

FY2018 Insp-

SM CMS

DEPARTMENT OF ENVIRONMENTAL QUALITY  
AIR QUALITY DIVISION  
ACTIVITY REPORT: Self Initiated Inspection

N340945158

FACILITY: ARMALY SPONGE COMPANY		SRN / ID: N3409
LOCATION: 1900 EASY ST, WALLED LAKE		DISTRICT: Southeast Michigan
CITY: WALLED LAKE		COUNTY: OAKLAND
CONTACT: Mr. Gilbert C. Armaly , VP		ACTIVITY DATE: 06/26/2018
STAFF: Iranna Konanahalli	COMPLIANCE STATUS: Compliance	SOURCE CLASS: SM OPT OUT
SUBJECT: FY 2018 SM CMS inspection of Armaly Sponge Company ("Armaly"), DBA Armaly Brands,		
RESOLVED COMPLAINTS:		

**Armaly Sponge Company (N3409)**

DBA Armaly Brands

1900 Easy Street

P.O. Box 611

P.O.: Walled Lake, Michigan 48390-0611

Plant Location: Commerce Twp., Michigan 48390-3220

Phone: (248) 669-2100

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Permit-to-Install No.: 307-92A dated May 15, 2007 (ROP & NESHAP / MACT Synthetic Minor or ROP opt-out); administrative PTI revision on June 15, 2007, to correct SRN.

PTI voids: 307-92 (5/15/2007). The PTI was revised to incorporate the MACT and ROP Synthetic Minor conditions.

Permit-to-Install Modification: PTI No. 307-92 (neither VOC nor HAP limit except material limits: SC 15 limits: 500 lbs. / yr. catalysts and 500 lbs. / yr. surfactants) → PTI No. 307-92A (SC1.2 limit: 788,400 linear feet of slab stock per year, SC1.3 limit: 473,040 pounds of catalyst per year, SC1.5 limit: 1,620 pounds of cleaning solvent per year and SC 1.1a limit: 5 tpy Aggregate HAPs) in order to resolve Nov 15, 2006, violation and to become ROP & NESHAP / MACT Synthetic Minor Source (Area MACT: SC 1.1a maximum 5 tpy Aggregate HAPs).

VN: AQD issued November 15, 2006, Violation Notice (VN) for failing to submit a complete ROP application, for failing to comply with Major Source NESHAP/ MACT III and for exceeding raw material usage limits for catalysts (PTI No. 307-92, actual 7,500 Vs limit 5000, lbs. per yr.) and surfactants (PTI No. 307-92, actual 24,750 Vs limit 5000, lbs. per yr.). This VN was resolved via the PTI modification: PTI No. 307-92 → PTI No. 307-92A.

Not subject to NESHAP/ MACT III: NESHAP/ MACT major source opt-out via PTI No. 307-92A: NESHAP / MACT standards for flexible foam production facilities (40 CFR, Part 63, Subpart III—National Emission Standards for Hazardous Air Pollutants for Flexible Polyurethane Foam Production, Page 53996, Federal Register / Vol. 63, No. 194 / Wednesday, October 7, 1998 / Rules and Regulations / Final Rule).

**Subject to NESHAP/ MACT OOOOOO (60) area source: 40 CFR Part 63, National Emission Standards for Hazardous Air Pollutants for Area Sources: Acrylic and Modacrylic Fibers Production, Carbon Black Production, Chemical Manufacturing: Chromium Compounds, Flexible Polyurethane Foam Production and Fabrication, Lead Acid Battery Manufacturing, and Wood Preserving; Final Rule. Page 38864, Federal Register / Vol. 72, No. 135 / Monday, July 16, 2007 / Rules and Regulations.**

**Area Source NESHAP / MACT 60: 40 CFR Part 63, Subpart OOOOOO (60)—National Emission Standards for Hazardous Air Pollutants for Flexible Polyurethane Foam Production and Fabrication Area Sources. Page 38910, Federal Register / Vol. 72, No. 135 / Monday, July 16, 2007 / Rules and Regulations.**

