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

B735753527

FACILITY: TEMPERFORM LLC		**SRN / ID:** B7357
LOCATION: 25425 TRANS X, NOVI		**DISTRICT:** Warren
CITY: NOVI		**COUNTY:** OAKLAND
CONTACT: Blake Albritton , Director of Engineering and Quality Assurance		**ACTIVITY DATE:** 03/05/2020
STAFF: Iranna Konanahalli	**COMPLIANCE STATUS:** Non Compliance	**SOURCE CLASS:** SM OPT OUT
SUBJECT: Synthetic Minor MACT 5E CMS FY2020 scheduled inspection of Temperform, LLC, Novi		
RESOLVED COMPLAINTS:		

Temperform, LLC (B7357)
25425 Trans-X Road
Novi, Michigan 48375

1-800-CASTING

PTI No. 60-00B (FG-SCRUBBERS1/2, 4.1c limit: 36.14 tpy VOC) dated July 1, 2003. Temperform performed stack tests for emissions from EUBAGHOUSE1 and EUBAGHOUSE2 during August 7-8, 2001. No hazardous air pollutants (HAPs) limits (e.g., Single HAP < 8.9 tpy and Aggregate HAPs < 22.4 tpy) to properly opt out of Major Source NESHAP / MACT 5E. See below as sand use limit may suffice per Area Source NESHAP / MACT 5Z.

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.

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. See below: Temperform is an **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). 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 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. 60-00B, FGSCRUBBERS1/2, SC 4.2, production limit: 18,913 tons of mold and core (sand) per year << 20,000 tons of metal melt production (≈ 80,000 tons of sand) per year; 1 ton of metal melt ≡ 4 tons of sand) is not subject to emission limits. For an existing affected source, a ‘‘small foundry’’ is an iron and steel foundry that has an annual metal melt production of 20,000 tons or less. An affected source is existing if it commenced construction or reconstruction of the affected 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 before Temperform was formed (1970). It may be noted that about 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 using 3,000-6,000 < 18,913 (PTI No. 60-00B, FGSCRUBBERS1/2, SC 4.2, production limit: 18,913 tons of mold and core (sand)) per year tons of sand per year.

Temperform may revise the permit (PTI No. 60-00B to PTI No. 60-00C) include MACT Synthetic Minor conditions (< 10 tpy Single HAP and < 25 tpy Aggregate HAPs) to properly opt-out of Major MACT 5E. It is not necessary to obtain 10/25 tpy HAPs limits, as stated above, if Temperform operates at a small area source limit of 20,000 tons of metal melt production per year < ≈ 80,000 tons of mold and core (sand) per year (1 ton of metal melt ≡ 4 tons of sand). The revised permit will include an afterburner for sand reclamation resin burn-off oven, baghouse, which will replace two identical scrubbers, followed by HEPA filter cartridge filters for indoor air quality when air is recycled into the plant, new capture systems, etc.

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.

Operating hours: Customarily, four ten-hour shifts from 4:00 am to 2:30 pm; Monday through Thursday. Hence, odor may be detected mostly in morning as molten metal pouring may end after noon; about 2 pm. When operating, it appears that resin burn-off oven is a significant source of odor. Since 2018, two (2) 10-hour shifts are operating hours. Not all hours, pouring molten metal takes place. Also, not all hours, resin burn-off takes place.

On March 05, 2020, I conducted a level-2 **Synthetic Minor MACT 5E CMS FY2020 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.

During the inspection, Mr. Blake Albritton (Phone: 248-349-5230-ext. 212; Cell: 217-412-2889; Fax: 248-349-0244; E-mail: bAlbritton@TemperForm.com), President, assisted me. Mr. Shane Reece (Phone: 248-349-5230-ext. 224; Cell: 248-302-5785; Fax: 248-349-0244; E-mail: shReece@TemperForm.com), Foundry Operations Manager, was busy with installation of afterburner. Also, Mr. Jason Conti (Phone: 313-234-7177; Cell: 586-419-9211; Fax: 313-

234-2800; E-mail: jConti@Foley.com), Foley & Lardner, LLP, Attorneys-at-Law, Detroit, MI 48226-3489, was present to assist with legal matters.

