

Now let's talk about PVC

WHAT IS PVC (POLYVINYL CHLORIDE) RESIN?

PVC resin is a white powdery substance. It is produced when VCM gas is heated with water and a catalyst in a pressurized reactor to stimulate a molecular chain reaction called polymerization. When the process is completed, the fine powder remaining is known as VC resin.

WHAT IS PVC RESIN USED FOR?

PVC resin is processed with other ingredients to form compounds which are made into thousands of industrial, automotive, household and general consumer products.

Dubbed the "miracle material", PVC can be moulded or extruded into an unlimited number of flexible or rigid products. It can also be blended with other materials to produce items of high strength which are impervious to the elements.

Commonly referred to as "vinyl", PVC products are in evidence wherever you look — house siding, phonograph records, packaging film, water and sewer pipe, swimming pool liners, electronic components, automobile upholstery, shoe soles, window gaskets, floors, garden hose, shower curtains, rain boots, wall-covering, carpet backing, coated fabrics, toys, dolls, and handles and flexible medical tubing — to name a few.

IS PVC RESIN CONSIDERED DANGEROUS?

No. PVC resin itself is an inert material and is not considered dangerous. In plants manufacturing finished goods from PVC resin worker exposure to low concentrations of VCM gas may exist but in every instance proper ventilation will eliminate health hazards.

ARE FINISHED PVC PRODUCTS DANGEROUS?

No. In its final form, PVC is an inert material. That is, it will not revert or depolymerize to VCM gas. Both the Ontario Ministry of Health and the Occupational Safety and Health Administration have stated that finished PVC products "do not constitute any known health hazard". No evidence to the contrary has been discovered. Products made from PVC have been used by consumers for almost 40 years.

WHAT ABOUT OTHER FINISHED PRODUCTS?

Unreacted VCM does not exist in food wrap as measured by the most sensitive instruments available today which measure VCM down to 50 parts per billion.

Some concern has been expressed over the odour evident from most vinyl products such as automobile seat covers. This odour is not vinyl chloride monomer. It is the smell of other compounding ingredients.

HOW MANY CANADIANS ARE EMPLOYED WITHIN THE VCM GAS/PVC RESIN INDUSTRIES?

About 600 men and women across Canada are employed in vinyl chloride monomer or polyvinyl chloride resin producing plants. A further approximately 50,000 people work in plastics plants producing PVC compounds and thousands of finished products.

WHICH COMPANIES MANUFACTURE VCM GAS AND PVC RESIN IN CANADA?

There are two vinyl chloride monomer (gas) manufacturers: Dow Chemical of Canada Limited, Sarnia; and Gulf Oil Canada Limited, Varennes, Quebec.

Three companies produce PVC resins and compounds: B.F. Goodrich Canada Limited, Niagara, Ontario and Shawinigan, Quebec; Imperial Oil Limited, Sarnia, and Monsanto Canada Ltd., Montreal.

For additional copies or more detailed information on this subject, phone or write:

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A division of The Society of the Plastics Industry of Canada (SPI Canada)



PLASTICS INDUSTRY COUNCIL

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SOME FACTS ABOUT VINYL CHLORIDE MONOMER AND POLYVINYL CHLORIDE

CURRENTLY, THERE IS JUSTIFIABLE PUBLIC CONCERN OVER POTENTIAL HEALTH HAZARDS RELATED TO VCM (VINYL CHLORIDE MONOMER) GAS. UNFORTUNATELY, SOME PEOPLE HAVE CONFUSED VCM GAS WITH PVC (POLYVINYL CHLORIDE) RESIN.

VCM GAS IS THE BASIC BUILDING BLOCK FROM WHICH PVC RESIN IS MADE. PVC RESIN, IN TURN, IS USED TO MAKE THOUSANDS OF HOUSEHOLD AND INDUSTRIAL PRODUCTS.

THE FOLLOWING INFORMATION SHOULD HELP CLEAR UP ANY CONFUSION THAT MAY EXIST BETWEEN THESE TWO PRODUCTS.

