Vinyl Chloride: Questions and Answers

Almost everything you always wanted to know about OSHA's vinyl chloride standard but were afraid to ask

JOB SAFETY AND HEALTH MAGAZINE APRIL 1975

"In the average year approximately 150 people are struck by lightning. Last year 32 cases of vinyl chloride-related cancer were discovered. In view of these numbers, should not workers be required to carry a lightning rod?"

Not every question OSHA gets asked about its vinyl chloride (VC) standard is as frivolous as this one from an anonymous user of polyvinyl chloride (PVC) resin. In fact, now that an appeals court has ruled the standard is effective April 1, 1975, hundreds of legitimate questions—the ones that get down to the nitty-gritty of how to comply in each plant—are rolling in. Here we offer OSHA's replies to some of the most frequently asked questions.

For more general information on the VC standard, check JOB SAFETY & HEALTH, January 1975. If you have further questions, write to: OSHA Regional Programs, Division of Occupational Health Programming, Room 760, 1726 M St., NW, Washington, D.C. 20210.

Q. *We know that the standard requires an initial monitoring program to tell if an employee is exposed above the action level of 0.5 ppm. Do we have to monitor VC exposures for every single employee?*

A. Each employee need not be personally monitored, but your monitoring must take into account all employees — whether they wear respirators or not — and must give a valid determination of employee exposures.

You might select representative employees for personal monitoring according to these criteria: the number of employees per shift, their duties, work areas and operations, and work practices in force. Each employee's VC exposure must be represented even though he may not be personally monitored.

Q. *How soon after the standard goes into effect must the initial monitoring be done?*

A. Where a process is already in operation, monitoring must be accomplished and regulated areas established by April 1, 1975. We recommend that new processes be monitored within one week after start-up and regulated areas established as soon as possible after the monitoring results are available.

Q. *We use PVC, but extensive monitoring has shown that VC concentrations are below the permissible limit—one ppm as a time-weighted average and five ppm as a ceiling. Do we have to establish a "regulated area?" What if concentrations are below the "action level" of 0.5 ppm?*

A. The standard sets two conditions, both of which must be met before a regulated area is required:

1) VC or PVC is manufactured, reacted, packaged, repackaged, stored, handled, or used.

2) VC concentrations are in excess of the permissible exposure limit.

If concentrations, then, are below either the permissible limit or the action level, you do not have to set up a regulated area.

Q. *Does every employee in our plant who with VC have to be given training? What about the employees exposed below the action level?*

A. There are no exceptions to the training requirement. Regardless of how low the monitoring results are, each employee "engaged in VC or PVC operations" must be given training in the hazards related to VC and the proper precautions for using it. This might include maintenance, laboratory, and supervisory personnel as well as production workers.

Q. *Occasionally our company uses what we consider temporary employees. These people would be exposed above the action level for no more than two weeks a year. Must we provide them with medical exams required by the standard?*

A. If the workers are exposed above the action level and if they are your employees, you are respon-

BOR 014990

sible for furnishing medical exams and holding the records for 30 years or the duration of employment plus 20 years, whichever is longer. There are no exceptions to the medical surveillance requirements, no matter how short the period of exposure.

Q. *Our company fabricates various packaging materials, some of which use* PVC. *Since one of our plants is pretty much like another, are we allowed to monitor typical operations rather than every single plant? We believe we can show that* VC *concentrations are nowhere near 0.5 ppm in our operations.*

A. Your program of initial monitoring must determine if any employee is exposed in excess of the action level—0.5 ppm. If the program you propose gives a true determination of your workers' exposures, it is satisfactory. If what you propose, however, gives a false reading of worker exposures and, as a result, you disregard requirements of the standard that are triggered by the action level, then your program is unsatisfactory and you will be in violation of the standard.

Q. *Our company has many plants throughout the country and few industrial hygienists, but we do have an excellent technical center. Can we monitor by taking grab samples of air in bags and sending them to the technical center for analysis?*

A. You may use any monitoring method that measures the exposures of employees to within the accuracy requirements given in the standard. For eight-hour exposures, the method must be accurate within plus or minus 50 percent from 0.25 ppm through 0.5 ppm, within plus or minus 35 percent from 0.5 ppm through one ppm, and within plus or minus 25 percent over one ppm. It must measure 15-minute exposures within plus or minus 25 percent from one ppm on up.

Q. *How do you figure out an eight-hour time-weighted average (*TWA*)?*

A. The basic formula is:

$$\text{TWA} = \frac{CaTa + CbTb \ldots\ldots CnTn}{8}$$

where C = VC concentration during any given period time
T = duration in hours of the exposure at contration C.

For example, the TWA for an employee who was exposed to 0.2 ppm for two hours, 3.0 ppm for four hours, and 1.0 ppm for two hours would be as follows:

$$\text{8-hour TWA} = \frac{2 \times 0.2 + 4 \times 3.0 + 2 \times 1.0}{8} = 1.8 \text{ ppm}$$

1.8 ppm

Q. *What procedure will an* OSHA *compliance officer use to determine ceiling-limit* VC *exposures?*

A. The ceiling limit for VC is five ppm for any sampling period under 15 minutes. A ceiling sample should be taken when you have any reason to believe —from the context of your operation—that some exposures are higher than the eight-hour time-weighted average.

OSHA industrial hygienists will measure ceiling exposures as 15-minute samples. At present, we will be taking air samples with charcoal-filled tubes that absorb the VC. In the laboratory the tube can be desorbed with carbon disulfide and the VC detected through gas chromotography. For a detailed account of this method, write NIOSH, Office of Technical Publications, 1014 Broadway, Cincinnati, Ohio 45202, and ask for a copy of "P&CAM No. 178."

