PROJECT OVERVIEW

Project Name:	PPE Assessment for PVC Unit
Company Address:	Westlake Vinyl Corporation, LP 4338 Highway 73 Geismar, Louisiana 70734
Project Date:	June 13, 2017

This document serves as documentation of the PPE Hazard Assessment and Certification, as required by OSHA regulation 29 CFR 1910.132(d)(2).

The hazard assessment was conducted for Westlake Vinyls, Geismar, LA.

Date(s) of Hazard Assessment: June 13 & 14, 2017

Name of workplace evaluated: PVC Unit, Geismar, LA

Person Performing & Certifying Hazard Assessment: Gregory Thorn, OHST; Blaine Ayres, CIH and Terry Andrews, PVC unit operator trainer of Westlake

Summary:

Westlake Vinyls operates a PVC unit that uses Vinyl Chloride Monomer, various chemicals, inhibitors, and hot deionized water as inputs to produce PVC. The processes' main chemicals include Vinyl Chloride Monomer, Polyvinyl Chloride Resin, and various peroxides based on PVC customer product needs. Vinyl Chloride Monomer is supplied by piping to the PVC Unit from the VCM Unit spheres, VCM is pumped to weigh tanks on the Poly System where six reactors are located. Various chemicals, catalysts, and inhibitors, along with VCM and hot deionized water, are charged into the reactors. The reaction produces PVC slurry. The PVC slurry is sent further through the process where it is cleaned and stripped of any remaining VCM. The stripped VCM is refined in the recovery area for reuse. The stripped PVC slurry is sent to the Dryer Feed Tank, which is a holding tank for the Drying System. The PVC Slurry Resin leaves the Dryer Feed Tank and is transferred to the Drying System. The PVC resin slurry is sent through a centrifuge to separate the water and PVC resin. The PVC is then dried in a fluid bed dryer and sent to storage Silos where it is loaded into railcars and trucks for shipment to customers.

Operators work out of a common control room, with assignment to Ground operations, Poly Floor and Rover responsibilities. The process is enclosed, with primary hazards identified as potential exposures, emissions to ambient air may occur due to system failures, maintenance activities, fugitive emissions, human errors and emergency situations. Workers in the facility may be exposed to inhalation to emissions of vinyl chloride vapor which is a known toxic, carcinogen with long-term potential health effects if over the permissible exposure limit of 1PPM. VCM is monitored 24 hours per day within the PVC unit with alarms set to notify personnel in the event of detection. Routine industrial hygiene monitoring is performed on all outside operator positions and vapors controlled to within allowable limits. Control measures include administrative, engineering and personal protective equipment.

The unit has a 98% sulfuric acid day tank and chlorine one ton cylinders used for cooling water treatment. The Sulfuric acid day tank is managed by a vendor. Operator involvement appears to be limited to monitoring levels with little or no contact with the contents.

The unit has another area, demineralization area, where Sulfuric Acid and Caustic (50% Sodium Hydroxide) are generally received by vendor-unloaded truck or container with minimal operator contact.

Initiators are delivered by truck and with assistance of Westlake operations loaded into freezer storage, where temperatures are monitored 24 hours per day by operations through the a software called Aspen on the DCS.

There is a potential for personnel exposure to strong acid or caustic, often at ambient temperatures. These materials represent chemical splash hazards and in some cases are combined with thermal hazards. The splash hazard can be reduced in some instances by ensuring proper connections and following standard operating procedures. Although not thermally rated, the lined and chemical resistant gloves are used for brief sampling episodes and most likely provide adequate thermal alarm time for personal protection.

Goggle-required areas are well defined.

The unit has a caustic, acid demineralization area. Goggles, rubber gloves and a face-shield are utilized for employee protection when maintenance is performed on the tanks and pumps of this area. Signs are posted throughout the area requiring goggles to be worn when entering the demineralization area or if performing routine work.

Job Training Observations (JTOs) are performed by the Lead Operator of each shift monthly to evaluate understanding of the employee's comprehensive application of the procedure. The employee is monitored during SOP work practices and a report is completed and reviewed with the operator making recommendations where needed to ensure proper PPE is utilized and specific step-by-step performance is done correctly.

VCM filter changing is performed weekly and presents a potential liquid VCM exposure hazard. PB-001A, VCM Filters procedure provides steps used to clear the liquid vinyl, by use of steam and air monitoring utilizing VOC detection, hand-held mini-Rae meter, specifically calibrated to detect VCM during the "opening loss" of each reactor to detect residual vinyl from the top, middle and bottom of the reactor. This process is performed every time, before a piece of equipment in vinyl service is opened. An SDS is attached to the SOP as well as review of the PPE matrix which requires an air-supplied respirator, chemical proof gloves, polyethylene coated Tyvek, splash-suit and rubber boots. However, all standard operating procedures and operator training require the complete removal of the liquid splash hazard during equipment preparation to reduce the potential for VCM exposure to personnel. The process of clearing equipment and use of PPE is demonstrated throughout the SOPs including; PC-002A Degas Tank System, PC-003A Slurry Stripper Feed Tank System, PE-014A Waste Water Storage Tank Service.