THE INFORMATION IS BASED ON DATA AVAILABLE TO THE SOCIETY OF THE PLASTICS INDUSTRY OF CANADA AS OF MARCH 15, 1975. RESEARCH INTO THIS SUBJECT BY INDUSTRY AND GOVERNMENT HAS BEEN ACCELERATED. AS NEW INFORMATION BECOMES AVAILABLE, WE WILL UPDATE THIS MATERIAL TO KEEP YOU FULLY INFORMED ON THE SUBJECT.

First let's talk about Vinyl Chloride Monomer

WHAT IS VINYL CHLORIDE MONOMER (VCM) GAS?

Vinyl chloride monomer is a colourless flammable gas at normal conditions of temperature and pressure. It has a pleasant, sweet odour only noticeable by smell at concentrations above 2,000 parts per million (ppm) and is practically insoluble in water.

WHAT IS VCM GAS MADE FROM?

VCM gas is produced from ethylene or acetylene, both refined hydrocarbons. It is supplied to PVC resin manufacturers by pipeline or in tank cars and tank trucks as a liquid under pressure.

WHAT IS VCM GAS USED FOR?

Today, VCM gas is used exclusively to produce PVC resin.

At one time, in the 1940's, vinyl chloride gas was tested as a medical anesthetic. Its use for this purpose was discontinued by the medical profession when it was discovered the gas caused rapid and uneven heart beat in their patients.

IS VCM GAS CONSIDERED DANGEROUS?

Yes. It is today. But this was not the case some years ago. VCM gas was considered virtually harmless when VCM and PVC resin were introduced in the United States in 1939 and in Canada in 1943. The most apparent dangers were explosion (VCM gas is explosive at concentrations between 36,000 and 264,000 ppm in air) and its narcotic-like effect on workers.

In those days, producers were unaware of health hazards associated with exposure to VCM gas. They were concerned mainly with keeping workplace exposures well below the levels of possible explosion and worker intoxication.

WHERE IS VCM GAS CONSIDERED MOST DANGEROUS?

Danger of exposure to VCM gas exists mainly within plants which produce PVC resin. Due to the nature of the "batch" PVC resin production process, and the frequent need to open vessels, atmospheric contamination by VCM gas can occur.

WHEN WAS VCM GAS FIRST SUSPECTED AS A HEALTH HAZARD?

In the 1950's and 1960's medical reports prompted research which established that workers were developing various medical symptoms and side effects from exposure to VCM gas.

Producers, during those years, were reducing exposure levels as evidence of health dangers was discovered.

In December, 1973, the plant physician at a PVC resin plant in Louisville, Kentucky, discovered that three workers had died of angiosarcoma, a rare form of liver cancer, since 1971. It was the first report of cancer in human beings linked to exposure to VCM gas.

WHAT ACTION RESULTED?

The announcement touched off world-wide concern and both VCM gas and PVC resin producers everywhere began extensive medical testing of their workers. Medical records of deceased workers were re-examined. To date 25 cases of angiosarcoma have been discovered among PVC resin workers (most of them deceased) in North America. It is believed by the medical profession that long-term exposure to high concentrations of VCM gas is the principle cause of the disease.

HAVE ANY CANADIAN WORKERS WHO HAVE BEEN EXPOSED TO VCM GAS DIED OF ANGIOSARCOMA?

Yes. Nine deaths which occurred in Shawinigan Quebec over the past 10 years were recently attributed to angiosarcoma. The discoveries were made following a search of death records and study of the pathological material available. Studies of previous employees' records are continuing.

WHAT IS INDUSTRY DOING TO SAFEGUARD WORKERS AND REDUCE EXPOSURE TO VCM GAS?

VCM gas and PVC resin producers today provide or are implementing, continuous round-the-clock monitoring of vinyl chloride gas levels within the plant work environment. Similarly, much work is going on to reduce exposure levels through a combination of engineering changes, new work practices and personnel monitoring devices carried by workers on the job.

Improved systems to minimize VCM emissions, either in plant or outside, are being installed.

In addition, all VCM gas and PVC resin production workers are now required to undergo, at least once per year, medical examinations developed by experienced liver and cancer specialists to detect early signs of disease.

