one for dry mix

process and one for dry mix bulk loading / bagging. Water is sprayed via a nozzle system; and PM is collected in water stream. A mist eliminator is associated with each scrubber (2). **Dry mix bulk loading / bagger scrubber (PTI No. 614-86B).** The **bulk scrubber (FP211)** uses only water (no caustic solution). The scrubber is used during bulk material loading to the four (4) of six (6) silos (2 of 6 silos have their own baghouses) from the tank trucks. Particulate laden air flow is horizontal, and water is sprayed in a counter-current manner. This scrubber was tested for its performance in 2005 but not in 2010. There are two identical scrubbers: one for **dry mix process (FP201)** and one for **dry mix bulk loading / bagging (FP211)**. Water is sprayed via a nozzle system while PM is collected. A mist eliminator on each scrubber is present. Two (2) of six (6) silos are equipped with fabric filters (bags), which are still operating; however, all six silos including these two with fabric filters use the scrubber for particulate matter emissions control. About 2005, MacDermid installed one additional scrubber (Ceilcote 6,000 cfm) (PTI No. 614-86B) so that one Ceilcote scrubber is dedicated to dry mix blending and the other Ceilcote is dedicated to bulk loading of six silos (2 of 6 silos are equipped with their own baghouses).

3. **Main mezzanine scrubber – North (PTI No. 614-86A, FP212) & Main mezzanine scrubber – South (PTI No. 614-86A, FP213).** pH of 8.5 (alkaline) is maintained using potassium hydroxide (KOH); sodium hydroxide (NaOH) is also used depending upon chemical costs and freezing properties of the solution. Exhaust from 27 mix tanks, 9 small mix tanks and few (30) portable mix tanks go to Main Mezz scrubbers (2), which run 24/7 (non-stop) to ensure proper operation. The Main Mezz scrubbers (north and south) were tested in 2005. Exhaust from known and fixed process units are ducted to either North or South scrubber. Typically, North Tanks are ducted to North Scrubber and South Tanks are ducted to South Scrubber. However, a capability to use only one of two (North or South) scrubbers for all the North & South process units exists if maintenance is needed. Each scrubber (North & South) is equipped with 15-foot packing for absorption and 1-foot packing for demister. pH readings are logged. About 2005, North and South scrubbers (located outside) replaced East and West scrubbers (located inside the building).
5. **. Tank Farm scrubber (PTI No. 61-04, FP206).** The vertical packed bed scrubber has no pH control. The scrubber operates only when receiving bulk load of acid materials (Nitric, HNO_3 & Hydrochloric, HCl). Potassium hydroxide (KOH) is added during the acid materials loading in order to maintain alkaline pH. The scrubber is equipped with 35-inch packed bed and 12-inch demister perforated polypropylene with 7/8 inch diameter holes. Tank farm has nine (9) tanks: five (5) tanks store acidic materials and four (4) tanks store basic (alkaline) materials; but only one of four base (alkali) tanks is currently (FY 2019) used. Tank farm scrubber controls only two (2) of the five (5) acid tanks (i.e. HNO_3 and HCl tanks). Sulfuric acid tanks do not need scrubber due to extremely low vapor pressure. pH is neither measured nor logged. 45%w KOH (pH = 14) from one of the caustic tanks is used in the scrubber. Sulfuric acid exists in gas (mostly air) stream as aerosol droplets because the acid has very low vapor pressure and its partial pressure is very low for 10 percent aqueous solution (0.353×10^{-13} bar at 100 degrees Celsius). See Perry's Chemical Engineers Handbook (pages 3-68 thru 3 -69). Hence, sulfuric acid practically does not exist in vapor phase in the gas stream; almost all sulfuric acid exists as particulate / mist.
6. **Electroless nickel (Ni) (EN) scrubber (614-86F, FP202).** The Electroless Ni (EN) scrubber was tested in 2005. NH_3 exhaust from 8 fixed and 6 spot portable and 1

packaging electroless Ni tanks were previously ducted to Electroless Ni (EN) Scrubber. Sulfuric acid (H₂SO₄) is used to maintain pH under 2 (i.e. acidic). There used to be horizontal NH₃ (NH₄OH) laden air flow vs. vertical spray of sulfuric acid solution. Scrubber solution pH readings are logged (manually). However in 2023, the old horizontal flow scrubbers have been replaced by vertical flow counter-current packed bed scrubber. New scrubber has been located 60 feet away (southwest) from the old scrubber. Six more permanent mixing tanks have already been added. New 16,000 cfm scrubber has already been installed to handle the additional load.

