

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

B735759534

<b>FACILITY:</b> TEMPERFORM LLC		<b>SRN / ID:</b> B7357
<b>LOCATION:</b> 25425 TRANS X, NOVI		<b>DISTRICT:</b> Warren
<b>CITY:</b> NOVI		<b>COUNTY:</b> OAKLAND
<b>CONTACT:</b> Blake Albritton , Director of Engineering and Quality Assurance		<b>ACTIVITY DATE:</b> 06/21/2021
<b>STAFF:</b> Iranna Konanahalli	<b>COMPLIANCE STATUS:</b> Compliance	<b>SOURCE CLASS:</b> SM OPT OUT
<b>SUBJECT:</b> Synthetic Minor MACT 5E CMS FY2021 scheduled inspection of Temperform, LLC, 25425 Trans-X Road, Novi, Michigan 48375		
<b>RESOLVED COMPLAINTS:</b>		

**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 ( $\approx$  80,000 tons of sand) per year; 1 ton of metal melt  $\equiv$  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, a small one-product family-owned business, based upon the property documents, before Temperform was formed (1970) and Temperform acquired it. 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 has recently (about August 15, 2021) submitted an application to 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 <  $\approx$  80,000 tons of mold and core (sand) per year (1 ton of metal melt  $\equiv$  4 tons of sand).** The revised permit will include an afterburner for sand reclamation resin burn-off oven, recently (2021) rebuilt & repaired two identical scrubbers, etc. As a replacement to the scrubbers (2) the planned installation of a filter system, a baghouse followed by HEPA filters, has been cancelled due to high cost and decreased business.

**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 November 10, 2020, VN response letter. Blake Albritton’s e-mail ( Wed 5/26/2021 12:00 PM) states the current project status:

1. Scrubbers – the replacement fans and ductwork were installed in October/November 2020 and are fully operational.
2. Thermal Reclaimer 5<sup>th</sup> burner/after burner – has been programmed and commissioned by the OEM, April 2021. Currently running, but temp reduced (1250° F) from optimal running temp to avoid damaging bags in the dust collector. New higher temperate bags have been ordered and are on the way. Once installed, temp will be set in the plenum to 1350degF to start. New bags will be installed by end June 2020.

3. Stack height and reduction of x-sec area – Hastings Environmental is working on calculations and a feasibility study. Study should be complete in June.
4. Permit to Install RevC – Review of draft permit application scheduled for Fri 5/28 at 1130a.
5. 8000cfm baghouse on mechanical reclamation and sand transport – removed from service. New 12000cfm collector being installed this week. RevC permit will reflect the new unit.

**PTI revision:** Temperform submitted an application for renewal of the existing permit (PTI No. 60-00B to PTI No. 60-00C) about August 15, 2021.

**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 were operating. Not all hours, pouring molten metal takes place. Also, not all hours, resin burn-off takes place. Currently (2021), one 10-hr shift per day due to labor shortage.

On June 21, 2021, I conducted a level-2 **Synthetic Minor MACT 5E CMS FY2021 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.

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. 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. In CY 2018, Temperform operated two ten-hour shifts (20 hours, 4:00 am thru 12:30 am) per day with Friday off. However, in CY 2021, Temperform is operates only one 10-hour shift due to COVID-19 and labor shortage. 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. Currently (June 2021) Mr. Albritton's title is CTO.

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) 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 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 (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 (2021) 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. Scrubbers use local well water. There are two (2: one 500-gallon tank and one 300-gallon tank) preliminary tanks before one large ( $\approx 35,000$  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<sup>2</sup>] &  $Q$  [cfm] =  $A$  [ft<sup>2</sup>] \*  $v$  [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. Exhaust from mechanical reclaimer (where sand particles are shaken and collected below a screen separator) and pneumatic conveyer are ducted to this BH1. New 12000cfm baghouse is being installed to replace 8000cfm baghouse. Per the August 2021 PTI application, existing : 8,000 CFM BH1 (pneumatic sand conveyor and mechanical reclamation) will be replaced with a 12,000 CFM Murphy-Rodgers MRJ-SE-1298-RAL continuous self-cleaning dust collector. This unit services the sand silo, sand return hopper, and sand handling system.