WHAT RESEARCH IS BEING DONE?

Currently an intensive international research and development program, sponsored by companies and industry associations is taking place with hundreds of scientists and technicians engaged full-time in programs with a combined cost estimated to be in excess of \$100 million over the next three years.

WHAT ARE THE CURRENT REGULATIONS CONCERNING WORKER EXPOSURE LEVELS IN VCM GAS AND PVC RESIN PLANTS?

The Occupational Health Protection Branch of the Ontario Ministry of Health recently issued Data Sheet # 21 which sets a maximum average exposure level of 10 parts per million (ppm) of VCM during an 8 hour day and a ceiling level of 25 ppm as measured over a 15 minute time period. B. C. recently adopted a similar standard. Quebec is currently developing a standard. Other provinces are studying the situation and are expected to establish their own industrial guidelines shortly.

ARE PEOPLE RESIDING NEAR VCM GAS OR PVC RESIN PLANTS BEING EXPOSED TO ANY HEALTH HAZARDS?

In Ontario and Quebec, Provincial environmental inspectors have been maintaining close contact with VCM gas and PVC resin producers to ensure operation of the production plants poses no hazards to public health. In addition, companies regularly monitor the atmosphere at plant fence lines. VCM gas is dispersed in air and is broken down by photodegradation into compounds harmless at the levels incurred.

HAS VINYL CHLORIDE MONOMER BEEN DETECTED IN CONSUMER GOODS?

Yes. Detectable levels of vinyl chloride monomer have been discovered in PVC bottles. Residual VCM gas is known to have migrated into products which are mainly alcohol based. For example, the Bureau of Chemical Safety, Department of Health and Welfare, Ottawa, has found unreacted VCM in certain PVC bottled wines, distilled spirits and vinegar. No evidence is available to indicate that the occurrence has endangered the health of users.

Since evidence of migration was discovered, PVC resin producers are working to develop improved technology so that manufacturers can produce PVC bottles which do not contain detectable amounts of residual vinyl chloride monomer using the most sensitive instruments available.

IS THERE A SAFE LEVEL OF EXPOSURE TO VCM GAS?

At this time medical data and industrial hygiene experience indicate that a 10 ppm maximum exposure level for an 8 hour time weighted average (TWA) is a prudent exposure level to protect the health of workers.

Modifications in PVC resin manufacturing plants are being made to attain these low levels. VCM plants are already operating at TWA below 10 ppm.



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SOME FACTS ABOUT
VINYL CHLORIDE MONOMER
AND
POLYVINYL CHLORIDE

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A DIVISION OF THE SOCIETY OF THE PLASTICS INDUSTRY OF CANADA (SPI CANADA)

WHAT IS VINYL CHLORIDE MONOMER (VCM) GAS?

VINYL CHLORIDE MONOMER IS A COLOURLESS FLAMMABLE GAS AT NORMAL CONDITIONS OF TEMPERATURE AND PRESSURE. IT HAS A PLEASANT, SWEET ODOUR ONLY NOTICEABLE BY SMELL AT CONCENTRATIONS ABOVE 2,000 PARTS PER MILLION (PPM) AND IS PRACTICALLY INSOLUBLE IN WATER. IT IS, HOWEVER, SOLUBLE IN ALCOHOL, ETHER AND CARBON TETRACHLORIDE.

VCM GAS IS PRODUCED FROM ETHYLENE OR ACETYLENE, BOTH REFINED HYDROCARBONS. VINYL CHLORIDE MONOMER IS A CHLORINATED HYDROCARBON. IT IS A GASEOUS SUBSTANCE PRODUCED BY THERMAL DEHYDROCHLORINATION OF ETHYLENE DICHLORIDE OR BY HYDROCHLORINATION OF ACETYLENE. VINYL CHLORIDE MONOMER IS POLYMERIZED TO FORM PVC RESIN OR COPOLYMERIZED WITH OTHER MONOMERS TO FORM COPOLYMER PLASTIC MATERIALS.

VCM GAS IS SUPPLIED TO PVC RESIN MANUFACTURERS BY PIPELINE OR IN TANK CARS AND TANK TRUCKS AS LIQUID UNDER PRESSURE.

