

DEPARTMENT OF ENVIRONMENTAL QUALITY
AIR QUALITY DIVISION
ACTIVITY REPORT: On-site Inspection

B735769243

FACILITY: TEMPERFORM LLC		SRN / ID: B7357
LOCATION: 25425 TRANS X, NOVI		DISTRICT: Warren
CITY: NOVI		COUNTY: OAKLAND
CONTACT: Gloria Webber , General Manager		ACTIVITY DATE: 06/16/2023
STAFF: Iranna Konanahalli	COMPLIANCE STATUS: Non Compliance	SOURCE CLASS: SM OPT OUT
SUBJECT: FY 2023 Synthetic Minor MACT 5Z CMS FY2023 Scheduled Inspection of Temperform, LLC, located at 25425 Trans-X Road, Novi, Michigan 48375.		
RESOLVED COMPLAINTS:		

Temperform, LLC (B7357)
Owner: The Lawton Standard Co.
25425 Trans-X Road
Novi, Michigan 48375

1-800-CASTING

NAICS Code 331513: Steel foundries, except investment. Temperform makes Steel 3 (almost always Stainless Steel) Castings using sand molds and wooden templates.

Contacts:

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5. **Dean Turk** (Cell: 248-291-7263; Phone: 248-349-5230; E-mail: dTurk@TemperForm.com), Production Manager

6. **Peter A. Tomasi** (Phone: 414-297-5621; Cell: NA; Fax: NA; E-mail: pTomasi@foley.com), Partner Attorney at Foley & Lardner LLP

Fee Category: Cat E \$250.

Active Permit-to-Install (PTI): PTI No. 60-00C (FG-SCRUBBERS1/2 (EUSCRUBBER1 and EUSCRUBBER2), I.3 & II.1 limits: **36.14** tpy VOC & 18,913 tons of mold and core sand per year and FG-MACTZZZZZ II.2 limit: **20,000** tons per year of metal melted based upon **40 CFR 63.10880(f)** dated April 27, 2022. The permit, also, requires the company to install and operate properly (≥ 1350 °F) an afterburner for sand reclamation process.

The permit further revised (PTI No. 60-00C → PTI No. 107-23, effective September 5, 2023): only change being 8,000 CFM baghouse is replaced by **25,000 CFM baghouse**. Thus, EU-BAGHOUSE2 (cleaning and finishing system) now consists of one **cyclone** and one 25,000 CFM **baghouse** operating in series. Inadvertently, the permit was renumbered as **PTI No. 107-23** instead of PTI No. 60-00D. Both permits are identical except Baghouse2 CFM.

Default VOC Emission Factor: 0.28 pounds of VOC per ton of metal poured (**PTI No. 60-00C**, FGSCRUBBERS1/2, VI.6).

Temperform performed stack tests for emissions from EUBAGHOUSE1 and EUBAGHOUSE2 during August 7-8, 2001. The PTI revision was required to properly opt out of **Major Source NESHAP / MACT 5E** by obtaining an annual limit for metal melting (i.e., < 20,000 tons per year). See below as sand and metal melt usage limit may suffice per Area Source NESHAP / MACT 5Z. Hazardous air pollutants (HAPs) limits (Single HAP < 8.9 tpy and Aggregate HAPs < 22.4 tpy) may NOT be necessary to opt-out of Major Source NESHAP / MACT 5E per Area Source NESHAP / MACT 5Z (Small). PTI No. 107-23 is the latest permit with updated 25,000 CFM for cleaning and finishing Bahghouse2.

August 2001 Stack Test: Temperform performed stack tests for emissions from EUBAGHOUSE1 and EUBAGHOUSE2 during August 7-8, 2001. Network Environmental reported the results in pounds of particulate matter (PM) per 1,000 pounds of dry exhaust: 0.0005 (August 7 sampling, 3,240 CFM) for sand reclamation baghouse 0.0002 (August 8 sampling, 4,952 CFM) for cleaning baghouse. The August 2001 tested emissions rates comply with the current permit: 0.0005 pounds of particulate matter (PM) per 1,000 pounds of dry exhaust. It may be noted that EUBAGHOUSE3 uses dilution air to cool hot gases from afterburner (1350 °F), including burn-off oven, products of combustion exhaust.

NOT subject to Major Source NESHAP / MACT 5E: 40 CFR Part 63, Subpart EEEEE (5E), National Emission Standards for Hazardous Air Pollutants for Iron and Steel Foundries. As stated below, Temperform is subject to **Area NESHAP / MACT 5Z Source (Small i.e., annual metal melt production of 20,000 tons or less).**

The HAP emitted by facilities in the iron and steel foundries source category include metal and organic compounds. For iron and steel foundries that produce low alloy metal castings, metal HAP emitted are primarily lead and manganese with smaller amounts of cadmium, chromium, and nickel. For iron and steel foundries that produce high alloy metal or stainless

-steel castings, metal HAP emissions of chromium and nickel can be significant. Organic HAP emissions include acetophenone, benzene, cumene, dibenzofurans, dioxins, formaldehyde, methanol, naphthalene, phenol, pyrene, toluene, triethylamine, and xylene. Temperform is an an **Existing** (constructed before September 17, 2007) **Area NESHAP / MACT 5Z Source (Small)**.

Subject to Area Source NESHAP / MACT 5Z: 40 CFR Part 63, Subpart ZZZZZ (5Z), National Emission Standards for Hazardous Air Pollutants for Iron and Steel Foundries Area Sources; Final Rule, Page 226 Federal Register / Vol. 73, No. 1 / Wednesday, January 2, 2008 / Rules and Regulations / Final Rule.

This Area Source MACT 5Z final rule is effective on January 2, 2008. The final rule is for two area source categories (iron foundries and steel foundries). The requirements for the two area source categories are combined in one subpart (5Z). The final rule establishes different requirements for foundries based upon size: **Small & Large**. Small area source foundries are required to comply with pollution prevention (P2) management practices for metallic scrap, the removal of mercury switches, and binder formulations (40 CFR, 63.10886).

