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CHAMBERLAIN: Clear thinking can keep us from throwing the baby out with the vinyl chloride.

THESE DAYS
BY JOHN CHAMBERLAIN
CONFRONTATION IN THE PLASTICS INDUSTRY

We live in the midst of many fears. The trouble is that we have no means of knowing in advance just how many of these fears are misplaced.

Yesterday it was cyclamates that were going to do us in. But today cyclamates have been given a reasonably clean bill of health. So it has been with cranberries. But other presumed perils arise.

The sudden publication by the B.F. Goodrich Co. of news that four workers at its Louisville, Ky., vinyl chloride conversion plant had died from a rare form of liver cancer called angiosarcoma now has workers in other chemical plants around the country lining up for diagnostic tests. The question is, will the new fear pass with the assurance that the chemical industry will accept a standard of 50 parts per million exposure level to the gas that is used to make solid polyvinyl chloride? (Such is the standard accepted in Britain.) Or will the Naderites, who don't believe that the industry ever has a case, insist on killing the entire polyvinyl chloride business by demanding a "zero exposure" safety standard, which cannot in the nature of things be guaranteed?

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Open Concern

Whatever one may say, the industry itself cannot be accused of cover-up practices. The B.F. Goodrich Chemical Company has led the way in making investigations designed to establish tolerable exposure limits. In the early days of vinyl chloride conversion to the polyvinyl plastic solid that is used in a myriad of industrial products, nobody worried about the sweet-smelling gas that lingered in the plants. Since it takes 15 years and more for an angiosarcoma tumor to develop, it is important to know whether the 20 or so cases of liver cancer that have been identified as originating from vinyl chloride exposure date back to a dark age of the plastics industry that has already passed away.

The trouble is that adversary proceedings in which the advocates of extreme positions face each other in Washington will not necessarily lead to a scientific settlement. In Europe, accredited technicians set standards without indulging in passionate arguments and incriminations. But in the U.S., opposing value systems clash, and the scare headlines make it seem that heroes are contending with villains, with industry invariably getting the worst of it.

Marginal Notes

Despite the Naderites, however, the general public has a special interest in a scientific determination of tolerable safety margins. Some 6,500 U.S. workers now work in plants that turn vinyl chloride gas into a solid plastic. Economically speaking, if 6,500 workers were forced to seek other employment it would cause no great crisis. But 700,000 workers are needed to make finished plastic products out of the raw polyvinyl material. And a grand total of 2.2 million workers throughout the U.S. economy have jobs that can be traced to the use of polyvinyl products.

Ticking these products off is an almost endless job. The pipe now in most frequent use for plumbing is a polyvinyl pipe. The tile in your shower bath, the cover on your automobile seat, the tubing used for electric milking machines that give you relatively cheap dairy products, the clear wrapping in which bacon and other meats are sold, the phonograph records that bring you music, and the safe insulation around copper wiring that enables you to electrify your house at a minimum of expense, are all fashioned out of polyvinyl chloride. Even the respiratory equipment used by doctors comes from polyvinyl plastic; the medical supplies made out of the stuff have surely saved more lives than have been lost by exposure to the raw vinyl chloride gas.

If polyvinyl plastic were to be replaced by a natural product, the whole of continental Europe would have to be turned over to sheep raising for industrial fabrics. The paper industry, even now suffering from shortages, would be unable to cope with the demands for wrapping derived from forest products.

Nevertheless, even though 2.2 million jobs are dependent on polyvinyl plastic, it is crass to use economics to make a case for the industry. The safe limit of vinyl gas control must be found. August 25 is the cut-off date for the submission of evidence in Washington. October 5 is the date set for the final decision about the safety margin. What we need is a lot of light and no heat when the ultimate judgment is made.

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Don Oakley

A matter of life and speed limits

By Don Oakley

There are few simple choices in this complex technological world. Often the question of what will bring the greatest good to the greatest number comes down to trying to decide what will cause the least harm to the least number.

Congress, for example, is considering making permanent the emergency 55-mile-per-hour speed limit on highways. A flood of data shows that not only has it saved fuel but it has brought about a significant reduction in deaths and injuries from traffic accidents.

Obviously, a lowering of the limit to 45 or 35 would save even more resources, both material and human. The ideal situation would be no traffic deaths at all. But long before we achieved that goal, which would require the banning of motor vehicles entirely, we would reach a point where the benefits would begin to be offset by other undesirable effects, such as the serious disruption of the economy.

Another example is the current controversy over polyvinyl chloride — PVC — a chemical used in an extremely wide variety of modern products, from food packaging to automobile parts to plastic heart valves to phonograph records.

Last January it was discovered that angiosarcoma, a rare form of liver cancer, had been the cause of death among some 19 workers in the United States and Europe involved in processing vinyl chloride, a gas, into PVC.

The workers had been exposed to the gas for anywhere from 14 to 27 years before the cancers appeared, raising the possibility that more cases would begin turning up.

Because of this, the Occupational Safety and Health Administration of the Department of Labor proposed an emergency standard, effective April 5, setting a maximum exposure level of 50 parts per million of vinyl chloride in the air. The previous level had been 500 parts per million.

Then in May, the OSHA proposed a permanent standard to reduce the exposure of vinyl chloride workers to a "no detectable level."

The Society of the Plastics Industry, claimed that there was no possible way to meet such a standard and that it would threaten the very existence of the industry. The OSHA, as is customary, held hearings in Washington at the end of June.

On one side, a number of PVC manufacturers or users of PVC, both large and small, testified that they would be forced out of business if the "no detectable level" were adopted. One maker of plastic tubing for medical uses warned that desperately needed equipment in kidney dialysis and heart surgery might become unavailable.

On the other side, organized labor strongly backed the proposed standard. "This country survived for nearly 200 years without polyvinyl chloride and we can survive in the future without it," said Peter Bommarito, president of the United Rubber Workers and chairman of the health and safety committee of the AFL-CIO.

Labor Department spokesmen disputed industry claims that the proposed regulation would stop vinyl chloride production and throw out of work as many as two million people in the plastics and other industries. The department did acknowledge the existence of some marginal firms might be jeopardized if they were forced to raise prices to pay for safety measures.

The upshot of the hearings was a decision to delay the standard until October 5 while a study of its technological and economic feasibility was made by the OSHA.

