

EXHIBIT C

ANGIOSARCOMA LIVER DEATHS - UNITED STATES

<u>DATE OF DEATH</u>	<u>COMPANY</u>	<u>LOCATION</u>	<u>YEARS FROM FIRST EXPOSURE TO DEATH</u>	<u>YEARS OF WORK EXPOSURE</u>	<u>EXPOSURE LEVEL (1)</u>
1964	B. F. Goodrich	Louisville, Ky.	20	18	High
1968	B. F. Goodrich	Louisville, Ky.	15	15	High
1971	B. F. Goodrich	Louisville, Ky.	14	13	High
1973	B. F. Goodrich	Louisville, Ky.	22	16	High
1973	B. F. Goodrich	Louisville, Ky.	28	28	High
1961	Goodyear	Niagara Falls, N. Y.	15	15	High
1968	Goodyear	Niagara Falls, N. Y.	17	17	High
1970	Goodyear	Niagara Falls, N. Y.	23	23	High
1968	Union Carbide	S. Charleston, W. Va.	18	18	High
1969	Firestone	Pottstown, Pa.	20	15	High

- (1) High Exposure as estimated by Air Products on the basis of information presented by the testimony of individual companies concerned; information received from The Chemical Industry Association of the United Kingdom; and known physiological effects of VCM is defined as at least 500 ppm TWA and possibly as high as 1,000 ppm. TWA, with known frequent excursions above 5,000 ppm.

file

File Products and Chemicals
INC

CHEMICALS GROUP

Five Executive Mall, Swedesford Road, Wayne, Pa. 19087

August 19, 1974

Mr. Herbert Terry
Vice President
Foster D. Snell, Inc.
Hanover Road
Florham Park 07932

Dear Mr. Terry:

We are transmitting to you our written replies to the questions discussed during your visit to these offices on 2 August 1974. We have followed the numbering system of your interview guide, but have not attempted to fit the answers to the individual sheets.

Please feel free to call at any time if you have further questions, either now or after your visit to our Calvert City plant on 14 August.

Very truly yours,



J.T. Barr
Technical Manager

JTB/lis

Bcc: A.R. Adams
T.L. Carey
R.E. Jones/ E.A. Primeau
J.D. Kramer/ G.B.H. Speed
J.T. Sebastianelli

I. GENERAL DATA

1. Air Products operates two PVC production facilities, both using the suspension process.

The Pensacola (Pace), Florida plant was built in 1957 by Blaw-Knox for Escambia Chemical Company. It now has a capacity of about 80 MM lb./Yr., and makes general purpose homo-polymer resin which normally runs 500-1000 ppm (by wt.) residual VCM. About 10% of the production is in our specialty Pearls (R) which contain 50-100 ppm VCM. These are used in highly plasticized applications.

The Calvert City, Kentucky plant was built in 1959, also by Blaw-Knox, and was purchased in 1971 from Airco, Inc. It has a capacity of about 125 MM lbs./Yr., divided approximately equally into three types of material. General purpose resins run 500-1000 ppm residual VCM. Vinyl Acetate copolymers, used for flooring, records, calendared and solution coated film and sheeting, contain 300-500 ppm VCM. The propylene vinyl chloride copolymers are proprietary products sold under the trade name Flo-Wel (R) or as compound under the name of Sta-Flo (R), and are used primarily for rigid applications such as injection molding, bottles, extruded film, and similar applications. These copolymers normally contain 200-400 ppm VCM.
2. The attached table of exposures shows the job classification and exposure ranges. The levels have been quite similar in the two plants over the period shown.

In order to estimate the number of "other" persons in any future regulated area, it is necessary to define the extent of the area in terms of probable exposures. In the event that the permanent standard provides for a 25 TWA/40 ceiling, then there might be 5 to 10 persons daily entering the regulated area in addition to the normal work force listed in the table. If the permanent standard encompasses all persons who might be exposed to a detectable level, then all of our employees in other work areas, plus all transients in the plant would be included for a total of 450-500 persons daily. This would include truck drivers, train crews, contractors and supplier's personnel, servicemen, and the like.
3. We have no data thought to be reliable by today's standards that is more than a year old, and even that is sketchy. At that time, we were in the 200-400 ppm range in the polymer building. Other areas were lower; but specific measurements were not made. You were given the best present data in the attachment.