**Armaly is an existing MACT 60 area source (construction before Apr. 4, 2007). Major MACT sources are defined as those that emit or have the potential to emit at least 10 tons per year of any single HAP or 25 tons per year of any combination of HAPs. A non-major or area HAP source is a source that has actual and potential annual emissions less than 10 tons of any single HAP and less than 25 tons of all HAP combined.**

**Isocyanates MDI & TDI: Armay uses TDI (two TDI tanks and one reactor mixing head)**

**Isocyanate is the functional group formula R-N-C-O. Organic compounds containing this group are known as isocyanates. Commonly used isocyanates are: MDI (methylene diphenyl di-isocyanate,  $C_{15}H_{10}N_2O_2$ , CAS # 101-68-8, PEL permissible = 0.02 ppm =  $0.2 \text{ mg/m}^3$ , IDLH immediate harm =  $75 \text{ mg/m}^3$ ) and TDI (toluene di-isocyanate,  $C_9H_6N_2O_2$ , CAS # 584-84-9, PEL permissible = 0.02 ppm =  $0.14 \text{ mg/m}^3$ , IDLH immediate harm = 2.5 ppm)**

**TDI / MDI is highly toxic compound and MIOSHA monitors a worker's breathing zone concentration periodically. About November 2015, at Armaly, MIOSHA sampled breathing zone air. On November 18, 2015, breathing zone air for Robert Gale showed 0.00012 ppm TDI.**

**Methyl isocyanate (MIC,  $CH_3NCO$ ,  $H_3C-N-C-O$ , CAS # 624-83-9, PEL permissible = 0.02 ppm =  $0.05 \text{ mg/m}^3$ , IDLH immediate harm = 3 ppm) was involved in 1984 Bhopal disaster causing death of nearly 4,000 people due to run-away exothermic chemical reaction (325 calories of heat release per gram of MIC) with an accidental contact with water. Due to boiling MIC (heat from enthalpy of chemical reaction) pressure build-up in storage vessels, the vessels ruptured resulting in releases of boiling MIC vapors to ambient air. Methyl isocyanate (MIC) is extremely toxic.**

**MIC demonstrates a number of dangerous physical properties. Its boiling point (BP) at atmospheric conditions is  $39.1^\circ\text{C}$ , and it has a vapor pressure (VP) of 348 mm Hg at  $20^\circ\text{C}$ . The vapor is about twice as heavy as air, ensuring that the vapors will stay close to the ground once released. MIC reacts exothermically (325 calories of heat release per gram of MIC) with water. MIC storage tanks are typically refrigerated to prevent this problem.**

**Carbon canisters (3 55-gallon canisters): Calgon Carbon Corporation (Phone: 866-225-4660), Pittsburgh, PA 15230-0717, supplies the canisters that last over five years based upon emission rate and adsorption capacity.**

On June 06, 2018, I conducted a level-2 self-initiated **FY 2018 SM CMS inspection** of Armaly Sponge Company ("Armaly"), DBA Armaly Brands, ("Armaly" or "the company"), a flexible foam cleaning products manufacturing company, located at 1900 Easy Street, P.O.: Walled Lake, Michigan 48390-0611 (P.O. Box 0611) / Plant Location: Commerce Twp., Michigan 48390-32220. 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; Michigan Department of Environmental Quality, Air Quality Division (MDEQ-AQD) administrative rules; PTI No. 307-92A; and NESHAP / MACT OOOOOO / 60.

Armaly was persistently trying to opt out of MAERS but could not due to the ROP opt-out permit (PTI No. 307-92A). However, subsequent to AQD's denial of such requests, Armaly regularly submits MAERS.

During the inspection, Mr. Gilbert C. Armaly (Phone: (248) 669-2100; Fax: (248) 669-3505; gcArmaly@ArmalyBrands.com) Vice President, assisted me. Mr. John W. Armaly, Jr., President was not present and was on vacation. Armalys are brothers. Son John W. Armaly, III, Plant Manager, was present and did not participate as well.

