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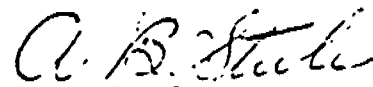
Date: July 2, 1974

From: Dr. A. B. Steele

Subject: UCC Contribution to the
SPI Presentation before
the CSHA Hearing on Pro-
posed Standards for Occu-
pational Exposure to Vinyl
Chloride

Many of you have contributed ideas and data in support of the position taken by the Society of the Plastics Industry; namely, that the actual human experience in the 36 plants operated in the United States in the manufacture of Polyvinyl chloride resins does not identify vinyl chloride as a material that impairs worker health when reasonable limits are imposed on its concentration in the workplace air. The industry's position was strengthened significantly by the testimony of our Dr. Carl U. Dernehl, who summarized the finding of no case of angiosarcoma of the liver among some 1,402 men working in 32 PVC plants even though their exposure time was sufficient for disease to have occurred and exposures were believed to have been in excess of 50 ppm on a time weighted average.

Appended for your reading and reference, please find a copy of the text submitted to SPI on the matter of industry experience as compiled and analyzed by us on behalf of SPI.


A. B. Steele

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Attachment

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STATEMENT OF PVC PRODUCERS IN THE UNITED STATES RELATIVE TO HEALTH
EXPERIENCE OF WORKERS IN PLANTS POLYMERIZING VINYL CHLORIDE

SUMMARY

The Department of Labor has imposed major restrictions on the exposure levels of workers in the VCM and PVC industry based on a possible connection between vinyl chloride exposure and deaths of a limited number of workers from angiosarcoma--a rare form of liver cancer. The Department's regulation on vinyl chloride limits in the workplace air is based, in part, on the findings of several scientists who report that vinyl chloride exposure in mice and rats causes cancer.

Because animal data are unreliable in measuring impact on man unless the test animal and man have been shown to have similar metabolic pathways and as such data have indicated a hazard from vinyl chloride exposure far greater than that generally experienced by workers and technicians in individual vinyl chloride monomer and polymer plants, a study was initiated to determine the actual experience in all operating plants within the United States where workers have been exposed to significant concentrations of vinyl chloride in the workplace air over extended periods of time. Reconstructions of past frequencies and levels of vinyl chloride exposure have been correlated with recent and current experience in 36 plants manufacturing PVC resins. The health status of individual workers has been determined by extensive medical examination and the cause of death of all PVC workers has been tabulated. Based on these evidences, we conclude:

- that there is no significant impairment of health to workers exposed to restricted amounts of vinyl chloride monomer for extended time periods.
- that exposures to high concentrations for short periods do not impair health; high concentrations being at or above the odor level of 250 - 300 ppm.

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- that an eight-hour time-weighted average (TWA) of 50 ppm represents a realistic exposure limit; at higher levels respiratory protection is appropriate.

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RELEVANCY OF ANIMAL TOXICITY DATA

Extrapolation of animal toxicity data directly to man is fraught with gross uncertainty without prior knowledge of the manner in which man metabolizes the compound. Thus, in the case of vinyl chloride monomer, the finding of angiosarcomas in mice and rats should not be considered pertinent to man until it is demonstrated that rodents metabolize vinyl chloride in a manner and at a rate similar to man. While methods have been established for the determination of metabolites in man and rodents ⁽¹⁾, such experimental procedures have yet to be applied to vinyl chloride, leaving in serious doubt the relevancy of the animal test data that are used to brand vinyl chloride a carcinogen in man.

Because vinyl chloride is a carcinogen for rats and presumably even a more potent one for mice does not mean that the same rapid induction can or will occur in man. ⁽²⁾ The evidence provided by the industry survey ⁽³⁾ in itself is evidence that very few men have been involved to date.. Witness more than thirty years of manufacturing experience with only limited cases of angiosarcoma among more than 1500 workmen variously exposed for 15 years or more. Additionally, no case should be charged solely to vinyl chloride exposure if the victim has a history of exposure to other chemicals.

