

TESTIMONY OF RICHARD J. HUGHES
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Before
Department of Labor
Occupational Safety and Health
Administration

Vinyl Chloride Occupational Exposure Standard

My name is Richard J. Hughes. I am Union Carbide's Chemicals and Plastics Vice President, and I have served with the Company for over 25 years in this area. I intend to present the position of the Company, a New York Corporation with headquarters at 270 Park Avenue in New York City, with respect to the proposed OSHA standard on vinyl chloride, 29 CFR Part 1910, Section 1910.93g. We are and have been for 38 years a substantial manufacturer of polyvinyl chloride homopolymer and copolymer resins from vinyl chloride gas or monomer. Union Carbide helped develop the monomer in 1936, but we no longer make it ourselves. In other Corporate divisions, we are also a substantial user and fabricator of various products from the polyvinyl chloride resin.

Our interest in the development of a workable standard has coincided with the initiation of OSHA proposals for such action. We submitted a position paper on March 5, 1974 to the preliminary OSHA hearings on this matter held in Washington before Administrative Law Judge Gordon J. Myatt in which we stated that:

While we saw no need for a temporary emergency standard, where no emergency existed, we welcomed the initiation of the regular

rule-making procedure under Section 6 (b) of the Act, in which we are now participating, because it afforded a highly useful opportunity to investigate and review thoroughly and objectively the potential problems of vinyl chloride monomer handling practices in industry. We were concerned that standards would be set without proper exploration of all phases of the matter. The institution and conduct of the present hearing accords with out stated objectives.

Our position in this situation is four-fold and may be summarized as follows:

1. There is no medical evidence provided by OSHA or NIOSH to justify the proposed OSHA standard of no detectable level of exposure, which evidence is required by statute. The evidence, set forth below, shows no need of such a restrictive limit.

2. We accept the temporary standard of 50 parts per million exposure level as safe. We support the SPI position as to lower levels of exposure. In fact, no tangible evidence has been presented at the present hearings that proves any lesser exposure is unsafe to humans.

3. We accept as a goal, a program to do whatever is technologically feasible to further reduce employee exposure to vinyl chloride.

4. We have an alternative proposal for OSHA, since we are sensitive to this problem and do not wish merely to be negative, as follows:

5. We recommend that OSHA proceed to establish a uniform regulatory work practice standard as suggested in draft language carefully prepared by Mr. R. N. Wheeler, Jr., and reviewed by many others. Some of the principles that appear therein have already been reflected in the proposed standard; others have not. We have already submitted it on June 27, 1974 at this hearing, with the strong recommendation that it be carefully considered in the final rule-making. Although we believe that we should continuously strive for the lowest possible exposure levels, we think that goals and rules should not be confused.

We take this position for the simple reason that there has been no demonstration whatever that worker exposure to vinyl chloride monomer is hazardous at levels of airborne concentrations. Our own experience tends to document this contention. Little or no benefit or potential benefit to employees from over-stringent regulation has been shown, and industry statements and evidence on the economic impact of such action should cause concern over the continued ability of the producers to continue to operate in such case. There is no legal warrant whatever, as the courts have already ruled, for establishing a standard at levels where no evidence supports it. The OSHA statute permits court approval of a Department promulgation of a standard only if buttressed by substantial evidence on the record as a whole. Associated Industries v. Department of Labor, 487 Fed. 2d 342 (CCA2, 1973).

We do agree, of course, that our goal should be wherever possible, to limit the exposure of employees by adoption of those engineering techniques and administration which are feasible. We agree that we should do whatever we can to install all technically feasible controls, and to adopt safe and progressive work practices. Our concern, however, is that goals and legal requirements are two different things. A regulation should not presently require that which is attainable only in the future after the attainment only in the future after the attainment of the knowledge and technology that we do not yet have.

It should be emphatically stated that the proposed permanent standard cannot possibly be met through application of any known technology today, regardless of cost. In short, industry does not know how to comply with the recommendation. Adoption of the proposal as law would face the industry with the clear choice of either (1) requiring its employees exposed to the extremely low levels of concentrations to wear clothing and respirators which are dangerous; cumbersome; uncomfortable; and resentment-building; which cause losses of employee productivity that will average up to 50 percent or more; and engaging in costly and time-consuming administrative monitoring, surveillance and record keeping; or (2) simply stopping production of the resin altogether with all the consequences that would ensue in the market place.

