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August 13, 1970

Dr. Jon Konzen
Medical Director
OWENS-CORNING FIBERGLAS CORPORATION
Toledo, Ohio 43601

Dear Dr. Konzen:

Presented herewith are two copies of our report covering the industrial hygiene survey conducted at the Bloomington plant several weeks ago.

In summary, we have found excessive exposures to asbestos fibers, marginally acceptable exposures to polyurethane dust and acceptable exposures to MDI vapor. From an overall viewpoint it is clear that the work environment in this facility must be improved, and it is our recommendation that an entirely new process be installed including the appropriate environmental controls to maintain workroom concentrations of asbestos and polyurethane dust at acceptable levels. The distinction between this facility and other facilities with which we are familiar is quite dramatic.

Very truly yours,

George D. Clayton
President

GDC:bh

INDUSTRIAL HYGIENE SURVEY
OWENS-CORNING FIBERGLAS CORPORATION
BLOOMINGTON, ILLINOIS

## PROBLEM

An industrial hygiene survey was conducted at the Bloomington, Illinois plant of Owens-Corning Fiberglas Corporation to measure the exposures of workers in the Plant to asbestos fibers, MDI (Methylene bis (4-phenylisocyanate)) vapor and polyurethane dust. This survey was conducted by Mr. George D. Clayton of Clayton & Associates, Mr. Sam Thomas and Dr. Jon Konzen of Owens-Corning Fiberglas Corporation.

## INTRODUCTION

Owens-Corning Fiberglas Corporation recently purchased a facility in Bloomington, Illinois which is being used to produce insulation materials made from asbestos and polyurethane foam. On June 30, 1970 sampling was conducted in the batch mix, sanding and side trim areas of the asbestos board operation under near-normal production conditions. The survey continued on July 1 when MDI samples were taken near the forming operation for the polyurethane foam and along the conveyor line as the foam was being sawed into smaller sections. The survey included dust samples taken near the sawing operations for polyurethane dust concentrations.

## ASBESTOS INHALATION

Until recently the standard method of sampling asbestos in the workroom was based on the number of particles per unit volume (millions of particles per cubic foot) determined by standard impinger sampling and 100X lightfield microscopy. For several years, the Threshold Limit Value (ACGIH) was set at 5 mppcf. In 1969 the Threshold Limits Committee changed the TLV to a tentative value of 12 asbestos fibers per ml for fibers greater than 5 microns in length, as determined by phase contrast microscopy at 430X. In 1970 the Committee reduced the TLV further to a tentative value of 5 fibers per milliliter on the same basis. The British Occupational Hygiene Society has adopted a standard for chrysotile of 2 fibers per ml for fifty years of exposure, 4 fibers per ml for twenty-five years of exposure, or 10 fibers per ml for ten years of exposure. These standards are, in the opinion of the experts, the best that can be drawn from existing data. These data are

not ideal, and of course, the standards are subject to review in the light of new evidence and improved methods of measurement.

Good industrial hygiene practice suggests controlling exposures below the maximum allowable level, rather than maintenance at the maximum. In this connection, it is appropriate to design current engineering controls for an expected airborne concentration of 2 fibers per ml in view of the trend downward in the acceptable exposure level and in accordance with good engineering practice.

## ASBESTOS SAMPLING PROCEDURE

In line with the latest sampling developments, those specified by the Threshold Limit Value, air samples were collected on pre-weighed cellulose ester membrane filters by the use of Mine Safety Appliances personal samplers. Sampling rates were 1.8 - 2.0 liters per minute. Sampling periods varied between 5 and 17 minutes, depending upon the expected dust loading. At the conclusion of the sampling period, the filter heads were removed and carried to a "clean" area where the filters were carefully transferred to sealed containers and transported back to the laboratory of Clayton & Associates.

## FIBER COUNTING PROCEDURE

The method of counting asbestos fibers was that used by the U.S. Public Health Service for the enumeration of asbestos dust on membrane filters. The description of this method by G. H. Edwards and J. R. Lynch appeared in Ann. Occup. Hyg., 11, 1-6 (1968).

After weighing, sections of the sample are mounted on standard microscope slides using a high viscosity solution of membrane filter material in a 1:1 mixture of diethyl oxalate and dimethyl phthalate to render the filter transparent. Since the mount is stable for 30 days, 35 mm color slides are taken as permanent records of representative areas of each filter.

