

INDUSTRIAL HYGIENE REPORT

Inland Manufacturing Division
Dayton, Ohio

March 16, 17 and 18, 1960

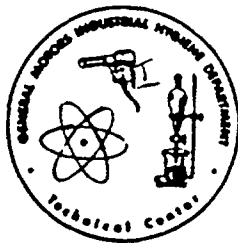
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GENERAL MOTORS CORPORATION

PERSONNEL STAFF

Industrial Hygiene Department
Vincent J. Castrop—Director

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Inland Manufacturing Division
Dayton, Ohio

March 16, 17 and 18, 1960

File

Trichloroethylene
Asbestos Dust
Chromic Acid
Toluene Diisocyanate (TDI)

No. 6031

Reported by: G. C. Stoecker

102

March 1960

Toluene Diisocyanate (TDI)

Toluene diisocyanate (TDI) is used in the polyurethane foam production for crash pads and seat pads. Crash pads are processed in the building adjacent Building 25. Seat pads are produced in Building 28.

The potential hazards of TDI are well recognized and the processes are well controlled by enclosures and local exhaust at points where exposures are likely to occur. It is understood that good control is enhanced by air sampling for TDI performed by personnel of the chemistry laboratory. A record of air analyses will be of value in the event of alleged illnesses which may be attributed to TDI exposures. However, periodic scheduling of such tests, rather than an occasional survey, should be considered. Such tests should also be made when production schedules are increased or new equipment put into operation.

Tests for TDI were made at several locations in Department 75, Building 28. The tests were taken under present production

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Toluene Diisocyanate (Cont'd)

rates with only the south side of the seat cushion line in operation. The results, recorded below, are well below the permissible limit for exposure to TDI.

Permissible Limit for TDI

The permissible limit for exposure to TDI is 0.1 part per million parts of air by volume (ppm).

Results of Tests for TDI

<u>Test No.</u>	<u>Location and Conditions</u>	<u>TDI in ppm</u>
15	Breathing zone of foamer operator. Exhaust slots along conveyor near this location	None Detected
16	Breathing zone along conveyor in area of mold covering operation. Exhaust slots behind conveyor	None Detected
17	Breathing zone at unloading station after first pass through oven	None Detected
18	General condition in area of transfer of pads from roller squeezer to conveyor for final cure oven	None Detected
19	General condition along conveyor where cloth strips are applied to finished pads	Less than 0.01

EXPLANATORY NOTESTest Methods

Trichloroethylene vapor was determined with a Davis Halide Meter.

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INDUSTRIAL HYGIENE REPORT

Inland Manufacturing Division
Dayton, Ohio

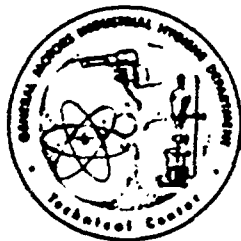
August 28, 29 and 30, 1961

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Industrial Hygiene Department
Vincent J. Castrop—Director

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Inland Manufacturing Division
Dayton, Ohio

August 28, 29 and 30, 1961

Toluene Diisocyanate (TDI)
Solvent Vapor
Trichloroethylene
Cement Solvent
Asbestos Dust
Noise

No. 6157

Reported by: J. R. Vander Roest

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Aug 28, 29, 30, 1961

DISCUSSION

Toluene Diisocyanate (TDI)

Crash pads and seat pads are produced from polyurethane foam containing toluene diisocyanate (TDI).

Crash pads are produced in Department 76, Building 28, on four foaming machines. Once the foaming machine is started, the necessary amount of foam is automatically released through a nozzle. After the proper amount of foam has been deposited between the fabric and backing, the parts are placed in a mold on a conveyor which carries them through an oven for curing. When the molds emerge from the oven, the parts are removed and packed for shipment after inspection. Slot exhaust ventilating ducts were located below the nozzles of the foaming machines, along the conveyor and at the openings of the oven.

Toluene Diisocyanate (Cont'd)

Seat pads are produced on both sides of a wide conveyor in Department 75, Building 28. Foam runs into the molds continuously from a nozzle on each side of the conveyor. A thin sheet of plastic and a perforated metal lid are then placed over the mold in that order. After passing through the curing oven the lids are removed and the pads are taken out of the molds and placed on an adjacent conveyor. Flashing is trimmed from the pads prior to the final cure oven. Two ten foot long exhaust slots, parallel to and above the center of the conveyor, were located just ahead of and behind the foam nozzles. A similar duct has been positioned above the conveyor where pads are removed from the molds and the molds are cleaned with a scraper and a compressed air jet. There was also a slot exhaust duct on the pad conveyor where pads are placed after removal from the molds. A flexible exhaust duct, six inches in diameter, had been provided for the scrap drum, near the nozzles, on each side of the conveyor.

No toluene diisocyanate was detected in any of the tests made at various operations in both Departments. Information was offered that low results from tests at these operations were also obtained by plant personnel. Ventilation appeared to be adequate and no changes are suggested.