In addition to emissions standards for melting furnaces and foundry operations, large area source foundries are required to comply with the same pollution prevention management practices as small foundries for scrap management and binder formulations by January 2, 2009. (40 CFR, 63.10885(a)). Large area source foundries are required to comply with the same pollution prevention management practices as small foundries in addition to emissions standards for melting furnaces and foundry operations (40 CFR, 63.10885(a)). All foundries must comply with the pollution prevention (P2) management practices for scrap management and binder formulations by January 2, 2009. While a **large existing foundry** must comply with applicable emissions limitations and operation and maintenance requirements no later than two (2) years after initial classification, a **small area source foundry** (Temperform with the PTI No. 60-00C, FG-MACTZZZZZ, II.2, production limit: < 20,000 tons per year of metal) is **not subject to emission limits**. An affected source is **existing** if it commenced construction or reconstruction of the source before **September 17, 2007**. AQD approved initial PTI No. 60-00 on October 18, 2000, for Temperform's steel foundry. Novi foundry was installed about 1968, a small one-product family-owned business, based upon the property documents (Temperform was formed (1970)). The foundry business was acquired by Temperform in 1970. It may be noted that about 3.5-4 tons of sand are equivalent to 1 ton of metal melt. In the previous few years, Temperform melted 750-1,500 tons of metal per year (<< 20,000) using 3,000-6,000 tons per year of sand < 18,913 tpy sand (PTI No. 60-00C, FGSCRUBBERS1/2, SC II.2, production limit: 18,913 tons of mold and core (sand)). 3.5-4 (depending on size of mold) tons of sand = 1 ton of molten steel poured. As expected, while smaller parts require less sand, larger parts require more sand (pounds of sand per pound of part).

Existing Small Area Source: Temperform is an **existing source** as it commenced construction or reconstruction of the affected source before **September 17, 2007**.

Unlike large area sources, as a small area source, Temperform is not subject to emission standards **but only to** pollution prevention practices.

The final NESHAP applies to each new and existing iron and steel foundry that is an area source of HAP. The final rule allows 2 years for existing foundries to comply with the

pollution prevention standards for mercury. All foundries (small as well as large area source foundries) must **comply with the pollution prevention management** practices for scrap management and binder formulations by **January 2, 2009**.

40 CFR, 63.10890 management practices and compliance requirements: Temperform has not yet complied with

- a. Pollution prevention management practices for metallic scrap and mercury switches in § 63.10885 and binder (no methanol) formulations in § 63.10886.
- b. Initial notification of applicability according to § 63.9(b)(2).
- c. Notification of compliance status according to § 63.9(h)(1)(i).

Area Source (Small) NESHAP / MACT 5Z Semi-annual Compliance Reports

On August 22, 2022, AQD received Semi-Annual Compliance Reports for:

1. Jan-Jun 2020
2. Jul-Dec 2020
3. Jan-Jun 2022
4. Jul-Dec 2022
5. Jan-Jun 2023

All reports stated: Existing Area Source (< 20,000 tons/year metal melted). Compliance with management practices of metal scrap. No mercury (Hg). No motor vehicle scrap. Temperform does not operate under a site-specific plan. **Methanol** containing binder formulations are **not** used at all. No mercury (Hg)

Gloria Webber certified all reports.

Temperform submitted an application (PTI Application No. of APP-2021-0207) to revise the permit include MACT Synthetic Minor conditions (< 10 tpy Single HAP and < 25 tpy Aggregate HAPs) to properly opt-out of Major MACT 5E and AQD has approved PTI No. 60-00C on April 27, 2022. The revised permit (PTI No, 60-00C) include an afterburner / thermal oxidizer to be operated at ≥ 1350 F to control emissions from sand reclamation resin burn-off oven. (PTI No. 60-00C EUBAGHOUSE3, IV>4: minimum temperature of 1350°F). In addition, recently (2021), Temperform rebuilt & repaired two identical scrubbers as a replacement. Again in 2023, AQD revised (PTI No. 60-00C → PTI No. 107-23, effective September 5, 2023). With this PTI revision to **PTI No. 107-23** (inadvertently renumbered), cleaning Baghouse2 (EU-BAGHOUSE2) now consists of one cyclone for large particles one 25,000 CFM baghouse for fine particles operating in series. No other change in the revision.

VN: AQD issued Violation Notice (VN) dated May 21, 2019 (AQD Engineer Robert Joseph) for Rules 901 (odor nuisance), 910 (failure to operate scrubbers properly),

and PTI No. 60-00B (SCs 1.2, 4.3 & 5.3). AQD received June 13, 2019, VN response letter that states in part one or both scrubbers have reached end of their respective life cycles. In addition, AQD issued VN dated October 20, 2021, for 901 (odor nuisance). AQD received the, VN response letter dated November 10, 2020. Blake Albritton's e-mail (Wed 5/26/2021 12:00 PM) states the current project status.

Furthermore, AQD issued **September 15, 2022, VN**, for violations of PTI No. 60-00C, MACT 5Z, Mich. Admin. Code R. 336.1910 (air-cleaning devices), etc. An egregious violation is operation of processes associated with FGSCRUBBERS1/2, including mold and core preparation, melting, pouring, and cooling, while Scrubber No. 1 and Scrubber No. 2 were not operating. AQD received VN response letter dated September 30, 2022, from Katherine Jungwirth, Tierney Grutza and Gloria Webber. Again, **AQD issued April 18, 2023, VN** for failure to operate the scrubbers while operating FG-SCRUBBERS1/2 process units (furnaces, melting, pouring, sand processing, etc.). AQD received Webber's VN response letter dated April 28, 2023, that stated the scrubbers would be replaced by July 2023. However, the scrubbers are have been replaced in September 2023.

Operating hours: The Temperform, LLC facility typically operates four (4) days per week (Monday through Thursday) for two (2) 10-hour shifts. The first shift runs from 4 a.m. to 2:30 p.m. with a limited second-shift crew that works from 2:30 p.m. to 12:30 a.m. in the cleaning area. The information is based upon the September 15, 2023, Foley & Lardner letter.

