

Guidance for Melting 4,4'-Methylene Diphenyl Diisocyanate (MDI) 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 4,4'-Methylene Diphenyl Diisocyanate (MDI).

Guidance

To help minimize the formation of a dimer, an insoluble white solid that may impact the quality of the product, 4,4'-methylene diphenyl diisocyanate (MDI) is usually stored and transported in drums at temperatures below 41°F (5°C). The freezing point of 4,4'-MDI is approximately 104°F (40°C). When this material is transported and stored in a frozen or fused state, the MDI needs to be melted before it can be discharged from the drum. The following information is intended to be general guidance on heating drums to melt frozen or fused MDI. 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.

- MDI reacts with moisture, even atmospheric moisture, to form carbon dioxide gas that could result in a dangerous pressure build-up in the drum. Verify both bungs on the drum are tight to avoid the ingress of moisture.
- The time it takes to melt MDI 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 steam chest, which can provide efficient heat transfer.
 - o Drums may be placed in a hot air oven or a room controlled at 140° - 176°F (60° - 80°C).

Regardless of the method used, when MDI is heated, the concentration of MDI 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 MDI at temperatures >122°F (50°C) could result in the formation of a dimer, which may impact the quality of the MDI product. Affixing electric heating bands, heating belts or other electrical devices to the outside of MDI drums could result in localized heating of the material, which also could increase dimer formation.
- Heating drums containing MDI with a gas torch could result in significantly high, localized heating. This may cause MDI to react, form carbodiimides and release carbon dioxide gas that could cause dangerous pressure build-up in closed containers.
- Agitation of the MDI 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 drums and mixing the contents.
- Consider means to monitor the drums while they are being heated for any abnormalities, particularly swelling. If you observe any abnormalities, immediate discontinuation of heating can 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 drum, consider measures such as the following to help minimize exposure to MDI or reactions of the MDI: 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 MDI, including personal protective equipment, consult these Center for the Polyurethanes Industry (CPI) publications:

PMDI User Guidelines for Chemical Protective Clothing Selection, AX178
Working with MDI and Polymeric MDI: What You Should Know, AX205
Model Respiratory Protection Program, AX246

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