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CONTINENTAL OIL COMPANY

RESEARCH AND DEVELOPMENT DEPARTMENT

ANALYTICAL RESEARCH SECTION
RESEARCH SERVICES DIVISION

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TECHNICAL SERVICE REPORT

NO. 407-74-GO
February 11, 1974

ADDRESS INQUIRY TO:

R. E. Laraway

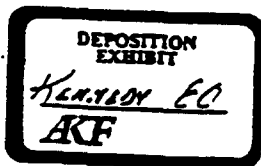
TO: Dr. Flynt Kennedy

SUBJECT: TRIP TO ATTEND MEETING OF THE VINYL CHLORIDE SAFETY ASSOCIATION

A meeting of the Vinyl Chloride Safety Association was held at the Sheraton-Hopkins Hotel in Cleveland, Ohio, on Friday, 8 February, 1974. I attended the meeting as a representative of Continental Oil Company. In addition to myself, other CONOCO representatives attending were Mr. George Tillson, plant manager, Oklahoma City PVC plant, Mr. Earl Cremillion, safety director, Lake Charles VCM plant and Mr. Jerry Powell, plant superintendent, Aberdeen, Mississippi PVC plant. This association is made up of VCM and PVC manufacturers for the purpose of sharing information with regard to plant safety. The meeting convened at 10 a.m. Friday, and although there was a tentative agenda, the meeting was very informal and varied from the agenda as to order; but the content was covered sometime during the day.

Due to the informality of the meeting, notes were difficult to organize and names of individuals were almost impossible to coordinate with the companies they represented. No formal notes were taken by a secretary and no list of attendees was furnished. There were approximately 60 people in attendance and some of the companies represented were:

CONOCO
Dow
General Tire
ICI
PPG
Goodrich
Hooker
Air Products
Diamond
Firestone
Tenneco
Uniroyal



The above list is not complete but covers those companies I was able to determine.

The meeting was called primarily because of the recent publicity given to the Goodrich disclosure of possible relationship between VCM and liver cancer, particularly angiosarcoma. In view of this, the following agenda of topics was prepared for discussion:

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- I. Monitoring VCL (vinyl chloride) contamination
 - A. Equipment available
 - B. Technique used
 - C. Current problems on obtaining reliable data
- II. Current Practices for Minimizing VCL Exposure
 - A. Reactor purging (vacuum/displacing)
 - B. Equipment bleeding
 - C. Residual VCL in slurry and effects in finishing area
- III. Future Actions
 - A. In what manner can our industry best attack the problem

I will attempt to relay the pertinent comments on each of the agenda items.

The meeting was opened by Mr. Joe Mudd, of General Tire, who turned over the floor to Mr. Walt Iliff, of Uniroyal. Mr. Iliff gave a brief rundown of the MCA (Manufacturing Chemists Association) meeting held in Washington, D. C., as a result of the announcement by B. F. Goodrich of the angiosarcoma diagnosis of personnel in their Louisville, Ky., PVC plant. As a result of the MCA meeting, various task forces have been established, including a Work Practice Group and an Industrial Hygiene and Monitoring Group. The MCA adopted a policy of giving maximum cooperation to NIOSH (National Institute of Occupational Safety and Health) which is the organization, at least for the present, that will be investigating the VCM-liver cancer problem. It was also agreed that a meeting of the task groups be held in Chicago on 20 February, 1974, to review their progress. A question from the floor was asked as to the conclusions from the Italian rat study (feeding rats with copious quantities, ~30,000 ppm, of VCM). To date the results are inconclusive, but a final report will be presented at a cancer meeting to be held in Italy in the fall of 1974.