We know of no evidence to demonstrate that advanced engineering and modified production practices could ever achieve operations meeting the non-detectable level of vinyl chloride in the work place air, as required by the proposed standard. Thus, as a practical matter, the proposed standard will require all personnel in the restricted area to make 100 percent use of respirators at all times or for a major portion of the work day. Union Carbide holds that it is impractical and unsafe for employees to work regularly and routinely with respirators such as are required by the proposed standard. Considerable persuasive testimony has already been presented to this same effect to this hearing. The use of respirators should be considered only as a temporary practice when atmospheric levels of monomer rise above the permitted maximum and should be required only until corrective measures have been taken to bring the level of vinyl chloride down to or below the permitted maximum. As to respirator use, we submit that:

1. Due to current configuration of our plants, the fact that batch processing is employed, and the state of technology, the practical effect of the proposed permanent standard will be to require employees to wear respirators 100 percent of their time spent in the regulated area as described by the work standard.

2. It is difficult to imagine that workers in regulated areas would be willing to remain employed under these untenable conditions. Heat exposure; lack of mobility; severe limitations

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on communications with fellow-workers, and the physical burden of respirator equipment will greatly lower employee morale over an extended period.

3. Workmen restricted by respirator equipment can precipitate safety problems due to awkwardness, limited ability to move to and from a unit due to emergency, restrictions on visibility, and fatigue from carrying and dragging cumbersome equipment.

4. Certain maintenance and operating tasks cannot be accomplished physically when a respirator is worn. The radius of activity is severely limited by length of hose, number and location of air supply outlets, and the weight and bulk of the respirator support apparatus. Moreover, the requirement of constantly checking supply source and hose to ensure operability is a burden.

Union Carbide has devoted much research, engineering, and production talent to bring its existing polyvinyl chloride plants simply to meet the present standards and, thus, to minimize the time employees in the restricted areas need wear respirators, as required by the standard now in effect. We have uncovered no engineering approach to reduce vinyl chloride emissions to a non-detectable level. Relief from the standard that employees be required to wear respirators 100 percent of their time spent in the regulated area must come from the setting of practical levels of permitted monomer exposure.

Indeed, it is not too much to say that the OSHA-proposed levels of exposure are unattainable, and unenforceable in practice

especially where non-continuous monitoring is adopted, even if such monitoring is faithfully carried out. One problem lies in the expected employee resistance to its effectuation, as a practical matter. It also would be simply impossible in many cases to ascertain whether a detectable level of vinyl chloride monomer has appeared in a given area, especially if as occurs with most excursions; it would persist for only short periods of time.

The actual hazard that is posed by any exposure of employees to vinyl chloride monomer is in fact a very limited one. It is always useful therefore to define what we are guarding against. Insufficient attention has to date been given to that simple fundamental; and the proposed standard itself avoids coming to grips with the matter. Instead, it attempts to settle the question by effectively forbidding all detectable exposure. Clearly this is "safe", but it hardly answers the problem. Indeed, it seems plainly to contravene the OSHA statute which abjures the Secretary to

"set the standard which most adequately assures, to the extent feasible, on the basis of the best available evidence that no employee will suffer material impairment of health or functional capacity." 29 USC Sec. 655 (b) (5).

The proposed standard hardly complies with that statutory command.

Yet there does appear to be a hazard to be met; and we agree with meeting it. What that hazard has been shown to be at this point is, that long-term exposure of employees on a continuous

basis to vinyl chloride monomer emissions at high concentrations may cause liver angiosarcoma in some cases where inhalation takes place. The proposed standard is unnecessarily restrictive, technically and economically, in terms of such a limited hazard.

At this point, it would be appropriate to define areas where the proposed standard need not go at all. Thus, employees of resin fabricators, or any employee whose only potential contact with vinyl chloride monomer is to resins or products containing polyvinyl chloride resins whose retained monomer is less than .1 percent by weight are exposed to no hazard.

