VINYL CHLORIDE REVIEW

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Statement

by

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Before a Fact-Finding Hearing on The Possible
Hazards of Vinyl Chloride Manufacture and Use
for The Occupational Safety and Health Administration

February 15, 1974

U. S. Department of Labor
Washington, D.C.

*a division of The B.F.Goodrich Company

TESTIMONY FOR FACT-FINDING HEARING FOR OSHA, CALLED BY OFFICE OF SECRETARY OF LABOR, FEBRUARY 15, 1974, WASHINGTON, D.C.

My name is Anton Vittone. I am president of B.F.Goodrich Chemical Company, a division of The B.F.Goodrich Company. Our headquarters are at 6100 Oak Tree Boulevard, Cleveland, Ohio (44131). I have a prepared statement, from which I will now read and submit for the record of this hearing. With me to assist me in answering questions which may follow this presentation are Maurice N. Johnson, M.D., director of environmental health; Dr. Roger W. Strassburg, director of environmental affairs, and L. B. Crider, senior scientist and specialist in analytical chemistry and monitoring systems — all of B.F.Goodrich. Their biographies are attached to our written paper.

Over the years, our Company has sought to maintain a safe working environment through two basic means — containment of potentially or known toxic materials during the manufacturing process and, secondly, protection of our employes through work practices, education and equipment.

Our efforts to maintain a safe working environment have been in keeping with then known scientific information or data relating to levels of exposure which has resulted in decreasing levels of exposure with time.

Our recent discovery of four deaths from a rare type of liver cancer among employes at our Louisville plant was, to our knowledge, the first evidence indicating a possible relationship between human angiosarcoma and chlorinated hydrocarbons used in the production of polyvinyl chloride resins (PVC). Our confirmation of the significance of this new evidence convinced us that we should report it to our employes and to the Federal and state agencies with primary scientific responsibility for occupational health.

Our statement today will focus on what we have learned about the four deaths at Louisville and our knowledge of previous toxicological data. We will also summarize our program to further safeguard employes now on the job through increased containment of vinyl chloride in processing and reduced worker exposure during all phases of the operation.

The B.F.Goodrich Company began commercial production of polyvinyl chloride resins and compounds in 1937. We currently operate five such plants — at Louisville, Kentucky; Avon Lake, Ohio; Long Beach, California; Henry, Illinois, and Pedricktown, New Jersey, and a vinyl chloride monomer plant at Calvert City, Kentucky. Approximately 1,700 of our employes are engaged directly in these processes. The Louisville, Kentucky plant is the oldest of our operating polyvinyl chloride resin plants having initially started production in 1942. We supply finished resins and compounds to about 2,200 domestic customer plants.

The Technologies Involved in the Production and Use of Vinyl Chloride

There are two types of vinyl chloride monomer processes: acetylene based and ethylene based.

B.F.Goodrich has operated both types. Prior to the early 1960's, our principal process for vinyl chloride involved the reaction of acetylene and hydrogen chloride using a mercuric chloride catalyst deposited on carbon. Starting with a pilot plant at Louisville in 1957 and culminating in a petrochemical complex at Calvert City in 1964, we converted to our present ethylene based vinyl chloride process. This consists of three operations: (1) reaction of ethylene with chlorine to produce ethylene dichloride, (2) thermal cracking of ethylene dichloride to produce vinyl chloride and hydrogen chloride and (3) reaction of hydrogen chloride with more ethylene in the presence of oxygen to produce more ethylene dichloride. The latter process is known as oxychlorination.

Significantly, the vinyl chloride monomer, produced in both processes, is distilled to yield commercial vinyl chloride with 99.9% purity. The purified vinyl chloride is either pipelined as a liquid under pressure to an adjacent consuming plant or transferred to pressurized tank cars for shipment to other polyvinyl chloride resin plants.

There are four types of polyvinyl chloride processes: suspension, emulsion, mass and solution. B.F.Goodrich Chemical uses the first three types with over three quarters of its production being by the suspension process.

The steps in the process for suspension are:

- Vinyl chloride monomer is received at the plant in pressurized tank cars as liquid.
- It is transferred to storage tanks and then piped in a closed system to reactors.
- Water, suspending agents and catalysts are added to the reactors.
- Polymerization is conducted at controlled temperatures.
- Unreacted monomer is recovered and recycled to the process.
- Water is centrifuged from the stripped polymer slurry and the wet polymer cake is dried.
- Dried polymer is bagged or siloed for bulk shipment or transferred to compound operations.

The emulsion PVC process differs only in the types of emulsifiers and catalysts used in the reactor.

- Most emulsion PVC processes in our plants are followed by spray drying of the emulsion.

The mass PVC process differs primarily in that it is anhydrous — no water is used in polymerization. After unreacted monomer is recovered, the dry powder is packaged.

Compounding

In all of our PVC production plants, we convert part of our resins into compounds in powder or cubed form. This compounding operation is the next step toward the finished products.

- PVC powder is mixed with stabilizers, lubricants and, in some cases, plasticizers in powder mixers of various types.
- The powder mix is fluxed in internal mixers and subsequently diced or pelletized before packaging for shipment.

B.F.Goodrich Toxicity Experience

In connection with these processes, our Company has had some experiences that we want to review with you in order to complete your understanding of certain factors that prompted us to interpret the most recent events as we did.

In mid-1964, Dr. John L. Creech, our Louisville plant physician, reported that an unusual hand problem had developed among a few employes who entered the polymerization reactors to manually remove the buildup of solid PVC from the reactor walls. This was the first time we encountered a problem anything like this. Dr. Creech's observation was found to confirm European published reports of a similar problem.

We called a meeting with other PVC manufacturers to review the situation and participate with them in an extensive research program through the Manufacturing Chemists Association. We then cooperated in a worldwide investigation of what came to be known as the "hand problem" or acroosteolysis. Our employes were advised of the problem and a continuing monitoring system of hand X-rays was established at all our plants. These studies of the hand problem correlated only with manual cleaning of PVC reactors.

Despite the lack of conclusive evidence as to a chemical cause of the hand problem, we initiated an aggressive program to reduce this type of exposure. Goodrich developed a hydraulic reactor cleaning process which is used on all our reactors. The use of hydraulic reactor cleaning reduced substantially the number of entries into reactors, and thus the manual hand effort as well as the exposure to vinyl chloride. In the past several years we have observed no new cases of the hand problem.

In May, 1970 Dr. P. L. Viola, of Rome, reported the appearance of tumors in rats exposed to 30,000 ppm of vinyl chloride vapor in inhalation studies. This level is close to the lower explosive limit of vinyl chloride vapor.

Nevertheless, knowledge of this published information caused the MCA Vinyl Chloride Task Group to initiate a suitable protocol to determine whether tumors could be induced at levels of exposure above or below the 500 ppm maximum standard then in effect.

In conjunction with the development of this protocol, the MCA task force learned of similar animal research which had been initiated by some European PVC manufacturers some time after Dr. Viola's report.

The MCA animal test program began in September, 1973. In addition, the MCA program was expanded to include an industry-wide epidemiology study now under way.

In January, 1973 we intensified air sampling analysis in all our plants to determine more accurately the levels of vinyl chloride monomer exposure. We soon learned that commonly used air sampling techniques were inadequate for fast measurements at low levels for extended periods of time and for determining the cause of any increase in level. Therefore, we investigated all other monitoring techniques, including those being used in other companies, and decided that we needed to develop our own advanced system which would be capable of monitoring at very low levels and over extended periods of time.

While we had been concentrating on reduction of any process loss of vinyl chloride for years, we began a series of special plant manager meetings in mid-1973 to minimize worker exposure to vinyl chloride, to discuss new monitoring systems and to put into effect new work practices. We established an interim goal of 50 ppm maximum exposure and are working toward lower levels.

Louisville Situation

In the spring of 1973, Dr. Creech believed that he was observing among some employes an increasing incidence of symptoms normally associated with possible liver ailments. He discussed his concern with Phillip H. Lawrence, manager of the Louisville plant, and recommended that liver function tests be initiated among certain groups of the plant's PVC employes.

The Company's newly appointed director of environmental health, Dr. Maurice N. Johnson, who is with me today, subsequently went to Louisville and started the testing program involving 271 employes.

The tests, which were completed in early December, 1973, showed that 55 employees had some evidence of slight liver abnormalities. Because of the known limitations of liver tests, these results were not in themselves a major cause for concern.

On December 18, Dr. Johnson again visited the Louisville plant. He consulted with Dr. Creech on these results and they agreed to retest those employes showing any indications of abnormality. These tests have just been completed and are now being evaluated.

In this meeting, Dr. Johnson was informed by Dr. Creech that he had recently learned that an employe died in March, 1973 of angiosarcoma of the liver. Dr. Creech also reported that this rare type of cancer prompted him to review medical records concerning another employe and former patient who died of liver cancer in 1971 and that review confirmed it was an angiosarcoma. Because of Dr. Creech's growing concern and Dr. Johnson's awareness of other pertinent toxicological studies, they reviewed available medical records in the plant and found that another employe had died of an unknown type of liver cancer in 1968. They also learned that another employe was critically ill with a diagnosis of cirrhosis. This man died the following day.

Dr. Johnson returned immediately to Akron for a special meeting with top corporate officers at which the developments at Louisville were reviewed. The decision was made to begin an in-depth investigation with the assistance of outstanding consultants in the field of industrial medicine. Dr. Johnson contacted Tabershaw-Cooper Associates, Inc., of Berkeley, California, because of their reputation and also their involvement in the MCA work that was mentioned earlier. Dr. Johnson met with Dr. Irving R. Tabershaw in California on January 14 and 15 to review all the information then known to the Cmpany. Before returning to Akron, Dr. Johnson learned that the cause of the third death, which had occurred on December 19, was angiosarcoma of the liver.

