PRELIMINARY SURVEY REPORT:

Chrysler Corporation Adhesive Operations:

Eldon Axle Plant
Sterling Stamping Plant
Jefferson Ave Assembly Plant

SURVEY CONDUCTED BY:
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REPORT WRITTEN BY:
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U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Centers for Disease Control
National Institute for Occupational Safety and Health
Division of Physical Sciences and Engineering
Engineering Control Technology Branch
4676 Columbia Parkway
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PURPOSE OF SURVEY:

To observe the processes involving adhesives, with emphasis on the method of application and the associated occupational health hazard controls.

EMPLOYER REPRESENTATIVES CONTACTED:

Mr. Gerald Sattelmeier, Manager, Industrial Hygiene, Chrysler Corporation
Paul Mallie, Personnel Administrator, Detroit Forge Plant
George Burak, Personnel Manager, Sterling Stamping Plant
Marvin Floer, Supervisor, Safety and Environment, Sterling Stamping Plant
John Kendall, Personnel Manager, Jefferson Ave Assembly Plant
Conroy Vance, Personnel Representative, Jefferson Ave Assembly Plant

EMPLOYEE REPRESENTATIVES CONTACTED:

James Mara, UAW, Eldon Axle Plant (Acting for William Sparks, UAW Health and Safety Representative)
John Luptak, UAW Health and Safety Representative, Sterling Stamping Plant
Oscar McWilliams, UAW Health and Safety Representative, Jefferson Ave Assembly Plant

STANDARD INDUSTRIAL CLASSIFICATION CODE OF PLANT:

3711: Motor Vehicles and Car Bodies

Introduction

Industrial adhesives involve monomers, polymers, organic solvents, and a variety of additives which may pose occupational hazards. An appropriate implementation of control technology may prevent the overexposure of workers to these substances.

The Engineering Control Technology Branch of NIOSH is conducting a research study to document control methods associated with the industrial use of adhesives. The first phase of this project will assess the application of control technology in conjunction with the use of adhesives. This assessment will be accomplished by walk-through surveys of plants in a number of different industries. The information gathered will be used to focus second phase efforts on the industry which can benefit most from further study and to plan for a second, more detailed survey at those plants which are selected for in-depth study.

On this preliminary visit, the NIOSH survey team met with Mr. Gerald Sattelmeier, Manager, Industrial Hygiene, Chrysler Corporation, and the personnel at the individual plants who are listed on the inside cover.

Adhesives are used to make a number of automobile components. The specific processes surveyed during this visit included: 1) the bonding of friction materials to metal brake shoes; 2) the bonding of inner panels to hood and rear deck lids; and 3) the installation of vinyl tops and sound deadener pads to car bodies.

Description of Facilities

The manufacturing facilities in which the above operations were observed are part of a multi-plant corporation involved in the production of both finished cars and trucks and vehicle components. Chrysler corporation is in the midst of a major product switch from rear- to front-wheel-drive (FWD) vehicles and a divestiture of much of its vehicle component manufacturing.

The Eldon Axle Plant is a one-floor manufacturing facility which was built in the late 1920's. It is basically a machining operation which produces rear axle assemblies for rear-wheel-drive vehicles. Adhesives have been used in this plant since 1948 for the bonding of friction materials to metal brake shoes. Current employment in this plant is approximately 1400 (both hourly and salaried workers). As the conversion of vehicle lines to front wheel drive becomes complete the production of bonded brake shoes at this facility may cease. It is likely that all FWD vehicles will use brake shoes supplied by another Chrysler plant or an outside source.

The Sterling Stampling Plant is a modern one-floor manufacturing facility built in 1965. It produces automobile body panels from sheet steel. Adhesives are used to bond inner support panels to hoods and rear deck lids. Current employment stands at 2600 workers, which is slightly greater than 50% of employment at maximum capacity.

The Jefferson Avenue Assembly Plant is a multi-floor manufacturing facility which straddles both sides of Jefferson Avenue. The main building was constructed in 1907, and revised through the years with changes in car lines and manufacturing processes. The plant currently produces the Plymouth Reliant, Dodge Aries, and Chrysler LeBaron models. The plant contains a production line some 5 miles long, which assembles a finished vehicle from components. Employment at the Jefferson Avenue Plant stands at over 5400.

