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Polyol Resin Blends Safety and Handling Guidelines

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Foreword

The Alliance for the Polyurethanes Industry (API) has prepared this guide to provide important health and safety considerations associated with working with polyol resin blends.

Polyurethane foams are often made using "systems," sometimes called "A-side" and "B-side," or "iso-side" and "resin-side." It is important to know which side of the system ("A-side" or "B-side") is the diisocyanate and which is the polyol resin blend. The hazards of the polyol resin are different from those of the diisocyanates, and different precautions should be taken when handling the individual components. This Technical Bulletin gives a brief summary of the hazards that may be associated with the "resin-side" of systems and addresses important issues in the safe handling of these chemicals.

This brochure does not provide guidelines on handling the "iso-side." That information is contained in other documents produced by API. (See "Additional Information," page 6.) Similarly, this brochure does not contain information on either the hazards associated with solvents used for equipment cleanup or the hazards associated with specific polyol formulations. For that information, refer to the product-specific Material Safety Data Sheet (MSDS), or consult the supplier.

Chemical Composition of Polyol Resin Blends

To make polyurethane, one reacts a polyol with a diisocyanate. A number of additional ingredients are required to achieve the desired properties in a polyurethane foam. These additional ingredients are typically blended with the polyol to form what we call a "polyol resin blend." These ingredients may include catalysts, surfactants, colorants (pigments or dyes), blowing agents, and flame-retardants.

Customers who purchase polyurethane foam systems receive a two-part package, consisting of a diisocyanate and a polyol resin blend. To make polyurethane foam, the user meters the "A-side" and "B-side" in the proper ratio, using a proportioning pump to a mix head or spray gun, where the ingredients are mixed and dispensed.

Acute Health Hazards and Handling Precautions

Acute health hazards associated with the typical ingredients in a polyol resin blend are summarized below. General recommendations to minimize exposure to these ingredients also are provided.

There are four general recommendations for handling polyol resin blends:

- Clean up spills promptly to minimize the potential for falls—polyol resin blends are slippery.
- Avoid eye or skin contact.
- Don't eat or smoke where chemicals are handled to prevent inadvertent ingestion of these chemicals.
- As with any chemical, review the MSDS from the manufacturer before using it. There should be a specific MSDS for the polyol resin blend. Be sure to follow all

of the manufacturer's recommendations.

Polyols

The major ingredient in polyol resin blends is a polyol or a mixture of several polyols. Although polyols differ in molecular weight, and somewhat in chemical structure, all are very large alcohol-type molecules. Polyols typically make up about 90% by weight of a polyol resin blend. While some polyols may be slightly irritating to the eyes and skin, most are not.

In addition to the relatively non-toxic polyol, polyol resin blends contain a number of additives that may be more hazardous (see below). This makes it important to avoid skin and eye contact with the blend.

Note: The principal hazard associated with polyol is a safety hazard—spilled material can be very slippery.

Catalysts

Some amine catalysts and various metal catalysts (e.g., tin, potassium, bismuth) can be strongly basic. Catalysts may be respiratory irritants and/or irritants to the eyes and skin. Some amine catalysts are skin sensitizers, causing persistent dermatitis and skin problems, and/or are corrosive to the skin. Each catalyst package may vary depending upon the application and manufacturer. Users of "systems" do not handle the catalyst package separately. It already is incorporated into the polyol resin blend at typically less than 5% by weight. Therefore, the hazards associated with the catalyst package itself are reduced greatly.

Surfactants

There are many commercial silicone surfactants whose structure and/or composition have been varied to obtain specific properties in the finished polyurethane foam. Surfactants, in general, are minimally or non-irritating and of low order toxicity by all typical routes of administration. However, some surfactants may be eye and/or skin irritants. Surfactants generally are a minor constituent of the polyol resin blend formulation (0 to 2% by weight).

Some surfactants are flammable; appropriate fire safety precautions must be taken.

Colorants

The coloring of polyurethane foam is obtained with pigment pastes, dyes, or dispersions, collectively called "colorants." Their presence at low levels (typically less than 1% by weight) in the blended polyol resin minimizes the potential for significant exposure. Again, skin and eye contact with the blend should be avoided.

Blowing Agents

A blowing agent is the ingredient that forms the cells in polyurethane foam. Blowing agents that currently are used include hydrochlorofluorocarbons (HCFCs), hydrofluorocarbons (HFCs), hydrocarbons (pentanes), liquid carbon dioxide (CO_2), acetone, and water (reacts with diisocyanate to form CO_2).

Like CO_2, many blowing agents are heavier than air. In high concentrations, they can displace oxygen available for breathing. HCFCs and HFCs in high concentrations can cause irregular heartbeat. Use general and/or local ventilation as necessary to prevent overexposure. Some blowing agents also are irritants to the eyes and skin.

Hydrocarbons are flammable; appropriate fire safety precautions must be taken.

Flame-Retardants

Some of the polyol resin blends used to make polyurethane foam for building construction contain flame-retardants. Because a variety of chemicals are used as flame retardants, it is difficult to offer more than general guidelines. Flame-retardants are incorporated into the polyol resin blend at low concentrations (typically less than 10% by weight). Avoiding skin and eye contact with the resin blend will minimize exposure to these materials.

