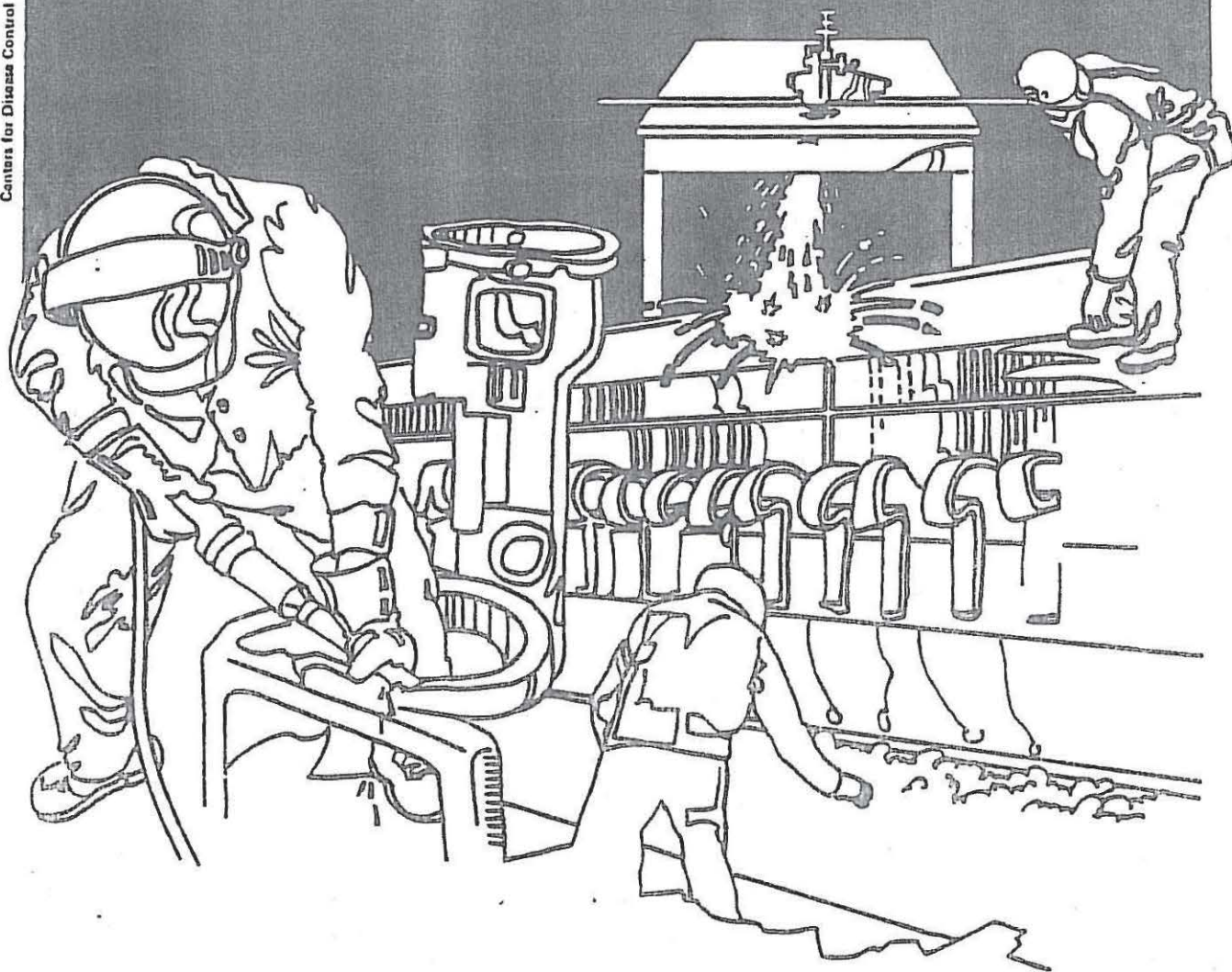


NIOSH



Health Hazard Evaluation Report

HETA 85-380-1651
CHAMPION DAIRYPAK
MORRISTOWN, 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.

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CHAMPION DAIRYPAK
MORRISTOWN, NEW JERSEY

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SUMMARY

On May 29, 1985 the National Institute for Occupational Safety and Health (NIOSH) received a request from the UAW Local 260 to investigate health hazards to their members at Champion DairyPak in Morristown, New Jersey. The request was assigned to the New Jersey State Department of Health (NJDOH) for follow-up under the NIOSH-NJDOH Cooperative Agreement. The request asked for information about toxicity of new products being used in the plant and cited respiratory complaints from polymer dust.

