U. S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
CENTER FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
CINCINNATI, OHIO 45226

HEALTH HAZARD EVALUATION DETERMINATION
REPORT NO. 75-181-287

FIBREBOARD CORPORATION
STOCKTON, CALIFORNIA 95203

MAY 1976

I. TOXICITY DETERMINATION

It has been determined that employees in the Litho Department at the Fibreboard Corporation plant are not exposed to toxic concentrations of offset lithography printing press dusting powders but are, at times, exposed to airborne dust levels from these powders which exceed the State of California OSHA (CAL/OSHA) standard and the TLV (threshold limit value) for "nuisance dust." The author is hesitant to call any nuisance-type dust toxic since dusts in the nuisance category have shown a long history of little adverse or toxic effect on the lungs when exposures are kept under reasonable control. At Fibreboard, dust levels over a 40-hour week are not expected to remain high enough to produce any adverse effects among the exposed employees. Therefore, this determination is based on several factors including the data gathered during December 18, 1975 and January 13, 1976. These factors are: (a) measured workroom dust levels; (b) non-directed medical interviews with employees; (c) an analysis of the compositions of the dusting powders; and (d) a review of the work practices and operating procedures in the Litho Department.

In keeping with NIOSH's policy of recommending sound industrial hygiene practices whenever possible, Section VI of this report contains some general recommendations which are designed to keep employee exposures to dust at a minimum.

II. DISTRIBUTION AND AVAILABILITY OF DETERMINATION REPORT

Copies of this Determination Report are available upon request from NIOSH, Division of Technical Services, Information Resources and Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio 45226. Copies have been sent to:

a) Fibreboard Corporation, Stockton, California
b) Authorized Representative of Employees
c) U.S. Department of Labor - Region IX
d) Division of Industrial Safety, California
e) NIOSH - Region IX

For purposes of informing the approximately 30 "affected employees" the employer shall promptly "post" the Determination Report in a prominent place(s) for a period of 30 calendar days near where exposed employees work.

III. INTRODUCTION

Section 20(a)(6) of the Occupational Safety and Health Act of 1970, U.S.C. 669(a)(6), authorizes the Secretary of Health, Education, and Welfare following a written request by 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 National Institute for Occupational Safety and Health (NIOSH) received such a request from an authorized representative of employees at the Fibreboard Corporation plant in Stockton, California. The request was initiated because of the concerns of employees in the Litho Department over the dusting powders used with offset litho printing presses.

IV. HEALTH HAZARD EVALUATION

A. Introduction

The Fibreboard Corporation plant in Stockton, California is involved in the manufacturing and printing of paperboard containers (boxes) for numerous consumer products such as foods and detergents. The request for a health hazard evaluation was limited to the Litho Department where approximately 30 employees are involved in operating several litho presses over two shifts.

B. Description of Process - Working Conditions

On December 18, 1975, NIOSH investigator, Melvin T. Okawa, conducted an opening conference with representatives from management and labor. Following the opening conference, a walk-through survey of the Litho Department was made. None of the offset litho presses were in operation due to unexpected mechanical problems, but a preliminary survey was conducted and non-directed medical questionnaires were administered to 16 employees.

The Litho Department is divided into the litho and letter press areas. Each area has dimensions of approximately 150 X 150 feet and they are connected by an open passageway. The litho area has one 60 inch Miehle litho press. The litho area also has a section where printed sheets of paperboard material are stacked. The stacking is done by two workers who are called "winders." The letter press area contains one 76 inch Harris press and two 60 inch Miehle presses. Every press is usually operated by a crew of three employees: first pressman, second pressman, and the feeder-helper.

Offset litho printing is a fast process, and the sheets of paperboard are run through the press at a high rate. In order to facilitate the process and prevent the ink from smearing, dusting powders are sprayed on each sheet from an internal applicator. The Miehle presses have some dust capturing capability as an exhaust duct is located under the point of application. The Harris press has a canopy hood over the applicator side of the press.

Each press is approximately 40 feet long and has a platform around it so that employees can reach the rollers and cylinders. In spite of the local exhaust ventilation, some dust does become airborne. The winders also have dust exposure above ambient levels during the stacking process. The residual powder left on the sheets of paperboard becomes airborne as the sheets are "rippled" by the winders.

C. Evaluation Criteria

Two brands of dusting powders are used by Fibreboard. The two brands are Oxy-Dry Type A and Varn Products. The ratio of Oxy-Dry to Varn is 5 to 1 in terms of the amount used. Both products are made up primarily of food starches such as corn, potato, tapioca, etc. Each powder, however, undergoes an encapsulation process so that the powder itself becomes more free-flowing and slippery. These processes are highly proprietary and are patented by the companies. However, enough information was obtained regarding these processes to be sufficient for the purposes of this determination.

