

April 11, 1975

MEMORANDUM TO: VCM-PVC Producers Committee

FROM: Matthew M. Swetonic

SUBJECT: Recent Developments

Attached for your information are a number of recent articles, medical papers, etc. of importance on vinyl chloride.

1. Article from the April 14 issue of Business Week on industry efforts to meet the new OSHA standards.
2. Article from the April 7 issue of The New York Times on a letter from Dr. Herbert Stokinger of NIOSH to his former boss, Dr. Marcus Kay, attacking the vinyl chloride standard as "irrational." Also attached is a copy of a 1971 paper by Stokinger on seven commandments for setting environmental standards. We are currently trying to interest selected segments of the media in doing more on this story.
3. Article from the February 22 issue of The Lancet on "Chromosome Aberrations in Workers Exposed to Vinyl Chloride."
4. Notice from March 17 issue of Commerce Business Daily announcing a solicitation by NIOSH for research organizations capable of doing work on the pathogenicity of vinyl chloride.
5. Article from the April 7 edition of Chemical & Engineering News on industry efforts to meet the new OSHA standards.
6. Articles from the April 1 issues of The Wall Street Journal and The Journal of Commerce on the Supreme Court's refusal to stay the effective date of the OSHA standards. UPI, AP and Reuters also carried stories on the Court decision. The New York Times mentioned it briefly in its weekly wrap-up of Supreme Court decisions.
7. Editorial from the February 8 issue of the Canadian Medical Association Journal.
8. Consumer Product Safety Commission "Fact Sheet" on vinyl chloride.
9. Interview with Louis Beliczky of the Rubber Workers Union from the latest issue of Job Safety & Health, an OSHA publication.
10. UPI story from the April 7 issue of The Financial Weekly on Robintech's efforts to control VCM levels in its plants.

BOR 008955

The struggle to meet PVC safety standards

Many producers claim that they cannot comply with OSHA's 1-ppm requirement

The vinyl plastics industry is not ready to show the white flag in its fight to get stringent worker-exposure standards reduced. But the Supreme Court's refusal this week to extend the Apr. 1 compliance deadline does not augur well for the Society of the Plastics In-

dustry's battle to overturn the regulations. So companies that work with the material are struggling to meet the standards in case SPI loses.

The 22 polyvinyl chloride manufacturers are facing the biggest challenge. They polymerize vinyl chloride, believed to cause cancer in humans, into PVC resin, which is then fabricated into a wide variety of industrial and consumer goods. Workers in PVC plants are exposed to high levels of vinyl chloride gas whenever the tank-like reac-

tors in which the polymerization takes place are opened for cleaning. What is more, a PVC plant is a veritable spaghetti bowl of pipes and pumps, and vinyl chloride "excursions" can occur at any one of the hundreds of flanges and valves. Many PVC producers say they cannot possibly comply with the Occupational Safety & Health Administration ruling that by April, 1976, workers may be exposed to an average of no more than one part per million of the gas during an eight-hour shift, and to no more than 15-minute peaks of 5 ppm. To meet these standards, workers may have to wear respirators, a fact that does not sit well with them. As Edwin W. Harrington, director of plastics manufacturing at B. F. Goodrich Co., flatly states, "2 ppm or 3 ppm is the lowest we could ever hope to get."

Goodrich effort. Goodrich, the nation's largest PVC manufacturer, is already spending some \$42-million on improved cleaning methods and the like. It has managed to lower exposure level at its five PVC plants from 50 ppm to an average of 6 ppm, but the mandated 1-ppm level remains out of reach. Other companies—particularly those with old reactors like Goodrich's that must be manually cleaned every other day, and indoor plants where ventilation is poor—have had similar failures. "The flanges are under 35 lb. of pressure per sq. in., and VC molecules still get through," says one plant manager who says he has spent \$25,000 on the development of better gaskets and seals. Such frustrations are not unique. Despite the recession-caused slump in demand, VC and PVC producers are already spending \$200-million to comply with the OSHA standards, estimates John R. Lawrence, SPI's technical director. Success remains elusive for most.

Because the leaks are so difficult to eliminate, several companies are turning to better cleaning methods to reduce worker exposure. Japan, with only a 25-ppm voluntary standard for the vinyl industry, is ahead of the U.S. in this area. According to the Japanese PVC Assn., all Japanese plants use mechanized high-pressure water jets to clean facilities in order to minimize workers' contact with gases.

U.S. producers are starting to follow suit. Most have installed powerful vacuum hoses to purge reactors of VC fumes before they are opened for cleaning. And many are using high-pressure spray cleaning devices to reduce the frequency of manual scraping and cleaning operations. After each



Point of danger: Workers are most exposed to vinyl chloride when they clean reactors.

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reminder to
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who in 1962
thought the
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BW

The large reactor is one answer

"Large reactor technology" may prove the most feasible way out of the vinyl chloride emission morass. One large reactor for polymerizing VC resin into PVC requires hundreds fewer flanges and valves than do a dozen small ones. This drastically slashes the number of potential VC leak points.

The concept is already working for Japan's Shinetsu Chemical Industry Co., which built Japan's only 35,000-gal. PVC reactor in 1970. And it is now working for Shintech, Inc., a joint venture of Shinetsu and Robintech, Inc., of Fort Worth, Tex. Shintech's Freeport (Tex.) PVC plant is using four 35,000-gal. reactors to produce the same amount of PVC that would be made in some 30 smaller reactors in traditional plants. The giant reactors require manual cleaning no more than once a year. Shintech's experiences since the plant came on stream in October have been more than encouraging. "All our tests indicate we're well below the 1-ppm level without the use of respirators," claims James M. Danial, Shintech vice-president.

Treatment. The key to Shintech's sharply reduced cleaning schedule is a

proprietary treatment applied to reactor walls after each batch of PVC is made. The coating is sprayed on under high pressure after the reactor is purged with a hydraulic spray and a vacuum.

"The whole plant is tighter than older PVC plants," claims Joseph L. Brawner, Shintech's plant manager. "We've used welded construction on lines holding vinyl chloride wherever we could, eliminating flanges." The plant is entirely computer-controlled and operates with only 25% of the 163-man work force required at Robintech's older Painesville (Ohio) plant, which has about the same capacity.

Tenneco Chemicals, Inc., has licensed the technology for its new PVC plant in Pasadena, Tex. The plant has five 35,000-gal. reactors and a capacity of 250-million lb. According to Joseph P. Fath, a Tenneco Chemicals vice-president, the plant incorporates some reactor cleaning technology that Tenneco developed on its own which will "obviate reactor opening and entry in the long run." But, Fath admits, there may still be maintenance situations where respirators are needed.

batch of PVC is made, the tanks are hosed down to flush out unreacted vinyl chloride monomers and accumulated PVC resin. "We are down to manual cleaning after only 2% of batches," says Goodrich's Harrington. "With hydraulic spraying, we are at 5 ppm for only five minutes instead of 30 minutes when we clean a reactor," adds Eli Zinn, plant manager at Diamond Shamrock Chemical Corp.'s Deer Park (Tex.) plant.

Both Goodrich and Diamond Shamrock use water hydraulic sprays. Other PVC manufacturers, such as Union Carbide Corp. and Monsanto Co., are trying closed-reactor solvent cleaning systems, and Carbide officials claim that reactors at their Texas City plant now need manual cleaning only once every two months.

Another problem. Even with perfected cleaning methods, however, the vinyl plastics industry will still have another hurdle to overcome: recovering unreacted VC monomer that may be trapped in finished PVC resin. If the monomer is not removed before shipping, it can escape when the resin is heated for fabrication. This then threatens fabrication workers with exposure to unacceptable VC levels.

Recovered VC can be recycled back into the PVC process, so PVC manufacturers are especially interested in developing technology for stripping unreacted monomers from the resins. But

so far, they are facing a Catch-22 type of problem. While the goal is to let fabricators heat the resin without releasing vestiges of VC, current stripping methods also require heating. The result can be overheating, which causes hydrochloric acid molecules to break away from the resin. The resin then turns brown and weakens. "Once this degrading starts at the PVC manufacturing level, it continues throughout fabrication, so the goal is to get the vinyl monomer out faster without excess heat," explains Goodrich's Harrington. One new process that looks promising involves use of a vacuum in the reactor to strip much of the unreacted monomer before the resin is dried. A number of PVC manufacturers have programs under way to develop recovery methods. Goodrich, for one, hopes to market a system by yearend.

But OSHA is leaving nothing to chance so far as claims for any system go. Its vinyl industry standard not only specifies exposure limits but mandates that all vinyl producers keep records of worker exposure and monitor vinyl chloride levels wherever they are expected to exceed 0.5 ppm.

The fabrication plants may escape the monitoring problems, because most can establish that they have exposure levels below 0.5 ppm. "In most fabricating plants, there are already ducts and vents above the blenders to meet earlier dust and fume regulations," notes

SPI's Lawrence. Fabricators may face exposure levels above 1 ppm in PVC resin storage areas, but "the over-all concern for reducing exposure is with the PVC producers," Lawrence says.

The monitoring requirements are a problem for PVC makers. The equipment is not cheap—Diamond Shamrock, for one, has already spent \$350,000 to monitor its Deer Park plant. And much of the monitoring technology is still embryonic. Only recently have vapor detectors and analyzers been able to work with levels as low as 0.5 ppm.

Bendix system. Most PVC producers are pursuing combination systems that include continuous area monitoring, portable monitoring, and personal monitors. Bendix Corp. pioneered most of the vinyl chloride monitoring equipment when the original PVC cancer scare broke a little more than a year ago, and the company's monitoring systems are still among the most widely used. At Goodrich's plants, the Bendix system includes funnel-like air samplers scattered throughout the work area. The samplers suck up air and feed it back into a gas chromatograph in a continuous stream. The chromatograph can detect VC monomer concentrations down to 1 ppm. In most plants, the chromatograph is hooked into an alarm system that is quickly

triggered when concentrations go above 25 ppm.

If area sampling indicates an upsurge in VC monomer, portable organic vapor analyzers are dispatched to the spot to pinpoint the valve causing the VC leak. These monitors are rarely accurate below a 5-ppm concentration, but that is good enough for the purpose. "They don't actually distinguish

The vinyl plastics industry says \$200-million still hasn't produced success

vinyl chloride, but tell us if there is alien vapor in the air so we know which trouble spots to check further," says a Goodrich spokesman.