"What we in OSHA have to do," said its director Daniel P. Boyd, "is to arrive at a practical solution based on a subjective, but detailed, analysis of all the factors under consideration."

In other words, just what is the balancing point between the health threat of vinyl chloride and PVC to workers and the public and the economic threat to the industry?

In still other words, what should this particular "speed limit" be?

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SEP 1974



The VC standard: The arguments are in, OSHA's decision is imminent

by Carl P. Musacchio

Is there a safe exposure limit for vinyl chloride? On that question could hang the fate of an entire industry, thousands of jobs, and billions of dollars in sales and profits.

OSHA's proposed standard for exposure to vinyl chloride (VC) holds that there is no safe limit. It calls for no measurable concentration of VC in the workplace—in other words a threshold limit value of zero. Spokesman from industry prophesy that adoption of this standard would end production of VC and, in so doing, have devastating effects on the plastics industry.

The drama began last January when B. F. Goodrich Chemical Co. announced that several deaths from angiosarcoma of the liver, an extremely rare cancer, had occurred among workers in vinyl chloride operations at the company's Louisville plant.

Goodrich Chemical called in Kentucky public health officials and the National Institute for Occupational Safety and Health. After an initial investigation Dr. Marcus Key, director of NIOSH, made a momentous announcement: "On the basis of the medical, epidemiologic, and toxicologic findings thus far, it would appear that a new occupational cancer has been discovered: angiosarcoma of the liver. It is associated with the polymerization of vinyl chloride in the manufacture of polyvinyl chloride. Vinyl chloride is the chief suspect among the more than 50 chemicals used in the plant."

That announcement hit the industry like an iceberg scraping the hull of a luxury liner. Without question an emergency was at hand, but as long as the watertight compartments held, there was no cause for panic. The deaths were, after all, in one plant, and they involved only the polymerization process which converts vinyl chloride monomer, a gas, into solid granules of polyvinyl chloride resin. Synthesis of VC monomer and the polymerization process involved only a small segment of the industry. Fabrication of PVC resins into myriad products, ranging from auto seat covers to insulated electrical wire, involved far more workers and was the economic mainspring of the industry.

As the Manufacturing Chemists Association pointed out: "It is estimated that about 1,500 workers are employed in monomer synthesis, and an additional 5,000 in polymerization operations. It is difficult to estimate the number of workers engaged in converting, molding, and fabricating these polymers, but they are numbered in the tens of thousands, working in thousands of plants. It has been estimated the wholesale value of the annual output of fabricated products is over \$3 billion."

Cancer spreads

Within weeks of the first announcement it became clear that the cancer was not confined to one

operation in one plant. Cases of angiosarcoma were discovered among workers in synthesis and polymerization plants in several States and in Europe.

In early May, the vast vinyl fabricating industry was implicated. A group of German scientists reported to a conference on vinyl chloride hazards sponsored by the New York Academy of Sciences, the American Cancer Society, and NIOSH that six cases of serious liver disease had been discovered in a German plant manufacturing vinyl floor tiles. None of the afflicted employees had cancer, but the scientists believed the symptoms might have been those of incipient cancer. Again, VC monomer was suspect. The investigators guessed some VC monomer had eluded the polymerization process, and had become trapped in the PVC resins. Over the years then, the workers had been exposed to VC monomer escaping from the resins.

A month later, the Connecticut Department of Health reported two deaths from angiosarcoma. Both victims had worked in plants making finished products from PVC. One had worked at coating electrical wire with vinyl. The second was an accountant for a firm that fabricated products of PVC. An investigation was launched to learn if he had ever worked in the plant.

Most ominous of all was a report from Connecticut that two cases of angiosarcoma might have resulted from environmental, not occupation-



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Dr. Daniel P. Boyd
Director,
OSHA Office of
Standards Development



"The effect [of the proposed standard] on the nation's economy would be catastrophic."

Ralph L. Harding
President,
Society for the
Plastics Industry

al exposure. One victim was a man who lived about a mile from a PVC product fabricating plant. The other, a housewife, lived even farther from a similar facility.

Now every phase of the industry had been involved, and some were calling to abandon ship. In April, Peter Bommarito, president of the United Rubber Workers, had warned: "I feel this is a figurative and literal life-and-death struggle for the polyvinyl chloride resin industry in the world." In June, after the dimensions of the outbreak had become clearer, Bommarito added: "If PVC cannot be made and used safely, then the proposed OSHA standard must be replaced by an orderly procedure to phase out VC production and find substitutes for its products, or to phase out the products themselves."

Out of business?

Little wonder that some spokesmen for the plastics industry believe that phaseout of VC and PVC is a real, though unjustified, possibility. They see the proposed OSHA standard for worker exposure to VC as the specific threat. Through their major trade associations, especially the Society for the Plastics Industry (SPI) and Manufacturing Chemists Association (MCA), manufacturers and users hammered across their message in 9 days of OSHA hearings on the proposed standard.

Apparently with some effect. No final standard was announced by presstime, but OSHA's top standards officials were talking of a compromise the industry could live with.

The issue in the VC standard is one that's been fought over before: Should the TLV for a carcinogen, proved or suspect, be set at zero, or is there an acceptable maximum dose, a threshold limit value, below which no adverse reactions can be expected?

Before the cancer scare, the TLV for VC was set at 500 parts per million (ppm), though as early as 1970 European researchers were reporting some disquieting data about the effects of that concentration on laboratory animals. Dr. P. L. Viola, of the Regina Elena Institute for Cancer Research, Rome, reported rats exposed to vinyl chloride at 30,000 ppm developed cancers of

the skin, lungs, and bones. Later, tests by Dr. Cesare Maltoni, of the Institute of Oncology (the study of tumors), Bologna, Italy, had produced tumors of the kidney and liver at concentrations of 500 and 250 ppm.

The MCA knew of the work of Drs. Viola and Maltoni. MCA's Chemical Safety Data Sheet on VC referred to the Italian carcinogenicity studies in its 1972 edition. Meanwhile, MCA had arranged for 17 U.S. companies to sponsor research and animal studies based on the findings of Maltoni and Viola.

