DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION
ACTIVITY REPORT: Self Initiated Inspection

B650124251

FACILITY: SPECIALTY STEEL TREATING Inc.		**SRN / ID:** B6501
LOCATION: 34501 Commerce Road, FRASER		**DISTRICT:** Southeast Michigan
CITY: FRASER		**COUNTY:** MACOMB
CONTACT: Rick Carroll , Quality Control Manager		**ACTIVITY DATE:** 01/16/2014
STAFF: Francis Lim	**COMPLIANCE STATUS:** Compliance	**SOURCE CLASS:** MINOR
SUBJECT: Self initiated inspection/complaint investigation		
RESOLVED COMPLAINTS:		

On January 16, 2014, Sam Liveson and I conducted a compliance inspection at Specialty Steel Treating Inc ('SST") located at 34501 Commerce Road, Fraser, Michigan. The purpose of the inspection was to determine compliance with the Federal Clean Air Act; Article II, Part 55, Air Pollution Control of Natural Resources and Environmental Protection Act, 1994 Public Act 451; Michigan Department of Environmental Quality, Air Quality Division (MDEQ-AQD) Administrative Rules; Permit-to-Install (PTI) Nos. 226-01 and 316-01; and to investigate a recent complaint regarding a strong ammonia smell. Mr. Rick Carroll, Quality Manager assisted during the inspection.

SST is a heat treating facility. 98% of their business is aerospace (military, commercial aircraft, space shuttle), and 2% commercial (Automotive & Truck, Industrial Bearing, Heavy Equipment and Tool & Die). SST is the only approved commercial heat treat company in the country to heat treat certain flight critical and flight safety configurations for prime aerospace and helicopter companies.

The heat treating process alters the alloy distribution and transforms the soft alloy into a hard alloy capable of withstanding the pressure, abrasion and impacts inherent in metal forming. This slow heating process at elevated temperatures (1200-1800 F) transforms the alloy into austenite, therefore calling this process austenitizing (or hardening). This temperature is below the critical temperature where the alloy turns into a molten metal. The alloy must be cooled fast enough to fully harden into martensite, which will provide the material's strength. This fast cooling is called quenching. Martensite, is extremely brittle. If the alloy is put into service (machined) in this condition, most alloy steels would shatter. To prevent this, a process called tempering is conducted after the hardening process. As soon as the alloy steel has been quenched to hand-warm (about 125/150°F), it should be immediately tempered. The tempering process involves reheating the alloy to about (800-1200 F) in a tempering (sometimes called "draw") furnace. At SST, some of the alloys go to a freezer (after hardening/tempering) to remove any retained austenite.

PTI No. 226-01

This permit is for 7 natural gas-fired integral heat treat quench furnaces, identified as IQF Nos. 36 to 42. In the hardening furnace, the metal parts are moved and heated in the different heating zones and then quenched in the quench oil tank. Quench means rapidly cooling. The quench oil tank is integral to the hardening furnace but is in a separate, closed compartment. After completion of the heating cycle, the door to the quench oil compartment is opened, and the metal parts are moved inside the compartment. The parts are dipped (by an elevator) into the bottom pit quench oil tank. The parts are then raised, the door of the compartment is opened, and the parts are moved out of the hardening furnace. There is a hood connected to an exhaust stack just outside the quench oil compartment hardening furnace to allow any

fumes (if any) to be vented out. The parts stay under the hood for a few seconds before being moved to the hot water washer and then to the tempering furnace. There are seven tempering furnaces; the parts can go to any tempering furnace, depending on the operating conditions needed. The alloy steel is then allowed to cool to room temperature. Parts are manually transferred from the hardening furnace to the wash tank and subsequently to the tempering furnace.

Quench oil emissions are assumed to be emitted as particulates. There is a monthly limit of 1,050 gallons per month, 53 pounds PM/day, and 9.5 tons PM/year. For 2013, highest monthly oil usage is 941 for October; highest monthly PM emissions are 443 pounds for October. Highest average daily PM emissions occurred in October with 14 pounds/day. Total PM emissions for 2013 are 1.7 tons. Oil usage and PM emissions are below limits. Please refer to attached report. Note that the facility subtracts the reclaimed oil from the total amount used. Facility keeps a daily logsheet of quench oil usage which is used as a basis for their monthly reports.

The two hot water parts washers are equipped with a heater to maintain water temperature at 110 °F. A rust preventative additive, Rust Veto is added to the wash water. In addition, a bacteriacide is added to prevent bacteria count buildup which prevents the wash water from emitting a moldy odor.

PTI No. 316-01

This permit is for the 8,000 gallon anhydrous ammonia storage tank. The ammonia is used for gas nitriding in the heat treating process. Nitriding is a surface-hardening heat treatment that introduces nitrogen into the surface of steel at a temperature range (500 to 550°C or 930 to 1020°F), while it is in the ferrite condition. Thus, nitriding is similar to carburizing in that surface composition is altered, but different in that nitrogen is added into ferrite instead of austenite. The alloy is first hardened and/or tempered before nitriding.

Nitrogen used in nitriding is produced by the dissociation of gaseous ammonia. The ammonia is first passed through an ammonia dissociator before it goes to the heat treating retort furnace.

