

WALK-THROUGH SURVEY OF

E. I. du Pont de Nemours and Company, Inc.
Louisville, Kentucky

SURVEY DATE
April 25, 1975

SURVEY CONDUCTED AND REPORT WRITTEN BY

James H. Jones
Ronald J. Young
Sherry Selevan

DATE OF REPORT

Dec. 1975

Division of Field Studies and Clinical Investigations
National Institute for Occupational Safety and Health
Cincinnati, Ohio

PLACE VISITED:

E.I. du Pont de Nemours and Company
Elastomer Chemicals Department
P.O. Box 1378
Louisville, Kentucky

DATE OF VISIT:

April 25, 1975

PERSONS MAKING VISIT:

James H. Jones
Ronald J. Young
Richard Waxweiler
Sherry Selevan

PERSONS CONTACTED:

L.M. Cresse, Manager
W.E. Egan, Asst. Manager
C.I. Shoch, General Production Superintendent
W.K. Witsiepe, R & D Superintendent
H.R. Deutsch, Environmental Control Supervisor
W.F. Hawn, M.D., Medical Director
R.N. Greene, R & D Supervisor
R.F. Willis, Chemist
J.A. Stephens, Personnel Supervisor

PURPOSE OF VISIT:

To observe the manufacture of neoprene and
to discuss their environmental monitoring
program.

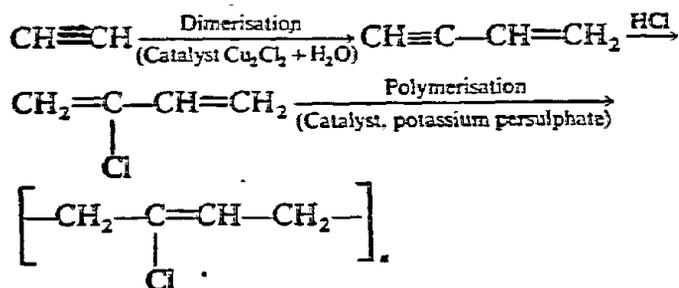
INTRODUCTION

Dr. John A. Zapp, Haskell Laboratory, E.I. du Pont de Nemours and Company in correspondence date December 16, 1974 advised NIOSH of potential carcinogenicity of chloroprene. A meeting was requested by DuPont to inform NIOSH of their program for investigating the toxicology of chloroprene and to secure the comments of NIOSH on that program. This meeting was subsequently held in Cincinnati on March 7, 1975.

On April 25, 1975, James H. Jones, Ronald Young, Richard Waxweiler and Sherry Selevan conducted a walk-through survey of the E.I. du Pont de Nemours and Company, Inc. in Louisville, Kentucky. The major purpose for this visit was to observe the manufacture of neoprene and to obtain information about their environmental monitoring program.

PLANT HISTORY

The plant started operations in 1942 and was owned by Rubber Reserve. The plant produced chloroprene monomer using acetylene as the raw material. The reactions are as follows:¹



In the first years of operations, the reaction was carried out in 400 gallon glass-lined reaction vessels, which were not completely sealed. Atmospheric concentrations of chloroprene are believed to have been many times the present TLV for chloroprene of 25 ppm.

In 1949 the plant was purchased by DuPont. In 1950 the first large glass-lined reactor vessel was installed. This vessel is a sealed unit. These larger reactor vessels gradually replaced the smaller 400 gallon units, and by 1960 most of the major production was carried out in the larger vessels.

Experimental work was completed on the engineering of a monomer-recovery unit in the late 1940's at DuPont's neoprene plant in New Jersey. After the Louisville Plant was purchased from the U.S. Government in 1949, lower conversion rates were introduced to impart different properties to neoprene. Along with lower conversion rates, a plant-scale monomer recovery unit was installed. Additional units were installed in the 1950's.

During 1960-67 the porcelain piping was replaced with a less fragile material resulting in less breakage and subsequently fewer spills.

Peak production at this site was realized in 1965. During this year an explosion which resulted in multiple deaths lead to increased safety measures.

Because of a price increase of acetylene, monomer production at this plant ceased in February, 1973. The monomer that is currently used at the plant is made from butadiene.

DESCRIPTIONS OF CURRENT OPERATIONS

Unrefined, refrigerated chloroprene monomer is brought to the plant by rail. It is about 95% pure, containing higher boiling chlorinated compounds, toluene and a significant quantity of inhibitor which, with the low shipping temperatures, prevents polymerization en route. The monomer is transferred to refrigerated storage tanks which are nitrogen blanketed. Chloroprene monomer is distilled as needed to remove inhibitors and residual high boiling compounds, and subsequently stored in another refrigerated nitrogen-blanketed tank. The "bottoms" from the distillation column are burned in a chemical waste incinerator which produced HCl. The HCl is absorbed in water and disposed by pumping it into a deep well.

