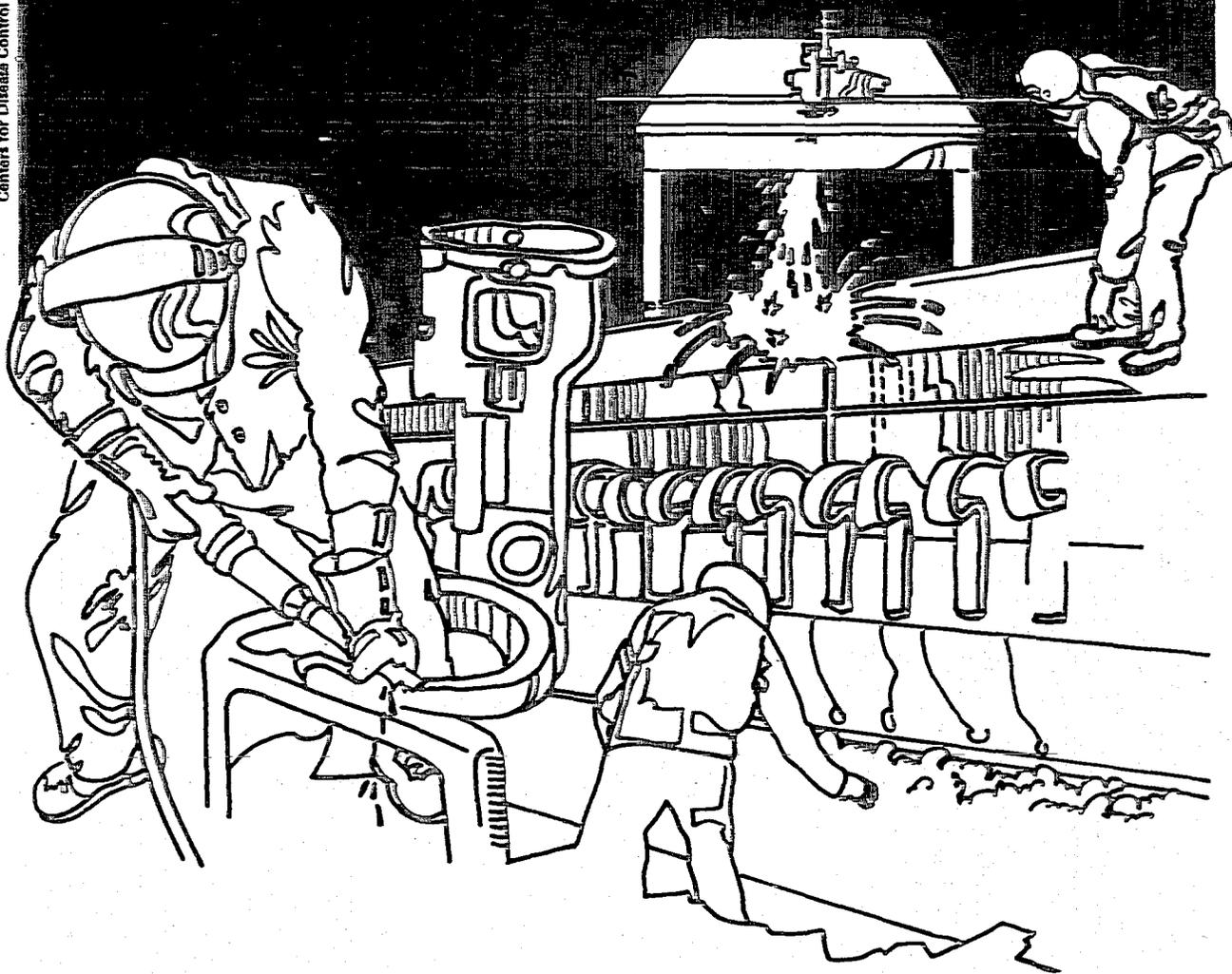


NIOOSH



Health Hazard Evaluation Report

TA 80-104-1158
PVC CONTAINER CORPORATION
EATONTOWN, NEW JERSEY

PREFACE

The Hazard Evaluations and Technical Assistance Branch of NIOSH conducts field investigations of possible health hazards in the workplace. These investigations are conducted under the authority of Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6) which authorizes the Secretary of Health and Human Services, following a written request from any employer or authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found.

The Hazard Evaluations and Technical Assistance Branch also provides, upon request, medical, nursing, and industrial hygiene technical and consultative assistance (TA) to Federal, state, and local agencies; labor; industry and other groups or individuals to control occupational health hazards and to prevent related trauma and disease.

Mention of company names or products does not constitute endorsement by the National Institute for Occupational Safety and Health.

I. SUMMARY

On April 1, 1980, the National Institute for Occupational Safety and Health (NIOSH) received a request from employees for a health hazard evaluation at the PVC Container Corporation, Eatontown, New Jersey. The requestor was concerned about skin contact with polyvinyl chloride (PVC) pellets, dust and coloring agents; inhalation of gases during the heating, manual pulling, and blow molding of PVC; and inhalation of PVC dust. NIOSH was asked to investigate these exposures and the symptoms (headaches, nausea, and dry skin) reported by employees.

