



The Industrial Commission
Of Ohio
Division Of Safety & Hygiene
246 N. High St., Col. O. 43215

May 7, 1984

Industrial Commission of Ohio
Legal Section
246 North High Street
Columbus, Ohio 43215

RE: OD 20718-22
Richard T. Roberts
Inland Mfg. Div. of GMC
Dayton, Ohio 45404

Attn: Judy Spencer

Dear Ms. Spencer,

On March 29, 1984 an investigation into the facts surrounding the allegations set forth by claimant Richard T. Roberts (OD 20718-22) against Inland Mfg. Division of GMC, in Dayton, Ohio was conducted. Mr. Roberts has filed a claim with the Industrial Commission of Ohio alleging that his exposure to industrial contaminants substantially caused and/or contributed to his August 6, 1981 disability. According to his attending physician, Dr. H. Mehbod of Dayton, the principal cause of disability was exposure to toluene diisocyanate commonly called "TDI". In a correspondence to Attorney James Piercy dated November 26, 1982 the doctor explains: "Based on the history as I have mentioned above, I am convinced that Mr. Robert's asthmatic problem was definitely precipitated by exposure to TDI."

Mr. Roberts suffers from symptoms including shortness of breath with episodes of nocturnal expiratory wheezing, and expectoration.

Company representatives from Inland however do not necessarily concur with his position. Workers' Compensation Administrator David Swafford believes there is insufficient medical evidence to warrant compensatory certification. He states on May 12, 1982, "...in the face of any lack of any medical evidence which causally connects the alleged incident in any accidental occurrence, the employer respectfully requests that the application be disallowed."

CLAIMANT'S WORK HISTORY

Speaking in behalf of Inland Mr. Swafford provided the following information regarding the claimant's work history. According to company personnel records, Mr. Robert's was hired and began working as a maintenance painter on September 23, 1974. During the course of employment at Inland he held several different positions until his August 6th disability. Below, a list has been compiled of the claimant's work history at Inland with approximations of time he spent in each occupation.

Position	Time (Mos.)	% of Total Time
1) Maintenance Painter	70	65%
2) Checker	13	12%
3) Appr. Millwright	7	6%
4) Clarkat Oper.	5	5%
5) Sickleave	5	5%
6) Trucker/Sweeper	4	4%
7) Pressman	2	2%
8) Factory Service	1	1%

POTENTIAL INDUSTRIAL EXPOSURES

A review of the Facsimile File would suggest that the fulcrum of this investigation is hinged upon two incidences occurring during his 7 month millwright apprenticeship. Mr. Swafford explained that an apprentice millwright is an individual usually in training who performs various vocational responsibilities such as welding, torch cutting, building, etc., or in other words, he is one who cares and maintains mechanical equipment. The first event happened in early August of 1981 when the claimant assisted the welding of a fan located above the polyurethane curing ovens. Once welding commenced he alleges he was exposed to TDI that "...had collected inside the fan". (Quote is from legal deposition given on June 21, 1982; page 4, line 25.)

A similar problem arose just four months later on November 13, 1981 when a mold car wrecked in the Line 4 curing oven. Repairmen worked to cut free demolished cars when fumes generated by the welding process were allegedly inhaled and caused recurrent respiratory difficulties.

According to Tom Jelenek, corporate industrial hygienist at Inland, the polyurethane formulation used to fabricate seat cushions is a standard 4:1 mixture of 2,4- and 2,6-isomers with the normal addition of various catalysts (e.g. tertiary amines such as triethylenediamine) and stabilizers. Typically, TDI polymerization is a rapid process in which nearly 100% is reacted in a very brief time particularly when curing oven temperatures reach 120 degrees F. According to Inland staff researchers, the reaction rate is estimated to be in the 95 percentile within two minutes of pouring.

6.

In an employee interview, maintenance welder Charlie Kaiser remarked that entry into the ovens normally occurs 5 minutes or longer after a given accident happens. It follows then that in both occasions unpolymerized TDI monomer would be at extremely low concentrations if existent at all by the time maintenance personnel began to work on the broken down equipment. More probable is an exposure to thermal decomposition products of completely reacted TDI polymers when torched by maintenance workers. An accumulation of cured polyurethane residuals and fugitive welding emissions were common elements in both instances.

Dr. Ruth Montgomery of the Haskell Laboratory for Toxicology and Industrial Medicine comments on the thermal degradation products of TDI-based flexible foams. She writes:

"In general, polyurethanes start to undergo major decomposition somewhere between 150 and 300 degrees C. Carbon monoxide and hydrogen cyanide are probably the products of greatest concern. Hydrogen cyanide (HCN) is evolved in air as a secondary product at approximately 500 degrees C and increases with rising temperature. Other nitrogen-containing decomposition products that have been reported include diaminotoluene (associated with the degradation of TDI), and also acetonitrile, acrylonitrile, pyridine, and benzonitrile at higher temperatures."

In her estimation, "the cyanide risk seems to be relatively low, in comparison with the risk from carbon monoxide." Few studies have actually detected TDI as a constituent of TDI foam pyrolysis. However, one such study on effluent analysis of pyrolytic yields remarked, "TDI (is) produced especially at about 250 - 300 degrees C in both air and nitrogen atmospheres, (TDI is) completely destroyed above about 700 degrees C."

With temperatures in excess of 3000 degrees C at the apex of a cutting torch it is reasonable to assume that at that specific point TDI is effectively degraded to diaminotoluene or entirely destroyed. However the temperatures in close proximity to the flame may not achieve the extremes regarded as chemically destructive. It may be argued then, that TDI may exist within the emissions of thermally deteriorating urethane foams and thus present a potential health hazard to exposed individuals. Unfortunately no values as to the concentrations liberated were provided in any of the studies examined.

CONCLUSION

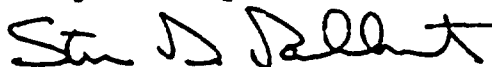
As is the case with any industrial mishap or importunity, recreation of the circumstance is often troublesome if not ethically impractical. Unlike many occupational disease investigations (or injuries as contended by Attorney James Piercy), not only was the claimant in a highly transient occupation, but the events leading to his alleged pulmonary distress were infrequently encoun-

7.

tered. Which leads one to believe his exposures were on an extremely limited basis. It may be said, however, from the literature cited in this report it is in part evident that exposure to TDI may occur as a result of thermal decomposition of polyurethane foam residuum. The relationship at least to this author is somewhat tenuous but nevertheless implied.

Should further clinical examination definitively conclude that Mr. Robert's demonstrates an immune-mediated hypersensitivity reaction to TDI, then this report may support a positive causal association with the claimant's work environment and his allergic respiratory pathologies.

Respectfully submitted,



Steven D. Parkhurst
Industrial Hygienist

SDP/sdp

Reference:

- 1) Clayton, G., & P. Clayton (Eds.), 1982. Patty's Industrial Hygiene and Toxicology, 3rd Revision, Vol. 2C, pp. 4447-4459.