7. Chrome (Cr) scrubber (PTI No. 62-04, FP205). 3-run particulate matter stack test was conducted on September 29, 2010, to show compliance with NESHAP / MACT 7B. pH, static pressure, pressure drop, liquid flow rate, pump pressure were monitored every 10 minutes during the stack test. The scrubber consists of a horizontal packed bed with 300-gallon sump tank. Potassium hydroxide (KOH) is used to adjust pH. Caustic solution is sprayed vertically down and contaminated air flow is horizontal. WalChem system monitors the scrubber solution pH and pumps KOH. Exhaust from 4 chrome mix tanks is vented to the Cr Scrubber. The scrubber solution pH is maintained at 9 (> 8.5). The pH readings are logged (manually). September 2010 tests showed that there no (below detection level) Cr⁺⁶ at the inlet of the scrubber.

8. Palladium (Pd) scrubber (PTI No. 73-02A, FP207). Copper chloride products have not been not made since 2005. Exhaust from one premix, two production, one packaging tanks is ducted to Pd scrubber. KOH is added to maintain the scrubber solution pH of 9 (> 8.5). The scrubber solution pH readings are logged. Pd scrubber consists of two towers: one of two towers is packed bed and the other is mist eliminator. pH of 8 or greater is required by the permit (PTI No. 73-02A, FGHCLBLENDS, 3.3) and MacDermid operates in compliance with this pH ≥ 8 limit.

About 2005 (July 13, 2005, letter), MacDermid replaced existing **EN scrubber** (6,000 cfm, 3-foot packing) with new EN scrubber (8,000 cfm, 8-foot packing) (PTI No. 614-86E) for control of ammonia (NH₃) using sulfuric acid solution (H₂SO₄). In addition, in the dry mix area, MacDermid installed one additional scrubber (Ceilcote, 6,000 cfm) (PTI No. 614-86B) so that one Ceilcote scrubber is dedicated to dry mix blending and the other Ceilcote is dedicated to bulk loading of six silos (2 of 6 silos are equipped with their own baghouses). The new dry mix area scrubber is of Multi-throat Venturi Rod type having collection efficiency equal to or greater than existing scrubber as company claims. Installation of EN scrubber is exempt from Rule 336.1201 pursuant to Rule 336.1285(2)(d) because it replaces the existing scrubber with equivalent or better collection / removal efficiency scrubber. Installation of the dry mix scrubber is exempt from Rule 336.1201 pursuant to Rule 336.1285(2)(f) because it augments the one existing scrubber (scrubber capacity increased from one to two scrubbers for the same process: bulk loading and dry mix process).

About 2005 (August 15, 2005, letter; PTI No. 614-86A), the original Main Mezz horizontal packed bed scrubbers known as East (12,000 cfm) and West (6,000 cfm) scrubbers were replaced with vertical packed bed (15 ft of packing plus 1 ft demister) scrubbers known as North (**FP212**) and South (**FP213**) (PTI No. 614-86A, SC20). 17,000 cfm exhaust gases are discharged vertically via 35-feet-tall stack with exit diameter of 30 inches. AQD considered the replacement of the scrubbers (2 for 2) as equivalent, or better, in

performance and hence exempt from Rule 336.1201 pursuant to Rule 336.1285(d). The installation of North and South scrubbers as replacement for East (12,000 cfm) and West (6,000 cfm) scrubbers was completed on October 28, 2005. The scrubbers are equipped with 1-foot demister packing. The replaced scrubbers are better because of higher packing surface area for mass transfer.

