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P. O. Box 8004

South Charleston, W. Va. 25303

Technical Task Group on
Vinyl Chloride Research
Manufacturing Chemists Association
1825 Connecticut Avenue, N.W.
Washington, D. C. 20009

SUBJECT: Proposed Occupational Safety and Health
Work Practice Standard for the Manufacture of
Synthetic Polymer Containing Vinyl Chloride

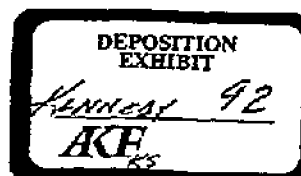
Gentlemen:

The attached Proposed Occupational Safety and Health Work Practice Standard for the Manufacture of Synthetic Polymer containing Vinyl Chloride is submitted for your consideration and possible use as an aid in preparing testimony for the Occupational Safety and Health Administration. The proposed working level exposure of 50 ppm TWA and the 0.1% or less exemption on solid or liquid mixtures are probably unrealistic in today's climate, but their values may be readily changed to fit your Company's situation without destroying the value of the proposed Work Practice Standard as an operating guideline.

The report of the Medical Subcommittee on Medical Procedures has been incorporated into the medical section. In the absence of a report from the Subcommittee on Sampling and Analysis, an example of the section on Sampling and Analysis has been prepared by your Chairman. The section on Sampling and Analysis is included only to illustrate how such a section contributes to the whole standard and is not to be considered a replacement for the report of the responsible Subcommittee.

The Work Practices Subcommittee, in preparing this proposal, set the following objectives:

1. Industry workers must be protected from known hazards related to vinyl chloride exposure.
2. A Work Practice Standard should require achievable performance and be clearly understandable.
3. Known hazards related to vinyl chloride exposure should be controlled within the monomer and polymer industry.



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4. A Work Practice Standard must represent a limit to acceptable performance. It does not define exact performance levels.

Known hazards related to vinyl chloride monomer exposure are liver angiosarcoma and acroosteolysis. Acroosteolysis, occurring in workers of a relatively few resin plants, was subjected to an industry-wide study in 1969. The causative agent was not identified; however, the industry acted on the assumption that its cause was somehow related to vinyl chloride inhalation or to vinyl chloride absorption through the skin of the hands when they were exposed to resin containing very high concentrations of vinyl chloride monomer. The correctness of that assumption is questionable since acroosteolysis has not been produced in laboratory animals by vinyl chloride exposure. Industry action to improve ventilation of reactors undergoing manual cleaning and to reduce the frequency manual cleaning was effective since no new cases of acroosteolysis have been reported in the U.S. in recent years. Long-term inhalation studies on laboratory animals started initially to study acroosteolysis have shown that vinyl chloride inhalation over a long period will produce angiosarcoma in rats and mice. The subsequent discovery of seven cases at B. F. Goodrich's Louisville, Kentucky plant, three cases at Goodyear's Niagara Falls, New York plant, one case at Union Carbide Corporation's South Charleston, West Virginia plant, and one case at Firestone's Pottstown, Pennsylvania plant apparently establishes a connection between human exposure to vinyl chloride and human angiosarcoma.

Data from animal toxicology studies cannot be directly applied to forecast human experience since laboratory animals, such as mice, tend to develop angiosarcomas spontaneously, they metabolize vinyl chloride differently, their lifetimes are shorter, and their rate of metabolism is higher. For these reasons, safe-exposure limits for workers must be based on human data and experience.

In 1968, J. E. Mutchler and C. G. Kramer reported on a long industrial health study of vinyl chloride workers. The study was initiated in 1950 and, after seventeen years of health studies on the workers, they concluded that exposure to a 300-ppm TWA resulted in some degree of liver disfunction. A continuation of this study has resulted in Dow Chemical Company's recommendation to industry that exposures be limited to 50 ppm TWA.