Another in a series of top management meetings was held on January 18 to discuss these developments. Dr. Tabershaw flew to Akron for a meeting with corporate and divisional officers on Sunday evening, January 20.

Because of the possibility that these deaths from a rare type of liver cancer might be work-related, the decision was made to inform the Occupational Safety and Health Administration (OSHA) through the Kentucky Department of Labor and the National Institute of Occupational Safety and Health (NIOSH), as well as to provide the essential information to our PVC employes, union officials and the public.

The initial meeting with NIOSH took place in Washington on January 22 after Doctors Johnson and Tabershaw returned from a visit to the plant and consultation with Dr. Creech in Louisville on January 21. The notification to OSHA through the Kentucky Department of Labor was made in Louisville by Doctors Johnson and Tabershaw on January 23.

A public statement was also released by the Company on January 23. A second statement was issued to the news media on January 29 immediately after it was learned that a review of autopsy records confirmed the cause of the 1968 death as angiosarcoma of the liver.

During this period, Harry B. Warner, president of B.F.Goodrich; Thomas B. Nantz, executive vice president, and I held private meetings with the families of three of the deceased employes. On the same day, Messrs. Warner, Nantz and I inspected the Louisville plant to observe current work practices and exposure levels. After these observations and consultation with Doctors Johnson and Tabershaw, we concluded that the existing situation warranted continued operation of the polyvinyl chloride facility.

Epidemiological Studies

We have actively supported and participated in both animal and epidemiological studies through the MCA's Vinyl Chloride Task Group of its Occupational Health Committee.

Because of recent developments, we have expanded the scope of our part of the MCA epidemiology study in order to obtain as in-depth a study as possible of employes exposed to vinyl chloride and related chemicals.

The deceased employes had an average exposure of approximately 19 years to vinyl chloride and 10 years to vinylidene chloride. They also had variable exposure times to such volatile organic chemicals as vinyl acetate, methyl acrylate, ethyl acrylate, methanol and chlorinated solvents.

It would be premature to report on the liver activity tests now in process at all our PVC plants or to provide any statistical analysis of the correlation with chemical exposures. We can tell you that no other cases of angiosarcoma have been found in our preliminary review of death records of employes and retirees from Louisville and our other plants. This review is continuing.

Summary

We have attempted to provide information with respect to our findings of four cases of angiosarcoma of the liver of deceased employes of our Louisville, Kentucky, plant which have brought about this hearing. With respect to Item 6 of the agenda, i.e., "whether the available information warrants the issuance of an Emergency Temporary Standard, or the commencement of a regular rule-making under Section 6(b) of the Occupational Safety and Health Act," we recommend that your Agency proceed with the regular rule-making procedure under Section 6(b).

We will do all we can to protect the health and safety of our employes. To help achieve these ends, we have brought exposure levels in all our operations below 50 ppm on a time-weighted average and are working toward lower levels of exposure. Our plant monitoring procedures are reliable and are being improved. We are in the process of providing liver function tests to all exposed employes. We are implementing most of the temporary precautionary procedures recommended by NIOSH on January 31 at all plants as rapidly as possible. Several recommendations will require further clarification and discussion with NIOSH before implementation. Our Medical Department is working closely with government and other medical authorities to specify the best possible medical screening and testing procedures.

In summary, the clinical evidence associated with the deaths of four of our employes identifies the need for scientific inquiry beyond the experience of any one company or industry group.

L B Downey

KEY POINTS FROM MR. VITTONE'S TALK
AT NEW YORK ACADEMY OF SCIENCES
MAY 10, 1974

Today, PVC is used in hundreds of products and also in the production of essential components for many other assembled products. Hundreds of thousands of workers are employed in industries that produce or depend on PVC for the manufacture of countless products.

Compared with just 10 years ago, the degree of exposure to vinyl chloride in our plants is many times lower as a result of closer monitoring and better controls of the various processes. Since our announcement of the Louisville situation in January both we and the industry have made additional substantial progress. Medical surveillance of employees is also improved.

In the past four months, we have accelerated these programs. In addition, we have redirected our other research and development effort by placing priority emphasis on lower exposure and starting new programs in these areas. In fact, we now have 135 scientists and technicians at our Research and Development facilities and plant facilities working on process and product improvements directed at lower vinyl chloride losses and lower exposure.

Our goals are to approach negligible losses of vinyl chloride to the air, to the water and in our PVC resins. Today we do not have the engineering capabilities of doing this. But, there is no more important activity in our operations today than to find out how to do it.

As hard as we try, I realize that the entire job cannot be done overnight.

We must look to science and technology and allow time for the process improvements, engineering, and installation of facilities that will lead to negligible losses of vinyl chloride to the air, water and in the PVC resins.

We can expect incremental improvements as research and development begin to pay returns.

Finally, industry, labor, government, and the scientific community must continue to cooperate to make the most of our time and our resources. All of us have a stake in the outcome of these efforts to assure the safety and well-being and continued employment of the thousands of workers in these industries.

The underlined sections represent the main points of our present position on this subject.

BFG10372

Anton Vittone - Speech
New York Academy of Sciences
May 10, 1974

From the beginning, when we first confirmed three angiosarcoma cases at Louisville, we made it a point to communicate openly and to stick to the facts. That remains our policy because we believe that self-serving comments and speculation serve no useful purpose. We realize that workers and the public at large want answers, not hollow statements.

We still agree with a statement that Dr. Selikoff made on February 15 at the OSHA hearing in Washington. In response to a question, Dr. Selikoff pointed out that data are badly needed and that it would be prudent to confine our judgment to the information at hand.

We believe this is <u>the</u> prudent course to follow with full urgency.

As a result of our policy of openness, all of you, I am sure, know the essential facts about how we discovered the problem at Louisville and what we have been doing to correct it and also to prevent a situation like it from happening again. Therefore, there is no reason for me to review what is already known. Like yourselves, we are concerned mainly about providing a greater margin of protection for vinyl chloride workers in the future, and the treatment of those who may now be ill.

I want to speak to you tonight as a man who has spent 33 years in the fields of manufacturing, research and development, and engineering. My plant PVC manufacturing experience goes back to some 25 years ago when levels of exposure to vinyl chloride were many times what they are today.

In that period of time there were occasional plant areas where one could smell vinyl chloride indicating fairly high levels.

Specifically, I want to mention a few facts that may have been overlooked in the rush of earlier events or perhaps taken for granted. I also want to express some thoughts on how I believe we should go about planning the manufacturing improvements that are necessary.

Like other chemicals and materials, the use of vinyl chloride and polyvinyl chloride expanded because these products were essential in many applications. In meeting these various needs, the production of vinyl chloride and polyvinyl chloride has provided many substantial social and economic benefits, many of which are not even fully appreciated by people

within our industry.

It is only natural that an unexpected, serious problem like the one we have experienced would overshadow the good that has resulted from the production and use of vinyl chloride and PVC.

The initial impetus for the growth of these materials in the United States came from the requirements of national defense in World War II.

The fire resistant properties of PVC made it a superior insulation for electrical wiring for naval vessels and other military applications. It provided a degree of protection against fire that had not previously existed. There is no doubt that these PVC uses helped save many lives during the War and since then in similar military and commercial applications.

Following the War, many new uses were found for PVC because of its versatility and inherent performance qualities. Today, it is used in hundreds of products and also in the production of essential components for many other assembled products. Hundreds of thousands of workers are employed in industries that produce or depend on PVC for the manufacture of countless products.

All of us will have a better idea of the full scope and importance of PVC to the economy when Arthur D. Little completes its current economic impact study.

The economic importance of PVC around the world is indicated in current production estimates. World-wide output is nearly 18 billion pounds annually, including 4.6 billion pounds produced in 1973 in the United States.

Throughout its long and sustained growth, the PVC industry, and certainly our Company, have established excellent safety records.

The chemical industry's safety record, expressed as the number of lost time accidents per million man-hours worked, was 4.12 in 1973 which is substantially better than U.S. manufacturing in general and even better than the accident frequency rate in homes. In our case, for example, even though we are never satisfied with it, we had a low frequency rate of 1.02 in 1973.

Obviously, these records, even with the improvements that can always be made, did not just happen nor were they talked into existence. They result from the conscientious efforts of many people, managers, professionals, and workers to safeguard themselves

through every means known to us. In the case of vinyl chloride and polyvinyl chloride, we voluntarily put into effect better safety controls, installed new equipment and established tougher standards when new concerns arose, such as in the actions that were taken following the acroosteolysis problem in the mid-1960's and Dr. Viola's reports in 1970 and the subsequent research.

None of this, however, lessens our concern nor erases our remorse about the angiosarcoma cases that have been discovered at our Louisville plant and at a few other industry locations.

Ironically, the Louisville plant, which is a forerunner among PVC facilities, provided much of the PVC for insulating electrical wiring during World War II when so many lives were at stake.

A great many new programs have been started since our announcement in January, but the need for better and more data is obvious.

Nevertheless, important progress has been made in this short period, primarily because of the cooperation between industry, labor, government, and the scientific community which, more than any other factor, must continue in order to solve this problem.

This cooperation has impressed many observers, including a number of journalists. We also have been told that this is a good example of the type of cooperation that is needed for our society to solve its problems.

Meetings such as this can certainly help in the over-all effort.

As we plan ahead and consider our actions, we must recognize that previous work has significantly reduced exposure in our plants. These improvements, in our case, resulted from a combination of technological improvements and the construction of larger, more efficient facilities.

Looking back, with the benefit of hindsight, there may have been some steps that should have been taken sooner. No one wishes more than we do that the potential danger of higher exposure levels in the past would have been recognized early enough to prevent the deaths that have been discovered.