2010 Stack Tests

On September 22, 2010, AQD approved the stack test plan for particulate matter for emissions from dry mix process scrubber (**FP201**) and chrome scrubber (**FP205**). On September 28 (dry mix process) and 29 (chrome), 2010, MacDermid conducted stack sampling of dry mix process and chrome scrubbers, respectively. The scrubber for the dry mix bulk material loading and bagging was not tested in 2010 because the scrubber is not subject to Area Source NESHAP / MACT 7B. On November 15, 2010, AQD received the stack test report for Sep 28 and 29, 2010, sampling. The purpose of the stack test was to demonstrate compliance with the MACT 7B.

The particulate matter emissions from chrome scrubber are 0.002 (Round [0.0018]) grains per dry standard cubic feet or 0.09 pounds per hour. The particulate matter emissions from dry mix process scrubber are 0.003 grains per dry standard cubic feet or 0.13 pounds per hour according to the stack test. The MACT 7B requires 95 percent reduction efficiency or maximum 0.03 grains / dscf concentration of particulate matter (PM), a HAP surrogate for Cr, Pb, Mg and Ni, in exhaust to atmosphere. MacDermid has chosen to comply with 0.03 grains of PM per dscf of exhaust standard.

2005 Stack Tests

Concerning the 2005 Stack Tests, AQD neither reviewed the test plans nor observed the sampling nor reviewed the test reports.

Main Mezz scrubbers (PTI No. 614-86A, North (FP212) & South (FP213)): On November 16 (South scrubber) and 17 (North scrubber), 2005, MacDermid conducted stack sampling of Main Mezz scrubbers (North & South) for particulate matter, formaldehyde (H-CHO or CH₂O, CAS #50-00-0, FP = 147 °F, highly explosive flammability range 7% [LEL]-73% [UEL], PEL permissible = 0.75 ppm, IDLH immediate danger = 20 ppm, >0.016 ppm formaldehyde concentration in indoor air not allowed in US buildings) and phosphoric acid (H₃PO₄, CAS #7664-3802, PEL permissible = 1 milligram per cubic meter, IDLH immediate danger = 1,000 milligrams per cubic meter) at both inlet and outlet of each scrubber. Inlet sample locations did not meet US EPA RM1 criteria.

The outlet emissions reported are: 0.07 (S) & 0.09 (N) pounds per hour of **VOC** (PTI No. 614-86A, SC14 limit: 0.3 lbs/hr & 1.3 tons/yr), 0.004 (S) & 0.0007 (N) pounds per hour & 0.061 (S) & 0.01 (N) mg / dscf of **formaldehyde** (PTI No. 614-86A, SC16 limit: 4.5 mg/dscf), 0.001 (S) & 0.001 (N) pounds per hour & 0.020 (S) & 0.019 (N) mg / dscf of **phosphoric acid** (PTI No. 614-86A, SC15 limit: 58 mg / dscf) and 0.10 (S) & 0.09 (N) pounds per hour of **particulate matter** (PTI No. 614-86A, SC17 limit: 0.5 lbs/hr).

The removal efficiencies are: 75.4 (S) & 74.1 (N) and 48.8 (S) & 82.2 (N) for particulate matter and VOC, respectively.

Electroless Nickel (Ni) (EN) scrubber (PTI No. 614-86E, FP202): On October 13, 2005, MacDermid conducted stack sampling of Electroless Nickel (EN) scrubber for particulate matter, formaldehyde and ammonia at both inlet and outlet of the EN scrubber. The outlet emissions reported are: 0.070 pounds per hour of **ammonia** (PTI No. 614-86E, SC1.1a limit: 0.2 lbs/hr), 0.025 pounds per hour of **particulate matter** (PTI No. 614-86E, SC1.1c limit: 0.03 lbs/hr) and $<1.66 \times 10^{-5}$ (detection limit) pounds per hour of **formaldehyde** (PTI No. 614-86E, SC1.1b limit: 0.05 lbs/hr).

The removal efficiencies are 99.7% and 87.6% for ammonia and particulate matter, respectively. New 16,000-cfm packed bed scrubber installed per PTI No. 614-86F in 2023 has not been tested.