Armaly manufactures polyurethane flexible foam cleaning products. The products are used at homes, car wash facilities, etc. Armaly operated, prior to May 15, 2007, its sponge manufacturing process under Permit-to-Install No. 307-92 dated June 25, 1992. The permit had neither Volatile Organic Compounds (VOC) nor Hazardous Air Pollutants (HAP) limit; it contained only yearly raw material usage limits. As a consequence of November 15, 2006, letter of violation (LOV), now known as Violation Notice (VN), Armaly revised Permit-to-Install No. 307-92 to Permit-to-Install No. 307-92A dated May 15, 2007 (ROP & NESHAP / MACT major source opt-out). The revised permit contains an aggregate HAP limit of 5 tons per year (PTI No. 307-92A, SC FG-FACILITY, I.1a). The HAP limit allows Armaly to opt-out of Renewable Operating Permit (ROP) program and major source NESHAP / MACT III standards for **Flexible Polyurethane Foam Production**. However, Armaly is subject to Area Source NESHAP / MACT 60, 40 CFR Part 63, Subpart OOOOOO—National Emission Standards for Hazardous Air Pollutants for Flexible Polyurethane Foam Production and Fabrication Area Sources (Page 38910, Federal Register / Vol. 72, No. 135 / Monday, July 16, 2007 / Rules and Regulations).

Major MACT sources are defined as those that emit or have the potential to emit at least 10 tons per year of any single HAP or 25 tons per year of any combination of HAP. A non-major, or area HAP, sources are defined as those that emit or have the potential to emit annual emissions less than 10 tons of any single HAP and less than 25 tons of all HAP combined.

The plant is divided into three sections:

1. Flexible Polyurethane Foam Production Process – VOC emissions are discharged via two (2) reaction tunnel stacks (SV-1 & SV-2)
2. Foam Fabrication (cutting, trimming, bonding to other substrates, etc.) - particulates are released to in-plant environment.
3. Finishing and Packaging - particulates are released to in-plant environment.

The production process results in VOC and HAP emissions; fabrication and packaging have practically no emissions except some indoor particulate matter emissions.

The manufacturing process includes chemical storage room. While TDI (2,4-toluene diisocyanate) and resins (polyols) come in bulk tank trucks, other chemicals (catalyst, pigments, surfactants) come in 55-gallon drums. Pigments may also come in 5-gallon containers.

There are two TDI ( $C_9H_6N_2O_2$  aromatic with benzene ring) tanks: one 7,000-gallon tank installed in CY2009 and one 6,000-gallon tank installed in CY1983. While 2,4-toluene diisocyanate is stored in 7,000-gal tank, 2,6-toluene diisocyanate is stored in 6,000-gal tank; 2,4 [CAS 584-84-9] and 2,6 [CAS 91-08-7] isomers (same chemical formula but different structural formula) are commercially important. In addition, there are three (3) resin tanks and about a half dozen (6) process tanks. Until CY2009, one older 6,000-gallon TDI tank was equipped with a vapor balance system, aka vapor return line, which was used during loading from tank trucks. Due to high-pressure drop ( $\Delta P$ ), the vapor balance system was not working properly. High pressure drop ( $\Delta P$ ) may be due inert nitrogen blanket in truck tanker. Nitrogen blanket prevents fire and explosion hazard (TDI: Flash Point FP = 261 °F and Flammability Range FR = 0.9% [LEL] - 9.5% [UEL], PEL [permissible] = 0.02 ppm = 0.14 mg / m<sup>3</sup>, due to low PEL many companies monitor TDI continuously in in-plant environment for worker safety, Armaly depends upon MIOSHA breathing zone sampling). Therefore, in 2009, the vapor balance system was replaced by two Carbon Canisters (Carbon Adsorption System): one canister for each TDI tank. That is, each TDI tank has a dedicated 55-gallon capacity carbon canister to control VOC / HAP emissions. In addition, there is one carbon canister for 100-gallon process tank. In all, there are three (3) 55-gallon carbon canisters. According to Calgon Company's calculations 55 gallons is enough capacity for five years. Carbon canisters are tested once a year for adsorption break-through using TDI monitor, a hand-held device. According to Calgon Company, a 55-gallon carbon canister has adsorption capacity of 60 pounds of TDI. Hence, Armaly may be able use weight gain as a guidance to determine carbon break-through. All 55-gallon carbon canisters discharge exhaust to outside ambient air upon adsorption / removal of VOC.