Q. *The standard says that within 10 days after monitoring discloses that an employee has been overexposed, we must notify him of the results and tell him what steps we're taking to control exposures. Our company, though, is using a continuous monitoring system for* VC. *How often do we have to notify our employees about overexposures if* VC *levels are constantly above one ppm? How many times do we have to tell them about our control measures?*

A. You should report the monitoring results each month when employees are exposed above the "action level" of 0.5 ppm. All monitoring results must be included, but they may be reported in a summary form that indicates the total extent of exposure. You must notify each individual employee in writing. If you've started to implement a regular program to control exposures, you need tell the employee about this in detail only once and may cite your original announcement thereafter.

Q. *We understand that certain processes involving* PVC *are not regulated by the* OSHA *standard. Our company manufactures a* PVC *part by extrusion. Our customers then mitre-cut the part and heat seal or heat weld it to form a gasket. The part is heated to approximately 450°F for 30 seconds to form a seal. Is any part of this operation covered by the standard?*

A. The standard excludes the handling and use of fabricated PVC products that don't require mass melting as part of their further processing. "Mass melting" occurs when the entire structure is heated so that the physical integrity and form of the input material is lost. Obviously, the melting or plasticization of PVC molding pellets in your extrusion process is covered by the standard. However, such operations as heat sealing (like that done by your customers), thermoforming, blister packaging, lamination, vacuum forming, and heat shrinking, do not destroy the essential form of the fabricated product and so are exempt from the standard.

Q. *I've been a meat wrapper for the last 15 years, and lately I've been hearing a lot about the dangers of* VC. *Every day I work with* PVC *meat packaging*

BOR 014991

film, sometimes cutting it with a hot wire. According to the OSHA standard, what should our company be doing to protect me?

A. Meat packaging films are considered a "fabricated product" under the OSHA standard since mass melting does not occur when they are cut with the hot wire. Consequently, the packaging operation you describe is not covered by the VC standard.

NIOSH has conducted research into the possible release of VC during PVC packaging operations and, using instruments sensitive to approximately one ppm, has not detected any VC. However, NIOSH has determined that when heated, PVC film decomposes into hydrogen chloride and carbonaceous gases. The hydrogen chloride gas, which becomes hydrochloric acid on contact with the mucous membranes of the eyes, throat, and nasal passages, can be irritating at concentrations above the OSHA standard of five ppm for hydrogen chloride. So far NIOSH has found no health hazards from exposure to other PVC decomposition products, though the investigation is continuing.

Q. *The standard says that it applies to the transportation of VC or PVC "except to the extent that the Department of Transportation (DOT) may regulate the hazards." Are the placards DOT requires for tank trucks carrying VC monomer enough to fulfill the labeling requirements of the standard? If not, what is meant by the requirement that labeling be "legible?" Is a tank truck on the road considered a "regulated area?" If the driver does not help in loading or unloading, is he covered by any of the provisions of the standard?*

A. There need not be duplication of DOT markings that cover such hazards as flammability. However, markings not required by DOT, such as "cancer-suspect agent," must be part of the container label. In other words, when placarding specified by DOT is not sufficient to meet requirements outlined in the OSHA standard, additional labeling will be required.

For working purposes, we define "legible" as the same size lettering as other emergency or warning instructions on the side of the container or vehicle.

A tank truck carrying VC would be considered a regulated area only if it were expected (based on measurements or other known facts) that VC concentrations would exceed one ppm as an eight-hour time-weighted average or five ppm as a ceiling. It appears unlikely that a truck on the road would be in this situation.

Whether the truck driver is covered depends on the amount of VC he is exposed to. If the exposure is below the action level of 0.5 ppm—as seems likely—only the training and labeling provisions of the standard would apply.

Q. *We are expecting shipments of PVC resin after the standard goes into effect. The resin is shipped in sealed containers 20 and 40 feet long. How will the standard affect our operation?*

A. The OSHA standard does not prohibit importing VC or PVC, but each employer is responsible for knowing the working conditions of his employees and controlling conditions to meet the standard's requirements.

Our information on VC exposure levels in handling packaged resins is limited. Concentrations above the exposure limit have been measured in warehouses where PVC resin is stored. Freshly opened containers, particularly air-tight ones, may release significant amounts of VC to the air. For instance, concentrations in trucks loaded with bagged PVC resin have been measured at 200 to 600 ppm.

It appears that, at the very least, you must do initial monitoring of employee exposures. If the eight-hour time-weighted average is below 0.5 ppm and 15-minute exposures below five ppm, then your duties are reduced basically to labeling containers and training employees.

Q. *The standard says that no employee can be exposed to VC concentrations above five ppm over a 15-minute period. What about those employees who decide not to wear a respirator for the standard's first year?*

A. Before April 1, 1976, the ceiling exposure limit of five ppm over 15 minutes does not apply to the employees who have elected not to wear respirators. They may be exposed to as much as 25 ppm over any 15-minute period.

Q. *The emergency provisions of the standard go into effect when you have a "massive release" of VC. Exactly how much VC does it take to trigger these provisions?*

A. We define a "massive release" as any operation or place where the VC concentration is greater than 100 ppm. For example, a broken pipe in a PVC plant might cause a massive release.

Q. *The standard says that no employees may have direct contact with VC. What do you mean by "direct contact?"*

A. Skin contact with liquid VC.

Q. *The standard requires us to keep a daily roster of authorized persons who enter a regulated area. What information should we include on the roster?*

A. The daily roster should consist of legible signatures—or printed or typed names—and social security numbers of authorized persons. Illegible names or numbers on the roster sheet will be considered as failure to keep a bonafide log. These rosters must be kept for 30 years.

BOR 014992