

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

N506423821

FACILITY: HARMAN CORP		SRN / ID: N5064
LOCATION: 360 SOUTH ST, ROCHESTER		DISTRICT: Southeast Michigan
CITY: ROCHESTER		COUNTY: OAKLAND
CONTACT: Tim Jenkins , Operations Manager		ACTIVITY DATE: 12/04/2013
STAFF: Francis Lim	COMPLIANCE STATUS: Compliance	SOURCE CLASS: Minor
SUBJECT: Scheduled inspection		
RESOLVED COMPLAINTS:		

On December 4, 2013, I conducted an unannounced inspection at Harman Corporation ("Harman") located at 360 South St., Rochester, Michigan. The purpose of the inspection was to determine compliance with the Federal Clean Air Act; Article II, Part 55, Air Pollution Control of Natural Resources and Environmental Protection Act, 1994 Public Act 451; Michigan Department of Environmental Quality, Air Quality Division (MDEQ-AQD) Administrative Rules; and Permit-to-Install (PTI) No. 787-92. Mr. Tim Jenkins, Operations Manager assisted during the inspection.

Harman Corporation produces small to medium miscellaneous plastic parts from plastisol dip molding. Some of the manufactured plastic parts are used in lawn and garden equipment as well as a protective cover for equipment during packaging and shipping. Facility operates one shift per day.

Process Description

Plastisol dip molding uses a heated mold which is dipped in plastisol liquid. A layer of plastisol adheres to the mold, which is then cured and then peeled off from the mold. Heat from the mold attracts the plastisol to the mold. The peeled off cured plastisol is the finished product. Controlling mold temperature and length of dip time determines thickness of the part. Molds used in the process are called mandrels, and referred to as "tools". Mandrels can be customized for a specific project where a particular shape is needed.

The plastic parts are molded in 20 rotary-conveyor mold lines. Each rotary-conveyor mold lines consists of a preheat section, dip tank, curing section, cooling section, and compressed air removal of the molded part from the mandrel.

The mandrel is first preheated to about 500 °F by direct heat using a natural gas fired burner. The mandrel is dipped in the plastisol dip tank for molding. When the mandrel is lifted, a layer of plastisol will remain and stick to the mandrel. The plastisol is cured in an infrared oven at about 350 °F. The product goes through a cooldown zone where it is air cooled before the product is peeled off from the mandrel by a burst of high pressure air.

In addition to the 20 rotary-conveyor mold lines, Harman operates three "rack" mold lines. The mandrels are placed in a rack and production is by batch instead of continuous. The product is cooled by immersing it in water. The finished product is removed manually by using compressed air. The rack mold lines produce larger and more complicated parts.

Plastisol is made up of approximately 57% PVC resins, 40% plasticizers, 2% stabilizers and 1% pigments. The purpose of the plasticizer is to increase the flexibility of the plastic. It also

keeps the mixture at a liquid phase at room temperature. Stabilizers contain Barium and Zinc. Harman purchases the plastisol used at the plant. The two mixers are still occasionally operated if Harman needs to manufacture a special blend of plastisol.

Some parts require a silicon based mold release applied to the mandrel, for easy removal of the manufactured plastic parts. Some of the parts also require printing on the plastic parts. This is done by applying plastisol using silk screen printing or pad printing.

Mandrels are cleaned by abrasive blasting using shot peening equipment. Plastisol dip tanks are cleaned using solvents especially when switching to a lighter colored plastisol.

Plastisol dip molding produces flexible plastic products of different textures and appearance.

Compliance Evaluation

Facility has a permit PTI No. 787-92 for a vinyl dip process consisting of two mixers, 17 molding machines and a printing machine.

It is estimated that 2% of the resin powder is lost as fugitive dust during the mixing phase of plastisol manufacturing. There are no baghouses installed, only roof vents. Since facility now buys plastisol (cheaper to buy than manufacture) and very seldom manufactures plastisol, total suspended particulate (TSP) emissions from mixing are very low. VOC emissions during the mixing process will come from the plasticizer (DIDP (diisodecyl phthalate)). But since DIDP has a low vapor pressure, VOC emissions from mixing will be low.

DIDP is neither a carcinogen nor a Hazardous Air Pollutant. Harman also use some DINP (diisonyl phthalate) as a plasticizer on some applications. DINP is also not a carcinogen or a Hazardous Air Pollutant.

DOP (di-2-ethyhexyl phthalate or dioctyl phthalate) is a carcinogen and a Hazardous Air Pollutant. Harman does not use DOP as a plasticizer.

For plastisol molding and curing, total volatile loss is expected to be 1 to 2% (mostly from the plasticizer) of the plastisol used. Expected emissions are smoke, fumes and some HCl and phthalate ester. HCl comes from the degradation of the plastisol at high temperatures. The permit engineer considered smoke and fumes as TSP emissions. Permit engineer assumed VOC emissions based only on VOC content of plastisol (0.004%).

VOC emission limit for plastisol molding is 0.082 pounds per hour and 0.36 tons per year. Plastisol usage limit is 210 pounds per hour and 1,769,884 pounds per consecutive 12-month period. TSP emission limit for plastisol mixing and molding is 73.85 tons per year.

Staff Comments: During plastisol molding and curing at 350 °F, approximately 1 to 2% of the plastisol is volatilized and emitted as fumes and smoke, mostly coming from the plasticizer. However, the permit engineer categorized emissions as TSP and not VOC. What was considered VOC emissions only were VOC content as specified in the MSDS. That is the reason why the VOC limit is low and the TSP limit is higher.

Since VOC content of plastisol is very low, VOC emissions based on permit engineer's criteria is negligible. Harman complies with VOC hourly and yearly limit. Harman's annual plastisol usage is approximately 1,000,000 pounds, which is below permit limit.

TSP emissions from plastisol dip/cure (which is really VOC emissions) is approximately 10 tons per year, which is below permit limit. This includes TSP emissions from plastisol mixing, which is low since Harman now buys plastisol and only occasionally use the mixers.

VOC emission limit for the printing process is 0.33 pounds per hour and 0.145 tons (290 pounds) per year. Plastisol is used as printing ink. Usage is about 200 pounds per year. Since plastisol has a very low vapor pressure at room temperature, VOC emissions from printing are very low.

Only 17 of the 23 plastisol dip lines are permitted. 4 rotary conveyor mold lines and 2 rack mold lines are exempt. VOC emission from these lines is less than 1000 pounds of noncarcinogens per month for each mold line.

There are no air emissions from the silicon-based mold release.

Miscellaneous solvent cleaning process use about 55 gallons per year, This is exempt under Rule 290.

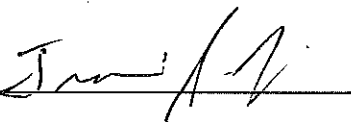
Shot peening process is used to clean the mandrels. This equipment has a baghouse and emit indoors. This is exempt under Rule 285(l)(vi)(B).

I did not notice any odor or smoke or fumes inside the facility.

Emissions from the cure oven from the rotary conveyor lines emit indoors. Emissions from the rack mold lines go through a stack that exhaust outdoors.

I did not notice any visible emissions from any stack or roof vents. This demonstrates compliance with the particulate emission limits in Appendix A of the permit.

NAME



DATE

12-10-13

SUPERVISOR

CJE