It was stated that the prepolymer foaming method, formerly used, had been replaced by a "one shot" method. The changeover resulted in the elimination of objectionable fumes that emanated from the curing oven at times.

Installation of a similar but larger seat pad production unit, located just south of the present unit, was in the final stages. Exhaust ventilating equipment appeared to be ample, although it was not in operation.

Permissible Limit for Toluene Diisocyanate (TDI)

The commonly accepted limit for TDI is 0.02 part per million parts of air by volume.

Results of Tests - TDI

Test

No.	TDI in ppm	Remarks
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Samples 1 through 3, inclusive, taken along south conveyor of the north seat pad installation with both sides of the conveyor in operation. Building 28, Department 75.

1	None Detected	Breathing zone of man clamping lids on molds after cutting plastic sheet with heat knife. Exhaust slot ten feet long over center of conveyor.
2	None Detected	Breathing zone of man cleaning molds with scraper and air jet after pads had been removed near exit of oven. Twenty-four inch pedestal fan directed west causing gusty air flow.
3	None Detected	Sample taken in breathing zone of man on north side of south trimming table. No local exhaust ventilation at this operation. No objectionable odors.

Sample 4 through 5, inclusive, taken at crash pad production operations in Building 27, Department 76.

4	None Detected	Breathing zone of No. 4 foamer operator producing Pontiac Bonneville crash pads. Exhaust slot below nozzle and above waste box. General air flow 50 feet per minute from open monitor in north wall.
5	None Detected	Sample taken in breathing zone of No. 3 foamer operator. Local exhaust duct in back of nozzle.
6	None Detected	Breathing zone of man unloading crash pads from molds on conveyor near oven exit. Exhaust slots at oven exit and along conveyor where parts are removed.

INDUSTRIAL HYGIENE REPORT

Inland Manufacturing Division
Dayton, Ohio

June 18, 19 and 20, 1962

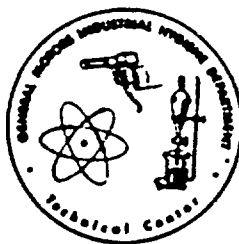
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Inland Manufacturing Division
Dayton, Ohio

June 18, 19 and 20, 1962

Solvent Vapors
Toluene Diisocyanate (TDI)

No. 6276

Reported by: J. R. Vander Roest

0000 0624

June 18, 19, 20, 1962

Toluene Diisocyanate (TDI)

Polyurethane foam containing toluene diisocyanate is used in the production of crash pads and seat pads. Both operations have been described in detail in a previous report.

Production of crash pads had been transferred to Building 31, Department 176. Although the equipment has been rearranged in the present layout, the exhaust ventilation appeared to be adequate.

Seat pads are produced in the same location in Department 75, Building 28. Line 1 on the original production unit and Lines 3 and 4 on the new production unit were in operation. The sequence of operations on both units was essentially the same. Exhaust ventilation on the new unit was similar to that on the older unit and appeared to be satisfactory.

Toluene Diisocyanate (Cont'd)

Results of tests taken at representative operations in both departments were below the permissible limit except for three tests taken near the foamers on the new unit. Two of the tests taken in the breathing zones of men placing lids on molds on Lines 3 and 4 were above the permissible limit and one test in the breathing zone of a man temporarily stationed just east of the foamer on Line 4 was equal to it. Since the last survey, two tempered air supply units each providing 80,000 cubic feet per minute had been installed between the two production units. Information was offered that branch ducts were to be added to the west supply unit to deliver fresh air to the areas near the foamers on Lines 3 and 4. Additional air supplied at these operations should dissipate the vapors to acceptable levels.

Permissible Limit for Toluene Diisocyanate (TDI)

The generally recognized limit for TDI is 0.02 part per million parts of air by volume.

Results of Tests - TDI

Test

No.	TDI in ppm	Remarks
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All samples taken in breathing zone of employees at locations noted. Samples 1 through 4, inclusive, taken at crash pad production operations in Building 31, Department 176.

1	None Detected	No. 2 foamer operator producing Pontiac Catalina crash pads. Exhaust slot below nozzle and a new flexible exhaust duct above waste box.
2	.006	No. 1 foamer operator producing Pontiac Bonneville crash pads. Local exhaust on unit as in Test No. 1.
3	None Detected	Man unloading pads from molds just after exit from curing oven.

