

WALK-THROUGH SURVEY OF
Goodyear Tire and Rubber Co.
Cast Film Division
St. Marys, Ohio

SURVEY DATE

February 9-10, 1976

SURVEY CONDUCTED BY

Paul Johnson
Robert Rinsky
Peter Infante
Mark Jones
Ronald Young

REPORT WRITTEN BY

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DATE OF REPORT

January, 1977

Industry-Wide Studies Branch
Division of Field Studies, Hazard Evaluations, and Field Studies
National Institute for Occupational Safety and Health
Cincinnati, Ohio

PLACE VISITED:

Goodyear Tire and Rubber Co.
Cast Film Division
St. Marys, Ohio

DATE OF VISIT:

February 9-10, 1976

PERSONS MAKING VISIT:

Paul Johnson
Robert Rinsky
Peter Infante
Mark Jones
Ronald Young

PERSONS CCNTACTED :

Clifford Johnson, M.D.
Corporate Medical Director

Jack Holiday, Plant Manager

Richard Ballinger, Safety Director

Sam Sekel, Assistant Personnel Manager

Harold Chrismer , General Foreman,
Cast Film Division

William Irons, Chemical Engineer

PURPOSE OF VISIT:

To determine if a suitable population exists for an environmental-epidemiological study of workers exposed to benzene.

INTRODUCTION

The Industry-Wide Studies Branch of the National Institute for Occupational Safety and Health has initiated an epidemiologic evaluation of mortality patterns among employees utilizing benzene. On February 9-10, 1976, a team of industrial hygienists and epidemiologists conducted a walk-through survey of the pliofilm operation of the Goodyear Tire and Rubber Company. The major purpose of that survey was to determine if a suitable population of workers exposed to benzene existed at this facility.

PLANT DESCRIPTION AND HISTORY

The Cast Films Division manufactures clear plastic films (polyvinyl chloride and rubber hydrochloride) by the solvent casting method. Of interest to this survey were the operations associated with Pliofilm (rubber hydrochloride). Pliofilm operations started in St. Marys in 1939 with two production units. In 1941, two more units were installed, and in 1947 two additional units were installed. Two units were "narrow" (48" recovered width) and the other four were "wide" (app. 60" recovered width). Full operation netted approximately 16,000 lbs./day. These six units ran until 1966. In 1967, production was cut-back to four units, and in 1970 a further reduction to three units was made. Subsequently, in 1974, operation was limited to one unit. By 1975, production had increased to two units and at the time of our visit, three units were operating.

The Pliofilm Department works three shifts (11-7, 7-3, 3-11), five or six days per week. When two units are operating, the following operating personnel are required:

<u>SHIFT</u>	<u># OF WORKERS</u>
1st Shift	10
2nd Shift	10
3rd Shift	9
	<u>29</u>

In addition, three maintenance personnel and six supervisors are required.

The ten operating personnel are divided as follows:

- 3 Casting Unit Operators
- 2 Casting Unit Helpers
- 1 Reactor Operator
- 2 Neutralizer Operators
- 1 1st Man Operator
- 1 Banbury - Quencher Operator

Department code number 146A refers to pliofilm production and 146B refers to the slading department where pliofilm is cut, wrapped and shipped.

PROCESS DESCRIPTION

A schematic diagram of the process is shown in Figure 1. Natural rubber is uncrated and dumped in a Banbury mixer for approximately 22 minutes. The rubber from the Banbury passes through a mill and is conveyed to agitated mixing tanks where benzene is added. During this three hour mixing process, the rubber is dissolved in the benzene. This liquid is then piped to blending tanks where further mixing takes place. These tanks also serve as a hold tank for the reactor. As the process continues, the solution is introduced to the reactor, where hydrochloric gas (HCL) is added. Also, measured amounts of benzene are added to reduce the percent solids from 20% to 9% or less. From the reactor tanks the rubber hydrochloride is dropped into neutralizing tanks. Film scraps, soda ash, plasticizers and additional benzene are added. The mixing is a 6 to 7 hour process, and is adjusted to 10% rubber hydrochloride. Next the mixture is passed through a plate and frame filter press. The

benzene in the filter cake **is** separated by a Quencher Unit. Residue from the separation **is** discarded, while the benzene **is** pumped to a still for further processing.

After filtration, the rubber hydrochloride **is** piped to a central storage area until needed. From storage the rubber hydrochloride solution passes through a small plate and frame filter press and then to the casting units. Here the solution **is** spread on a conveyor, the solvent evaporated, and the finished film taken up on rolls. Temperatures during the drying process reach and many times exceed 170°F. This unit is enclosed and entered only for maintenance or to rethread the film take-up system. A hinged door **is** located in front of the dam. The door **is** opened periodically to make necessary adjustments for film thickness. The final rolls of film from these units are stocked in bulk rolls and or cut for size and packed for shipping.