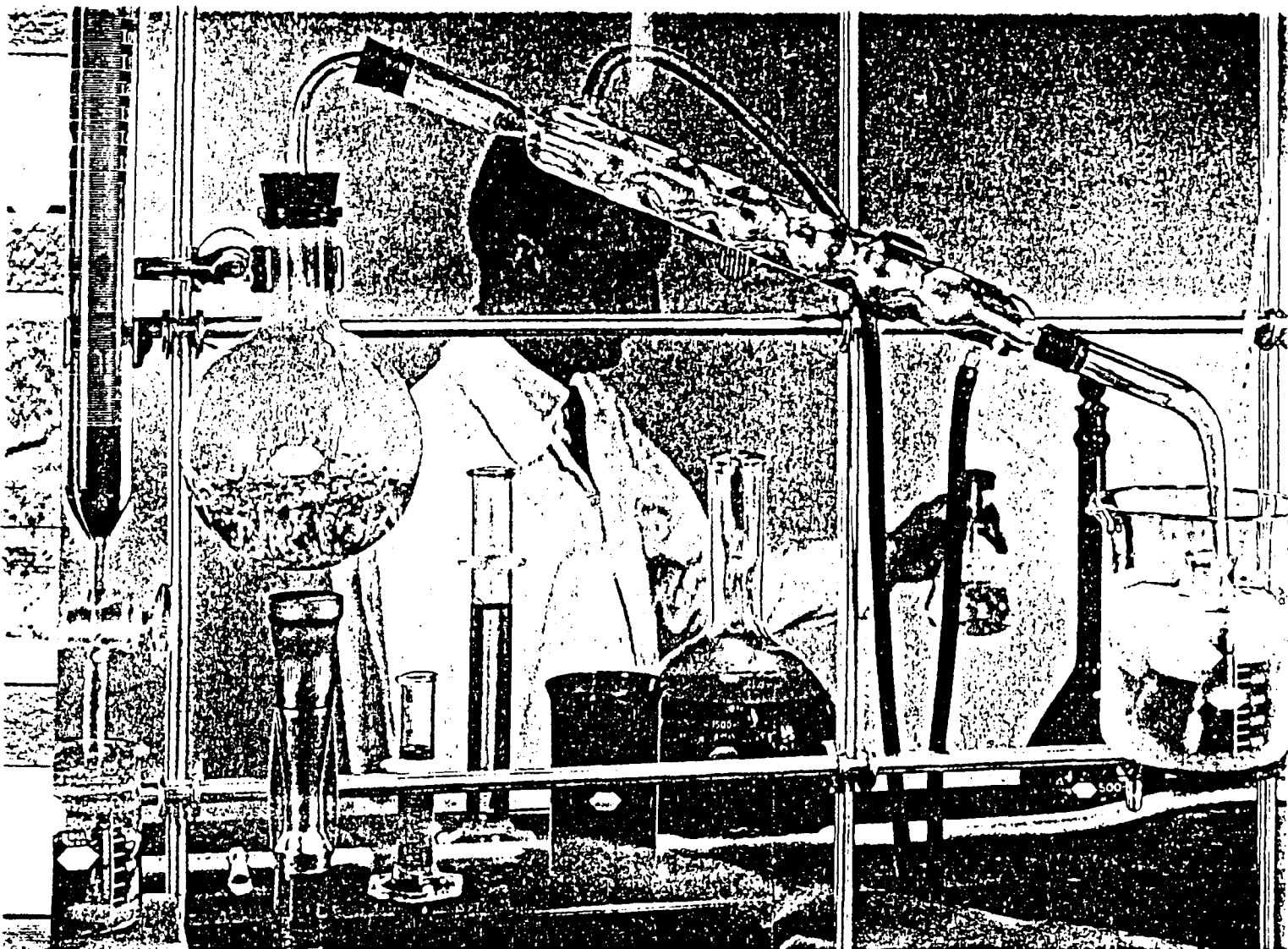
Zero exposure

In the furor that followed the VC disclosures, OSHA felt pressure, notably from the United Rubber Workers, Oil Chemical and Atomic Workers Union, and the AFL/CIO to issue a temporary emergency standard on VC.

On April 5, OSHA issued an emergency standard that limited exposure to VC to 50 ppm and that established monitoring and record-keeping requirements. The OSH Act limits the life of temporary emergency standards to 6 months. This one, then expires on October 5.

When the emergency standard was promulgated, the only generally known experiments on the carcinogenicity of VC were those of Dr. Maltoni and Dr. Viola. Neither had observed cancers in laboratory animals exposed to 50 ppm. But shortly after announcement of the 50-ppm emergency standard, preliminary test results became available from one of the research projects MCA had sponsored as a result of the Italian studies. Industrial Bio-Test Laboratories of Northbrook, Ill., the MCA contractor on the project, revealed that mice exposed to 50 ppm for 7 hours a day, 5 days a week, for 7 months, had developed angiosarcomas.

The industry knew then, that OSHA's proposed permanent standard, unlike the temporary emergency standard, would come in below 50 ppm, but most PVC manufacturers and users were stunned when the proposed permanent standard was issued. It called for limiting occupational exposure to vinyl chloride to "no detectable level," as determined by sampling and analytical methods



capable of detecting VC in concentrations of 1 ppm, with an accuracy of 1 ppm plus-or-minus 50 percent.

The proposal applies to any area or operation in which vinyl chloride is manufactured, reacted, released, repackaged, stored, or used. Thus, the standard would cover PVC fabricating operations if the PVC resin being used is releasing detectable amounts of VC monomer. The standard specifies monitoring to assure that any exposure for any employee can be determined. It orders feasible engineering controls to hold concentrations below the detectable level. Self-contained respirators are to be used where concentrations can't be kept down.

Challenge and response

In their response to the proposed standard, industry representatives

lined up to testify that:

- There is no scientific evidence establishing the need for a zero TLV.
- Enforcement of the standard would destroy the industry.
- Current control technology cannot achieve the concentration levels ordered by the standard.

Questioning the need for the no-detectable-level standard, Dr. Carl U. Dernehl, associate medical director for Union Carbide, offered results of a survey of employees in 36 VC producing plants.

"The tests have failed to show the existence of abnormal liver function in greater proportion than would be found in a control population," he said. The test involved 1,402 men, all of whom had been exposed to concentrations of 50 ppm or higher, and all of whom had been exposed long enough to develop the disease. "Yet, there was not a

single case of angiosarcoma," Dernehl said.