An epidemiological study of industry workers, completed by Tabershaw-Cooper Associates, shows that workers exposed to relatively

high concentrations of vinyl chloride are more likely to develop malignant neoplasms than workers exposed to low concentrations. Workers exposed to low concentrations are less likely to develop malignant neoplasms than a standard population group.

Study of the cases of human angiosarcoma occurring in vinyl chloride workers shows that a significant number of cases occurred in two plants - B. F. Goodrich's Louisville, Kentucky plant and Goodyear's Niagara Falls, New York plant. Eliminating the two plants where one case occurred, this leaves 14 monomer plants and 33 resin plants where no angiosarcoma has occurred. Comparison of Dow Chemical's experience at Midland, Michigan and Union Carbide Corporation's experience at Texas City, Texas with that of Goodyear at Niagara Falls and B. F. Goodrich at Louisville shows that the differences in occurrence of angiosarcoma between the plants are directly related to vinyl chloride exposure levels. While the exposure levels cannot be clearly defined at the plants, it is believed to be in the range of 20-50 ppm at Dow and Union Carbide whereas exposures at the affected plants were ten times that level.

For the foregoing reasons, a maximum exposure level of 50 ppm TWA with maximum excursion to 75 ppm was chosen as the operating level for the proposed Work Practice Standard.

There is no known data indicating a hazard from contact with polymers produced from vinyl chloride or from vinyl chloride monomer absorbed through the skin from low concentrations in air or water. Therefore, no impervious protective clothing or similar protective devices other than ordinary cleanliness are recommended to protect the worker from these items.

With regard to the exemption of liquids or solids containing 0.1% or less vinyl chloride monomer, exposure data in downstream facilities was notably lacking. Polymer from the plants contained vinyl chloride in concentrations ranging from nil to 0.4%. In Work Practice Standards established already for known human carcinogens, the exemption concentration was set at 0.1%. The Subcommittee believed that with good practice the polymer plants could produce polymer containing 0.1% or less free monomer and that with proper ventilation no hazard would exist for workers in waste treatment plants, in transportation operations, and in compounding and fabrication of the polymer when employed in normal operations. Air spaces in closed unventilated containers or vessels filled with resin would contain high concentrations of vinyl chloride monomer. These spaces are not, however, a part of the workplace environment. To limit vinyl chloride

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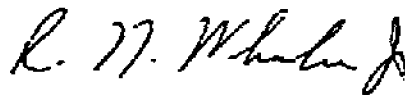
exposure hazard to monomer or polymer plants, the Subcommittee therefore chose 0.1% or less by weight vinyl chloride content as the exemption level and recommends further study of this problem.

The desire of everyone in industry, government, labor, and medicine to eliminate all hazard to workers from vinyl chloride exposure has led to requests for a Work Practice Standard that requires exposure limits, such as no detectable level or ceiling limits of 5 or 10 ppm. Exposure ceiling limits are normally imposed to avoid the short-term effects of exposure; i.e., dizziness, nausea, and so forth. The vinyl chloride concentrations proposed by this Work Practice cause no immediate effects; therefore, only average exposure or time weighted average values have meaning in hazard reduction. The exposure limit of 50 ppm TWA, proposed in this Work Practice Standard due to analytical and control problems, actually means that worker exposure maximums will be in the range of 30 to 40 ppm TWA. In the unlikely event that an employer chose to expose his workers to exactly 49 ppm TWA, there is no way he could operate with a one ppm margin of control with present technology.

The proposed Work Practice is restrictive, as necessary, but it permits the workers and industry to exercise judgment and innovation in carrying out to requirements. With only slight modification, it is adaptable to the vinyl chloride monomer plants and to the vinyl chloride resin compounding and fabricating plants, if the need arises.

The Subcommittee on Work Practices recommends this Proposed Work Practice for your use and consideration.

Very truly yours,



R. N. Wheeler, Jr.
Chairman
Subcommittee on Work Practices

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Attachment

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