NIOSH conducted an initial survey on June 10-12, 1980. A follow-up survey was conducted on January 26-28, 1981. Medical questionnaires were administered on both the initial and follow-up surveys. To assess the workplace for potential thermal decomposition products of polyvinyl chloride (PVC) and other additives, personal and general area air samples were collected for organotins, hydrogen chloride, vinyl chloride monomer, benzene, styrene, methyl methacrylate, butadiene, and phthalic anhydride; also air samples were collected for respirable dust, and a noise survey was conducted.

Personal samples for respirable dust ranged from below the limit of detection to 0.14 mg/m³ [OSHA Permissible Exposure Limit (PEL) for respirable nuisance dust is 5 mg/m³]. Personal breathing zone samples for hydrogen chloride were below the limits of detection, however, 3 general area samples taken near the extruder head ranged from 0.13 to 0.19 ppm (OSHA PEL is 5 ppm). Personal samples for organotins, taken while the packers stood at their stations were below the limits of detection, however, 3 area samples taken at the extruder head demonstrated levels of 0.02, 0.10 and 0.13 mg/m³ (OSHA PEL 0.1 mgTin/m³, 8-hour TWA). Personal dosimetry for noise demonstrated 3 exposures which were above the OSHA PEL (90 dBA) and OSHA action level and NIOSH recommended standard (85 dBA, 8-hour TWA). Process samples taken at the extruder heads for vinyl chloride monomer, butadiene, styrene, methyl methacrylate and phthalic anhydride were below the limits of detection. Benzene was detected on an area sample at one extruder head at 0.02 ppm. NIOSH recommends a ceiling of 1 ppm for benzene.

Medical interviews determined that employees reported headaches, nausea and dry skin when pulling parison (plastic) from the extruder heads, especially when they had to do so for more than 15 minutes at a time. (Pulling parison occurs during minor maintenance activities when the automatic hot melt grinders are inoperative.) The association of symptoms with the pulling of parison suggests that the volatilized organotins, along with other decomposition products (i.e. coloring agents, HCl), at the extruder head are the cause of the symptoms, which are not reported when the packers are at their normal work station.

Based on the environmental measurements and medical questionnaire data collected during this survey, NIOSH concluded that the headaches, nausea, and dry skin which occurred during the pulling of parison from extruder heads were probably caused by exposure to volatilized organotins and other decomposition products, i.e. coloring agents and HCl. Overexposures to noise were also measured. Recommendations to control exposures and increase worker comfort are included in Section VIII of this report.

KEYWORDS: SIC 3079 (Plastics Products), organotin, noise, hydrogen chloride, headache, nausea, dermatitis, plastic, PVC.

II. INTRODUCTION

On April 1, 1980, the National Institute for Occupational Safety and Health (NIOSH) received a confidential request from an authorized representative of employees for a health hazard evaluation at the PVC Container Corporation in Eatontown, New Jersey.

The requestor was concerned about skin contact with polyvinyl chloride (PVC) pellets, dust and coloring agents; inhalation of gases during the heating, manual pulling, and blow molding of PVC; and the inhalation of PVC dust. NIOSH was asked to investigate these exposures and the symptoms of headache, nausea, and dry skin reported by employees in these work areas.

On June 10-12, 1980, NIOSH investigators met with representatives of the PVC Container Corporation and the Retail Wholesale and Department Store Union for the opening and closing conferences, walk-through survey, and discussions of environmental sampling and medical interviews. Discussions with management concerned process description, engineering controls, composition of the PVC pellets and coloring agents, health surveillance monitoring, personal protective equipment, work practices, and environmental and medical monitoring for the areas in question. Employee interviews focused on the job description, exposure histories, work practices, maintenance procedures and associated health problems.

Environmental and initial survey medical results and recommendations were forwarded to PVC and the requestor in October 1980 in Interim Report No. 1. A follow-up industrial hygiene and medical survey was conducted on January 26-28, 1981. Environmental results from the follow-up survey were reported in Interim Report No. 2, June 1981, to both PVC Container Corporation and the requestor.

III. BACKGROUND

PVC Container Corporation produces polyvinyl chloride (PVC) bottles through a blow molding process. Clear PVC pellets are purchased from a supplier. Color compounds are added to the pellets in a blender and dry mixed by means of an augur. The compound is then transported in large cardboard containers (gaylords) to the production area, where the virgin pellet compound is combined with recycled PVC and fed to a hopper. The mixture is then blown through an overhead compound supply system to another hopper positioned above the blow molding machine. PVC then drops into a heater which propels the molten plastic to the extruder head by means of an internal screw. (Electric coils around the heater melt the plastic).