Unfortunately, hindsight is always better than foresight in any field or profession, but we should not completely overlook the many improvements that were made in the past, especially in recent years, in response to all that was known at various stages of the industry's development.

For example, we did provide safeguards for workers in our very first vinyl chloride and PVC facilities against the known hazards of fire, explosion, toxicity and mechanical equipment.

Our goal, then and now, is to reduce the degree of risk to a controllable level where proper precautions and watchfulness can further minimize the potential hazards that are not unlike those we encounter in daily activities at home, in travel, or even in recreational pursuits.

Compared with just 10 years ago, the degree of exposure to vinyl chloride in our plants is many times lower as a result of closer monitoring and better controls of the various processes. Since our announcement of the Louisville situation in January both we and the industry have made additional substantial progress. Medical surveillance of employees is also improved.

To seek further improvements, we must turn again to science and technology and allow adequate time for research and development and enough lead time to engineer, build, and install new equipment.

There are several processes with many variations in the PVC industry and many different products that must be studied in order to determine the best and fastest ways to decrease vinyl chloride exposure.

Some will lead to faster solutions by research and development than will be possible with others. This must be determined by looking at all the feasible possibilities.

At B.F.Goodrich, we have been working for some time on research and development programs to decrease losses of vinyl chloride.

In the past four months, we have accelerated these programs. In addition, we have redirected our other research and development effort by placing priority emphasis on lower exposure and starting new programs in these areas. In fact, we now have 135 scientists and technicians at our Research and Development facilities and plant facilities working on process and product improvements directed at lower vinyl chloride losses and lower exposure.

Our goals are to approach negligible losses of vinyl chloride to the air, to the water and in our PVC resins. Today we do not have the engineering capabilities of doing this. But, there is no more important activity in our operations today than to find out how to do it. It involves our most capable and dedicated people. Our full resources are supporting this work which is on a six-day week basis for most of the people who are involved. In fact, some of our pilot plant facilities are now operating a seven-day basis to accomplish these goals.

As hard as we try, I realize that the entire job cannot be done overnight. Even after promising new concepts are developed and tried, we still face the time for engineering, fabrication, and delivery of equipment and its installation.

While these intensive programs are continuing, we are working to develop new administrative and medical procedures, including better screening of employees on the job, and new hires, as well as better continuing medical surveillance.

In summary, I hope I have made these points tonight:

1. PVC has made substantial social and economic contributions to our society.

2. These benefits can increase as we work to reduce levels of exposure below those that have already been achieved.

3. We must look to science and technology and allow time for the process improvements, engineering, and installation of facilities that will lead to

negligible losses of vinyl chloride to the air, water and in the PVC resins.

4. We can expect incremental improvements as research and development begin to pay returns.

5. We must more closely coordinate medical procedures and surveillance and personnel administration with greater emphasis on prevention and research at the first sign of any unusual condition.

6. Finally, industry, labor, government, and the scientific community must continue to cooperate to make the most of our time and our resources. All of us have a stake in the outcome of these efforts to assure the safety and well-being and continued employment of the thousands of workers

in these industries.

Thank you for allowing me the opportunity to express my thoughts to you tonight.

6/21.

Statement of Anton Vittone
President, B.F.Goodrich Chemical Company
Prepared For
Presentation At
Department of Labor Hearings On
Vinyl Chloride, Occupational Exposure Standard
June 25, 1974

My name is Anton Vittone. I am President of B.F.Goodrich Chemical Company, a Division of The B.F.Goodrich Company. Our headquarters are at 6100 Oak Tree Boulevard, Cleveland, Ohio. I graduated in Chemical Engineering with a Masters Degree in 1939 from the University of Washington at Seattle. For the past 32 years I have been employed by The B.F.Goodrich Company. Most of my experience with Goodrich has been in the fields of manufacturing, development, and engineering having started as a shift foreman in manufacturing. Since April 16, 1974 I have served as chairman of the Society of The Plastics Industry's Committee of Vinyl Chloride Monomer and Polyvinyl Chloride Producers. Members of this Committee represent over 90 percent of the current United States capacity for the production of vinyl chloride and polyvinyl chloride resin.

I have prepared a statement in behalf of SPI and the Committee which I will read and submit for the record of this hearing. More detailed testimony concerning certain aspects of my testimony will be presented by others in behalf of SPI. My statement represents the views of the majority of the Committee, however, different positions will be expressed on certain sections of the proposed permanent standard by industry members in the course of this proceeding. The Committee is unanimous in its position that the proposed permanent standard is not technologically feasible and, if adopted, would shut down the industry.

The PVC and vinyl monomer producers are aware of the experimental work of Professor Maltoni and Industrial Bio-test Laboratories in which angiosarcoma of the liver has been reported in both rats and mice at long-term exposure levels as low as 50 ppm. We are also aware of the fact that in recent work reported by Professor Maltoni the angiosarcoma which developed in rats following long-term exposure at 50 ppm occurred at the end of their normal life span.

Dr. Marcus Key of NIOSH, in his letter to the Department of Labor on March 11, 1974, made the following comment and I quote -- "Based on theoretical considerations there is probably no threshhold for carcinogenesis although it is possible that with very low concentrations the latency period might be extended beyond the life expectancy" -- end of quote.

The recent results of Professor Maltoni of rats exposed to 50 ppm indicates that the latency period was approaching the life span of rats which we understand is equivalent to an 80 year human life span.

In turn, we all must be aware of the inherent uncertainties of extrapolating from animals to humans and also from high level of exposures that existed in our plants in earlier years to those that exist today.

The exposure of workers to vinyl chloride has varied with the age of the industry. In the 1940's the degree of exposure of workers to vinyl chloride

was no doubt greater than in the 1950's and, in turn, the 1950's versus the 1960's, etc.

Unfortunately records are not available on the precise level of exposure with respect to periods of the industry's history. In order to get some estimate of exposure levels in history we must depend on the recollections of employees as to levels of odor and work practices and to reconstruct today, conditions considered to exist 30 and 20 and 10 years ago. To the extent that this has been done, we believe that the average exposure in the decade of the forties could have been done, we believe that the average exposure in the decade of the forties could have been some forty times greater than they are today. With respect to peak exposures they no doubt were some 100 times of today's emergency standard of 50 ppm since employees were known to have become mildly intoxicated from exposure to vinyl chloride.

On the basis of this background of information, it is only prudent that we continue to decrease the level of exposure of our workers. While it can be argued that there is no safe level of exposure, the basis of the proposed standard, it can similarly be argued that there is no data showing that exposure levels as provided for under the emergency standard are not safe or of low degree of risk. The current levels of exposures, when considered in the light of past exposures especially in the decades of the 40's and the 50's, certainly must be considered in judging the degree of risk of a standard above the no-detectable level. It is simple to

assume zero exposure and, therefore, zero risk. The only practical way of accomplishing this is to shut down the PVC industry or to impose work practices which will create a greater immediate risk to health and safety than exposure to low levels of vinyl chloride.

It is the position of the industry, which I will detail later, that it will commit itself to lowering exposure of its workers by a combination of lower levels of vinyl chloride in the work atmosphere and work practices. Such a commitment cannot be accomplished overnight since, in certain areas, the technology for accomplishing it is, as yet, not developed and, when developed, facilities must be installed requiring time for engineering, procurement, and installation.

We fully recognize that there are those who will say that the industry can do better than it says and, therefore, tighter restrictions should be imposed than proposed by the industry. It should be recognized that the proposal which I will make later has already taken into consideration projections for improvement which are not in hand but depend on new developments and additions to facilities.

Polyvinyl chloride represents a large industry which, in 1973, had an estimated world-wide output of 18 billion pounds and a United States output of 4.6 billion pounds.

The initial impetus for the growth of PVC in the United States came from the requirements of national defense in World War II. The fire resistant properties of PVC made it a superior insulation for electrical wiring for naval vessels and other military applications. It provided a degree of protection against fire that had not previously existed. There is no doubt that these PVC uses helped save many lives during the War and, since then, in similar military and commercial applications. Following the War, many new uses were found for PVC because of its versatility and inherent performance qualities. Today, it is used in hundreds of PVC products and also in the production of essential components for many other assembled products. Hundreds of thousands of workers are employed in industries that produce or depend on PVC for the manufacture of countless products.

The production of vinyl chloride, its polymerization into PVC resin, and the processing of PVC resin into semi-finished or finished products is treated in the proposed permanent standard as one industrial health problem. However, each is an entirely different manufacturing operation posing its own problems, permitting and requiring different solutions. Of the hundreds of thousands of workers whose jobs are dependent on PVC only 6,500 are involved in the manufacture of vinyl chloride and polyvinyl chloride resins.

Furthermore, that segment that involves the production of polyvinyl chloride is not a monolithic operation. Several different processes are utilized

with many process variations and with a wide variety of polyvinyl chloride resin products. Current installations are extremely varied and do not lend themselves to the simple solution of a restricted area where employees would only work for a brief part of the work day and, thus, be able to utilize self-contained breathing apparatus as provided for in the proposed permanent standard. The imposition of the no-detectable level as provided for in the proposed permanent standard would require the full-time utilization of self-contained breathing apparatus during the work period in vinyl chloride and PVC resin producing facilities. This would impose a severe and unnecessary physical burden on our workers as well as a potential health and safety problem. Further, because of space limitations, it is impossible to use self-contained breathing apparatus in cleaning reactors.

Historically, the greatest exposure of workers to vinyl chloride has occurred in the polyvinyl chloride production segment of the industry.

Currently the level of exposure is lower in the vinyl chloride production segment of the industry. Nevertheless, the imposition of a no-detectable level standard for this segment of the industry, as proposed, would, as in the case of the PVC resin plants, require the full-time utilization of self-contained breathing apparatus with the problems and potential hazards I have already mentioned.