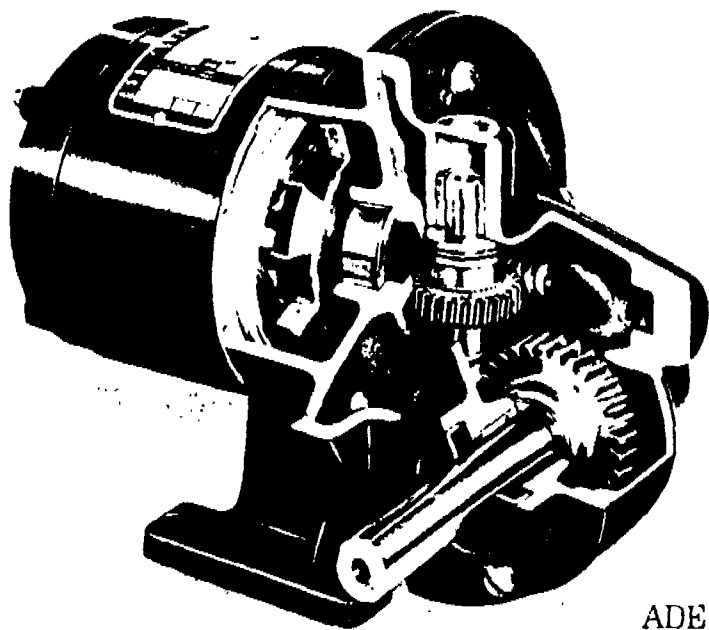
Personal monitoring comes closest to detecting actual worker exposure. This is the method used by OSHA inspectors themselves. Workers wear a battery-powered device about the size of a transistor radio. It houses a charcoal tube, which absorbs VC vapors. The tube is inserted in a gas chromatograph, which can determine the amount of VC the worker was exposed to. Such personal monitoring may prove the crucial area for OSHA compliance. Says Robert N. Rylands, manager of Goodrich's Avon Lake (Ohio) plant, "As far as the OSHA standard is

concerned, the real story is told with the personal monitoring."

Even if the vinyl companies manage to meet OSHA's exposure and monitoring rules, they may face additional problems from the Environmental Protection Agency. The EPA is in the preliminary stages of developing an emission standard for vinyl chloride. Unlike the OSHA standard, the EPA rule is unlikely to pinpoint parts-per-million limits. Most industry sources expect that the agency will stress add-on pollution control devices, such as carbon adsorption and solvent absorption scrubbers, and incineration of captured VC gas.

But the SPI's Lawrence and several EPA officials are optimistic that many of the measures that will satisfy OSHA will also satisfy the EPA. Better seals and ventilation in plants, improved maintenance procedures for flanges and seals, and advanced stripping technology can all help. "If they can remove the monomer in the stripping process, they won't need so much control equipment downstream," admits Susan R. Wyatt, departmental engineer at the EPA's Office of Air Quality Planning & Standards. Lawrence agrees, saying: "Many things the industry is doing to meet the OSHA standards will go a long way in meeting EPA requirements." ■

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OFFICIAL ASSAILS CANCER INSTITUTE

Scientist Calls Strong Curb on Exposure to Vinyl Chloride 'Irrational'

By DAVID BURNHAM

Special to The New York Times

WASHINGTON, April 6—A key Federal official has denounced the scientists of the National Cancer Institute as "a lot of old fogies" and has described as "an irrational decision" a Government requirement that workers be exposed to virtually no vinyl chloride.

The criticism was voiced by Dr. Herbert E. Stockinger, who occupies prominent positions in both the Federal agency now responsible for establishing industrial exposure levels and the professional association that has recommended these standards for many years.

The position of the cancer institute and other Federal agencies is that exposure to even the smallest amounts of vinyl chloride—the chemical base of a widely used plastic—should be avoided by workers because it has been shown to cause cancer at very low levels of exposure and because its safety has not been demonstrated at any level.

Dr. Stockinger is chief of the toxicology branch of the National Institute for Occupational Safety and Health, the Federal agency established in 1970 to develop industrial exposure levels. He is also chairman of the committee on threshold limits of the American Conference of Governmental Hygienists, an organization whose recommended standards have dominated health practices in the United States and scores of other countries for many years.

Criticized Institute

The official criticized the cancer institute during a telephone interview when asked about a letter in which he said the Government's vinyl chloride requirement was wrong.

The letter, a copy of which has been obtained by The New York Times, was addressed to Dr. Marcus M. Key, the recently retired director of the Institute for Occupational Safety and Health and Dr. Stockinger's superior.

"I was consternated, as were members of my threshold limits committee, when we noted your name associated with the essentially zero tolerance for exposure to vinyl chloride," Dr. Stockinger's letter began.

"In making the irrational decision it is clear to us that you have fallen into the fallacious trap of believing that because the substance produces dire consequences at massive concentrations (and in this case probably aided by promoters), such consequences will result from exposure at all concentrations. Wrong!"

In the interview last week, Dr. Stockinger stood by his criticism of the Government's position on vinyl chloride, which he charged had been made for "political and other reasons."

Dr. Stockinger then was asked about the statement of Dr. Frank J. Rauscher, director of the National Cancer program of the cancer institute, that repeated exposures to 250 parts per million of vinyl chloride should be regarded as a carcinogenic risk.

"The safety of vinyl chloride has not been demonstrated at any level: there is no practical scientific method to prove experimentally the safety of any level of exposure to a carcinogen," Dr. Rauscher said.

"Oh, there are a lot of old fogies over there at the National Cancer Institute," Dr. Stockinger replied.

Dr. Key, who received Dr. Stockinger's letter, now is a professor of occupational medicine at the University of Texas's School of Public Health in Houston.

Asked about the letter, Dr. Key said that though he had the "utmost respect for Dr. Stockinger, I think I just let it drop."

The threshold limits committee that Dr. Stockinger heads has recommended exposure levels for more than 500 individual chemicals or families of chemicals since it was formed in the late nineteenth-thirties. These standards were accepted as a package by the Federal Government in 1971 under the law creating the National Institute for Occupational Health and Safety, pending the slow process of a complete review.

U.S.S.R. an Exception

The standards of Dr. Stockinger's committee also form the basis for the exposure levels permitted in almost all other countries of the world except the Soviet Union and the Eastern European socialist countries.

In another Government health development the institute for occupational health has begun proceedings to discharge one of its scientists after he accused the institute of needlessly exposing American workers to the risk of cancer.

The allegation was made a little more than two months ago by Dr. Stanley C. Mazaleski, in an affidavit filed in Federal court.

On March 19, the institution which has denied the charge, informed Dr. Mazaleski that his services would "be terminated because of marginal or substandard performance by you." The scientist, who is challenging his dismissal, said that the action was "an act of retaliation because of my criticism."

Sanity in Research and Evaluation of Environmental Health

How to achieve a realistic evaluation
(in seven commandments).

H. E. Stokinger

Early in 1969, before the methylmercury story broke into headlines, I presented a Cummings Memorial Lecture titled, "The Spectre of Today's Environmental Pollution—U.S.A. Brand—New Perspectives from an Old Scout" (1). I attempted a sane and realistic, comprehensive toxicologic evaluation of the potential hazards to human health from man-made and natural environmental pollutants (except radiation) in air, water, and food, based on their occurrence in the continental United States then and in the foreseeable future. The evaluation was made on a "before and after" consideration of all those substances about which health-oriented groups had expressed concern. After a considered appraisal of the available facts, I judged the validity of the concern for each individual pollutant.

Of 18 major pollutants or groups of pollutants from all sources (air, water, and food) combined, only eight were reevaluated as potentially hazardous, and not all of these with the same degree of certainty. There was no question, for example, of the deleterious effects of environmental nitrates (and nitrites) on infants and on genetically hypersusceptible Alaskan Eskimos and Indians, but the hazards to public health of "hard" water constituents, while suggestive, were far from proven. Respiratory irritants (particularly oxidants) and carcinogens from all three

environmental sources, either alone or in combination with respiratory irritants, headed the list as pollutants of primary concern; yet pesticides of all types, as well as teratogens and mutagens, as found in the three environmental sources, were conspicuously absent from the list. Asthmagens were not absent.

What has the record shown since? The pesticide DDT [1,1,1-trichloro-2,2-bis(p-chlorophenyl)ethane] and the herbicide 2,4,5-T (2,4,5-trichlorophenoxyacetic acid) were, on first action, banned from further use, as were all uses of organic mercurials as pesticides. Swordfish has been removed from sale, although people may still eat fish, just as they have since before the time of Christ (2). Cyclamates have gone, and monosodium glutamate is on its way out. Nitrilotriacetic acid (NTA), the soap industry's dream substitute for the polyphosphates that the industry itself banned from laundry detergents, was summarily prohibited on fragile and provocative evidence (3). Detergent enzymes appear to be on their way out. Potato chips may be next because of their increased solanine content, caused by dehydration of hot fat.

What next? If man is prohibited from consuming foodstuffs because of their content of natural toxins, where will it end? Honey contains the potent grayanotoxins (given intraperitoneally, a dose lethal to 50 percent of the animals tested is approximately 1 milligram per kilogram) (4). German raisins have been found to be teratogenic (5), while caffeine (6) and tannin are tumorigenic (7); nutmeg, parsley, and dill are highly toxic because of their myristicin and apiol contents (8). Vitamin C has produced tumors in mice (9).

The following rules, if followed, should go far in improving the criteria and standards for judging environmental pollution, as well as making them less worrisome to those who are being protected and more acceptable to those who must comply.

Commandment 1

Standards must be based on scientific facts, realistically derived, and not on political feasibility, expedience, emotion of the moment, or unsupported information. If necessary data are not available, studies should be made to supply them. Meanwhile, provisional, tentative, or best judgment standards, clearly marked and recognized as such, should be proposed, but only upon definite need. If the need is not there, it is better to withhold until such time as the facts are in.

This commandment poses relatively few difficulties for drinking water standards. Based on the accepted average daily intake of 2 liters per person (in the United States), and primarily on human health or esthetic considerations, standards have been and can be determined reasonably well. For toxic food contaminants, the problems are more numerous but not unresolvable. In this case, because of widely varied eating habits, realistic evaluation of the facts (generally derived from animals) requires more erring on the side of common sense than on the side of the over-protection complex that seems to have captivated the thinking of those committed to setting tolerances. In the case of air pollutants, scientific facts for each of the multiple criteria (for example, human health, nuisance, crop and vegetation damage, surface erosion, and soiling) must be carefully developed and painstakingly assessed before air quality standards are proposed and decisions are made about which of the multiple criteria the standards rest on.

In selecting criteria on which to base standards for the prevention of diseases caused by more than one factor, the temptation to ascribe an effect of questionable significance and doubtful connection to a pollutant, merely because that pollutant was selected for investigation, must not be yielded to. All too often in the past this commandment has not been followed, particularly in those cases in which a disease entity was not sharply defined or when there was a paucity of data on it.

The author is chairman of the Threshold Limits Committee of the American Conference of Governmental Industrial Hygienists, chairman of the Subcommittee on Toxicology of the Public Health Service Drinking Water Standards, and chairman of the National Research Council's Committee on Toxicology. He is also chief of the Laboratory of Toxicology and Pathology in the National Institute for Occupational Safety and Health, U.S. Department of Health, Education, and Welfare, Cincinnati, Ohio 45202.

Further compounding the difficulties of arriving at scientifically based standards is the modish procedure of "consensus" standards, in which individuals from all walks of life have their say through public hearings, citizens' advisory committees, and Senate investigating committees. But when all the statements have been heard and judgments and opinions sifted, the tenets of commandment 1 should prevail, with the added proviso of commandment 2.