Enforcement of the standard could mean a loss of production and sales of between \$65 and \$90 billion according to a study by A. D. Little, Inc. contracted by SPI. Not only the plastics industry, but autos, construction, communications, toys, shoes, luggage, and many others would be hit hard, the study's authors concluded.

SPI president Ralph L. Harding said, "The effect [of the proposed permanent standard] on the nation's economy and on the social order in terms of human hardship it would cause would be catastrophic. We expect the final results from A. D. Little will show a potential loss in excess of 2 million jobs. This is all the more regrettable in light of the fact that the industry is taking every possible step to reduce worker exposure to VC monomer."

a standard of no-detectable concentration, Walker concluded that Firestone would have to cease VCM operations. Studies made by engineering consultants indicate Firestone would have to spend from \$50 to \$55 million to meet the proposed OSHA standard. Even a 50 ppm level would require about \$10 million in engineering controls alone.

Dow Chemical Co.'s testimony at hearings on the proposed standard caused a stir that may have undercut other industry testimony. Dow announced it has achieved a no-detectable level of VC monomer on some operations. On the average, the company has held levels down to 10 ppm on an 8-hour time-weighted average. This level has been achieved for most operations, though occasional malfunctions or emergencies cause briefly higher concentrations.

Dow's medical records show workers exposed to VC had a malignancy rate no different from what would be expected in a comparable group which had never been exposed. Records show no deaths due to angiosarcoma or any other type of liver cancer.

Common ground?

"There isn't any likelihood in my mind that we're going to put the industry out of business," remarked Daniel P. Boyd, director of OSHA's Office of Standards Development after hearing testimony on the proposed standard. Boyd doesn't expect the final standard to require industry to achieve a no-detectable level of VC monomer in the workplace. "Evidence at the hearings indicates a standard of 25 parts per million can be met across the industry. The final standard will probably be somewhere between zero and 25 ppm," he said.

In any event, the final standard won't be issued until OSHA has completed a study of the technological and economic feasibility of various levels of exposure. "Now that we have the drift of the hearings of VC, we are able to focus on the cost-benefit elements which must be part of our decision making process," Boyd said.

One argument the Department of Labor has apparently not bought is that compliance with the proposed standard would shut down the in-

dustry. The Department of Labor's draft environmental impact statement on the standard acknowledges that some marginal firms might be hurt, but adds that demand for PVC is so strong, it would probably remain relatively unresponsive to price increases made necessary by the cost of compliance with the standard.

In any case the standard is being reconsidered, and, as far as the Department of Labor is concerned, the zero concentration requirement seems to be out of the running. Most insiders think a limit of 10 ppm, however, is a distinct possibility for the permanent standard.

Labor views

"It will be a tragedy if OSHA adopts a common denominator standard that everybody can meet so that those plants that can go further are under no incentive to do anything more. For those plants which cannot meet a no-detectable-level standard, the variance procedures of the OSH Act should be utilized," said Anthony Mazzocchi, citizenship and legislative director of the Oil, Chemical, and Atomic Workers Union.

Mazzocchi, like many other union officials in the petrochemical and plastics industries, believes industry's claims that the proposed standard will bankrupt them requires much closer scrutiny than it is getting. He pointed to the Dow Chemical Co. testimony that some plants had achieved the zero TLV in monomer

operations. "It is our hope that the proposed permanent standard would force the industry into a proper preventive maintenance program which will reduce exposure to VC to the nondetectable level," he said.

Peter Bommarito, president of the United Rubber Workers, maintained the industry threats were nothing but blackmail. "This country survived for nearly 200 years without polyvinyl chloride and we can survive in the future without it," Bommarito told the press.

With labor leaders playing the role of immovable object, it's clear that any proposal to back away from the no-detectable-level standard will be in for trouble. And the trouble will come not only from the leadership, but from the rank-and-file membership as well.

Angelo Cefalo, special assistant to the president of the International Association of Machinists and Aerospace Workers, pointed to growing fears of his union's members who work with PVC. Cefalo said one member told him that he was beginning to feel that breathing in VC had caused something to grow in his body that eventually would make him die of cancer.

Whoever sets the final standard, then, is going to have to reckon not only with technological and economic feasibility, but with a very normal ailment that many people, including much of the industrial workforce, suffers. It's called carcinophobia and it means a fear of cancer. ■

"Goodyear fails to see how OSHA can scientifically conclude that exposure to VC at concentrations of 50 ppm can constitute a serious health hazard to humans."

"It will be a tragedy if OSHA adopts a common denominator standard because those plants that can go further will have no incentive to do so."

Rather than the controversial proposed standard which lumps together both producers and users, Anton Vittone, president of B. F. Goodrich Chemical, speaking for SPI, asked for separate standards for PVC resin producers and VC synthesizers. The standard for resin producers should require:

- Effective October 5, 1974, a ceiling of 40 ppm with a maximum daily time-weighted average (exposure averaged out for an 8-hour workday) of 25 ppm. Levels above 40 ppm would require use of practical and effective respiratory protection.

- Effective October 5, 1975, a ceiling of 25 ppm with no time-weighted average. Levels above 25 ppm would require use of practical and effective respiratory protection.

For plants that synthesize vinyl chloride monomer, Vittone's suggested standard would require:

- Effective October 5, 1974, a ceiling of 25 ppm and a maximum time-weighted average of 10 ppm. Levels above 25 ppm would require the use of practical and effective respiratory protection.

- Effective October 5, 1975, a ceiling of 10 ppm and a maximum time-weighted average of 5 ppm. Levels above 10 ppm would require the use of practical and effective respiratory protection.

Vittone noted, "It is the position of industry that it will commit itself to lowering exposure of its workers by a combination of lower levels of vinyl chloride in the work atmosphere and work practices. [This] proposal makes projections for improvement which are not in hand but depend on new developments and additions to facilities."

The SPI proposal, according to Vittone, would require substantial outlays and could take more time than estimated. The standard should, Vittone maintains, permit companies to apply for variances.

Vittone also maintains that the no-detectable-level standard being considered by OSHA would require full-time use of self-contained breathing apparatus during the workday for many employees. "This would impose a severe and unnecessary physical burden on workers and create potential health and safe-



"This is a life-and-death struggle for the [PVC] industry in the world..."

