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

B592930832

FACILITY: COMMERCIAL STEEL TREATING CORPORATION		**SRN / ID:** B5929
LOCATION: 31440 STEPHENSON HWY., MADISON HTS		**DISTRICT:** Southeast Michigan
CITY: MADISON HTS		**COUNTY:** OAKLAND
CONTACT: Ajay Jain , Environmental Manager		**ACTIVITY DATE:** 08/06/2015
STAFF: Francis Lim	**COMPLIANCE STATUS:** Compliance	**SOURCE CLASS:** SM 208A
SUBJECT:		
RESOLVED COMPLAINTS:		

On August 6, 2015, I conducted an inspection at Commercial Steel Treating Corporation, located at 31440 Stephenson Highway, Madison Heights. During the inspection, staff was assisted by Ajay Jain, Environmental Manager.

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; and the conditions of Permit-To-Install (PTI) Nos. 487-97, 488-97, 489-97, 167-99, 69-01, and 306-02B.

This facility was a Rule 208a opt out facility. Since Rule 208a has been rescinded, the facility will be applying for an Opt-Out permit.

Commercial Steel heat treats customer supplied steel parts (primarily automotive, some aerospace) using a variety of metallurgical processes, which includes:

1) Gas nitriding
2) Carburizing
3) Case hardening
4) Tempering

The major products at the facility are heat treated fasteners and other small automotive steel components. The products are made up of primarily heat treated carbon and alloy steel.

The purpose of heat treating is to change the structure of the steel to make it harder, tougher, and workable. The process alters the material properties of the steel parts by changing the internal lattice structure of the steel through heating. Hardening furnaces are also called austenitizing furnaces (turning the steel into the austenite phase). Austenitizing is the process of heating up the metal and rapidly cooling it down by oil, water, or air quenching. The purpose of austenitizing is to harden the metal. However, this causes the metal to be brittle, so it is necessary to temper the metal. Tempering involves heating up the metal and slowly cooling it. The purpose of tempering is to soften, toughen and reduce the brittleness of the metal. In general, at this facility hardening temperature is 1500-1700 °F and tempering is 400-1100 °F.

After heat treating in the hardening furnace, the metal is immersed in the oil quench tank, located internally at the front end of the furnace. The oil quench tank is located below grade. The oil flash off is flared as it exits through an exhaust stack. The metal parts are then either

transferred by carts on rails (batch furnaces) or continuously transferred by conveyor (atmospheric continuous furnaces) to a steam wash tank (immersion or spray) to remove residual oil. Parts washers, generally heated between 150-160 °F do not use any VOC containing solution. A limited amount of alkaline washing solution is used. Wash tanks are cleaned every six months. Some parts are delivered coated with oil, therefore oil is removed by prewashing before entering the hardening furnace.

After washing, the parts are tempered in the tempering furnaces (also called draw furnaces). After exiting the tempering furnaces, the parts are sometimes dipped in an oil/water emulsion to provide a rust protective coating.

For batch operations, the parts are removed from the hardening furnaces and transferred by rail carts to the wash station and then transferred to the tempering furnaces. When the hardening furnace doors are opened, heavy smoke and oily odor may be observed. The smoke and furnace atmospheric gasses are emitted through a hood and flared before it exits through the stack.

The process of nitriding/carburizing is called case hardening – this gives an extremely hard wear resistance case. For case hardening, the carbon and nitrogen content of the steel at the surface is altered. Carburizing/nitriding increases surface hardness of the metal -higher carbon content, harder the steel. Nitrogen assists in the hardening of the steel. Parts are hardened first before nitriding/carburizing.

Reducing atmosphere (very low oxygen) gas is passed through the hardening furnace. To increase the carbon content, natural gas (methane) is added to the furnace. To decrease the carbon content, air is added to the furnace. The furnace atmosphere gas is flared upon exiting the hardening furnace. This also serves as an air seal to prevent any air in leakage, preventing an explosive hazard. The furnaces are kept at positive pressure – air leaks out, not into the furnace. The atmospheric gas (also called endothermic gas) used inside the furnaces is produced by the endothermic generators. Tempering furnaces do not use atmospheric gas.

