U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
CENTER FOR DISEASE CONTROL
NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH
CINCINNATI, OHIO 45226

HEALTH HAZARD EVALUATION DETERMINATION REPORT
HHE 77-99-726

DUPONT, CHAMBERS WORKS
DEEPWATER, N.J. 08023

AUGUST 1980

I. SUMMARY

The National Institute for Occupational Safety and Health (NIOSH) received a confidential request concerning exposures to chemicals at the DuPont Chambers Works site in Deepwater, New Jersey SIC 2899. After several discussions with the requestor of the health hazard evaluation and representatives of the employees, it was decided to evaluate employee exposures to nitrotoluene and chlorobenzene compounds which had been identified in atmospheric samples collected at the Chambers Works as part of the EPA project. Samples were collected in early October, 1979. Exposures to chlorobenzene were less than 2 milligrams per cubic meter of air (mg/M^3). Exposures to dinitrotoluene were less than 0.05 mg/M^3. Concentrations of dichlorobenzene (all three isomers), 1,3,5-trichlorobenzene, nitrobenzene and 1-chloro, 2-nitrobenzene were less than could be determined analytically.

Exposures to chlorobenzene; dichlorobenzene isomers; 1,3,5-trichlorobenzene; nitrobenzene; 1-chloro, 2-nitrobenzene and dinitrotoluene were less than the permissible exposure limits established by the Occupational Safety and Health Administration (OSHA).

II. INTRODUCTION

In July, 1977, the National Institute for Occupational Safety and Health (NIOSH) received a confidential request from employees at the DuPont, Chambers Works facility, concerned about exposures to various chemicals.* The Chambers Works occupies about 1 square mile of land area, has an employment of about 3,000 workers and produces a large number of chemical products.

Meetings were begun in Fall 1977 with the requestors of the hazard evaluation, union representative, NIOSH, OSHA, and the New Jersey Environmental Protection Administration (N.J. - E.P.A.). At these meetings, the following areas were reviewed:

Petroleum chemicals - tetraethyl lead (TEL), tetramethyl lead (TML). In 1972, environmental controls were installed to control emissions of TEL/TML. In 1974, odors of TEL/TML were detectable in nearby work areas

*Section 20 (a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669 (a)(6) authorizes the Secretary to Health and Human Services, following a written request by an employer or authorized representative of employees, to determine whether any substance in the place of employment might have potentially toxic effects as it is used or may be used.

such as laboratories and engineering shops. OSHA investigated this complaint and found no analytically detectable levels of TEL/TML.

Elastomer - OSHA conducted an extensive survey in 1976 for toluene diisocyanate (TDI) exposures. No notices of violation were issued.

Monastral Building - The main concern of workers regarding this area was the emission of a yellowish plume from the Nitrator and possible irritation from the plume. The possibility of exposure to oxides of nitrogen was investigated by OSHA in 1977. No excessive exposure was detected. It appears that the installation of proper air pollution controls solved this problem.

Environmental Services - In this area, the concern appears to be with the fact that workers are exposed to a variety of chemicals while disposing them. However, the exposures are for short periods. This area was looked at by OSHA with regard to personal protection afforded workers. No specific problems were found, but OSHA will review this area on a continuing basis.

Construction and Engineering - Workers are concerned about exposures to zinc at galvanized metal welding stations and to phosgene when welding on parts that had just been cleaned with a chlorinated degreaser. These operations were investigated by OSHA Industrial Hygienists. No notices of violation were issued.

Most production employees are protected by respirators, protective clothing and shower after each shift. Raw chemicals are received in bulk by freight or tank car, pumped into holding tanks until processing in closed systems or in enclosed batch systems. Most employees appear to be protected from exposure to the chemicals with which they work. The major problem was identified as concern about exposures to emissions from the numerous processes at the site. In December, 1977, during a meeting between NIOSH, N.J. - E.P.A. and the requestors, it was decided to await the results of analysis of samples collected as part of a federal E.P.A. study. In June, 1977, samples to detect minute quantities of organic chemicals in the atmosphere were collected at several sites within the Chambers Works. The results of this survey were obtained in mid 1979.

About 60 compounds or isomers were identified as present in the atmosphere at the work site. Concentrations were in the range of 10^{-9} to 10^{-6} gram per cubic meter of air (See Table I). Further consultation with the requestor of the hazard evaluation and with representatives of the employees indicated that they wanted to obtain exposure information on nitrotoluene

and chlorobenzene compounds which had been identified in the E.P.A. report. This selection partially was based on the fact that exposures to these compounds had not previously been documented, either by OSHA or by DuPonts monitoring program.