The PVC is heated to 350-375°F, and leaves the extruder head in two continuous cylindrical streams. Each machine has two mobile molds which move up to surround the cylindrical streams of plastic. Air is

then injected inside the plastic cylinder to blow the plastic into the shape of the mold. The molds then open and drop the formed piece onto a conveyor belt which carries the pieces to a holding bin for inspection and packing. Each blow molding line also has a conveyor belt which carries scrap plastic and substandard pieces back to a grinder which grinds, then recycles the plastic into a hopper with the PVC pellets. Each blow molding line also has a hot melt grinder located at the floor level directly below the extruder head. The hot PVC (parison) enters the hot melt grinder and is automatically recycled. PVC will solidify in the extruder if the machine is turned off. Therefore, the machines must be purged with polyethylene before they are turned off for major repairs. The presence of the hot melt grinder, however, enables minor repairs to be performed on the machine while it is still operating. When the automatic hot melt grinders were not operative (during routine, short-term maintenance on the blow molding machines) it was necessary for the packer to pull the parison from the extruder head by hand to prevent a large-scale buildup of the parison beneath the extruder head. The employee complaints of headache, upset stomach, and dry skin were temporally associated with the need to pull hot parison from the extruder head during routine, short-term maintenance and malfunctioning of the blow molding machines.

Each blow-molding machine has a local exhaust ventilation canopy-type hood located above the heater and extruder. This hood is mobile and is often swung out of the way while the mechanics are making minor repairs.

Eight blow molding lines were in operation during the initial visit in June 1980. Nine lines were in operation during the follow-up survey in January 1981; there are plans to bring a tenth line into production.

IV. EVALUATION DESIGN AND METHODS

A. Environmental

The sampling strategy for the initial survey was based on the possible thermal decomposition products of PVC and polyethylene. Area samples, positioned as close as possible to the extruder head, were taken for hydrogen chloride, vinyl chloride monomer, benzene, styrene, methyl methacrylate, butadiene and phthalic anhydride. The area samples were taken to determine whether any of the above decomposition products were being formed as the heated PVC leaves the extruder head.

Personal samples for hydrogen chloride, vinyl chloride monomer and respirable dust were taken in the breathing zones of workers with the greatest possibility for exposure to these substances.

Hydrogen chloride was collected on silica gel tubes at a flow rate of 200 cc/min. Benzene, butadiene, methyl methacrylate and styrene were collected on charcoal tubes at a flow rate of 50 cc/min.

Vinyl chloride monomer was collected on two charcoal tubes positioned sequentially in the sampling train at a flow rate of 50 cc/min. Respirable dust was collected on preweighed FWSB filters equipped with nylon cyclones with a flow rate of 1.7 L/min. Phthalic anhydride was collected on cellulose ester membrane filters at 1.5 L/min. All environmental samples were obtained with portable pumps.

Spot noise measurements were also taken with a General Radio Noise Meter to determine exposure levels of the packer inspectors and the grinder operator.

The follow-up industrial hygiene survey focused on air sampling for organotin compounds and personal noise dosimetry based on: 1) the essentially negative PVC thermal decomposition products environmental measurements, however, positive medical questionnaire results (headache, nausea, skin problems) from the initial survey; 2) the development of a measurement method for organotin, another PVC thermal decomposition product reported to cause the above symptoms; and 3) the elevated spot noise measurements from the initial survey. Air samples for organotin were collected on mixed cellulose ester membrane filters with charcoal tube backups at a sampling rate of 1.5 liters per minute (Lpm). The mixed cellulose ester membrane filters were wet ashed with nitric and sulfuric acids. The ashed samples were aspirated into an atomic absorption spectrophotometer and analyzed by NIOSH Method S-183. The charcoal tube backups were also analyzed for tin: there is no established method for analyzing tin on charcoal, however, the following procedure was developed and found to be effective:

- 1) Samples were separated into sections
- 2) To each sample, 4 mL of HNO₃ was added
- 3) Sufficient HClO₄ was added to each sample to ash the charcoal
- 4) H₂SO₄ was used to remove HClO₄ from the solution
- 5) Samples were diluted to 10 ml and analyzed by aspiration AA
- 6) Standards were prepared and processed along with the samples.

The limit of detection is 15ug (micrograms) per sample section.

Personal noise measurements were taken with DuPont Model 100 Audio Dosimeters, which were attached to the lapel of the employee's clothing. Dupont Model 100 Audio Dosimeters detect only sound levels which are above 90 dBA.

B. Medical

The initial medical survey combined a non-directed and directed medical questionnaire to assess worker exposure histories, possible work-related health problems, other health problems and specific

symptoms (headache, stomach upset and skin problems) identified in the Health Hazard Evaluation Request.

The workers with suspected significant exposure to the PVC thermal decomposition products were ranked by job title during the walk-through survey. Job titles in descending order of suspected exposure were: 1) Packer/Inspector, 2) Manufacturing Engineer Operator (M.E. Operator), 3) Material Handler, 4) Grinder, and 5) Blender.

The potentially exposed group in the initial survey was defined as all packer/inspectors working at PVC Container Corporation longer than four months, all M.E. operators, the day shift material handler, and the one grinder and one blender.