IS VINYL CHLORIDE GAS CONSIDERED DANGEROUS?

YES. IT IS TODAY. BUT THIS WAS NOT THE CASE SOME YEARS AGO. VINYL CHLORIDE GAS WAS CONSIDERED VIRTUALLY HARMLESS WHEN VCM AND PVC RESIN WERE INTRODUCED IN THE UNITED STATES IN 1939 AND IN CANADA IN 1943. THE MOST APPARENT DANGERS WERE EXPLOSION (VCM GAS IS EXPLOSIVE AT CONCENTRATIONS BETWEEN 36,000 AND 264,000 PARTS PER MILLION IN AIR) AND ITS NARCOTIC-LIKE EFFECT ON WORKERS. AT ONE TIME, IN THE 1940s, VINYL CHLORIDE GAS WAS TESTED AS A MEDICAL ANESTHETIC. ITS USE FOR THIS PURPOSE WAS DISCONTINUED BY THE MEDICAL PROFESSION WHEN IT WAS DISCOVERED THE GAS CAUSED RAPID AND UNEVEN HEART BEAT IN THEIR PATIENTS.

IN THOSE DAYS PRODUCERS WERE UNAWARE OF HEALTH HAZARDS ASSOCIATED WITH EXPOSURE TO VCM GAS. THEY WERE CONCERNED MAINLY WITH KEEPING WORKPLACE EXPOSURES WELL BELOW THE LEVELS OF POSSIBLE EXPLOSION AND WORKER INTOXICATION.

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EXPOSED TO 50 PPM OF VCM GAS. TABERSHAW AND GAFFEY REORTED THEIR FINDINGS ON A MORTALITY STUDY OF WORKERS IN THE MANUFACTURE OF VINYL CHLORIDE MONOMER AND ITS POLYMERS IN THE JOURNAL OF OCCUPATIONAL MEDICINE - AUGUST, 1974.

IN DECEMBER, 1973, THE PLANT PHYSICIAN AT THE B. F. GOODRICH PVC RESIN PLANT IN LOUISVILLE, KENTUCKY, DISCOVERED THAT THREE WORKERS HAD DIED OF ANGIOSARCOMA SINCE 1971. THE COMPANY'S ENVIRONMENTAL HEALTH DIRECTOR PROMPTLY REPORTED THE FINDINGS TO THE NATIONAL INSTITUTE OF OCCUPATIONAL SAFETY AND HEALTH, AN AGENCY OF THE UNITED STATES GOVERNMENT. IT WAS THE FIRST REPORT OF CANCER IN HUMAN BEINGS LINKED TO EXPOSURE TO VINYL CHLORIDE MONOMER.

THE ANNOUNCEMENT TOUCHED OFF WORLD-WIDE CONCERN AND BOTH VCM GAS AND PVC RESIN PRODUCERS EVERYWHERE BEGAN EXTENSIVE MEDICAL TESTING OF THE WORKERS. MEDICAL RECORDS OF DECEASED WORKERS WERE EXAMINED. TO DATE 25 CASES OF ANGIOSARCOMA HAVE BEEN DISCOVERED AMONG PVC RESIN WORKERS (MOST OF THEM DECEASED) IN NORTH AMERICA. IT IS BELIEVED BY THE MEDICAL PROFESSION THAT LONG-TERM EXPOSURE TO HIGH CONCENTRATIONS OF VCM GAS IS THE PRINCIPLE CAUSE OF THE DISEASE. THE INDUSTRY INVESTIGATION OF ALL KNOWN FACTS RELATED TO THE ANGIOSARCOMA CASES DISCOVERED TO DATE SUPPORTS THIS VIEW.

WHAT IS PVC (POLYVINYL CHLORIDE) RESIN?

PVC RESIN IS THE POWDERY WHITE SOLID SUBSTANCE PRODUCED WHEN VCM GAS IS HEATED WITH WATER AND A CATALYST IN A PRESSURIZED REACTOR TO STIMULATE A MOLECULAR CHAIN REACTION CALLED POLYMERIZATION. WHEN THE PROCESS IS COMPLETED, THE FINE POWDER REMAINING IS KNOWN AS PVC RESIN.