About May 15, 2018, Armaly received three (3) 55-gallons carbon canisters from Calgon Company. However, as of June 2018, these were not installed.

Carbon adsorption is gas-solid contact mass transfer operation that is exothermic (release of heat). Activated carbon is highly porous (micro-pores) providing high surface area for adsorption: over 5,000 square feet per gram of activated carbon. Activated carbon may be regenerated via desorption (stripping) using heat (steam or hot gases) or vacuum. Solutes (pollutants) in gas stream give up kinetic energy in the form of heat (exothermic) and become bound to carbon pores via Van Der Waals forces. Due to exothermic (release of heat) nature of adsorption, low operating temperatures favor adsorption (adsorption isotherm). Armaly's adsorption units do not have heat generation problem due to low VOC laden exhaust volume and concentration.

During FY 2014 inspection Mr. Armaly stated that each canister gained about 5 pounds in the entire period since 2009. During FY 2018 inspection, canister weight gains were not determined; it is estimated that the weight gain is less than 20 pounds. Based upon December 31, 2016 readings, Canister1 gained 0.5 pounds per year and rest of the canisters (Canister2 & Canister3) gained immeasurable pounds. Hence, most of carbon capacity is still

available for adsorption. As of May 2018, as stated before, three canisters have arrived and stored on site.

From the raw material storage tanks (5 above ground tanks) and 55-gallon drums, the reactant components —TDI, resins (polyols), catalysts, surfactants, pigments, etc.— are metered (flow rate) and pumped to a sealed mix-head, where all reactants are mixed to practically homogenous concentration level, and poured over a release paper spread over an exothermic reaction tunnel. The foam release paper is spread on a conveyor belt, which is under a tunnel facilitating emissions transport via stacks (2:SV-1 & SV-2). An exothermic (releasing heat) chemical reaction, involving TDI, polyols (resins), pigments, surfactants, water, etc., takes place in presence of a proprietary catalyst. Curing to solidify into a foam sheet takes place under the tunnel using heat of reaction (exothermic); no additional heat is supplied. The curing temperature never exceeds about 150 degrees Fahrenheit. The product is known as a polyester foam slab. The product is allowed to cool for a day before cutting. Foam buns are cut to desired size. Cutting and trimming foam wastes are recycled into other products such as carpet padding.

During the previous inspection, Mr. Gilbert Armaly stated that exhaust fan serving the polymerization reaction tunnel would be replaced with an equivalent or better fan: about same exhaust flow rate (acfm) but higher efficiency to save energy. As of June 2018, the energy saving fan has not been replaced.

There are different types of foams: polyurethane, polyether, polyvinyl. Both polyester and polyether are polyurethane foams. Armaly makes polyester foams. Furniture foams are polyether. Armaly does not make furniture foam at all.

Only HAP at this site is TDI, which is received via tank trucks. Per Mr. Gilbert Armaly, in CY2009, a carbon adsorption system (two 55-gallon canisters: one for each TDI tank) replaced a vapor balance system (aka a vapor return line). HAP ABA (auxiliary blowing agents), or methylene chloride, is not used at this site; water is used for cleaning. Soap and ethanol (denatured ethyl alcohol for laminator) are occasionally used to clean process equipment and tools. To prevent leaks, seal-less pumps (magnetic drive) for TDI service are used. Methylene chloride (MeCl) is never used for cleaning.

At this site, slab-stock, aka continuous pour, aka one-shot, flexible foam product is made. Only low index foam products are made. Methylene chloride, a commonly used HAP ABA in the industry, is not used at Armaly. Only foam products made here are polyester; polyethers are not made. Polyether foams are used in furniture industry.