On **June 16, 2023**, I conducted a level-2 **FY 2023 Synthetic Minor MACT 5Z CMS FY2023 Scheduled Inspection** of Temperform, LLC, located at 25425 Trans-X Road, Novi, Michigan 48375. The inspection was conducted to determine compliance with the Federal Clean Air Act; Article II, Part 55, Air Pollution Control, of the Natural Resources and Environmental Protection Act, 1994 PA 451; and Michigan Department of Environment, Great Lakes & Energy, Air Quality Division (EGLE-AQD) administrative rules; and PTI No. **60-00C / PTI No. 107-23**.

During the FY 2023 inspection, **Chris Duckett** Maintenance Manager, and **Gloria Webber**, General Manager, **Dean Turk**, Production Manager, assisted me.

Founded in 1970, Temperform is a multi-alloy, mostly stainless steel, foundry. Temperform specializes in manufacturing corrosion and abrasion resistant castings for the cement, mining, aircraft, pulp & paper, petrochemical, oil & gas, etc. industries. **Ray Witt** owned Novi foundry starting in 1960s and operated just one furnace. **Bartoleeto** bought the furnace in 1970 and incorporated it as TemperForm. Temperform has, usually, approximately 50 (63 in CY 2022) employees and, usually, operates four ten-hour shifts: from 4:00 am to 2:30 pm; Monday through Thursday; Fridays only if needed. Normally, pouring molten metal ends about 2 pm.

About January 15, 2020, C. A. Lawton Company (changed to The Lawton Standard Co., or simply Lawton Standard, in 2021) of De Pere, WI, and Temperform of Novi, MI, merged to create new specialty metals platform.

Because Temperform serves wide variety of essential industries including cement, oil & gas, it was exempt from mandatory shutdown due to COVID-19 as an essential industry.

PTI No. 60-00C Emission units (EUs)

Tables Temperform, LLC (B7357)

PTI No. 60-00C Emission units (EUs)

Emission Unit ID	Emission Unit Description (Including Process Equipment & Control Device (s))	Flexible Group ID
EUSCRUBBER1	Melting, pouring and cooling operations equipped with 4 electric induction furnaces, pour station, ladle drying station, and heaters. This emission unit is controlled by a 40,000 CFM wet scrubber.	FGSCRUBBERS1/2
EUSCRUBBER2	Melting, pouring and cooling operations equipped with 4 core machines, a pour station, casting cooling tunnel, heaters, mold spray. This emission unit is controlled by a 40,000 CFM wet scrubber.	FGSCRUBBERS1/2
<p>Two (2) sand mixers are present; one for each line. Five (5) furnaces are present with two (2) control panels: two (2) 2-ton furnaces, two (2) 1-ton furnaces, and one (1) 500-pound furnace. All furnaces are charged to ASTM Spec. Positive Metal Identification Gun (PMI Gun) is used for X-ray analysis. Heat resistant alloys (Ni-Cr) are used. Geiger-Miller Detector (a radiation detection and measuring instrument) is used for all incoming materials to ward off radioactive materials. All furnace and molten metal pouring emissions are released to in-plant environment and such emissions are controlled by the two (2) parallel (not in series) packed (each ball with high mass transfer surface area to volume ratio with low weight) bed scrubbers.</p> <p>Two packed bed well water scrubbers control in-plant emissions (sand particulate and resin & binder VOC burn-off due to high temperature at mold surface in contact with molten metal) due to predominantly casting using two (two 500-gallon tanks) preliminary tanks before one large (≈ 14,000 gallon) settling tank and liquid phase carbon adsorber.</p>		

Scrubber water returns from scrubbers (2) to 500-gallon Tank1. From Tank1 water is pumped to 14,000-gallon settling Tank3 which separates undissolved solids using gravity settling principles. From Tank3 water is pumped to 500-gallon Tank2. From Tank2 water is pumped to the scrubbers (2), operating in parallel. As noted below scrubber water got contaminated with adsorber's carbon. Consequently the pump failed. Hence scrubbers were not operating in August 2022. In this month of 2022, Temperform operated furnace for a couple weeks without operating the two parallel scrubbers in violation of the permit conditions. Two 500-gallon tanks (2) have been replaced with stainless steel tanks of same capacity to ward off corrosion.

Only one 400-GPM community pump is present for both scrubbers. New back-up pump was installed about October 2022. The scrubbers use three tanks: 500-gallon Tank1, 500-gallon Tank2, 14, 000-gallon Tank3. Water flow: Scrubbers to Tank1 to Tank3 to Tank2 to Scrubbers. Tank Nos. 1 & 2 have been replaced, about July 2023, with equal size SS tanks.

Pumped 400-GPM water splits between two scrubbers although not equally due to different resistance to flow (friction, pressure drop) at a given Reynolds number Re : about 250 GPM at Scrubber1 and 150 GPM at Scrubber2. I have recommended to install a couple of valves to be able to control flow rates (GPM) in each scrubber such that about 200 GPM is maintained in each. It is impossible to achieve 475 GPM flow rate per scrubber with one and only one pump of capacity 400 GPM between two scrubbers. 475 GPM flow rate identified in the recordkeeping form is erroneous.

Mold cooling is conducted on the floor, in the location that the mold was poured. Cooling does not have a specific capture system, with emissions being emitted to the general in-plant air to be controlled by two parallel packed bed scrubbers.

Temperform has three (3) shell core machines. The emissions vent to in-plant air to be controlled by the scrubbers (2).

As of September 2023, the scrubbers are being replaced with equal or better ability and capacity scrubbers. The mist eliminators are improved to avoid visible emissions of water mist and moreover to save water. Temperform does not have a NPDES PTP discharge permit. Occasionally, scrubber water is hauled away for disposal.

Temperform does NOT use any paper form to record data, anymore, since August 2021, as it became obsolete upon installation of Continuous Monitoring System (CMS). Temperform installed and has been operating CMS that uses HMI Technology. The data (liquid flow rates, pressure drop readings for each scrubber, etc.) are exported to MS Excel in 30-second intervals community 400-GPM pump.