On January 26-28, 1981, a follow-up medical survey was conducted. A directed medical questionnaire was administered to all PVC Corporation employees, working the dates of the evaluation, who had been interviewed on the initial medical survey. Packer/Inspectors and manufacturing engineer operators (M.E. Operators) were the two groups of employees with the highest suspected exposure to organotin compounds from the extrusion process and noise from the air hoses and from blowing out the hoppers. The material handler, grinder and blender positions were all held by new employees. The medical questionnaire was used to assess the prevalence and severity of the recognized health effects from exposure to organotin compounds. These include irritation of the skin, mucous membranes, eyes, and upper and lower respiratory tract, and the potential toxic responses of the liver, kidney, pulmonary and central nervous systems at low concentrations. Questions were also asked concerning each employee's health history and smoking and drinking habits.

V. EVALUATION CRITERIA

Evaluation Criteria Other Substances

A. Organotin

Organotin compounds cause irritation of the eyes, mucous membranes, and skin; some produce cerebral edema and others cause hepatic necrosis.¹ Organotin compounds differ in the severity of their toxic effects as well as in the organs they affect. The trialkyltins are apparently the most toxic group, followed by the dialkyltins and monoalkyltin. The major concern in occupational exposure to organotins is the potential for liver, kidney, pulmonary and central nervous system damage at low concentrations. Dermatitis, irritation of the eyes, and irritation of the upper and lower respiratory tract have been associated with inhalation of, or skin or eye contact with organotins.²

In a butyltin-manufacturing plant, Lyle⁵ found that, although there were no signs of systemic intoxication or skin sensitization in the employees, the chlorides of dibutyltin and tributyltin (the organotin used at PVC Corporation) were highly irritating to the skin and eyes. Chemical burns of the skin commonly occurred in handlers of the chlorides of dibutyltin and tributyltin when the compounds were in contact with their skin for more than a few minutes. Although painful, these burns were never severe and healed in 7 to 10 days; itching was the principal complaint. Diffuse, slowly healing skin lesions were observed in all employees at the butyltin-manufacturing plant. These faint, red skin eruptions occurred primarily on the lower abdomen, thighs, groin, and perineum of employees handling butyltins, probably resulting from prolonged contact with contaminated clothing. An accident involving the eyes of one employee was reported. Lacrimation and intense and sudden dilatation of the blood vessels of the conjunctivae appeared in minutes, despite immediate lavage, and persisted for 4 days. After 1 week, the employee's eyes were normal, but erythema of the surrounding skin persisted. The prevalence of skin lesions indicates the importance of a good program of work practices, with emphasis on personal hygiene to minimize skin and eye contact.

Zemen et al³, in 1951, reported four cases of employee exposure to unknown concentrations of tetramethyltin (TMT) and tetraethyltin (TET) in a laboratory. The routes and durations of their exposures were not specified, however, one employee had cleaned up traces of TMT with a wiping cloth 2 days prior to onset of illness. Initial symptoms in all four subjects included severe headaches and nausea, with vomiting in two instances. The illnesses lasted 4 to 10 weeks.

Both the NIOSH recommended standard and the Occupational Safety and Health Administration standard set for exposure to organotin compounds are 0.1 mg/m^3 measured as tin, 8-hour TWA.

B. Noise

Occupational exposure to high levels of noise can result in temporary and permanent losses in hearing sensitivity; and physical and psychological disorders.⁶

Explosive sounds or blasts can rupture the eardrum and possibly dislodge the ossicular chain. These disorders prevent or reduce the normal passage of sound energy from the outer to the inner ear and therein create a conductive-type of hearing loss. More commonly, excessive noise exposure produces hearing loss of a neural type involving injury to the hair cells of the inner ear. Histological studies of animal ears subjected to a high level noise have confirmed the site and extent of damage to the cell structures of the Organ of Corti.

Temporary hearing loss can be produced by brief exposures to high level sound and shows recovery following a period of time in quiet. As a general rule, a noise capable of causing a temporary threshold shift with brief exposures is probably capable of causing significant permanent losses in hearing, given prolonged or recurrent exposures.

Noise may also trigger changes in cardiovascular, endocrine, neurologic and other physiologic functions, all of which are suggestive of a general stress reaction. These physiologic changes are produced typically by intense sounds of sudden onset, but can also occur under sustained high level or even moderately strong noise conditions.

NIOSH recommends that exposures to noise be limited to 85 dBA as an 8-hour time-weighted average. The OSHA standard is 90 dBA for an 8-hour time-weighted average. The revised OSHA Occupational Noise Exposure and Hearing Conservation Standard Amendment sets 85 dBA TWA as an action level which requires initiation of a hearing conservation program including: 1) exposure monitoring, 2) an audiometric testing program, 3) education and training program, and 4) hearing protection.

VI. RESULTS

A. Environmental

Table 1 indicates the results of aerometric sampling for respirable dust. Personal samples for respirable dust ranged from below the limits of detection to 0.14 mg/m³. The OSHA standard for respirable nuisance dust is 5 mg/m³.