Palladium (Pd) scrubber (PTI No. 73-02A, FP207): While palladium activator batch production is continuing, copper chloride products production ceased in 2005. On August 5, 2005, MacDermid conducted stack sampling of hydrogen chloride (HCl) at both inlet and outlet of the Pd scrubber. The outlet emissions reported is 0.0035 pounds per hour of **hydrogen chloride** (HCl) (PTI No. 73-02A, SC2.1b limit: 1.0 lbs/hr).

The removal efficiency is 99.76% for hydrogen chloride.

Chrome or Chromium (Cr) scrubber (PTI No. 62-04, FP205): On August 3 & 4, 2005, MacDermid conducted stack sampling of chromium (Cr+6) at both inlet and outlet of the Cr scrubber. The outlet emissions reported is $<2.06 \times 10^{-6}$ (below the detection limit) pounds per hour of Cr+6. PTI No. 62-04 has no chrome limit.

Chrome scrubber is tested again on September 29, 2010, for particulate matter as HAP surrogate; Cr⁺⁶ test was not done in 2010.

Dry mix process (FP201) and bulk-loading / bagger scrubbers (FP211) (2) (PTI No. 614 -86B): On August 2 & 3, 2005, MacDermid conducted stack sampling of particulate matter (PM) at both inlet and outlet of both bulk-loading / bagging (on 8/3) and dry mix process scrubbers (on 8/2). The outlet **particulate matter** (PM) emissions reported are: 0.034 pounds per hour (PTI No. 614-86B, SC 14 limit: 0.3 lbs/hr) and 0.002 pounds per 1,000 pounds of exhaust gases (PTI No. 614-86B, SC 14 limit: 0.01 lbs/1,000 lbs) for dry mix process scrubber (FP201) and 0.011 pounds per hour (PTI No. 614-86B, SC 14 limit: 0.3 lbs/hr) and 0.0005 pounds per 1,000 pounds of exhaust gases (PTI No. 614-86B, SC 14 limit: 0.01 lbs/1,000 lbs) for bulk-loading / bagging scrubber (FP211).

The removal efficiencies are 90.3% and 93.1% for particulate matter for dry mix process and bulk-loading / bagging scrubbers, respectively.

Both scrubbers are made by Ceilcote and hence are known as Ceilcote scrubbers (2).

Dry mix process (and not bulk loading) scrubber is tested again on September 28, 2010, because only dry mix process scrubber (and not bulk-loading / bagging scrubber) is subject to NESHAP / MACT 7B.

PTI No. 614-86B: Chemical dry mixing with a dry mix process scrubber (FP 201, Ceilcote) and a dry mix bulk loading scrubber (FP 211, Ceilcote)

See above for stack test results.

2005 stack test results show compliance with PTI No. 614-86B, SC 14 limits. While a dry mix process scrubber (Ceilcote) is operated during chemical dry batch mixing, a dry mix bulk loading scrubber (Ceilcote) is operated only when the materials are transferred from trucks to six (6) silos or bagging is in operation (2 of 6 silos are equipped with their own baghouses) (PTI No. 614-86B, SC 17: shall operate Ceilcote scrubbers properly). Each mist eliminator is integrated with each scrubber (PTI No. 614-86B, SC 17). Only water (no pH adjustment) is used to control particulate matter (PM) emissions.

According to 2010 stack tests, the particulate matter emissions from dry mix process scrubber (FP 201) are 0.003 grains per dry standard cubic foot or 0.13 pounds per hour (PTI No. 614-86B, SC 14 limit: 0.3 lbs./hr. & 1.3 tons/yr.). Particulate matter is HAP surrogate according to NESHAP / MACT 7B.

Neither silo loading nor bagging operation result in HAP emissions. Hence, the dry mix bulk loading scrubber (FP 211) was not tested in 2010; i.e. the scrubber is not subject to NESHAP / MACT 7B.

FP 201 & FP 211 maintenance and operating records are kept.