Commandment 2

All standards, guides, limits, and so on, as well as the criteria on which they are based, must be completely documented. In such documentation it must be made emphatically clear on what basis a given standard rests. This must not only be done in a formal, written document, but in the press and other forms of news media as well, thus preventing the public from becoming unnecessarily or unduly alarmed. For example, in all the public announcements of the banning of DDT, it was never made clear that it was not for protecting human health, but for protecting such endangered species as osprey, bald eagle, and other fowl. Similarly, in the confiscation of canned tuna in 1970, no effort was made to evaluate for the public the degree of hazard or the margin of safety in eating the fish. Positive assurance should be given those with the highest fish intake (those on prescribed tuna diets for reducing) that, for a given intake, there is a given margin of safety (10).

Similar clear and properly phrased disclosures should be made for the bases of air quality criteria and standards. Most criteria and proposed standards that have been developed thus far tend to be misleading either (i) through juxtaposing statements [first by stating what exposure at unrealistically high levels can do to human health, directly followed by the proposed standard at an unrelated, extremely low level (11), when in reality it is corrosion, plant damage, or something else on which the standard rests], or (ii) through assessing the data that comprise the criteria with unwarranted bias, a practice which can lead to needlessly overprotective levels (12). This is not to infer that the levels are incorrect on a "consensus" basis, but that they have been erroneously depicted.

Commandment 3

Avoid the establishment of unnecessarily severe standards. This admonishment runs against the current tide of boiling popular enthusiasm for cleaning pollution up completely. But it is time that popular enthusiasm cool down, to recognize the consequences of establishing goals instead of standards. The following instances illustrate and support my stand.

The townspeople of Fallon, Nevada, as well as residents on a nearby Navy base, were gravely concerned for their health when on 16 February 1969 the state's health officer informed the mayor that Fallon's water supply (which is exclusively well water) has consistently contained levels of arsenic in excess of 0.05 milligram per liter, which is considered the "mandatory" limit by the United States Public Health Service. Analyses of the well waters in the area for arsenic confirmed this statement. Depending on the season, concentrations of arsenic ranged from 0.05 to 0.22 milligram per liter, from June 1963 to June 1968. Despite a survey by the county medical society and the mayor's subsequent statement that the town's population had been drinking the water for 28 years without any known cases of arsenic poisoning; despite the fact that some of the people concerned were over 70 years of age; and despite the Attorney General's ruling, after public hearings with expert testimony, that there is no evidence that the drinking water of Fallon is harmful (a finding in consonance with that of the National Research Council's Committee on Toxicology, which conducted a study at the request of the Navy's Bureau of Medicine and Surgery), the townspeople are still worried, and the health officer is working elsewhere. All of this could have been avoided had the drinking water standard been set more appropriately at 0.2 milligram per liter (13).

A similar unpleasant situation could have been avoided in the Coho salmon-DDT episode had the tolerance limit of DDT in fish been set at 20 parts per million instead of 5. There is evidence that human intakes of DDT in far greater quantities than 20 parts per million were entirely safe and that the tolerance limit of 5 parts per million is unnecessary severe (14).

To an even greater degree, unnecessarily severe standards for air pollutants should be avoided, especially those standards not strictly related to health,

for example particulates and sulfur dioxide. Here, the result of almost total elimination is either tremendous and disproportionate costs to industry (costs that are ultimately passed on to the public) or the shutting down of industries, with the resulting loss of personal and state income.

Clearly, the establishment of unnecessarily severe standards for all types of pollutants must be avoided—for a number of good and sufficient reasons; otherwise, their repercussions will be felt in a variety of undesirable ways.

Commandment 4

Determine realistic levels. What is realistic may be defined for each pollutant type (air, water, and food) as follows. For air, tested levels (dosages) should bracket the national average concentration of a particular pollutant in urban air by at least one logarithmic decrement and two logarithmic increments. Tested levels for water pollutants should similarly bracket the national average for the particular pollutant found in surface waters. In like manner for food contaminants, the focal point for bracketing in this instance being the intended level of addition; or, when naturally occurring or environmentally imposed, the span of tested dosages should embrace three logarithmic increments.

Establishing dosage-response relationships in this manner provides three determinants critical to the setting of realistic permissible limits or standards: a "no-effect," a borderline, and a "frank-effect" level. From these determinants, a permissible limit can be selected at some point below the no-effect level. A known safety factor, the magnitude of which would be commensurate with the seriousness of the response, can be incorporated in this limit.

To what extent have efforts to date met these minimal requirements? Examination of the criteria used for developing guides and standards in all three areas reveals that they have rarely conformed. Haste to "put a number on it" (15) has resulted in criteria developed by heavy-handed, opportunistic toxicologists driven by a "look what I found" attitude, and acceptance of weak, or even questionably related, information by harried standard-setters grasping at straws under legal pressure to comply with an unreasonable deadline. Current instances abound in all three areas of

pollution. For air, criteria have been accepted for some of the more common urban pollutants on evidence no stronger than a highly questionable statistical association—where adverse effects on health were “possibly related” to the pollutant investigated. [For water, see (3).] In the case of food, low-protein diets, or better, diets devoid of protein, resulted in the greatly increased lethality of several pesticides for rats (16). However, companion studies for effects under realistic environmental conditions were not performed; nor has anyone considered the question of how human beings on such a diet would be exposed to significant levels of pesticides.

Clearly, nothing short of determining complete dosage-response relationships is acceptable, if solid, unassailable criteria are to be provided. No purposeful evaluation can be made by determining such relationships from a single point.

Along the lines of appropriate data-gathering, two ancillary commandments, applying chiefly to epidemiologic studies, should be heeded: (i) study hypersusceptible populations, and (ii) make repeated samplings.

It becomes obvious upon slight reflection that, in assessing the effects that extremely low levels of pollutants have on human populations, a far greater chance of success is assured by studying the most susceptible populations. Such a procedure avoids the “diluting” effect of a random sample. For example, a study of the effects of air pollutants that irritate the respiratory system should single out asthmatics, people with a hereditary deficiency of antitrypsin serum (candidates for hereditary pulmonary emphysema) (17), and people with a deficiency of leukocytic enzymes (candidates for chronic granulomatous disease) (18). Such groups are now readily identified by simple blood tests—a deficiency of serum antitrypsin by the procedure of James *et al.* (19), and a deficiency of leukocytic enzymes by Schlegel and Bellanti (20). This is so obvious a procedure for increasing the sensitivity of epidemiologic investigations that it is surprising that greater use has not been made of it (21). The procedure is applicable to other types of pollutants as well. For example, hypersusceptibility to waterborne nitrate, a condition caused by hereditary methemoglobinemia (in Alaskan Eskimos and Indians), may be identified by a test for methemoglobin: nicotinamide adenine dinucleotide oxidoreductase (22).

One of the most serious deficiencies

in the use of the epidemiologic method is the complete lack of repeated sampling of the population under study. Far-reaching conclusions on the health hazards of pollutants have invariably been based on the analysis of one sample taken at one time. Daily variations in personal habits of eating, drinking, and sleeping, as well as environmental variations in temperature and humidity, which influence not only the duration and intensity of exposure but also the metabolism of the pollutant, can result in great circadian variations in the same individual from day to day. Obviously, only repeated samplings can provide a reliable estimate of an individual's response to a particular pollutant.

Commandment 5

Interpret the “Delaney clause” with informed scientific judgment. This much-maligned clause has become an excuse for oncologists to use inappropriate and unrealistically high levels in testing for carcinogenic potential. Why this approach has been used so uniformly and without exception since the law's enactment in 1958 is difficult to understand. The Delaney clause (23) reads: “That no additive shall be deemed to be safe if it is found to induce cancer when ingested by man or animal, or if it is found, *after tests which are appropriate for the evaluation [italics added]* . . .” A review of the data purporting to demonstrate carcinogenicity shows complete disregard for the qualifying clause relating to appropriateness. Why?

Commandment 6

Determine trends, not pro tempore monitoring. To take official action to ban distribution and consumption of industrial commodities on the basis of newly discovered environmental levels without the perspective afforded by comparison with past levels in the environment, is to put unbridled enthusiasm for environmental control ahead of common sense. The most flagrant violations of this commandment are the previously noted recommendations that tuna and swordfish be confiscated or denied access to the family dining table. One moment's reflection would reveal that the concentration of mercury in the oceans has not changed perceptibly since the white men reached these shores, and that men have eaten these

fish and lived and died without signs or symptoms of mercury poisoning. This is not to say that local, aqueous mercury or other excess pollutants should not be spotted and, when possible, controlled, but that the thoughtless and irrational extension of a local finding to global dimensions is inconceivable in persons of sound mind (24).

Accordingly, investigators should determine trends before summoning the news media, in order that they may present the current picture fairly in relation to the past.

Commandment 7

Delimit banning. With the reexamination of the list of foods generally regarded as safe (25) by the National Research Council's Food Protection Committee has come a succession of bannings of long-used food additives, coumarin (vanilla flavor), safrole (root-beer flavor), red and yellow food colorings derived from coal tar products, and cyclamates. These compulsory actions on food additives are now setting a pattern for banning industrial chemicals, but for entirely different reasons. The banned food additives were either unnecessary or could be readily substituted with less harmful substances. Not so the totally banned DDT and alkyl mercury compounds. First, DDT does not present an “imminent hazard” to public health, despite misstatements to the contrary; second, its use for controlling the spread of malaria and African trypanosomiasis is unexcelled, and equivalent substitutes are not available at this time (26). Nevertheless, the banning of DDT “for all uses” was made official by court order (27), in spite of remonstrances and admonitions from the World Health Organization. Similarly, evidence is being gathered to ban organic mercurials, although in some uses (treating seeds for example) the mercurials are agents par excellence.

Instead of wholesale banning in situations of this sort, limited use should be permitted by a procedure of “licensing” and provisions for “restricted use.” Such procedures have been used in the U.S.S.R. for about a decade (28) and are working well. Monsanto, the sole producer of the polychlorobiphenyls, highly persistent but relatively nontoxic chemicals for mammalian species, has voluntarily adopted a form of this “restricted use” by confining its sales and distribution only to those uses and processes known to be controllable. Such

procedures offer a saner approach to environmental control than do the present ventures of complete removal from commerce.

Consequences of Dereliction

When the pollution-oriented health administrators and the public alike begin to focus clearly on the enormity of the bill that would be required to reduce pollution to meet unnecessarily severe standards (versus commandment 3) precipitously prepared from undigested, dubiously related facts (versus commandments 1 and 4) on which the public has been ill-advised or misled (versus commandment 2), then will come the day of reckoning and rude awakening to the folly of past antipollution actions. Already industry has felt the bite; shortly, the public will. Hardest hit are the mineral and chemical industries. On top of multimillion-dollar outlays for air pollution control, and sums of similar magnitude for water, are multibillion-dollar legal suits that stagger the imagination, cripple large industry, and eliminate small industries. Two consequences of profound economic importance are the increased price of basic chemicals and the loss of employment. Already a number of small manufacturing plants have been forced to close, unable to bear the burden of meeting pollution standards. Heavy industry, unable to survive on repeated annual financial losses or to continue on less than a 4 to 6 percent profit margin, will ultimately pass the needless charge on to the consumer.