The third segment of the industry is that of processing and fabrication where the level of exposure is the lowest. Available data indicate that worker exposure in most work areas is at no-detectable levels as defined by the proposed standard.

The areas of potential exposure are those involving bulk unloading, storage, and mixing areas. Even in these areas it appears that level of worker exposure can be reduced to low levels by known engineering solutions. In addition, the reduction of residual vinyl chloride monomer in the PVC resin by the PVC resin producer will further lower the potential of worker exposure.

Since the problems of worker exposure in processing and fabricating plants are limited and engineering solutions are available, this segment of the industry should not be subjected to the full coverage of the proposed permanent standard.

With respect to PVC resin and vinyl chloride, the producers have stated that a no-detectable level for vinyl chloride, as defined, would shut the industry down.

As stated earlier, it is not feasible to require workers to continuously use self-contained breathing apparatus.

Therefore, there are only two ways to seek a no-detectable level: To eliminate all losses of vinyl chloride or to dilute losses through ventilation.

Neither of these alternatives is feasible, in our judgment, because losses from processing equipment will always occur. Some are identifiable and others are fugitive losses.

The fugitive losses are those losses which occur from mechanical equipment, such as valves, pumps, flanges or fittings, column manheads, reactor manheads, etc. and impossible to quantify. All plants have hundreds of valves, pumps, flanges, etc. all of which are a potential source of a small leak and which must receive constant attention. This is especially true in older plants with small reactors. The industry has, for years, tried to improve its losses from this source, has made progress and should continue to make progress. Nevertheless, this one type of loss will, in today's plants, provide detectable levels of vinyl chloride in many work areas. This is the primary source of vinyl chloride in the work atmosphere of today's polyvinyl chloride and vinyl chloride plants.

The identifiable losses are those losses which take place from our processes which are inherent in today's plants. While we know of their existence, they are not precisely measured but can be estimated. Technological

improvements requiring time for research and development followed by procurement of equipment and installation can reduce these losses. Any timetable projecting lower levels of exposure is dependent on projection of technological achievement.

The industry has made progress in reducing its losses of vinyl chloride as well as polymer from its processes. I am aware of newer PVC resin plants which have reduced total losses of PVC resin and vinyl chloride to 2%. This compares to an approximate 5% for the industry, in total.

The industry recommends the following standards for polyvinyl chloride resin plants:

> Effective October 5, 1974, a ceiling of 40 ppm of vinyl chloride and a maximum daily time weighted average of 25 ppm. Levels above 40 ppm would require the use of practical and effective respiratory protection.
>
> Effective October 5, 1975, a ceiling level of 25 ppm with no time weighted average. Levels above 25 ppm would require the use of practical and effective respiratory protection.
>
> Effective October 5, 1976, a ceiling level of 25 ppm with a maximum time weighted average of 10 ppm. Levels above 25 ppm

would require the use of practical and effective respiratory protection.

That sequential monitoring be required of work areas with proper alarms to limit peak exposures to those recommended. The peak exposure levels would be determined by the sequential monitoring system with a built-in 10 minute average sample and/or by a 10 minute grab sample. Instantaneous readings for determining exposure levels are highly unreliable.

The location and number of sampling points would be determined by statistical methods to make certain that the measurements represent the work areas.

The state of the technology today is one where excursions of vinyl chloride in the work atmosphere for one reason or another do occur, although the average level of vinyl chloride in the work atmosphere throughout the day is considerably below the level of such excursions.

The imposition of the 40 ppm ceiling will require the utilization of respiratory equipment for those periods of time when such excursions occur and when corrective action is taken.

The utilization of respiratory equipment for this purpose would not be excessive and, therefore, feasible. The adoption of a 25 ppm time weighted average exposure as of October 5, 1974 would, in practice, result in substantially lower time weighted average exposure for the working population than indicated by the 25 ppm time weighted average since this is a time weighted ceiling.

The adoption of a 25 ppm ceiling as of October 5, 1975 will require industry to make substantial progress in reducing levels of exposure during the one year period. A 25 ppm ceiling will further substantially reduce the time weighted average exposure. Theoretically, it could allow for an occasional 25 ppm time weighted average. However, exposure in such event is highly unlikely and would be rare.

The further imposition of a 10 ppm time weighted average standard on October 5, 1976 would, again, provide assurance of lower levels of exposure for, again, the 10 ppm time weighted average would become a ceiling by this method of measurement and, in practice, would result in substantially lower time weighted average exposure for the working population.

The industry believes it is feasible to operate under more restrictive standards in its vinyl chloride monomer producing operations.

The industry recommends the following standard for levels of exposure in its vinyl chloride monomer producing plants:

> Effective October 5, 1974, a ceiling of 25 ppm and a maximum time weighted average of 10 ppm. Levels above 25 ppm would require the utilization of practical and effective respiratory protection.
>
> Effective October 5, 1975, a ceiling of 10 ppm and a maximum time weighted average of 5 ppm. Levels above 10 ppm would require the utilization of practical and effective respiratory protection.

As in the case of the polyvinyl chloride resin plants, the adoption of a time weighted average standard will result in a practical exposure below these ceiling time weighted average values.

It should be recognized that these proposals represent ambitious, difficult levels of operational exposure dependent on large expenditures of money, reduced capacity and the development of technology not currently in hand. Many companies will probably require variances of time or methods, therefore, provision for such variances should be made in the permanent standard.

It should also be recognized that medical and epidemiological data may be developed in the meantime which will require or allow a re-examination of the proposed levels.

We will present testimony later in these hearings as to the feasibility of utilizing canister masks for protection over short periods of time. It is recommended that the utilization of canister masks be permitted when adequate.

The proposed permanent standard calls for the utilization of self-contained respiratory apparatus and an air-supplied impervious suit when cleaning vessels and doing other types of maintenance work. Such a proposal is not feasible, is potentially hazardous, and is unnecessary.

It is recommended that air line supplied respirators be permitted for such operations and, further, that water impervious clothing be used instead of air-supplied suits.

Earlier in this testimony I pointed out that the processing and fabricating segment of the industry currently has a low level of exposure and that problem areas can be solved by engineering methods.

The proposed permanent standard calls for labeling of polyvinyl chloride containing detectable levels of vinyl chloride as to its containing vinyl chloride, a cancer suspect agent absorbed by breathing and through the skin. Such action would essentially require that all polyvinyl chloride be so labeled and is inconsistent with prior standards with carcinogenic chemicals.

In view of the data which has been obtained in fabricating plants, it is recommended that appropriate labeling, as has already been discussed by Mr. Heckman, be required of polyvinyl chloride on October 5, 1974 only when the level of vinyl chloride in the polyvinyl chloride exceeds 0.1 percent.

The industry realizes that it is prudent on its part to reduce levels of vinyl chloride in the polyvinyl chloride resin and, therefore, will attempt in a short period of time to carry out the necessary research and development activities and, assuming success, procure and install the necessary facilities to reduce the vinyl chloride monomer content of polyvinyl chloride.

We believe it difficult, but feasible, by October 5, 1977 to have the major volume of polyvinyl chloride resin produced with less than 100 ppm of vinyl chloride in the polyvinyl chloride. The labeling level could then be dropped to 100 ppm.

6/21.

Statement of Philip J. Weaver
Director of Industry Affairs, B.F.Goodrich Chemical Company
Prepared For
Presentation At
Department of Labor Hearings On
Vinyl Chloride, Occupational Exposure Standard
June 25, 1974

My name is Philip J. Weaver. I am Director of Industry Affairs, B.F.Goodrich Chemical Company, a Division of The B.F.Goodrich Company. I graduated from Purdue University with a B.S. degree in Chemical Engineering in 1942.

Most of my assignments for the past 31 years with B.F.Goodrich have been closely aligned to the application and use of polyvinyl chloride materials by the plastics industry. I spent most of my time as a technical service expert in plastic processor plants for ten years. I have had plant experience in all conventional types of PVC processing plants.

I spent many years supervising work on the application and performance characteristics of PVC materials in product application laboratories and in market development activities. In addition, for a two-year period, I supervised staff services at our Technical Center, including safety programs and analytical services.

Most recently, as Manager of National Accounts, I was concerned with the requirements of multi-plant customers, and on my present assignment, I am involved with general industry problems such as presented by the proposed OSHA Standard on vinyl chloride.

I have prepared this statement to be submitted on behalf of the Vinyl Chloride (VC) and Polyvinyl Chloride (PVC) Producers Committee of The Society of The Plastics Industry (SPI). The statement will demonstrate that workers in PVC processor plants are not normally exposed to detectable levels of vinyl chloride gas -- i.e., levels of 1.0 ppm $\pm$ 50 percent. Therefore, processors of PVC should be viewed in a different light with respect to the proposed permanent standard.

Processors handle and process PVC resins, PVC pre-mixed compounds, PVC latexes (PVC suspended in water), and PVC resin dispersed or dissolved in plasticizer or solvents. There are at least 3,000, and possibly 4,000, such processing plants in the United States. Generally speaking, these plants are owner managed small businesses. The average number of workers per shift is estimated to be 10 to 20 in a typical PVC processing plant. These typically small companies, which are a most important segment of the plastics industry, generally do not have the highly scientific capabilities required for detection of vinyl chloride at 1 ppm $\pm$ 50 percent as detailed in OSHA's proposed permanent standard.