PVC RESIN IS SUBSEQUENTLY PROCESSED WITH OTHER INGREDIENTS TO FORM COMPOUNDS WHICH ARE MADE INTO THOUSANDS OF INDUSTRIAL, AUTOMOTIVE, HOUSEHOLD AND GENERAL CONSUMER PRODUCTS. DUBBED THE 'MIRACLE MATERIAL' PVC CAN BE MOULDED OR EXTRUDED INTO AN UNLIMITED NUMBER OF FLEXIBLE OR RIGID PRODUCTS. IT CAN ALSO BE BLENDED WITH OTHER MATERIALS TO PRODUCE ITEMS OF HIGH STRENGTH WHICH ARE IMPERVIOUS TO THE ELEMENTS.

WHAT IS INDUSTRY DOING TO SAFEGUARD WORKERS AND REDUCE EXPOSURE TO VINYL CHLORIDE GAS?

VCM GAS AND PVC RESIN PRODUCERS TODAY PROVIDE OR ARE IMPLEMENTING, CONTINUOUS ROUND-THE-CLOCK MONITORING OF VINYL CHLORIDE GAS LEVELS WITHIN THE PLANT WORK ENVIRONMENT. SIMILARLY, MUCH WORK IS GOING ON TO REDUCE EXPOSURE LEVELS THROUGH A COMBINATION OF ENGINEERING CHANGES, NEW WORK PRACTICES AND PERSONNEL MONITORING DEVICES CARRIED BY WORKERS ON THE JOB. IMPROVED SYSTEMS TO MINIMIZE VCM EMISSIONS, EITHER IN PLANT OR OUTSIDE, ARE BEING INSTALLED.

IN ADDITION, ALL VCM GAS/PVC RESIN PRODUCTION WORKERS ARE NOW REQUIRED TO UNDERGO, AT LEAST ONCE PER YEAR, MEDICAL EXAMINATIONS DEVELOPED BY EXPERIENCED LIVER AND CANCER SPECIALISTS TO DETECT EARLY SIGNS OF DISEASE. EXTENSIVE INDUSTRY SPONSORED MEDICAL RESEARCH TO BETTER UNDERSTAND THE PATHOLOGY AND EARLY WARNING SYMPTOMS OF VCM RELATED DISEASE HAS BEGUN.

PVC RESIN PRODUCERS HAVE MADE AND ARE CONTINUING TO MAKE PROGRESS IN REDUCING RESIDUAL VINYL CHLORIDE GAS TRAPPED IN PVC RESIN. THIS WILL EVENTUALLY ELIMINATE POTENTIAL WORKER EXPOSURE IN PROCESSOR PLANTS. CURRENTLY AN INTENSIVE INTERNATIONAL RESEARCH AND DEVELOPMENT PROGRAM SPONSORED BY COMPANIES AND INDUSTRY ASSOCIATIONS IS TAKING PLACE WITH HUNDREDS OF SCIENTISTS AND TECHNICIANS ENGAGED IN THE PROGRAM (2).

WHAT ARE THE CURRENT REGULATIONS CONCERNING WORKER EXPOSURE LEVELS IN VCM GAS AND PVC RESIN PLANTS?

THE OCCUPATIONAL HEALTH PROTECTION BRANCH OF THE ONTARIO MINISTRY OF HEALTH RECENTLY ISSUED DATA SHEET #21 WHICH SETS A MAXIMUM TIME-WEIGHTED AVERAGE OF 10 PPM OF VCM DURING AN EIGHT-HOUR DAY AND A CEILING LEVEL OF 25 PPM AS MEASURED OVER A 15 MINUTE TIME PERIOD. B. C. RECENTLY

- (2) The Manufacturing Chemists Association, the Society of the Plastics Industry, Inc., individual companies and producers in the U. K. and Europe have all embarked on research programs. Within the North American plastics industry alone, hundreds of scientists and technicians are employed full-time on intensive research programs aimed at developing new technology which will reduce VCM exposure and residual VCM in PVC resin. The combined cost of these programs is estimated to be in excess of \$100 million over the next three years.

