Purpose

The Center for the Polyurethanes Industry (CPI), prepared this guidance documents to help remind professionals about important health and safety considerations when working with TDI. It supplements the more comprehensive information contained in your supplier’s Safety Data Sheets (SDSs), which is used as the primary document for specific TDI distribution and handling issues.
Guidance for Working with TDI: Things You Should Know

Identifying TDI

Toluene Diisocyanate, commonly referred to as TDI, is a colorless to pale yellow liquid at room temperature with a sharp, pungent odor. Other important physical properties are:

<table>
<thead>
<tr>
<th>Physical State</th>
<th>Liquid at ambient conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Molecular Weight</td>
<td>174.2</td>
</tr>
<tr>
<td>Boiling Point</td>
<td>486 - 489°F (252 - 254°C)</td>
</tr>
<tr>
<td>Freezing Point</td>
<td>49 - 50°F (9.5 - 10°C)</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>1.22 @ 68°F (20°C)</td>
</tr>
<tr>
<td>Density</td>
<td>10.2 lbs/gal</td>
</tr>
<tr>
<td>Vapor Pressure</td>
<td>0.0105 mm Hg at 68°F (20°C)</td>
</tr>
<tr>
<td>Saturated Vapor</td>
<td>14 ppm at 68°F (20°C)</td>
</tr>
<tr>
<td>Viscosity</td>
<td>3.0 m Pas @ 77°F (25°C)</td>
</tr>
<tr>
<td>Solubility in Water</td>
<td>not soluble; reacts with the evolution of CO2</td>
</tr>
<tr>
<td>Flash Point</td>
<td>270°F (132°C)</td>
</tr>
<tr>
<td>Auto ignition Temperature</td>
<td>&gt;1103°F (595°C)</td>
</tr>
</tbody>
</table>


Recognizing Potential Health Hazards

Overexposure to TDI vapor, liquid or aerosol can be harmful to your health. There are four possible routes of exposure:

- inhalation
- eye contact
- skin contact
- ingestion

Here are the potential effects of overexposure and some first-aid tips:

**Inhalation:**

Even if you cannot smell TDI, you may be in danger of overexposure, because most people cannot smell TDI until concentrations are above applicable exposure limits. Exposure limits are set by regulatory organizations like the Occupational Safety and Health Administration (OSHA) and other professional organizations such as the American Conference of Governmental Industrial Hygienists (ACGIH). Exposure limits typically define the maximum air concentration to which you can be exposed without the need for respiratory protection.
Airborne exposure to TDI may include possible respiratory irritation effects such as:

- nose irritation
- coughing
- chest tightness or discomfort
- shortness of breath

If overexposed to TDI, you may become sensitized or "allergic." If diagnosed with sensitization, avoid future exposure. You may feel tightness in your chest and have difficulty breathing. Effects may be either immediate and/or delayed for several hours. Exposure to extreme TDI vapor concentrations may cause lung injury or, in rare cases, even death.

Wear a respirator, either air-supplied or air-purifying, when handling TDI in an open system, process areas near foam production not covered by a ventilation system, and spill or emergency situations. Also wear a respirator when handling TDI in a closed system, during the time you are making or breaking hose connections, initial line breaking and in similar situations where a sudden pressure release could cause an overexposure. OSHA requires employers to provide appropriate respiratory protection when airborne exposure limits are exceeded (29 CFR 1910.134).

The type of respiratory protection will depend upon whether you know the maximum exposure concentration. Usually, this information is obtained through frequent air monitoring performed by a qualified individual. Emergency or spill situations are seldom able to be characterized, thus emergency responders may consider a supplied air respirator for protection based on their determination and the situation.

If you suspect someone has become overexposed, remove the person to an area with fresh air, and try to keep them calm and warm — but not hot. Seek immediate medical attention. If they are having difficulty breathing, a qualified person may provide oxygen. If they stop breathing, a qualified person may administer artificial respiration.

