INDUSTRIAL HYGIENE SURVEY
GENERAL CABLE CORPORATION
MEMPHIS, TENNESSEE

INTRODUCTION

N & M Protection Consultants retained George D. Clayton & Associates to conduct an industrial hygiene survey of the General Cable Corporation extrusion plant located in Memphis, Tennessee. Purposes of this study were to determine concentrations of vinyl chloride to which workers were being exposed and to interpret the results in terms of potential health hazards, with particular reference to regulations promulgated under the Occupational Safety and Health Act of 1970 and other accepted standards of good practice within the field of occupational health. Results of the survey, conducted on May 16, 1974 by Mr. Michael S. Mosher of Clayton & Associates, are reported herein.

DESCRIPTION OF OPERATIONS

The General Cable Corporation employs approximately 100 people at their Memphis, Tennessee Plant in the manufacture of extruded wire products incorporating polyvinyl chloride (PVC). Raw PVC is mixed with dibasic lead phthalate in a dry blend room, which is a regular work station for only one man. An exhaust hood is used at the weigh area but there is no local exhaust ventilation where the lead is dumped into the hot (250°F) mixer with the PVC. The mixture is then transfered from the hot to the cold (room temperature) mixer, from which the mixture is transfered to bins by means of a conveyor. The mixed PVC is allowed to free-fall from the end of the conveyor into open bins.

The extruders, which are fed from the bins containing polyvinyl chloride by a pumping mechanism, operate at approximately 425°F. Metal wire is pulled through the hot extruders and then through a water quenching operation in a trough located within a foot of the extruder head. From the end of the trough the coated wire is wound and packaged. The regular domestic sources of PVC were in use during the survey.

DISCUSSION OF POTENTIAL HEALTH HAZARD ASSOCIATED WITH EXPOSURE TO VINYL CHLORIDE

Vinyl chloride is a gas at standard conditions. Until very recently the material was considered to be much more of a fire and explosion hazard than a health hazard. Although vinyl chloride was known to be anesthetic at relatively high concentrations (16,000 ppm) there was no evidence of a significant hazard associated with exposures of workers to concentrations normally encountered in industrial situations of manufacture and use.

However, in January, 1974, the B. F. Goodrich Company reported that four of their employees at the Company's plant in Louisville, Kentucky, had died of liver angiosarcoma, a cancer apparently related to their past exposure to vinyl chloride. As a result of this report and subsequent investigations by the National Institute for Occupational Safety and Health and the Occupational Safety and Health Administration, the acceptable limit for concentrations of vinyl chloride in air to which workers could be exposed was reduced by an emergency temporary health standard established by the U.S. Department of Labor on April 5, 1974, from a ceiling of 500 ppm to a ceiling of 50 ppm.

Continuing studies with animals, and comprehensive epidemiological studies of vinyl chloride and polyvinyl chloride workers, indicate that exposure to concentrations as low as 50 ppm are capable of producing adverse effects. Accordingly, the U.S. Department of Labor has proposed a permanent health standard limiting worker exposures to "no detectable level" using methods capable of measuring one part per million with an accuracy of plus-or-minus 50 percent.

SAMPLING AND ANALYTICAL METHODS

Air sampling conducted during this study was of two basic types: general area and personal breathing zone. For both types, samples were collected by drawing air through small glass tubes, packed with activated carbon, at a measured flowrate by means of small battery-operated pumps (Mine Safety Appliances Company, Model G).

The general area samples were collected at stationary sites strategically located through the work areas. The personal breathing zone sampling units were worn by the workers; the pump was attached to the belt and the sampler head (activated carbon tube) was attached on the outside of the worker's shirt in the approximate breathing zone. Thus, these latter samples were representative of the conditions to which the worker was exposed during the sampling period.

After collection of the sample, the glass tubes were sealed with small plastic caps for transfer to the Clayton & Associates laboratory. All samples were analyzed subsequently using gas chromatographic techniques. These analytical results, in conjunction with the sampling data (air flowrate and duration of the sampling to yield the total volume of air sampled) were used to calculate the corresponding concentrations of vinyl chloride in terms of parts of vinyl chloride per million parts of air, by volume.