Process samples taken at the extruder head for butadiene, methyl methacrylate, styrene and phthalic anhydride were below the limits of detection. Three process samples for benzene were taken at the extruder head. A level of 0.02 ppm was measured at the extruder head of Line 7. NIOSH recommends a ceiling of 1 ppm for benzene.

The results of sampling for hydrogen chloride (HCl) are contained in Table 2. Process samples taken at the extruder head at Lines 5, 7 and 8 ranged from 0.13 to 0.19 ppm. Personal samples for hydrogen chloride which were taken while the packers were at their work station were below the limits of detection. Personal and area samples for HCl taken during the teardown and heating of an extruder head at a workbench were below the limits of detection. The OSHA standard for hydrogen chloride is 5 ppm.

Table 3 depicts the results of organotin sampling. Personal samples taken while the packers stood at their inspection stations were below the limit of detection for organotin. An area sample

taken at a remote spot on an electrical box detected no organotin. However, process samples taken at the extruder head at Lines 4, 6 and 10 demonstrated organotin levels of 0.13, 0.10 and 0.02 mg/m³ respectively. The OSHA standard and NIOSH recommended standard for organotin, reported as the concentration of tin detected, are 0.1 mg/m³.

The results of the noise sampling survey are depicted in Table 4. Spot noise measurements taken on June 12, 1980, indicated that packers at their inspection station were exposed to noise levels ranging from 85-92 dBA. Noise level at the face of the blow molding units ranged from 88-102 dBA. The grinder, working in a remote area was exposed to noise levels ranging from 92-102 dBA. The grinder was provided with hearing protection. DuPont Model 100 Audio Dosimeters do not detect noise levels less than 90 dBA, and therefore, the data is not suitable for comparison to the NIOSH recommended standard of 85 dBA. Personal noise dosimetry demonstrated that packers were exposed to noise levels which were below the OSHA standard.

Mechanics were exposed to "noise" levels ranging up to 91 dBA. Material handlers were exposed to noise levels which were below the OSHA standard for an 8-hour time-weighted average.

B. Medical

1. Initial Survey

All 36 potentially exposed employees identified during the initial walk-through survey and working June 11-12, 1980, (packer/inspectors-22, M.E. operators-11, material handler-1, grinder-1, and blender-1) were interviewed. The packer/inspector group consisted of 21 females with a mean age of 35.2 years and one male. The mean ages of the 11 male M.E. operators and of the 3 male "other" category (material handler, grinder, blender) were 25 years and 31 years, respectively. The mean length of employment at PVC Corporation for each worker group was: packer/inspector - 2.4 years; M.E. operators - 3.2 years; and "other" - 1.8 years. This included all employees (four shifts) in the identified job classifications working June 11-12, 1980, with the exception of two packer/inspectors who were absent.

Of 36 employees, 27 (75%) reported work exposures to dust and/or fumes. As can be seen in the following table, 21 of 36 employees (58%) reported occasional to frequent headache while at work. Eighteen (50%) of employees reported occasional to frequent stomach upset or nausea and 20 (56%) reported one or more of the following skin conditions: dryness, redness,

pruritis (itching), scaling, soreness, rash, blisters and burns and lacerations (cuts) which were slow to heal.

Reported Symptoms by Job Title
Initial Survey - June 10-12, 1980

Job Title	No. in Job Title	Reported Symptoms		
		Headache	Stomach Upset/Nausea	Skin Conditions
Packer/Inspector	22	12 (55%)	10 (45%)	11 (50%)
M.E. Operator	11	7 (64%)	7 (64%)	7 (64%)
"Other"	3	2 (67%)	1 (33%)	2 (67%)
Totals	36	21 (58%)	18 (50%)	20 (56%)

The job classification packer/inspector was identified by observation of working conditions as the most exposed group. Both M.E. operators and the "other" job classification, however, reported greater percentages of all three symptoms (64%-67% compared to 45%-55% of packer/inspectors) with one exception. Stomach upset/nausea was reported by only 33% of the "other" job category as compared to 45% of packer/inspectors.

Employees also expressed other concerns, specifically eye, nose, throat irritation identified by 9 (25%) of the employees interviewed. The five most frequently cited causes of symptoms reported by employees were:

- a. Fumes from pulling parison with symptoms increasing in severity with time spent pulling parison longer than 15 minutes. Thirteen of 22 packer/inspectors (60%) reported headache, stomach upset, and/or skin problems from fumes and increased skin contact from pulling parison.
- b. Specific coloring agents (yellow, orange, white) were identified as causing more symptoms than others.
- c. Specific lines (3, 5, and 7) were reported by packer/inspectors as causing more symptoms than others, due to either inadequate fume control equipment or more frequent breakdown of the line.
- d. Fumes associated with the PVC teardown when repairing damaged motors were reported by 6 (55%) of the M.E. operators.

- e. Dust causing mucous membrane irritation when the hoppers were being blown out was mentioned by 12 workers.