The plant employs approximately 135 workers on 3 shifts printing and folding plastic impregnated cartons used for dairy products. A detailed walk through of the plant was conducted, material safety data sheets and company industrial hygiene sampling results were obtained and brief medical questionnaires were administered to all first shift employees exposed to dust. Four of 15 employees questioned noted respiratory irritation from dust during clean-up procedures on the sealing machines.

Air sampling was conducted by the company in December, 1982 and January, 1983 for exposure to organic solvents. Exposure to 2-ethoxyethanol (Cellosolve) were between 3.2 and 12.7 ppm, ethyl acetate from 30-65 ppm and ethyl alcohol from 73-160 ppm. As a result of this monitoring, and information on potential toxicity, 2-ethoxyethanol was replaced with propylene glycol monomethyl ether. Sampling for PGME in September, 1984 indicated levels from 3.6 to 19.0 ppm. The sampling data indicated that exposures to ethyl acetate and ethyl alcohol were below the recommended limits and substitution of PGME for cellosolve reduced the potential health risks of exposure to this solvent.

On the basis of a walkthrough evaluation and interviews of potentially exposed employees, it has been determined that minimal health hazards exist at Champion DairyPak from exposure to dusts on the sealing machines and solvents in the printing process. Recommendations are given to protect workers from exposure to irritating dust and solvents.

Key Words: SIC 2654, Sanitary Food Containers, polymer dust, solvents, respiratory complaints

INTRODUCTION

On May 29th, 1985, NIOSH received a request from the UAW Local 260 to investigate health hazards to their members at Champion DairyPak in Morristown, New Jersey. On June 5th, the request was referred to the New Jersey Department of Health for follow-up. The request stated two potential problems. First, respiratory problems were suspected in workers exposed to polymer dusts and second, there was concern about the potential effects of inks that had recently been introduced to the process.

BACKGROUND

Champion produces paper containers, primarily for dairy products, at its plant in Morristown. A total of 135 production workers are employed at the plant on three shifts. Production involves two major manufacturing processes, converting and sealing, in addition to warehousing, packaging and shipping.

In the converting area, eight printing presses, termed convertors, print one surface of polyethylene impregnated paper board, score and cut the board for folding, apply an adhesive and stack the products for further processing. Three people run each of the convertors. Normally, six machines are run on first and second shifts, and one on the third shift.

In the sealing department, six sealing machines fold the converted paper board, heat the polyethylene on two edges with a gas flame and seal one edge to the other. Three to four operators run each sealing machine and normally six machines are run on first and second shift, one on third shift.

The main manufacturing area which includes converting and sealing is a high noise area and ear plugs are required for all employees in the area.

Other areas of the plant include an ink room where inks and solvents are stored and prepared, a plate room in which rubber printing plates are prepared, and a small machine shop.

The plant used primarily solvent-based inks until recently. In 1984, about two thirds of production was with water-based inks.

Air sampling for solvents was performed by the company in December, 1982 and again in January, 1983. These studies were done using two sampling methods, standard charcoal tubes with calibrated air pumps, and 3M Passive Dosimeters, Model 3500. Desorption was conducted with carbon disulfide. Results of the 12/82 study are summarized below:

<u>Area</u>	<u># of Samples</u>	<u>Time Weighted Average Exposures</u> <u>parts per million (ppm)</u>		
		<u>Cellosolve</u>	<u>Ethyl Acetate</u>	<u>Ethyl Alc.</u>
Convertor Operator	2	12.0, 6.1	50, 65	--
Convertor Helper	1	--	40	--
Ink Room	2	6.1, 3.2	35, 45	73, 160
Plate Room	2	--	54, 30	--

The January, 1983 study utilized methylene chloride for the desorption solvent. Results of this study indicated exposures to cellosolve of 9.6 to 12.7 ppm on the converter operators and helpers and in the ink room, in the same range as the earlier measurements. As a result of these two tests, the use of the 3M Passive Dosimeter, with methylene chloride desorption was adopted for all future cellosolve sampling.

An additional study of airborne solvent levels was conducted in September, 1984 after the introduction of propylene glycol monomethyl ether (PGME) and elimination of cellosolve from the process. The four samples collected on convertor operators indicated exposures of 5.1-19.0 parts per million (ppm) with a mean of 9.6 ppm PGME. The highest level, 19.0 ppm was on the #16 Convertor Operator. One measurement of exposure level to PGME in the Ink Room was 3.6 ppm.