There is no need to be concerned about exposure to the polyvinyl chloride resin as such; it is chemically inert, not only as resin but also in the form of fabricated or mixed product. OSHA's nuisance dust standard with adequate ventilation adequately covers any exposure thereto. We are concerned solely about the gaseous monomer, which may be emitted during its production; during the reaction which produces the polymers; or retained in the resin and released into the atmosphere.

There has been, moreover, no showing that the monomer in its usual gaseous state causes any deleterious results by contact with the skin, nor by ingestion. The retention of monomer on skin or clothing is unlikely because the product is volatile and non-adhesive, even where liquid monomer spills occur; a low boiling point assures such volatility. There could possibly be some

absorption through the skin, but the percentage is not known, nor has it been shown or claimed to have had adverse effects. A limitation will certainly pose no greater hazard to the skin than to the lungs.

So the hazard we need to meet is that of potential angiosarcoma after long-term inhalation exposure at high concentrations. Nothing else has been shown hazardous; any other hazard is simple speculation and nothing more, plainly not the sort of thing that would support a rule of law.

The proposed vinyl chloride monomer exposure standard of "no detectable level" in polymer operations implies that the health of workmen will be impaired materially if exposed even to traces of vinyl chloride. We know of no human or other medical data to support this conclusion. Actually, human experience in polyvinyl chloride plants operated by Union Carbide refutes it completely.

The solvent process ⁽¹⁾ as operated by Union Carbide at Texas City has remained essentially unchanged as to process, recipe, equipment and operating procedure since about 1953. Its vinyl chloride emissions are presently the same as has been experienced regularly over the past 20 years. Furthermore, measurements of vinyl chloride monomer in the workplace air and of exposure of operators to monomer made recently, are representative of the continuing condition since 1953.

(1) This is a process unique to Union Carbide, producing resins suitable for coating use.

Measurements during the first quarter of 1974 established that operators in the polymerization section of this plant were exposed to levels of vinyl chloride approximating 30 parts per million on an eight-hour time weighted average basis. Included in the tasks assigned to these operators is the taking and testing of autoclave samples to determine degree of conversion. During sampling and testing, which occurs four times each shift and requires about eight minutes to complete, workplace environmental levels can range as high as 400 parts per million in the sampling area. We have taken steps to eliminate the need for this procedure.

Exposure time has been gathered on all of the 54 employees working in this job at the Texas City plant from 1948 to date. Twenty-four have from one to twelve years work experience on this job; two employees have had twelve years or more of exposure. No unusual liver function test results have been found based on a recent review of the medical evidence in the records.

In Union Carbide polyvinyl chloride suspension resin operation the business realities since 1965 resulted in improved efficiencies in conversion of vinyl chloride monomer to polymer through modification of operating procedures and plant facilities. Increases in monomer efficiency (Polymer/Monomer charged x 100) from 85 percent in 1958 to 96 percent in 1974 at our Texas City plant have been and are being realized. Improved machinery for recovering the monomer from vapors released in venting and stripping sections accounts for more than half of the improvement which resulted

in significant reductions in monomer emitted into the workplace atmosphere.

Recent measurements within polyvinyl chloride suspension operations established that maximum vinyl chloride levels in the workplace air approximated 30 parts per million time weighted average (eight-hour) at a ceiling of 45 parts per million. Based on the known improvement in monomer efficiency, it is certain that the vinyl chloride monomer levels in the 1974 workplace environment are significantly below those of the years prior to 1965.

Here too, health records of employees at Texas City show no deterioration in the health of the workmen exposed during this period.

The Union Carbide experience is instructive in another respect. We operate several fabricating plants which use the polyvinyl chloride resin for a variety of products. Monitoring of our resin-handling at our fabrication plants show that the monomer levels (using a gas chromatograph sensitive to 0.15 parts per million) in the air around suspension resins rarely exceed 1 part per million at our calendars, 3-8 parts per million at our Banbury mixers; or an occasional "extreme" excursion to 18 parts per million in rare cases of exposure to the resin in the course of unloading. There has been discovered at those plants, moreover, after a check of employee medical records, not one case of angiosarcoma, nor any other liver or other disorder traceable to vinyl chloride. Many

of our employees "exposed" to such concentrations are long-term employees who have worked on these substances for many years.