May 2024: Pump Pressure = 25 psi. 24 gpm. Pressure Drop = 5.6 psi. (Monthly statical data)

PTI No. 614-86A: Main mezzanine scrubbers (2) – North FP212 and South FP213

Both scrubbers (each: 17,000 cfm blower, 250 gpm pump, 647 cub. ft. Packing) are vertical packed bed scrubbers (180 inches) with demisters (12 inches)

See above for stack test results.

About 2005, the original Main Mezz horizontal packed bed scrubbers known as East (12,000 cfm) and West (6,000 cfm) scrubbers were replaced; see above for the replacement information.

The scrubber solution pH of 8.5 is maintained using **potassium hydroxide** (KOH); sodium hydroxide (NaOH) may also be used. Exhaust from 27 mix tanks, 5 small mix tanks and few (30) portable mix tanks go to Main Mezz scrubbers, which run 24/7 to ensure proper operation (PTI No. 614-86A, SC20: operate properly the scrubbers). Daily check on pressure gauge is performed to ensure liquid flow (PTI No. 614-86A, SC21: flow indicators). 17,000 cfm exhaust gases are discharged vertically via 35-foot-tall stack with exit diameter of 30 inches (PTI No. 614-86A, SC22: Hs ≥ 35 ft.).

FP 212 & FP 213 maintenance and operating records are kept.

May 2024 (North Scrubber): Pump Pressure = 32 psi. pH = 8.1.
Pressure Drop = 2.6 psi.

May 2024 (South Scrubber): Pump Pressure = 31 psi. pH = 8.34.
Pressure Drop = 3.1 psi.

Based upon monthly statistical data.

PTI No. 61-04: Tank farm and tank farm scrubber.

One 6,503-gallon 36 %w **hydrochloric acid** (HCl), one 6,344-gallon 93 %w (PTI 100 %w) **sulfuric acid** (H₂SO₄), one 6,344-gallon 67 %w (PTI 69 %w) **nitric acid** (HNO₃), one 10,000-gallon 35 %w **ammonium hydroxide** (NH₄OH; empty since 2002) and two 4,000-gallon **chromic acid** storage tanks are present. The tank farm wet scrubber uses water with potassium hydroxide (KOH). Although there is no pH monitoring, KOH is pumped at a steady rate (PTI No. 61-04, SC 1.5: operate properly scrubber) when loading acids. The scrubber operates only when of materials (HNO₃ & HCl) are loaded into the tanks. The records of throughput are kept (PTI No. 61-04, SC 1.6). Emission calculations are kept on a database (PTI No. 61-04, SC 1.7).

CY 2012, 2018 & 2023 throughputs: 8,155, 4,483 & **9,012** (89,040 pounds) gallons of **Hydrochloric Acid** (440281) (HCl) per year (PTI No. 61-04, SC 1.1 limit: 62,330 gallons / 12-mo), 49,929, 45,899 & **38,076** (446,800 pounds) gallons of **Nitric Acid** (440300) (HNO₃) per year (PTI No. 61-04, SC 1.2 limit: 75,000 gallons / 12-mo), 23,699, 35,896 & **24,528** (375,269 pounds) gallons of **sulfuric acid** (H₂SO₄) (PTI No. 61-04, SC 1.3 limit: 50,000 gallons / 12-mo) and zero gallon of ammonium hydroxide (NH₄OH) per year (PTI No. 6104, SC 1.4 limit: 42,750 gallons / 12-mo). **Ammonium Hydroxide** (440806) is not purchased anymore in bulk (after about 2002). NH₄OH is only handled by drums.

Tank farm scrubber maintenance and operating records are kept.

PTI No. 614-86E: Electroless nickel (Ni) (EN) scrubber FP202

This is a horizontal packed bed scrubber (FP202: 8,000 cfm blower, 175 gpm pump, 210 cubic feet Packing).