In order to provide general guidance for PVC processors, we determined the level of worker exposure to vinyl chloride in fourteen processing plants using various types of PVC materials. A scientific team supervised personal monitoring of the workers. The air samples collected in glass collecting tubes and in charcoal traps were tested according to a NIOSH recommended

procedure utilizing a gas chromatograph and backed up with additional sophisticated equipment in 10 of the 14 plants tested to specifically identify vinyl chloride gas. The research equipment provided accuracy in the range of 0.05 to 0.10 ppm. I will give details of one report and summarize the others.

Monitoring - Plant #12

Personal monitoring of workers for vinyl chloride exposure in a plant processing PVC medium porosity resin (B.F.Goodrich No. 300X6 and Diamond Shamrock No. 450) with hot powder mixing and extrusion equipment used to make rigid vinyl house siding and accessories. A sample pump and glass collecting tubes were utilized plus a Gas Chromatograph backed up by a Mass Spec. instrument and computer to attain detection levels of 0.1 ppm.

Workers Monitored	Vinyl Chloride - ppm
Extruder Operator	N.D.
Extruder Operator	N.D.
Mixer Operator - mezzanine	0.13 Trace
Asst. Mixer Operator - floor level	N.D.
Materials handler - raw materials	N.D.
Grinder Operator	N.D.
Packer	0.06 Trace
Day Worker - extrusion area	N.D.
Warehouse man	N.D.

WORKER EXPOSURE TO VC WAS WELL BELOW DETECTABLE LEVEL OF 1.0 PPM IN ALL OPERATIONS.

Personal Monitoring of PVC Processing Workers

Plant Mfg.	Type PVC Material Used	Type Process	No. of Operators Monitored	Results Greater than 1.0 ppm VC
Floor Covering	PVC Dispersion Resin	Mix & coating	9	None
Bottle Cap Closures	PVC High Porosity Resin	Mix & Extrusion	10	None
House Siding & Accessories	PVC Rigid Compound-Cubes	Extrusion & Molding	8	None
Drain, Waste & Vent Pipe	PVC Pipe Grade Resin	Mix & Extrusion & Molding	10	None
Blister Packaging Sheet	PVC Low Porosity Resin	Mix & Extrusion	10	None
Refrigerator Door Gaskets	PVC Plasticized Powder Compound	Extrusion & Fabrication	5	None
Molding & Dipping Liquids	PVC Dispersion Resin	Cold Mixing	4	None
Appliance Gaskets	PVC High Porosity Resin	Mix & Extrusion	7	1
Pre-mixed Compound	PVC Medium Porosity Resin	Mix Powder & Heavy Duty Mixing	5	None
Flexible Tubing & Shapes	PVC High Porosity Resin	Mix & Extrusion	8	None
Pipe	PVC Rigid Compound-Cubes	Extrusion	9	None
House Siding & Accessories	PVC Medium Porosity Resin	Mix & Extrusion	9	None
Non-Woven Batting	PVC Latex	Spray & Fusion	5	1
Flexible Shapes	PVC Plasticized Compound-Cubes	Extrusion	3	None
Total - 14 plants	8 basic types of PVC materials	8 different processes	102	2

In summary, 102 workers were monitored in 14 PVC processing plants using 8 basic types of PVC materials in 8 different manufacturing processes.

The typical result was non-detectable based on 1 ppm $\pm$ 50 percent accuracy. One worker was exposed to 1.25 ppm and one was exposed to 14.2 ppm while operating a makeshift supply system to a PVC latex spraying operation. In this latter situation, the normally used gravity feed system from a supply tank was not operating.

PVC resin, when hot mixed, releases residual vinyl chloride gas which must be exhausted. If proper ventilation is provided, the exposure is generally non-detectable in the work areas of forming, shaping, molding, coating and packaging as shown by data in this statement.

We acknowledge that there are some areas where there may be detectable quantities of vinyl chloride and where appropriate work practice and engineering control procedures might be required.

The following specific space sample data is submitted for information even though the samples were taken in non-work areas:

General Space Area	Specific Sample Area	Vinyl Chloride PPM
Mixing of PVC Compound	Inside - low speed mixer - cold	26
	Inside - low speed mixer - hot	84
	Inside - high speed mixer @ 100°F.	72
	@ 190°F.	310
	@ 230°F.	440
	Inside - cool down mixer	5 - 10
	Over - storage bin - after cooled	1
Unloading PVC Resin	Inside bulk car - air space above resin	1520
	Inside tank car - air space above latex	1770
	Inside box - air space above 1,500 lbs. of warm pre-mixed compound	20 - 150
	Inside bag - air space above resin	1 - 10

(If a worker does not purge the air space in a bulk car before taking samples, he may be exposed momentarily to 5 - 30 ppm of vinyl chloride.) Proper ventilation would reduce exposure to acceptable levels.

Paragraphs 1910.93q (a) (1) and (b) (4) would impose the provisions of the proposed standard on any area where vinyl chloride is capable of being released. This could cover all processors of PVC resin, PVC compound, and specialty PVC materials, such as latex and solutions of PVC.

We object to this blanket inclusion. Our data does not support this concept of inclusion of such processor operations. We find no detectable levels of vinyl chloride in most of the processing work places. Possible exposure, at varying levels, may occur in unloading, warehousing, or during mixing if appropriate engineering and work practice programs have not been implemented.

We urge that the standard be amended to exclude processor work areas or that a separate standard be developed to permit a processor to exclude most of his work areas from coverage after certification that he has provided for engineering control methods and a work practice program for the possible areas of exposure.

With appropriate control methods, exposure to VC in the processor's plant would be rare. We recommend the elimination of all other items in the proposed rules; namely, respiratory protection for vinyl chloride, protective clothing, medical surveillance, records and reports, and monitoring.

As pointed out in other SPI testimony, a majority of the PVC resin manufacturers have set a goal of reducing residual vinyl chloride in vinyl resins to 100 ppm by October, 1977, thus further minimizing exposure levels in PVC processor plants. It should be noted that the current levels of residual vinyl chloride are very low in many types of resins, i.e., in high porosity resins, in fine particle size dispersion resins, in pre-mixed compounds, and in a number of general purpose resins.

Reports of personal monitoring in 14 PVC processor plants are attached.

Monitoring - Plant #1

Personal monitoring of workers for vinyl chloride exposure in a plant processing PVC dispersion resins (B.F.Goodrich No. 121 and Diamond Shamrock No. 71) with cold mixing, reverse roll coating and fusion equipment used to make resilient floor covering. A sample pump and glass collecting tubes were utilized plus a Gas Chromatograph backed up by a Mass Spec. instrument and computer to attain detection levels of 0.1 ppm.

Workers Monitored	Vinyl Chloride - ppm
Operator #1 - plastisol mixing	0.3 Trace
Operator #2 - plastisol mixing	N.D. - Non-Detectable
Operator - plastisol deaeration	N.D.
Operator #1 - reverse roll coater	N.D.
Operator #2 - reverse roll coater	N.D.
Operator - oven	N.D.
Operator - Wind-up	N.D.
Fork Lift Driver - shipping	N.D.
Operator - printing line	N.D.

WORKER EXPOSURE TO VC WAS WELL BELOW DETECTABLE LEVEL OF 1.0 PPM IN ALL OPERATIONS.

Monitoring - Plant #2

Personal monitoring of workers for vinyl chloride exposure in a plant processing PVC high porosity resin (B.F.Goodrich No. 92) with hot mixing extrusion and stamping equipment used to make bottle cap closures. A sample pump and glass collecting tubes were utilized plus a Gas Chromatograph backed up by a Mass Spec. instrument and computer to attain detection levels of 0.1 ppm.

Workers Monitored	Vinyl Chloride - ppm
Blend Plant Operator - Platform	0.1 Trace
Blend Plant Operator - Boxing Area	0.1 Trace
Blend Plant Operator - Platform	N.D.
Blend Plant Operator - Boxing Area	N.D.
Extruder Operator -	N.D.
Extruder Operator - Die Tear Down	N.D.
Cap Inspector - 1 -	N.D.
Cap Inspector - 2 -	N.D.
Chopper Operator - Scrap Processing	N.D.
Extruder Operator -	N.D.

WORKER EXPOSURE TO VC WAS WELL BELOW DETECTABLE LEVEL OF 1.0 PPM IN ALL OPERATIONS.

Monitoring - Plant #3

Personal monitoring of workers for vinyl chloride exposure in a plant processing PVC Rigid Compound - Cubes (B.F.Goodrich No. 7082) with extrusion, injection molding, and vacuum forming equipment used to make rigid vinyl house siding and accessories. A sample pump and glass collecting tubes were utilized plus a Gas Chromatograph backed up by a Mass Spec. instrument and computer to attain detection levels of 0.05 ppm.

Workers Monitored	Vinyl Chloride - ppm
Extruder Operator	N.D.
Grinder Operator	N.D.
Injection Mold Operator	0.08 Trace
Extruder Operator	N.D.
Vacuum Forming Operator	0.09 Trace
Fabricator	N.D.
Extruder Operator	N.D.
Die Dismantler	0.06 Trace

WORKER EXPOSURE TO VC WAS WELL BELOW DETECTABLE LEVEL OF 1.0 PPM IN ALL OPERATIONS.

Monitoring - Plant #4

Personal monitoring of workers for vinyl chloride exposure in a plant processing PVC pipe grade resin (B.F.Goodrich No. 103EPF76) with extrusion, injection molding and sawing equipment used to make rigid vinyl DWV construction pipe and fittings. A sample pump and glass collecting tubes were utilized plus a Gas Chromatograph backed up by a Mass Spec. instrument and computer to attain detection levels of 0.1 ppm.

