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

B592933589

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:** 02/09/2016
STAFF: Francis Lim	**COMPLIANCE STATUS:** Compliance	**SOURCE CLASS:** SM ~~208A~~ Opt-Out
SUBJECT:		
RESOLVED COMPLAINTS:		

On February 9, 2016, I conducted an inspection at Commercial Steel Treating Corporation, located at 31440 Stephenson Highway, Madison Heights. During the inspection, staff was assisted by Dave Yanochko and Ajay Jain.

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) No. 160-15.

This facility was a Rule 208a opt out facility. Commercial Steel now has an Opt-Out Permit No. 160-15.

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 steel components. The products are made up of primarily heat treated carbon and alloy steel. Commercial Steel operates 24/7.

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 process 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 between 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 which is located below grade. For the batch furnaces, the oil quench tank is located internally at the front end of the furnace. 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. The flare also serves as an air seal to prevent any air in leakage, preventing an explosion hazard. The furnaces are kept at positive pressure – air leaks out, not into the furnace. The atmospheric 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, atmospheric gas and ammonia is introduced to the furnace; when carburizing is done, only atmospheric gas is introduced. The nitrogen from the atmospheric gas and nitrogen from the ammonia dissociation is used for hardening.

The permitted processes for this facility are mostly furnaces. Quench oil is assumed to evaporate as 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 amount of oil recovered and recycled. 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. The waste oil that is recovered is recycled. 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.

Opt-Out Permit 487-97

This Opt-Out Permit was issued on November 20, 2015.

EU-AC727

EU-AC727 is an atmospheric continuous steel hardening furnace with oil quench tank, post washer, and continuous tempering furnace. AC means atmospheric continuous. Furnaces are natural gas-fired.

Since this is a continuous line, the parts are automatically fed into the hardening furnace 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 (optional) 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 VOC hourly limit of 2.35 lbs/hr – highest hourly emissions are 2.01 lbs/hr (March 2015). Facility complies with the VOC annual limit of 10.3 tons/yr, based on a rolling 13 4-week periods. For the period ending December 2015, emissions are 3.7 tons/yr. See attached records.

EU-AC734

EU-AC734 is an atmospheric continuous rotary steel hardening furnace with oil quench tank, post washer, and continuous tempering furnace. Furnaces are natural gas-fired.

The parts are automatically fed into the rotary hardening furnace by conveyor belt; dropped off by elevator to a below grade oil quench tank ; conveyed through a heated alkaline wash station; conveyed into a tempering furnace; and immersed (optional) 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 VOC hourly limit of 1.6 lbs/hr – highest hourly emissions are 0.73 lbs/hr (October 2015). Facility complies with the VOC annual limit of 7.0 tons/yr, based on a rolling 13 4-week periods. For the period ending December 2015, emissions are 1.55 tons/yr. See attached records.

EU-AC737

EU-AC737 is an atmospheric continuous steel hardening furnace with pre-washer, oil quench tank, post washer, and continuous tempering furnace. Furnaces are natural gas-fired.

From the pre-washer, parts are automatically fed into the hardening furnace by conveyor belt; dropped off by elevator to a below grade oil quench tank ; conveyed through a heated alkaline wash station; conveyed into a tempering furnace; and immersed (optional) 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 the VOC annual limit of 12.0 tons/yr, based on a rolling 13 4-week periods. For the period ending December 2015, emissions are 5.2 tons/yr. Facility complies with the quench oil annual usage limit of 3,384 gallons/yr, based on a rolling 13 4-week periods. For the period ending December 2015, quench oil usage is 1438 gallons/yr. See attached records.

Stack parameters were not verified. Facility claims they verified it.

EU-AMMONIA

EU-AMMONIA 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. A copy of "Part 78, Storage and Handling of Anhydrous Ammonia" is kept on site. Facility implements a weekly and monthly maintenance and inspection program. I reviewed the ammonia tank maintenance and inspection records. 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.

The ammonia supplier (Tanner) performs an inspection each delivery. The checklist includes a physical inspection, leak check, lubrication and inspection of the remote shutoff valve. Safety relief valves are recertified every 5 years by their ammonia supplier. The supplier also evaluates the thickness of the storage tank.

