File VCl (HC) 5/13/76 C.C. H.O.

# ETHYL CORPORATION

INTER-OFFICE

To : T. R. Robinson, M.D. ADDRESS : BRP

FROM : J. D. Watts ADDRESS : BRT/BRP

SUBJECT : Vinyl Chloride Monomer Survey - Hydrocarbon Area DATE : Nov. 14, 1975

As part of the comprehensive survey, an industrial hygiene evaluation was made of the airborne contaminants associated with the production of vinyl chloride monomer.

## Summary and Recommendations

The environmental sampling scheme indicates that the levels of vinyl chloride monomer (VCM) are usually below the OSHA standard of 1.0 ppm on a time weighted basis. Furthermore, only five of 21 samples collected (24%) exceeded the action level of 0.5 ppm. Also, the levels of many other hydrocarbon contaminants (the spectrum from methyl chloride to perchloroethylene) were well below their respective standards.

The highest VCM concentrations were localized on the ground floor of the #2 EDC plant (compressor P23A) and in the rundown tank area. From an environmental standpoint and under restrictive operating conditions (production rates less than 50% of maximum), there appears to be no hygienic problem and thus, no additional control measures are recommended.

## Description of Process - Recognition

Vinyl chloride monomer is used predominantly in the manufacture of polyvinyl chloride but is also utilized as an intermediate in the production of 1,1,1 trichloroethane. It is manufactured by the cracking of 1,2 dichloroethane (EDC) as shown in the following reaction:

$$\underset{\text{EDC}}{CH_2ClCH_2Cl} + \text{heat} \xrightarrow{Cl_2} \underset{\text{VCM}}{CHCl = CH_2} + HCl$$

The gas mixture from the furnace is quenched, partially condensed, and fractionated into VCM product, by-product HCl, and recovered EDC for recycle to the process.

Seven employees are potentially exposed to this cancer-suspect agent including the following operator job codes: control room (2), compressor house, tower, furnace cracking, tank car loader, and process attendant. The compressor house man and loading operator are potentially exposed to the higher VCM concentrations due to the collection of quality control samples and disconnecting tank car lines.

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Evaluation

Samples were collected at fixed station points (#2 EDC plant, control room, VCM/HCl column, and rundown tank area) at a sample rate of approximately 1.5 liters/minute. The hydrocarbon contaminants were adsorbed on activated charcoal with subsequent analysis by gas chromatography. The survey results are shown in the following appendix.

J. D. Watts

J. D. Watts
Industrial Hygienist

JDW:sp

cc: H. M. Taylor

Enclo.

Note: All samples analyzed for all components — absence of a listing for a compound, or for a number for a given compound, should be interpreted as "nil" or "trace or lesser concentrations found".

EC 4328

# A P P E N D I X

## VCM Plant Survey Results

AREA: #2 EDC Plant (North)

| Component | TLV (ppm) | Sampling Dates and Concentrations (ppm) | | | |
|---|---|---|---|---|---|
| | | 8/29 | 10/7 | 10/8 | 10/21 |
| Benzene | 10 | | < 0.04 | | |
| Butane | | 0.02 | | 0.07 | 0.12 |
| Carbon Tet | 10 | 0.11 | | | |
| Chloroform | 25 | | | | |
| 1,1 DCE | 100 | 0.16 | | | < 0.03 |
| EDC | 50 | 0.53 | 5.4 | 1.06 | 1.26 |
| Ethyl Cl | 1000 | 0.03 | 0.24 | 0.24 | 0.05 |
| Methyl Cl | 100 | | 0.09 | 0.16 | 0.27 |
| Methylene Cl | 200 | | | | < 0.02 |
| Per | 100 | 0.15 | 0.06 | 0.06 | < 0.01 |
| Propane | | 0.21 | 0.06 | 0.34 | 1.8 |
| Toluene | 100 | 0.01 | | 0.02 | 0.01 |
| 1,1,1 TCE | 350 | 0.24 | | | < 0.005 |
| Tri | 100 | 0.24 | 0.13 | 0.035 | 0.01 |
| VCM | 1 | 0.09 | 4.45* | 0.13 | 0.49 |
| Vinylidene Cl | 10 | 0.07 | 0.18 | | 0.05 |
| $Unk_1$ | | | | | x |
| $Unk_2$ | | | | | x |
| $Unk_3$ | | | | | x |
| Weather Conditions | | PC, 85° ESE-E | Cloudy, 70°, NW | Cloudy-PC, 75°, variable | Clear, 76°, S |