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- (1) In vitro vs in vivo chromatographic profiles of Carbaryl anionic metabolites in man and lower animals. Sullivan, L. J., B. H. Chin and C. P. Carpenter. Tox. Appl. Pharm. 22: 161-174 (1972).
 - (2) Deringer, M. K. - Journal of National Cancer Institute; 12, p. 437 - 445, October 1951.
 - (3) EPIDEMIOLOGICAL STUDY OF VINYL CHLORIDE WORKERS - FINAL REPORT - May 3, 1974: Tabershaw-Cooper Associates Berkeley, Calif. for Manufacturing Chemists Association.

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LEVELS OF VINYL CHLORIDE EXPOSURE IN PVC OPERATIONS

Experience within the PVC industry generally has shown that workers exposed to vinyl chloride have maintained health status comparing favorably to that of workers in other chemical and resin operations and to other industrial populations, yet the PVC workers have been exposed to significant concentrations of vinyl chloride in the workplace air over extended periods of time and to concentrations well in excess of the limits now imposed on the industry by the present temporary OSHA standard of 50 ppm ceiling level. Attempts to quantify the levels of exposure to which workmen were subjected in past years on each job and in each plant had to be abandoned because reliable measurements of vinyl chloride levels in the workplace air over extended periods of time are generally not available. However careful examination of certain plants and of their operating data has provided insight into the vinyl chloride exposure levels of workmen in specific assignments. Case studies have been documented and support the view that there is no discernible impairment to health of workers exposed either to restricted amounts of vinyl chloride for extended time periods or to high concentrations for short periods.

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CASE STUDY-VCM EXPOSURE IN PVC SOLVENT POLYMERIZATION OPERATIONS

The solvent process as operated by Union Carbide has remained essentially unchanged as to process, recipe, equipment and operating procedures since about 1951. It is the testimony of those closely associated with the plant operation that vinyl chloride emissions are presently of the same order of magnitude in the Solvent polymer plant as has been experienced regularly over the past twenty 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 in which significant and frequent excursions beyond the 50 ppm ceiling standard were experienced as determined by detection of vinyl chloride odor (250 - 300 ppm VCM assumed as the odor threshold).

Recent determinations (January and February, 1974) identified the following VCM exposures to operators in the polymerization section of the plant:

<u>Operator Number</u>	<u>Time Weighted Average - PPM - 8 Hour</u>
1.	16.9
2.	9.8
3.	23.6
4.	3.5
5.	4.8
6.	21.3

One of 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 the task, workplace environmental levels range as high as 400 ppm

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in the sampling area.

Exposure time has been gathered on all employees working this job at the Texas City plant from 1948 to the present. There were 53 such employees; 24 had more than 1 year work experience on this job; 2 employees had 12 years of exposure. None of these have liver abnormalities, based on recent medical evidence. At South Charleston where a similar line is operated with almost identical exposure levels, a similar breakdown on operators is not available due to differences in job dynamics. Nevertheless, health of PVC workers is statistically similar to that of other workers in the same plant and no case of angiosarcoma has been identified among these operators.

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CASE STUDY -- IMPROVED CONVERSION OF VINYL CHLORIDE MONOMER
IN PVC SUSPENSION AND PVC DISPERSION OPERATIONS

The economic realities of the VCM resin business since 1965 have forced all resin producers to seek improved efficiencies in conversion of VCM to PVC through modification of operating procedures and plant facilities.

Increases in monomer efficiency (Polymer/Monomer Charged x 100) from 85 per cent in 1968 to 96 per cent in 1974 in suspension resin manufacture are documented. Improved machinery for recovering VCM from vapors released in venting and stripping sections is estimated to have accounted for more than half of the improvement. Similar improvements in monomer efficiency within the PVC dispersion resin process have been recorded; i.e. 78% in 1968 increasing to 91 per cent in 1973 is representative of the improvement. While such increases in monomer efficiency were oriented toward economic considerations, reductions in monomer lost to the air lessened the amount that emitted to the workplace atmosphere. Graphs A and B record the annual improvements being achieved in monomer efficiency in polymer production of both suspension and dispersion resins.