The methods of sampling and analysis used in these studies of cellosolve exposure appear to be valid and the results give a reasonable indication of average exposures to the operators monitored on the day of sampling.

Occupational health standards for cellosolve and other chemicals used at the plant are given in the Evaluation Criteria section, below.

The company's industrial hygienist stated that he had taken one area sample and one personal sample for total dust in the sealing department in September, 1984. No airborne dust was detected in these measurements.

The company's hygienist also reported that noise measurements taken in the converting and sealing department indicated levels between 85 and 90 dBA. The OSHA standard for noise exposure is 90 dBA

for eight hours with a hearing conservation program required if exposures exceed 85 dBA and NIOSH recommends keeping noise levels below 85 dBA averaged over an eight hour exposure.

Employees are given a pre-employment examination and an annual audiometric evaluation. Results of air sampling are not routinely made available to the employees. Audiometric testing results have been transmitted to employees.

EVALUATION CRITERIA

A. General

As a guide to the evaluation of the hazards posed by workplace exposures, NIOSH field staff employ environmental evaluation criteria for assessment of a number of chemical and physical agents. These criteria are intended to suggest levels of exposure to which most workers may be exposed up to 10 hours per day, 40 hours per week for a working lifetime without experiencing adverse health effects. It is, however, important to note that not all workers will be protected from adverse health effects if their exposures are maintained below these levels.

In addition, some hazardous substances may act in combination with other workplace exposures, the general environment, or with medications or personal habits of the worker to produce health effects even if the occupational exposures are controlled at the level set by the evaluation criterion. These combined effects are often not considered in the evaluation criteria. Also, some substances are absorbed by direct contact with the skin and mucous membranes and thus potentially increase the overall exposure. Finally, evaluation criteria may change over the years as new information on the toxic effects of an agent become available.

The primary sources of environmental evaluation criteria for the workplace are: 1) NIOSH Criteria Documents and recommendations, 2) the American Conference of Governmental Industrial Hygienists (ACGIH), Threshold Limit Values (TLV's), and 3) the US Department of labor (OSHA) occupational health standards. Often, the NIOSH recommendations and ACGIH TLV's are lower than the corresponding OSHA standards. Both NIOSH recommendations and ACGIH TLV's usually are based on more recent information than are the OSHA standards. The OSHA standards also may be required to take into account the feasibility of controlling exposures in various industries where the agents are used; the NIOSH-recommended standards, by contrast, are based primarily on concerns relating to the prevention of occupation disease. In evaluation the exposure levels and the recommendations for reducing these levels found in this report, it should be noted that industry is legally required to meet the levels specified by an OSHA standard.

A time-weighted average (TWA) exposure refers to the average airborne concentration of a substance during a normal 8 to 10 hour workday. Some substances have recommended short-term exposure limits or ceiling values which are intended to supplement the TWA where there are recognized toxic effects from high short-term exposure.

Criteria for exposure limits for the chemicals used at Champion are as follows:

8 Hour Time Weighted Average
(parts per million)

<u>Compound</u>	<u>OSHA</u>	<u>ACGIH</u>	<u>NIOSH</u>
Cellosolve	200	5	LFL*
PGME	--	100	--
Ethyl Acetate	400	400	--
Ethanol	1000	1000	--

* Lowest Feasible Level

B. Toxicity

Glycol ethers including cellosolve (2-ethoxyethanol) and propylene glycol monomethyl ether (PGME) have toxic properties characteristic of solvents, including central nervous system depression, liver and kidney damage, and effects on the skin. In addition, 2-ethoxyethanol has been found by NIOSH to present a significant reproductive hazard on the basis of damage to both male and female reproductive systems in animals and recommends that exposure be reduced to the lowest feasible level(1). NIOSH has determined on the basis of animal studies that PGME is metabolized differently from 2-ethoxyethanol and that it is not thought to have significant reproductive toxicity (2,3).

Cellosolve has been used at the plant in the past. In March, 1983 the company's industrial hygienist recommended that it be replaced with PGME. The plant thus no longer uses cellosolve.

Overexposure to ethyl acetate also produces typical solvent effects on the central nervous system, liver, kidneys and skin. In addition, it is irritating to the eyes and respiratory tract (4).

Ethanol is a solvent with relatively low toxicity, with effects on the central nervous system at very high doses. It is irritating to the eyes only if in concentrated or pure form and is not a skin irritant. With prolonged high exposure, liver damage may result (4).

