

Guidance for Melting Toluene Diisocyanate (TDI) in Drums

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Purpose

The purpose of this document is to provide general guidance on heating drums to melt frozen or fused Toluene Diisocyanate (TDI).

Guidance

The freezing point of TDI is approximately 57°F (14°C). In colder climates, drums of toluene diisocyanate (TDI) are normally transported in heated trucks so the material arrives in a liquid state. Occasionally, TDI freezes or fuses during transportation or storage. Under these circumstances, the drums are heated to melt the frozen material. The following information is intended to serve as general guidance on heating drums to melt frozen or fused TDI. This guidance is not exhaustive nor is it meant to be a “how to” manual. Each situation may be different depending on the equipment and expertise available at the facility.

- TDI reacts with moisture, even atmospheric moisture, to form carbon dioxide gas that could result in pressure building-up in the drum to a dangerous level. Verify both bungs on the drums are tight to avoid the ingress of moisture.
- The time it takes to melt TDI depends on many factors, like the temperature of the room, heat source, air circulation and ability to rotate the drum during heating. Accomplish the melting process as quickly as possible while avoiding excessive localized heating. Depending on the equipment available, the following methods may be employed.
 - o Drums may be placed in a hot air oven or a room controlled at 75° - 95°F (23° - 35°C).
 - o Drums may be rotated as they are heated to improve heat transfer and reduce melting times. This can be accomplished with the use of a mechanical drum roller rotating at about 5 rpm.

Regardless of the method used, when TDI is heated, the concentration of TDI vapor in the headspace of the drum increases with the increasing temperature of the product. Regular inspection of the drums and air monitoring are important to help avoid a hazardous situation.

- Prolonged storage of TDI at temperatures >120°F (49°C) could result in formation of a dimer, an insoluble white solid, which may impact the quality of the TDI product. Affixing electric heating bands, heating belts or other electrical devices to the outside of TDI drums could result in localized heating of the material, which also could increase dimer formation.
- Heating drums containing TDI with a gas torch could result in significantly high, localized heating. This could cause TDI to react, form carbodiimides and release carbon dioxide that could cause dangerous pressure build-up in closed containers.
- Because TDI is comprised of two isomers with slightly different freezing points, melting within the drum may be uneven. Agitation could assist with melting as well as mixing. This can be accomplished without having to open the drum by using a mechanical drum roller. If the drum is opened to mix the contents after heating, locate drums in a properly ventilated area. Consult the Material Safety Data Sheet for guidance about what personal protective equipment should be worn when opening the drums and mixing the contents.
- Consider a means to monitor the drums while they are being heated for any abnormalities, particularly swelling. If you observe any abnormalities, immediate discontinuation of heating will help minimize hazards (e.g., risk of a leaking product). Contact your company's emergency response expert or your supplier for guidelines on handling swollen drums. See the Material Safety Data Sheet for the supplier's emergency telephone numbers.
- After melting is complete and prior to opening the drums, consider measures such as the following to help minimize exposure to TDI or reactions of the TDI: wipe any moisture from the top of the drums; move the drums to a well-ventilated area; wear appropriate personal protective equipment; and open the bung slowly to relieve any pressure build-up that may have occurred during the melting process.

Additional Information

For further information on handling TDI, including personal protective equipment, consult these Center for the Polyurethanes Industry (CPI) publications:

TDI User Guidelines for Chemical Protective Clothing Selection, AX179
Working with TDI: What You Should Know, AX202

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