It thus should be evident that such actions, with their unbearable consequences, should only be taken when it is clear beyond a shadow of scientific doubt that human health is in imminent danger, as was the case in the localized pollution of water by mercury. In all other situations, the consequences of eliminating pollution must determine the character of antipollution actions. Does the public really want to spend billions to reduce particulates in the vicinity of heavy industry to levels of an air-conditioned, air-filtered home? Or does the public want to ban DDT, thereby eliminating the questionable harm to the osprey and bald eagle

while certainly reducing food production and possibly allowing malaria to return to the United States?

The ruinous concept of "zero tolerance" for pollutants must go! Man has never, before he was a man or ever after, survived in an unpolluted void. One has only, on a sultry day, to cast his eyes unto the terpene-laden haze of the hills, or, on a humid day, to bring into view the fog born of condensation nuclei of many chemicals from the oceans to realize that this is true. Physiologically, man needs continual toxicologic nudging to maintain the homeostatic mechanisms that keep him physically and mentally alert. On the practical side, zero tolerance can only be attained by complete elimination of the source of pollutants, a situation that may not be desirable, or, in fact, possible if the pollutant is ubiquitous.

Finally, it may be too much to hope that antipollutionists will not direct a blind eye and turn a deaf ear to the precepts I have put forth as necessary for proceeding rationally against problems with which we are all deeply concerned and involved. No matter what the immediate reception may be, antipollution efforts must ultimately take the direction indicated in these commandments, or we will be faced with an economic upheaval approaching disaster.

References and Notes

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2. Matthew 14:17; Mark 6:38; Luke 9:13; John 6:9. Measurements of ocean waters in the 20th century indicated that they contain an average of 127 kilograms of mercury per cubic mile (4.1 cubic kilometers), or 2 parts per billion, probably only slightly more than at the time of Christ (*Encycl. Chem. Technol.* 8, 562 (1952)).
3. For the record, first, it should be noted that polyphosphates were removed from laundry detergents not for reasons of human health, but solely to reduce the growth of algae in stagnant surface waters. Second, I call the evidence "fragile and provocative" because the questionably determined teratogenic effects were not for NTA (nitrilotriacetic acid), but for cadmium-NTA chelate and an NTA-methyl mercury combination at 6 milligrams per kilogram of a rat's body weight. However, we do not know when levels of this magnitude may be encountered in the environment. Critical experiments not done: extension of dosage-response curves to realistic environmental levels and parallel experiments with related NTA chelates, citric acid, humic acids, salicylates, and others.
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7. *Survey of Compounds Which Have Been Tested for Carcinogenic Activity* (Suppl. 1, Public Health Service Publication No. 149, Government Printing Office, Washington, D.C., 1957).
8. W. von Oettingen, *Phenol and Its Derivatives: The Relation between Their Chemical Constitution and Their Effect on the Organism* (National Institutes of Health Bulletin No. 190, Government Printing Office, Washington, D.C., 1949).
9. N. Dobrovol'skaia-Zavad'skaia, *C. R. Seances Soc. Biol.* 119, 83 (1935).
10. Data from the Food and Drug Administration indicate that, for man, levels of less than 50 micrograms of methyl mercury per 100 grams of blood are symptom-free. From the knowledge that the average content of methyl mercury in ocean fish is somewhat below 1 part per million of body weight, it is possible to stipulate the safe daily intake of ocean fish, making due allowance for mercury intake from other sources.
11. *Air Pollution Control Rules Concerning Air Quality Standards* (public hearing proposals, New York State Department of Environmental Conservation, New York, 1970).
12. *Air Quality Criteria for Sulfur Oxides* (National Air Pollution Control Administration, Washington, D.C., 1969).
13. Consideration is now being given to this suggestion by the Drinking Water Standard Committee on Toxicology of the Division of Water Hygiene.
14. The finding of a concentration of 19 parts of DDT per million of body weight (the highest concentration found) in the edible part of Coho salmon resulted in the ban on Coho salmon fishing. Assuming the highly unlikely daily consumption of 1 kilogram of fish containing 20 parts per million of DDT, that 20 milligrams of DDT per day is still about one-half of the daily dose found entirely safe [See W. Hayes, Jr., W. Dole, C. Pirkle, *Arch. Environ. Health* 22, 119 (1971)].
15. A. Wolman, *Chem. Eng. News* (30 November 1970), p. 5.
16. E. Boyd, I. Dobos, C. Krzyznan, *Arch. Environ. Health* 21, 15 (1970).
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21. The closest approaches have made use of records of hospital visits for asthma, and a study of school children with respiratory "cripples."
22. E. Scott and D. Hoskins, *Blood* 22, 295 (1958).
23. Federal Food, Drug, and Cosmetic Act, Section 409(c)(3)(A).
24. The tuna caught off Nova Scotia originate off Africa's northwest coast, swim to Bimini, and thence northward along the Atlantic coast in pursuit of herring. These tuna scarcely ever enter the mercury-rich St. Clair estuary. (Could control officials have overlooked frowning upon kippered herring?)
25. Reference to a list prepared in 1958 by the Food and Drug Administration, which defines a GRAS substance as one "generally recognized as safe."
26. *The Place of DDT in Operations against Malaria and Other Vector-Borne Diseases* (World Health Organization Report No. EB 47/WP/14, World Health Organization, Geneva, 1971).
27. The court order was issued on 15 January 1971. On 18 March, the Environmental Protection Agency announced that "DDT and Aldrin, Dieldrin, and Mirex may stay on the market."
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release of low concentrations of proteolytic enzymes in the skin due to the non-specific cytotoxic effects of bile salts could account for both the pigmentation and the pruritus of patients with chronic obstructive jaundice.

Department of Dermatology,
Bristol Royal Infirmary,
Bristol BS2 8HW.

J. L. BURTON
J. KIRBY.

CHROMOSOME ABERRATIONS IN WORKERS EXPOSED TO VINYL CHLORIDE

SIR.—Epidemiological evidence suggests that the risk of malignancy is increased in workers chronically exposed to vinyl chloride (v.c.).¹⁻⁴ The carcinogenicity of v.c. has been demonstrated in animal experiments.⁵ In-vitro⁶ and in-vivo⁷ experiments suggest that the carcinogenicity of v.c. probably depends on the formation of an alkylating compound, presumably chloroethylene oxide. Since carcinogenic chemicals are often mutagenic,⁸ we wondered if v.c. is also mutagenic. In fact v.c. has been reported as inducing mutations in *Salmonella typhimurium* in the presence of metabolically active liver homogenates.¹⁰ If alkylation of D.N.A. by v.c. metabolites also produces chromosomal aberrations in man, chromosomal analyses could be used as an indicator of risk and also possibly be helpful in establishing a genetically meaningful maximum allowable concentration of v.c. We report an increased frequency of chromosomal aberrations in workers exposed to v.c.

Seven occupationally exposed male workers and three non-exposed control subjects, all employed in the same factory, were studied. The level of exposure to v.c. had continuously decreased during past years. In the weeks preceding the collection of blood-samples for chromosomal analysis (before the summer holidays in 1974) the air concentration in the polymerisation department was estimated to be 20-30 p.p.m. Workers had been exposed

to v.c. for 9-29 years. Clinical examinations had been carried out at regular intervals. None of the workers had showed disturbed liver function, signs of acro-osteolysis or haematological changes, except for case A in which there was slight thrombocytopenia and an α_1 -antitrypsin deficiency. Chromosomal analyses were made on cells from conventional lymphocyte-cultures incubated for 48 and 72 hours. All blood specimens and slides were coded and analysed blindly.

The result of the chromosome analysis is given in the accompanying table. The data for the control subjects were homogenous and therefore pooled. Altogether they comprised 566 cells, 11 of which (1.94%) contained chromosomal aberrations. This finding might be explained by previous diagnostic X-rays. The frequency of aberrations nevertheless accorded with that of a male population selected at random.¹¹

1450 cells from the group exposed to v.c. were analysed, 800 in the 48-hour cultures and 650 in the 72-hour cultures. In none of the cases was there a statistically significant difference in the frequency of aberrations between the 48 and 72 hour cultures. Therefore these data were pooled. The frequency of abnormal cells in the group exposed to v.c. (9.52%) was significantly greater than in the controls ($P < 0.001$). This was also true for chromatid and isochromatid breaks when analysed separately, but not for the remaining types of aberrations.

The highest frequency of abnormal cells was found in those subjects who had the shortest duration of exposure (see table), and two cases (C and F) did not differ significantly from the controls. A χ^2 test of the frequencies of abnormal cells also revealed a significant deviation from homogeneity ($P < 0.001$). The negative correlation of the frequency of abnormal cells with the time of exposure was not significant. Therefore, on the basis of the present data it is not possible to discuss the biological background of this heterogeneity.

We thank the staff at KemaNord, Stockviksverken, for cooperation and Miss Anita Tillberg for technical assistance. The expenses for the present study were covered by grants from the Swedish Medical Research Council (3681) and the Swedish Board of Occupational Safety and Health.

Department of Clinical Genetics,
Karolinska Hospital,
Stockholm, Sweden.

Department of Radiobiology,
Wallenberg Laboratory,
University of Stockholm,
Sweden.

FRANCISCO FUNES-CRAVIOTO
BO LAMBERT
JAN LINDSTEN.

LARS EHRENBORG
A. T. NATARAJAN
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CHROMOSOMAL ABERRATIONS IN WORKERS EXPOSED TO VINYL CHLORIDE

Subjects	Duration of exposure (yr.)	No. of cells analysed	Gaps		No. of different types of aberrations							No. of abnormal cells	
			Chromatid	Isochromatid	Chromatid breaks	Chromatid exchanges	Isochromatid breaks	Dicentric chromosomes	Ring chromosomes	Other types	Total	Total	%
Controls (3)	0	566	5	4	4	1	4	2	1	0	12	11	1.94
Exposed:													
A	9	200	22	8	19	2	19	0	0	1	41	36	18.00
B	9	250	15	14	24	1	17	3	1	2	48	37	14.80
C	12	250	4	6	5	1	5	2	1	0	14	12	4.80
D	18	200	8	5	12	1	9	0	0	2	24	22	11.00
E	19	150	3	2	4	0	5	0	0	2	11	11	7.33
F	20	200	1	1	0	0	1	0	0	2	3	3	1.50
G	29	200	9	12	7	0	9	1	1	1	19	17	8.50
Total (A-G) (7)	..	1450	62	48	71	5	65	6	3	10	160	318	9.52*

* A test of heterogeneity gave $\chi^2 = 47.72$, 6 d.f., $P < 0.001$.