With this introduction the first agenda item, i.e., the monitoring of vinyl chloride, was opened to the floor. Joe Mudd began the discussion by reviewing General Tire's efforts at their Ashtabula, Ohio, PVC plant. Presently they use only Drager tubes and sporadic air sampling. They have no idea of the TWA (time weighted average) amount of VCM in the air. A lively discussion followed as to whether PVC (polyvinyl chloride) dust was a major problem in the plants. Although nothing conclusive was stated, it was decided to table the dust problem and pursue VCM monitoring. From this discussion it was made clear that Goodrich is not stating and is not at all positive what chemical if any, is correlatable to the angiosarcoma. However, circumstantial evidence makes VCM a prime suspect. Goodrich then gave a brief synopsis of their monitoring program which includes spot air sampling using the Century organic vapor analyzer (OVA), fixed sampling using a Bendix total hydrocarbon analyzer, and personnel monitors fashioned after those used by Dow Chemical. We have literature on all this so I will not elaborate further on the specifics. Pittsburgh Plate Glass is also using the personnel monitors. Considerable concern was expressed by several individuals that the total hydrocarbon analyzers, not being specific, could give erroneous results. In addition, the type and amounts of other hydrocarbons, including chlorinated and nonchlorinated, could be just as suspect as VCM. Dow Chemical proposed that through their studies (which have been numerous and detailed) over the past 16 years, VCM was the chemical of importance and that other compounds were present in concentrations so small as to be negligible. It was brought out, however, that Dow was concerned primarily with monomer plants and the same conclusions are probably not valid for resin plants. The consensus of opinion appeared to be that the Century OVA was indeed the instrument of choice for spot checks of the air throughout the plant and for use in finding VCM leaks.

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The inclusion of a chromatographic column with this instrument would make it even more valuable. However, it was generally agreed that in addition to the OVA, fixed sampling and personnel monitoring were required. John Burr, of Air Products, has begun to install gas chromatographic analyzers with multiple sampling stations. He is convinced we need to know the type and amount of all the organics in the air. These will require a capital outlay of approximately \$15,000 each and he is proposing two to three such instruments in each of three plants. The Wilks Miran infrared detector was being used by Diamond-Alkali, but their complaints were much the same as those given by Goodrich, i.e., it weighs about 50 pounds, which at best makes it only semiportable, and is rather slow in response. However, it is sensitive and it is specific. The TVA catalytic combustion detector was discussed and again the complaints were much the same as those given by Goodrich--it is not sensitive below 50 ppm and is neither reliable nor stable at high sensitivity settings.

Where to sample was the next question discussed. Other than using fixed and spot sampling, the question arose as to where the personnel monitors should be placed. Although placing them in close proximity to the breathing zone seemed the logical choice the problems of mounting and encumbering the personnel are obvious. Dow reported they mount theirs at the waist and have found excellent correlation of the results obtained there with the results obtained when the monitor is near the breathing zone.

Ventilation patterns were discussed, and Goodrich volunteered that the VCM flows in waves, making discretion and careful examination of results mandatory. With our OVA analyzer at Aberdeen Dave Cox has found the same phenomenon, where orders-of-magnitude differences in concentrations of VCM can be observed by standing in one spot and continuously monitoring. Goodrich reported that forced ventilation helped, requiring at least 20 air changes per hour to make significant reductions of VCM in air when in initial concentrations of approximately 200 ppm.

With whatever type of monitoring finally used, the very valid point was made that accurate, thorough calibration had to be done if NIOSH was to be satisfied.

Based on the visit to the Goodrich, Louisville, Ky., PVC plant, NIOSH submitted a list of precautionary monitoring and control procedures to the MCA (copy is attached). This list created great consternation among most of those present, eliciting such comments as, "This will shut down many PVC plants across the nation!". This list will be discussed at an open meeting to be held at the Sheraton-Hopkins Hotel (Pickwick Room) beginning at 10 a.m., Tuesday, February 12. The general consensus of those present was that several of the items needed clarification and modification. A representative from CONOCO should attend this meeting.