III. BACKGROUND

Nitrotoluene and chlorobenzene compounds are produced in Buildings 1221 and 1440. Chemicals are piped into the wall-less "buildings" and undergo a series of reactions in enclosed vessels with the finished product piped into holding tanks to await shipment from the plant. The processes are monitored from an enclosed control building adjacent to the two reaction buildings. The employees who enter the buildings to collect samples and make minor adjustments to flow-rates, etc. wear rubberized protective clothing, goggles, hard hats and NIOSH approved respirators. The use of respiratory protection is mandatory in the production buildings and the general area (and in most of the plant except for offices and laboratories). Five employees per shift work in the immediate area - a yard man who receives the bulk chemicals, one individual who collects samples, etc. for each building, a supervisor and an employee in charge of the control room. The latter two rarely leave the control building.

IV. SAMPLING AND ANALYTICAL METHODS

Breathing zone samples were collected on the outdoor employees in October, 1979. General air samples were collected inside the control room to represent the exposure of indoor employees. Samples were collected at rates of 100 cubic centimeters per minute over entire shifts (in reality 6 to 7 hours) using silica gel tubes for adsorption of nitrotoluene and charcoal tubes to adsorb chlorobenzene compounds. Sample volumes were generally 35 to 42 liters. The nitrotoluene was analyzed using a high pressure liquid chromatography technique. The chlorobenzene compounds were analyzed using a modification of NIOSH's method 127 - gas chromatography with a flame ionization detector.

V. TOXICOLOGY

Table II lists the major physiologic responses to the substances analyzed and the OSHA permissible exposure limits for these substances where applicable. Most are eye and mucous membrane irritants. 2,4-Dinitrotoluene has been identified as causing tumor development in rats (oral administration), chlorobenzene is currently being tested for carcinogenicity by the National Cancer Institute. The carcinogenicity tests for dichlorobenzenes have been indeterminate and further tests have been scheduled.

VI. DISCUSSION AND RESULTS

The results of analyses of the samples are listed in Table III. No dichlorobenzene (ortho, meta, and para isomers); 1,3,5-trichlorobenzene; nitrobenzene or 1-chloro, 2-nitrobenzene were detected. Small concentrations of chlorobenzene and dinitrotoluene were found. These concentrations represent exposure levels far below the threshold limit values that OSHA has established for these compounds. Because the samples were collected on individuals who work most directly with the substances or were collected in areas where these individuals would be found, and because the concentrations determined were less than the established limits, no recommendations are made.

VII. DISTRIBUTION - AVAILABILITY

For purposes of informing the affected employees, the employer shall post this report for 30 days in a prominent place near where employees work.

Copies of this report are currently available upon request from NIOSH Division of Technical Services, Information Resources and Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days, the report will be available through the National Technical Information Service (NTIS), Springfield, Virginia, 22161. Information regarding its availability from NTIS can be obtained from NIOSH's Publication Office at the Cincinnati address. Copies of this report have been sent to:

1. DuPont, Chambers Works, Deepwater, New Jersey
2. The requestor of the Health Hazard Evaluation
3. Chemical Workers Association, Inc.
4. U.S. Dept. of Labor, OSHA, Region II
5. U.S. Dept. HHS, NIOSH, Region II
6. N.J. Commissioner of Health
7. N.J. Office of Epidemiology

VIII. AUTHORSHIP - ACKNOWLEDGEMENTS

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TABLE I

AMBIENT AIR LEVELS OF SEVERAL VOLATILE ORGANIC VAPORS SURROUNDING
E. I. DuPONT deNEMOURS, DEEPWATER, NJ[a]
E.P.A. STUDY, JUNE, 1977