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UNREACTED VCM IN CERTAIN PVC BOTTLED WINES, DISTILLED SPIRITS AND VINEGAR, NO EVIDENCE IS AVAILABLE TO INDICATE THAT THE OCCURRENCE HAS ENDANGERED THE HEALTH OF USERS.

SINCE EVIDENCE OF MIGRATION WAS DISCOVERED, PVC RESIN PRODUCERS ARE WORKING TO DEVELOP IMPROVED TECHNOLOGY SO THAT MANUFACTURERS CAN PRODUCE PVC BOTTLES WHICH DO NOT CONTAIN DETECTABLE AMOUNTS OF RESIDUAL VINYL CHLORIDE MONOMER USING THE MOST SENSITIVE INSTRUMENTS AVAILABLE.

UNREACTED VCM DOES NOT EXIST IN FOOD WRAP AS MEASURED BY THE MOST SENSITIVE INSTRUMENTS AVAILABLE TODAY WHICH MEASURE VCM DOWN TO 50 PARTS PER BILLION.

SOME CONCERN HAS BEEN EXPRESSED OVER THE ODOUR EVIDENT WITH MOST VINYL PRODUCTS SUCH AS AUTOMOBILE SEAT COVERS. THIS ODOUR IS NOT VINYL CHLORIDE MONOMER. IT IS THE SMELL OF OTHER COMPOUNDING INGREDIENTS

HOW MANY CANADIANS ARE EMPLOYED WITHIN THE VCM/PVC RESIN INDUSTRIES?

ABOUT 600 MEN AND WOMEN ACROSS CANADA ARE EMPLOYED IN THE VINYL CHLORIDE MONOMER OR POLYVINYL CHLORIDE RESIN PRODUCING PLANTS. A FURTHER APPROXIMATELY 50,000 PEOPLE WORK IN PLASTICS PLANTS PRODUCING PVC COMPOUNDS AND THOUSANDS OF FINISHED PRODUCTS. THE CANADIAN PVC INDUSTRY GENERATES AN ANNUAL INCOME OF ABOUT \$500,000,000.

WHICH COMPANIES MANUFACTURE VCM GAS AND PVC RESIN IN CANADA?

THERE ARE TWO VINYL CHLORIDE MONOMER (GAS) MANUFACTURERS: DOW CHEMICAL OF CANADA LIMITED, SARNIA; AND GULF OIL CANADA LIMITED, VARENNES, QUEBEC.

THREE COMPANIES PRODUCE PVC RESINS AND COMPOUNDS: B. F. GOODRICH CANADA LIMITED, NIAGARA, ONT. AND SHAWINIGAN, QUE.; IMPERIAL OIL LIMITED, SARNIA AND MONSANTO CANADA LTD., MONTREAL.

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polyvinyl chloride product. From a public health standpoint, such bans are completely unnecessary and would serve only as meaningless gestures.

Question: Did the PVC industry withhold important information on the health effects of vinyl chloride from the public?

Answer: The PVC industry throughout the world has consistently acted in a responsible manner with regard to the development and dissemination of information on vinyl chloride. The industry has sponsored the majority of the medical research on vinyl chloride conducted to date, and essentially all of it conducted before 1974, when the first tentative link between vinyl chloride exposure and angiosarcoma in humans was discovered by an industry doctor and publicly announced by his company. In fact, were it not for the actions taken by the PVC industry from 1970 onward, we might still know next to nothing about the health effects of vinyl chloride.

Question: Does vinyl chloride increase the risk of still births and miscarriages among the wives of heavily exposed industry workers?

Answer: While one recent research project at a single plant in Pennsylvania reported that such a risk may exist, serious scientific questions have been raised concerning the manner in which the study was conducted. It is clear that a more thorough scientific investigation of this subject will be required before any definitive conclusions can be reached. In addition, since the research was conducted, vinyl chloride exposure levels throughout the industry have been reduced

a hundredfold or more. Even if a problem did exist, it has already been eliminated.