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# A P P E N D I X

## VCM Plant Survey Results

AREA: #2 EDC Plant (Ground Floor)

| Date | Location | Component | Concentration |
|---|---|---|---|
| 10/7 | South Compressor P28A | Benzene | < 0.04 |
| | | EDC | 6.8 |
| | | Ethyl Cl | 0.27 |
| | | Methyl Cl | 0.08 |
| | | Per | 0.06 |
| | | Propane | 0.085 |
| | | Tri | 0.095 |
| | | VCM | 0.78 |
| | | Vinylidene Cl | 0.06 |
| 10/8 | Middle Compressor P28-C-P28D | Butane | 0.07 |
| | | EDC | 1.83 |
| | | Ethyl Cl | 0.25 |
| | | Methyl Cl | 0.16 |
| | | Per | 0.04 |
| | | Propane | 0.45 |
| | | Toluene | 0.01 |
| | | Tri | 0.04 |
| | | VCM | 0.175 |

AREA: #2 EDC Plant

| Component | 10/7 | 10/8 | 10/17 | Location |
|---|---|---|---|---|
| Benzene | < 0.04 | 0.075 | | Between Compressor |
| Butane | | | 0.13 | House & Production Unit |
| EDC | 6.64 | 3.7 | 1.06 | |
| Ethyl Cl | 0.31 | 0.33 | 0.26 | |
| Methyl Cl | 0.085 | 0.19 | 0.32 | |
| Methylene Cl | | | 0.07 | |
| Per | 0.06 | 0.04 | | |
| Propane | 0.37 | 0.97 | 5.08 | |
| Toluene | | 0.02 | 0.01 | |
| Tri | 0.08 | 0.03 | | |
| Unk | | | x | |
| VCM | 0.42 | 0.24 | 0.12 | |
| Vinylidene Cl | 0.02 | 0.02 | | |

AREA: Control Room

| Component | 10/9 | 10/14 | 10/17 | 10/21 |
|---|---|---|---|---|
| Benzene | | | | |
| Butane | 0.08 | | 0.21 | 0.14 |
| Carbon Tet | | 0.4 | | |
| Chloroform | | | | |
| 1,1 DCE | | 0.63 | 0.04 | 0.23 |
| EDC | 0.8 | 0.22 | 0.56 | 0.185 |
| Ethyl Cl | 1.8 | 0.02 | 0.4 | 0.06 |
| Methyl Cl | 1.85 | 0.15 | 3.06 | 2.37 |
| Methylene Cl | | | 0.14 | < 0.06 |
| Per | 0.06 | 0.09 | | 0.11 |
| Propane | 0.03 | 2.26 | 36.2 | 35.2 |
| Toluene | | 0.02 | 0.05 | 0.04 |
| 1,1,1 TCE | < 0.025 | 0.51 | | 0.26 |
| Tri | 0.05 | 0.11 | | 0.05 |
| VCM | 0.15 | 0.03 | 0.135 | 0.19 |
| Vinylidene Cl | | | 0.04 | < 0.01 |
| Unk | | x | x | x |
| Weather Conditions | | Clear-PC, 80°, E-SE | Cloudy, 70° WNW-MW | Clear, 76°, S |

AREA: VCM/HCl Column

| Component | 10/9 | 10/14 | 10/17 | 10/21 |
|---|---|---|---|---|
| Butane | 0.05 | 0.03 | 0.25 | 0.15 |
| 1,1 DCE | | | 0.03 | 0.23 |
| EDC | 0.31 | | 0.30 | 0.07 |
| Ethyl Cl | 0.34 | 0.02 | 0.295 | 0.03 |
| Methyl Cl | 0.20 | 0.06 | 0.06 | 0.24 |
| Methylene Cl | | | 0.28 | 0.07 |
| Per | 0.03 | 0.29 | | |
| Propane | 1.06 | 0.25 | 0.59 | 0.09 |
| Toluene | | 0.01 | 0.06 | 0.03 |
| 1,1,1 TCE | 0.03 | 0.24 | | 0.01 |
| Tri | 0.05 | 0.07 | | 0.07 |
| VCM | 0.57 | 0.24 | 0.22 | 0.12 |
| Vinylidene Cl | | | 0.04 | |
| Unk | | x | x | x |

AREA: VCM Rundown Tanks

| Component | 10/9 | 10/14 | 10/17 | 10/21 |
|---|---|---|---|---|
| Butane | 0.05 | 0.06 | 0.31 | 0.16 |
| Carbon Tet | | 0.22 | | |
| 1,1 DCE | | | < 0.01 | < 0.03 |
| EDC | 0.66 | 0.05 | 0.06 | 0.12 |
| Ethyl Cl | 0.31 | 0.01 | 0.29 | 0.01 |
| Methyl Cl | 0.10 | 0.06 | 0.03 | 0.25 |
| Methylene Cl | | | 0.17 | 0.07 |
| Per | 0.02 | 0.55 | | |
| Propane | 0.03 | 0.11 | 0.02 | 0.075 |
| Toluene | | 0.01 | 0.05 | 0.01 |
| 1,1,1 TCE | < 0.02 | 0.06 | | 0.01 |
| Tri | 0.07 | 0.08 | | 0.02 |
| VCM | 1.98* | 0.08 | 0.05 | 2.75* |
| Vinylidene Cl | | | < 0.01 | |
| Unk | | x | x | x |