PRESENTATION OF RESULTS

The results of the vinyl chloride sampling in the personal breathing zones and general areas of the operation are presented in Tables I and II, respectively. Examination of these data shows that no detectable amount of vinyl chloride was observed in any of the samples collected. The limit of detection for the combined sampling and analytical methods was 0.04 ppm, or less.

CONCLUSION

On the basis of observations and measurements made during this survey, it is concluded that the concentrations of vinyl chloride to which workers are exposed during the course of routine operation of the plant are within acceptable limits. In all areas, concentrations were less than 0.04 ppm, considerably less than the currently acceptable ceiling concentration (50 ppm) established by the U.S. Department of Labor's emergency temporary standard and the proposed permanent standard of one ppm.

This report prepared by: Michael S. Mosher for GDX

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TABLE I
GEORGE D. CLAYTON & ASSOCIATES
INDUSTRIAL HYGIENE SAMPLING SUMMARY

Plant General Cable Corp. Memphis, Tennessee — Material Vinyl Chloride

1974 Date	Sample No.	Description	Sampling Period Start	Sampling Period Stop	Sample Weight	Sample Volume liters	Concentration Vinyl Chloride ppm	Concentration	Concentration
		EXTRUSION LINE OPERATORS' PERSONAL BREATHING ZONES							
5/16	VC-1	Line Number 13, Russell Freeman	9:11	12:33		162	<0.02		
5/16	VC-2	Line Number 12, Lee Stevenson	9:14	12:34		170	<0.02		
5/16	VC-4	Line Number 11, Ken Sultzbach	9:28	13:12		190	<0.02		
5/16	VC-6	Line Number 8, Packager, Jerry Grey	9:43	13:23		143	<0.02		
5/16	VC-8	Line Number 12, Elray Young	11:16	13:27		105	<0.02		
5/16	VC-9	Line Number 8, Jerry Simmons	13:07	15:32		123	<0.02		
5/16	VC-13	Line Number 10, Charles Dugger	14:05	15:27		57.4	<0.04		
5/16	VC-14	B-Line, Charley Oliver	14:08	15:30		65.6	<0.04		
		Acceptable ceiling concentration (OSHA)					50		
		Emergency Temporary Standard promulgated on April 5, 1974							

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TABLE II
GEORGE D. CLAYTON & ASSOCIATES
INDUSTRIAL HYGIENE SAMPLING SUMMARY

General Cable Corp.
Plant Memphis, Tennessee — Material Vinyl Chloride

1974 Date	Sample No.	Description	Sampling Period Start	Sampling Period Stop	Sample Weight	Sample Volume liters	Concentration Vinyl Chloride ppm		
		STATIONARY AREA SAMPLES							
5-16	VC-3	Work Station Between Lines 12 and 13	9:16	12:36		140	<0.02		
5-16	VC-5	PVC Feed Bin to Line Number 11 Approximately 1.0 Foot From Opening	9:33	13:13		198	<0.02		
5-16	VC-7	Over Control Panel on Line Number 12, Approximately 3 Feet Above Extruder	9:55	13:26		222	<0.02		
5-16	VC-10	Approximately 2 Feet Above Line Number 8 Extruder	13:10	15:41		90.6	<0.03		
5-16	VC-11	Southwest Corner of Scrap Room, Near Power Switches	13:21	15:47		117	<0.02		
5-16	VC-12	Above Control Box in Dry Blend, Near Center of Room	14:00	15:50		105	<0.02		
5-16	VC-15	Approximately 1.5 Feet From Extruder on Line Number 9	14:17	15:57		105	<0.02		
5-16	VC-16	Approximately 4 Feet From Number 12 Line Extruder, Above Control Panel	14:30	15:59		79.7	<0.03		
		Acceptable Ceiling Concentration (OSHA)					50		
		Emergency Temporary Standard Promulgated on April 5, 1974							

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