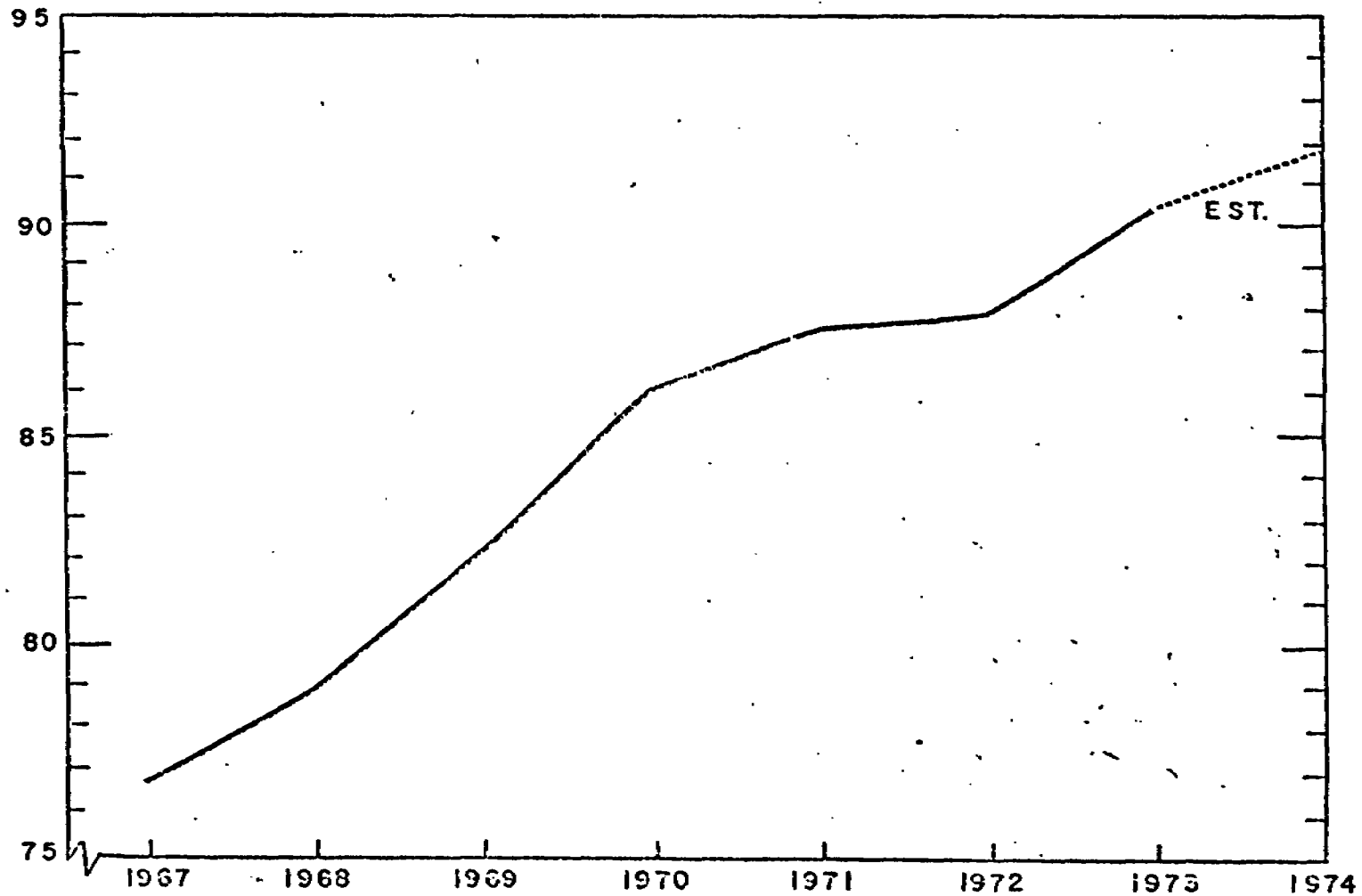
Recent measurements within both PVC suspension and dispersion operations established that maximum VCM levels in the workplace air approximated 30 ppm TWA (eight hour) at a ceiling of 45 ppm. Based on the known improvement in monomer efficiency, it is certain that the VCM levels in the workplace environment in 1974 are below those of prior years when recovery was less efficient; and that PVC workers in the prior years were exposed to significantly higher concentrations than is presently experienced.

The employee health records of workmen operating in the majority of the plants where the data show a significant and continuing reduction in VCM losses from the experience of 1967 show no measurable deterioration in the health of the workmen exposed during this period.