These were obtained by 4-8 hour personal monitors using the carbon tube method, and are the averages of the 8-hour calculated TWA for each classification.

APCI has testified that it believes the CIA estimates to be representative of past exposures.
4. A simplified flow diagram is attached. Highest exposure levels are in the reactor building, including those workers who charge and dump reactors (third floor operators or reactor operators and solutions men), operate the strippers and transfer slurry (recovery operators), and clean reactors (utility men).

Our long-standing vessel entry procedures now include monitoring the vessels in the ppm range for VCM and the use of half-face, air-supplied respirators for reactor cleaning or any other maintenance or equipment disassembly where exposure to VCM could reasonably be expected.

Our operating procedures are in the process of revision. You will be able to observe and discuss current practices in your visit to the plant 14 August.

The table furnished as part of the reply to I.2. shows lower exposures for other jobs.

II ENGINEERING CONTROLS

As our testimony before OSHA states, we do not have available to us now technology that permits us to be assured that we are not violating the temporary standard of 50 ppm ceiling. Carbon tube or air bag personal monitoring is an after-the-fact method and the results we get from these when used as short-term TWA monitors (10-30 minute) give us occasional readings of over 50, even though most are well below 50. There is no instantaneous instrument now available that is small enough to be a personal monitor. Thus, we cannot say with any certainty that a man will not be exposed to a value above a specified level. We are adding to our area monitoring system, which we believe to be the best protective and warning system, in order to better detect and define the excursions which are inevitable in any batch operation.

1. Capital Costs For Equipment

The attached table shows the identifiable costs of work which is far enough along to have made a contribution to exposure reduction. Not included are many small projects done by plant maintenance and thus not separated as to cost or projects which have not proceeded past engineering or purchasing.

Also not discussed in this interview are the costs, engineering, operating, or capital of efforts to reduce VCM in the product in order to lower exposures in fabrication plants.

2 & 3. Because we do not know how to meet the present temporary standard levels of 50 ppm on a 100% basis, we cannot make any firm statement about lower levels. We are proceeding with our existing abatement plan, and after each step we see what we have learned and proceed to the next most promising action. We may, of course, have several specific changes being made at any one time. See answer to V 1 A for costs.

4. We have in progress an extensive abatement plan at each plant. Commitments now made total over \$500,000 for projects in progress. We cannot estimate how much more will be spent until we see results from these programs. These include refinement and expansion of work done to date, replacement of temporary systems with permanent installations, and new projects.

5. The lowest feasible level of operation for any VCM processor will be in a monomer plant since it is a continuous, outdoor, remote-operated plant. A batch operation carried on indoors will necessarily be higher. Thus, if the VCM manufacturers feel that they can get to the 5-10 range, we must say our operations will be above this.

The cost is purely speculative, but we know that a new plant specifically designed for the problem now at hand offers the best probability of success. Our Engineering estimate made last year showed a cost of just under \$30 MM to replace our capacity. The present cost would be higher because of inflation (15-30%) and added protective measures needed (unknown).

6. We are beginning to have some feel for the added costs but cannot define them completely, not having operated such a plant. The added equipment will be high-cost, high complexity systems, and will add at least 10-15% to the operation and maintenance budget of an already inflated capital base as well as reduce productivity well beyond the 10% reduction already seen.
7. As stated earlier, this is a batch operation. The reactors must be opened at some interval. The piping must be flanged rather than welded because of the fouling that occurs due to the very nature of the monomer handled. Absolutely leak-proof pumps and agitators do not exist for this service. It is not possible to remove all of the monomer from the slurry. Failure of equipment and instruments do occur from time to time causing releases. Even the best trained and most dedicated operator makes a mistake occasionally. For all these reasons, and more, there will be releases. The industry being regulated here is orders of magnitude greater in size than those producing the 14 carcinogens covered in the January 1974 standards, and because of the pressures involved, volatility, and the sheer size and number of pieces of equipment, losses cannot be contained as readily. A non-detectable or 1 ppm level is not possible in the foreseeable future in the industry as it exists today. Many years of hard work and high capital investment are needed just to know what level is attainable.