A--DESIGN AND DEVELOP A MICROWAVE FREQUENCY COUNTER — Negotiations will be conducted with SRI, Menlo Park, CA. See Note 27 (P071)

A--DESIGN, DEVELOP AND FABRICATE A PROTOTYPE PULSED LASER INTERCEPT RECEIVER — Negotiations will be conducted with Argo Systems, Inc., Palo Alto, CA. See Note 27 (P071)

A--CONSTRUCT AND TEST A 28.5 TO 40GHZ RF MODULE to replace a Rf Module in the AN/WLR-II — Negotiations will be conducted with Argo Systems Inc., Palo Alto, CA. See Note 27. (P071)

Naval Electronic Systems Command,
Washington, DC 20360

A--STUDY OF RADIATION EXPOSURE DUE TO BUILDING MATERIALS. In order to establish baseline levels of population exposure due to the presence of natural radioactivity in construction materials, the contractor will be required to determine the distribution and use of various building materials in the United States, develop a methodology of investigative techniques to obtain meaningful data, and develop a mathematical model which may be used to compute population exposure due to naturally occurring radioactivity in building materials. Firms desiring a copy of this RFP should send their requests in writing — RFPs will be issued 1 Apr 75 — RFP WA 75-R236. (P071)

Environmental Protection Agency,
Contracts Management Division,
R&D Procurement Section, Crystal Mall #2,
(PM-214), Room 700, Washington, DC 20460
Attn: L. McKay, Tel: 703/557-7460

A--PERFORM STUDIES AND DEFINE PARAMETERS OF OVER THE HORIZON (OTH) SYSTEMS FOR SURFACE SHIPS — NAVSEASYS COMM is seeking expressions of interest and qualifications from capable firms willing to participate in an unfunded preliminary systems analysis to define parameters required of various potential OTH sensor and relay systems to determine if they are to be of value to surface units in tactical situations. It is anticipated that these studies will require 1 to 2 man-months of effort. Firms experienced in systems analysis, elevated sensors, weapon guidance and control, electronic CM and thoroughly familiar with the state of electronic microminutization, are invited to submit expressions of interest and a brief summary of qualifications to Attn: Code 03C. Refer to Synopsis Number 279 by 4 Apr 75. Respondents will not be notified of the results of Command's evaluation of information submitted. Only firms judged capable will be invited to the subsequent informal technical system symposium at NAVSEA to discuss proposed system concepts. This effort will require a Secret Security Clearance. This is not a Request for Proposal. (P071)

Naval Sea Systems Command,
Washington, DC 20360

A--PATHOGENICITY OF VINYL CHLORIDE — EFFECT OF AGE AND EXPOSURE DURATION. The National Institute for Occupational Safety and Health is soliciting proposals from organizations interested in: (1) determine the effect of exposure duration on the incidence of vinyl chloride induced lesions, (2) define the histologic alterations that can be used to predict the development of vinyl chloride induced tumors, (3) determine the effect of the age of the animal on the incidence of vinyl chloride induced lesions, (4) determine the usefulness of some clinical tests in the diagnosis of vinyl chloride induced lesions in rats—Job issue dtd 21 Mar 75, of contract proposals is C.O.B., 9 May 75. RFP due date 9 May 75. (P071)

National Institute for Occupational Safety and Health, 5600 Fishers Lane,
Rockville, MD 20852, Room 3-44
Attn: L. A. Sanders,

A--STUDY TO PRODUCE MORE ENERGY EFFICIENT WATER HEATERS AND REFRIGERATORS—Job—RFP 50228, Anticipated release dtd 18 Mar 75; RFP due date Thirty days after release date, requests for RFP's must be in writing: (P071)

Federal Energy Administration Room 8447
Washington, DC 20461
Attn: R. Marshall, Tel (202) 961-8434

A--LOW LIGHT LEVEL SENSOR TUBE DEVELOPMENT. A System Program Office of the Electronic Systems Division, L. G. Hanscom AFB, MA is surveying the field for firms with experience. Specific characteristics of the sensor tube must be high resolution, large format, sensitive in the visible spectrum, and must operate in the photon noise limited mode. In addition, the sensor tube must have a flat raster response and have minimum geometric distortion. A laboratory device may be considered but it is highly desirable that the sensor tube be capable of shipment to a testing facility for evaluation.

The System Program Office is also surveying the field for firms with experience in Moving Target Indicator techniques. This involves discrimination of objects in earth orbit against a star background with electro-optical systems based on the earth's surface. Doppler techniques are to be excluded and the output of the system will be as near real time as possible.

Interested firms who have demonstrated capabilities and experience in these areas should submit information in accordance with Note 68 in four copies within ten days from the date of publication. This is not a request for proposal. Telephone inquiries will not be honored. Specific data must be forwarded to the program office in writing. See Note 48 (P071)

Deputy for Surveillance and Navigation
Systems, OCTE, Electronics Systems
Division, AFSC, Hanscom AFB, MA 01731

A--DEVELOPMENT OF MANNED SPACECRAFT AUDIO TERMINAL EQUIPMENT—RFP No. 9-BC73-38-5-108P. It is anticipated that RFP will be issued o/a 17 Mar 75. Proposals are due 30 days after release of RFP. See Notes 2, 32 and 82. (P071)

A--DEVELOPMENT OF A LIGHTWEIGHT, FIRE-RETARDANT, THERMAL AND ACOUSTICAL AIRCRAFT INSULATION—Job—RFP 9-BC72-3-5-183P. It is anticipated that RFP will be issued o/a 17 Mar 75. Proposals are due 30 days after release of RFP. See Notes 2, 32 and 82. (P071)

NASA, Lyndon B. Johnson Space Center,
BF/Small Business and Industry Affairs
Office, Houston, TX
Tel A/C 713, 483-4511

A--SPACE PROCESSING PAYLOAD EQUIPMENT STUDY. RFP DCN 1-5-31-00383; RFP due date 10 Apr 75. Copies of RFP will be available upon written request. (P071)

Procurement Office, NASA, George C.
Marshall Space Flight Center, AL 35812
Attn: AP14, C. H. Brown

*** A--CONDUCT AN R&D PROGRAM ENTITLED "HELICOPTER TRANSMISSIONS INPUT MODULE MODEL & EMERGENCY LUBRICATION.** Follow on to Contract DAAD05-74-C-0788. Negotiations will be conducted with SKF Industries, Inc., Engineering & Research Center, King of Prussia, PA. See Note 46. (P071)

Procurement Directorate, Aberdeen
Proving Ground (AA), MD 21005

A--EVALUATE FEASIBILITY OF INCREASED IN-PLANT ELECTRICAL GENERATION IN THE PAPER, CHEMICALS AND PETROLEUM REFINING INDUSTRIES and develop recommended mechanisms as warranted, on an industry by industry and regional basis for enhancement of in-plant generation. Technical, materials, economic, environmental, legal and regulatory, social and political impacts of increased in-plant generation will be studied for each industry — Job — RFP 224 — RFP due date 25 Apr 75 — RFP will be distributed until the limited supply is exhausted. (P071)

Federal Energy Administration,
Office of Contracts & Procurement
Management, 12th & Pennsylvania Ave. NW,
Washington, DC 20461, Attn: R. Marshall
Tel: 202/961-8434

H Expert and Consultant Services.

H--PROVIDE EXPERT TECHNICAL SUPPORT IN THE EVALUATION OF VARIOUS HEALTH PROGRAMS FOR THE JOB CORPS HEALTH OFFICE. The services under this requirement will be to provide qualified personnel, services, facilities and materials to evaluate, maintain

and administer current Job Corps Enrollee Health Programs to embrace the medical, dental and mental health aspects, in support of this program. Request for proposal availability is limited to 195 copies and will be furnished to requestor on a first received, first served basis. The period of performance will be 24 months from date of award.—Job—RFP ONP75-1 RFP due date 14 Apr 75. L. Harley, 202/376-7284 (P071)

U. S. Department of Labor Manpower
Administration Office of National Programs
Patrick Henry Building, Room 8406
801 "D" Street, N. W.,
Washington, DC 20213

*** H--ENGINEERING AND TECHNICAL SERVICES** in support of the 5"/54 Caliber Gun Mount Mk 42 Mods 1 through 10. Negotiations are being conducted with FMC Corporation, Northern Ordnance Division, Columbia Heights Post Office, Minneapolis, MN. See Note 46. (P070)

Naval Ordnance Station, Indian Head,
MD 20640

H--INSPECTION SERVICES. For Level I, Sub-Safe Stock Program material. Contractor to perform all work on location at the Mare Island Naval Shipyard, Vallejo, CA — MIL-I-45208A applies—Total quantity, 3 Line Items—Delivery point, Mare Island, NSY, Vallejo, CA — Must be qualified in one of following trades: Machinist, Shipfitter, sheetmetal, pipefitter, welder, pattern-maker — Sol. N00228-75-R-4168. See Notes 23 and 56. (P071)

Regional Procurement Department,
Naval Supply Center, Oakland, CA 94625

H--HOUSEHOLD PRODUCT SURVEY. The consumer product safety commission is interested in conducting a household survey to gather use data on selected products and to develop a method to obtain user data on other specified product categories in a short period of time.—Job—RFP CPSC-75-325; RFP due date o/a 14 Apr 75. (P071)

Contracts Branch, Consumer Product
Safety Commission, Washington, DC 20267
Attn: R. Nance, Tel 301/486-7354

H--IMPACT ANALYSIS PROJECT. — Impact assessment(s) of experimental projects funded by the Foundation to increase the numbers of ethnic minorities and women pursuing careers in science and technology. Respondents must possess science competency and experience in science education as well as in the professional problems of ethnic minorities and women. Qualification statements for this RFP were solicited in the CBD dated 23 Sep 74 — RFP 75-129 — Correction to PSA-6274. (P071)

National Science Foundation,
Contracts Office, Room 630,
1800 "G" Street, NW, Washington, DC 20550

*** H--PREPARING A TOTAL PROCUREMENT HANDBOOK LIBRARY.** The Procurement Management Division is planning to enter into negotiations with Management Concepts, Inc., Arlington, VA. See Note 46. (P071)

NASA, Goddard Space Flight Center,
Greenbelt Road, Greenbelt, MD 20771

H--FLOOD INSURANCE STUDIES. The Department has selected the Ohio Department of Natural Resources, State of Ohio, Columbus, OH 43215 to conduct Flood Insurance Studies for Canal Winchester and Gahanna, OH. See Note 27. (P071)

Department of Housing and Urban
Development, Office of Procurement and
Contracts, 451 Seventh Street, Southwest,
Room 2142, Washington, DC 20410

*** H--TECHNICAL SUPPORT FOR THE NAVY WEAPONS SYSTEMS TEST, EVALUATION AND TRAINING RANGES.** The Naval Air Systems Command intends to negotiate with Stanford Research Institute, 333 Ravenswood Ave., Menlo Park, CA 94025. This is a continuation of a program already undertaken by Stanford Research Institute. See Note 46 — PR 75-AN042 — NAVAIR Synopsis 319-75. (P071)

Naval Air Systems Command Headquarters
Washington, DC 20341

Th Chemical World This Week

VINYL CHLORIDE MAKERS MEET OSHA STANDARD

The Occupational Safety & Health Administration's permanent standards for worker exposure to the suspected carcinogen vinyl chloride went into effect last week over the protests of vinyl chloride makers that the new standards are unnecessarily low. Nevertheless, major manufacturers say that they are in compliance with the standards and have not had to curtail vinyl chloride production even at older plants to meet the standards.