Chemical Class	Compound	P4/L5	P4/L6	P4/L7	P4/L8	P5/L5	P5/L6	P5/L7	P5/L8	P6/L5	P6/L6	P6/L7	P6/L8	Tenax Blank
Halogenated Hydrocarbons	methylene chloride	65	405	35	437	75	486	-	625	345	248	261	81	T
	chloroform	152	-	-	T	150	439	-	64	-	70	90	13	T
	1,2-dichloroethane	12	-	-	T	-	-	-	53	-	-	-	24	-
	1,1,1-trichloroethane	-	-	2,842	T	-	-	-	67	-	-	-	14	-
	carbon tetrachloride	19	-	-	-	-	-	-	-	-	-	-	32	-
	trichloroethylene	4	-	-	-	-	-	-	56	-	-	-	5	-
	1,2-dibromoethane	-	-	T	-	-	-	-	-	-	-	-	-	-
	tetrachloroethylene	6	13	T	60	69	-	-	218	22	29	-	57	-
	chlorobenzene	14	15	11	512	55	-	-	305	25	17	12	669	-
	o-dichlorobenzene	17	554	-	51	25	-	-	-	T	-	-	1,319	-
	dichlorobenzene isomer	19	12	-	1,240	21	-	-	T	101	404	-	14	-
	trichlorobenzene isomer	T	T	-	136	-	-	-	150	13	-	-	113	-
	dichloroethylene	-	-	-	-	-	-	-	-	-	-	-	-	-
	dichlorotoluene	-	-	-	59	-	-	-	61	-	107	-	29	-
Sulfur	2,3-benzothiophene	-	-	-	T	-	-	-	-	-	536	-	T	-
	methylbenzothiophene	-	-	-	-	-	-	-	-	-	116	-	T	-
Oxygenated Compounds	furan	T	-	-	-	-	-	-	-	59	-	-	-	-
	acetone	T	-	-	-	-	-	-	-	-	-	-	-	-
	methyl ethyl ketone	T	-	-	-	-	-	-	-	-	-	-	-	-
	methyl vinyl ketone	T	-	-	-	-	-	-	-	72	-	-	-	-
	methyl methacrylate	-	-	-	25	-	-	95	27	-	21	-	16	-
	dibenzofuran	-	184	-	-	-	138	-	29	-	3,279	-	-	-
	phenylacetladehyde	-	28	33	-	-	-	-	-	-	41	T	-	-
Nitrogen Compounds	cyanobenzene	T	-	12	21	35	-	-	-	-	-	-	-	-
	aniline (or methylpyridine)	-	-	-	28	-	-	-	-	-	-	-	-	-
	nitrobenzene	-	-	-	123	-	-	-	-	-	-	-	105	-
	chloroaniline isomer	-	-	-	146	-	-	-	-	-	5,960	-	T	-
	nitrophenol	-	-	-	73	-	-	-	-	-	-	-	24	-
	o-nitrotoluene	-	-	-	T	-	-	-	-	-	47	-	-	-
	p-nitrotoluene	-	-	-	59	-	-	-	86	-	-	-	-	-

(continued)

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Table I (cont'd)

Chemical Class	Compound	P4/L5	P4/L6	P4/L7	P4/L8	P5/L5	P5/L6	P5/L7	P5/L8	P6/L5	P6/L6	P6/L7	P6/L8	Tenax Blank
	chloronitrobenzene isomer (or chloroaniline)	-	-	-	360	-	-	-	T	-	-	-	-	-
	dichloronitrobenzene (or dichloroaniline)	-	-	-	2,704	-	-	-	T	-	-	-	32	-
	quinoline	-	42	-	-	-	-	-	-	-	-	-	-	-
	methylquinoline	-	-	-	-	-	-	-	-	-	1,478	-	-	-

[a]Values are in ng/m^3.

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TABLE II

PHYSIOLOGIC RESPONSES
AND STANDARDS
FOR SELECTED SUBSTANCES

Substance	Symptoms of Exposure	OSHA Permissible Exposure Limit (mg/M^3)
Chlorobenzene	Eye & nose irritation, drowsiness, skin irritation and liver damage.[A]	350 Time weighted average (TWA) for an 8 hour daily exposure.
Dichlorobenzene ortho isomer	Eye & nose irritation, skin blisters, liver and kidney damage.[A]	300 (Ceiling)
para isomer	Eye irritation, headache, rhinitis, nausea, jaundice.[A]	450 (TWA)
1,3,5 trichlorobenzene	Eye, skin and mucous membrane irritation.[B]	No OSHA limit is specified at this time.
Nitrobenzene	Eye irritation, anemia, dizziness, nausea, dermatitis.[A]	5 (TWA)
1 - chloro, 2-nitrobenzene	"High" toxicity via oral and inhalation routes[B], methemoglobinemia	No OSHA limit is specified at this time.
2,4 dinitrotoluene	Anemia, jaundice, anoxia.[A]	1.5 (TWA) (skin absorption).

A. NIOSH/OSHA, Pocket Guide to Chemical Hazards, DHEW (NIOSH) Publication No. 78-210.

B. Dangerous Properties of Industrial Materials, N. Irving Sax, Van Nostrand Reinhold Company, New York, New York, 1979.

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TABLE III

RESULTS OF SAMPLING

NIOSH STUDY, OCTOBER, 1979
(milligrams/meter^3)

	Chlorobenzene	Dichlorobenzene*	1,3,5-Trichlorobenzene	Nitrobenzene	1-chloro 2 nitrobenzene	Dinitrotoluene
Yardman (breathing zone)	1.9 ND	ND	ND	ND	ND	.042
MPU-Building 1221 (breathing zone)	0.3 0.2					ND
DNT-Building 1140 (breathing zone)	1.7					.032
General Air Control Room	0.3 ND					ND
Limit of Detection (mg/sample)	0.01	0.01	0.01	0.08	0.05	0.0003

ND = None Detected

* Samples were analyzed for all three isomers of dichlorobenzene -ortho, meta and para. None were detected.