Oxy-Dry Type A starts as a starch powder. The starch undergoes a curing process that coats the starch particle with a silicone resin. The mixture is first diluted with a solvent (1,1,1-trichloroethane) during this curing process which eventually leaves the encapsulated starch particle. A small amount of tricalcium phosphate may be added at the end of the process. The particle size range of Type A is reported by Oxy-Dry as being between 15-40 microns. Studies have shown that fewer than 0.002% of particles larger than 10 microns remain in the lungs.[1] Therefore, the Oxy-Dry powder is not expected to be respirable.

The Varn product is produced from an emulsion process. A catalyst (dibutylin dilaurate) is added to the emulsion to cure the silicone resin and the encapsulated particle of starch is formed. Calcium silicate or tricalcium phosphate may be added. No particle size distribution was available, but the size range should be similar to Oxy-Dry's size range.

The substances noted above should be discussed as to their potential hazards, if any, to the employees at Fibreboard. 1,1,1-trichloroethane is an organic solvent and is considered to be of rather low toxicity. It acts mainly as a central nervous system depressant. However, its use in the Oxy-Dry powder manufacturing process is such that it is not expected to remain after being heated in the curing stage. Silicone resins are relatively inert and have little or no toxic or irritative action.[2] Tricalcium phosphate is used as a noncaking agent in animal

1. Wright, George, M.D.: "The Influence of Industrial Contaminants on the Respiratory System," The Industrial Environment Its Evaluation and Control, p. 496, U.S.D.H.E.W., 1973.
2. The Merck Index - An Encyclopedia of Chemicals and Drugs, 8th Edition, p. 946, 1968.

feed and as an antacid for human medical use. No toxic or irritative properties for tricalcium phosphate are noted.[3] Dibutylin dilaurate is used as a catalyst for curing certain silicones. It also is used in dilute solutions to combat tapeworms in chickens. No human toxicity is reported.[4] Calcium silicate is used as a noncaking agent and as a filler and extender in many products. It is considered as being nontoxic and is listed as one of the nuisance dusts in the TLV booklet of 1975. The TLV's are published by the American Conference of Governmental Industrial Hygienists. Nuisance dusts carry a TLV of 10 mg/m^3 (milligrams of dust per cubic meter of air sampled) and are described as dusts which have a long history of little adverse effect on the lungs.

In assessing the potential toxicities of Oxy-Dry and Varn, it is probable that their primary effects are those of a nuisance-type dust. Starch is the major ingredient in each product and is also listed as a nuisance dust by the American Conference of Governmental Industrial Hygienists (ACGIH). The TLV of 10 mg/m^3 is based on a time-weighted average over a 40-hour week. The Federal Standard for nuisance dust as promulgated by the U.S. Department of Labor (Federal Register, Section 1910.1000, 40 FR 23072, May 28, 1975) is 15 mg/m^3. This standard is based on an 8-hour time-weighted average over a 40-hour week.. The CAL/OSHA standard for nuisance dust is 10 mg/m^3 based on an 8-hour time-weighted average over a 40-hour week (General Industrial Safety Orders - Airborne Contaminants, Section 5155).

D. Medical Criteria

Non-directed medical questionnaires were administered to as many employees as possible in the Litho Department. The responses were analyzed by the Medical Services Branch, NIOSH, for signs or symptoms which might indicate the presence of adverse effects as a result of exposure to the dusting powders.

E. Evaluation Results

1. Environmental Results

Table I contains the results of the environmental samples which were collected on January 13, 1976. The litho presses are suppsed to run continuously, but in actual practice there is a certain amount of downtime over a shift. On January 13, a Miehle press (O-5) in the litho area and Miehle press (O-3) in the letter press area were the only presses operating.

In area O-3, the Miehle press was operated by the first and second pressmen without a feeder-helper. Oxy-Dry powder was being used. Two samples

3. The Merck Index - An Encyclopedia of Chemicals and Drugs, 8th Edition, p. 195, 1968.
4. ibid., p. 348.

were collected in each worker's breathing zone over an approximate 6-hour period (8:40 am - 2:40 pm). MSA Model G Personal Sampling pumps and Millipore membrane filters with a pore size of 0.8 micrometers were used for all environmental samples. The filters were weighed before and after the sampling on a Cahn G-2 Electrobalance in order to determine the weight of the dust. The average dust level collected in the breathing zone of the first pressman was 5.8 mg/m^3 and the average for the second pressman was 4.8 mg/m^3 (the two samples were averaged).

In area O-5, the Miehle press was operated by a first pressman, second pressman, and a feeder-helper. Varn was the dusting powder used. One sample was collected in the breathing zone of the first pressman who was stationed almost exclusively at the control panel. His exposure level to dust was 8.8 mg/m^3 as measured over an approximate 2-hour period. It was decided to sample the helper instead of the second pressman since he rotated over the entire press and had the greatest dust exposure. Two samples were collected over an approxiamte 5 1/2 hour time period. The average dust level was 16.5 mg/m^3.