The Society of the Plastics Industry, acting for the vinyl chloride makers, has requested a Supreme Court review of a court of appeals decision last February upholding the OSHA standards (C&EN, Feb. 10, page 5). The industry group also has requested a delay in implementation of the standards while the court decided whether to hear the case. The Supreme Court refused the delay last week, allowing the standards to go into effect April 1. The court has not yet decided whether it will hear the appeal.

Under the present OSHA standard, worker exposure limits are set at 1 ppm for a time-weighted average over an eight-hour day with brief exposures of up to 5 ppm allowed for periods of less than 15 minutes. Engineering controls are to be used to lower vinyl chloride levels in plants as low as practicable, with respirators available for workers whenever vinyl chloride concentration levels exceed the standards. For the first year, workers can choose not to wear respirators as long as concentrations of the monomer are less than 25 ppm. Beginning next April 1, however, respirator use will be mandatory whenever vinyl chloride concentrations exceed the standards.

Only one major manufacturer claims to be able to meet the new standards without the use of respirators. Vinyl chloride concentra-

tions at Shin-tech's new polyvinyl chloride facility at Freeport, Tex., are well below the OSHA requirement, according to spokesmen for Robintech, manager and part owner of the Shin-tech plant along with Shin-Etsu Chemical Industry Co. of Japan. Although OSHA has not scheduled an inspection visit for the Shin-tech plant yet, Robintech says that both its own monitoring and that of an independent third party indicate compliance with the 1-ppm standard via engineering controls.

Robintech is optimistic that it can lower vinyl chloride exposure at its older, Painesville, Ohio, plant to within the OSHA standard through engineering changes currently under way. The modifications are scheduled for completion next year, hopefully in time to meet the April 1 requirement for mandatory use of respirators. For now, respirators are available for workers who want them at the Painesville plant.

Exposure levels at most other producers' plants are much lower than they were a year ago, and frequently lower than the 50-ppm interim standard that was in effect until last week. Exposure levels at Dow Chemical's vinyl chloride plant, for example, have been less than 10 ppm for the past year. And B. F. Goodrich says it has lowered vinyl chloride levels at its polymerization plants to about 6 ppm and even lower at its vinyl chloride production plant.

The Society of the Plastics Industry and others had expressed doubts that there were enough respirators available to allow full production of vinyl chloride if the standard was set so low that respirators were required. OSHA has modified its position on this point somewhat, according to SPI, and now allows a more available canister-type respirator to be used.

How much meeting OSHA stan-

dards will cost is still uncertain. In addition to the capital expenses for engineering controls and respirators, worker productivity is expected to decline whenever the use of respirators is necessary. Diamond Shamrock estimates that meeting the OSHA regulations will raise the price of PVC about 5%. Other companies suggest that this estimate may be low. But most agree that production probably will not be curtailed because of the new standard, either by an inability to keep certain plants in operation or by price increases so severe as to reduce demand for the product. □

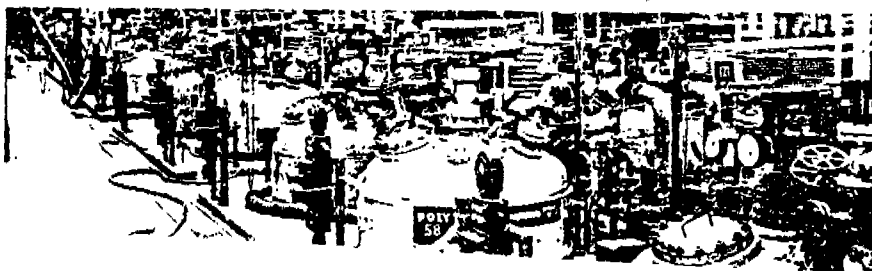
NAS agrees SST would reduce ozone

The National Academy of Sciences' Climatic Impact Committee issued a report last week that agreed with earlier predictions by scientists that emissions of nitrogen oxides and sulfur oxides from supersonic and subsonic aircraft would react with and deplete ozone in the stratosphere. Because ozone absorbs ultraviolet radiation in the upper atmosphere, its depletion would lead to more ultraviolet radiation reaching ground level, causing increased incidence of skin cancer among the earth's white population. The committee, chaired by Dr. Henry C. Booker of the University of California, San Diego, recommends modification of aircraft engines and fuel as well as close international cooperation. The committee was formed in 1972 to advise the Department of Transportation on its Climatic Impact Assessment Program.

The committee's 348-page report, based in part on mathematic modeling, points out that a fleet of 300 to 400 SST aircraft of the type formerly considered by the U.S. government in 1970 "in all probability" would cause stratospheric ozone to decrease 10% (and then stabilize at that reduced level) after the planes had been in service for number of years (the report doesn't specify how many). That ozone reduction, according to the report, would cause a 20% increase in skin cancer over a long period of time.

A hundred of today's SST aircraft—Anglo-French Concorde and Soviet TU-144—cruising at 16 k

Worker exposure to vinyl chloride is restricted around polymerization tanks



Vinyl Chloride Exposure Curbs Go Into Effect

High Court Refuses Delay; It Doesn't Set Halt Date In Reserve Mining Case

By a WALL STREET JOURNAL Staff Reporter

WASHINGTON—The Supreme Court refused to delay federal standards that require, by today, a sharp reduction in workers' exposure to vinyl chloride gas.

Separately, the Justices declined to set a specific timetable for Reserve Mining Co. to stop dumping wastes from its Silver Bay, Minn., taconite-processing plant into Lake Superior.

The vinyl chloride petition was filed by Firestone Plastics Co. and the Society of the Plastics Industry Inc., a trade association. They asked the Supreme Court to stay the new federal regulations while it considers whether to hear their full-fledged appeal seeking to invalidate the standards.

Under a ruling by the Labor Department's Occupational Safety and Health Administration, vinyl chloride producers must reduce workers' exposure to the gas to one-fiftieth of current standards. Long-term exposure to the gas, which is the raw material for the widely used polyvinyl chloride plastics, has been linked to a rare but fatal liver cancer. The society and several individual manufacturers have argued that the reduction isn't technologically and economically feasible, and that it isn't necessary on the basis of existing medical evidence.

On Jan. 31, the U.S. Appeals Court in New York upheld the standards. The industry's appeal of that ruling still is pending before the Supreme Court.

In the Reserve Mining case, the states of Minnesota, Wisconsin and Michigan and a half dozen environmental groups had asked the Supreme Court to set a two-year deadline for Reserve Mining to halt any dumping of wastes into Lake Superior. Reserve is owned jointly by Republic Steel Corp. and Armco Steel Corp. It supplies taconite iron ore pellets to both companies.

The latest move was technically an amendment to a petition, filed in early March, that asked the Supreme Court to reinstate a federal district court injunction that closed the Silver Bay plant for a few days last April. That injunction was lifted by the federal appeals court in St. Louis. Last week, the appeals court handed down a final ruling ordering the company to switch to on-land disposal of wastes and to reduce air emissions. The decision didn't set a timetable for the changes and that is what the states and environmentalists sought to have the Supreme Court impose.

While their petition for a deadline was rejected, the states and environmental groups still have the right to seek a full Supreme Court review of the appeals-court decision.

High Court Won't Delay Vinyl Rule

By LEAH YOUNG

Journal of Commerce Staff

WASHINGTON — New stringent occupational health and safety standards for the vinyl chloride industry will go into effect today following a Supreme Court decision Monday not to delay the standards.

The decision affects all manufacturers of vinyl chloride monomer (VCM), widely used in the plastics industry. The standards will require that workers be exposed to no more than one part vinyl chloride per million parts of air in any eight-hour period, with no more than five parts per million permitted in any 15-minute period.

Firestone Plastics Co. division of Firestone Tire and Rubber, Union Carbide Corp. and the Society of the Plastics Industry have all appealed to the Supreme Court to overturn a lower court decision upholding the new standard.

There is no way of knowing whether the refusal to grant a stay of the new standard means the high court will affirm or decline to hear the decision of the 2nd Circuit Court of Appeals which agreed with the Occupational Health and Safety Administration that the standard is rational.

'Good Indication'

But, lawyers for the Department of Labor are optimistic. They say that the denied stay is a "good indication" that the court will not grant review.

OSHA spokesmen say that the standard will be in effect April 1. They note that this is

(Continued on Page 21)

High Court Won't Delay Vinyl Rule

(Continued from Page 1)
a postponement from the original date of Jan. 1. OSHA promulgated the vinyl chloride standard following reports of 13 deaths from a rare liver cancer traceable to exposure to the chemical in the workplace.

The chemicals industry has been fighting the standard on the grounds that it does not have the technical ability to reduce exposure to VCM to practically zero.

Labor Department attorneys, however, say they do not expect any massive closings of chemical plants. They do expect, however, that many companies will apply for temporary variances while respirator equipment needed to protect workers is on order.

In a friend of the court brief, the National Association of Manufacturers (NAM) argues that if the lower court is upheld the secretary of labor will be able to "disregard the statutory mandate which requires the secretary to give due consideration to economic and technological feasibility factors in promulgating standards dealing with toxic substances and harmful physical agents and predicate such standards essentially on medical considerations. Thus, the ramifications of the decision below are not limited to the vinyl chloride industry but can have application to many other industries which are subject to the (Occupational Health and Safety) Act."

The Chamber of Commerce has filed a friend of the court brief charging the lower court with considering only the evidence in favor of the standard and none that questioned the data.

But U. S. Solicitor General Robert H. Bork argues that the labor secretary "is not obligated to await human deaths at a particular level of exposure before he may bar exposure at that level."

The industry has argued that the standard should remain at the current 50 parts per million until technology is developed.

"All of the factual evidence demonstrates that the engineering controls and work practices necessary to comply with the OSHA standard do not now exist, and that there is no reason to believe they can be developed in the foreseeable future," the plastics industry told the court.

No reason was given by the justices for denying the stay. Justices William O. Douglas and Lewis Powell took no part in the determination.

Vinyl chloride and cancer

Every supermarket contains goods packaged in polyvinyl chloride (PVC) and it has so far been assumed, probably correctly, that this substance is free from carcinogenic properties. However, some disturbing information has recently come to light with regard to the vinyl chloride monomer that is produced in a monomer plant, such as that owned by B. F. Goodrich in Kentucky, from petrochemical feed stock combined with chlorine. The monomer is then fed to an autoclave in the polymerization plant, where water and catalysts are added, and by heat and pressure the end product, a fine powder, is produced.