**Eye Contact:**
Getting liquid TDI in your eyes may be extremely painful and could cause permanent damage. High vapor concentrations or mists may cause pain, tearing and irritation. Wear chemical goggles or safety glasses with side shields whenever you might be exposed to liquid or vapor TDI, or TDI mists. Low concentrations of TDI vapor may cause mild tearing or a slight burning sensation. If you get TDI in your eyes, wash them immediately with a continuous flow of low pressure water, preferably from an eyewash fountain, for at least 15 minutes. See a doctor at once.
**Guidance for Working with TDI: Things You Should Know**

**Skin Contact:**
If you get TDI on your skin, wash thoroughly with soap and flowing water (warm water if available). Do not use solvents. It is possible to check for residual TDI on skin or in hair after washing by using commercial products that show a color change reaction. Repeated or prolonged skin exposure to TDI may cause discoloration, redness, swelling, or itching. If your skin is irritated, seek medical attention. Properly discard clothing exposed to TDI, as well as contaminated items such as shoes, belts, and watchbands.

**Ingestion:**
Swallowing TDI can cause irritation in your mouth, throat and stomach. If you swallow TDI rinse the mouth with water, do not try to induce vomiting. See a physician immediately.

**Protecting Yourself from TDI Overexposure**

Overexposure to airborne TDI can occur when working with TDI even at room temperatures, particularly if ventilation is inadequate. In addition, overexposure can occur when there is direct skin contact with liquid TDI.

Where there is a risk of exposure to TDI vapor in excess of applicable exposure limits, consider using:

- An approved respirator, either air-supplied or air purifying (consult your company safety professional or the product SDS for guidance). The type of respiratory protection will depend upon the maximum exposure concentration.
- Elevated airborne concentrations may be irritating to the eyes, therefore eye protection may also be needed if not already provided by the respirator.

Where there is a risk of skin and eye exposure to TDI liquid, consider using the following, at a minimum:

- Chemical safety goggles
- TDI-resistant chemical gloves (see CPI document TDI User Guidelines for Protective Clothing Selection AX-179)
- If there is potential for more extensive exposure, the following may also be necessary:
  - TDI-resistant long-sleeve coveralls or full body suit
  - TDI-resistant fitted boots and
  - Head protection, such as a close-fitting hood

In spray applications, respiratory protection, eye protection, and complete skin protection are necessary.
Understanding Potential Reactivity Hazards

TDI is a reactive chemical. Rapid reactions with buildup of heat or pressure can result from improper mixing with:

- Acids, inorganic bases (such as sodium hydroxide or potassium hydroxide), ammonia, and amines
- Magnesium, aluminum and their alloys
- Other metal salts, especially halides (such as tin, iron, aluminum and zinc chlorides)
- All strong oxidizing agents (such as bleach or chlorine)
- Polyols
- Water (typically a relatively slow reaction)

Caution: Resealing TDI containers contaminated with any of the above materials can cause a buildup of pressure in the container and could cause it to explode. TDI can react with itself in a fire or at very high temperatures releasing carbon dioxide and causing the buildup of pressure in sealed containers sufficient to cause explosion.

Handling, Unloading and Storing TDI

To minimize hazards when handling, unloading, or storing TDI, consider taking the following steps:

- Wear protective clothing
- Follow employer's established procedures for normal operations, emergencies, maintenance, loading/unloading sampling and special operations
- Use appropriate checklists provided by the employer for specific procedures
- Inspect equipment to ensure operating integrity following maintenance procedures
- Maintain good housekeeping
- Participate in relevant training programs

Handling drums, consider the following steps:

- Wear protective clothing
- Follow all safety precautions for handling TDI until empty drums are decontaminated
- Handle and store drums in a well-ventilated area with containment
- Check drum shipments for leakage
- Do not use pressure to empty drums
- Do not store TDI in open-head drums
- Use plugs/caps on terminal valves or fittings and bleed valves
- Keep drum overpacks available
- Keep drums segregated from containers of material that are incompatible with TDI
- Provide secondary containment
- Do not cut empty TDI drums with a torch
Guidance for Working with TDI: Things You Should Know

- Do not use empty TDI drums from a worksite for personal use such as a barbecue pit, flower box, trash barrel, etc.

Empty drums should be handled by a qualified drum reconditioner. Contact the Reusable Industrial Packaging Association (RIPA - www.reusablepackaging.org) to locate a drum reconditioner near you.

Responding To Emergencies

Fires, spills, bulging drums, and other emergencies involving TDI require immediate responses. If you are not a trained, designated emergency responder, leave the area immediately and notify the appropriate emergency response personnel.

If you need assistance with a spill or other emergency involving TDI, call CHEMTREC at 1-800-424-9300.
Chemtrec operators are available 24 hours a day, seven days a week.

Legal Notice
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