According to 2005 stack tests, the outlet emissions reported are: 0.070 pounds per hour of **ammonia** (PTI No. 614-86E, SC1.1a limit: 0.20 lbs/hr), 0.025 pounds per hour of **particulate matter** (PTI No. 614-86E, SC1.1c limit: 0.03 lbs/hr) and $<1.66 \times 10^{-5}$ pounds per hour of **formaldehyde** (PTI No. 614-86E, SC1.1b limit: 0.05 lbs/hr). The removal efficiencies are 99.7% and 87.6% for ammonia and particulate matter, respectively.

The wet scrubber is operated properly (PTI No. 614-86E, SC1.2). The scrubber is equipped with a rotameter (PTI No. 614-86E, SC1.3: equip Ni EN scrubber with liquid flow indicator) to ensure liquid flow.

FP 202 maintenance and operating records are kept.

PTI No. 62-04: Chrome (Cr) scrubber FP205

One 1500-gallon (Hex Chrome Blending Tank No. **23**), one 1000-gallon (Tri Chrome Blending Tank No. **24**) and one 1200-gallon (Blending Tank No. **25**) blending tanks are present. While 2010 stack test was done for particulate matter, a HAP surrogate, 2005 stack test was done for Cr+⁶. Hexavalent chromium (Cr+⁶) emissions were below detection limit during the 2005 test. The permit does not contain Cr+⁶ limit.

According to 2010 tests, the **particulate matter** emissions from chrome scrubber are 0.002 (Round [0.0018]) grains per dry standard cubic feet or 0.09 pounds per hour.

Scrubber solution pH, static pressure, pressure drop, liquid flow rate, pump pressure were monitored every 10 minutes during the 2010 stack test. The scrubber consists of a

horizontal packed bed with 300-gallon sump tank. Potassium hydroxide is used to adjust pH. WalChem system monitors pH and pumps KOH. Exhaust from 3 chrome mix tanks is ducted Cr Scrubber. The scrubber is operated when Chrome Mezz is operating (PTI No. 62-04, FG-CHROMEZZ, SC 1.1). pH of greater 8 (pH > 8) is maintained. Chemical usage and number of batches records kept (PTI No. 62-04, FG-CHROMEZZ, SC 1.2 & 1.3). Emissions calculations are kept in a database (PTI No. 62-04, FG-CHROMEZZ, SC 1.4).

FP 205 maintenance and operating records are kept.

PTI No. 73-02A: Palladium (Pd) scrubber

Copper chloride products are not made since 2005 (PTI No. 73-02A, SC 1.1a and 1.1b). Exhaust from one premix, two production, one packaging tanks is ducted to the Pd scrubber, equipped with a packed bed with KOH solution spray. A mist eliminator is present.

According the 2005 tests, the outlet emissions reported is 0.0035 pounds per hour of **hydrogen chloride** (HCl) (PTI No. 73-02A, EU-PDPLATEBLEND, SC2.1b limit: 1.0 lbs/hr). The removal efficiency is 99.76% for hydrogen chloride. The HCl content is limited to 36% w (PTI No. 73-02A, FG-HCLBLEND, SC 3.1). Only one 8-hour shift is operated (PTI No. 73-02A, FG-HCLBLEND, SC 3.2). The packed bed Pd scrubber with spray uses water and KOH to maintain the scrubber solution pH of 8 or greater (PTI No. 73-02A, FG-HCLBLEND, SC 3.3). The scrubber is equipped with a rotameter (PTI No. 73-02A, FG-HCLBLEND, SC 3.4). The scrubber is equipped with a pH meter (PTI No. 73-02A, SC 3.5) to maintain the scrubber solution pH between 10 and 12; minimum pH of 8. An operator records pH daily when the process operates (PTI No. 73-02A, FG-HCLBLEND, SC 3.6). Maximum HCl content is 36%w (PTI No. 73-02A, FG-HCLBLEND, SC 3.7). Start and end times of a batch are noted and about 3 batches per month are produced (PTI No. 73-02A, FG-HCLBLEND, SC 3.8).

NESHAP / MACT 7B Initial Notification

On April 28, 2010, AQD received the NESHAP / MACT 7B Initial Notification for Area Source. The Notification was due within 120 day of the rule promulgation date (December 30, 2009). MacDermid, as an area MACT source, is exempt from Title V (RO) permit.