Information was obtained by B. F. Goodrich that several of their long-service employees had died of angiosarcoma of the liver. Nineteen cases of angiosarcoma of the liver have been identified in individuals in various parts of the world who had been exposed over a long period to vinyl chloride and in addition often had had massive exposure to the chemical some years ago when manufacturing processes were not so carefully controlled. In this respect the study of Jacob and Thériault in this issue of the Journal (page 307) is of interest.

Block¹ summarizes six cases in patients who had previously had from 15 to 30 years of exposure to vinyl chloride, all of whom were found at postmortem to have angiosarcoma of the liver. Two of these patients presented with enlargement of the spleen and liver; two with gastrointestinal tract bleeding, diagnosed originally as being due to gastric ulcer; and two with vague pain in the right hypochondrium, suspected of being due to cholecystitis. The pathologists also reported that four of these patients had an unusual, non-alcoholic type of cirrhosis of the liver, which may have played a role in the genesis of the angiosarcoma. Such cases have also been identified in the United Kingdom, Sweden and Germany, and all occurred in persons exposed for 12 to 27 years to vinyl chloride. This sub-

stance had already been indicted as a cause of Raynaud's phenomenon, which fortunately is apparently self-limiting, and also of disease of a variety of systems, particularly by the Germans, who recognized a "vinyl chloride disease".

Block suggested that the serum alkaline phosphatase value is a sensitive early indicator of the disease; other enzyme values rise only late. He speculates on the possible use of α -fetoprotein measurements to screen vinyl chloride workers, but believes that liver biopsy in suspected cases is not without risk of bleeding.

In the first report from the United Kingdom Lee and Harry² describe the case of a 71-year-old man who was admitted to hospital because of edema of the legs, ascites and liver enlargement. He had no definite indication of a liver tumour. He died suddenly 2 weeks later and was found at autopsy to have angiosarcoma of the liver.

Monson, Peters and Johnson³ discussed a retrospective analysis of mortality in 161 deceased workers who had been exposed to vinyl chloride in two plants. The patterns of mortality among the workers in the two plants were similar, and the most striking feature was a 50% excess of deaths due to cancer in these workers over the number in the general population. There were five deaths from angiosarcoma of the liver. In addition, cancer had occurred in the gallbladder, common bile duct and liver. There were also five brain tumours and a 60% excess of cancer of the lung, together with two cases of unusual cancer in the thyroid and the nasopharynx. The excessive mortality due to cancer was seen primarily in men dying before the age of 60. This excess has been identified only in persons dying from 1970 onwards. It would appear that the relative frequency of all cancers in vinyl chloride workers is increasing with time and there is no evidence that the trend has stopped.

The authors point out that it may

be several years before a final conclusion can be arrived at with respect to the carcinogenic potential of vinyl chloride; meanwhile, current exposure must be controlled.

As *The Lancet* points out in a recent editorial,⁴ it is surprising that nobody has paid attention to the work of experimental pathologists who reported in 1971 a variety of cancers induced in rats exposed to 30 000 ppm vinyl chloride for 20 hours a week. But experimental pathologists have too often cried wolf in relation to cancer, and 30 000 ppm is a very high level of exposure. Because of the findings of vinyl chloride disease other than cancer the exposure limit had been reduced to 200 ppm in some countries, and in Britain it has now been reduced to 50 ppm. However, this limit may be further lowered since at a meeting on May 10, 1974 at the New York Academy of Sciences Maltoni claimed to have produced angiosarcoma of the liver by exposing rats to only 50 ppm of vinyl chloride.

Apart from the occupational health angle, there is a wider question of public health. Newly manufactured PVC may release vinyl chloride during storage, and although there is no evidence that this constitutes a hazard to the buyer of food, there is a need for further information about the release of vinyl chloride from packaging such as that used in the food industry.

The alarming news that vinyl chloride exposure might be associated with angiosarcoma of the liver later in life caused the Goodrich Company to start a medical screening program at their Louisville plant, aimed at earlier detection of liver abnormalities. Results have recently been reported.⁵ Two additional cases of hepatic angiosarcoma in vinyl chloride polymerization workers without notable symptoms or signs were detected by liver biopsy. In addition, three cases of portal fibrosis were discovered.⁶ It is hoped that continuous health monitoring in polymerization plants may aid detection of liver abnormalities while they are still in a reversible or curable state.

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FACT SHEET

U.S. CONSUMER PRODUCT SAFETY COMMISSION
WASHINGTON, D. C. 20207

No. 58: Vinyl Chloride

Vinyl chloride is a monomer, or molecule, which is used as the propellant in many aerosols, such as hairsprays, insecticides, and spray paints. In its polymeric (combination of molecules) state, vinyl chloride is known as polyvinyl chloride (PVC). In that form, it is a plastic used for containers of shampoo and detergent, for water pipes, and for plastic upholstery on furniture.

Vinyl chloride has been linked in laboratory tests to a rare form of liver cancer, and it also has been named as the cause of liver cancer found in some workers at a plant which processes the chemical.

Various Federal agencies have taken action in response to the hazards of vinyl chloride and PVC:

1. U.S. Consumer Product Safety Commission-- On Aug. 16, 1974, CPSC announced that it will ban vinyl chloride for use in aerosol household products. Under the Federal Hazardous Substances Act such products will be declared banned hazardous substances and may not be sold. Consumers who purchased products covered by the ban should return them for complete refunds.
2. Food and Drug Administration-- FDA has recalled 52 brands of products, many of which were hairsprays, because they used vinyl chloride as a propellant. FDA has proposed a ban on the use of vinyl chloride in drug and cosmetic aerosol products in general.
3. Environmental Protection Agency-- On April 24, 1974, EPA issued an emergency ban on 28 brands of pesticide sprays containing vinyl chloride, requiring the recall of 19,000 cans of aerosol pesticides already on the market.
4. Occupational Safety and Health Administration-- OSHA has set a temporary exposure limit for workers of 50 parts per million (vinyl chloride in air) and proposes to reduce that limit by October, 1974, to no detectable parts per million.
5. Treasury Department (Bureau of Alcohol, Tobacco, and Firearms)-- The bureau ended the use of PVC plastic bottles which were used to package liquor because it was demonstrated that the chemical "migrated" (leached) into liquor stored in such bottles. FDA recently announced that it will ban the use of PVC containers for all food because of similar "migration" to nonalcoholic foods.

Products covered by the CPSC ban include some spray paints, finishes, paint removers, degreasers, and adhesives. Retailers are required to post lists of specific products which are covered by the ban, and you will be able to return these products for refunds.

To report a product hazard or a product-related injury, write to the U.S. Consumer Product Safety Commission, Washington, D.C. 20207. In the continental United States, call the toll-free safety hot line 800-638-2666. Maryland residents only, call 800-492-2937.

Would You Take \$1,000,000 For Your Life



Louis Beliczky, director of industrial hygiene for the United Rubber Workers, talks about the pitfalls of hazard pay, the need for chemical safety data sheets, and the lack of trained industrial hygienists.

At professional meetings Louis Beliczky is often introduced as the first industrial hygienist employed full-time by a labor union. Beliczky spends most of that time as a traveling trouble-shooter who helps "put out the fires," as he calls it, for many URW locals around the country. He has also served as a member of OSHA Standards Advisory Committees on heat stress, carcinogens, and hazardous materials labelling. And you can bet that when OSHA holds public hearings for almost any new health standard, the Rubber Workers' testimony will be among the loudest and clearest.

Q. According to OSHA's vinyl chloride standard, during the first year each worker may decide whether to wear a respirator if VC exposure levels are under 25 parts per million (ppm). Are the United Rubber Workers making a special effort to educate their members about respirators?

A. We've already done that. When the VC situation was first brought to light in January of last year, Mr. Bommarito [president of the URW] or I personally visited every polyvinyl chloride manufacturing plant we had. Since we had good rapport and understanding with the management people, our first approach was: "Give the workers protection as soon as you possibly can." We immediately initiated input to get everybody into an air-supplied type of respirator with special emphasis on protection for our members who enter reactor vessels.

After the OSHA standard came out, each of our locals involved in manufacturing polyvinyl chloride resin and each plant that fabricates it into a finished product received communications from Mr. Bommarito's office and from my office emphasizing the absolute need to wear a respirator and giving guidance on the various types. We've informed the companies, and our people in the plant: "If you can't get down to one ppm, you're going to have to learn to live with an air-supplied respirator." As far as I'm concerned, it's the only kind of respirator that gives the worker adequate protection at the present time.

Q. When will the workers in these plants be able to take off their respirators? In other words, how soon is the engineering technology to cut VC levels below one ppm likely to become available?

A. I think you're referring primarily to the plants that manufacture polyvinyl chloride resin. I must qualify my answer by stating that perhaps three or four of the larger plants will probably be able to meet OSHA's one ppm requirement within six or seven months. However, I do feel that there are some plants—those built in the late 1940's and early 1950's—that will have great difficulty ever meeting this level. Because of the structure of the reactor vessels and the physical layout of the plants themselves, workers in these plants are likely to be wearing respirators for the foreseeable future.

It's true that most of the companies that have these older facilities also have some new facilities, built at the plant location, to handle increased production demands. I have the feeling, then, that the companies may wind up phasing out or temporarily closing some of these older portions of plant facilities.

Q. *The URW local at Uniroyal's polyvinyl chloride plant in Painesville, Ohio, recently walked out over working conditions. How did the walkout relate to the VC situation?*

A. I can't make any official statement at this point, but I would like to comment. First, there had just been a change in local union leadership when that unauthorized work stoppage occurred. Frankly, it came as a surprise to me. I live in that county, and I visited the plant on numerous occasions in 1974. The initial issue, as I understand it, was an effort to reopen wage negotiations in the contract, possibly related to the cost-of-living escalator that we're trying to renegotiate in some of our other contracts. This issue may have been tied inadvertently to a safety and health matter. I saw statements in the local newspaper to the effect that "if the workers were going to be exposed to VC, they wanted to get monetary compensation for it."



"What we need is more professionally trained industrial hygienists to go into a plant, get their hands dirty, get involved with management, and straighten things out."

Q. *"Hazard pay" was the term I saw.*

A. That's a term I shy away from using. I don't think we should ever get "hazard pay" for any kind of environmental health condition. Our basic philosophy is that the company should use any extra money to make improvements that would make the work environment safer. What hazard pay boils down to is this: "If you pay me 75¢ more an hour, I don't mind getting killed or exposing myself to a hazardous situation."

This whole concept came up when our union had its first reported angiosarcoma death at Firestone's plant in Pottstown, Pennsylvania. Naturally, the workers were concerned. I spent three full days in the plant and at the union hall, and I spoke to each shift for at least a couple of hours in an effort to help them understand the problem, make them aware of the VC hazards, and let them see that all that could be done was being done. Most people accepted the situation, but there were some in the local union—mostly the younger people—who expressed the same

kind of feeling as the newspapers have reported about the Painesville plant: "Let's get maybe 10¢ or 25¢ or 30¢ more an hour because we're working with VC." Now, 10¢ more an hour comes out to be about \$200 more a year. If I were to offer you \$1,000,000 for your life, would you take it? You know you wouldn't. Life's pretty damn precious to everyone. So, after we spent a fair amount of time talking to our people at Pottstown, they understood this concept of hazard pay, and they didn't press the issue further.