The casting unit **is** swept with air to maintain benzene concentrations below the lower explosive limit. The exhaust air from the casting unit **is** passed through a wet scrubber before being channeled into one of 2 absorber units. The absorber units contain activated charcoal which absorbs the benzene. When the charcoal bed is saturated the contaminated air stream **is** diverted to a second absorber unit while the first unit **is** being desorbed by the use of a steam sparger. The benzene vapor and stream **is** then condensed and piped to the decanter, where the benzene **is** drawn off and sent to a receiving tank. Finally, the benzene **is** purified and returned to underground storage.

MEDICAL

The Goodyear Tire and Rubber Co. has a corporate medical director, Dr. Johnson, is located in Akron, Ohio. A local general practitioner, Dr. Harbord, is retained as a consultant to the plant and performs all physical examinations. Also present during each shift is a registered nurse.

Pre-employment physicals are required of all persons which include chest x-rays, blood cell counts, hemoglobin, platelet, and routine urinalysis. Medical controls consist of monthly white blood count and hemoglobin determination of all employees with benzene exposure. These records are kept indefinitely. Over the years, occasional decreases in white blood cell counts ($<4,000$) have been observed. In these cases, the employee is removed from benzene exposure.

POTENTIAL HAZARDS

The major health hazards observed during this survey were as follows:

1. Respiratory exposure to benzene vapors.
2. Potential noise exposure.

INDUSTRIAL HYGIENE AND SAFETY PROGRAMS

Industrial Health and Safety programs are supervised by Mr. Ballinger.

Also under his supervision is a preventive maintenance program to replace leaky valves, pipes, seals, and packings as leaks are detected. Industrial hygiene surveys and monitoring are conducted on a regular basis. Personal protection programs presently in force include safety glasses in selected areas, and respirators where benzene exposures may occur.

VENTILATION SYSTEMS

During the Pliofilm operation, exhaust ventilation ducts are provided at each unit. The system consists of hoods and vents with the air flow provided by centrifugal fans. Improved ventilation systems which discharge into large roof collectors have been installed in potential high exposure areas.

ENVIRONMENTAL MONITORING

Sampling and analytical methods for analysis of benzene in air employs absorption on charcoal, followed by desorption and gas chromatographic measurement. To obtain this data 20 breathing zone samples were collected on charcoal tubes by a Dupont pump using a flow rate of 100 cc/minute. Samples were collected for approximately 4 hours. After collection the charcoal tubes were sent to Salt Lake City, Utah for analysis. The results obtained can be found in Table I. It should be noted that appropriate respiratory protection was worn, at least part time, by the Neutralizer Operator and 1st man Operator.

RECOMMENDATIONS

Exposure to benzene should be controlled so that no worker will be exposed to benzene in excess of 1 ppm as determined by an air sample collected at one liter/minute for two hours.

CONCLUSION

A suitable population exists at this facility to conduct an epidemiologic evaluation of mortality patterns.

NATURAL RUBBER

BANBURY MIXER
22 MINUTES

MILL

MIXER
3 HRS.
20.5% Solids

BENZENE

R. END TANK

BENZENE

REACTOR
8 HRS.
HCl
9% Solids

RUBBER HYDRO-CHLORIDE

BENZENE

PLATE & FRAME FILTER PRESS
10.5% Solids
7 HRS.

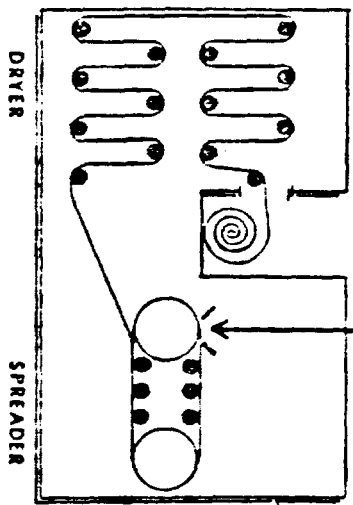
Scrubber
Benzene
Soda Ash
Steam
Plasticizer
7 HRS.
10.5% Solids

RUBBER HYDRO-CHLORIDE STORAGE

PLATE & FRAME FILTER PRESS

Soda Ash
QUENCH
Residue (discarded)

CASTING



SCHEMATIC DIAGRAM OF PILOFILM MANUFACTURING

SCRUBBER
Cooling Coils
Steam Coils
Vapor
 C_6H_6

2 ABSORBING UNITS (Steaming, Airing)
Steam Sparger
Scrubbed Air
 C_6H_6 & Steam
Scrubbed Air
 C_6H_6 & Steam

STORAGE TANK

RECEIVING TANK

DECANTER
 H_2O

CONDENSER
COOLER
80°-90°

STILL

UNDERGROUND STORAGE

BENZENE

TO MIXER, REACTOR AND NEUTRALIZER