During September 8-17, 2023, Temperform upgraded the scrubber with a capital expenditure of 0.4 million dollars.

As a result of April 18, 2023, VN, Temperform installed a visual alarm (scrubbers operating = GREEN light & scrubbers not operating = flashing RED light). When RED light flashing, maintenance manager is immediately notified via e-mail.

Scrubber operating information (FY23):

1. **April 12, 2023:** The scrubbers were not operating during the inspection. See April 18, 2023, VN. Upon starting the common pump, Scrub1: flow rate = 271 GPM & ΔP = 3" water and Scrub2: flow rate = 150 GPM & ΔP = 1" water.
2. **May 25, 2023:** Scrub1: flow rate = 250 GPM & ΔP = 2" water and Scrub2: flow rate = 105 GPM & ΔP = 1" water.
3. **June 27, 2023:** Scrub1: flow rate = 250 GPM & ΔP = 2" water and Scrub2: flow rate = 149 GPM & ΔP = 1" water. Light = GREEN.
4. **July 18, 2023:** Scrub1: flow rate = 215 GPM & ΔP = 2" water and Scrub2: flow rate = 115 GPM & ΔP = 1" water. Light = GREEN.

EUBAGHOUSE1	Sand silo, sand return hopper and handling system controlled by a 12,000 CFM baghouse.	NA
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Temperform has three (3) sand silos. Two of three silos are located inside the plant and are associated with the mold lines. These silos receive reclaimed sand from one thermal reclamation unit (recently equipped with an afterburner for odor control), as well as new sand. Emissions from these two silos are controlled by Baghouse No. 1.

Sand from mechanical reclaim (Gudgeon shakeout table) unit is stored in a silo which supplies sand to the thermal reclamation unit. The mechanically reclaimed sand silo is controlled by a bin vent filter. All exhaust to in-plant environment. All sand from shakeout table is processed through the thermal reclaim unit (EUBAGHOUSE3). The reclaimed sand is reused in the mold making process.

EUBAGHOUSE2	Cleaning and finishing system with two blast booths controlled by cyclones and an 8,000 25,000 CFM baghouse.	NA
<p>AQD issued new revised PTI No. 107-23, effective September 5, 2023. Only change being 8,000 CFM baghouse is replaced by 25,000 CFM baghouse. All other permit conditions remain the same.</p>		
EUBAGHOUSE3	Sand reclamation system controlled by a thermal secondary combustion chamber and 13,000 CFM baghouse. The thermal secondary combustion chamber is used to destroy fumes from a burn-off oven that removes resins and binders from sand. The burn-off oven is a continuous process operated as needed with a maximum design capacity of 1.5 tons of sand processed per hour.	NA
<p>All baghouse processes (EUBAGHOUSE1 thru EUBAGHOUSE3) have identical requirements (malfunction abatement plan (MAP), satisfactory operation of each BH, lower indoor pressure with respect to outside ambient air, each BH be equipped with static pressure drop monitoring device, verification (using smoke test) that the direction of air flow at each natural draft opening (NDO) is into the building, except EUBAGHOUSE3 that has additional requirements due to the afterburner (secondary combustion chamber) for the burn-off oven (afterburner shall be installed, maintained, and operated in a satisfactory manner, while burn-off is occurring minimum afterburner temperature of 1350°F shall be maintained, the temperature shall be monitored and logged on continuous basis.</p> <p>The stack dimensions have been modified per the permit.</p> <p>Temperform uses shell cores. It has three (3) shell core machines, from which emissions vent to in-plant air. All plant air laden with particulate and odor is controlled by two packed bed scrubbers.</p>		

Thermal oxidizer (afterburner) operating information(FY23):

1. **April 12, 2023:** At 12:48 pm the reclamation stopped. At 11:46 am, T =1350 °F.
2. **May 25, 2023:** At 8:22 am, T =1350 °F with process T =1200 °F.
3. **June 27, 2023:** T =1372 °F with process T =1150 °F.
4. **August 01, 2023:** . T =1371 °F with process T =1193 °F.

Setpoint T =1370 °F. Afterburner temperature limit: ≥ 1350°F (PTI No. 60-00C EUBAGHOUSE3, IV.4 limit: minimum temperature of 1350°F shall be maintained for the afterburner). The setpoint was upgraded from 1350 to 1370 °F after September 15, 2022, VN (Grinstern).

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Casting process starts with wood patterns that are used to create a mold of sand, binder, and a catalyst. Foundry sand is high quality silica sand with uniform physical characteristics. Molten steel (2,200-3,000 °F, different SS Alloys with different melting points) is poured into the sand molds and allowed to cool and freeze to solid. Metal is melted to molten phase using five (5) electric induction furnaces for both lines (2 lines: one small and the other large). Upon cooling and freezing, metal contracts allowing sand to separate from metal easily. The sand is separated and recycled / reused upon subjecting the sand to reclamation process including resin burn-off (continuous process but operated when sand is available for reclamation / resin burn-off). Make-up sand is added for the losses. The steel casting is wiped clean before shipment to the customer. Some finishing work such as cutting, grinding, etc. is performed as well. Two mold lines are used to set the materials (sand, binder, catalyst) in-place from the wood patterns. A refractory coating is applied to sand mold to prevent contamination of the part being molded by sand. Upon pouring molten metal, some resins and binders burned off due to high temperatures at an area near molten metal (up to 1-2 inches from molten metal).