2. Follow-Up Survey

On the follow-up survey 21 employees (4 shifts) were interviewed using a directed medical questionnaire related to exposures, their possible origin, and symptoms specifically associated with organotin and noise exposure. This included all employees (20) who were interviewed on the initial survey and were currently employed at PVC Corporation, and one maintenance mechanic. Nineteen employees (13 of 46 packer/inspectors and 6 of 15 M.E. operators) whose job title at the time of both surveys was either packer/inspector or manufacturing engineer (M.E.) operator, were included in the follow-up survey data analysis. One employee was excluded due to change to non-included job title, another because of not being in the initial survey.

The 12 females and 7 males interviewed included 11 female and one male packer/inspectors, and 6 male M.E. operators. The mean age of the 12 females was 40.8 years with a mean length of employment at PVC Corporation of 2.3 years. The mean age of the 7 men was 25.7 years with a mean length of employment of 3.9 years. All means were comparable to the initial survey.

Thirteen of the 19 employees (68%) reported one or more work exposures to fumes, vapors, aerosols, dust, humidity, heat and noise.

Eighteen employees reported health problems from exposure to organotin and noise (Following Table). Seven reported headaches; 17 mucous membrane irritation of the eyes, nose, and throat; 14 skin conditions, rashes which included dry, cracked, red skin, and multiple burns in various stages of healing; 12 reported hearing problems which ranged from having difficulty in communicating while working to reported actual hearing loss; and 10 reported fatigue (See Table). There was no unusual prevalence of any one health problem of the hepatic or genitourinary systems. The one significant pulmonary system finding, a daily chronic cough, was reported by 6 of 19 (32%) employees, however, all were either current or ex-smokers.

Reported Symptoms/Health Problems by Job Title
Follow-Up Survey - January 26-28, 1981

Reported Symptoms/Health Problems	Number of Workers by Job Title		
	Packer/Inspector (13)	Mechanical Operator (6)	Totals (19)
Headaches	5 (38%)	2 (33%)	7 (37%)
Mucous Membrane Irritation	12 (92%)	5 (83%)	17 (89%)
Skin Conditions	10 (77%)	4 (67%)	14 (74%)
Rash	10 (77%)	1 (17%)	11 (58%)
Burns	0	0	0
Rash and Burns	0	3 (50%)	3 (16%)
Fatigue	6 (46%)	4 (33%)	10 (53%)
Hearing Problems			
Hearing Difficulty at Work	9 (69%)	3 (50%)	12 (63%)
Hearing Loss	2 (15%)	1 (16%)	3 (16%)

Seven of the 19 employees temporally related their headaches to one or more of the following exposures: fumes and coloring agents from pulling the hot plastic parison during breakdowns and from the melting plastic during teardowns, especially during dry cold weather; aerosols from the spray stencils used in labeling the boxes; vapors from the glue in sealing the boxes; and noise from the machinery specifically air hoses, and the blowers used in cleaning the hoppers.

Ten of 13 packer/inspectors temporally related their dry, cracked, red skin and rashes to pulling hot plastic parison during breakdowns and in removing the tails from the hot plastic bottles in handling during packing and inspecting; to solvents used in cleaning bottles; and to the dry environment due to low humidity seasonal variations and the building ventilation system. The 4 of 6 mechanical operators temporally related their burns predominantly to repair of hot die parts and to contact with hot plastic during machine repairs, and the rash to the hot humid environment.

Mucous membrane irritation was reported by 17 of 19 (89%) packer/inspectors and M.E. operators. Both groups of workers temporally associated their exposure to parison fumes, coloring agent vapors, spray stencil mist, dust from blowing out the hoppers, and to the dry humid environmental conditions in the plant which were seasonal. Two of each group reported allergies aggravated by their exposures. Fatigue was reported by 33% of employees: Packer/inspectors temporally associated fatigue to noise, repetitive motion, muscle strain, and the hot

environment; M.E. operators to physical work load/stress and noise.

Work related hearing problems were identified by 12 of 19 workers ranging from difficulty hearing at work due to the noisy environment to reported actual hearing loss. The air hoses and blowing out of hoppers were identified by both groups as the causes of the excess noise.

Comparison of the significant chemical hazard health problem findings by job title from both the initial and follow-up surveys are presented in the following table.

Percent of Reported Health Problems from Initial and Follow-Up Surveys by Job Title

Job Title	Percent of Reported Symptoms/Health Problems by Survey			
	Headache		Skin Conditions	
	Initial Survey	Follow-Up Survey	Initial Survey	Follow-Up Survey
Packer/Inspector	55%	38%	50%	77%
M.E. operator	64%	33%	64%	67%

As can be seen in the table, headaches had decreased from the Initial to Follow-Up Survey in both exposed groups. PVC Container Corporation had instituted some engineering and administrative controls to control fume exposure following the initial survey. Skin conditions had increased in both groups, and substantially in the packer/inspector group from 50% to 77% (an increase of 22%), and in the machine operators 64% to 67%. Seasonal variations and resulting climatic conditions may account for this as the initial survey was in June, the follow-up survey in January, where the dry plant environment compounded with the low humidity and cold weather most probably initiated and aggravated skin conditions.