Anhydrous ammonia is used to supply nitrogen to three retort furnaces for nitriding. Retort furnaces are sealed vessels. For nitriding, both ammonia and atmospheric gas is introduced to the furnace; when carburizing is done, only atmospheric gas is introduced. The nitrogen in the atmospheric gas is not used for nitriding. The nitrogen from the atmospheric gas is only used as "filler gas". Only nitrogen from ammonia is used for hardening.

The permitted processes for this facility are mostly furnaces which have particulate limits, except for AC 737 which has a VOC limit. Quench oil is assumed to evaporate as particulate (or VOC). Quench oil addition is determined using flowmeters. An operator records each oil addition in a log sheet. I conducted random reviews of log sheets. I verified quench oil log sheets are maintained near the hardening furnaces. The facility estimates amount of oil emitted by using an emission factor that they developed based on historical amount of oil recovered and recycled. Emission factor is unique for each furnace. Quench oil that accumulates in the wash tank is recovered by skimmers and sent to the waste oil storage tank. The oil from the skimmer is collected in a separate tank. Wolverine collects the oil and recycles it to be reused at the plant. Usher Oil collects the oily water.

Facility submits MAERS annually and presents a summary of emissions from each emission unit. Natural gas usage is obtained from gas meters. For furnaces that do not have gas meters, natural gas is estimated from furnace capacity and hours of operation.

Permit 487-97

This permit is for 3 atmospheric batch steel hardening furnaces (AB620, AB622, and AB623). AB means atmospheric batch. These furnaces are normally used for case hardening – the carbon and nitrogen content of the steel is altered. Occasionally, the hardening furnaces are used for normalizing and annealing. Annealing is a heat treating process to induce ductility, soften material, and relieve internal stresses on the metal. Normalizing produces a more uniform carbon distribution – metal is not as soft compared to an annealed metal. After washing, tempering is done at the following tempering furnaces: AB621, AB624 and AB625. After tempering, the parts are sometimes dipped in an oil/water emulsion. These tempering furnaces are exempt. Facility complies with PM hourly limit of 0.80 lbs/hr. Annual emissions limit for all three hardening furnace is 3.5 tons/yr based on a rolling 12-month period. At the end of July 2015, emissions are 0.1 tons/yr. See attached records.

Permit 488-97

This permit is for one atmospheric continuous steel heat treating process, line AC727. AC means atmospheric continuous.

Since this is a continuous line, the parts are fed into the hardening furnace automatically by conveyor belt; dropped off by elevator to a below grade oil quench tank (8-10 feet below); conveyed through a heated alkaline wash station; conveyed into a tempering furnace; and immersed into a tank containing oil/water emulsion. Flash off from the oil quench tank goes to a flare before exiting through a stack. Facility complies with PM hourly limit of 2.35 lbs/hr – highest hourly emissions is 1.6 lbs (March 2015). Facility complies with the annual limit of 10.3 tons/yr, based on a rolling 12-month period – at the end of July 2014, emissions are 3.7 tons/year. See attached records.

Permit 489-97

This is for a 10,000 gallon ammonia storage tank. Anhydrous ammonia is used to maintain the nitrogen and hydrogen content of the atmosphere gases for the gas nitriding and case hardening process furnaces. Facility has an emergency response plan which is reviewed with the fire department annually. Facility implements a weekly and monthly maintenance and inspection program. Attached is a record of weekly inspection conducted July 29, 2015 and monthly inspection conducted July 7, 2015. The remotely operated internal positive shutoff valve is installed. A sign stating emergency phone numbers is installed. Although the tank has a 10,000 gallon capacity, the facility stores only a maximum of 2000 gallons in the tank. Condition 21 states that any vapor or liquid line requiring venting after ammonia transfer shall be vented through a water trap of 55 gallons minimum size. Facility does not vent any ammonia line to the atmosphere.

Gas nitriding with ammonia is done in three retort furnaces, 282, 283, and 284. Retort furnace 283 is down due to furnace cracks. Temperature is about 975 °F. A retort is a self-contained sealed (oil sealed) vessel. A gas nitriding cycle usually takes several hours up to several days. Initially, the retort is injected with raw ammonia. Subsequent injection of ammonia is of a lower concentration of ammonia, usually dissociated ammonia. Facility operates an ammonia dissociator for this purpose. Since this is a sealed furnace, gas is vented out through a bubbler before it gets vented out through a stack. Ammonia odor could possibly be

emitted through the stack or through the oil seals during a sudden overpressure condition (burping) of the vessel. Ammonia usage for 2014 is 18,862 pounds.