At outside surface of sand mold (up to about 0.5 inch depending upon the size of mold and, hence, thermal energy, $mC_p\Delta T$), in the beginning especially, VOC are emitted via evaporation and migration through porous sand due to lower temperatures ($\approx 200-600$ °F). Mold sand contains about 1-2 percent resins and binders; recently (September 15, 2023 Foley letter) Temperform reduced resin usage. The emissions, due to melting, pouring and cooling operations, are controlled by two (2) identical 40,000 CFM wet scrubbers

(EUSCRUBBER1 & EUSCRUBBER2), which condense as well as capture VOC and encapsulate into water particles (PM). The packed bed scrubbers have packing material to enhance gas liquid contact surface area for mass and heat transfer. Scrubbers use local well water. There are two (500-gallon tanks) preliminary tanks before one large ($\approx 14,000$ gallon) settling tank. The particulates are allowed to gravity-settle in settling tank. Two (2) carbon adsorption units (about 400 gallons of carbon per unit) remove organic compounds from water. A purge fraction of total water is removed from the scrubbers to clean in liquid phase adsorber. Carbon is replaced about once per year. Make-up well water is added to make up for evaporative losses. Two scrubbers are equipped with stacks (SV001 & SV002). The scrubbers control emissions from the entire plant via maintaining negative pressure with respect to outside ambient air. After filtration to remove suspended particulates, liquid phase carbon adsorption is used to remove organic matter from water. Two scrubbers, located side by side, draw air from the entire plant and ensuring negative pressure in the plant w.r.t. outside ambient air. Upon scrubbing, exhaust air is discharged through two (2) vertical stacks above 30-foot building. AQD recommend that stack heights be increased, and cross-sectional areas of exhaust flow be reduced ($A = \pi D^2 / 4$ [ft²] & Q [cfm] = A [ft²] * v [ft/min]). However, stack dimensions modifications for the scrubbers will not be performed per the settlement during the permit review. Accordingly, Baghouse3 dimensions (see below) have been changed to improve the pollutants dispersion in ambient air upon discharge.

Three baghouses are used to control sand particulate emissions:

1. EUBAGHOUSE1: 12,000 CFM (5,000 CFM per MAP) baghouse for sand silo, sand return hopper and handling system. Baghouse1 is used for the loading and unloading of the storage bins for new sand. This is known as sand system baghouse. Exhaust from mechanical reclaimer (where sand particles are shaken and collected below a screen separator) and pneumatic conveyer are ducted to this BH1. New 12000 cfm baghouse (12,000 CFM Murphy-Rodgers MRJ-SE-1298-RAL continuous self-cleaning dust collector) has been installed replacing previous 8000 cfm baghouse. This unit services the control for emissions from the sand silo, sand return hopper, and sand handling system.
2. EUBAGHOUSE2 (85 bags): 25,000 CFM (changed from 8,000 CFM in September 2023 and PTI No. 107-23 covers this activity) baghouse for cleaning and finishing system. Large particles are removed by one cyclone to reduce mass load and to prevent bag damage. Baghouse2 is used for the cleaning (cleaning room, arch booth) and finishing of the molds.
3. EUBAGHOUSE3 (212 bags): 14,000 CFM baghouse for sand reclamation system. The bags have been upgraded to high temperature bags such that it can handle emissions from afterburner (for resin burn-off unit to reclaim sand) with a temperature as high as 1350 °F. The baghouse also controls emissions from the Sand burn-off oven. Ambient air is used as dilution and cooling air to reduce the temperature (to 200 -300 °F) for the baghouse (EUBAGHOUSE3). In addition to lowering the concentrations of the pollutants, the dilution air enhances the dispersion of the odors due to increased discharge velocity. About September 15, 2022, Temperform

installed 50-foot-tall stack along with new 30,000-cfm fan replacing old 15,000-cfm fan, new air-lock system for the hopper. New stack has reduced exit diameter such that exhaust exit velocity is increased. Increased exhaust flow rate (doubled from 15,000 cfm to 15,000 cfm) together with increased exhaust velocity of discharge (by reducing the diameter at the stack's exhaust tip), has tremendously improved pollutant (s) dilution and dispersion.

All baghouses use pulse jet mechanism to clean bags of sand cake. Pulse rate is once per 15 seconds. Five furnaces, one burn-off oven and three baghouses are present. Sand burn-off oven also uses this baghouse (EUBAGHOUSE3).

Resin binder: Temperform used to use a mixture of thermally reclaimed (80%) and mechanically separated (20%) sands. Starting in 2021, Temperform stopped using the mixture and began using only (100%) thermally reclaimed sand. Previously, Temperform used 1.8-2.5% binder in the sand. Currently, Temperform uses **1.29%** resin / binder in the sand according to September 15, 2023, Foley & Lardner letter. This reduces the bubbles in cast product due to reduced organic vapors migrating. Hence improved quality of castings. In addition, reduction in binder usage mitigates odor in the neighborhood. 1.29% resin / binder in sand is the lowest it ever has been. Lower resin use reduces ambient odor, improves quality of castings and, above all, saves money.

Molds are broken the following day to allow significant cooling of sand. Broken sand is pneumatically conveyed to 50-ton sand tank exhausting particulate laden air to EUBAGHOUSE3.

One thermal reclamation or resin burn-off unit is present. The sand particles are maintained at fluidized conditions to enhance heat transfer. It burns off resin and binders on sand particles from the 50-ton tank. The emissions from the burn-off furnace are controlled the same baghouse (No.3).

PTI No. 60-00C Compliance

PTI No. 60-00C, EUBAGHOUSE1, EUBAGHOUSE2 & EUBAGHOUSE3

EUBAGHOUSE1 (128 bags): Sand silo, sand return hopper and handling system controlled by a 12,000 CFM baghouse.

PTI No. 60-00C, EUBAGHOUSE1, I.1-2 PM limits: 0.0067 pound of PM per 1000 pounds of exhaust gases on a dry & hourly basis and 0.36 pound of PM per hour.

EUBAGHOUSE1 SV004 = 22 feet. June 16, 2023, range finder = 23 ft.

EUBAGHOUSE2 (NA bags): Cleaning and finishing system with two blast booths controlled by cyclones and an 25,000 CFM (formerly 8,000 CFM) baghouse.

PTI No. 60-00C, EUBAGHOUSE2, I.1-2 PM limits: 0.01 pound of PM per 1000 pounds of exhaust gases on a dry & hourly basis and 0.36 pound of PM per hour.