Peter Bommarito
President,
United Rubber Workers



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Anton Vittone
President,
B.F. Goodrich Chemical

ty problems as well," he said.

William Miller, manager of corporate safety and workmen's compensation, Goodyear Tire and Rubber Co., recommended not two but three standards, one each for the producers of VC monomer, the producers of PVC resin, and the fabricators and processors of PVC resins.

"Goodyear fails to see how OSHA can scientifically conclude that exposure to VC at concentrations of 50 ppm can constitute a serious health hazard to humans," Miller told OSHA.

What's possible?

John L. Nelson, vice president of manufacturing for B. F. Goodrich Chemical Co., offered evidence on the level of contamination his firm has been able to meet. "Hundreds of readings per day taken at several plants show considerable progress in reducing levels of exposure," he said. "The average reading was reduced from about 35 to 40 ppm early this year, to about 12 to 14 ppm at present. Readings range

from 1 to 2 ppm as a general level with occasional excursions over 50 ppm. A summary of time-weighted average exposures by job classification showed considerable variation in time-weighted measurements, ranging from below 5 ppm to 31 ppm on polymerizer charging operations." Nelson also noted that reduction of leaks had done the most for reducing general levels of VC in Goodrich Chemical plants.

Firestone Plastics Co., about the only major producer to disagree with the SPI proposal of a step-by-step reduction in the TLV, called for a standard that would limit exposure to 40 ppm with a time-weighted average of 25 ppm.

T. C. Walker, president of Firestone Plastics, said, "Clearly, the human deaths caused by admittedly high levels of VCM exposure not now permitted in Firestone's plants or industry generally, suggest nothing with respect to the effects on humans of the low levels of VCM presently permitted in Firestone's plants and industry generally." If compelled to comply with

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Plastics magazine editors tell of PVC decision coming from OSHA

By Dave Kaiser

FORT LAUDERDALE, Fla. Sept 5 is the deadline for a decision from the Occupational Safety and Health Administration (OSHA) on the dangers involved in the production of polyvinyl chloride resin and the possible formation of industry standards.

SPW/A Exclusive

The controversy arose on April 15 when the results of animal exposure studies were submitted to OSHA by Industrial Bio-Test Laboratories, Northbrook, Ill. The tests indicated that vapor released in the manufacture of PVC resin could cause cancer. Since that time numerous articles have appeared in the consumer press on the subject.

SPW/A contacted the leading authorities within the plastics industry in an effort to find out exactly what effects might result from the pool industry. Included in our exclusive interviews were manufacturers of PVC resin, the Society of the Plastics Industry, and editors of trade publications within the plastics industry. Publications

polled in our survey included: Modern Plastics, Plastics Design and Processing, Plastics Engineering, Plastics Machinery and Equipment, Plastics Technology, Plastics World, and Plastics World News.

A three-week hearing on the topic of the vinyl chloride monomer and proposed standards was held starting June 25 in Washington, D.C., and closed in mid-July. Results have to be presented in the Federal Register no later than Sept. 5.

The hearing was called by OSHA and attended by representatives from involved groups, including trade unions and the Society of the Plastics Industry.

OSHA, in calling the hearings, contended that its own temporary emergency standard, adopted on April 5, 1974, should be replaced with a more stringent permanent standard.

The Society of the Plastics Industry, which presented key witnesses during the hearings for the opposition, appealed to OSHA on the basis that OSHA's proposed standards were unreasonable and could put the industry out of business.

"The OSHA standard proposed in April called for no more than 50 parts per million of vinyl chloride monomer," explained Thomas McGrath, general manager of the Society, in an exclusive interview with SPW/A. "We gave OSHA conclusive evidence to show that there should be no concern at 200 parts per million.

"This was demonstrated through checks on workers throughout the years," he said. "We have to take the situation in perspective. There have been 13 deaths in over 40 years.

"Based on this record, if you had an impartial toxicologist or health official listen to the testimony he would come away unconcerned."

Delving directly into the effect of such standards on the pool industry, McGrath said that "there could be devastating effects if stringent standards were set because PVC production would come to a halt." He indicated that the April restrictions have already caused some problems and slowed production.

As far as the standards themselves are concerned, McGrath said pool industry manufacturers would be involved only if they take PVC resin and extrude their own products.

"In this case they would be involved from the standpoint that a small amount of vinyl chloride monomer is emitted," he explained. "We demonstrated to OSHA that in such cases the level is inconsequential and only amounts to one part per million."

The susceptibility of the pool industry was further clarified by Bernie Miller, editor of Plastics World in Boston. According to Miller, the hearings will mainly affect resin manufacturers who work with vinyl chloride vapors.

"At this level they are usually working with 100 parts per million of the monomer said to cause cancer," explained Miller. "At each successive stage of the process the amount of monomer is reduced considerably and it is practically non-existent when it gets to the consumer."

According to Miller, the monomer is decreased to one part per million when poolmen become involved with producing products from the material. It is even less when the material reaches the pool.

"The key question here is with the vapor," said Miller. "If vapor is not involved and it is not inhaled, then there is no problem."

A.A. Schoengood, editor of Plastics Engineering, the official publication of the Society of Plastics Engineers went one step further. He said to SPW/A in a letter:

- There is no alleged connection whatsoever between users of PVC and their contraction of liver cancer.

- There appears, however, to be a connection between vinyl chloride monomer and liver cancer, as well as other diseases to unprotected workers engaged in the manufacture of vinyl chloride and in its polymerization to polyvinylchloride.

- There is at least one case of a worker handling polyvinylchloride in the manufacture of insulation who contracted liver cancer. It must be remembered that in this case, the PVC resin was exposed to high temperatures and therefore capable of liberating entrapped vinyl chloride monomer.

SWIMMING POOL WEEKLY
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B. Miller

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perspective



By Lloyd Stouffer
Executive Editor/New York

The fate of PVC hangs in balance, but there's hope

FIGHTING HARD against a proposed safety standard which, they said, could result in a complete shutdown of the polyvinyl chloride industry, with a loss of 2.2 million jobs and \$65 billion in sales and production, members of the Society of the Plastics Industry apparently scored some points in week-long hearings before the Occupational Safety & Health Administration late in June.