A monomer solution is made by adding chloroprene monomer, resin, and modifier. A water solution is made from caustic and water. The two solutions are pumped into a large glass-lined reactor vessel, "large poly kettle". Here the monomer is emulsified in an aqueous soap solution and polymerized under atmospheric pressure frequently in the presence of sulfur, with a catalyst to initiate the polymerization.

If a full conversion latex is desired, the reaction is run to completion. The emulsion is cooled and put in tank cars or 55 gallon drums. If the conversion is not complete, the emulsion is stripped of the unreacted monomer and then packaged.

If a solid material is desired, the emulsion is stripped to recover the unreacted monomer. The unreacted monomer is piped back to the distillation column, while the aqueous neoprene emulsion is freeze coagulated on the surface of a brine chilled drum. The film is washed, goes through a squeeze roll, a dryer, gathered by means of rolls to form a rope, cut and bagged. Talc is added at the cutting step to keep the neoprene from sticking together.

A flow sheet of the process is shown in Figure 1.

MEDICAL AND PERSONNEL RECORDS

Current total employment is in excess of 1000. Presently 10 to 15% of the employees are black. Approximately 33% of the hourly employees work in maintenance, 50% in operations, and the balance are assigned to supporting departments (e.g. shipping). The operators are assigned to specific areas (i.e. polymer, monomer, laboratory, power), but the maintenance people generally work out of central shops and may be all over the plant, which makes determinations of their exposure difficult. About one-third of the salary employees are foremen. DuPont has sent us a listing of the number of people employed on the plant and the percent of total employment assigned to the monomer and polymer units of production.

Medical Records

There is a complete pre-employment physical, plus an additional one every three years for employees less than 40 years old, and once every 1.5 years for those greater than or equal to 40 years. These include blood chemistry, chest x-ray, and pulmonary function tests. Approximately one year ago, they started recording smoking histories and alcohol and drug consumption. Audiometric tests and asbestos medical examinations are performed yearly.

They have had three cases of asbestosis in pipe insulation workers. They have had a few cases of hair loss due to chloroprene exposure; the most recent being within the last five years. Some cases of skin cancer have also been documented. Unfortunately, information in the medical folders is incomplete.

In 1956 DuPont began collecting death certificates of deceased active employees, and pensioners and ten years later they began adding pathology reports when possible for these deaths.

Personnel Records

The personnel records go back to the beginning of the plant, 1942. One of their forms, the G149, has been used for all employees since that time. It includes: name, social security number, pay, work locations and date the worker changed positions, date of birth, race, marital status, and address. Pensioner's forms are kept active (current addresses).

Approximately eight thousand hourly and 1,000 salaried employees have worked at the plant since its opening.

There are three unions, all independent; Neoprene Craftsmen Union, Neoprene Clerical Workers Union, Chemical Protection Employees Local #1.

ENVIRONMENTAL MONITORING

Although considerable expertise exists at the corporate level, apparently little professional industrial hygiene services have been routinely provided to this plant. A chloroprene monitoring program was initiated by

plant management in the early 1970's for the Louisville plant. Apparently, this was initiated for air pollution, not industrial hygiene purposes. A sampling protocol dated, October 4, 1971 exists in the plant files. This method involves taking grab samples by means of a glass sampling flask and a rubber aspirator bulb. The sample is then analyzed by gas chromatography.

The first in-depth monitoring for chloroprene was done for air pollution purposes in early 1973. These were grab samples taken at the "worst places" with the glass sampling flask procedure or with Drager detector tubes. Plant correspondence entitled "Air Pollution Survey in West Poly" dated January 24, 1973, identifies three areas where excessive chloroprene concentrations were found.

In the large weigh tank pits while flusing the charging lines, the chloroprene concentrations ranged from 610 to 1200 ppm. Under the large poly kettles with the strainer open, chloroprene concentrations ranged from 310 to 4170 ppm.

A similar report, "Air Pollution Survey-East Poly" dated February 12, 1973 revealed five grossly contaminated areas. Chloroprene concentrations as high as 6760 ppm were recorded.

Based on these surveys, corrective action was taken to lower chloroprene concentrations. At the large weigh tank pit, piping was installed from the strainer to a closed ditch. A "fume trap" and a vent stack were added at the ditch. Additional improvement was made by making it possible to water flush the strainer. Corrective action taken at the large polymerization kettle included installation of exhaust ventilation around the opening of the strainer case, a comfort fan, and water flushing prior to opening. These areas are now reported to be within the current TLV.

