WALK-THROUGH SURVEY REPORT:

Monsanto Plastics and Resins Company
Phenol/Formaldehyde Resin Facility
Port Plastics Plant
River Road
Addyston, Ohio

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Introduction

The study of control technology associated with the use of adhesive products in manufacturing is being performed to determine the best means of controlling occupational exposures to formaldehyde, certain organic solvents, and other potentially harmful agents associated with adhesives. After evaluating the existing technology, additional research needs and priorities will be identified, and all the information will be published to advance the practice of control technology.

Purpose of trip

This walk-through survey of the phenol/formaldehyde (P/F) resin production facility at the Monsanto's Port Plastics Plant on May 15, 1981 was conducted to establish a bench mark for future study of formaldehyde resin adhesives. As expected, much was learned during this tour that will help in studying the industrial users of this class of adhesives.

Contacts

The primary contact for this visit was Mr. Vincent Mazzella, a Senior Engineering Specialist. Mr. Bob Newton, acting both as the Manufacturing Superintendent for resins and as the Process Control Group Superintendent, was present for most of the meeting. We also met with Mr. Herb Behr, a chemical engineer in the process control group.

Plant Description

The Port Plastics Plant is on River Road (US-50) in Addyston, Ohio, approximately ten miles west of Cincinnati. The Plastics Division of Monsanto Plastics and Resins Company controls the plant and manufactures polystyrene and acrylonitrile-butadiene-styrene (ABS) polymers. The Resins Division, a tenant at the plant, manufacturers formaldehyde and Resinox*, a family of P/F resin products available as liquid resins, laminating varnishes, and solid or "lump" resins, processed into powdered resin compounds.

Monsanto began operations at this plant in 1952, and resins were among the first products. The large, two-story, brick building that houses the P/F production equipment is one of the original structures on the site. It presently contains a number of reactors and holding tanks, some ancillary equipment for processing the solid resin, and a storage area.

Phenol/Formaldehyde Resin Production

The employees involved in the production of P/F resins are scheduled in four shifts to cover a 24 hour/day, 7 day work week. Two or three workers per shift are responsible for charging and monitoring the reactors.

*Resinox is a trade name of Monsanto Plastics and Resins Company.

Process Description

The unit processes and operations for producing the solid and the liquid resins start out similarly, with the components being charged into the reactors according to the formulation required to meet the customer's specifications. The list of component substances includes phenol, formalin (an aqueous solution of formaldehyde), sodium hydroxide, concentrated sulfuric acid, hexamethylenetetramine (HMT), methanol, ethanol, and xylene. Not all these substances are present in each product. For example, HMT is a curing agent added only to the solid resin batches. The principal liquid ingredients are piped from storage tanks outside the building into weigh-cases for proportioning, then siphoned into the reactors.

When fully reacted, the material destined to become solid resin may either be dumped directly onto the "cooling floor" below the reactor (done infrequently) or transferred to a holding tank for deposition onto a cooling belt. The hardened resin may be milled, blended, and screened before bagging. The liquid resins are transferred to holding tanks, then passed through filters before being placed in refrigerated storage tanks to await shipment. Bulk shipment in refrigerated tank cars or trucks is recommended to prevent hardening of the liquid resin.

Description of Health and Safety Programs

An industrial hygienist (IH), who is organizationally under the Technical Services Superintendent, is responsible for monitoring the work place environment. Samples are analyzed by the plant laboratory, which also performs both raw material and finished product testing. The industrial hygienist also oversees the respirator program, which encompasses fit testing, cleaning, and maintenance.

Both a medical doctor* and a registered nurse are at the plant during the day-shift Monday through Friday. They conduct annual physical examinations on all employees. Each employee has access to his own medical records. A number of employees are trained in cardiopulmonary resuscitation and first-aid. The plant also has its own ambulance.

The safety engineer, under the Personnel Superintendent, has responsibility for the fire brigade in addition to the safety-oriented programs, which include safety/housekeeping inspections and job-safety audits by small foreman/worker teams. A large display-board, located in the center of the building on the second floor, promotes the safe use of chemicals. For each chemical used in the building, the nature of its hazard, the recommended personal protective equipment, and the essential first-aid actions to be taken are listed. All pipes are labeled with the substance being carried and the direction of flow.

A variety of personal protective equipment, including respirators, safety glasses and/or face shields, hard hats, aprons and gloves, and hearing protectors, is required depending on the work area. All respirators are maintained under a fit-testing program administered by the IH.

*Two physicians share this coverage.

Employee job training is primarily handled by departmental on-the-job training. For both job and safety training, a library of video tapes is maintained which cover initial and recurring safety briefing items. A select number of these must be seen by each new employee. A video tape viewing room is located in the center of the work area to facilitate the reviewing of these video tapes by employees. These are usually viewed during work hours on assignment by the foreman.

Plant housekeeping is an individual responsibility. Each work area is to be cleaned by the workers before the close of the shift. There are no contract housekeeping services for the production areas.

Hazard Control Measures

The reactors are sealed during most of the work shift and operated below atmospheric pressure. When one is opened to be charged or cleaned, a local exhaust collar-hood can be placed around the opening. The vacuum system (which is water quenched) can also be operated when the hatch is open to reduce the escape of vapors from the reactor. Each reactor is equipped with an over-pressure relief valve, which vents the reactor to a catch tank outside the building. The building itself has general ventilation with exhaust fans (but none of these were observed to be operating the day of the tour). Another feature of the building construction is the hinged-panel "venting roof", which would reduce the severity of an explosion inside the building. A dust collector is in the process stream for milling and blending the solid resin.

There are no continuous ambient air monitors. Respirators are worn only during certain situations, such as entering a reactor. A safety-line attached to a manual winch must also be worn by a worker who climbs down into a reactor, and other workers must be present at the access hole to monitor the activities of the person inside the vessel.

Each process has a set of written procedures and a check list on which tasks are to be initialed when completed. This maintains continuity through all work shifts involved in a batch of resin and assures that no step is omitted or performed more than once.

Conclusions and Recommendations

No measurements were made during the walk-through, but it was evident that Monsanto has put considerable effort into worker safety and health at this facility. During our tour, only steady-state operations were in progress; we did not observe charging a reactor, dropping hot resin onto the cooling-floor, or bagging the solid resin. This latter process did have local exhaust ventilation, although no judgement of its effectiveness can be made without an evaluation. The procedures for working inside a reactor are well planned; however, the emergency egress procedure should be practiced to make sure things go as planned. For maximum benefit, it is suggested that a practice emergency egress be videotaped.

We do not plan at this time to visit this facility for an indepth survey. The current focus of this study is on the users of adhesives products.