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Working With MDI and Polymeric MDI: What You Should Know

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Here are six important points you should know about working with MDI or polymeric MDI

The Center for the Polyurethanes Industry of the American Chemical Council, prepared this guide to help remind professionals like yourself about important health and safety aspects of working with MDI or polymeric MDI.

It supplements the comprehensive information contained in your supplier's Material Safety Data Sheets, which should always be used as the primary document for specific MDI or polymeric MDI distribution and handling issues. Throughout this brochure the term MDI is used to include both MDI and polymeric MDI.

1. Identifying MDI

Diphenylmethane diisocyanate, commonly referred to as MDI, is a white to yellowish solid at room temperature with no odor. Polymeric MDI, which is most commonly used, is a mixture of MDI and polymeric MDI and is a brownish liquid at room temperature and may have a slight odor. Some typical values for other physical properties are:

	Pure MDI	Polymeric MDI
Physical State	Solid at ambient conditions	Liquid
Molecular Weight	250	varies
Boiling Point	392°F (200°C) @ 5 mm Hg	410°F (210°C) @ 5 mm Hg
Freezing/ Melting Point	100°F (38°C) varies	varies
Specific Gravity	1.33 @ 68°F (20°C) 1.18 @ 122°F (50°C)	1.24 @ 68°F (20°C)
Density	10.2 lbs/gal	10.2 lbs/gal
Vapor Pressure	<<10 ⁻⁵ mm Hg at 68°F (20°C)	<<10 ⁻⁶ mm Hg at 68°F (20°C)
Viscosity	4.0 cps @ 68°F (20°C)	varies
Solubility in water	not soluble; reacts with the evolution of CO ₂	not soluble; reacts with the evolution of CO ₂
Flash point	>392°F (200°C)	>392°F (200°C)

2. Recognizing Potential Health Hazards

Contact with excessive amounts of MDI vapor, liquid or aerosol can be harmful to your health. There are four possible ways you may become overexposed:

- breathing high airborne concentrations
- getting it in your eyes
- getting it on your skin
- swallowing it

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

Inhalation: If MDI is sprayed as a mist or heated, or handled where there is poor ventilation, there is a greater chance of overexposure. Even if you cannot smell MDI, you may be in danger of overexposure, because most people cannot smell MDI until concentrations are well above allowable limits. MDI can irritate your nose and lungs. You may feel tightness in your chest and have difficulty breathing. Overexposure may cause you to become sensitized or

“allergic” to MDI which will cause you to have asthma-like attacks if you breathe MDI vapors again. If this happens, any further exposure must be avoided. Effects may occur immediately upon exposure, or be delayed for several hours after exposure ends.

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. Call a physician at once. If they are having difficulty breathing, a qualified person may provide oxygen. If they stop breathing, give artificial resuscitation. Call a doctor at once.

Eye Contact: Getting MDI in your eyes can be painful and could cause tearing and irritation. If you get MDI 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.

Skin Contact: Getting MDI on your skin may play a role in sensitization. Animal tests have indicated that respiratory sensitization may occur from skin contact with MDI. Repeatedly getting MDI on your skin may also cause discoloration, redness, swelling, blistering, or burns. It is best to conduct your work to avoid skin contact, but if you get MDI on your skin, wash thoroughly with soap and flowing water (warm water if available). If your skin is irritated or burned, seek medical attention. Any clothing contaminated with MDI must be removed and small amounts can be decontaminated by soaking them in an 8% ammonia solution for one hour before washing with detergent and hot water. Leather items cannot be decontaminated. Any contaminated leather items, including shoes, belts, and watchbands or clothing which has been exposed to large amounts of MDI, should be properly discarded.

Ingestion: Swallowing MDI can cause irritation, burns or sores in your mouth, throat and stomach. If you swallow MDI, drink two to three glasses of water or milk. Do not try to vomit. See a physician immediately.

3. Protecting Yourself from MDI Overexposure

With proper precautions, you can use MDI safely by protecting yourself from overexposure. Where there is adequate ventilation and potential for overexposure to MDI liquid or vapor is minimal, you should use:

- Safety glasses or chemical worker’s goggles
- MDI-resistant chemical gloves¹
- Long-sleeve coveralls (Heavy cotton preferred)
- Safety shoes or boots

Where there is a risk of exposure to MDI liquid or vapor above allowable exposure limits, you should use:

- An approved respirator, either air-supplied or air-purifying (consult your company safety professional or the product MSDS for guidance)
- Chemical worker’s goggles
- MDI-resistant long-sleeve coveralls or full body suit
- MDI-resistant fitted boots and
- Head protection, such as a close-fitting hood

4. Understanding Potential Reactivity Hazards

MDI is a very reactive chemical. Reactions with buildup of heat or pressure can result from improper mixing with:

- Acids, inorganic bases (such as sodium 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

Caution: Resealing MDI containers contaminated with any of the above materials can cause a buildup of pressure in the container and cause it to explode. All forms of MDI can also self-react in a fire or at very high temperatures, releasing carbon dioxide and causing the buildup of pressure in sealed containers sufficient to cause explosion.

¹ See API Technical Bulletin AX-178

5. Handling, Unloading and Storing MDI

To minimize hazards when handling, unloading, or storing MDI:

- Wear protective clothing
- Follow established procedures for normal operations (Take special care to minimize hazards when transferring MDI from one container to another.), emergencies, maintenance, loading/ unloading, sampling and special operations
- Use appropriate checklists for specific procedures
- Inspect equipment to ensure operating integrity following maintenance procedures
- Maintain good housekeeping
- Participate in company-sponsored training programs

Handling Drums:

- Wear protective clothing
- Follow all safety precautions for handling MDI until empty drums are decontaminated
- Handle and store drums in a well-ventilated area with containment
- Check drum shipments for leakage
- Do not strike drums and bungs with tools which may cause sparking
- Never use pressure to empty drums
- Do not store MDI in open-head drums
- Use plugs/caps on terminal valves or fittings and bleed valves
- Keep drum overpacks available
- Do not stack palletized drums more than three high
- Never cut empty MDI drums with a torch

- Never remove empty MDI drums from a worksite for personal use

6. Responding To Emergencies

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

If the spill involves a tank car or tank truck, or you need additional guidance, call CHEMTREC[®] at 1-800-424-9300.

CHEMTREC[®] operators are available 24 hours a day, seven days a week.
2 See API Transportation Guidelines AX-198

July 2003 Reference Number: AX205

Note: The principal purpose of this guide is to briefly summarize information regarding the hazards, or potential hazards, to health and safety associated with working and handling diphenylmethane diisocyanate (MDI). The information herein is offered in good faith and is believed to be accurate and reliable as of the date of publication; however it is offered without warranty, express or implied, as to merchantability, fitness for a particular purpose, or any other matter.