PRELIMINARY SURVEY REPORT:

CONTROL TECHNOLOGY FOR NEW PLASTICS PROCESSES

AT

AIR PLASTICS, INC.
CINCINNATI, OHIO

REPORT WRITTEN BY:

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NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
Division of Physical Sciences and Engineering
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PLANT SURVEYED:	Air Plastics, Inc. P.O. Box 62067 Cincinnati, Ohio 45242
SIC CODE:	3079 (Miscellaneous Plastics Products)
SURVEY DATE:	April 3, 1984
SURVEY CONDUCTED BY:	William F. Todd Dennis M. O'Brien
EMPLOYER REPRESENTATIVES CONTACTED:	Al Perkins, General Manager Ray Woll, President
EMPLOYEE REPRESENTATIVES CONTACTED:	None

I. INTRODUCTION

The National Institute for Occupational Safety and Health (NIOSH) is the primary Federal agency engaged in occupational safety and health research. Located in the Department of Health and Human Services (formerly DHEW), it was established by the Occupational Safety and Health Act of 1970. This legislation mandated NIOSH to conduct a number of research and education programs separate from the standard setting and enforcement functions carried out by the Occupational Safety and Health Administration (OSHA) in the Department of Labor. An important area of NIOSH research deals with methods for controlling occupational exposure to potential chemical and physical hazards. The Engineering Control Technology Branch (ECTB) of the Division of Physical Sciences and Engineering has been given the lead within NIOSH to study the engineering aspects of health hazard prevention and control.

Since 1976, ECTB has conducted a number of assessments of health hazard control technology on the basis of industry, common industrial processes, or specific control techniques. Examples of these completed studies include the foundry industry; various chemical manufacturing or processing operations; spray painting; and the recirculation of exhaust air. The objective of each of these studies has been to document and evaluate effective control techniques for potential health hazards in the industry or process of interest, and to create a more general awareness of the need for or availability of an effective system of hazard control measures.

These studies involve a number of steps or phases. Initially, a series of walk-through surveys is conducted to select plants or processes with effective and potentially transferable control concepts or techniques. Next, in-depth surveys are conducted to determine both the control parameters and the effectiveness of these controls. The reports from these in-depth surveys are then used as a basis for preparing technical reports and journal articles on effective hazard control measures. Ultimately, the information from these research activities builds the data base of publicly available information on hazard control techniques for use by health professionals who are responsible for preventing occupational illness and injury.

This survey report covers a walk-through survey of the Air Plastics plant in Cincinnati, Ohio. This survey was conducted to familiarize the investigators with the filament winding process, to understand the potential of these operations for exposure to air contaminants, principally styrene, and to observe the control measures employed to prevent the overexposure of workers to these substances.

II. PLANT AND PROCESS DESCRIPTION

Air Plastics produces air pollution and corrosion control equipment. They produce tanks, scrubbers, and pipe from polyester styrene resin using the filament winding process. Corrosion resistant fans are fabricated from sheet polyvinyl chloride. Air Plastics employs seven persons.

Plant Description:

The manufacturing plant is a 12-year-old, steel-framed, concrete block structure covering about 8,500 square feet. The plant consists of a single open bay containing two filament winding stations, a grinding area, assembly area, and a fan fabrication shop.

Process Description:

During this survey, 10-foot diameter sections of a scrubber were being fabricated by the filament winding process. The mold consists of a mandrel that rotates at about 6 rpm. A layer of felted glass mat and woven roving wetted with resin is first applied to the mandrel for hoop and axial strength. The filament winding is then begun with sixteen strands wound alternately up and down the mandrel to provide hoop strength. The filaments are applied to the mandrel simultaneously with a resin. The filament wound mandrel is covered with chopped glass strands and resin, rolled out, and sprayed with a pigmented resin topcoat. The product thickness varies with specifications, but typically ranges from 1/4 to 3/8 inches thick.

Potential Hazards:

The major hazard associated with this process is exposure to styrene. Central nervous system effects have been observed in workers exposed to styrene. Styrene also irritates the eyes and the respiratory tract. NIOSH has recommended that employers should observe an enviromental limit for styrene equivalent to an 8-hour time-weighted average concentration of 50 ppm (parts per million, volumetric basis) and a ceiling concentration of 100 ppm. The current Occupational Safety and Health Administration (OSHA) 8-hour and ceiling standards for styrene are 100 and 200 ppm, respectively.

