DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION
ACTIVITY REPORT: Scheduled Inspection

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| FACILITY: Surface Activation Technologies, Inc. | | SRN / ID: N5637 |
| LOCATION: 1837 THUNDERBIRD., TROY | | DISTRICT: Southeast Michigan |
| CITY: TROY | | COUNTY: OAKLAND |
| CONTACT: Brad Radke , Process Engineer | | ACTIVITY DATE: 02/27/2018 |
| STAFF: Adam Bognar | COMPLIANCE STATUS: Compliance | SOURCE CLASS: MINOR |
| SUBJECT: Scheduled Inspection | | |
| RESOLVED COMPLAINTS: | | |

**On Tuesday, February 27th, 2018, Michigan Department of Environmental Quality Air Quality Division (MDEQ-AQD) staff, I, Adam Bognar, Joseph Forth, and Lauren Magirl conducted a targeted inspection of Surface Activation Technologies (SAT or "the facility") located at 1837 Thunderbird Street, Troy, Michigan. The purpose of the inspection was to determine the facility's compliance with the requirements of the federal Clean Air Act; Part 55, Air Pollution Control, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (Act 451); Michigan Department of Environmental Quality-Air Quality Division (MDEQ-AQD) Administrative Rules; National Emission Standards for Chromium Emissions from Decorative Chromium Electroplating Tanks (Chrome NESHAP); and PTI No. 65-14A.**

**We arrived at the facility at around 9:30 am. We were greeted by Ms. Anastasia Plonkey, Quality Manager. Anastasia showed us to the meeting room where we met with Mr. Brad Radke, Plant Manager. Both Anastasia and Brad joined AQD staff for the pre-inspection meeting. We identified ourselves, provided identification, and stated the purpose of the inspection.**

**During the pre-inspection meeting we discussed PTI No. 65-14A, Chrome NESHAP requirements, and current operations of the facility. Ms. Plonkey provided me with records to review at this time. Mr. Radke stated that there have not been any equipment changes at the facility since the previous MDEQ-AQD inspection in 2016. The facility has eleven employees and operates Monday through Friday from 7 am to 6:30 pm, with occasional Saturdays.**

**SAT performs copper, nickel, and chrome plating on plastic substrates. No metal parts are plated. Plastic substrates include but are not limited to acrylonitrile butadiene styrene (ABS), polyether ether ketone (PEEK), polyvinyl chloride (PVC), polyphenylene sulfide (PPS), and nylon. A variety of industries are served including military, medical, and automotive. SAT originally operated as a research and development facility from 2004 to 2014. In 2014 SAT began manufacturing products. After the pre-inspection meeting, Mr. Radke gave us a tour of the facility and explained the various processes.**

**The plating process starts with their surface activation technique. Since plastic parts are electrically non-conductive, they must have their surface "activated" before metal can be electroplated on the surface. To achieve this activation, parts first enter a sealed chamber where they are treated with sulfur. Sulfur is provided to the chamber from a sulfur dioxide tank. The sulfur dioxide ($SO_2$) is pumped from the tank into a packed bed column filled with a vanadium oxide catalyst. The vanadium oxide catalyst donates oxygen to $SO_2$ to create $SO_3$ according to the ratio: 2 $SO_2$ (g) + $O_2$ (g) ---> 2 $SO_3$ (g). The catalyst regenerates the oxygen that it donates when in the presence of oxygen.**

**The newly created sulfur trioxide ($SO_3$) is piped into a sealed chamber where it contacts the plastic parts. This creates the desired surface characteristics of the part. When surface treatment is complete, water is pumped into the chamber to convert the excess sulfur trioxide ($SO_3$) to sulfuric acid ($H_2SO_4$) according to the ratio $SO_3 + H_2O$ ---> $H_2SO_4$. The sulfuric acid produced is pumped to the on-site waste water treatment system. This is a closed loop process. Nothing is exhausted during any part of this process. Once the sulfuric acid is completely washed out of the reaction chamber, the chamber is**