Workers Monitored	Vinyl Chloride - ppm
Operator - Mixing Room - PVC	N.D.
Production Worker-PVC-Extrusion-Saw	N.D.
Die Setter - PVC extrusion at die	N.D.
Floor Worker-PVC-Inj.Molding-Packaging	N.D.
Production Worker-PVC (saw-packaging)	N.D.
Production Worker-PVC (saw packaging)	N.D.
Operator - Blending - PVC	N.D.
Die Setter - PVC - extrusion (die)	N.D.
Hopper grinder & filler-PVC-Inj.Molding	N.D.
Machine Operator-PVC-Inj.Molding	N.D.

WORKER EXPOSURE TO VC WAS WELL BELOW DETECTABLE LEVEL OF 1.0 PPM IN ALL OPERATIONS.

Monitoring - Plant #5

Personal monitoring of workers for vinyl chloride exposure in a plant processing PVC low porosity and low molecular weight resin (B.F.Goodrich No. 80X5) with hot mixing and sheet extrusion equipment used to make rigid vinyl sheet for blister packaging. The charcoal trap collection method was utilized plus a gas chromatograph backed up by a Mass Spec. instrument to attain detection levels of 0.05 ppm. These are time weighted average (TWA) data based on four hour exposures.

Workers Monitored	Vinyl Chloride - ppm
Mixing Operator	0.09 Trace
Extruder Operator	0.07 Trace
Mixing Operator	0.08 Trace
Mixing Operator	0.11 Trace
Line Operator	0.07 Trace
Mixing Operator	0.19 Trace
Extruder Operator	0.04 Trace
Extruder Operator	0.03 Trace
Extruder Operator	0.04 Trace
Extruder Operator	0.03 Trace

WORKER EXPOSURE TO VC WAS WELL BELOW DETECTABLE LEVEL OF 1.0 PPM IN ALL OPERATIONS.

Monitoring - Plant #6

Personal monitoring of workers for vinyl chloride exposure in a plant processing PVC plasticized compounds as premixed powders (several B.F.Goodrich compounds used) with extrusion plus sealing and trimming fabricating equipment used to make gaskets for refrigerators and dishwashers. The charcoal trap collection method was used plus a gas chromatograph. A Mass Spec. was not used to rule out interference of other hydrocarbons. Detection levels of total hydrocarbon identified as vinyl chloride should be in the range of 0.1 to 0.2 ppm. These are time weighted average (TWA) data based on approximately two hour exposures.

Workers Monitored	Vinyl Chloride - ppm
General atmosphere between extruders - Foreman Area	0.46 Trace
Personnel sample - sealing gaskets	0.51 Trace
Personnel sample - sealing refrigerator gaskets	0.63 Trace
Personnel sample - trimming refrigerator gaskets	0.13 Trace
Personnel sample - sealing dishwasher gaskets	0.21 Trace
Personnel sample - granulator operator	0.21 Trace

WORKER EXPOSURE TO VC WAS WELL BELOW DETECTABLE LEVEL OF 1.0 PPM IN ALL OPERATIONS.

Monitoring - Plant #7

Personal monitoring of workers for vinyl chloride exposure in a plant processing PVC dispersion resins (B.F.Goodrich No. 128 and Ethyl No. 255) with cold mixing used to make liquid plastisol formulations for sale to subsequent processors of molded and dipped items. The charcoal trap collection method was used plus a gas chromatograph. A Mass Spec. was not used to rule out interference of other hydrocarbons. Detection levels of total hydrocarbon identified as vinyl chloride should be in the range of 0.1 to 0.2 ppm. These are time weighted average (TWA) data based on approximately two hour exposures.

Workers Monitored	Vinyl Chloride - ppm
Personnel sample - opening bags and mixing batches	0.08 Trace
Personnel sample - working with color mixing tanks and loading mixes	0.07 Trace
Personnel sample - loading drums with mixtures	0.18 Trace
Personnel sample - lift-truck operator	0.07 Trace

WORKER EXPOSURE TO VC WAS WELL BELOW DETECTABLE LEVEL OF 1.0 PPM IN ALL OPERATIONS.

Monitoring - Plant #8

Personal monitoring of workers for vinyl chloride exposure in a plant processing PVC high porosity and some medium porosity resins (B.F.Goodrich No. 92 and 103EP) with hot mixing, extrusion, sealing and trimming fabricating equipment used to make gaskets for business machines and appliances. The charcoal trap collection method was used plus a gas chromatograph. A Mass Spec. was not used to rule out interference of other hydrocarbons. Detection levels of total hydrocarbon identified as vinyl chloride should be in the range of 0.1 to 0.2 ppm. These are time weighted average (TWA) data based on approximately two hour exposures.

Workers Monitored	Vinyl Chloride - ppm
Personnel sample - gasket extrusion area	0.08 Trace
Personnel sample - gasket extrusion area	1.25 Detectable
Personnel sample - operator trimming	0.16 Trace
Personnel sample - business machine part area	0.09 Trace
Personnel sample - gasket area	0.14 Trace
Personnel sample - hopper utility	0.06 Trace
Personnel sample - mixing compound	0.12 Trace
Personnel sample - mixing compound	0.12 Trace

WORKER EXPOSURE TO VC WAS WELL BELOW DETECTABLE LEVEL OF 1.0 PPM IN ALL OPERATIONS EXCEPT ONE - NOTE ONE GASKET EXTRUSION AREA SLIGHTLY OVER 1.0 PPM.

Monitoring - Plant #9

Personal monitoring of workers for vinyl chloride exposure in a plant processing PVC medium porosity resins (B.F.Goodrich No. 103EP types) with hot mixing including Banbury and continuous mixer units to make small cubes of solid vinyl for sale to processors to make vinyl siding, window components, and pipe. The charcoal trap collection method was utilized plus a gas chromatograph backed up by a Mass Spec. instrument to attain detection levels of 0.05 ppm. These are time weighted average (TWA) data based on four hour exposures.

Workers Monitored	Vinyl Chloride - ppm
Banbury Operator	N.D.
CML-Henschel Mixer Operator	0.16 Trace
Weigh Man (does not weigh resin)	0.08 Trace
Banbury Mill Operator (strips hot batch)	0.18 Trace
CML Mill Operator + cubing	0.32 Trace

WORKER EXPOSURE TO VC WAS WELL BELOW DETECTABLE LEVEL OF 1.0 PPM IN ALL OPERATIONS.

Monitoring - Plant #10

Personal monitoring of workers for vinyl chloride exposure in a plant processing PVC high porosity resin (B.F.Goodrich No. 92) with hot mixing, extrusion, sealing and forming equipment used to make flexible tubing and shapes. A sample pump and glass collecting tubes were utilized plus a Gas Chromatograph backed up by a Mass Spec. instrument and computer to attain detection levels of 0.1 ppm.

Workers Monitored	Vinyl Chloride - ppm
Mix Operator - mix room - charging blends	0.5 Trace
Mix Operator - while mix being heated	N.D.
Mix Operator - during blender discharge	0.2 Trace
Grinder Operator - regrind room - scrap	N.D.
Finishing Operator - heat sealing	N.D.
Extruder Operator - clearing die	N.D.
Tube Operator - tube cutter	N.D.
Fabrication - heat forming	N.D.

WORKER EXPOSURE TO VC WAS WELL BELOW DETECTABLE LEVEL OF 1.0 PPM IN ALL OPERATIONS.

Monitoring - Plant #11

Personal monitoring of workers for vinyl chloride exposure in a plant processing PVC rigid compound - cubes (B.F.Goodrich No. 8761) with extrusion and cut-off equipment used to make rigid vinyl pipe. A sample pump and glass collecting tubes were utilized plus a Gas Chromatograph backed up by a Mass. Spec. instrument and computer to attain detection levels of 0.1 ppm.

Workers Monitored	Vinyl Chloride - ppm
Grinder Operator - at saw cut-off	N.D.
Shift Foreman - in extrusion area	N.D.
Extruder Operator - near cooling tank	N.D.
Extruder Operator - next to puller	N.D.
Extruder Operator - next to die	N.D.
Shipping Clerk - Shipping Dept.	N.D.
Shipping Clerk - taken in warehouse	N.D.
Extruder Operator - at die	N.D.

WORKER EXPOSURE TO VC WAS WELL BELOW DETECTABLE LEVEL OF 1.0 PPM IN ALL OPERATIONS.

Monitoring - Plant #12

Personal monitoring of workers for vinyl chloride exposure in a plant processing PVC medium porosity resin (B.F.Goodrich No. 300X6 and Diamond Shamrock No. 450) with hot powder mixing and extrusion equipment used to make rigid vinyl house siding and accessories. A sample pump and glass collecting tubes were utilized plus a Gas Chromatograph backed up by a Mass. Spec. instrument and computer to attain detection levels of 0.1 ppm.

Workers Monitored	Vinyl Chloride - ppm
Extruder Operator	N.D.
Extruder Operator	N.D.
Mixer Operator - mezzanine	0.13 Trace
Asst. Mixer Operator - floor level	N.D.
Materials handler - raw materials	N.D.
Grinder Operator	N.D.
Packer	0.06 Trace
Day Worker - extrusion area	N.D.
Warehouse man	N.D.

WORKER EXPOSURE TO VC WAS WELL BELOW DETECTABLE LEVEL OF 1.0 PPM IN ALL OPERATIONS.

Monitoring - Plant #13

Personal monitoring of workers for vinyl chloride exposure in a plant processing PVC latex (PVC resin suspended in water - B.F.Goodrich No. 576) with spraying and fusion equipment used to make non-woven batting. A sample pump and glass collecting tubes were utilized plus a Gas Chromatograph backed up by a Mass Spec. intrument and computer to attain detection levels of 0.05 ppm.