Since Goodrich announced the liver problem, NIOSH has visited their Louisville plant and plans to visit a second plant during the week of 12 February. Hooker Chemical Company (New Jersey) has also been visited by NIOSH since the announcement. They had no details of what NIOSH found or will report. During the meeting, Tenneco received word that NIOSH had contacted their plant requesting the age of the plant and number of employees, surely preparatory to a visit. In view of this, it was concluded by all those present that NIOSH will be visiting all plants in the very near future. It was also stated that the state of New Jersey is planning a meeting of all PVC producers within the state sometime in the very near future.

Diamond-Alkali gave a short presentation of their immediate plans which can be summarized as follows:

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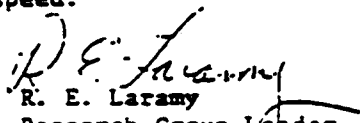
1. Installing hydraulic cleaning systems in their reactors.
2. Use air purging systems.
3. Daily in-plant monitoring program—each individual will be personally monitored for one 8-hour shift/week.
4. Continuous air monitoring will begin as soon as equipment arrives.
5. SMA-12 blood tests for all personnel.
6. Annual physical exams for all personnel.
7. Possibly go to a liver profile test. Will wait on advice of medical people.

In addition, B. F. Goodrich will probably disallow anyone with a liver disorder to work in VCM or PVC plants. Only two companies represented required a liver test in their pre-employment physicals; however, it was about unanimous that this will now be required by all companies.

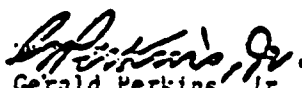
Practices to minimize VCL exposure were concentrated primarily in how to clean reactors without exposure to copious quantities of VCM. Harlan Jewett, of General Tire, gave a presentation on their system for accomplishing this. Since George Tillson, Jerry Powell and Earl Gremillion were present and are infinitely more knowledgeable in this area than I, suffice it to say they are cognizant of the problem and are already working in this area.

Future actions were reduced to waiting until the results of the NIOSH, MCA and OSHA meetings are known. It was decided that this association would meet again at the same place in approximately two to three months to discuss problems and progress.

In summary, it was apparent to me that the current problem is one of gigantic ramifications and needs rapid and serious consideration. Although VCM has not been proven to be the culprit, the companies have by design chosen to limit its presence in air and to closely monitor its concentration. As a goal, most of the companies present have chosen an upper limit of 50 ppm VCM in air. This is a maximum and not a time-weighted average (TWA). The TWA should be considerably less. Steps to reduce VCM concentration in air have already been taken by some companies with the remaining companies at various stages of initiating or implementing programs. Monitoring the VCM levels is being attacked by all companies, some with programs already far advanced and some just beginning. The attitude was one of solving the problem, a positive approach, rather than waiting to see if it goes away. It was not a question of whether to monitor but rather how much and how fast. Here again, the majority of companies are attacking the problem with considerable effort and haste. The meeting was very informative to me and left no doubt in my mind of the seriousness of the problem and the immediate need for maximum effort and speed.


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Research Group Leader
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APPROVED: 2-14-74


Gerald Perkins, Jr.
Director
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BW

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*filed - will be discussed
at the Tuesday Mtg.*

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Enclosure 1

NIOSH Recommended Precautionary Monitoring and Control Procedures for Polymerization Processes Involving Vinyl Chloride

I. General Housekeeping Procedures

A. The spillage of Vinyl Chloride and Polyvinyl Chloride in and around the production facilities should be controlled as follows:

1. Housekeeping procedures should be implemented to assure immediate removal of VC and PVC material around polymerization operations including drying, packaging and loading operations.
2. Recovered PVC material which is to be packaged should be stored in closed containers.
3. Waste PVC material should be stored in closed containers and consideration should be given to the adequacy of its disposal and/or destruction. Care should be taken in the storage of closed containers to insure that unsafe conditions do not result from an internal build-up of pressure in the container.

