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

M329041077

FACILITY: TI-COATING INC		**SRN / ID:** M3290
LOCATION: 50500 CORPORATE DR, UTICA		**DISTRICT:** Southeast Michigan
CITY: UTICA		**COUNTY:** MACOMB
CONTACT: Leo Manoogian , Manufacturing Manager		**ACTIVITY DATE:** 07/20/2017
STAFF: Francis Lim	**COMPLIANCE STATUS:** Compliance	**SOURCE CLASS:** MINOR
SUBJECT:		
RESOLVED COMPLAINTS:		

On July 20, 2017, I conducted an inspection of Ti-Coating, Inc. ("Ti-Coating") located at 50500 Corporate Drive, in Utica. The purpose of this inspection was to determine the facility's compliance with the Federal Clean Air Act Part 55, Air Pollution Control, of the Natural Resources and Environmental Protection Act of 1994, PA 451, as amended, Michigan's Air Pollution Control Rules, and Permit to Install (PTI) No. 431-87A. Leo Manoogian, Manufacturing Supervisor (586-726-1900, l.manoogian@ticoating.com) represented the facility.

Established in 1975, Ti-Coating provides thin film coating technologies services (mostly titanium) and equipment to the metal cleaning and metal forming industries. The thin film coating technology includes two processes: the chemical vapor deposition (CVD) process, and the physical vapor deposition (PVD) process. These processes are used to deposit a variety of coatings to aerospace and other industrial metal parts and tools. Coatings are used for various applications such as wear resistance, corrosion resistance, and erosion protection. This facility also provides Hydrogen Fluoride ion cleaning to remove deeply embedded oxides from super alloys. Ti-Coating operates two shifts per day.

Chemical vapor deposition

Chemical vapor deposition (CVD) is a process that involves depositing solid material from a gaseous phase. In the CVD process, the coating is achieved by a chemical reaction at very high temperatures between the coating compound and the surface of the heated substrate material. Metal parts are placed in a CVD reactor vessel inside an electrically heated furnace.

Gaseous compounds of the coating (titanium tetrachloride, methane, nitrogen) diluted with carrier gases (for example, hydrogen, HCl, argon) are added to the hot reactor vessel. As the gases come into contact with the heated metal parts, the gases react or decompose, forming a solid phase deposited on the metal substrate, producing a titanium carbide/nitride coating to the metal parts. Each CVD cycle ranges from 8-14 hours, depending on the coating.

The facility operates seven CVD furnaces which are permitted under PTI No. 431-87A. Each CVD reactor exhausts to an individual caustic tower scrubber. Four of the CVD reactors' individual scrubbers exhaust to a larger rooftop tower scrubber. The other three individual scrubbers exhaust to another larger rooftop tower scrubber.

The two sets of scrubbers are each serviced by a 150 gallon recirculating scrubber fluid tank. Each of the recirculating tanks is further serviced by another small tower scrubber to control whatever gases end up in the recirculating scrubber fluid tank. Those scrubbers also exhaust to the larger rooftop scrubbers.

The pH off the central scrubber system is automatically monitored and maintained between 8-

10; the system alarms when pH is below 8 or above 10. Neutralizing solution used is KOH.

Scrubber fluid under pressure enters a venturi through a spray nozzle. The venturi creates a draft which pulls out the gas from the reactor vessel. The scrubber liquid chemically mixes with the gas. The gas liquid mixture flows into a separating drum where the liquid is discharged back to the scrubber fluid recirculating tank. The cleansed gases rise to the rooftop tower scrubber containing plastic wet balls, capturing remaining particulate before discharging through the exhaust stack. A spray nozzle in the tower wets the plastic balls with scrubber fluid.

Flow to the scrubbers is monitored by a pressure gage for the scrubber fluid pump. Pressure is maintained between 20 to 30 psig.

Facility follows a very good maintenance plan on the scrubbers. HCl emissions are expected to be negligible after exciting the scrubber controls.

Physical Vapor Deposition

Ti-Coating's physical vapor deposition (PVD) process produces multi-layered, heat resistant coatings used to extend the life of tools. Physical vapor deposition is similar to CVD. Main difference is that in physical vapor deposition, the solid material that is deposited starts in a solid phase, then vaporized and finally deposited in a solid state. PVD processes are carried out under vacuum conditions.