Chlorine is used at the PVC area for cooling tower water treatment. The chlorine is vendor supplied and managed in one ton cylinders. PVC standard operating procedure PZ019A requires googles, face shield, chemical proof gloves to be used when the hypo-chlorinator delivery system is swapped as chlorine cylinders are emptied. This task is performed about every three (3) months.

In the production of low molecular weight PVC resin, a chain transfer agent can be used to lower the reaction pressure and temperature requirements. 2-Mercaptoethanol (2-ME), also known as BME, is the chemical in use at Westlake for this purpose. 2-ME is a Class B Poison (as it contains hydrogen sulfide) and the PVC SOP PB-026A requires rubber gloves, rubber boots, goggles and face shield when clearing a 2-ME line, preparing equipment for service or maintenance. This task is performed monthly. 2-ME is stored in a charged 450 gallon stainless steel tank as a closed system, located on the poly floor. Because 2-ME is very hygroscopic and easily oxidized, the storage tank is padded with nitrogen to minimize exposure to moisture and air. The tank is piped to a drum containing activated carbon for fume/ odor control. 2-ME is a Category 4 Flammable with a flash point of 154.9 °F. As this product is considered a poison, run-off should be controlled and this presents additional concerns with the product storage being located on the second floor of the Poly deck. SCBAs, supplied air respiratory equipment is required when responding to spills/ leaks. Minor spills may be neutralized with bleach and washed down to the poly area sump. Significant spills must be contained and washed to the poly sump where it can be neutralized. Safe work practices should consider preventing skin contact from this product as it is a skin irritant and contact with small amounts of the eye can cause irreversible tissue damage and blindness. If skin or eye contact occurs flush with copious amounts of water and seek medical assistance.

Operators remove initiator (organic peroxide) from the storage freezers each day. The initiator is immediately transferred to the Poly floor chest freezer. The chest freezers provide a temporary storage location that is convenient when the initiator is needed to charge the PVC reactors at one of the six reactor charge stations. SOP PB-008A requires chemical proof gloves, safety goggles and a face shield is required when pouring the initiator into the charge pot. After the task, the charge pot is flushed with water as well as the polyethylene, 1 gallon storage containers.

PVA (polyvinyl alcohol) powder is used in the reactors as a suspending agent. The PVA powder is a strong oxidizer. The PVA is added one (1) time per twelve (12) hour shift. According the SOP PB-002A, the 50 pound bags, are opened with a sharp, razor knife and then manually lifted and dumped into the tank. Gloves, goggles and safety glasses are worn while performing the task.

Test runs are performed on the short-stop pots that contain sodium nitrite, which is an irritant. The short-stop pot is changed out four (4) times per year and is designed to control-runaway reactions inside the reactor. SOP PB -003A provides the step by step process to refill the short-stop pots. The operator manually mixes the powder (supplied in 50lb bags) with water. The mixture is then manually poured into the short-stop pot. Goggles and chemical proof gloves are worn by the operator during this process.

Sodium nitrite is strong oxidizer that is supplied in 50 pound bags. Operators utilize SOP PB-009A about every 10 days to add the sodium nitrite to the process. During the operation, goggles, face shield and rubber gloves are worn while the operator uses a razor knife to open the bags and manually lifts the bags and pours the sodium nitrite in a shoot that runs into the pot. The task is performed in an outdoor setting to allow for required ventilation.

A noise survey and noise contour map were made in May 2016. Based on those data, much of the unit was found to have noise levels in the 85-100 dBA range with one area, the Drier building, found to be over 100 dBA. Another noise survey performed on the new PVC cooling tower area provided results that also greater the 100 dBA at the top of the cooling tower where the fans are located. Westlake provides a choice of three hearing protectors to employees:

3M EAR foam earplug #311-1254 (NRR=33dB), 3M EAR hardhat earmuff #330-3031 (NRR=21 dB), and 3M EAR Peltor Optime 101 earmuff #H7A (NRR=27). OSHA provides several methods for estimating the adequacy of hearing protector attenuation (29CFR1910.95 Appendix B); the most common is subtraction of 7dB to give the 'effective NRR', or 26 dB for the earplugs provided at the facility, 14 dB for hardhat earmuffs and 20 dB for Optime 101 earmuffs. Additional NRR de-rating is often conservatively applied. Double protection (earplugs + muffs) is appropriate for operators spending significant time in areas identified >100 dBA.