Process begins with the metal parts charged into the retort furnace. Acetylene is added to the furnace to supply and maintain the carbon content of the alloy steel. The furnace temperature is ramped up to approximately 975 °Fwhile 20% dissociated ammonia (80% ammonia, 20% dissociated ammonia, also referred to as "raw ammonia") is charged to the furnace for about 3 hours. The next cycle is the addition of 20-24% dissociated ammonia for another 8 hours. The final cycle is the addition of 80-84% dissociated ammonia for approximately 30 hours. Note that cycle time may vary depending on the product that is being heat treated. Some parts are heat treated for almost a week. Ammonia concentration is measured through a bubbler. Every hour, a gas sample from the retort furnace is passed through the bubbler to determine the ammonia concentration.

Nitriding of certain alloys may require an addition of hydrogen to the nitriding atmosphere, which in some cases improves the control of nitriding potential. However, additions of pure hydrogen are not practical. Instead, the hydrogen is supplied as a gas mixture composed of 75% molecular hydrogen and 25% molecular nitrogen. Such a mixture is produced through dissociation of ammonia using the ammonia dissociator.

According to Rob, maintenance supervisor, the ammonia tank is inspected and maintained by their ammonia supplier. Check valves, relief valves, positive shut-off valves are inspected for operability. The facility has discontinued conducting the in-house Inspection and Maintenance checklist. However, the facility conducts other maintenance activities that include painting the tank and visual inspection of pipes and valves. Facility was requested to continue the monthly inspection and maintenance activity even though the supplier is already conducting maintenance and inspection since the monthly activity is a permit requirement.

The Emergency Response plan is contained in the Risk Management Program. Facility also has a Pollution Incident Prevention Plan that contains a section regarding the anhydrous ammonia storage tank. A remotely operated internal positive shut off valve is installed by the north wall. The Fire Marshall regularly conducts training to SST personnel to prepare them in case of an ammonia leak. Rick mentioned that the Fire Marshall is scheduled to conduct a training later that day. A copy of Part 78, Storage and Handling of Anhydrous Ammonia (MIOSHA 1910.111) also known as Rule 7801 should be kept on-site. It could not be located and therefore was not presented to us during the inspection. AQD has a copy and is attached to the permit.

There are 11 retort furnaces used for nitriding. The retort furnaces are exempt from permits under Rule 282(a)(i). Heat treating furnaces are exempt if the furnaces do not involve molten materials, oil coated parts and oil quenching.

For MAERS 2012, facility reported 1569 pounds of ammonia used.

Halogenated Vapor Degreaser

Facility operates a perchloroethylene batch vapor degreaser subject to the degreaser NESHAP. Facility chose to comply with the NESHAP using Control Combination Option No. 6, which requires freeboard ratio of at least 1, and installation of a freeboard refrigeration device. During the previous inspection, I verified that the freeboard ratio is at least 1 and the freeboard refrigeration device is installed. The temperature of the vapor zone is about 60 °F. For perchloroethylene, maximum allowed temperature is 75 °F. The cover of the degreaser was in place. Facility submits a semi-annual exceedance report as required by the NESHAP. It is used primarily to clean up the parts that go to the retort furnace prior to gas nitriding.

For MAERS 2012, facility reported 642 gallons of perchloroethylene usage.

Other Equipment

Facility also operates three vacuum heat treating furnaces. Vacuum heat treating is used to produce high quality, precision alloy steel parts. Vacuum furnaces are exempt under Rule 282 (a)(i).

Facility also operates a rotary furnace which contains a turntable inside the furnace. Parts from the rotary furnace are oil quenched in tanks called Gleason presses. There are three Gleason presses. The rotary furnace with oil quenching is exempt under Rule 290. For 2013, highest monthly PM emissions from the Gleasons are 11 pounds (March, May, June, August, September, October). Oil usage and particulate emissions are included in the emission and usage report for the integral quench furnace covered by PTI No. 226-01.

Facility used to operate a natural gas-fired pusher furnace at the site. This pusher furnace has been moved to their facility in Farmington Hills.

A vapor combustor that controls ammonia emissions from the retort furnaces was installed in 2010 to resolve a then ongoing complaint about ammonia odors. At the end of the nitriding cycle, the retort furnaces are purged with nitrogen to remove the residual ammonia. Exhaust from the 3-hour purge cycle is released to a pipe which goes to the vapor combustor. During the plant inspection, we noticed that the combustor tripped. Several attempts by Rob to reignite the combustor failed. Facility claims that the vapor combustor was operating before the trip.

Complaint Investigation

On January 13, 2014, AQD received a complaint about a strong ammonia odor from the facility. The complaint was forwarded by the US EPA.

Rick mentioned that last week, there was a leak in one of the retort furnaces resulting from a frozen plastic pipe. This might have caused the odor. NOTE: The leak was not from the ammonia storage tank.

We conducted an odor observation on Klein Street (west of the facility) and also downwind of the facility on Commerce Road. Wind was blowing towards the east. We did not verify any strong ammonia odor. There was a slight ammonia odor inside the facility and inside the vapor combustor shelter.

I will conduct a followup inspection to verify if the vapor combustor is operating properly.

NAME J. A. J. DATE 02-7-14 SUPERVISOR CJE