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POLYVINYL CHLORIDE DISPERSION RESIN OPERATIONS
VINYL CHLORIDE EFFICIENCY
TOTAL POLYMER/MONOMER CHARGED X 100

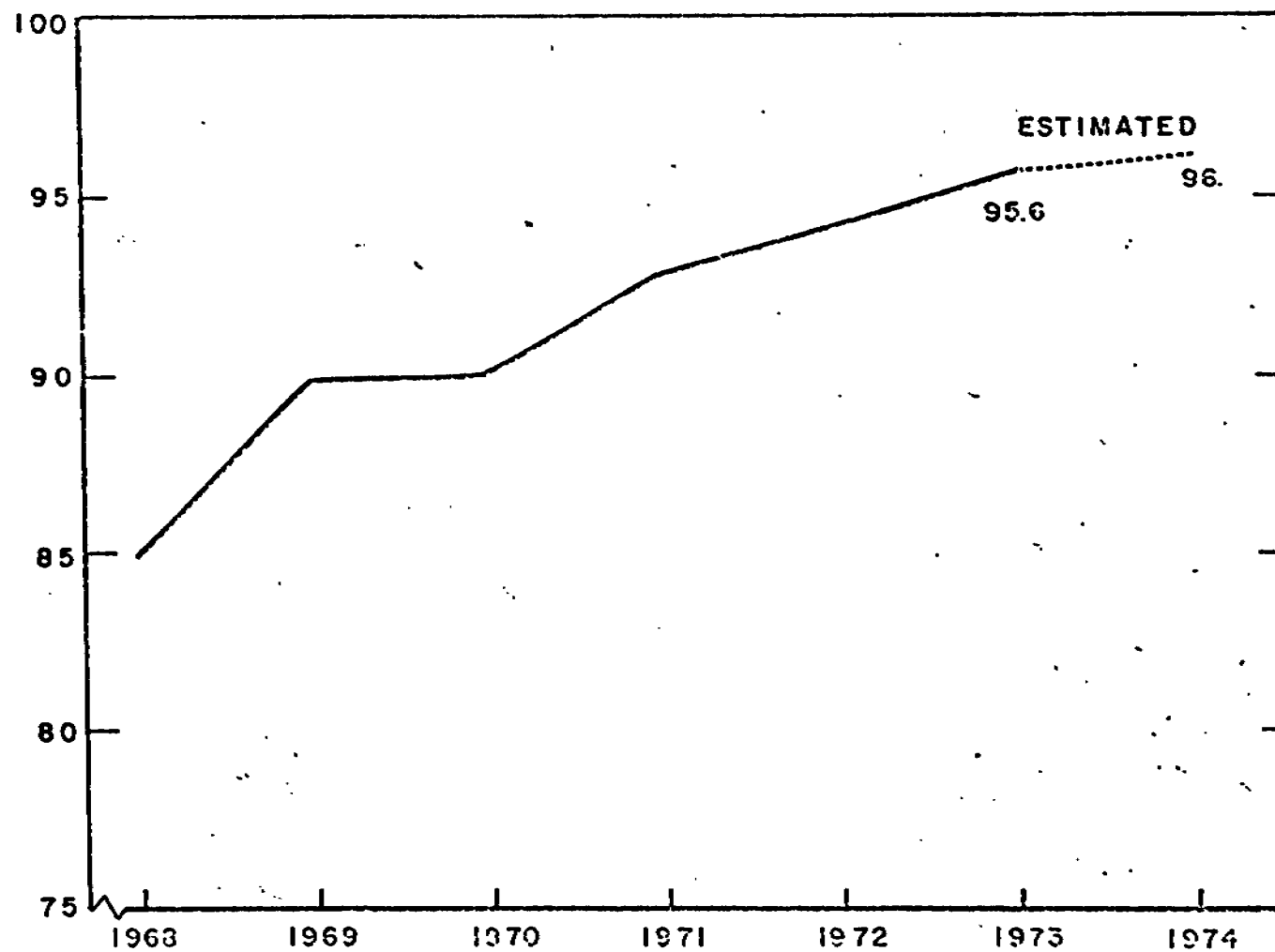
EFFICIENCY
PER CENT



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POLYVINYL CHLORIDE SUSPENSION RESIN OPERATIONS
VINYL CHLORIDE EFFICIENCY
TOTAL POLYMER/MONOMER CHARGED X 100

PER CENT



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