As you can imagine, then, I was surprised to see the news accounts of the Painesville walkout. Mr. Bommarito was concerned. It is our international union's policy not to become involved in local union matters unless the local president personally requests it. I did call our district director for that area and state, "If there is any way we can help in the Painesville situation, have them give me a call." Because the walkout was unauthorized and the issue itself was not a valid one, we can't say that this local represents the official position of the URW. I'm not sure how the situation was resolved, but in the end the plant did go back to work. Yesterday the district director responsible for that plant told me that, to date, the local union has not made any effort to contact his office on this matter. I feel it's unfortunate that this particular situation was given such wide publicity since it doesn't really reflect good policy from the standpoint of environmental health.

Q. *Can you make any predictions about what the next "vinyl chloride" will be? What general types of substances deserve a closer look now?*

A. Well, I have to qualify my statements by saying that they are based on my experience in the rubber and plastics industries. I have a feeling that there will be further studies involving other polymers besides VC. There are a lot of synthetic rubbers that fall in this category—styrene, butadiene, and other types of isoprene polymers. We already have an indication that some of our people are being affected in plants where styrene monomer is used or released as a by-product. We have found an increased incidence of nodes and tumors on the vocal cords, though so far no tumors have been classed as malignant.

Another area of concern, based on epidemiological studies by Harvard and the University of North Carolina, is the relatively high incidence of various forms of cancer, especially the leukemias. I think we had better take a good, hard look at the petroleum distillates, particularly benzene. Everyone knows that benzene is a toxic material; it's considered a leukemogenic agent. We don't find much of it in the plants we're involved with. But I think we have to be aware that even gasoline, which is sometimes

used in making rubber cement, can contain anywhere from two to ten percent benzene. Petroleum naphtha may contain from two to 20 percent benzene.

I also think it's high time we stopped placing the big emphasis on chemicals that are carcinogens. We must start looking more closely at materials which may not cause cancer but can shorten the worker's life by causing other disabling diseases such as silicosis or emphysema or heart disease. From the worker's standpoint, these problems can be just as incapacitating and final as cancer.

Simply because of our increased awareness of the problems, then, we are likely to see other epidemics involving substances as hazardous as VC. I think last year was the beginning of a new consciousness in this country. It was the year of enlightenment where occupational health hazards are concerned and at the same time the year of fear. It's unfortunate that it takes situations like those involving VC or inorganic arsenic to make most Americans aware of the health hazards that confront us.

Q. *What kind of unpublicized health problems do you, as an industrial hygienist for the URW, become involved in?*

A. Last year one of our plants in Pennsylvania, to give one example, was using a material called dichloroethane as a solvent base in a cement to make a plastic product. Thirteen of the women who were putting together small parts in the operation had to be hospitalized. They had all the classic symptoms of dichloroethane exposure—loss of memory, unconsciousness, double vision, possible corneal damage, kidney and liver damage.

One would expect that in this day and age the company, which manufactured environmental health equipment, would have studied the hazards related to this material. But they had no awareness of a hazard and did not apply local exhaust ventilation or dilution ventilation. So, when I went to the plant, I told the management, "I am making a strong recommendation to stop using dichloroethane. In this modern world of advanced science and technology, you can certainly find a substitute for this material." They said, "Well, we don't think we can," and I told them I didn't believe that. The company did stop the operation for awhile but began it again three or four weeks later. I kept in touch with the local union and managed to get it stopped again. The company finally promised to get physical exams for the workers affected to check their kidneys, livers, and eyes for permanent damage. Our staff representative is keeping us posted on the progress being made.

Q. *So right now this situation is unresolved?*

A. Well, they have stopped the operation. When I got NIOSH to check into the problem, the company told them that they were not using dichloroethane anymore and in all probability would phase out the process. That's one of the things we hear all the time. A company will say that if they have to spend money controlling an environmental health problem—on ventilation, for instance—then they're better off shutting down the operation. Almost always it turns out to be a threat by the company. Somehow, in the end, they manage to reset their priorities and continue the operation.



"We find that companies cooperate much better if we have language in our contracts covering safety and health issues."

Q. *As a member of OSHA's Advisory Committee on Hazardous Materials Labelling, you are in a position to help formulate a standard that could keep this kind of situation from occurring. I've noticed that you're chairman of a subcommittee on safety data sheets and training. What is a "safety data sheet?"*

A. In order to understand the concept, we have to go back historically to the maritime trades. In 1958, before OSHA existed, the federal government legislated a special standard for the maritime industries, including longshoring, shipbuilding, shipbreaking, and ship repair work. The problem was that dockworkers and printers or welders in shipyards really weren't aware of the potential hazards of the materials they were dealing with every day. Under the maritime standard's requirement for material safety data sheets, then, the employer must provide the employees enough information to make him aware of the health hazards related to a particular material.

The subcommittee I head is working on extending this kind of requirement to all industry. I personally feel that one thing that would make my job much easier and greatly help local unions and safety committees, would be specific information on the physical characteristics of a chemical, the hazards related to it, and the kind of control measures required—exactly what a safety data sheet should tell you.

The current practice in most industries is just to designate a chemical by a number or series of letters. I know that in rubber plants, the chemicals are coded with designations such as 51 A-B-C, and most of the time even the management people don't have much awareness of that particular chemical. If they called a chemical "benzene" rather than its code name, this would immediately ring a bell of warning. This is one area where I've tried to get some input into the language of our union contracts. In some of our contracts, we do have requirements for the companies to provide the chemical names and other hazard information to a worker if he so requests.

Now, this idea is a two-way street. Many companies, both large and small, are relatively uninformed about the chemicals they're using. If the company itself had the responsibility of filling out a material safety data sheet, it would have to become aware of the hazards related to a particular chemical.

Q. *Do you foresee any problems in getting companies to reveal what they might consider trade secrets—the names of the chemicals they use?*

A. I think that the matter of the proprietary nature of some chemicals and processes can be handled relatively easily. Section 15 of the Act says that the Secretary of Labor can issue orders "to protect the confidentiality of trade secrets." I'd say that in the rubber industry, maybe one percent or half of one percent of all commonly used chemicals could be considered secret. So industry's argument that it will have to divulge trade secrets to give you the name of a chemical is more often fictitious than factual.

Q. *At a recent conference of international unions in Switzerland, the president of the URW, Peter Bommarito, said that collective bargaining is the "most fundamental, the most effective" method of getting safety and health protection for workers. What, then, is the government's role in occupational health?*

A. Each national or international union has its own approach in this area. Some unions feel that most of their efforts should be put into enacting laws and standards to protect the worker. We in the URW feel that effective and enforceable legislation is good, but generally speaking our philosophy of dealing with these problems is: "Let's try to work it out, keep it in the family, and get the company to comply voluntarily without the threat of an OSHA inspection." We find that companies cooperate much better if we have language in our contracts covering safety and health issues. That doesn't mean that we don't care about government involvement. In fact, some of our contract language "dove-tails" with the OSHA standards. The majority of companies just seem more concerned about their contractual obligations

to a local or international union than about their legal commitments to OSHA and the various state programs.

Q. *What do you see as the most pressing current problem in the field of occupational health?*

A. It is probably the lack of trained professionals to handle the multitude of jobs that have to be done. I'm not only talking about the development of standards, or the pre-testing of chemical compounds, or large-scale toxicological studies, but also about the plain old "gut" kind of work required—things like air sampling in a plant or testing a worker's lung function. If you look at the membership roster of the American Industrial Hygiene Association, you'll see about 1,800 people, among them university researchers, company medical directors, and people in related fields. I would guess, though, that only 500 at most are actually going out in the field, taking air samples, recommending control measures, and so on. What we need is more professionally trained industrial hygienists to go into a plant, get their hands dirty, get involved with management, and straighten things out.

Q. *How would you rapidly increase the supply of industrial hygienists?*

A. I see no solution to this dilemma at present. Because of budget cutbacks in the Department of Health, Education, and Welfare, the schools of public health, which had been turning out some industrial hygienists, are no longer getting funds for research and training grants. Consequently, the supply of new industrial hygienists is drying up at its source. We will really suffer from this problem four, five, or six years from now when we look around and see how few industrial hygienists we have. The only solution I see, and it's a long-range one, is to make enough training funds available to interest college students in an environmental health career.

Q. *I've seen you introduced at occupational health meetings as one who has "jumped the fence to labor" or "gone over to the other side." Why does this kind of introduction disturb you?*

A. What we're talking about here are the age-old adversary roles of labor and management. I feel generally that where workers' health is concerned there should be no adversary roles. We should all try to work objectively. However, if objectivity fails, if there are attempts to misrepresent the facts, then representatives of the labor movement have to assume the adversary stance to accomplish the goals to which they've professionally dedicated themselves.

Mr. Beliczky was interviewed by George Clack.

Vinyl Chloride Firm Says It Has Answer

Financial Weekly 11/7/75
By United Press International

FORT WORTH, Tex. — Industrialist Brad Corbett is confident that his vinyl chloride resin factories pose no health threat to his employees. They're new and meet stringent federal standards.

Inhalation of vinyl chloride, a raw

material in plastics production, recently was linked with cancer of the liver. Stringent new government standards, formulated to cut exposure of factory workers, took effect April 1.

Corbett, principal owner of Texas Rangers baseball club, is president of Robintech, Inc., based in Fort Worth. He says the company's plastics factories are new and comply with the federal standards. The new chloride resin plant at Freeport in South Texas, for instance, uses a Japanese production technique which Corbett says virtually eliminates worker exposure to the substance.

Following publication of studies linking inhalation of vinyl chloride with angiosarcoma of the liver, the U.S. Labor Department imposed standards on the plastics industry calling for reduction of the chloride to an undetectable level, or at most one part per million parts, in the air of the factory. The industry level had been 500 parts per million.

Several large companies and the society of the plastics industry filed suit challenging the standards.

Corbett, 37, a native of New York, parlayed a \$300,000 loan from the Small Business Administration into a thriving plastics and chemical firm. He did not join in the industry suit. He said the industry could easily achieve between one and three parts per million of vinyl chloride by improving the quality of the plants.

There are 49 vinyl chloride plants in the United States, with a total of 6,500 workers engaged in turning the chemical into polyvinyl chloride plastic. Two dozen cases of liver cancer were found among vinyl chloride workers and 13 deaths recorded before the government set new standards effective Jan. 1.

The Second U.S. Circuit Court of Appeals upheld the order but pushed the effective date forward to April 1.

The Supreme Court is considering the decision. It refused to delay the standards beyond April 1. The government argued that the Labor Department "is not obligated to await human deaths at a particular level of exposure" before barring exposure at that level.

The plastic is used in thousands of products, ranging from industrial pipeline to shower curtains and phonograph records. Vinyl chloride also was used as a propellant in some aerosol cans until the Food and Drug Administration and Consumer Products Safety Commission banned it last year.

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