On October 7, 1998, US Environmental Protection Agency (EPA) promulgated federal NESHAP / MACT standards for flexible foam production facilities (40 CFR, Part 63, Subpart III—National Emission Standards for Hazardous Air Pollutants for Flexible Polyurethane Foam Production, Page 53996, Federal Register / Vol. 63, No. 194 / Wednesday, October 7, 1998 / Rules and Regulations / Final Rule). The MACT standard applies only to a flexible foam production facility located a plant site that is a major source (40 CFR, Part 63, Subpart III, 63.1290(a)(3)). In addition, a major MACT source is required to obtain a RO permit. Major MACT sources are defined as those that emit or have the potential to emit at least 10 tons per year of any single HAP or 25 tons per year of any combination of HAP. Armaly is not a major source as of May 15, 2007, upon approval of PTI No. 307-92A.

On July 16, 2007, US Environmental Protection Agency (EPA) promulgated federal NESHAP / MACT standards for area source of flexible foam production facilities (40 CFR Part

63, Subpart OOOOOO (60)—National Emission Standards for Hazardous Air Pollutants for Flexible Polyurethane Foam Production and Fabrication Area Sources. Page 38910, Federal Register / Vol. 72, No. 135 / Monday, July 16, 2007 / Rules and Regulations). Final Preamble and Rule as published in the Federal Register on July 16, 2007 (72 FR 38864) may be obtained from <http://www.epa.gov/ttn/atw/area/fr16jy07.pdf>.

Based upon USP EPA's draft guidance document for Flexible Polyurethane Foam Production and Fabrication NESHAP (40 CFR Part 63, Subpart OOOOOO §63.11414 through §63.11420), as Armaly does not use methylene chloride as an ABB (auxiliary blowing agents), it is subject the following:

1. Submit the Initial Notification by November 13, 2007. Coincidentally, I conducted a schedule annual inspection on November 13. Mr. Armaly prepared the notification immediately and hand-delivered to me.
2. Submit a notification of compliance status within 180 days of July 16, 2008, which is compliance date for **existing** (construction before Apr 4, 2007) Slabstock Flexible Polyurethane Foam Production facilities. The draft guidance document is in error regarding this date.
3. Keep records of ABA used. Armaly does not use any HAP-containing ABA.

### **NESHAP / MACT 60 Notifications**

1. On November 13, 2007, AQD received the NESHAP / MACT 60 Initial Notification via the letter dated November 13, 2007.
2. On Jan 10, 2008, AQD received the NESHAP / MACT 60 Notification of Final Compliance Status via the letter dated Jan 8, 2008.

Armaly does not use any methylene-chloride-containing adhesive.

### **Emissions and Material Usage Limits**

Armaly does not have a loop-slitter. Armaly complies with Total HAPs limit (PTI No. 307-92A, SC FG-FACILITY, 1.1a limit: 5 tpy aggregate HAPs) based upon emission factor related to linear feet of foam production.

CY2014: Armaly produced 125,093 linear feet of slab stock (PTI No. 307-92A, SC FG-FACILITY, 1.2 limit: 788,400 linear feet per year); Armaly used 11,336 pounds of catalyst (PTI No. 307-92A, SC FG-FACILITY, 1.3 limit: 473,040 pounds of catalyst per year); Armaly used 1,094 pounds of cleaning solvents (PTI No. 307-92A, SC FG-FACILITY, 1.5 limit: 1,620 pounds of cleaning solvent per year). Armaly did not use during CY2014 any HAP-containing solvent (PTI No. 307-92A, FG-FACILITY, SC1.4 limit: cleaning solvents < 5% HAPs). But, Armaly used 1,094 pounds of denatured ethyl alcohol per year in CY2014.

CY2015: Armaly produced 135,076 linear feet of slab stock (PTI No. 307-92A, SC FG-FACILITY, 1.2 limit: 788,400 linear feet per year); Armaly used 12,654 pounds of catalyst (PTI No. 307-92A, SC FG-FACILITY, 1.3 limit: 473,040 pounds of catalyst per year); Armaly used

1,298 pounds of cleaning solvents (PTI No. 307-92A, SC FG-FACILITY, 1.5 limit: 1,620 pounds of cleaning solvent per year). Armaly did not use during CY2015 any HAP-containing solvent (PTI No. 307-92A, FG-FACILITY, SC1.4 limit: cleaning solvents < 5% HAPs). But, Armaly used 1,298 pounds of denatured ethyl alcohol per year in CY2015.