Industry's dire prediction was based on OSHA's proposed imposition of a "no detectable level" of vinyl chloride emission in the manufacture and fabrication of PVC. Arguing that such a zero level was literally impossible, the SPI spokesmen suggested instead a stepped reduction from the presently permitted 50 parts per million to 10 ppm for VC monomer plants and 25 ppm for PVC resin plants. Both levels, they said, could be attained by October 5, 1975, and with the use of effective respiratory protection should be sufficient to protect workers.

The controversy, of course, stems from the recent finding that 19 cases of a fatal liver cancer have occurred in workers exposed to vinyl chloride fumes over a period of years. While these cases have primarily occurred in plants converting VC monomer to PVC, the scare has recently extended to plants dealing only with PVC, on the theory that the heat of sealing or molding the plastic might release the suspect monomer gas.

The hearings will continue, and no decision is likely before September or October. But industry representatives came away from the first session with the feeling that OSHA, despite rigorous cross examination, was trying to be open and fair, and that the Administration probably recognized that a zero level was untenable. One hope is that the fabricating companies, of which there are hundreds, will be given a workable standard, apart from the processors

An entirely different problem is the possible ingestion of VC monomer through migration into foods and drugs packaged in PVC. As reported here earlier, the Food & Drug Administration — having already banned PVC bottles for liquor — is giving intensive study to food applications, but it probably will take no action pending the completion of the OSHA hearings.

An FDA source reports that migration levels into foods may be lower than previously suspected. Industry data suggests that migration

from rigid PVC runs about 20 parts per billion, which is lower than the limit FDA has been considering.

The Environmental Protection Agency also will come into this complicated picture, with its responsibility to protect the atmosphere outside of plants. However, it is reported that an EPA sampling, conducted at varying distances from a dozen vinyl chloride and polyvinyl chloride plants around the country, turned up safe atmospheric levels of less than one part per million in 95% of the readings.

No lost year for PEF

CONTINUED SUPPORT for the Packaging Education Foundation has been pledged by the Packaging Machinery Manufacturers Institute, despite the fact that PMMI's money-making packaging show after this year will go on an every-other-year schedule.

PMMI's executive director, Claude Breeden, told the Foundation's recent annual meeting that the \$1-per-registration contribution will continue to be effective with this year's October 7-10 show in Chicago, and that when the next show is held in the fall of 1976 it is planned to increase the contribution to \$2 per paid U.S. visitor, up to a maximum of \$40,000. Thus, PMMI will make up for the "lost" year.

Thanks in part to PMMI's support, PEF's annual report shows that contributions in the last year mounted to a record of over \$150,000. Grants have gone to 10 colleges who have or are establishing degree-granting packaging courses. Requests from three additional schools are under consideration.

Selection of a Packaging Man of the Year and five nominees for Packaging's Hall of Fame will be revealed at the annual awards dinner at McCormick

PACKAGING DIGEST
CLEVELAND, OHIO
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Place on October 9. A decision was made by the board to streamline the ceremonies. There will be only one featured speaker, and adjournment is planned by 9:15 p.m.

It was also decided that there will be a PEF Awards Dinner in New York in the fall of 1975. In the absence of a packaging show next year, it is expected that this will be coordinated with a National Packaging Week in which the American Management Association, the Packaging Institute and the Society of Packaging and Handling Engineers will participate.

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INSULATION CIRCUITS
LIBERTYVILLE, ILL.
MONTHLY 27,000

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B. Hill

Government Regulations Threaten
Vinyl Chloride Industry;
SPE Meets to Discuss Problems

A minimum of 1.6 million jobs would be lost if the producers of vinyl chloride, an industrial chemical, and polyvinyl chloride (PVC), a widely used plastic resin, were forced to shut down because of a pending OSHA regulation. That's the latest from the Society of The Plastics Industry whose economic consulting firm recently unveiled the aforementioned staggering figures. The reason for this crisis is that the technology just does not exist to achieve a "no detectable level" of exposure as proposed by OSHA. Vinyl chloride monomer (VCM) has been linked in recent months with higher than normal incidence of angiosarcoma of the liver, a rare type of cancer, among previously highly exposed workers. Vinyl chloride is used primarily to produce PVC resin, which in turn is fabricated into a variety of products including telephone equipment, insulated wire, and various electrical components.

With this impending OSHA crisis in mind, the Society of Plastics Engineers plans to sponsor a conference which will look at the problem from a processing perspective. The Regional Technical Conference (RETEC) scheduled for late October is going to be a special educational symposium which will present the latest information on the means of dealing with the VCM problem. The proposed eight-part program will include an historical summary; an update on the current situation; a summary of OSHA, FDA, and EPA regulations; discussion of what the regulations mean to producers, processors, and users of vinyl plastics products; analytical methods of detection and monitoring; protective equipment; processing techniques to minimize VCM contact; and an analysis of future needs.

Further details of the symposium are available from Kenneth A. Galione, SPE, 656 W. Putnam Ave., Greenwich, Conn. 06830.

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W. 8, 132

SEP 30 1974

By Miller

PVC Ruling: Real Shake-Out Seen in Industry

NEW YORK, (Reuters) — The Department of Labor early next month is expected to hand down a work safety standard that could ultimately result in the loss of as many as 2.5 million jobs and \$1 billion in annual revenues to the plastic and chemical industry in the United States.

And according to the Society of Plastics, the order setting the maximum ~~permissible~~ level of vinyl chloride to which workers can be exposed at best will cause temporary plant shutdowns and could halt production of polyvinyl chloride.

In any event, the decision is expected to be a controversial one, since the question has been raised over a cancer threat in polyvinyl chloride.

Presently there are about 22 companies, operating 50 plants in the United States, that produce the gaseous vinyl chloride, which since its commercialization in 1940, has been a key element in making polyvinyl chloride (PVC), a resin used in thousands of products.

The largest producer of PVC is B. F. Goodrich Co., but other companies — Firestone Tire and Rubber Co., Tenneco, Inc.; Goodyear Tire and Rubber Co.; and Dow Chemical Co. — could be seriously affected by the ruling which will be set by the Occupational Safety and Health Administration (OSHA).

Until the definitive standard is set by OSHA, the industry is operating under an average interim level of 50 parts per million allowable in the air.