EUBAGHOUSE2 SV003 = 33 feet. June 16, 2023, range finder = 32 ft.

EUBAGHOUSE3 (132 bags): Sand reclamation system controlled by a thermal combustion chamber and 14,000 CFM baghouse arranged in series. The thermal secondary combustion chamber is used to destroy fumes from a burn-off oven that removes resins and binders from sand. The burn-off oven is a continuous process operated as needed with a maximum design capacity of 1.5 tons of sand processed per hour. Burn-off oven with an afterburner process is operated on as needed basis.

PTI No. 60-00C, EUBAGHOUSE3, I.1-3 PM limits: 0.01 pound of PM per 1000 pounds of exhaust gases on a dry & hourly basis, 0.36 pounds of PM per hour and 0.3 pound of VOC per hour. No fuel other than pipeline quality sweet natural gas is allowed. Temperform's burn-oven and corresponding afterburner are not capable of burning any fuel other than natural gas.

Temperform submitted a malfunction abatement plan (MAP) (PTI No. 60-00C, EUBAGHOUSE1, EUBAGHOUSE2, EU-BAGHOUSE3, III.1). The maintenance manager is responsible for overseeing the execution of this MAP and the inspection, maintenance, and repair of air cleaning devices and associated process equipment. The maintenance manager is responsible for proper documentation and recordkeeping demonstrating compliance with the MAP.

During the inspection, the baghouses were operating properly (PTI No. 60-00C, EUBAGHOUSE1, EUBAGHOUSE2, EU-BAGHOUSE3, III.2: baghouse operating in a satisfactory manner). During the FY 2022, the sand material was spread near the bag hopper. I requested the hopper collection system be repaired immediately. Per Gloria Webber's e-mail (gloria@temperform.com, Wed 7/27/2022 5:05 PM) the sand spill situation was repaired by installing stack of pallets. Also, a contractor installed the rotary air lock to prevent future spills. A Violation of Notice (VN) was not issued for this incident and the BAGHOUSE3 sand leak situation was promptly corrected upon final rotary air lock installation.

Ambient fresh air is only sucked into of the building maintaining a negative pressure and all exhaust air passes through either baghouses or scrubbers. (PTI No. 60-00C, EUBAGHOUSE1, EUBAGHOUSE2, EU-BAGHOUSE3, IV.3).

Only cleaning and finishing system EUBAGHOUSE2 is equipped with precleaning cyclone for large particles. The Baghouse2 fan is upgraded to 25,000 CFM (changed from 8,000 CFM in September 2023 with new PTI No. 107-23)

Also, Temperform is performing smoke tests to demonstrate the building negative pressure (PTI No. 60-00C, EUBAGHOUSE1, EUBAGHOUSE2, EU-BAGHOUSE3, IV.1-3 & VI.2).

As stated above, all ambient air flows into the building via negative pressure created by control equipment such Baghouses 1-3, Scrubbers 1-2, i.e., there no fan or compressor to deliver outside fresh ambient air into the building.

At any rate, Temperform always keeps the doors closed except when doors need to open for materials movement in-and-out.

On July 15, 2022, I observed sand spills near sand reclaimer BH3 obviously due to improper installation and operation of the hopper bag. This situation was promptly

corrected per my advice to Temperform. An airlock system has been installed by September 16, 2022.

Burn-off oven and associated afterburner are capable of burning only pipeline quality sweet natural gas (PTI No. 60-00C, BAGHOUSE3, II.1: only use natural gas).

About March 2020, Temperform installed a secondary combustion unit (afterburner) operating at ≈ 1250 °F for fumes / odor. However, afterburner started operating in April 2021 due to COVID-19 cross border issues (USA & Canada). When (about July 4, 2021) the bags replaced with high temperature bags, afterburner has been operating at 1350 °F.

See above for afterburner operating information (PTI No. 60-00C, BAGHOUSE3, IV.3-5: operate properly afterburner, minimum temperature of 1350°F, a device to monitor and record, using a data logger the temperature and VI.1-2: record the temperature). The temperature T is logged once every 15 seconds.

Setpoint = 1370°F. See above for afterburner and process temperatures (PTI No. 60-00C, BAGHOUSE3, IV.3-5).

Upon changing setpoint from 1350°F to 1370°F, AQD has NOT detected temperature below 1350°F.

Stack modifications have been completed (PTI No. 60-00C, BAGHOUSE3, IX.1: Stack dimensions of 13 inches diameter and 46.5 feet tall). SV005 = 46.5 feet tall and 13 inches diameter. June 16, 2023, range finder height = 46 ft.

An afterburner has been installed (March 2020) to resolve odor issues and the May 21, 2019, violation. Also, the pouring process capture system improvements and repairs and upgrades of the scrubbers has been accomplished. Afterburner started operating in April 2021 as stated above. High temperature bags have been installed in July 2021. After July 2021, afterburner started operating at 1350 °F with temperatures logged every 15 seconds. I recommended lower amounts of data collection (e.g., 1/ 10 minutes) so that temperature data becomes much more manageable.

Burn-off oven is a fluidized sand bed combustion oven. The purpose is to retain all sand particles although some fines and dirt make it to the baghouse (EUBAGHOUSE3). Make-up virgin sand is added such that fines fraction is at optimal level for product quality. When a fluid (in this case ambient air) is passed upwards through a bed, the pressure drop is the same as that for downward flow at relatively low rates. When, however, the frictional drag on the particles becomes equal to their apparent weight, that is the actual weight less the buoyancy force, the particles become rearranged thus offering less resistance to the flow of fluid and the bed starts to expand with a corresponding increase in voidage. This process continues with increase in velocity, with the total frictional force remaining equal to the weight of the particles, until the bed has assumed its loosest stable form of packing. If the velocity is then increased further, the individual particles separate from one another and become freely supported in the fluid. At this stage, the bed is described as fluidized.

While burn-off oven ($\approx 1,200$ °F) is equipped with four (4) burners, afterburner or thermal oxidizer ($\approx 1,350$ °F) is equipped with fifth burner; five (5) burners in all.