NESHAP / MACT 7B Notice of Compliance Status Report (NOCSR)

On October 18, 2010, AQD received NESHAP / MACT 7B Notice of Compliance Status Report (NOCSR) dated September 13, 2010 (due within 180 days of compliance date – within 180 days of December 30, 2010) for five scrubbers for five scrubbers:

1. Main Mezz North
2. Main Mezz South
3. Electroless Nickel
4. Chrome
5. Dry Mix

The stack tests were conducted for particulate matter, which is a surrogate for target HAP, e.g. Cr, Pb, Mg, Ni. The MACT requires 95 percent reduction or maximum 0.03 grains of particulate matter per dscf of exhaust to atmosphere. MacDermid has chosen to comply with 0.03 grains of PM / dscf emission rate standard. As an **Existing Source** (40 CFR, Part 63, §62, commenced construction before August 5, 2009), MacDermid is required to comply by Dec 30, 2010. The emission standard is based upon GACT Technology. The stack tests should have been conducted in the past five (5) years (40 CFR, Part 63, §63.11582).

July 14, 2008, Incident

Portable diaphragm pumps are used to pump raw materials into the batch tanks. One of 810 pumps exploded (Polyol). As soon as employees heard the explosion noise, an evacuation alarm was sounded. ADT Security Company called Ferndale Fire Department (Ferndale FD). Hazmat teams of five Fire Departments (Ferndale, Pontiac, Birmingham, Southfield, etc.) showed up. 2.2 gallons of Polyol was spilled. Polyol, which is practically incombustible, was sprayed due to explosion.

The incident started at 9:40 a.m. Employees returned to the building by 2:30 p.m. By 5:30 p.m. all Polyol was cleaned up.

CY 2006 Noise Nuisance

Both City of Ferndale Police Department (FPD) and MacDermid conducted noise study in the area. FPD's Sergeant Simon determined that the noise levels were in compliance with the Ferndale Noise Ordinance. Permissible sound levels for industrial operations at the property line are 75 decibels (dB) using the A-weighted network and 90 decibels (dB) using the C-weighted network. Please see the noise study map and the June 28, 2006, letter to FPD Chief.

Ammonia (NH₃ as NH₄OH) odor complaint (C-20-04212-2020-08-24 on Farrow Ave.)

MacDermid get ammonia in 55-gallon drums as NH₄OH in water. MacDermid pumps NH₄OH into to a tank with other materials. EN scrubber handles emissions if any. Scrubbing liquid in electroless nickel (Ni) (EN) scrubber is sulfuric acid (H₂SO₄) solution in water (pH = 2-2.5). This process may be responsible for NH₃ if not controlled properly.

The complainants of AirGas were confused regarding a nature of odor (complainant indicated that a very strong sulfur or ammonia like odor had been originating from the MacDermid). Yes, AirGas fills propane (a mal-odorant methyl mercaptan is added to propane for safety purposes) tanks.

In addition, about August 24, 2020, timeframe, regarding Sulfur odor, Mr. Budziak of MacDermid stated, "At the plant we do use a sulfur compound in our wastewater treatment process to eliminate metals in the water. This process can cause a rotten egg/sulfur odor if the pH is too low in the tank when the material is added. In the time frame of 8/10/20 – 8/24/20 we had two tanks that were treated in this way, in both cases the pH of the tank was above 8.2 which should be high enough to eliminate any odors."

Sulfuric acid

Sulfuric acid exists gas stream as aerosol droplets because the acid has very low vapor pressure and its partial pressure is very low for 10 percent aqueous solution (0.353×10^{-13}

bar at 100 degrees Celsius). See Perry's Chemical Engineers Handbook (pages 3-68 thru 3-69). Hence, sulfuric acid practically does not exist in vapor phase in the gas stream.

Conclusion

MacDermid is subject to Area NESHAP / MACT 7B but AQD did not perform complete evaluation of compliance due to lack of funding / delegation. However, MacDermid is in compliance with the permits.

NAME

J. S. Marshall

DATE

08-09-2024

SUPERVISOR

Joyce