About February 2019, Mr. Nicolo Riccobono (Phone: 248-349-5230-ext. 215; Cell: 248-635-6710; Fax: 248-349-0244; E-mail: nRiccobono@TemperForm.com), Director, Manufacturing Operations, moved from Manufacturing to Sales and retired about February 2020. Besides, about December 2018, Mr. Brad H. Rolfe (Phone: 248-349-5230-ext. 212; Cell: 248-613-7394; Fax: 248-349-0244; E-mail: bRolfe@TemperForm.com), CEO, Separated from Temperform per Ms. April Jewell (248-349-5230-ext. 201), HR Manager.

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, etc. industries. Temperform has approximately 50 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. Currently (2018-present), Temperform operates two ten-hour shifts (20 hours, 4:00 am thru 12:30 am) per day with Friday off. Not all hours, molten metal pouring, sand burn-off, etc. take place.

About January 15, 2020, C. A. Lawton Company (300 employees, 400-30,000 pounds larger gray & ductile iron castings) of De Pere, WI, and Temperform (50 employees,10-6,000 smaller steel and stainless-steel castings) of Novi, MI, merged to create new specialty metals platform. Mr. Albritton will continue to be the president of Temperform of Novi.

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 (2,200-3000 ºF) 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. The sand is separated and recycled / reused upon subjecting the sand to reclamation process including resin burn off. Make-up sand is added to make up 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 burn off due to high temperatures at an area near molten metal (up to 3-4 inches from molten metal).

At outside surface of sand mold, in the beginning especially, VOC are emitted via evaporation and migration through porous sand due to lower temperatures (≈ 200-600 ºF). Mold sand contains about 1 percent resins and binders. The emissions, due to melting, pouring and cooling operations, are controlled by two (2) identical 40,000 CFM wet scrubbers (EUSCRUBBER1 & EUSCRUBBER2) by condensation (VOC) and capture & encapsulation into water particles (PM). The packed bed scrubbers have packing material to enhance gas liquid contact surface area. Scrubbers use local well water. There are two (2: one 500-gallon tank and one 300-gllon tank) preliminary tanks before one large (≈ 35,000 gallon) settling tank. The particulates are allowed to gravity-settle in settling tank (two [2] preliminary tanks and one [1] settling tank). Two (2) carbon adsorption units (about 400 gallons of carbon per unit) remove organic compounds from water. 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. After filtration

to remove suspended particulates, liquid phase carbon adsorption is used. Two scrubbers, located side by side, draw air from the entire plant. 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 ($A = \pi D^2 / 4$ [ft^2] & Q [cfm] = A [ft^2] * v [ft/min]).

Three baghouses are used to control sand particulate emissions:

1. EUBAGHOUSE1: 8,000 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.

2. EUBAGHOUSE2: 8,000 CFM baghouse for cleaning and finishing system. Large particles are removed by one cyclone. Baghouse2 is used for the cleaning and finishing of the molds.

3. EUBAGHOUSE3 (212 bags): 13,000 CFM baghouse for sand reclamation system.

All baghouses use pulse jet mechanism to clean bags of sand cake. Five furnaces, one burn-off oven and three baghouses are present. Sand burn-off oven also uses this baghouse (EUBAGHOUSE3). Ambient air is used as dilution and cooling air to reduce the temperature (200-300 ºF) for the baghouse (EUBAGHOUSE3).

During the FY 2020 inspection (March 5, 2020), EUBAGHOUSE1 (no cyclone) & EUBAGHOUSE3 were not operating as the processes were not operating.