No heat recovery heat exchanger for the afterburner. However, ambient air is mixed with hot ($\approx 1,350\text{ }^{\circ}\text{F}$) exhaust gases via venturi to cool air to $\approx 200\text{ }^{\circ}\text{F}$ to protect the baghouse (EUBAGHOUSE3).

EUBAGHOUSE3 SV005 = 46.5 feet. June 16, 2023, range finder = 46 ft.

Original stack height of 36.5 ft and diameter of 26 inches (PTI No. 60-00B). Updated stack height of 46.5 ft and diameter of 13 inches (PTI No. 60-00C).

PTI No. 60-00C Flexible groups

PTI No. 60-00C Flexible groups

Flexible Group ID	Flexible Group Description	Associated Emission Unit IDs
FGSCRUBBERS1/2	Melting, pouring, cooling of metal and mold/core preparation operations controlled by two 40,000 CFM wet scrubbers that are arranged in parallel. There is a liquid phase carbon adsorption system, with random packing to increase mass transfer surface area and is present to reduce organics in the scrubber liquor.	EUSCRUBBER1 EUSCRUBBER2
FGMACTZZZZZ	The affected source is an existing iron and steel foundry, that is (or is part of) an area source of hazardous air pollutant (HAP) emissions. The affected source is an existing small foundry as defined by 40 CFR Part 63 Subpart <u>ZZZZ</u> .	NA

PTI No. 60-00C, FGSCRUBBERS1/2

PTI No. 60-00C, FGSCRUBBERS1/2

Melting, pouring, cooling of metal and mold/core preparation operations controlled by two 40,000 CFM wet scrubbers that are arranged in parallel; NOT in series. There is a liquid phase carbon adsorption system for a purged water cleaning, with scrubber (packed bed) random packing to increase mass transfer surface area and is present to reduce organics in the scrubber liquor.

Two 40,000 CFM packed bed water scrubbers (EUSCRUBBER1 and EUSCRUBBER2) are equipped with flow meters (\approx 350-400 gallons per minute water flow (total for two side by side scrubbers) by gravity with water pumper to the top of each packed bed) and pressure drop devices for packed beds and mist eliminators.

PTI No. 60-00C, FGSCRUBBERS1/2, I.1-3 VOC emissions limits are: 2.5 pounds per hour, 0.28 pounds per ton of metal melted (this is also a default emission factor) and 36.14 tons per year. VOC emissions stack test has never been conducted (PTI No. 60-00C, FGSCRUBBERS1/2, V.1: VOC stack testing upon request).

If 18,913 tons of mold and core sand per year through casting limit (PTI No. 60-00C, FGSCRUBBERS1/2, II.1.) is met VOC limit is deemed to have been met (PTI No. 60-00C, FGSCRUBBERS1/2, I.1-3 VOC emissions limits). The emissions are based upon an emission factor of 0.28 pounds of VOC per ton of iron poured (PTI No. 60-00C, FGSCRUBBERS1/2, I.2 VOC emissions limit of 0.28 pounds per ton of metal melted).

CY 2019: 1,403 tons of metal poured per year (PTI No. 60-00C, FGSCRUBBERS1/2, II.1 Material Limit: 18,913 tons of mold and core per year (sand)). 1 ton of metal \approx 4 tons of sand.

CY 2020: 961 tons (1,922,653 pounds) of metal poured per year. Reduced production due to COVID-19 and associated labor shortages.

CY 2021: 1,192 tons (2,383,316 pounds) of metal poured / melted per year with corresponding sand usage of 4,768 tons per year.

CY 2022: 1,227 tons (2,654,746 pounds) of metal poured / melted per year with corresponding sand usage of **4,645** tons per year.

Evidently, the annual production rates are significantly less than 20,000 tons per year (Small Area Source Classification Limit)

CY 2022: 4,645 tons (9,291,611 pounds) of total sand was used by Temperform.

CY 2022: 59.72 tons (119,440 pounds) of resin was used by Temperform with average 1.29% resin in molding sand.

CY 2022 Proportionality factor: The metal poured to sand used ratio is 1 pound of metal poured to 3.5 pounds of sand used.

CY 2022 information is based upon the September 15, 2023, Foley & Lardner, LLP letter.

Temperform (Chris Duckett via e-mail Wed 6/1/2022 6:25 AM) submitted MAP for baghouses and scrubbers (PTI No. 60-00C, FGSCRUBBERS1/2, III.1: malfunction abatement plan (MAP))

Temperform generally operates pouring processes when scrubbers are operating (PTI No. 60-00C, FGSCRUBBERS1/2, III.2-3: operate properly both scrubbers (2) and carbon adsorption unit). There are instances of scrubber failures as noted in VNs.

However, during the inspection with Grinstern both scrubbers failed on August 04, 2022, while due to contamination of water with carbon from the carbon adsorption unit (CAU). AQD advised Ms. Gloria Webber that Temperform **should not** operate any process served by scrubbers during the period when scrubbers are shut down as such operation is a violation of the permit. Despite the advice, Temperform continued to operate the processes including metal pouring while the scrubber was down during the period of August 04 thru 18, 2022 (PTI No. 60-00C, FGSCRUBBERS1/2, III. 3: The permittee shall not operate FGSCRUBBERS1/2 if the associated scrubbers are not operating in a satisfactory manner).

Again, AQD issued April 18, 2023, VN for failure to operate the scrubbers while FG-SCRUBBERS1/2 process units (furnaces, melting, pouring, sand processing, etc.) were operating.

See above for scrubbers operating data: April 12, May 25, June 27, July 18, 2023.

See above for sand reclamation unit afterburner temperature: April 12, May 25, June 27, August 01, 2023. AQD has not noticed afterburner temperature below $T_{\text{afterburner}} = 1350 \text{ }^{\circ}\text{F}$ after the setpoint has been upgraded from 1,350 to 1,370 $^{\circ}\text{F}$.