Results of Tests - TDI (Cont'd)

Test No.	TDI in ppm	Remarks
4	None Detected	Employee cleaning Pontiac Bonneville crash pads at bench.
Samples 5 through 10, inclusive, taken at seat pad operations on Lines 3 and 4 in Department 75, Building 28.		
5	.09	Man placing lids on molds at foamer on Line 3. Air flow 100 feet per minute toward 14 foot exhaust slot between Lines 3 and 4. There was also a slot behind the foamer and a flexible exhaust duct over a waste drum.
6	.04	Man placing lids on molds at foamer on Line 4. Air flow 0 to 100 fpm toward center exhaust slot. Other exhaust ducts as in Test 5.
7	.02	Man checking temperature of molds just east of foamer on Line 4. Very light air flow at this location.
8	Less than .005	Man removing lids from molds on Line 4. Turbulent air flow from 24 inch pedestal fan blowing west 400 to 600 fpm.
9	None Detected	Man removing lids from molds on Line 3. Air flow greater than 600 fpm from east air supply unit. There was a large exhaust slot between Lines 3 and 4 at this operation.
10	None Detected	Man trimming seat pads at table on Line 3 - adjacent to trimming table on Line 4. Air flow variable in direction and rate.

Results of Tests - TDI (Cont'd)

Test No.	TDI in ppm	Remarks
11	None Detected	Man placing lids on molds at foamer on Line 1. Air flow 125 to 175 fpm toward exhaust slot between Lines 1 and 2. There was a flexible exhaust duct over an adjacent scrap barrel.
12	None Detected	Man removing lids from molds on Line 1. Air flow gusty and in excess of 600 fpm from pedestal fan.
13	Less than .005	Trimming operation at table on Line 1.

EXPLANATORY NOTES

115.

INDUSTRIAL HYGIENE REPORT

Inland Manufacturing Division
Dayton, Ohio

September 26 and 27, 1962

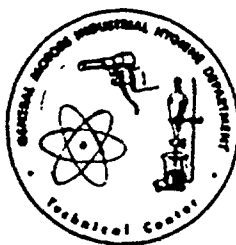
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Industrial Hygiene Department
Vincent J. Castrop—Director

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Inland Manufacturing Division
Dayton, Ohio

September 26 and 27, 1962

Toluene Diisocyanate (TDI)
Solvent Vapors

No. 6293

Reported by: J. F. Stephens

117

0000 0630

Toluene Diisocyanate (TDI)

The production of seat and safety pads using polyurethane foam in Buildings 28 and 31, respectively, have been adequately described in previous reports. Branch ducts had been added to the west air supply unit in Building 28 to deliver fresh air to areas near the foamers on Lines 3 and 4. A similar extension of the east air supply unit was planned.

Production was normal on Lines 3 and 4 at the time of this survey, and air tests for TDI were made in some detail. The results demonstrated virtual absence of this contaminant. Although the building was relatively open, the prevalence of effective supply air and local exhaust systems encourage the opinion that control will also be adequate during winter months.

Building 31 was also reviewed under essentially normal production conditions. This building was more closed, but its mechanical ventilating facilities proved beneficial and control was adequate. No suggestions for change are offered relative to TDI control in these areas.

The use of trichloroethylene to flush foam nozzles in Building 31 was observed incidentally to the TDI tests. Except for No. 8 foamer, see TDI Tests 12 and 16, the escape of solvent vapor was not apparent. The No. 8 foamer was a manually operated engineering unit that was soon to be removed from the area.

Results of Tests - TDI (Cont'd)

Test No.	Parts TDI per Million Parts of Air	Remarks
6	N.D.	Same as Test 5 above except on Line 3. Compare with Test 9, Report No. 6276.
7	N.D.	Trimming operator at end of lines, repeating Test 10, Report No. 6276.

Except for Tests 13 and 15, Tests 8-16 below involved sampling in the breathing zone of employees at locations noted in Building 31, Department 176 - building generally closed. Test 13 and 15 conditions are described.

8	N.D.	Man at No. 2 foamer safety pad filling operation. Effective exhaust slots behind foam nozzle and at lip of waste box. Good general ventilation throughout building. Trichloroethylene nozzle flushing not done.
9	N.D.	Man at No. 1 foamer safety pad filling operation. Local exhaust on unit as in Test No. 8. Trichlor flushing of nozzle done involving about a five second flush with about eight ounces of liquid each minute.
10	N.D.	Man at No. 5 foamer. Trichlor flush done and local exhaust ventilation provided.
11	N.D.	Man at No. 7 foamer (old No. 6) filling pads. Trichlor used.

120.

Results of Tests - TDI (Cont'd)

Test No.	Parts TDI per Million Parts of Air	Remarks
12	N.D.	One of two men at No. 8 foamer, temporarily used by engineering personnel. Foamer was manually operated, trichlor flushing was done with some odor of escaping vapor apparent at times. Fairly effective exhaust duct at box, but none at nozzle.
13	N.D.	Possible source zone (not breathing zone) test at south end of last oven where positive pressure caused out-flow. Employees infrequently present at this location for brief intervals.
14	N.D.	One of several men cleaning foam from inserts at south end of second long table from east oven.
15	N.D.	General condition sample collected among men unloading molds at end of east oven (good indraft) and at unloading table near west oven.
16	N.D.	Repetition of Test 12 at No. 8 foamer.