VII. CONCLUSIONS

The results of the area air monitoring indicate that organotins and small amounts of hydrogen chloride are being volatilized at the extruder head. These were not detected in personal samples taken while the packers worked at their inspection stations. On the days of the surveys, there were no opportunities to conduct personal sampling during the pulling of parison. Medical survey data results determined that employees suffered headaches, nausea and dry skin when pulling parison, especially when they had to do so for longer than 15 minutes at a time. This may occur because the overhead exhaust canopy is

usually swung out of the way to allow access to the machine and the volatilized organotins and HCl are not exhausted efficiently nor away from the worker. In addition, the employee must hand roll the parison in a ball and place it on trays to cool, thus increasing worker potential exposure. The association of symptoms with the pulling of parison strongly suggests that the volatilized organotins or other material released at the extruder head are the cause of the symptoms, which are not reported when the packers are at their normal work station. This situation may be resolved by the repair and maintenance of the automatic hot melt grinders and appropriate use of ventilation hoods. This recommendation was made in Interim Report No. 1. Mechanics and operators now check the hot melt grinders before each shift to ensure that they are functioning properly. No pulling of parison was noted on the second survey. As a result, headaches and gastrointestinal upset symptoms have decreased. Mucous membrane irritation and skin problems, however, continue to occur during the pulling of parison, and are especially acute and severe during the winter months when climatic conditions are dry with low humidity.

The follow-up noise survey indicated that noise levels had been reduced since the first survey by the company noise control program. Foam padding had been placed around the metal pipes through which PVC pellets were blown by compressed air. Noisy blowers were replaced and expanded metal grates in front of the blow-molding machines had been replaced by plastic enclosures. Some noise levels continue to exceed 85 dBA with workers reporting associated health effects.

Most of the personal dosimetry for noise exposures were below the OSHA standard. The mechanics, however, are often called upon to work closely with the machines. Therefore, hearing protection should be made available to them.

Respirators used in the mold cleaning area should be of the organic vapor type when solvents are in use.

VIII. RECOMMENDATIONS

1. Continue preventive maintenance program of ventilation and hot melt grinders. This will eliminate the need to manually pull the plastic parison from the extruder head. The practice of manually pulling plastic should be avoided.
2. Until noise exposure has been reduced to acceptable levels, continue the noise reduction program according to the NIOSH Recommended Noise Standard⁶ and OSHA mandated Occupational Noise Exposure, Hearing Conservation Amendment.⁷

IX. REFERENCES

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XI. DISTRIBUTION AND AVAILABILITY OF REPORT

Copies of this report are currently available upon request from NIOSH, Division of Standards Development and Technology Transfer, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days, the report will be available through the National Technical Information Service (NTIS), 5285 Port Royal, Springfield, Virginia 22161. Information regarding its availability through NTIS can be obtained from NIOSH Publications Office at the Cincinnati address. Copies of this report have been sent to:

1. PVC Container Corporation, Eatontown, New Jersey
2. Retail and Wholesale Department Store Union (R.W.D.S.U.), Local 108
3. Confidential Requestor
4. NIOSH, Region II
5. OSHA, Region II

For the purpose of informing affected employees, copies of this report shall be posted by the employer in a prominent place accessible to the employees for a period of 30 calendar days.



TABLE 1
AEROMETRIC SAMPLING FOR RESPIRABLE DUST

PVC CONTAINER CORPORATION
EATONTOWN, NEW JERSEY
HE 80-104

June 11, 1981

JOB DESCRIPTION OR LOCATION	DATE OF SAMPLING	TYPE OF SAMPLE	DURATION OF SAMPLING	CONCENTRATION (mg/m ³)
Material Handler	6/11/81	Personal	7:28am-3:12pm	0.14
Mechanic	"	"	7:23am-3:14pm	BLD
Mechanic	"	"	7:20am-3:16pm	0.14
Grinder	"	"	7:10am-3:42pm	0.05
Blender	"	"	7:05am-3:16pm	0.09
Mechanic	"	"	8:18am-3:22pm	BLD
Custodian	"	"	8:31am-2:34pm	0.02
Mechanic	"	"	8:14am-3:22pm	0.03
Evaluation Criteria				5

BLD = Below limit of detection

TABLE 2
 HYDROGEN CHLORIDE SAMPLING
 PVC CONTAINER CORPORATION
 EATONTOWN, NEW JERSEY
 HE 80-104

June 11, 1981 and January 27, 1981

JOB DESCRIPTION OR LOCATION	DATE OF SAMPLING	TYPE OF SAMPLE	DURATION OF SAMPLING	SAMPLE VOLUME (Liters)	CONCENTRATION (PPM)
Extruder Head, Line 8	6/11/80	Area	6:35am-4:07pm	97	0.13
" " " 7	"	"	6:40am-4:10pm	100	0.18
" " " 5	"	"	6:43am-4:16pm	108	0.19
" " " 3	"	"	6:45am-4:42pm	109	BLD
Packer, Line 8	"	Personal	7:36am-1:25pm	43	BLD
" " 7	"	"	7:44am-3:25pm	79	BLD
" " 5	"	"	7:47am-3:26pm	20	BLD
" " 2	"	"	7:52am-3:27pm	87	BLD
Teardown and Heating of Extruder Head					
A. Mechanic	1/27/81	Personal	1:47pm-4:20pm	29	BLD
B. Mechanic	"	"	1:47pm-4:20pm	28	BLD
C. General Area	"	Area	1:49pm-4:31pm	30	BLD
Evaluation Criteria					5