Description of Processes and Controls

Friction materials are bonded to metal brake shoes using a proprietary thermosetting adhesive. This adhesive is a solvent-based formulation (approximately 50 percent solvent by weight) containing methyl ethyl ketone and monochlorobenzene as solvents and 2.5 percent of an unspecified acrylic monomer.

The adhesive is applied in an isolated "glue room". Two people are directly involved in this process. One loads the friction material into the gluing machine, which coats the lining and discharges it onto a moving belt; the other individual places the coated linings onto racks hanging from an overhead

conveyor. The racks are transported out of the gluing room into an overhead oven (185°F) which dries the adhesive. The linings are then removed from the racks, stacked, then clamped to the brake shoes and baked at 385°F for curing. Six workers were observed to be engaged in the loading and unloading of the curing oven; actual employment at this operation may be somewhat lower as some of these workers were being trained.

Solvents were controlled in the gluing operation by isolation of this process in an enclosed block structure with local exhaust ventilation. The ventilation consisted of a duct connected directly to the gluing machine, a slot running the length of the conveyor, and a canopy hood enclosing the overhead racks as shown in Figure 1. Make-up air was introduced into the glue room through two ceiling mounted diffusers. Total exhaust exceeded the supply volume as there was a noticeable indraft through openings in the glue room. This is intentional in order to contain the solvent vapors. Exposures at the curing oven were controlled by covering the openings with custom-cut curtains and ventilating the oven.

No solvent odor was present at either the oven loading or unloading station. The odor of solvent was noticeable but not irritating in the glue room. The AIHA Hygiene Guide[1] states that the odor of chlorobenzene is barely perceptible at a concentration of 60 ppm; at 200 ppm the odor is unpleasant and eye and nasal irritation begin to occur. The current PEL for monochlorobenzene is 75 ppm. The PEL for methyl ethyl ketone is 200 ppm based upon irritation of the nose and throat.[2]

Vehicle hoods and rear deck lids are bonded to reinforce inner panels using a polyvinylchloride-based structural adhesive. Drums of adhesive are placed in a "grease gun" assembly and pressure fed to a fixture which applies the adhesive to the hood. Critical areas of the hood are then painted with an anti-corrosion primer, welded, cleaned, inspected, and racked for shipment. Most operations are automatic; manual operations are limited to loading, unloading, inspection, and some cleaning of the equipment. The adhesive contains less than 1 percent by weight volatile materials. No odor was evident. There may be limited skin contact with the adhesive during nozzle cleaning or replacement. Control is achieved through isolation by virtue of

the automatic nature of the process. The plant is well ventilated with fresh air supplied at truss level through distribution ducts spaced at about 40 foot intervals.

In the assembly operations, adhesives are used in the installation of vinyl tops and sound deadener pads. Approximately 40% of the cars are equipped with vinyl roofs; all receive the sound insulation pads. Both operations use contact-type adhesives which are spray applied. The vinyl roof adhesive is neoprene-based; the pad adhesive is based on styrene-butadiene rubber. Although the formulations differ, these adhesives both contain approximately 75 percent(by weight) fast-evaporating solvents (acetone, toluene, textile spirits, and naphtha).

The vinyl tops are applied in a long spray tunnel. Of approximately 24 workers in this tunnel, 4 individuals spray adhesive while the remainder fit the top, trim the vinyl, and remove the protective masking. Air is supplied at the sides of the tunnel and is exhausted through the slots in the ceiling, as shown in Figure 2.

Sound deadener pads are applied at two stations along the assembly line. At the first station a worker sprays adhesive on the pad in a dry, bench type booth, then sprays the firewall, and installs the pad. At a second station a worker sprays the metal ceiling, then applies the sound deadener pad in three sections, using a roller to press on the pad. Both operations are controlledby dilution ventilation; fans are placed parallel to the line which permits air to flow through the body. (At this point in the operation no windows are in most of the vehicles.) Workers at operations subsequent to the pad installation may have some solvent exposure. Air samples taken by Chrysler indicate airborne solvent levels meet current OSHA and ACGIH criteria but are above the NIOSH recommended level for alkanes (350 mg/m^3)[3].