The asbestos fibers which lie on the surface of the filter are counted with phase contrast microscopy (as specified by the tentative Threshold Limit Value) using 10 x eyepiece and a 40 x phase contrast objective.

In mounting the sample, the transition of the dust-supporting substrate from translucent solid membrane filter cellulose ester material to a transparent, optically homogeneous gel is very gentle. Clearing of the filter is slow, requiring about 15 minutes, and at no time does a meniscus sweep

across the dust deposit. The filter slowly softens from below causing no redistribution of the fibers.

Ten fields selected at random on the sample are counted and total fibers, fibers from 0 to 5μ, fibers greater than 5μ, and fibers greater than 10μ are recorded. Any particle having an aspect ratio of 3 or greater is considered to be a fiber.

## MDI INHALATION

The use of MDI (Methylene bis (4-phenylisocyanate)) has become widespread in recent years in the production of polyurethane foam. MDI is a liquid of relatively low volatility, however, it is sufficiently volatile to produce vapor concentrations of MDI in the air in the range of one ppm which has been shown to be very irritating to many individuals. The ACGIH Threshold Limit Value is 0.02 ppm based on industrial experience with the material.

## MDI SAMPLING PROCEDURE

Samples were collected by the use of midget impingers and battery driven pumps at a rate of 1.8 - 2.0 liters per minute for a minimum of ten minutes. The sampling solution was 15 milliliters of a mixture of 35 ml of concentrated hydrochloric acid and 22 ml of glacial acetic acid diluted to 1 liter of water. A second impinger containing 10 ml of 1N caustic was used in series with the first impinger to absorb acid vapors. After sampling, the liquid solution was transferred to a clean glass sample bottle for shipment back to the laboratory. The samples were analyzed by using a colorimetric method at 550 millimicrons. The micrograms of MDI in the sample were calculated to ppm of MDI in the air samples.

## POLYURETHANE DUST SAMPLING PROCEDURE

Samples were collected on millipore membrane filters using the MSA personal samplers in much the same way the asbestos samples were collected. Polyurethane dust is considered to be a nuisance dust for which the Threshold Limit Value is 10 milligrams per cubic meter.

## RESULTS OF STUDY

The asbestos fiber samples are summarized in Table 1. Polyurethane dust samples are summarized in Table 2, and the MDI vapor samples are summarized in Table 3. Asbestos concentrations are well above the acceptable levels, and only 2 of 34 samples showed less than 5 fibers per milliliter for fibers greater than 5 microns. The polyurethane dust samples gave mixed results, with concentrations in excess of the TLV measured in about half the samples. The MDI samples were all less than the Threshold Limit Value of 0.02 ppm, and apparently this material presents no hazard in the plant at this time.

## OBSERVATIONS AND RECOMMENDATIONS

The atmospheric conditions in the work environment of this plant are unbelievably bad. Obviously, at the time of construction of this facility, no consideration was given to protecting the health of the work force. Such items as the baghouse discharging into the workroom are unacceptable when dealing with such toxic materials as asbestos. The outdated equipment and methods of handling products prevent proper control under present conditions. Therefore, it is recommended:

1. An entirely new facility should be built for this operation;

2. Process engineers should be brought in to study the processes and material handling with the idea of up-dating and improving the present process with modern equipment.

   Prior to installation, however, the ventilation for the processes should be designed by persons who appreciate the consequences of over-exposure to toxic agents in the work environment and who are competent to prevent such exposures by appropriate engineering control.

These observations and recommendations apply both to the Unarco Board Line and the Polyurethane Line. No attempt is made at this time to make specific suggestions because the plant is so ganerally unacceptable. In the meantime, consideration must be given to providing immediate personal respiratory protection for these workers until the plant has been remodeled. We strongly suggest that clinical studies be

conducted on these workers to determine the extent of injury that may have already occurred because of the excessive exposures these men have experienced over a period of time.

It is obvious that this plant has not been fully incorporated into the Owens-Corning Fiberglas corporate structure, for it does not resemble other OCF plants with respect to environmental control.

This report prepared by John E. Mutchler

John E. Mutchler
Chief, Engineering Services

George D. Clayton
President

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