**CY2016:** Armaly produced 137,715 linear feet of slab stock (PTI No. 307-92A, SC FG-FACILITY, 1.2 limit: 788,400 linear feet per year); Armaly used 12,695 pounds of catalyst (PTI No. 307-92A, SC FG-FACILITY, 1.3 limit: 473,040 pounds of catalyst per year); Armaly used 1,144 pounds of cleaning solvents (PTI No. 307-92A, SC FG-FACILITY, 1.5 limit: 1,620 pounds of cleaning solvent per year). Armaly did not use during CY2016 any HAP-containing solvent (PTI No. 307-92A, FG-FACILITY, SC1.4 limit: cleaning solvents < 5% HAPs). But, Armaly used 1,144 pounds of denatured ethyl alcohol per year in CY2015.

**CY2017:** Armaly produced **146,791** linear feet of slab stock (PTI No. 307-92A, SC FG-FACILITY, 1.2 limit: 788,400 linear feet per year); Armaly used **13,973** pounds of catalyst (PTI No. 307-92A, SC FG-FACILITY, 1.3 limit: 473,040 pounds of catalyst per year); Armaly used **1,154** pounds of cleaning solvents (PTI No. 307-92A, SC FG-FACILITY, 1.5 limit: 1,620 pounds of cleaning solvent per year). Armaly did not use during CY2017 any HAP-containing solvent (PTI No. 307-92A, FG-FACILITY, SC1.4 limit: cleaning solvents < 5% HAPs). But, Armaly used **1,154** pounds of denatured ethyl alcohol per year.

### **Recordkeeping**

Records of the required calculations using a spreadsheet (PTI No. 307-92A, SC FG-FACILITY, 1.6), HAP emissions rates (PTI No. 307-92A, SC FG-FACILITY, 1.7), linear feet production of slab-stock TDI polyurethane foam (PTI No. 307-92A, SC 1.8), catalyst usage (PTI No. 307-92A, SC FG-FACILITY, 1.9), HAP content of cleaning solvents (nil usage, i.e. methylene chloride is not used, PTI No. 307-92A, SC FG-FACILITY, 1.10) and cleaning solvent usage (PTI No. 307-92A, SC FG-FACILITY, 1.11) are kept.

### **Shaper Machines (6)**

Six shaper machines that shape the foam that is cut to desired size for the market are present. The machines produce foam dust. Each machine has its own capture device for particulate matter emissions. The device is Armaly-designed rudimentary cyclone with a hopper to store collected foam dust. There is no exhaust to outside ambient air; i.e. all emissions are in-door.

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

### **VN and Permit Revision (PTI No. 307-92 → PTI No. 307-92A)**

AQD issued Violation Notice dated November 15, 2006, for failure to comply with NESHAP / MACT III, for exceeding the material usage limits (PTI No. 307-92, SC 15 limits: 500 lbs / yr catalysts and 500 lbs / yr surfactants).

On May 15, 2007, PTI No. 307-92 was revised, as a result of the letter of violation dated November 15, 2006, to PTI No. 307-92A to facilitate opt-out of ROP Program and major NESHAP / MACT.

The revision: PTI No. 307-92 (SC 15 limits: 500 lbs / yr catalysts and 500 lbs / yr surfactants) → PTI No. 307-92A (SC1.2 limit: 788,400 linear feet of slab stock per year, SC1.3 limit:

473,040 pounds of catalyst per year, SC1.5 limit: 1,620 pounds of cleaning solvent per year and SC 1.1a limit: 5 tpy HAPs).

### Conclusion

Armaly is in compliance with PTI No. 307-92A. Armaly does not use any HAP-containing ABA. Armaly does not use any methylene-chloride-containing adhesive. Armaly does not use any HAP-containing solvent. Armaly is subject to area source NESHAP/ MACT 000000 (6O) for Flexible Polyurethane Production.

NAME J. Brennan Hall DATE 07/12/2018 SUPERVISOR Joyce St