To return to the record at our Texas City plant, there have been 431 employees potentially exposed to vinyl chloride monomer at that location. This includes all workers that could possible have been so exposed. There have been a total of 24 deaths since 1948. Not one has occurred from angiosarcoma. The exposure of these workers has, moreover, been lengthy and extensive. Seventy-four of them were exposed for more than 20 years. Ninety-seven were from 10 to 20 years. One-hundred ninety-one were exposed for 1 to 10 years, and 69 for less than one year. Exposure levels at Texas City, moreover, parallel that of many other older plants in Union Carbide and the entire industry. The memory of many employees attests to the frequent detection of vinyl chloride odor over the years. Levels above the odor threshold were frequently reached in the early days. A recent test of levels of airborne concentration of vinyl chloride monomer which could be detected by odor was conducted by a panel of seven at our South Charleston, West Virginia plant. It was discovered that none of the panel could detect the monomer by odor at 146; 385 or 746 parts per million. Two of the seven detected it at 1317 parts per million. All seven detected it at 2150 and 3800 parts per million. The results support recent statements including several made at the hearing that vinyl chloride monomer levels in the past were far

higher than thought initially. The limited dispersion of angiosarcoma in evidence found to date must be evaluated in the light of this knowledge.

Union Carbide has also produced polyvinyl chloride at our South Charleston, West Virginia, plant from 1936 to date. At one time, we also made the vinyl chloride monomer; but we discontinued such operations in 1968. After complete review of all available health records a group of some 550 employees potentially exposed to vinyl chloride monomer at that location, where the early exposure levels were far heavier than at Texas City, there have been discovered two cases of angiosarcoma. One employee, deceased in 1968, was exposed for 18 years, from 1944 to 1962, at high vinyl chloride concentrations. The other, still living, was exposed to high and medium high concentrations for approximately 24 years (1944 to 1968). The exposures were continuous over the years.

Yet many other employees plainly and obviously have been subject to the same high exposure levels and have suffered no ill effects therefrom. It is noteworthy moreover, that both reported cases -- the only ones discovered out of a total of almost 1,000 Union Carbide polyvinyl producing employees reviewed -- were of individuals exposed in the earlier years of polyvinyl chloride production, when no concern about inhalation of the material was felt necessary. The only problem that arose then was at very high concentrations and was of flammability; protection was and is aimed at elimination of that hazard.

At one time, there was a body of medical opinion that felt that vinyl chloride monomer was useful as an ether substitute; other materials proved more adaptable as an anesthetic.

In operating polyvinyl chloride plants, we continue as in the past to give high priority to safe practices that will avoid the development of explosive concentrations of vinyl chloride monomer in the plant atmosphere and will eliminate ignition sources. A defect in performance in this area of safety could lead to massive destruction of life and property. Thus, work practices must be written and carried out with avoidance of explosive concentrations and of ignition sources as the primary safety instruction regardless of exposure of workmen to monomer. As earlier indicated, such considerations did de-emphasize reliance on respirators as a safety device.

We therefore recommend that: (1) higher priority be given in the total safety procedure to isolating leaking pumps, sealing off ruptured lines, closing valves, blowing down autoclaves showing mechanical deficiencies, and taking all actions that will minimize the possibility of catastrophe from explosion and fire than to avoidance of exposure of workmen to even substantial concentrations of vinyl chloride for brief periods; (2) employees must be able to respond to upsets and emergency conditions not hampered to trailing airhoses or the 30 pound weight of a portable back-pack air supply, not immobilized by vapor-impervious clothing, and not cut off from vital communication by limited visibility and limited hearing; (3) it is sensible to accept a brief exposure to vinyl

chloride monomer and thus to avoid a larger exposure or a greater hazard.

It is also noteworthy that concentrations of vinyl chloride monomer have been reduced over the years at the various American producing plants, including our own. It is clearly a significant fact for these hearings that not one angiosarcoma case has occurred among the employees of a single one of the United States polyvinyl chloride producers whose operations began in or after 1950. It is also significant that, of the 13 United States cases so far reported, the average exposure of all such employees has been 19 years at high concentrations (i.e. above the odor parts per million or above threshold) and that most of them had an exposure period whose onset antedates 1950. Moreover, the exposures that have resulted in the 13 reported cases occurred at only four of the 36 United States polyvinyl chloride producing plants. There are thus in the United States, 13 monomer producing plants and 32 polyvinyl chloride resin producing plants where no cases have been reported at all.