The winders have the responsibility of stacking the printed material. Two winders stack, but only one winder ripples the sheets. Therefore, the other winder receives the greatest dust exposure as the air between the sheets is forced into his breathing zone. The winders do not stack all day. The morning sample was for Varn dust and the stacking lasted for only 1 hour. The dust level in the winder's breathing zone was 16.0 mg/m^3. The afternoon stacking lasted for about 2 hours, and the residual powder on the sheets was Oxy-Dry. The dust level in the winder's breathing zone was 4.6 mg/m^3 for this time period.

The results of the environmental sampling seem to reflect the feelings of the employees that the Varn powder resulted in "dustier" conditions. In terms of the TLV and the CAL/OSHA standard of 10 mg/m^3, the dust exposures of the helper and the winder exceeded this level when Varn powder was used. The helper's exposure seemed to be representative of a working shift as a 5 1/2 hour period was measured. The winder's exposure was short-term and reflects the stacking process itself. The dust levels in the other samples were well below 10 mg/m^3.

As one additional check, the Varn powder was tested for the presence of free silica since a silicate was reported to be added to the starch. No free silica was detected in the sample. The limit of detection of the method used was 0.5% free silica.

2. Medical Results

Sixteen employees in the Litho Department were administered non-directed medical questionnaires. In the opinion, of Dr. Robert Ligo, Chief, Medical Services Branch, NIOSH, all of the responses indicated that the dust was acting as an irritant to the nasal passages and eyes and

was not producing any symptoms of lower respiratory tract involvement. The predominant symptoms of exposure to the dust were sneezing and dry or plugged noses.

V. DISCUSSION AND CONCLUSIONS

An environmental study of the dusting powders used in the Litho Department was conducted. At times, the airborne dust levels can exceed the TLV and the CAL/OSHA standard of 10 mg/m^3 for nuisance dust, but it does not appear likely that dust levels over 10 mg/m^3 are sustained over a 40-hour work week. An analysis of the ingredients in the dusting powders tend to support the fact that these powders should be categorized as nuisance-type dusts. However, it should be noted that there is no dust which does not result in some cellular response in the lung if inhaled in sufficient quantities. The responses on the medical questionnaires indicated that symptoms of irritation and mechanical plugging of the nasal passages occurred.

In conclusion, measurements taken during the day of the survey (January 13, 1976) and an analysis of the composition of the dusting powders indicated that employees in the Litho Department are not exposed to toxic concentrations of dusting powders based on a time-weighted average over a 40-hour week. However, since some workers are, at times, subjected to dust levels which exceed the TLV and the CAL/OSHA standard for nuisance dust, steps should be taken to keep workers exposed to as little dust as possible. Some general recommendations are listed below.

VI. RECOMMENDATIONS

Since dust is genreated from the litho presses, steps should be taken to keep airborne dust levels at a minimum. It is recommended that:

1. All local exhaust ventilation systems should be studied to determine whether they are adequately designed to be efficient for the given process.

2. All local exhaust ventilation systems should be serviced regularly to insure that they are operating at maximum efficiency.

3. Vacuum cleaning of dust should be done instead of dry sweeping.

4. NIOSH certified respirators should be readily available if needed.

VII. AUTHORSHIP AND ACKNOWLEDGMENTS

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Acknowledgments

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TABLE I. ENVIRONMENTAL LEVELS OF DUSTING POWDERS IN MG/M^3 BY OPERATION AT THE FIBREBOARD PLANT, STOCKTON, CALIFORNIA, JANUARY 13, 1976*

Sample No.	Type of Powder	Job Title	Area	Sample Time	Dust Level(mg/m^3
1	Oxy-Dry	1st Pressman	(0-3)	8:39 am - 11:40 am	7.0
2	Oxy-Dry	2nd Pressman	(0-3)	8:40 am - 11:37 am	4.8
3	Oxy-Dry	1st Pressman	(0-3)	11:38 am - 2:40 pm	4.6
4	Oxy-Dry	2nd Pressman	(0-3)	11:41 am - 2:35 pm	4.9
5	Varn	1st Pressman	(0-5)	8:50 am - 10:40 am	8.8
6	Varn	Helper	(0-5)	8:55 am - 11:31 am	12.4
7	Varn	Helper	(0-5)	11:32 am - 2:22 pm	20.7
8	Varn	Winder		10:45 am - 11:52 am	16.0
9	Oxy-Dry	Winder		12:27 pm - 2:22 pm	4.6

* mg/m^3 - milligrams of dust per cubic meter of air sampled