NOTE: Westlake Vinyls has minimal PPE requirements where all personnel that enter the production areas must have;

Hard Hat
Safety Glasses w/ side shields
Hearing Protection
Fire Retardant Clothing
Protective-toed footwear
Gloves
Acid Gas Escape Respirator
Goggles (if entering specific areas)

Recommendations

- Ensure that employees required to wear respirators are included in a respiratory protection program (29 CFR 1910.134), including training, fit testing, maintenance, and use requirements.
- Ensure that PPE and safety requirements are included in SOPs, and control SOP distribution to ensure availability of the latest revision at the point of use.
- Follow MOC change procedure to endure process changes include continued assessment.

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Table 1: Westlake Chemicals Hazard assessment matrix:

Hazard Assessment completed by: Gregory Thorn & Blaine Ayres

Date: June 13-14, 2017 Assessment #: PVC Unit This document serves as documentation of the PPE Hazard Assessment and Certification, as required by OSHA 29 CFR 1910.132 (d)(2)

Job Title/ Classification: PVC Unit Operator

Process Unit Area: PVC Unit

Department: Operations

Task/ Process/ Job Description: Normal Operations / PVC Unit Operator

General Protection: All employees are required to wear safety glasses with side shields, ANSI approved footwear, flame retardant clothing (Protera, Nomex-cotton blend and FR Carhart), Acid-gas (Cl2) escape respirator and a Class B hard hat are standard personal protective equipment (PPE) when entering an area with hazardous materials or processes. Hearing protetction is required in hearing protection designated areas. The General personal protective measures listed below are required for working with all materials at the Geismar Facility. Goggles are required in idenified areas. Additional PPE requirements for each material are idetnifed in teh table below.

Task/Activity/ SOP		EYE PROTECTION (Chemical/ Thermal)			HAND PROTECTION (Chemical/ Thermal)					BODY PROTECTION (Chemical/ Thermal/ Falls)				RESPIRATORY PROTECTION Supplied-air	RESPIRATORY PROTECTION Air-purifying respirator (APR)		OTHER
		Safety Glasses w/ sideshields	Chem goggle (1)	Face shield (1)	Leather gloves (2)	Cut resistant glove	PVC lined glove	Neoprene	Temptec insulated thermal glove (alternative)	Rain suit	Chemical protective coveralls/ jacket	Rubber Boots	Fall Protection Safety Harness	Line-breaking and/ or APR not approved (3)	Acid gases(1)	HEPA filter cartridges	Radio
										Minimal contact	Line breaking/ Hazardous contact				APR with OVAG/HEPA cartridges	APR particulate cartridges	
PVC Unit	1.) 98% Sulfuric Acid Day tank and truck off-loading. (4)		✓	✓			✓	✓	✓		✓	✓					
	2.) Demineralization area, 50% Caustic and truck off-loading.		✓	✓			✓	✓			✓	✓					
	3.) Initiator Deliver/ Transfer to/ from freezer	✓		✓	✓												✓
	4.) VCM filter change out and process clearing.							✓			✓	✓		✓			
	5.) (Re)connecting hypochlorinator at one ton chlorine cylinder		✓	✓				✓									
	6.) Clearing 2-ME line or BME		✓	✓				✓				✓					
	7.) Initiator transfer into charge pot		✓	✓				✓									✓
	8.) PVA (polyvinyl alcohol) powder opening bags. (5)		✓			✓											
	9.) Short Stop Test runs for refilling short stop pot		✓	✓				✓									
	10.) Loading sodium nitrite bags		✓	✓				✓									

OPT: Recommended but not required.

(1) Where respiratory protection is needed, a full facepiece respirator may be used in place of a half facepiece and a chemical goggle. Googles are required if using a half mask respirator.

(2) Cannot be worn by itself where chemical contact is likely. Use in combination with a chemical resistant glove.

(3) Supplied Air required for initial line break.

(4) Ensure maintenance of eyewash/ deluge stations.

(5) Ensure cut protection and safety blades when opening bags.

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Table 2: PPE Inventoried in the site Warehouse Store Stock.

Manufacturer	Model	Description	Link
Gloves			
Ansell	92-600	nitrile chemical	Link
Westchester	750	Cotton poly brown jersey glove	Link
Kimberly Clark	55084	6-mil nitrile exam	Link
Memphis	6412	green pvc jersey lined chemical glove	Link
Showa	730	green nitrile, flock-lined chemical glove	Link
Showa	6781R	Neoprene, rough grip, lined chemical	Link
Respirators			
MSA	200LS	Half Mask respirator	Link
MSA	815366	Multi-gas cartridge	Link
3M	8212	N95 welding	Link
Garments			
NEESE	96SJ	Chemical splash suit	Link
Dupont Tychem	CPF3	Chemical splash suit	Link
Hearing Protection			
3M E-A-R	311-1254	NRR 33dB foam earplug	Link
3M E-A-R	330-3031	NRR 21dB 2000H hardhat earmuff	Link
3M E-A-R	H7A	NRR 27 dB Peltor Optime 101 earmuff	Link