The conclusion is inescapable that the only hazard of potential angiosarcoma against which protection for employees is current required is that of long-term exposure to high concentrations of vinyl chloride monomer. A level of exposure based on our recognition of the actual hazard would, we believe implicitly, pose

no risk to the health of employees that could be in any way termed abnormal. Any extra limitations required below would clearly be unnecessarily burdensome, and add nothing to improving worker health.

This is borne out in the recently issued Tabershaw-Cooper findings released May 3, 1974, in which that organization reviewed the records of a total of 8,384 polyvinyl chloride-exposed employees of whom at least 1,500 had been exposed for fifteen years or more, and all of whom had had at least one year of exposure prior to December 31, 1972. The findings were that the mortality rate of this group was only 75 percent of what would be expected in a comparable group of the United States male population; and that no cause of death in the polyvinyl chloride group studied showed a statistically significant increase over a comparable non-exposed group; yet all reported United States angiosarcoma deaths of vinyl chloride monomer exposees were found. The only caveat issued by Tabershaw-Cooper was that liver cancer occurred "more often than expected" in "those members of the group with the greatest exposure"; but that several other forms of cancer occurred at lower levels than those normally expected. However, the incidence of occurrence of other forms of cancer was not statistically significant.

A comparable study in Great Britain covering a group of polyvinyl chloride workers completed early in 1973, showed no

increased incidence of cancer among the exposed workers, as compared to a control population; yet the British airborne concentration of vinyl chloride monomer in 1973 were found to average 150 parts per million; from 1960 to 1970, to range from 300 to 400 parts per million; and from 1955 to 1960, 400 to 500 parts per million.

We also note with approval Dr. Dernehl's testimony reviewing an epidemiological survey whose conduct he oversaw which shows that liver abnormalities in the study group of employees exposed to vinyl chloride are comparable to those of employees in non-exposed control groups. Such a study of human reaction certainly does not suggest any need for an extraordinarily restrictive exposure level.

The only support, indeed, suggested for such restrictions, moreover, has been studies not of humans but of rats and mice. The results of these studies, taken by themselves, are far from constituting conclusive or exhaustive proof of vinyl chloride monomer's carcinogenic effects at even the exposure levels set by the temporary standard current currently in force.

Moreover, the transferability of mice studies to human experience is of dubious value. It is not known, indeed is doubtful, whether humans will react the same as mice to vinyl chloride monomer exposure. The only possible valid data that OSHA should consider in setting regulatory standards is that relating to humans. The wealth of such data confirms our belief that exposure at our recommended level is safe.

There are numerous objections to the actual language of the proposed standard itself; many changes must be made. We would list them as set forth in an appendix to my testimony which I submit herewith.

We are aware --and acutely so-- of the need of assuring every worker's health and safety. We have been in the forefront of such efforts for many years. Indeed, in 1973, our safety record was one of the best in the industry. Nevertheless, we see no merit in OSHA establishing unnecessarily restrictive rules in the light of what we have defined above as the actual known hazard. Where there is no reason for regulation, it is folly to attempt it.

Summarizing our position once again:

1. There is no medical evidence provided by OSHA or NIOSH to justify the proposed OSHA standard of no detectable level of exposure, which evidence is required by statute. The evidence, based on human data, shows no need of any such restrictive limit.]

2. We accept the temporary standard of 50 parts per million exposure level as safe. We support the SPI position as to lower levels of exposure.

3. We accept as a goal a program to do whatever is technologically and economically feasible to further reduce employee exposure to vinyl chloride.

4. Since we are sensitive to the problem and do not wish merely to be negative, we are submitting an alternative proposal for an OSHA standard as an appendix to this testimony.

There is merit in imposing limits on the vinyl chloride monomer and polyvinyl chloride manufacturers along the lines we have suggested. We believe that appropriate employee protection can result from their adoption.