Question: Does vinyl chloride cause birth defects in communities with PVC facilities?

Answer: Because of a report from Ohio of excess birth defects in three widely separated communities with PVC facilities, the Center for Disease Control (CDC) of the U.S. Department of Health, Education and Welfare conducted its own two-part study—one part in Pennsylvania and the second in Ohio. CDC concluded, on the basis of these investigations and a thorough analysis of the existing research data, that the evidence to date did "not establish any association between (birth defect) cases and vinyl chloride exposure."

PVC AND HEALTH QUESTIONS AND ANSWERS

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PVC AND HEALTH QUESTIONS AND ANSWERS

Since early 1974, vinyl chloride, the gaseous industrial chemical from which polyvinyl chloride (PVC) plastic is made, has been the subject of widespread misunderstanding regarding questions of occupational and public health. While a variety of erroneous and misleading impressions concerning vinyl chloride and PVC have been created in the public mind, the known facts, supported by extensive medical and technical research, are that:

1. The development of angiosarcoma of the liver, a rare form of cancer, from vinyl chloride exposure has been confined exclusively to the occupational setting.
2. Angiosarcoma may develop only after the inhalation of substantial amounts of vinyl chloride over an extended period of time.
3. There is no evidence of hazard to the general public either from exposure to the minute amounts of vinyl chloride that may be found in the air around PVC plants, or from the use of finished polyvinyl chloride products.

Following are some questions commonly asked about vinyl chloride and health. Answers are based on known scientific evidence and industry experience.

Question: What is PVC and how is it used?

Answer: Polyvinyl chloride or PVC is the second most widely used plastic resin in the United States. It is produced from vinyl chloride gas by a process called polymerization. The resin is, in turn, fabricated

into a wide variety of consumer and industrial products, including floor tile, curtains, shoes, electrical insulation, telephone equipment, medical-surgical devices, phonograph records, food packaging, upholstery, umbrellas and raincoats, luggage and sporting goods. Approximately 2.2 million American jobs are directly or indirectly dependent on the PVC industry.

Question: How serious an occupational hazard is vinyl chloride?

Answer: Over the past 15 years, fewer than 20 deaths from angiosarcoma have occurred among U.S. workers heavily exposed to vinyl chloride gas. The workers' jobs principally involved cleaning residue of PVC resin from the reactors in which it was produced. While it can be expected that some additional deaths will occur in the future as a result of these heavy past exposures, with the strict control measures instituted over the last two years, there is every reason to believe that vinyl chloride related disease has already been eliminated as an occupational problem.

Question: Is vinyl chloride a major air pollutant?

Answer: No. Measurements taken by the Federal Environmental Protection Agency (EPA) determined that, even in the past, the average exposure of individuals living in proximity to vinyl chloride gas and PVC resin plants was many times lower than that now considered to be safe for occupational exposure. As a purely precautionary step, new EPA regulations will further significantly reduce even this minimal exposure. In addition, the EPA has concluded that the potential public

exposure from PVC fabricating plants is so minimal as to require no regulations whatever.

Question: Does vinyl chloride cause disease in the general public?

Answer: No. A government survey of all angiosarcoma deaths in the United States between 1964 and 1974 found no excess of deaths from this disease among people living within five miles of vinyl chloride gas and PVC resin plants. The report concluded: "This survey has produced no evidence that living around vinyl chloride plants is a risk factor in the occurrence of liver angiosarcoma." In addition, there is no evidence whatsoever that any person has contracted this disease from the use of finished PVC products, or from ingesting food or beverages packaged in PVC containers.

Question: Is it safe to consume food or beverages packaged in PVC?

Answer: Yes. As a result of strenuous industry efforts over the past few years, the residual vinyl chloride content has been reduced to "non-detectable" levels in packaging products made from food-grade PVC resins. Therefore, there is no reasonable possibility of vinyl chloride migration into foods, drugs, cosmetics or other products contained in such packages.

Question: Should the manufacture and use of PVC products be banned?

Answer: Vinyl chloride concentrations in the workplace, in community air, and in finished PVC products are being rigidly controlled, and there is therefore no reason to ban the manufacture or use of any