Workers Monitored	Vinyl Chloride - ppm
Spray Area Operator	0.01 Trace
Take-Up Roll Operator	0.07 Trace
Oven & Control Panel Operator	0.02 Trace
Operator Feeding Spray Head (temporary)	14.2
Finished Product Storage Operator	0.25 Trace

The worker measured at 14.2 ppm was operating a make-shift supply system to the spraying operation. The normally used closed gravity feed system from a supply tank was not operating. The processor has been advised to use his closed system at all times.

WORKER EXPOSURE TO VC WAS WELL BELOW DETECTABLE LEVEL OF 1.0 PPM IN ALL OF HIS NORMAL OPERATIONS.

Monitoring - Plant #14

Personal monitoring of workers for vinyl chloride exposure in a plant processing PVC plasticized compound - cubes (B.F.Goodrich Nos. 83715, 8865, 83700) with extrusion equipment to make flexible shapes for automotive use. A sample pump and glass collecting tubes were utilized plus a Gas Chromatograph backed up by a Mass Spec. instrument and computer to attain detection levels of 0.05 ppm.

Workers Monitored	Vinyl Chloride - ppm
#1 Extruder Operator	0.03 Trace
#2 Extruder Operator	0.01 Trace
#3 Extruder Operator	N.D.

WORKER EXPOSURE TO VC WAS WELL BELOW DETECTABLE LEVEL OF 1.0 PPM IN ALL OPERATIONS.

Statement

by

John L. Nelson

Vice President-Manufacturing

B.F.Goodrich Chemical Company
6100 Oak Tree Boulevard
Cleveland, Ohio 44131

July 8, 1974

Prepared For Presentation

At

Department of Labor Hearings on

Vinyl Chloride, Occupational Exposure Standard

* a division of The B.F.Goodrich Company

I am John L. Nelson, vice president-manufacturing of B.F.Goodrich Chemical Company, A Division of The B.F.Goodrich Company. Our headquarters are at 6100 Oak Tree Boulevard, Cleveland, Ohio 44131.

I received a B.S. in Chemical Engineering from the University of Wisconsin in 1939. My experience in the chemical industry covers a period of thirty-five years, all of which has been with Goodrich, and most of which has been directly or indirectly connected with the production of vinyl chloride and polyvinyl chloride. I was located in our Louisville plant for nineteen years, during the last ten of which I served as plant manager. In 1961 I transferred to our Divisional offices.

Seated on this panel with me are all of the Goodrich representatives who participated in the presentation by The Society of the Plastics Industry, and who will be available to answer questions on our testimony. They are:

- Mr. Anton Vittone
  President, B.F.Goodrich Chemical Company
- Mr. Philip J. Weaver
  Director of Industry Affairs, B.F.Goodrich Chemical Company
- Dr. Roger W. Strassburg
  Director of Environmental Affairs, The B.F.Goodrich Company
- Dr. Maurice N. Johnson
  Director of Environmental Health, The B.F.Goodrich Company

Also included on this panel is Dr. Condict Moore, Professor of Surgery and Director of the Cancer Center, University of Louisville School of Medicine. Dr. Moore will present a statement summarizing the program which the University is initiating pursuant to a grant from Goodrich.

The main purpose of my testimony will be to examine the question of technical feasibility in the light of our current engineering and scientific knowledge. In addition, I will discuss on-going research and development programs directed at the reduction of vinyl chloride losses from our manufacturing operations. Our goal is to reduce vinyl chloride exposure to the lowest feasible levels and to preserve the jobs dependent upon this widely used and versatile plastic material.

We will discuss these subjects in terms of our own extensive experience. Specifically, we will review:

1. Vinyl chloride exposure levels in Goodrich plants.

2. Our current programs to reduce exposure levels, including engineering, work practices, and training.

3. Our research and development programs to reduce further exposure levels in the future.

We will conclude with our position on certain aspects of the proposed permanent standard.

Goodrich is a major producer in the U.S. polyvinyl chloride (PVC) industry. We began commercial production of polyvinyl chloride resins and compounds in 1937. We currently operate five polyvinyl chloride plants - at Louisville, Kentucky; Avon Lake, Ohio; Long Beach, California; Henry, Illinois; and Pedricktown, New Jersey. We supply finished resins and compounds to about 2,200 domestic customer plants.

We also operate a vinyl chloride monomer plant at Calvert City, Kentucky. We buy, sell, produce, and use vinyl chloride, and our monomer and polymer capacity represents approximately 15-18% of the domestic capacity for these products. We employ about 1,500 workers in vinyl chloride, polyvinyl chloride, and compounding operations.

Review of Levels of Exposure to Vinyl Chloride

Over the years, our Company has sought to provide a safe working environment through two basic means - containment of known or potentially toxic materials during the manufacturing process, and protection of our employees through work practices, education and equipment.

Our efforts to provide a safe working environment have generally paralleled known scientific information or data relating to levels of exposure. This has resulted in decreasing levels of exposure with time.

The properties of vinyl chloride have been frequently and adequately described by other witnesses. I will review briefly the characteristics most important in PVC production. It has an intoxicating effect in concentrations of about 5000 ppm in air. The level of concentrations in air at which it can be detected by smell varies with individuals, but ranges between 250 and 4000 ppm. Our processes require handling of this material both as a gas and as a liquid. The gas will liquify at 6°F. at atmospheric pressure, or at about 45 psi at ambient temperatures. In our plants, operating pressures range from a vacuum to 160 psi. These pressures, coupled with the thousands of potential leak sources, make it extremely difficult to control exposure. Vinyl chloride is completely colorless, and odorless up to fairly high concentrations. Thus, at low levels it cannot be detected except with sensitive instruments.

There are four types of polyvinyl chloride processes which are used to convert vinyl chloride monomer to PVC: suspension, emulsion, mass, and solution. Goodrich uses the first three types, with over three-quarters of its production being by the suspension process.

There are many variations within these types; problems and solutions applicable to one type of process, product or plant are not necessarily applicable to other processes, products or plants.

The equipment used in the conversion of monomer to polymer in all three processes consists of multiple units of vessels, pumps, piping and valves, with thousands of potential sources of small fugitive or elusive leakage of vinyl chloride gas. The process is batch-type and, after each reaction is completed, the vessel in which it is conducted requires varying kinds of purging, entering, cleaning, and preparation before the next batch can be started. These vessels, which we call polymerizers or reactors, have gone through an engineering evolution over the past thirty-five years.

During our first twenty years in the business, we used 1100-gallon reactors of stainless steel construction, which required entry and manual cleaning after every charge. This cleaning took about one hour, during which time workers cleaning vessels were exposed to vinyl chloride levels of an estimated 200-500 ppm. The worker would clean an average of five vessels every eight-hour work shift. We can only estimate early exposure levels, since the analytical sophistication to determine low levels of vinyl chloride in air has only been available in recent years. Our estimates were based on fragmentary data and interviews with employees to determine how often odor was evident, if and when they were aware of the intoxicating effect, and what level of explosimeter readings they might recall. While this method used to estimate exposure levels may seem crude by today's standards, our estimates are consistent with other similar testimony presented in this hearing.

Peak exposure levels ten and twenty years ago were one hundred times today's emergency standard, and probably averaged forty times today's average levels. My personal PVC experience goes back to when levels of exposure were of this magnitude.

Beginning in 1959, we experimented with glass-lined polymerizers and revisions to agitators and baffles to minimize buildup and cleaning time and did, as a result, reduce cleaning time to 20-30 minutes.

The next engineering breakthrough occurred in the late 1960's, with the Goodrich development of hydraulic reactor cleaning. This is a programmed high pressure water mechanism which is inserted into a polymerizer to remove buildup almost completely. This has greatly reduced human entry into polymerizers for manual cleaning. On some of our products, human entry has been reduced to as few as 3% of the batches. On some products, entry is still required after each batch. Over our total product mix, entry is required in about 10% of the batches.

Concurrent with the evolution of polymerizer design and mechanized cleaning, we installed additional equipment to improve the removal of vinyl chloride from the reactor prior to entry. With our current multi-step procedure, we have reduced vinyl chloride levels in open polymerizers down to the ambient level in the buildings today. The worker is further protected from vinyl chloride release from PVC resin buildup by use of an air line supplied respirator during the cleaning operation.

In the late 1950's, we began the development and installation of larger reactors. These steps reduced worker exposure, and also increased productivity and raw material efficiencies. Large polymerizers automatically reduce the number of vessels, the amount of interconnecting piping, and reactor opening and cleaning operations. We now operate reactors in sizes of 1100, 1750, 2500, 3300, 4300, and 5300 gallons.

Some of our recent engineering and development effort has resulted in further scale-up of polymerizer size. By mid-1975, we will start up a new facility utilizing polymerizers of significantly larger size, which I will describe later on.

Some of our PVC workers in the Louisville plant had an additional exposure to high levels of vinyl chloride because of infrequent entry into what we term "cold rooms". Basically, these were large, insulated, multi-story refrigerated rooms which housed equipment for the distillation and storage of vinyl chloride.

Operator activity in these rooms took 10 to 15 minutes, once or twice a shift; but, during those periods, exposure levels were up to 3000 ppm. Today, entry is permitted only with an air supplied respirator.

The background of the Goodrich Louisville, Kentucky angiosarcoma problem was covered by Mr. Vittone's statement at the OSHA fact-finding hearing on February 15, 1974.

At that time, we reported three deaths from angiosarcoma of the liver among Louisville plant workers. Since then, we have reported to governmental agencies two additional deaths and two living cases of the disease, all at our Louisville plant.

After extensive and intensive epidemiological investigation of all of our monomer and PVC workers, no cases of angiosarcoma have been found in any other location.