Chris Duckett of Temperform stated that Greats Lakes Carbon Treatment tests water for organics and carbon for break-through once in six months (PTI No. 60-00C, FGSCRUBBERS1/2, III. 2: adsorbent and carbon testing). Adsorbent Carbon has never been saturated (activated carbon break-through) as activated carbon is replaced once in six months by Greats Lakes Carbon Treatment.

The building inside pressure is lower than outside ambient air pressure as demonstrated by smoke test (PTI No. 60-00C, FGSCRUBBERS1/2, III. 3: building housing is operating at a pressure lower than the outside, so that air flows into the building through all natural draft openings (NDOs)). Besides, only way outside air finds its way into the building is via negative pressure created by control equipment such as scrubbers and baghouses.

AQD has not requested VOC stack testing (PTI No. 60-00C, FGSCRUBBERS1/2, V. 1: **VOC stack testing** upon the request). Especially after the afterburner has been installed and operating, VOC (and hence odor) emissions have significantly reduced.

Temperform is keeping the required records for afterburner temperatures (T data logger), Baghouse pressure drop readings (EUBAGHOUSE1, EUBAGHOUSE2, EUBAGHOUSE3, Shot Blaster BH, Scrubber 1 MAGNAHELIC, Scrubber 2 MAGNAHELIC, **Scrubber 1 MIST PAD**, Scrubber 2 MIST PAD), scrubbers liquid flow rates, sand processed, metal melted, etc. (PTI No. 60-00C, FGSCRUBBERS1/2, VI.1-7: records).

FGSCRUBBERS1/2 SV001 & SV002 = 45 feet tall. June 16, 2023, range finder = 47 ft.

PTI No. 60-00C, FG-MACTZZZZZ

The affected source is an existing SMALL iron and steel foundry, that is (or is part of) an area source of hazardous air pollutant (HAP) emissions. Temperform is an **existing small** foundry as defined by 40 CFR Part 63 Subpart ZZZZZ.

Temperform does not use **methanol formulation binders** (PTI No. 60-00C, FG-MACTZZZZZ, II.1: binder chemical formulation that uses methanol is prohibited)

CY 2019: 1,403 tons of metal poured per year (PTI No. 60-00C, FGSCRUBBERS1/2, II.1 Material Limit: 18,913 tons of mold and core per year (sand)). 1 ton of metal \approx 4 tons of sand.

CY 2020: **961** tons (1,922,653 pounds) of metal poured per year. Reduced production due to COVID-19 and associated labor shortages.

CY 2021: **1,192** tons (2,383,316 pounds) of metal poured / melted per year with corresponding sand usage of 4,768 tons per year.

CY 2022: **1,227** tons (2,654,746 pounds) of metal poured / melted per year with corresponding sand usage of 4,646 tons per year.

CY 2019 thru CY 2022: metal poured \ll **20,000** tons per year of metal melted / poured per year. PTI No. 60-00C FGSCRUBBERS1/2, II.1 limits the sand usage to no more than **18,913** tons of mold and core sand per year. Proportionality factor: The metal poured to sand used ratio is 1 pound of metal poured to 3.5 pounds of sand used. Hence, Temperform can pour no more than 5,400 tons of metal per year, an indirect limitation on metal poured: **5,400 \ll 20,000** tons of metal poured per year.

As stated by the above production records Temperform melts steel significantly less than the Small Area MACT 5Z Source limit of 20,000 tons per year of metal melted / poured per year (PTI No. 60-00C, FG-MACTZZZZZ, II.2: the permittee shall not melt more than 20,000 tons per year of metal, based on a 12-month rolling period, as determined at the end of each calendar month). As stated above, Temperform cannot pour more than \approx **5,400 tons of metal per year** based upon annual sand use limit (18,913 tons of mold and core sand per year).

Temperform does not use mercury containing materials. Temperform does not use motor vehicle scrap. Temperform scrap does not include mercury switches. Alloy records (Cr, Co, Ni, etc.) are kept. Out of CY 2021 1191.7 tons of metal poured, Ni = 234 (20%), Cr = 222.8 (19%), Co = 7.8 (0.7%) tons per year. (PTI No. 60-00C, FG-MACTZZZZZ, III.1: a) Metallic scrap management program. (40 CFR 63.10885(a) & b) Mercury requirements. (40 CFR 63.10885(b)))

Wheelbrator cabinets (2)

Two (2) Wheelbrator shot blast (steel shots) cabinets are present. Each machine is equipped with its own dedicated cartridge filter system. The machines are used for finishing castings. Each cartridge filter system is equipped with one 55-gallon drum (hopper) for collection of captured dust.

The machines are exempt from Rule 336.1201 (Permit-to-Install) pursuant to Rule 336.1285 (2)(l).

August 2001 Baghouses Stack Test

In August 7-8, 2001, Network Environmental performed sampling for PM using US EPA Reference Method 17. Mr. Thomas Maza of TPU-AQD observed the stack testing. Network reported the results in pounds of particulate matter (PM) per 1,000 pounds of dry exhaust: 0.0005 (August 7 sampling, 3,240 CFM) for sand reclamation baghouse 0.0002 (August 8 sampling, 4,952 CFM) for cleaning baghouse. The limit is 0.01 pound of particulate matter (PM) per 1,000 pounds of dry exhaust (PTI No. 60-00B, EUBAGHOUSE1 (sand), 1.1a & EUBAGHOUSE2 (cleaning), 2.1a).

US EPA Environmental Justice (EJ)

US EPA to look into 80th national percentile and EJ indexes.

Conclusion:

Not in compliance. Previously issued VNs have **not** been resolved yet. Currently (September 2023), under Administrative Consent Order (ACO) negotiations.

Odor Scale

0 = Non-detectable (no odor)

1 = Barely detectable (faint)

2 = Distinct and definite odor (moderate)

3 = Distinct and definite objectionable odor (strong)

4 = Odor strong enough to cause a person to attempt to avoid it completely (extremely strong)

5 = Odor so strong as to be overpowering and intolerable to for any length of time (intolerably strong).

NAME

J. S. Marshall

DATE September 29, 2023 SUPERVISOR

Joyce