Special Condition IV.5 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. A retort is a self-contained sealed (oil sealed) vessel. Although there are three furnaces, they have only two covers, so only two furnaces can be used at any time. Operating temperature in the furnace is about 975 °F. A gas nitriding cycle usually takes several hours up to several days. Initially, the retort is injected with a high ammonia concentration. Subsequent injection of ammonia is at lower concentration. The ammonia is passed through an ammonia dissociator before injection to the furnace. 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. In 2015, facility received 29,500 pounds of anhydrous ammonia and used 28,350 pounds.

FG-AB618/619

FG-AB618/619 is made up of AB618 and AB619, which are natural gas-fired atmospheric batch steel hardening furnaces with oil quench tank. AB means atmospheric batch.

These furnaces are used to harden customer-supplied medium sized parts. After the heating cycle in the batch furnace, parts go to the internal oil quench tank, transferred to a wash station and then transferred to any of three tempering furnaces (AB 621, AB624 and AB 625). Flash- off from the oil quench tank goes to a flare before exiting through a stack. After tempering, the parts are sometimes dipped in an oil/water emulsion. Facility complies with the VOC annual limit of 2.4 tons/yr, based on a rolling 13 4-week periods. For the period ending December 2015, emissions are 0.63 tons/yr. See attached records.

FG-AB620/622/623

FG-AB620/622/623 is made up of AB620, AB622, and AB623, which are natural gas-fired atmospheric batch steel hardening furnaces with oil quench tank.

These furnaces are used to harden customer-supplied medium sized parts. After the heating cycle in the batch furnace, the parts go to the internal oil quench tank, transferred to a wash station and then transferred to any of three tempering furnaces (AB 621, AB624 and AB 625). Flash-off from the oil quench tank goes to a flare before exiting through a stack. After tempering, the parts are sometimes dipped in an oil/water emulsion. Facility complies with VOC hourly limit of 0.8 lbs/hr – highest hourly emissions are 0.46 lbs (February 2015). Facility complies with the VOC annual limit of 3.5 tons/yr, based on a rolling 13 4-week periods. For the period ending December 2015, emissions are 0.26 tons/yr. See attached records.

These atmospheric batch furnaces can be used for case hardening – the carbon and nitrogen content of the steel is altered to harden the surface. The hardening furnaces are also 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.

FG-AC735/736

FG-AC735/736 is made up of AC735 and AC736, which are atmospheric continuous steel hardening furnaces with pre-washer, oil quench tank, post washer, and continuous tempering furnace. Furnaces are natural gas-fired.

From the pre-washer, parts are automatically fed into the hardening furnace by conveyor belt; dropped off by elevator to a below grade oil quench tank ; conveyed through a heated alkaline wash station; conveyed into a tempering furnace; and immersed (optional) 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 the VOC annual limit of 12.0 tons/yr (for each furnace), based on a rolling 13 4-week periods. For the period ending December 2015, emissions from AC735 are 5.4 tons/year; from AC736, 5.00 tons/year. Facility complies with the quench oil annual usage limit of 3,384 gallons/yr (for each furnace), based on a rolling 13 4-week periods. For the period ending December 2015, quench oil usage from AC735 is 1508 gallons/yr; from AC736, 1388 gallons/yr. See attached records.

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

FGFACILITY

VOC facility-wide annual limit is 82.4 tons/yr, based on a rolling 13 4-week periods. For the period ending December 2015, total VOC emissions are 33.03 tons/yr. See attached records.

Facility-wide quench oil annual usage limit is 22,000 gallons/yr, based on a rolling 13 4-week periods. For the period ending December 2015, total quench oil usage is 9175 gallons/yr. See attached records.

Grandfathered/Exempt Equipment

AC 730 and AC 732 are older, atmospheric continuous hardening (with oil quenching) and tempering lines. AC 731 has been inoperable since 2011.

AC729 is an older, atmospheric continuous rotary hardening (with oil quenching) and tempering furnaces.

AC 728 is an older 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 or exempt 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. Even with oil quenching, the furnaces are exempt prior to April 17, 1992. The grandfathered/exempt furnaces are natural gas-fired. Oil usage is monitored for MAERS

purposes.

Facility operates two small induction heat furnaces. This is used to heat treat small, thin metallic parts. Oil quenching is not done.

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 JMH DATE 03-04-16 SUPERVISOR CTE