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

As stated above, EUBAGHOUSE3 serves sand reclamation. Usually, molds are broken the following day to allow them to cool. Sand is pneumatically conveyed to 50-ton tank. 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. Burn-off furnace uses the same baghouse (No.3). Burn-off occurs at ≈ **1,300 ºF**. It is **NOT** equipped, although it should be, to control fumes, with a secondary combustion unit operating at ≈ 1400 ºF with proper residence time. Hence, burn-off oven that operates on and off, mostly morning hours from 5:30 am to 1 pm, may be a significant source of odor.

However, an afterburner is being installed (March 2020) to resolve odor issues and the May 21, 2019, violation. Also, the pouring process capture system improvements and replacement of the scrubbers with baghouse is being done.

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.

During the FY 2020 inspection (March 05, 2020), EUBAGHOUSE3 was not operating as final connections were being made for already installed afterburner.

While burn-off oven (**≈ 1,300 ºF)** is equipped with four (4) burners, afterburner or thermal oxidizer (**1,400-1,500 ºF)** 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 (**≈ 1,500 ºF)** exhaust gases via venturi to cool air to **≈ 200** ºF to protect the baghouse (EUBAGHOUSE3).

As stated above, Temperform issued a purchase order ($26,000) on July 07, 2019, for an afterburner (secondary combustion chamber) to control fumes from the burn-off oven. In addition, Temperform hired Apex (about July 2019, supported by Apex's private equity owners Sentinel Capital Partners, Apex of Rockville, Maryland purchased Bureau Veritas) to review the processes & emissions (quality & quantity) and to revise the existing permit (PTI No. 60-00B ➔ PTI No. 60-00C) to include afterburner for burn-off oven, replace scrubbers with baghouses, install five (5) emissions capture devices to replace existing entire plant capture, increase stack height & exit velocity by tapering (to reduce discharge cross-sectional area) the stack at exit point, etc. Apex (Bureau Veritas) will conduct a stack test to characterize current emissions. Moreover, the modified permit may require stack test. Further, I recommended activated carbon injection into the baghouse to control odor from the capture devices. An afterburner (secondary combustion chamber) with no heat recovery, for burn-off oven, has already (March 2020) been installed but final connections are being made.

PTI No. 60-00B (to be revised to 60-00C)

Emission Units:

Emission Unit ID	Emission Unit Description	Stack Identification
EUSCRUBBER1	Melting, pouring and cooling operations equipped with 4 electric induction furnaces, pour station, ladle drying station, heaters, and mold spray. This emission unit is controlled by a 40,000 CFM wet scrubber	SV001
EUSCRUBBER2	Mold/core preparation, melting, pouring and cooling operations equipped with 4 core machines, 4 shell molding machines, pour station, casting cooling tunnel, heaters, mold spray. This emission unit is controlled by a 40,000 CFM wet scrubber	SV002
Two identical packed bed scrubbers are equipped with **plastic packings** to increase gas-liquid contact surface area. The scrubbers will be replaced by a baghouse followed by HEPA cartridge filter system.		
EUBAGHOUSE1	Sand silo, sand return hopper and handling system controlled by a 8,000 CFM baghouse	SV004

Emission Unit ID	Emission Unit Description	Stack Identification
EUBAGHOUSE2	Cleaning and finishing system with two blast booths controlled by cyclones and an 8,000-CFM baghouse	SV003
EUBAGHOUSE3	Sand reclamation system controlled by a 13,000 CFM baghouse	SV005
Each baghouse is equipped with pulse-jet air mechanism to clean dust cake from bag surfaces. BH#3 serves just (March 2020) installed afterburner (≈1500 °F) and fluidized sand burn-off oven ((≈1300 °F). Hot exhaust gases are cooled ((≈200 °F) with ambient air via use of venturi.		
Changes to the equipment described in this table are subject to the requirements of R336.1201, except as allowed by R336.1278 to R336.1290.		

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Flexible Group ID	Emission Units Included in Flexible Group	Stack Identification
FGSCRUBBERS1/2	EUSCRUBBER1 EUSCRUBBER2	SV001 SV002
FGFACILITY	All equipment at the facility including equipment covered by other permits, grand-fathered equipment and exempt equipment.	