But OSHA last year tried to come down hard on the industry, according to the Society of Plastics, with a "completely

unrealistic and unattainable" proposal, which amounted to "zero-parts-per-million."

The industry countered with a range of 25 to 40 parts per million, and warned of widespread plant closings as a result of costs involved in meeting such standards.

With some 5,000 million pounds of PVC produced each year in the United States — about 18 to 20 percent of total plastic output in the country — the scope of the ruling is ominously clear, the industry said.

Those in the industry seem less than optimistic as to the outcome of the controversy and the alternatives to what they would consider "an unrealistic" OSHA standard.

PAPER FILM AND FOIL
CONVERTER
PARK RIDGE, ILL.
MONTHLY 14,000

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1974

By Miller

Controls On Vinyl Chloride are being opposed by manufacturers who use it on the grounds that the proposed reduction of exposure to a "no detectable" level or ranges of $\frac{1}{2}$ -1 $\frac{1}{2}$ ppm, would drive many facets of the plastics industry out of business, resulting in the loss of thousands of jobs. Hearings on the cancer-linked chemical began in the last week of June. It is hoped that consideration will be given to industry's letters to the Labor Department, most of which urged delay in the imposition of harsh restrictions. This delay would allow scientists more time to discover suitable substitutes and give businesses time to phase in new controls. According to Society of Plastics Industry, 1.6 MM jobs and at least \$65 billion in sales and production could be lost. To date, vinyl chloride has been correlated to 19 cases of rare liver cancer among workers handling it in the U.S. and other countries, 16 of which ended in fatalities. OSHA recently issued guidelines for inspections of PVC manufacturers.

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CHICAGO DAILY NEWS

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Vinyl chloride issue Health ruling seen as threat to plastics

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in the country — the scope of the ruling is ominously clear, the industry said.

Those in the industry seem less than optimistic as to the outcome of the controversy and the alternatives to what they would consider "an unrealistic" OSHA standard.

In a recent interview, Uniroyal president David Beretta said the decision, if lower than the current interim standard, will inevitably cause "a real shake-out, especially with marginal companies," in the field.

Moreover, according to the Society of Plastics Industry, there is no substance that could effectively replace PVC.

23527027

Showdown on vinyl plant rule presages shutdowns

Newly issued advisory reports hint at compromise in fight to curb vinyl chloride fumes, but battle may continue in court. Industry insists OSHA's proposal would be ruinous

The bitter controversy over worker exposure to vinyl chloride gas may climax on Oct. 5 when the U.S. Dept. of Labor is expected to set permanent standards for the 17 U.S. plants that produce the monomer, the 37 that polymerize it to make polyvinyl chloride resins, and the thousands of plants that mold, extrude and otherwise shape those PVC resins into plastic pipe, vinyl flooring, house siding and phonograph records.

The controversy has raged since last January, when medical data apparently established a link between workers' exposure to vinyl chloride monomer (VCM) and angiosarcoma, a rare liver cancer.

And last week the scores of chemical and plastic companies that have a stake in this \$3-billion/year business were given some inkling of whether the government will stay with the 50-ppm. emergency standard, adopt the proposed "no detectable level"

limit or move to some compromise position. Whatever standards are set could determine the profitability of producing and processing vinyl compounds in the U.S. for many years and are likely to be attacked in the federal courts, either by the companies or the labor unions involved.

Conflict: As to exactly what standards will be promulgated next week, various indications—sometimes contradictory—can be found in three newly issued reports:

■ Foster D. Snell's final report to the Occupational Safety and Health Administration on the economic impact of the agency's proposed VCM exposure standards. A principal conclusion: "achieving no detectable level... is judged not feasible, both in PVC and VCM sectors."

■ The Occupational Health and Safety Administration's final environmental impact statement on the physiological effects

of the proposed standard. This report does not discount the possibility of a level higher than the 1 ppm. implicit in "no detectable level." But it concludes that anything higher is a risk to workers. "Despite significant cost increases that may occur, the high demand for PVC resins is likely to continue," the report states.

■ The Environmental Protection Agency's notification that within nine months it will set VCM plant emission standards that could add 4% to the cost of PVC. This would seem to preclude the engineering possibility of venting all the in-plant VCM leaks to the atmosphere.

Double Negative: OSHA's proposed goal of operating monomer and polymer plants at no detectable level of vinyl chloride exposure is "not feasible," according to Snell. Moreover, the firm's analysis indicates that the U.S. industry would com-

els; and there are no technology transfer opportunities to permit development of design for no detectable levels in new plants. Moreover, Snell says that because PVC manufacture is a batch operation, emissions couldn't be completely eliminated.

Something to Live With: Those conclusions would seem to support a compromise regulation that the vinyl makers could live with—perhaps not too happily. But probably because of the imminence of the Labor Dept.'s new regulations, industry representatives were reluctant to discuss Snell's final report, noting that they haven't had time to examine it.

Nor did they have much time to react to Snell's preliminary report, which contained pretty much the same data used in the final report but did not contain any conclusions. OSHA issued the preliminary report Aug. 28, called for response

by Sept. 6. Nevertheless, industry leaders submitted comments, and these were generally negative and caustic.

One point of contention in the preliminary report was the use of Firestone data for bringing a PVC plant into compliance with a no-detectable-level standard. Firestone, Snell reported, was the only company that said it could meet such a standard.

Firestone replied that studies of its polymerization plants in Pottstown, Pa., and Perryville, Md., actually indicated a contrary judgment.

Declares a Firestone executive: "Independent of economic considerations and despite enormous equipment, engineering and process changes at both facilities, costing in excess of \$50 million, it is not possible to achieve the drastic exposure levels required by the proposed standard, based on engineering controls and technology that now exist."