B. Inventories of beginning and recovered quantities of VC and quantities of PVC produced, packaged and recovered should be made to determine losses and probable areas affected. - *How often?? Since 2 times*

C. PVC material should be removed from overhead structures and conduits where it tends to collect.

D. Consumption of food should be permitted only in separate facilities provided for this purpose, and no food products should be permitted elsewhere in the polymerization facility.

II. Protective Clothing

A. A daily change of protective clothing including full coveralls, or the equivalent, should be provided each employee in areas where possible exposure to VC PVC could occur. Clothing contaminated by accidental spills should be changed as soon as feasible. *Not only does this not work, it's also not.*

B. Protective gloves and footwear, or footcovers, should be worn as appropriate in those PVC operations where exposure to PVC material is possible. *New jersey elastic compression gloves.*

C. Protective head covers should be worn during PVC operations as appropriate (e.g. hard hats in those areas where physical protection of the head is necessary and hair coverings, or the equivalent, in

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operations such as cleaning of polymerization reactor tanks and packaging operations).

D. Where employees are engaged in maintenance or cleaning operations of polymerization reactor tanks they should wear full impervious suits to guard against skin contact of PVC material and VC vapors. Procedures for safe entry to confined spaces should be observed.

BFG frequently disposable coveralls

III. Showers

Showers at the termination of an eight-hour work shift should be mandatory for all workers with possible contact with VC-PVC.

only 1 shower, pay for the time taken showers - No other showers.

IV. Monitoring

A. Environmental Monitoring

1. In-plant environmental monitoring programs should be implemented; and where workers are required to enter polymerization tanks, a survey of the VC concentrations should be made in the reactors immediately after opening, immediately prior to entry of maintenance personnel and during the tank cleaning operation.

2. Data obtained from the environmental monitoring program should be used to indicate those areas where efforts should be directed to reduce airborne levels of VC.

3. Positive programs to initially control VC levels well below the present Federal Standard of 500 ppm should be developed (some companies are targeting at 50 ppm) and efforts to further reduce levels should be given consideration concomitantly with the necessary modifications in engineering and design controls. *Goal level 50 ppm. Not enough to do enough.*

4. The concentration of VC in exhaust ventilation should be determined to estimate the amount of VC lost during operations and the possible exposure of personnel immediately outside the facility.

5. Monitoring for PVC particulate material should be accomplished to estimate the degree of exposure to this substance throughout the facility.

B. Personal Monitoring

1. Integrated, eight-hour personal monitoring samples should be obtained from those employees considered to receive the greatest exposure to VC or PVC.

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2. Breathing zone samples should be obtained to complement environmental monitoring program for VC, and similar samples should be obtained for PVC.

V. Respiratory Protection

Because VC is a gas under ambient conditions and PVC is a solid under these conditions, it is recommended that respiratory protection for employees take these circumstances into consideration.

A. Where employees are engaged in cleaning and maintenance operations inside polymerization reactors they should be equipped with an atmosphere-supplied respirator in order to protect against both VC vapor and PVC particulates. *3 Companies now do this*

B. During housekeeping procedures and packaging operations where the possibility of PVC dust inhalation is a factor, it is recommended that an air-purifying respirator equipped with a mechanical filter designed to remove particulate material be worn. Respiratory protective devices which meet this requirement, as well as protect against VC vapors in concentrations less than 0.1% have been approved by the NIOSH Testing and Certification Laboratory and bear the numbers: TC-23C-40, TC-23C-47, TC-23C-48. *(all NIOSH)*

C. Where employees are engaged in transfer operations of VC from railway tankcars to storage facilities or at any similar transfer point which requires manual operations, they should wear a self-contained breathing apparatus (SCBA) during such operations to guard against unexpected release of VC during such operations. *Highly important to provide it before 5 min. after release - only heavy duty SCBA*

D. Other operations involving possible exposure to VC or PVC should be evaluated as the individual situation exists and respiratory protection provided as appropriate. *Examine*

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