III PERSONAL PROTECTIVE EQUIPMENT

1. A. Persons entering vessels, unloading tank cars, and breaking lines, use air-supplied half-face respirators. Temporary air systems are in use awaiting new compressors, etc. We ordered respirators in March and April, but are still partially back-ordered.
- B. Self-contained apparatus (Scott) is on hand for emergencies.
- C. Rain gear, gloves, boots, hard hats, safety glasses, face shields, safety shoes, etc. are issued to all men with appropriate instructions for use.
- D. Dust filter respirators are issued for use in areas where needed.
2. A. Installation of the permanent air systems will be approximately \$100,000 in one plant and \$200,000 in the other. Operation and upkeep cannot be estimated yet due to lack of experience, but will certainly be in excess of \$25,000/year per plant.
3. A. Compliance with a firm 25 ppm ceiling 100% of the time, or at any other level for that matter, would require all men in the PVC plant to wear respirators all of the time. Systems are being sized for this, of course for emergencies, but such a requirement would so reduce operator productivity as well as safety and comfort, so that if a work force could be maintained it would be productive at no more than 50% of its present level.
- B. Under a no detectable limit the same requirements would apply to the entire work force of the whole complex, an intolerable situation, so that even if it could be approached in the PVC plant, its effect on the remaining plants would be so great that the PVC operation would cease to exist.

4. A. We have seen no serious ill effects at our present limited use level. We know that long-term use of dry air is harmful to lungs. We have found problems with mobility, vision, and communication which will get worse as the usage factor increases at lower permissible limits. Tripping and entanglement are constant hazards. We will probably be restricted in our hiring and transfer policies due to medical recommendations as to who should wear respirators for extended periods.

B. We have had informal preliminary talks with the union in one plant on the problems to be expected in the future, and the need for strict supervisory enforcement to assure compliance with the present rules due to reluctance to wear the masks.

C. Under the present standard, there are 16-20 people who wear masks daily for various periods of 10 minutes to two hours at a stretch. Some may wear them for as long as four hours total per shift on several different occasions.

Any more stringent ceiling standards, with no exemption from short excursions, will require all persons to wear masks all of the time.

D. Costs for the air system were given above as \$300,000 plus over \$25,000 per plant upkeep. No other protective systems have been investigated far enough to get costs, because of impracticality or lack of availability.

E. Output loss at:

50 ppm ceiling 10%
 25 ppm ceiling 50 - 75%
 1 ppm ceiling 100%

IV MONITORING

1. Costs of Monitors (Data given for (1) plant-double for total).

<u>EQUIPMENT</u>	<u>NO. AND SOURCE</u>	<u>COST</u>	<u>O & M</u>	<u>PROCURE</u>	<u>START UP</u>
Portable Explosion Meters	4	\$ 500e	\$ 500/Yr.	3 Mos.	1 Wk.
Century OVA	3	\$ 3,000e	\$ 1,000/Yr.	2 Mos.	1 Wk.
Infrared	1	\$ 5,000e	\$ 1,000/Yr.	3 Mos.	2 Wks.
Portable Chromatograph	1	\$ 5,000e	\$ 1,000/Yr.	3 Mos.	2 Wks.
Personal Monitors	4	\$ 600e	\$ 2,000/Yr.	2-6 Mos.	1 Wk.
Fixed Point System	30 Points	\$100,000e	\$10,000/Yr.	3-6 Mos.	1 Mo.
Explosive Limit Monitor	30 Points	\$ 45,000e	\$ 5,000/Yr.	8 Mos.	2 Mos.
TOTALS		\$159,100	\$20,500		

In addition, there is required the time of:

1/2 instrument man
1 mechanic for leak patrol
2 lab technicians for analyses
Supervision, Data Processing, and Evaluation of Results
Total cost here over \$90,000/Yr/Plant

2. Medical costs have averaged nearly \$200 each for the 500 persons checked so far. We estimate nearly \$100 per man per year for the continuing program. We have not yet completed retirees, ex-employees, etc. Thus, nearly \$100,000 has been spent, with one third to one half that amount continuing each year.

3. Presently, medical records on this particular subject are maintained by the special medical consultants, and work and employment records by the Personnel Departments at the plants. Duplicates of the consultants files are being prepared for our plants. We will decide on how to handle these on a permanent basis when standard is finalized. Cost to date are included in answer to (2) for out-of-pocket. Internal costs, which have been high, were not segregated. Future costs are not known.