opened and parts are removed. Exemption Rule 291 (2)(f) states, in part, that the facility must provide documentation and/or calculations identifying the quality, nature, and quantity of air contaminants emitted from the exempt process and indicating that $SO_2$ emissions are below 10 tons per year. Mr. Radke estimated his annual sulfur dioxide usage for this process to be around 1200 pounds. The total usage is estimated to be less than 10 tons per year and little to none of what is used is expected to be emitted due to the close loop nature of the process. Emissions appear to be very small. This process appears to be exempt from the Rule 201 requirement to obtain a permit to install pursuant to Rule 291 (2)(f). The sulfur dioxide storage tank appears to be exempt from Rule 201 requirements pursuant to Rule 284 (2)(j). A process flow box diagram is attached to this report (Attachment 1).

After the surface activation chamber, plastic parts are dipped into a caustic palladium tank to complete surface activation. Next the parts are subjected to the various plating, stripping, cleaning, and rinsing processes.

PTI No. 65-14A: FGPBS

This flexible group consists of two process lines. Both lines are a series of process tanks consisting of acid tanks, plating tanks, cleaning tanks, and rinse tanks. Line 1 has twenty tanks and line 2 has sixteen tanks. All non-rinse tanks are vented to a common packed bed scrubber system with a mist eliminator. Rinse tanks are vented to the general in-plant environment. Mr. Radke allowed us to walk along both lines and explained the purpose of each tank. While standing directly next to the process tanks, I did not notice any odors or misting from the processes. The push-pull emission capture system appears to be working well.

Section I – Special Conditions 1,2,3: Sets emission limits for formaldehyde, methanol, and nickel to 0.045 pounds per hour (pph), 2.5 pph, and 0.00010 pph, respectively. These emissions are controlled by a packed bed scrubber with mist eliminator. Based on what I observed and the records I reviewed, the emission control equipment is operating correctly and should achieve these emission limits.

The formaldehyde and methanol emissions were estimated for a similar process tank at Lacks Enterprises, Inc – PTI No. 23-12A. At Lacks Enterprises the emission rates were 1.0 pound per hour for formaldehyde and 9.0 pounds per hour for methanol. These emission rates were scaled down to the volume of SAT's electroless copper tank (7,600 gallons --> 31 Gallons). Since the processes at both facilities are substantially the same, this appears to be a valid method of determining emissions. This scaling would put SAT's emissions at 0.0045 pounds per hour of formaldehyde and 0.037 pounds per hour of methanol. These emissions are below permit requirements.

Nickel emissions were determined using EPA established emission factors. For electroless nickel the emission factor used is 0.314 mg/dscm, for electrolytic nickel the emission factor used is 0.08mg/dscm. The total estimated nickel emissions based on these emission factors is 0.000076 pph, which is below permit limits. The calculations assume a scrubber removal efficiency of 90%.

Section III – Special Condition 1: States that SAT shall not operate any tank in FGPBS unless a malfunction abatement plan (MAP) is submitted, implemented, and maintained. A MAP for FGPBS was submitted on June 19, 2014. The MAP is on file at the facility and in the AQD file. The contents of the MAP meet permit requirements. Mr. Radke stated that there have not been any changes to equipment since the MAP was implemented in 2014.

Section IV – Special Condition 1: States that SAT shall not operate any tank in FGPBS unless the packed bed scrubber with mist eliminator is installed, maintained, and operated in a satisfactory manner. The packed bed scrubber appears to be operating correctly. I observed that emissions from the process tanks were being captured and sent to the scrubber unit. Records show that the differential pressure and make-up water flow rate are consistent with proper scrubber operation. Mr. Radke stated that the polypropylene packing is in good shape and has not been changed since the 2014 installation of the scrubber.

Section IV – Special Condition 2: States that the packed bed scrubber with mist eliminator system must be equipped with a differential pressure monitoring device. I observed that a pressure gauge was installed. The reading was approximately 1.6" water column during the inspection. This reading is consistent with proper scrubber operation. Additionally, a rotameter is present that measures the flow

rate of make-up water to the scrubber water. During the inspection the rotameter indicated a flow rate of approximately 0.7 gallons per minute. Records of scrubber water flow rate are kept along with the scrubber pressure drop records (Attachment 2).