Nitrogen, argon, hydrogen, krypton and methane gases are injected into each machine. The solid coating material, titanium and aluminum are vaporized in the heated reactor vessel, inside a furnace, using a process called "sputtering", which produces a titanium/aluminum/carbide/nitride coating.

The facility operates six PVD furnaces. The facility is installing two more used PVD furnaces. Emissions from the furnaces are emitted through exhaust stacks uncontrolled. Gaseous emissions are negligible and contain no toxic components. This process is exempt pursuant to Rule 290.

Hydrogen Fluoride (HF) Ion Cleaning

Hydrogen fluoride (HF) ion cleaning is a process to remove deeply embedded oxides from superalloys containing significant amounts of aluminum and titanium. At temperatures greater than 1750 °F, Fluorine reacts with the oxides that have formed on the surface and converts them to fluorides, which can then be easily removed. HF ion cleaning is carried out under vacuum conditions.

The facility operates three HF ion cleaning reactors/furnaces. Each HF ion cleaning reactors exhausts to an individual caustic tower scrubber which exhausts to another larger rooftop tower scrubber.

The scrubbers are serviced by a 250 gallon recirculating scrubber fluid tank. The recirculating tank is further serviced by another small tower scrubber to control whatever gases end up in the recirculating scrubber fluid tank. This scrubber also exhaust to the larger rooftop scrubber.

The pH of the central scrubber system is automatically monitored and maintained between 8-10; the system alarms when pH is below 8 or above 10. Neutralizing solution used is KOH.

Flow to the scrubbers is monitored by a pressure gage for the scrubber fluid pump. Pressure is maintained between 20 to 30 psig.

Facility follows a very good maintenance plan on the scrubbers. HF is a highly toxic gas.

On September 26, 2016, Mr. Manoogian provided the AQD with potential to emit calculations for the HF ion cleaning process. The calculations provided indicate the worst case scenario emissions, which assume proper operation of both sets of scrubbers, are 0.00073 lbs. of HF per month. Based on this information, the HF ion cleaning process is exempt pursuant to Rule 290.

This facility operates a vacuum heat treat furnace near the HF ion cleaning area. Since no oil quenching is done, the vacuum heat treat furnaces are exempt pursuant to Rule 282(2)(a).

Prep Area

The metal parts are washed in wash tanks before undergoing the vapor deposition process. Soap based cleaners and acid rinses are used. One of the immersion tanks is a heated vibration tank. A dryer is used to remove moisture from the parts. The cleaning lines are exempt from obtaining a PTI pursuant to Rule 285(2)(r)(i).

The prep area also has an enclosed sandblasting room which is exhausted to an indoor baghouse/cyclone. This equipment is exempt Rule 285(2)(l)(vi).

Manufacturing Department

Ti-Coating is also a manufacturer of vapor deposition equipment and HF ion cleaning equipment. Ti-Coating has a welding area (TIG, MIG welding), machining equipment (lathes, boring mills), and portable plasma cutters. A small amount of an environmental friendly coolant called Cool Mist is used. The processes are exempt pursuant to Rule 285(2)(i) and Rule 285(2)(l).

Gas Storage

Ti-Coating stores gas cylinders inside the building. Bulk tanks of Hydrogen (1500 gallons), Argon (500 gallons), and Nitrogen (1500 gallons) are located outside. Tanks are exempt pursuant to Rule 284(2)(j).

During my inspection I did not observe any visible emissions from the CVD, PVD and HF ion cleaning process. PTI No. 431-87A established a CVD process particulate limit of 0.08 pounds per hour and 0.33 tons per year; and a HCl limit of 0.40 pounds per hour and 1.71 tons per year. Based on the permit engineer's assessment, these worst case limits for the CVD process can be met with scrubbers operating at 94% control efficiency. The double scrubbers in series are expected to operate at 99% efficiency. I also observed that the scrubbers are operated and maintained properly. See attached daily, bi-weekly and weekly checklist for the scrubbers.

NAME Iram A. J. DATE 08-15-17 SUPERVISOR Joyce K