1. EUBAGHOUSE2: 8,000 CFM baghouse for cleaning and finishing system. Large particles are removed by one cyclone. Baghouse2 is used for the cleaning (cleaning room, arch booth) and finishing of the molds.
1. EUBAGHOUSE3 (212 bags): 13,000 CFM baghouse for sand reclamation system. The bags will be upgraded to high temperature bags such that afterburner, for resin burn-off unit to reclaim sand, can be operated at 1350 °F. Afterburner started operating about April 19, 2021, at 1250 °F in interim. When high temperature bags become operational, it will be operated at the manufacturer recommended temperature of 1350 °F.

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 °F) for the 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. Before the change, Temperform used 1.8-2.5% binder in the sand. After the change, Temperform uses 1% binder in the sand. 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.

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).

During the inspections, burn-off was occurring at  $\approx 1,149$  °F (FY20) and  $\approx 1,149$  °F with **afterburner at 1,252 °F (FY20)**. About March 2020, Temperform installed a secondary combustion unit (afterburner) operating at  $\approx 1250$  °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 was expected to operate at 1350 °F. This operating temperature will be verified during a next inspection.

During the FY 2021 inspection:

- Photophilic pressure reading = 0.4 inch of water
- Afterburner temperature = **1,252 °F**

- Temperature of exhaust discharge to ambient air from BH3 = 133 °F

However, 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. Also, as stated above, high temperature bags have been installed in July 2021.

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 ( $\approx 1,500$  °F) exhaust gases via venturi to cool air to  $\approx 200$  °F 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. Installed the afterburner in March 2020 and started operating in April 2021; the delay was due to COVID-19 cross-border (US-Can) issues. 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  $\rightarrow$  PTI No. 60-00C) to include afterburner for burn-off oven, update scrubbers, 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 if and when installed to control odor from the capture devices. The baghouse project has been cancelled and the scrubbers (2) and the capture systems have repaired and upgraded. An afterburner (secondary combustion chamber) with no heat recovery, for burn-off oven, has already (March 2020) been installed but final connections were made in April 2021 to start operating. The operating temperature will be 1350 °F when high temperature bags will be installed.

**PTI No. 60-00B (to be revised to 60-00C per the August 2021 PTI application # APP-2021-0207)**

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 <b>plastic packings</b> to increase gas-liquid contact surface area.		
EUBAGHOUSE1	Sand silo, sand return hopper and handling system controlled by a 8,000 CFM baghouse	SV004
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 ( $\approx 1500$ °F) and fluidized sand burn-off oven ( $\approx 12300$ °F). Hot exhaust gases are cooled ( $\approx 200$ °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.		

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

Magneheilig 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  $\Delta P$  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 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  $\approx$  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.

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. During the June 21, 2021, inspection Scrubber No. 2 had 332 gallons per minute liquid water flow. Scrubber No. 1 display was not accurate.

Unlike the current permit, the revised permit must require data logging regarding the scrubber flow rates. **AQD has received** PTI Application No. of APP-2021-0207.

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<10 $\mu$ m, vis-à-vis thermal oxidizer for VOC & odor and baghouse for PM. Per my reasonable estimate, up to 80% of VOC / odors are emitting from the burn-off process.

## 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: ).

**CY 2020: 961** tons (1,922,653 pounds) of metal poured per year. Based upon 2.8 pounds of VOC per ton of ton of iron poured, 1.35 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 upon approval of PTI App # APP-2021-0207 (PTI No. 60-00C).



## 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:

VNs are **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/m<sup>3</sup>, annual averaging time. A short-term ITSL has not been finalized for MDI; however, a surrogate acute ITSL of 5 ug/m<sup>3</sup> 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 J S Kennahall.

DATE August 26, 2021 SUPERVISOR Joyce JH