Section VI – Special Conditions 1+2: Requires that SAT perform inspections of the packed bed scrubber systems. These inspections include daily pressure drop readings and quarterly inspections that ensure the integrity of the scrubber, mist eliminator, and ductwork. Records must be kept that document these inspections. SAT performs these inspections in accordance with permit requirements. Records were made available to me during the pre-inspection meeting. Recordkeeping for FGPBS appears to be satisfactory. I collected copies of quarterly inspections from 2017 (Attachment 3), and daily pressure drop readings from January 2018 and February 2018 (Attachment 2).

Section VII – Special Condition 1: Specifies stack dimension requirements. AQD staff did not perform a rooftop inspection to verify stack dimensions. The stack appeared to be discharged unobstructed vertically upwards to the ambient air.

Section IX – Special Condition 1: States that the permittee shall comply National Emission Standards for Plating and Polishing operations, Subpart WWWWWW (6W). MDEQ-AQD does not have delegation of this standard, so no attempt was made to verify compliance.

PTI No. 65-14A: FGCMP

This flexible group consists of two decorative chromium electroplating tanks and a chromium etch tank. All three of these tanks are vented to a three-stage composite mesh pad scrubber with a HEPA filter. In addition to this control, all three tanks utilize a fume suppressant to maintain the surface tension below 40 dynes/cm$^2$. The two decorative chromium electroplating tanks utilize a trivalent chromium ($Cr^{+3}$) solution. Only one of the decorative chromium tanks is currently being used for production – the black chrome tank. The chromium etch tank utilizes a hexavalent chromium ($Cr^{+6}$)/sulfuric acid solution to etch plastic parts before plating.

Section I – Special Conditions 1,2,3: This condition limits total chromium emissions from the three chromium process tanks. These emissions are controlled by both a three-stage composite mesh pad scrubber and a chemical fume suppressant. According to the chrome NESHAP, it does not appear to be necessary for SAT to perform a stack test to verify emissions so long as the facility adds a chemical fume suppressant to the chromium electroplating tanks in sufficient amounts to maintain surface tension below 40 dynes/cm$^2$. Based on what I observed and the records I reviewed, the emission control equipment is operating correctly and should achieve these emission limits.

Section III – Special Condition 1: Requires that SAT submit an approvable operation and maintenance plan to the AQD that addresses the two decorative chrome tanks (EUCHROME1 & EUCHROME2). A plan was submitted to the AQD on June 19, 2014 and was found to be approvable. The plan includes all information required by the permit. This plan is kept in AQD files and maintained at the facility. Mr. Radke stated that there have not been any changes to equipment since the plan was implemented in 2014.

Section III – Special Condition 2: Requires that SAT submit an approvable malfunction abatement plan (MAP) for the three-stage composite mesh pad scrubber system with HEPA filter that includes all information outlined in the permit. The MAP was submitted on June 19, 2014 as a joint document along with the operation and maintenance plan for the decorative chrome tanks. The MAP that was submitted appears to contain all information required by the permit.

Section III – Special Condition 3: States that SAT shall not operate the decorative chrome plating tanks in FGCMP unless a chemical fume suppressant containing a wetting agent is applied to maintain surface tension below 40 dynes/cm$^2$, measured with a stalagmometer. Surface tension measurements are taken on-site with a stalagmometer. The records I reviewed indicate that surface tension of the chrome tanks is being kept below the 40 dynes/cm$^2$ limit. (Attachment 4)

Section IV – Special Conditions 1, 2: States that SAT shall not operate any tank in FGCMP unless the three-stage composite mesh pad system with HEPA filter is installed, maintained, operated in a satisfactory manner, and equipped with a differential pressure monitoring device. I observed that

emissions from the three chromium process tanks were vented to this control device. The control device appeared to be in good working order. Mr. Radke stated that the mesh pads and HEPA filter are in good shape and have not been changed since the 2014 installation of the CMP system. A differential pressure gauge was present that indicated a pressure of 0.4 PSIG during the inspection. The records I reviewed indicate that the control equipment is being operated correctly. Regular washdowns of the mesh pads are performed at a rate depending on production. Based on the records I reviewed it appears five-gallon washdowns occur approximately every 2-7 days (Attachment 7).