Firestone, No. 5 in PVC output, has

OSHA's vinyl standards impact: higher costs, fewer plants

Proposed VCM exposure standard* (ppm.)		Increase in average unit costs (cents/lb.)			Time needed to comply (months)	Proportion of industry endangered ²
Maximum	Time-weighted average	Direct	Loss of productivity	Total ¹		
Monomer plants						
50	15	0.04	0.03	0.07 ± 10%	0	0%
25	15	0.09	0.03	0.12 ± 40%	24	0%
10	2.5	0.17	0.15	0.32 ± 40%	36	0%
"No detectable amount"		—	—		Not feasible	100%
Polymer plants						
50	—	0.19	0.35	0.54 ± 20%	0-6	Negligible
25-40	15-25	0.36	0.49	0.85 ± 35%	30	4%
15-25	10-15	0.90	0.70	1.60 ± 50%	30	26%
"No detectable amount"		4.01 ³	3.07 ³	7.08 ± 75% ³	30-48 ³	100%

* Vinyl chloride monomer (VCM) content, expressed as parts per million, in the air to which employees are exposed. ¹ With estimated range of variance for individual plants, based on partial statistical analysis of data. ² Percentage of capacity that management would seriously consider shutting down. ³ Based on Firestone's estimates; actual compliance is not considered feasible. Source: Foster D. Snell, Inc.

pletely collapse under that restrictive standard, with all producers indicating they would have to close their plants.

The study offers several reasons for reaching these conclusions: technology to eliminate VCM leaks and fugitive losses is not available; existing plants have not been designed for total VCM containment; there has been no operating experience in maintaining very low VCM lev-

some differences with the rest of industry on the exposure level standards that would be manageable. Industry generally supports the Society of the Plastics Industry's proposal: that the present temporary emergency standard of 50 ppm. be lowered in several stages to 25 ppm. for PVC plants by Oct. 5, 1975, with further imposition of a time-weighted average limit of 10 ppm. Standards for VCM production, says SPI, could be more restrictive—10 ppm. by October 1975, and a time-weighted average (twa.) of 5 ppm.

T.C. Walker, president of Firestone Plastics, says that a "safe and medically sound—as well as technologically and economically feasible—standard" is 40 ppm. maximum exposure and 25-ppm. twa.

Snell's analysis offers data on several alternatives, maintaining the SPI distinction between VCM and PVC plants (table, p. 15). Cost data indicate that VCM makers can manage with a 10-ppm. limit and a 2-5-ppm. twa. without closing any plants. Meeting such a standard would increase their average unit manufacturing cost by an estimated 0.32¢/lb., which is about 4-5% of the present range (7-10¢/lb.) of list prices for various grades of VCM.

For polymer producers, however, some plant closings may be necessary when the present emergency standard is tightened. According to the Snell study, at an exposure limit of 25-40 ppm. and a 15-25 twa., 4% of the existing PVC plants may have to be shut down. This might not be too disastrous, considering that 58% of the industry's plants are more than 10 years old, and only 8% are less than five years old.

But for an exposure limit of 15-25 ppm. and a twa. of 10-15 ppm., 26% of the PVC plants could face the axe. Snell's survey indicates that with this standard, unit costs of PVC would increase 1.6¢/lb., or about 4-8%, at those plants that can take the needed engineering changes. At some older, smaller batch operations, the companies say it would be impossible to reach such a low exposure level without building a new plant. At certain plants, Snell believes, the additional cost might be 50% more or less than the 1.6¢/lb. average.

Schedule Makers: Snell estimates it will take VCM plants up to three years to achieve what it considers the lowest achievable level. For PVC plants, the estimate is two and a half years.

This is based on engineering estimates of installation time for various kinds of apparatus to reduce exposure levels at

PVC plants. Examples: major ventilation system improvement, 18 months; replacement or reconditioning of reactors, 18-24 months.

Overly Optimistic? Some companies contend that these estimates are overly optimistic in light of today's materials shortages and delivery delays. Observes a Firestone executive: "Individual company confidence in being able to attain compliance with even the SPI recommendations has been eroding as lead times for obtaining equipment expand, as capital costs rise rapidly, and as the prospect for financing these projects becomes dimmer."



VINYL SIDING costs will rise as makers meet new in-plant and emission standards.

Industry criticism has also centered on Snell's projection of cost data to meet projected standards. The figures are said to be heavily weighted in favor of newer plants and suspension homopolymerization units in warmer climates. Such plants could probably be most readily adapted to meet a more stringent exposure standard.

Separate Standards: The proposed no-detectable-level standards would be applicable to VCM and PVC plants as well as fabricators. But the Snell study follows the SPI proposal of separate standards for VCM and PVC plants.

Reasoning is based on relative ease of controlling emissions at VCM plants, which are generally closed systems, operating in the open air. Leaks may occur around pump packings, during samplings or maintenance operation, or at tank-car

loadings. The batch operation of PVC plants involves continuous emptying and recharging of autoclaves and frequent inspections and cleaning out of these reactors. Chance of VCM exposure in these plants is high even in the packing areas.

While separate standards would seem reasonable to manufacturers, the practicality of this approach is limited. It's unlikely that labor groups, strongly in favor of the no-detectable level and opposed to the concept of a threshold level for any carcinogen, could accept different exposures for workers in various plants.

Outside Plant: If the vinyl producers solve their in-plant exposure problems, they will still have to deal with monomer gas escaping from the plant. EPA Administrator Russell Train said last week that his agency will set standards for vinyl chloride plant emissions by next June. And without firm data on health effects of VCM at various levels in the atmosphere, Train is proposing that the standards be based on "best available technology."

EPA's survey of air and water around 10 PVC plants indicated VCM air levels of 1 to 2 ppm. Through those emissions, the agency estimates, PVC plants are losing monomer at the rate of 200 million lbs./year.

With controls, EPA says emissions from PVC and VCM plants could be cut 75% and 90%, respectively. Capital outlays for these controls are put at \$80 million for the industry as a whole, with operating expenses estimated at some \$40 million/year.

John Nelson, vice-president for manufacturing at B.F. Goodrich Chemical, approves of Train's analysis, especially the statement that there is "no imminent hazard" from VCM exposure in the atmosphere.

But if OSHA's no-detectable-level proposal becomes the law, the vinyl chloride industry might have to re-evaluate its domestic production. Although industry spokesmen have warned of extensive shutdowns if such a standard is adopted, OSHA's environmental impact statement merely suggests that the costs will be high but will be passed on to the consumer, and that the time needed to reach the standards would be long.

But this report also suggests that "in the long run U.S. companies might find it profitable to build plants abroad." Clearly, this will depend not only on traditional market and raw-material logistics but also on whatever in-plant and emission standards are put in force in the U.S. and other nations.