Other potential exposures include exposure to methylene chloride, used as a cleaning solvent, and fiber glass dust from the grinding operations. Methylene chloride may produce eye, nose, and throat irritation, dermatitis, and is mildly narcotic. NIOSH has recommended that employers should observe an enviromental limit for methylene chloride equivalent to an 8-hour time-weighted average concentration of 75 ppm.

Skin, eye, and upper respiratory tract irritation are the primary health effects associated with exposure to glass fibers. The American Conference of Governmental Industrial Hygienists (ACGIH) recommend a Threshold Limit Value (TLV^R) of 10 mg/m^3 for fibrous glass.

III. CONTROLS

Principles of Control:

Occupational exposures can be controlled by the application of a number of well-known principles, including engineering measures, work practices, personal protection, and monitoring. In general, a system comprised of the above control measures is required to provide worker protection under normal operating conditions as well as under conditions of process upset, failure, and/or maintenance. Process and workplace monitoring devices, personal exposure monitoring, and medical monitoring are important mechanisms for providing feedback concerning effectiveness of the controls in use. Ongoing monitoring and maintenance of controls to ensure proper use and operating conditions, and the education and commitment of both workers and management to occupational health are also important ingredients of a complete, effective, and durable control system. These principles of control apply to all situations, but their optimum application varies from case-to-case. The application of these principles are discussed below.

Engineering Controls:

The filament winding operation relied on dilution for control of any air contaminants. During warm weather, overhead doors in the shop are kept open. Comfort heating was accomplished by indirect fired gas space heaters. An exhaust air fan is located in the wall behind each of the winding stations.

Work Practices:

The workers positioned themselves upwind of the product during spraying and roll-out. Since the mandrel turns on its upright axis, the workers do not need to move. This allows them to maintain the best position for avoiding backspray from the operation.

Monitoring:

The plant has purchased a detector tube kit for monitoring exposure to styrene. A combustible gas meter/oxygen deficiency indicator is used for confined space entry.

Personal Protection:

Employees engaged in spray-up/roll-out operations wore Pulmosan protective goggles and half-mask respirators equipped with organic vapor cartridges and prefilters. Employees engaged in fiber glass cutting and grinding operations wore Pulmosan nuisance dust respirators. All respiratory protective equipment was NIOSH approved.

IV. SAMPLING AND ANALYSIS

Grab samples were collected in the breathing zone of the chopper gun operator and roll-out man for the purpose of evaluating potential exposures to styrene vapors. At the request of the plant, a measurement was also made at the exhaust fan. All measurements were performed with Draeger Monostyrene 50/a detector tubes. Concentration measurements are reported in Table 1. Breathing zone concentrations exceeded both NIOSH and OSHA ceiling levels for the roll-out man and exceeded the NIOSH ceiling level for the chopper gun operator. Because of the cyclical nature of the work, 8-hour average exposures would be substantially lower than the levels reported here.

V. CONCLUSIONS and RECOMMENDATIONS

From discussion with Mr. Perkins, it can be concluded that the Air Plastics facility is typical of that found in the filament winding segment of the reinforced plastics industry. Exposure to styrene in the filament winding of tanks and process vessels is similar to that found in the lay-up of fiber glass ship hulls. Because of this similarity, further study of this process is not suggested at this time.

The following suggestions are offered to assist the plant in improving their work environment:

1. Because the chopper gun operator wears a full beard, he does not receive the full benefit of wearing his assigned respirator. This employee should be required to shave or should be assigned a supplied air hood.

2. Installation of an oil-free compressor for a source of breathing air and purchase of air supplied hoods would assure adequate protection for the chopper gun operator and would also benefit those workers assigned to work in confined spaces.

3. Consideration should be given to installing partitions around each winding mandrel to increase airflow near the chopper gun operator and the roll-out man.

Table 1. Styrene Concentration Measurements During the Filament Winding Operation*

Location	Concentration (ppm)
Chopper gun operator (breathing zone)	180
Roll out man (breathing zone)	300
Exhaust fan (area)	400
NIOSH recommendation (ceiling)	100
OSHA standard (ceiling)	200

* Draeger, Monostyrene 50/a Detector Tubes