Section VI – Special Conditions 1, 5: Requires that SAT monitor surface tension of each decorative chrome tank in FGCMP once every 40 hours of tank operation. The records I reviewed indicate that SAT monitors surface tension at a frequency that complies with this requirement. Since they did not appear to have any exceedances, SAT is not required to increase monitoring frequency. Included with the surface tension records are records indicating the quantity of chemical fume suppressant added along with the date and time of those additions. (Attachment 4)

The fume suppressant used is called Macuplex STR NPFX, manufactured by MacDermid Enthone. Macuplex STR NPFX does not contain PFOS or PFOA. This product has been used since 2015. Prior to 2015, a PFOS based fume suppressant was used for one year. The PFOS based fume suppressant that was used between 2014 and 2015 was Macuplex STR NPF, manufacturned by MacDermid Enthone. MacDermid Enthone reformulated this product (NPF --->NPFX) after the change in the chrome NESHAP that began regulation of PFOS based fume suppressants. Mr. Radke stated the facility has replaced all of the chrome tanks that once contained the PFOS based fume suppressant because the PFOS residue would likely remain in the tank for a long time.

Ms. Plonkey provided me with safety data sheets for both the new product (Macuplex STR NPFX) and the old product (Macuplex STR NPF) (Attachments 5 and 6).

SAT also makes daily surface tension checks/adjustments of certain non-chrome tanks such as the Acid Copper Strike tank, Semi-Bright Ni tank, and Satin Nickel tank. Mr. Radke stated that the fume suppressant in these non-chrome tanks does not contain PFOS or PFOA.

Section VI – Special Condition 3: Requires that SAT monitor emissions and operating and maintenance information in accordance with the chrome NESHAP. SAT appears to be in compliance with the requirements of the chrome NESHAP. The facility maintains an ongoing compliance status report pursuant to the chrome NESHAP (Attachment 9).

Section VI – Special Conditions 2, 4: Requires that SAT determine the pressure drop across the CMP system on a daily basis and perform quarterly inspections that ensure the structural integrity of the CMP system. Based on the records I reviewed SAT performs these inspections. Records of these inspections are kept on file at the facility. I collected copies of quarterly CMP inspection records for 2017 and records of daily CMP pressure drop measurements from January + February, 2018 (Attachment 8).

Section VIII – Special Condition 1: Specifies stack dimension requirements. AQD staff did not perform a rooftop inspection to verify stack dimensions. The stack appeared to be discharged unobstructed vertically upwards to the ambient air.

Section IX – Special Condition 1: States that the permittee shall comply National Emission Standards for Plating and Polishing operations, Subpart WWWWWW (6W). MDEQ-AQD does not have delegation of this standard so no attempt was made to verify compliance.

Sandblasting unit

A small sandblasting unit is present. Mr. Radke stated that it is seldom used. The unit is ventilated to the general in-plant environment. The sandblasting unit appears to be exempt from Rule 201 requirements pursuant to Rule 285 (2)(l)(vi)(B).

Research and Development Plating Line

A small plating line is present research and development purposes. The line contains various plating, stripping, and rinsing tanks. These tanks are much smaller than the tanks used for manufacturing. All

**tanks are ventilated to the general in-plant environment. No chrome tank is present in this line. These tanks appear to be exempt from Rule 201 requirements pursuant to Rule 285 (2)(r).**

**Compliance Determination**

**Surface Activation Technologies appears to comply with the federal Clean Air Act, Part 55, Air Pollution Control of the Natural Resources and Environmental Protection Act, 1994 Public Act 451; Michigan Department of Environmental Quality, Air Quality Division (MDEQ-AQD) rules; Permit to Install No. 65-14A; and the Chrome NESHAP (Subpart N).**

NAME Adam Boyer DATE 03/15/2018 SUPERVISOR SK