Permit 167-99

This is for a case hardening furnace and steel tempering continuous line, AC 734. This line has a rotary hardening furnace, below grade oil quench tank, conveyorized alkaline spray wash station, conveyorized tempering furnace, and conveyorized soluble oil tank. Flash off from the oil quench tank goes to a flare before exiting through a stack. Facility complies with PM hourly limit of 1.6 lbs/hr – highest hourly emissions is 0.5 pounds (September 2014). Facility complies with the annual limit of 7.0 tons/yr, based on a rolling 12-month period – at the end of July 2015, emissions are 1.3 tons/year. See attached records.

Permit 69-01

This is for 2 atmospheric batch steel hardening furnaces (AB 618 and AB 619). These furnaces are used to harden customer-supplied medium sized parts. Once hardening is complete, the parts go to the internal oil quench, transferred to a wash station and then transferred to any of three tempering furnaces (AB 621, AB624 and AB 625). Facility complies with PM monthly limit of 0.20 tons/month - highest monthly emissions is 0.07 tons (November 2013). See attached records.

Permit 306-02B

This is for 3 continuous hardening (with integral oil quench) and tempering furnaces (AC 735, AC 736, and AC 737). Flash off from the oil quench tank goes to a flare before exiting through a stack. Facility complies with the monthly PM limit of 1.0 ton/month each for AC 735 and AC 736. Highest monthly emissions for AC 735 is 0.5 tons (January 2015) and for AC 736 is 0.5 tons (September 2014). AC 737 has no monthly limit. Facility complies with the monthly quench oil usage limit of 282 gallons and PM emissions limit of 1.0 ton per month for AC 735 and AC 736. Facility complies with the annual VOC limit of 8.0 tons/year based on a rolling 12 -month period for AC 737. VOC emissions at the end of July 2015 are 3.6 tons per year. Facility complies with the annual quench oil usage limit of 2208 gallons for AC 737. Yearly oil usage at the end of July 2015 is 1011 gallons. See attached records.

The steam parts washer of AC 735 exhausts through a side building vent. The stack is vented sideways.

Grandfathered Equipment

AC 730 and AC 732 are older, atmospheric continuous hardening and tempering lines. AC 731 is inoperable since 2011.

AC729 is an older, atmospheric continuous hardening (cylindrical furnace) and tempering lines, with oil quenching.

AC 728 is an offline tempering furnace only. Although this is labeled AC, it is a conveyor belt fed tempering furnace only.

The older furnaces have flares for the quench oil flash off, but flares are not used.

Company claims these furnaces are grandfathered equipment. Prior to April 17, 1992, "natural gas-fired, liquefied petroleum gas-fired or electrically heated furnaces for heat treating metals, the use of which does not involve molten materials" were exempt under Rule 282. The

grandfathered equipment are natural gas-fired or electrically heated. Oil usage is monitored for MAERS purposes.

Permit 760-83 (Voided)
This is for the salt bath nitriding operation. Salt bath nitriding is a low temperature liquid nitriding salt bath case hardening treatment for mild, stainless and alloy steel, as well as cast iron. Equipment has been dismantled and removed, including the scrubbers.

Permit 382-84 (Voided)
This is for the molten salt quench furnace used in salt bath nitriding. After the metal is immersed in the salt bath nitriding tank, the metal is "cooled" at the molten salt quench furnace. Equipment has been dismantled and removed, including the scrubbers.

Permit 760-83A (Voided)
This is for the molten salt paint stripping process. This equipment is commonly used for stripping of paints applied to fasteners, if the wrong type of coating was applied. Paint is stripped by a combination of heat and chemical reaction. Equipment has been dismantled and removed, including the scrubbers.

In connection with the salt bath nitriding, molten salt quench furnace, and molten salt paint stripping facility used to have a waste water permit from the City of Detroit. This waste water permit has been voided.

NAME _____ DATE 08-27-15 SUPERVISOR CTE