BLD = Below limit of detection, (0.01 mg per sample)

TABLE 3
 ORGANOTIN SAMPLING
 PVC CONTAINER CORPORATION
 EATONTOWN, NEW JERSEY
 HE 80-104

January 27-28, 1981

JOB DESCRIPTION OR LOCATION	DATE OF SAMPLING	TYPE OF SAMPLE	DURATION OF SAMPLING	SAMPLE VOLUME (Liters)*	CONCENTRATION mg/m ³ (as TIN)
Packer, Line 10	1/27/82	Personal	8:04am-3:02pm	627	BLD
" " 8	"	"	8:07am-3:00pm	620	BLD
" " 7	"	"	8:11am-2:57pm	609	BLD
Extruder Head, Line 6	"	Area	8:15am-3:21pm	639	0.10
Packer, Line 4	"	Personal	8:18am-3:20pm	633	BLD
" " 3	"	"	8:25am-2:55pm	585	BLD
" " 2	"	"	8:27am-3:03pm	594	BLD
Packer Trainee, Line 3	"	"	8:35am-3:15pm	585	BLD
Extruder Head, Line 4	"	Area	8:37am-3:20pm	605	0.13
" " " 10	"	"	8:43am-3:30am	611	0.02
Area Sample on Electrical Box, West Wall of Prod. Area	"	"	11:49am-3:32pm	223	BLD
Packer, Line 10	1/28/81	Personal	9:35am-2:43pm	462	BLD
" " 4	"	"	9:21am-2:52pm	496	BLD
Area Sample on Electrical Box, West Wall of Prod. Area	"	Area	9:07am-2:45pm	507	BLD
Substitute Packer, Lines 4 and 5	"	Personal	9:03am-2:47pm	516	BLD
Packer, Line 2	"	"	8:56am-2:57pm	452	BLD
" " 9	"	"	8:49am-2:44pm	443	BLD

Evaluation Criteria

0.1

* Organotin results reported as the concentration of Metallic Tin
 BLD = Below limits of detection (0.01 mg per sample).

TABLE 4
NOISE SAMPLING
PVC CONTAINER CORPORATION
EATONTOWN, NEW JERSEY
HE 80-104

June 12, 1981 and January 27-28, 1981

JOB DESCRIPTION OR LOCATION	DATE OF SAMPLING	TYPE OF SAMPLE	DURATION OF SAMPLING	NOISE LEVEL (dBA)
Line 1, Packer	6/12/81	Spot-Area	-	88-92
" Extruder Head	"	"	-	88-102
Line 2, Packer	"	"	-	88-90
" Extruder Head	"	"	-	88-97
Line 3, Packer	"	"	-	85-86
" Extruder Head	"	"	-	88-92
Line 5, Packer	"	"	-	85-90
" Extruder Head	"	"	-	89-102
Line 6, Packer	"	"	-	87-89
" Extruder Head	"	"	-	89-96
Line 7, Packer	"	"	-	86-87
" Extruder Head	"	"	-	89-94
Line 8, Packer	"	"	-	88-89
" Extruder Head	"	"	-	89-92
Blender	"	"	-	87-88
Grinder, Machine on, no Grinding	"	"	-	92
" While Grinding	"	"	-	96-98
" " " & Using Air	"	"	-	98-102
Compressor to Clean off the Machine	"	"	-	98-102
Material Handler	1/27/81	Personal Dosimetry	8:59am-2:54pm	BOS
Packer, Line 3	"	"	9:14am-2:55pm	93
Mechanic	"	"	9:16am-2:55pm	BOS
Packer, Line 8	"	"	9:25am-3:00pm	BOS
" " 2	"	"	9:30am-3:03pm	BOS
Utility Man	"	"	4:09pm-11:05pm	BOS
Material Handler	"	"	4:13pm-11:03pm	BOS
Mechanic	"	"	4:16pm-11:11pm	BOS
Packer, Line 4	"	"	4:29pm-11:08pm	BOS
" " 7	"	"	4:33pm-11:05pm	BOS
Material Handler	1/28/81	"	9:11am-2:45pm	BOS
Mechanic	"	"	9:17am-2:51pm	91
Packer, Line 4	"	"	9:35am-2:43pm	90
Mechanic	"	"	10:40am-2:52pm	BOS
Packer, Line 10	"	"	9:35am-2:43pm	BOS

OSHA Standard - 90 dBA - 8-hour
NIOSH Criteria - 85 dBA - 8-hour

BOS - Below OSHA Standard