EU-BAGHOUSE1-3

Magneheilic static pressure drop monitoring devices are installed for properly operating baghouses (PTI No. 60-00B, EU-BAGHOUSE1, 1.2 & 1.3; EU-BAGHOUSE2, 2.2 & 2.3; EU-BAGHOUSE3, 3.2 & 3.3: operate properly and equip with ΔP gauge). The pressure drop displays are present but not recorded.

BAGHOUSE3 serves fluidized bed burn-off oven and newly installed afterburner. BAGHOUSE2 is equipped with a cyclone to remove large particles and hence reduce load on the baghouse. Hot gases are cooled using ambient air before delivering to the baghouse (BAGHOUSE3), which collects mostly dirt and fines from the fluidized bed burn-off oven.

FG-SCRUBBERS1/2

If 18,913 tpy of sand production limit (FGSCRUBBERS1/2, 4.2) is met VOC limit is deemed to have been met (PTI No. 60-00B, FGSCRUBBERS1/2, 4.1c limit: 36.14 tpy VOC). The emissions are based upon an emission factor of 0.28 pounds of VOC per ton of iron poured (PTI No. 60-00B, FGSCRUBBERS1/2, 5.2).

CY 2019:1,403 tons of metal poured and per year (PTI No. 60-00B, FGSCRUBBERS1/2, 4.2 limit: 18,913 tons of mold and core per year (sand)). 1 ton of metal ≈ 4 tons of sand.

The scrubbers are equipped liquid flow monitoring devices(PTI No. 60-00B, FGSCRUBBERS1/2, 4.3). However, flow readings are displayed only but not logged. During the March 05, 2020, inspection Scrubber No. 2 had 320 gallons per minute liquid water flow. Scrubber No. 1 was not operating (0 gpm). Liquid-to-gas flow ratio must be monitored for proper operation.

It may be noted that neither melting nor pouring nor reclamation using burn-off oven was going on during the inspection.

A packed bed water scrubber (FGSCRUBBERS1/2) is not a good control system for VOC (odor) and particulate matter (PM), especially PM<10µm, vis-à-vis thermal oxidizer for VOC & odor and baghouse for PM.

FG-FACILITY

CY 2019:1,403 tons of metal poured and per year. Based upon 2.8 pounds of VOC per ton of ton of iron poured, 2 tons of VOC per year are emitted (PTI No. 60-00B, FG-FACILITY, 5.1-2:).

Temperform submitted February 2001 malfunction abatement plan (MAP) (PTI No. 60-00B, FG-FACILITY, 5.3: The permittee shall develop and submit a malfunction abatement plan (MAP)).

MAP is outdated. PTI No. 60-00B is not reviewed and written properly and hence needs to be revised.

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).

Conclusion:

VN is **not** resolved yet. Numerous odor complaints are received by AQD. Installation and operation of an afterburner and other improvements may resolve odor issues.

FYI: Mike Depa, Toxicologist, E-mail (Depa, Michael (EGLE) DEPAM@michigan.gov; Tue 8/13/2019 9:28 AM)

The monomers and pyrolysis products of the polymers of this sand-mold resin system are toxic to the lungs, and may cause asthma and exacerbation of pre-existing asthma. The most toxic component of pyrolysis is methylene diphenyl diisocyanate (MDI) (CAS No. 101-68-8). There are also a large number of other pollutants that are expected from pyrolysis that are irritating to the respiratory tract. The initial threshold screening level (ITSL) for MDI is 0.6 ug/m3, annual averaging time. A

short-term ITSL has not been finalized for MDI; however, a surrogate acute ITSL of 5 µg/m³ with 8-hr averaging time should be used to evaluate emissions from this source.
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Without quantitative exposure estimates of ambient air impacts of isocyanates I cannot assess the potential health risks of emissions from this facility. However, I recommend that no open-door fugitive emissions be allowed from this source.

Let me know if you would like to discuss this matter further.

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 _____ DATE September 30, 2020 SUPERVISOR _____