Handling

Personal Protective Equipment

- Safety glasses with side shields or chemical goggles. For some operations, such as “pouring-up,” a face-shield is required.
- Steel-toed shoes when handling drums or other heavy containers.
- Chemical resistant gloves. (Because most polyurethane workers handling polyol resin blends also are working with diisocyanates, using gloves approved for diisocyanates is recommended. (See “Additional Information,” page 6.)
- Organic vapor respirator with a particulate pre-filter may be worn if vapors are detected or irritating. Check with your supervisor to determine if respirators are required to protect against exposure to vapors in handling polyol resin blends

Table 1—Acute Health Hazards of Polyol Resin Blends

Component	*Chemical Composition*	*Eye Irritant*	*Skin Irritant*
Polyols	**Polyhydric alcohols**	**Yes (some)**	**Yes (some)**
Catalysts	**Amines, Metallic salts**	**Yes**	**Yes**
Surfactants	**Silicones**	**Yes (some)**	**Yes (some)**
Colorants*	**Carbon Black, Dyes, Metal complexes**	**Yes**	**Yes**
Blowing Agents*	**HCFCs, HFCs, Hydrocarbons, CO_2, Acetone and Water**	**Yes (some)**	**Yes (some)**
Flame Retardants*	**Brominated compounds, Antimony compounds**	**Yes**	**Yes (some)**

*Represents a whole family of materials all of which are present in very small amounts or not present at all.

- under the circumstances unique to your workplace. If so, be sure to wear them when instructed. If you use respirators, your employer must comply with the OSHA Respiratory Protection Standard.

The personal protective equipment specified above is for routine handling only. Additional equipment may be required for emergency response operations. (See “Emergency Response,” page 5.)

Ventilation

When working with materials in drums, use adequate ventilation and do not breathe

vapors. Normal air movement may provide adequate ventilation if there are no obstructions and the area is relatively open. However, in confined spaces and close quarters, mechanical exhaust may be required.

Decontamination

Proper decontamination of exposed clothing and apparatus must be performed. Please see manufacturer's MSDS for information on decontamination solutions to use with polyol resin blends.

Used decontamination fluids must be handled and disposed of according to regulations.

Fire and Explosion Hazards

In general, the flash point of polyol resin blends will be greater than 200˚F. As with most fires, combustion of polyol resin blends will produce carbon monoxide and carbon dioxide. (See "Emergency Response," page 5, for additional information on fire.)

Emergency Response

Spill Containment

- Stop the spill if possible.
- Do not empty into drains.
- Dike the area with absorbent material. Vermiculite, sawdust or sand may be used to absorb as much of the spill as possible.
- Shovel spilled material into an over-pak drum or open 55-gallon drum.
- Dispose according to your state, local or federal regulations.

Fire

- Evacuate the area immediately.
- Only trained personnel should fight any industrial or chemical fire. All fire fighters must wear fully protective clothing, including a self-contained breathing apparatus (SCBA).

First Aid

- Flush eyes with water for 15 minutes.
- Wash skin with soap and water.
- Clean clothes and shoes before reuse. Any contaminated leather items, including shoes, belts, and watchbands or clothing that has been exposed to large amounts of polyol resin blends, should be properly discarded.
- If swallowed, seek medical attention immediately. Do not induce vomiting.

Waste Disposal Considerations

Dispose of waste in compliance with your local, state and federal regulations.

Disposal of Empty Drums

- Dispose of drums in accordance with applicable regulations (See “Additional Information,” below.)
- Empty drums contain liquid or vapor residue, which may be dangerous. Do not hammer, strike, weld, braise, solder, drill, grind or expose containers to heat or flame.
- Drums must be “drip dry” (i.e., emptied by pouring, pumping or aspirating) before disposal.
  Note: The “one-inch” residue rule for determining whether a drum is empty applies to non-flowable products (e.g., very viscous resins).

Polyols typically are not considered hazardous material; therefore, drums may be reconditioned or landfilled.

Storage

- Stack palletized drums no more than THREE high.
- Maintain good housekeeping in the work area.
- Store in an enclosed, ventilated area.
- Do not store above temperature recommended by supplier.

Check for leaking or bulging drums. (See “Spill Containment,” page 5, for proper response to spills.) Bulging drums should be isolated and treated carefully by a trained waste management professional.

Additional Information

Alliance for the Polyurethanes Industry (API) 2001.
PMDI User Guidelines for Chemical Protective Clothing Selection (Technical Bulletin AX178). Arlington, VA: American Plastics Council.

Alliance for the Polyurethanes Industry (API) 2001.
Working With MDI and Polymeric MDI: What You Should Know (Technical Bulletins AX205-English, AX215-Spanish, AX218-Portuguese, AX220-French). Arlington, VA: American Plastics Council.

Alliance for the Polyurethanes Industry (API) 2001. *Working With TDI: What You Should Know* (Technical Bulletins AX202-English, AX216-Spanish, AX217Portuguese, AX219-French). Arlington, VA: American Plastics Council.

Alliance for the Polyurethanes Industry (API) 2001.
TDI User Guidelines for Chemical Protective Clothing Selection (Technical Bulletin AX179). Arlington, VA: American Plastics Council.

Alliance for the Polyurethanes Industry (API) 2002.
Guidelines for the Responsible Disposal of Wastes and Containers from Polyurethane Processing (Technical Bulletin AX151). Arlington, VA: American Chemistry Council (ACC).

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