Description of Programs

Industrial hygiene, safety, medical, and worker compensation are organized into a single department at the corporate level. The industrial hygiene group is composed of 11 individuals with the responsibility of monitoring for

potentially hazardous conditions. Included in this group is an AIHA accredited laboratory with capabilities for analyzing samples for metals, solvents, silica, and asbestos. Under development is a computer-based hazardous material control system.

Each plant has both medical and safety departments. The larger plants employ a physician. Each plant also has a union (UAW) safety and health representative. These officials are appointed by the local union president and serve in a permanent capacity at the discretion of the international joint committee on safety and health.

Conclusions and Recommendations

From initial observations, it seems that potential health hazards at these facilities are well controlled. The brake bonding operation at the Eldon Axle plant had a well-designed but aged local exhaust system which vented all possible emission points in the process. The potential abandonment of this plant renders this operation unsuitable for further study.

The adhesive operation in the stamping plant is inherently free of hazard, due to the physical properties of the adhesive, and the degree of automation of the process. The adhesive operations at the assembly plant involve a relatively small number of workers, whose exposure to solvents appears to be readily controlled by rather unsophisticated ventilation techniques. For these reasons, it is recommended that the automotive industry not be considered a primary candidate at this time for the detailed investigation of adhesive usage.

References

1. American Industrial Hygiene Association: "Chlorobenzene", Hygienic Guide Series, Detroit, Michigan, 1964.

2. Criteria for a Recommended Standard. Occupational Exposure to Ketones . DHEW (NIOSH) Publication No. 78-173.

3. Criteria for a Recommended Standard. Occupational Exposure to Alkanes (C5-C8). DHEW (NIOSH) Publication No. 77-151.

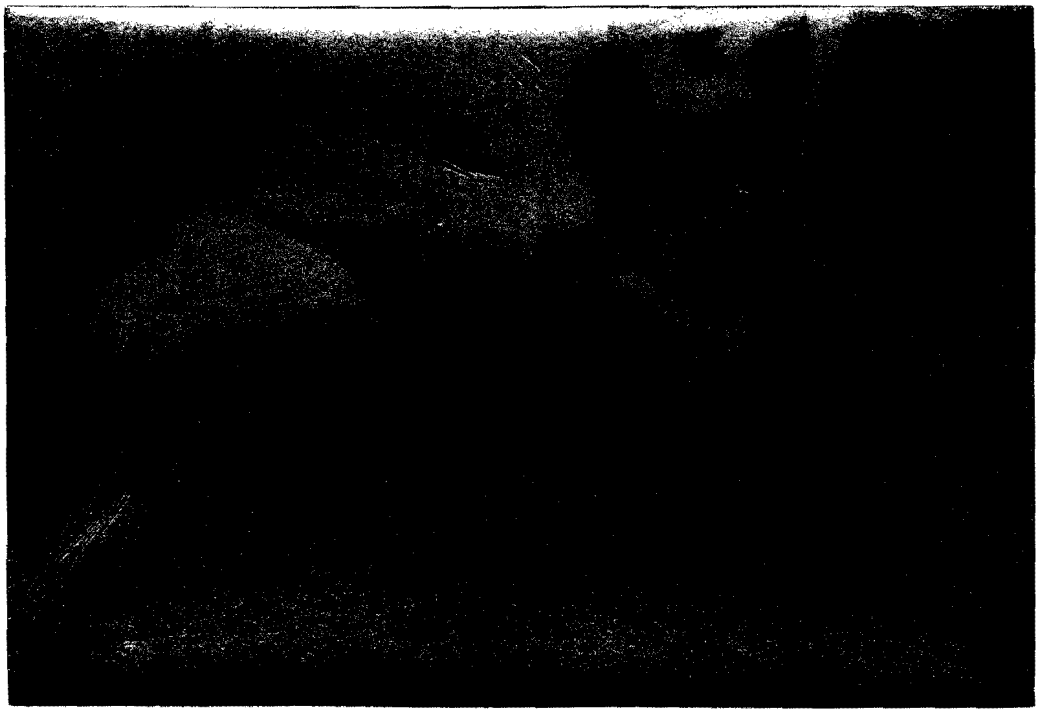

Figure 1 Local Exhaust of Friction Material Gluing

Figure 2 Vinyl Top Installation Booth