The contents of the water-based inks currently in use differ from the older solvent-based inks primarily in the amount of solvent used. The water-based inks include only minute amounts of solvent while the solvent-based inks are primarily solvent. Both types include solvents such as ethanol, isopropyl alcohol, ethyl acetate, VM&P naptha and small amounts of ethylene glycol monobutyl ether. As with PGME, recent animal studies suggest that ethylene glycol monobutyl ether is not a reproductive hazard. In addition, the inks also contain pigments, most of which are organic pigments, titanium dioxide or carbon black, and are not volatile. The water-based inks are inherently less toxic than the solvent-based inks since they are less volatile, and are therefore less likely to become airborne and inhaled by workers. Dermal toxicity would also be expected to be lower.

No specific health hazard information is available on polyethylene impregnated dust. Neither polyethylene nor paper dust is known to cause any chronic adverse health effect, however, paper dust may have an irritant effect of mucous membranes.

MATERIALS AND METHODS

On August 7, 1985 a walkthrough inspection was conducted to identify potential health hazards and evaluate the potential for studying the problems identified in the MHE request. Participating in the walkthrough were representatives of the New Jersey Department of Health, Champion DairyPak and UAW Local 260.

In addition to the walkthrough of all work areas of the plant, a brief questionnaire to elicit respiratory symptoms was administered by a New Jersey Department of Health physician to employees in the sealing department. Material Safety Data Sheets of all materials used in the plant were also obtained for review.

RESULTS

In general, the plant appeared well-maintained and clean. Fresh air is supplied through several overhead supply ducts and exhausted primarily through the local exhaust vents on the drying units of the presses.

A. Walkthrough

1. Convertors -- The primary potential hazard in this area comes from exposure to solvents used as ink carriers and in washing down the printing rollers. Pressmen pour inks from 2 1/2 gallon pails into trays mounted on the press. The paper is fed between a series of rollers and the ink is applied. The paper is then fed into an enclosed, heated drying chamber which is vented with a local exhaust system. The paper board then runs through a series of cutters and is automatically stacked at the end of the machine. Between runs, the pressmen must clean the ink trays and ink-covered rollers.

For water-based inks, the trays are removed, the excess ink is drained back into the pail with a squeegee, and the tray is put into a hot water/detergent bath to soak. Water is used to wash down the rollers. For solvent-based inks, the trays are emptied, then ethanol is poured over the rollers and the solvent is collected in the tray. Waste solvent is removed to waste drums for shipment out of the plant. Operators in contact with inks sometimes wear gloves. No evidence of ink misting in the press area was observed.

2. Sealers -- The sealing machines automatically load stacks of paper board and send one at a time through a heating element to soften the polyethylene, then fold the board over and press the two heated edges together to form a bond. The paper is fed through the machine at high speed on a series of belts. Some dust accumulation is visible in the area. There are occasional breakdowns of the system requiring employees to clear the machines and make minor adjustments. Visible fume is evolved from the plastic only when the machine breaks down and a paper-board is stuck in the gas heating segment. There is no dust control ventilation applied to the machines. Employees blow the dust off the machines daily with compressed air hoses and sweep up the resulting accumulations.

3. Ink Room -- One employee works in this room keeping track of ink supplies and preparing the colors for the pressmen as needed. Occasionally, special ink colors need to be hand mixed. The ink man does the mixing on a work bench in the room. Solvents and the adhesive are supplied to the process by taps in the ink room. Converter operators fill containers with the solvents or adhesive directly from the taps and take them to the press operation as needed. A tray under the filling station catches overflow and is unvented. Solvent sits in this tray and is occasionally tapped off and removed as waste. The room has general ventilation supplied by a central supply unit and exhausted by five exhaust vents located near the floor on three walls. Inks are stored in aisles in small covered pails ready for use. Although the inks are covered and good general ventilation is supplied there is a distinct solvent odor in this room.

4. Plate Room -- Rubber plates for printing are prepared in this room. Engraved steel plates are used to form an impression in a composite board under heat and pressure. Then rubber matting is cut and placed over the composite-board impression and again heated under pressure to form the image in the rubber. The rubber plate is then mounted on a metal "saddle" which is mounted on the press during printing. Ethyl Acetate is used to mount the rubber to the steel plate. A vent hood is in place over the heated press to remove any volatile contaminants. Rubber gloves are supplied and are used by some operators.