Current Programs to Reduce Levels of Exposure

All PVC plants in our manufacturing system have achieved significant reductions in the level of vinyl chloride in the general work areas over recent months. This progress has been measured through the use of organic vapor analyzers, both portable and fixed, and based on literally hundreds of readings every day. The average of the readings has been reduced from about 35-40 ppm early this year to about 12-14 today. These readings range from 1-2 ppm to some excursions over 50 ppm. We are working hard to reduce the frequency of these excursions. During these excursions, or when there is a risk of such excursion, workers are required to wear air-supplied respiratory protection.

This improvement is the result of aggressive and comprehensive programs carried out in each of our PVC plants and in our VCM plant to identify and correct leaks, initiate operating improvements and emphasize increased employee communications. Here are some of the more important parts of these programs.

Leak Reduction

Leak reduction has been the single greatest reason for reduced vinyl chloride levels. The indispensable key to this progress was diligent monitoring on a 24-hour a day, seven days per week basis to record concentrations of monomer and track down the exact source of each leak. Early in January, personnel were assigned in each plant to do nothing but measure and record monomer concentrations and identify sources of the concentrations. Then, corrective action followed swiftly. OVA monitoring is still being done to locate sources of leaks.

Now, continuous recording fixed Bendix organic vapor analyzers are installed in all polymerization buildings in all plants. The Bendix instrument shows a higher reading if there is a significant leak anywhere in the area. The leak is tracked down with the portable OVA and repaired.

Operating Improvements

We have also made many operating improvements that have helped to reduce vinyl monomer concentrations in the work area. These include:

Vessels and pipelines containing monomer such as polymerizers, strainers, tank car unloading lines and Hamer blind installations, are being more thoroughly evacuated to recovery pumps before opening.

New procedures have been implemented for opening reactor manhole covers which reduce emission to the work area.

Regular vinyl monomer recovery operations have been improved and monomer efficiency raised.

Number of entries and time of each entry into polymerizer vessels for cleaning have been reduced.

Better manhole lid closure seals have been developed for polymerizers.

General ventilation has been greatly improved in many buildings. Localized ventilation has been installed at some repetitive trouble spots, such as pump seals.

Compressor and vacuum pump seal water have been put into closed systems.

Draining from foam traps has been put into closed systems.

Some ventilation and vent stacks have been put high above buildings so no monomer can be drawn back into the work area.

Tank car loading pipelines are vented and purged to flare before disconnecting.

Tank car sampling procedure is being refined for venting sample containers and purging to flare.

Employee Communications

Also important to the effectiveness of the overall program has been personnel motivation, awareness, training and dedication. Considerable time has been spent in every plant to develop 100% diligence in keeping concentrations of vinyl monomer in the work atmosphere low. Employee cooperation has been excellent.

Potential for Further Improvements

Further improvements can be expected from our work in the following areas:

A continuing investigation of better gaskets and seals.

Installation of special localized ventilation where determined necessary.

Better general push-pull, sweep-through ventilation is being installed where it does not already exist.

Continuing education and motivation of our people.

Further improvement of automatic systems to warn of excursions.

Installation of magnetic level indicators on our fleet of tank cars to replace dip-tubes which release monomer in the tank car loader work place. This will require eighteen to twenty-four months to complete.

I mentioned earlier that we are constructing a new PVC facility. This is at our Louisville plant, and will start up about mid-1975. This installation is a part of our continuing program to improve our PVC resin manufacturing system. Preliminary engineering of this plant was started in late 1972, funds were appropriated in July-1973, and field construction work began early this year. It will employ large polymerizers, computer control, outdoor design and the latest technology. We expect vinyl chloride exposure levels to be lower than those currently existing in our PVC plants, but actual exposure levels will not be known until the fall of 1975.

We estimate that for the same capacity, a plant utilizing large reactors will have about 87% fewer potential fugitive leak sources compared with our smaller reactor plants.

Although this new facility incorporates our latest technology, we fully expect to make additional improvements resulting from our on-going research and development work. It is expected that some of these improvements will take up to 24 months after the completion of the developmental effort.

Research and Development

Goodrich is doing everything it can with current technology, as rapidly as possible, to reduce vinyl chloride exposure levels. Further improvements and reductions in levels will come from the engineering changes and work practices we outlined previously. Improvements beyond these can only be achieved through future technological breakthroughs. In the past five months, we have redirected and greatly accelerated our research and development efforts. We have 135 scientists and technicians at our Research and Development facilities and in our plants working on process and product improvements directed at lower vinyl chloride losses and reduced exposure. Our goal is to approach negligible losses of vinyl chloride from all sources.

About a quarter of the research and development effort is involved with analytical techniques and equipment, analyst training, and developmental analyses directed at worker exposure and residual monomer content of resins. During 1973, this effort resulted in selection of direct reading portable and sequential continuous monitoring equipment which have been essential tools in our efforts to reduce vinyl chloride levels in work areas of our production plants. Current effort is being directed toward more precise and rapid measurement of worker exposure.

About half of this research and development effort concerns fundamental process improvements to reduce losses inherent in our present processes. To our knowledge, there is no PVC production plant in the world operating in a completely closed polymerizer mode because of the buildup problem in reactors. Our programs toward this end include investigations of the fundamental mechanisms leading to resin adherence to polymerizer surfaces and a wide variety of methods aimed at eliminating adherence, chemically and/or mechanically. It is difficult to estimate how soon, if ever, we might achieve our goals in a practical way.

The balance of our research and development program includes reduction of monomer losses beyond the polymerization area. This is the development of a process by which the vinyl chloride monomer is removed from the PVC resin slurry before drying, thus increasing the recovery of vinyl chloride monomer.

This would also result in lower residual vinyl chloride in our finished resins when proven in production plant installations. We can foresee completion of this work and installation of facilities in two to four years for the majority of our resins.

Finally, in order to reach levels below .01% residual vinyl chloride in some PVC resins, we see the necessity for some basic changes in our manufacturing technology and the structure of PVC particles. This will take time to complete the small-scale work and scale up to production facilities.

Goodrich Position

Goodrich believes it prudent to reduce levels of exposure to vinyl chloride, but opposes the proposed permanent standard for vinyl chloride. Achievement of no-detectable level of VCM exposure is not technically feasible. Neither is it feasible nor safe to require VCM and PVC workers to wear respiratory protection for full eight-hour work shifts. Thus, if the proposed standard is adopted, Goodrich would have no alternative but to shut down its monomer and PVC resin operations.

Goodrich generally supports the position outlined by witnesses for The Society of the Plastics Industry.

Exposure Levels

More specifically, we endorse the SPI proposal on the stepwise reduction of vinyl chloride levels in PVC work areas and in vinyl chloride monomer work areas.

Further, Goodrich is committed to reach these levels of exposure in the shortest practical time. As evidence of our commitment, before OSHA issued the proposed permanent standard, we set an internal goal of achieving a 25 ppm ceiling and 10 ppm TWA as soon as possible.

Monitoring

The standard should require sequential monitoring of work areas in both monomer and polymer plants with proper alarms to signal the need for respiratory protection. This should be backed up with adequate personnel monitoring to validate the area monitoring system.

Respiratory Protection

We support the SPI recommendation that OSHA give management the necessary flexibility to select and utilize the most appropriate respiratory equipment for the protection of workers. This could include the use of half-face air-purifying type protection.

Impervious Clothing

We urge OSHA to reconsider the requirements covering the use of impervious clothing. Others have previously testified that such clothing presents a serious restraint on worker mobility. It also exposes the wearer to severe heat stress, particularly when worn in confined areas and where physical effort is required on the work assignment.

There may be some occasions where high exposure levels can occur. In those instances, suits impervious to water should be adequate. But for most jobs in vinyl chloride monomer and polyvinyl chloride plants, including reactor cleaning, where exposure is at low levels, regular work type clothes (coveralls or pants and shirts with full length sleeves) should be adequate.

Vinyl Chloride Level in PVC

Goodrich supports the SPI proposal that appropriate labeling of PVC containers be required when vinyl chloride levels in PVC exceeds 0.1%, effective October 5, 1974 and, further, that the requirement for labeling be changed to 0.01% effective October 5, 1977.

Labeling

We support the SPI position that the language to be used on signs at regulated areas emphasize the precautionary steps to be taken, rather than "scare" language emphasizing the nature of the substance.

Similarly, we support the SPI concept of product labeling, both monomer and polymer, and agree that such labeling should be designed to provide information to those who need it, rather than a basis upon which to panic because of a potential disease characterization.

IN SUMMARY, then, Goodrich's position is as follows:

1. We are committed to reduce vinyl chloride exposure to the lowest level that is feasible through a combination of engineering changes, work practices, the part-time use of respiratory equipment, and technological development.

2. A no-detectable level of VCM in its monomer and polymer plants is not technically feasible.

3. Full-time use of respiratory protection by PVC and VCM workers is not feasible.

4. We will be forced to shut down our PVC and VCM operations if the proposed permanent standard is adopted.

5. We have embarked on a multi-million dollar research and development program to generate new technology which might make possible further reduction in levels of vinyl chloride exposure.

6. We oppose the permanent standard as proposed by OSHA, and generally endorse the position taken by witnesses for the SPI.

7. We will support and cooperate with programs to obtain medical and toxicological data that are needed.

PERSONAL AND CONFIDENTIAL

August 27, 1975

TO: A. J. Ashe

FROM: Cleveland Lane

You asked me to prepare a summary of steps we have taken to reduce vinyl chloride losses and human exposure to vinyl chloride. You suggested that this be a working paper to form the basis for discussion on how this information could be communicated, especially to investors and analysts, but also to other audiences.

The attached is in no special form. However, it could be adapted for a speech, a magazine article, a letter to analysts or other forms of communications.

I am putting a copy privately into the hands of Bob Downey to check accuracy. He will not review it with any other personnel until we have had a chance to discuss it. I would like to get together with you and Bob at your earliest convenience.

CL:ld