Other Environmental Contaminants

Asbestos has been used on process piping in the past but is no longer used. However, potential exposure to asbestos still exists. Acrylonitrile is sometimes used as a copolymer in chloroprene production. Exposures to talc were considerably above the TLV in the past. Freon 22 (chlorodifluoromethane) is also manufactured at this location.

RECOMMENDATIONS

- 1) Reduction of exposure to the lowest possible level should continue to be a goal because of the possible mutagenicity and carcinogenicity of chloroprene.
- 2) The analytical procedure used by DuPont should be verified.
- 3) The chloroprene concentrations at neoprene user's facilities should be monitored to ascertain extent of exposure.

REFERENCES

1. Roff, W.J. and Scott, J.R.: Handbook of Common Polymers. Cleveland, Ohio, Chemical Rubber Co., 1971, p. 408.

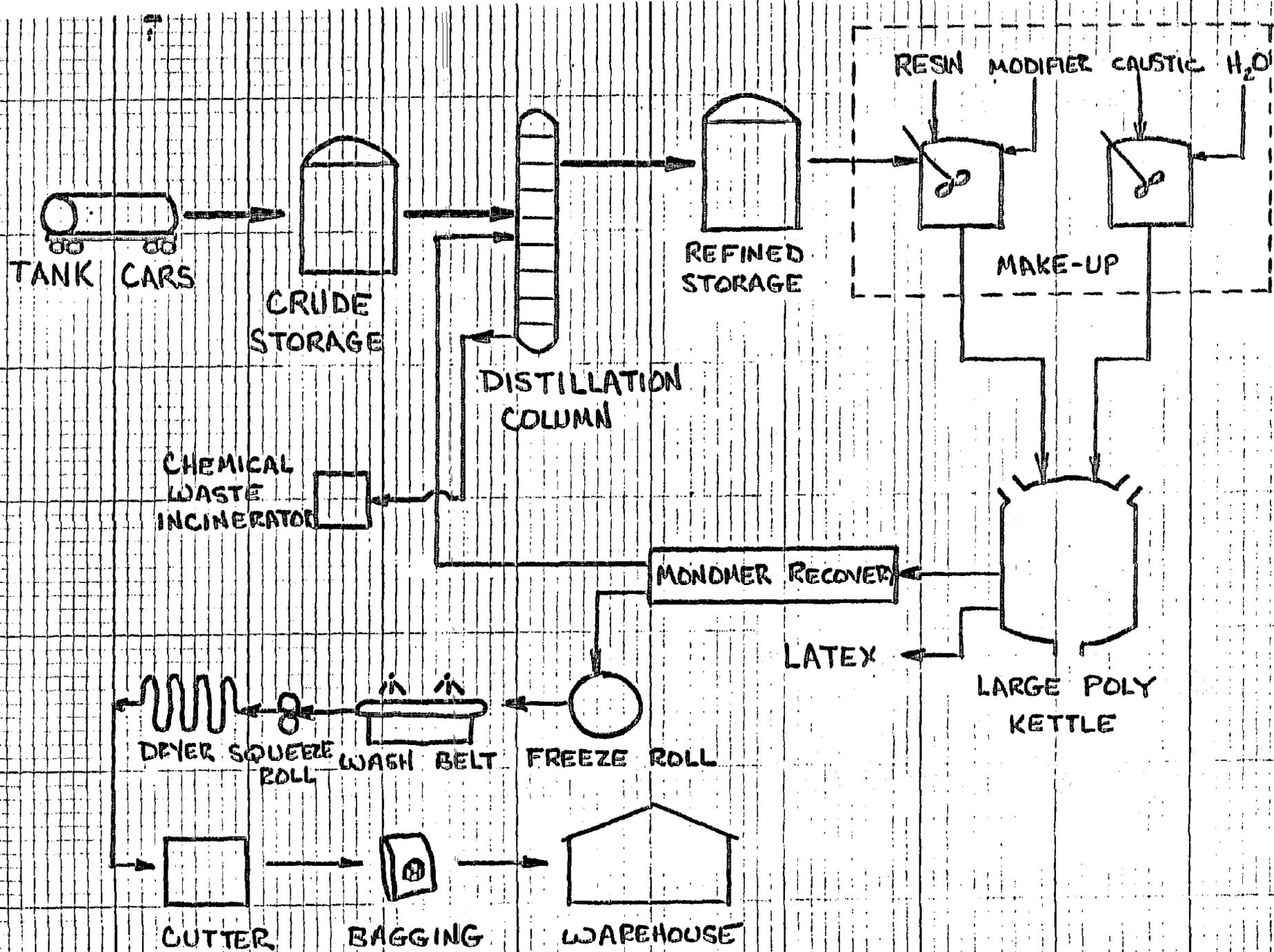


FIG. 1 CHLOROPRENE FLOU) SHEET