5. Waste Storage Area -- Drums of waste are held in one area of the manufacturing room along with drums of press lubricants. In addition, waste water-based solvents are placed in a "boil-down"

container for driving off the excess water. The boil-down is heated electrically and the water vapor produced is vented off through a four inch pipe to the outside. The residue is periodically shoveled out of the tank into a drum and carried off as waste.

B. Symptom Survey

Fifteen people on the first shift were questioned privately concerning respiratory symptoms that might be related to dust exposure at work. Of the fifteen, eleven reported no relevant respiratory symptoms. One employee with longstanding asthma and hay fever complained of occasional eye and nasal irritation, primarily during blowing of dust from the machines. One employee reported occasional coughing when blowing dust from machines and also has trouble wearing contact lenses because of dust irritation. One employee report throat irritation during blowing of dust and one ex-smoker reported frequent bronchitis, upper respiratory irritation and sore throat. Thus, four of fifteen employees interviewed on the first shift reported symptoms associated with an irritant dust; three of these four experience their symptoms only during cleaning of machines.

DISCUSSION AND CONCLUSIONS

The primary potential exposures in this plant are noise, solvents and polyethylene dust. The noise problem has been evaluated by the company and a hearing conservation program has been put in place.

The greatest potential for solvent exposure occurs among convertor operators and employees in the ink room. Of primary importance is exposure to cellosolve. Based on information on the potential reproductive hazards of cellosolve, the company replaced the solvent with ArcosolveTM, which is propylene monomethyl glycol ether (PGME). This substitution is appropriate as current information indicates that PGME does not present the same reproductive hazard. Exposures to solvents on the presses appear to be well controlled and sampling results from the company suggest that exposures are well below OSHA standards, and NIOSH recommended standards.

As no evidence of misting of inks was observed, it is unlikely that workers on the presses have any airborne exposure to ink components other than the volatile solvents. Therefore, no health hazards from ink exposures are present.

Dust exposures to employees on the sealing machines appear minimal. Employee complaints suggest that during clean-up procedures, which include blowing dust from the machines with compressed air, eyes and upper respiratory irritation may occur. No chronic hazard from this exposure is expected since neither polyethylene nor paper dust is known to cause any chronic adverse health effects. However, attempts at minimizing this dust exposure should be pursued.

Based on these findings, it has been determined that only minimal health hazards currently exist at Champion DairyPak and further study of exposures or health effects is not required. Some changes in the work areas to further reduce potential exposures, provide adequate protection, and communicate health hazard information are recommended.

RECOMMENDATIONS

1. All employees handling solvents should be given impervious gloves and instructed on the importance of protection of skin from solvent exposures.
2. A vacuum system should be set up to aid cleaning of the sealing machines. For cleaning areas which cannot be reached by a vacuum hose, the current system of blowing down the machine is acceptable. The pressure in the air line should not exceed 30 psi as dictated by OSHA Standard 1910. 242(b). Employees involved in the clean up should be provided with eye protection goggles and a dust respirator. Only respirators approved by NIOSH for use with toxic dusts should be used. The use of the respirator should be conducted in conformance with the OSHA Respiratory Protection Standard, CFR 1910.134.
3. The solvent dispensing station in the ink room should be fitted with an appropriate local exhaust ventilation system to collect solvent vapors from the taps, the drip tray and the waste bucket. The drip tray should also be improved to allow rapid draining of spilled solvents into a covered container.
4. A periodic preventive maintenance schedule should be set up for the general ventilation in the ink room. The program should include monthly measurement of exhaust velocities and recording of the findings in a log book.
5. An assessment of solvent exposure should be conducted for employees in the plate room. If appreciable exposure is present, installation of slot exhaust ventilation on work tables should be considered.
6. Since the contents of the boil-down residue is not known, employees cleaning out the tank should be provided with full protective clothing and combination dust and organic vapor cartridges.
7. In addition to the current hearing protection program, a detailed noise survey should be conducted in order to identify sources of noise and potential noise control strategies. Steps should be taken to reduce noise levels in the plant where they are found to exceed 85 dBA.

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DISTRIBUTION AND AVAILABILITY OF THIS REPORT

Copies of this report are currently available, upon request, from NIOSH, Division of Technical Services, Information Resources and Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days, the report will be available through the National Technical Information Service (NTIS), Springfield, Virginia 22161.

Copies of this report have been sent to:

1. United Auto Workers, Local 260
2. Champion DairyPak, Morristown, PA
3. NIOSH, Region II
4. OSHA, Region II

For the purpose of informing the 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.