V OTHER DATA

1. A. Economic impact on our plants at 50 ppm include over \$1.5 MM of spent or committed capital, \$150 M/Yr. of O & M, and \$250 M or out-of-pocket. At a 7 year depreciation rate this comes to \$614,000/Yr. added costs or 0.3 ¢/lb. There is the further effect of a 10% production loss, or 0.3¢ per pound, and a gross profit loss of 0.24/lb. on the resin not produced, for a total of 0.8 ¢/lb. before tax. This is a significant portion of our profit margin.

It has been impossible to determine all of the costs to date. The time of management, supervision, research, and engineering that has been lost or not devoted to normal applications, has had a significant effect on our progress in not only the PVC area, but also on our entire business. Many expenses have not been segregated, but taken as overhead. We will never know how much this has cost.

B. We have estimated a 50% loss of productivity because of wearing respirators full time, and because of other precautions needed to meet a firm 25 ppm ceiling. This doubles our conversion cost (3¢/lb.), increases the burden of new capital to over 1¢, and increases lost profit to 1¢, for a total of at least 5 ¢/lb. If respirators are not needed full time to meet 25 ppm, the loss will be somewhere between 10 and 50%.

C. Any lower levels will be a shut-down case for us, as might indeed be the situation above in B.

D. We understood this to be a survey on conventional PVC manufacture alone. However, we also operate an emulsion plant in Calvert City that produces a significant proportion of a terpolymer of vinyl chloride with vinyl acetate and ethylene. Our monitoring in this plant shows much lower levels than in PVC because it is a newer plant with better ventilation, and is built for the higher pressures needed for ethylene. The reactor is larger, and can be cleaned with only very infrequent opening or entering.

The cost of compliance will depend on the standard promulgated, but basic monitoring and personal protection will run \$150-250 M, as a minimum, based on our experience in PVC.

A similar plant is being built in New Jersey.

One additional cost we cannot yet estimate is the expense of establishing and maintaining a regulated area. Probable costs here are fencing, new segregated lunch, shower and locker facilities, probable relocation of warehouse and maintenance facilities, added guards and record keeping, and further lost productivity.

II. ENGINEERING CONTROLS AND WORK PRACTICES

1. Cost of equipment and technology to comply with temporary standard

<u>EQUIPMENT</u>	<u>USE</u>	<u>COST</u>		<u>TIMING</u>	
		<u>CAPITAL</u>	<u>O & M</u>	<u>PROCURE</u>	<u>INSTALL</u>
General Area Ventilation					
Building heaters and fans	Calvert poly bldg.	110,000	5,000	9 mos.	2 mos.
Additional fans	Pace poly bldg.	18,000	3,000	2 mos.	2 wks.
Point source Ventilation					
Reactor blowers	Pace reactor purging	20,000	1,000	3 mos.	2 wks.
Reactor and point pick ups	Calvert plant	140,000	5,000	*	
Point pickups	Pace compressor	3,000	1,000	4 mos.	3 wks.
Raise discharge stacks	Pace blend tanks	6,000	--	3 mos.	2 wks.
Raise discharge tanks	Calvert blend tanks, screens	20,000	1,000	3 mos.	1 mo.
Pipe vents outside	Calvert charge pots	10,000	500	1 mo.	1 mo.
Additional steam jets	Calvert reactors	10,000	5,000	5 mos.	2 wks.
Reroute open drains	Calvert Centrifuge reactors	35,000	8,000	6 mos.	3 mos.
Other					
New slurry pumps	Calvert strippers	50,000	2,000	*	
Relocate VOM Pump	Pace charging system	6,000	--	--	2 wks.
TOTAL		429,000	31,500		

* Not yet fully complete.

VINYL CHLORIDE IN WORK SPACE
CALVERT CITY COMPOUND PLANT

24-Hr. Averages From Fixed Monitor - All Data In ppm.
Resin Used Averaged About 250 ppm. Free VCM In This Period

<u>Date</u>	<u>Location</u>		
	<u>Ribbon Blenders</u>	<u>Roll Mill</u>	<u>FCM Mixer</u>
2 July 1974	1.0	1.0	1.0
3	0.5	0.5	0.5
4	0.5	0.5	0.5
5	1.0	1.0	1.0
6	0.5	0.5	0.5
9	1.5	1.5	1.5
10	2.0	1.5	2.0
12	2.5	2.0	2.0
13	1.5	1.5	1.5
14	1.0	1.5	1.5
15	1.5	1.5	1.5
16	2.0	2.5	2.5