



ISOCYANATES

Q&A

*Questions and
Answers About Use
and Handling*



**PRODUCT
SAFETY
FIRST**

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TLVs, PELs, Manufacturers' Guidelines and How to Know Whether Your Operation Meets or Exceeds These

1. **Question:** *What is a TLV?*

Answer: TLV stands for Threshold Limit Value. These values refer to airborne concentrations of substances and represent conditions under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse effect. They are guidelines that are recommended by the American Conference of Governmental Industrial Hygienists (ACGIH). TLVs are based on the best available information, but they should not be regarded as fine lines between safe and dangerous concentrations. They are not a relative index of toxicity. Some individuals may be unusually susceptible and react to concentrations lower than the TLV. For example, an individual may become "sensitized" to certain chemicals such as amines, epoxy resins or isocyanates and then react to concentrations below the TLV. Therefore, a TLV may not protect a sensitized individual. (See Section IV).

For a more complete description, please read the current issue of **Threshold Limit Values and Biological Indices** published by the ACGIH (<http://www.acgih.org/tlv-bei-guidelines/policies-procedures-presentations/overview>). These are commonly referred to as TLV booklets and are revised and published each year.

2. Question: What is a PEL?

Answer: PEL stands for Permissible Exposure Limit and refers to airborne concentration standards established by the Occupational Safety and Health Administration (OSHA). These can be found in Title 29 of the Code of Federal Regulations (CFR), Section 1910.1000, or in one of the chemical-specific OSHA regulations. PELs are legally binding. Because many PELs are based on the ACGIH TLV, they are subject to many of the same limitations discussed in the previous question. For example, compliance with a PEL may not protect a sensitized worker.

Some states administer their own OSHA programs. These states sometimes issue PELs which may be equal or more stringent than those established by federal OSHA.

3. Question: What is a Manufacturer's Exposure Guideline?

Answer: Some chemicals used in the workplace do not have a published TLV or PEL. For some of these, the manufacturer has suggested an airborne concentration guideline for worker exposure.

4. Question: What is the best source of information concerning TLVs, PELs, or manufacturer's guidelines for Covestro isocyanate products?

Answer: The best source of information is the most current Covestro safety data sheet (SDS). An SDS can be obtained by accessing Covestro's product stewardship website, Product Safety First, at <http://www.productsafetyfirst.covestro.com/> or calling the Covestro Product Safety Department at 412-413-2835.

5. Question: As a user of isocyanates, can I know if I am being overexposed?

Answer: If you believe you have isocyanate-caused eye irritation or respiratory irritation, you are probably being exposed to a concentration greater than the allowable limit. If you experience no effects, you still **may** be overexposed. Isocyanate users cannot tell by their senses alone if they are exposed to levels exceeding the allowable limits (TLV, PEL or manufacturers' guidelines). For isocyanates, these values are lower than the odor threshold (lowest level at which the odor can be detected) and the level at which irritation occurs. To ensure that published exposure limits have not been exceeded, monitoring for the airborne isocyanate should become part of the overall employee exposure characterization program. NIOSH, OSHA, Covestro, and others have developed sampling and analytical methods. Covestro methods can be made available, upon request.

6. Question: Can Covestro assist a customer or end-user who needs help performing air monitoring?

Answer: Yes. Requests for such assistance should be directed to your Covestro technical, sales or marketing representative. If you are unable to identify your Covestro representative, you can directly contact the Covestro Product Safety Department at 412-413-2835.

Chemical Properties of Isocyanate Products

1. Question: What is an isocyanate?

Answer: An isocyanate is any chemical that contains at least one isocyanate group in its structure. An isocyanate group is a group of atoms containing one nitrogen atom attached by a double bond to one carbon atom, which in turn is attached by a second double bond to an oxygen atom ($-N = C = O$). A chemical containing two such groups is called a diisocyanate. Common examples are toluene diisocyanate (TDI), hexamethylene diisocyanate (HDI), isophorone diisocyanate (IPDI), dicyclohexylmethane-4,4'-diisocyanate (HMDI), and diphenylmethane diisocyanate (MDI). These also are often called monomers because they can be made to react with one another and various other chemicals to form large chain-like chemicals called polymers. Prepolymers are intermediate in size between the small diisocyanate monomers and the very large polymers, which often are called polyisocyanates.

2. Question: Is there cyanide in isocyanates or is cyanide given off during the normal use of isocyanate products?

Answer: Although the two chemical names are similar, no cyanide is used to make or is present in isocyanate products. In addition, no cyanide will be released during the normal use of isocyanate products. However, burning any nitrogen-containing material, even those that were not made from isocyanates, can produce hydrogen cyanide. Therefore, hydrogen cyanide can be produced from the thermal decomposition (e.g., through burning) of isocyanates. Some examples of these nitrogen-rich materials not made from isocyanates include epoxy/polyamide coatings, melamine coatings, alkyd urea coatings, and even natural materials such as wool and leather.

3. Question: Is “urethane” used to make polyurethane coatings (commonly called urethane coatings)?

Answer: No. “Urethane” is actually ethyl carbamate, a low molecular weight molecule with the Chemical Abstract Service Registry number (CAS#) of 51-79-6. It is not used in the manufacture of Covestro resins for polyurethane paints, nor is it a byproduct of their manufacture or use. Thus, it is not expected to be present in these resins even as a residual.

4. Question: Why are hardeners used? Do non-isocyanate hardeners cause health effects?

Answer: For a coating to have good properties and low-temperature curing, a material with some chemical reactivity is needed to act as a hardener. Materials that have chemical reactivity tend to have biological reactivity and toxicity. This is true for isocyanate-containing hardeners as well as for non-isocyanate hardeners. To distinguish between the hazards of using the various hardeners, the user must carefully examine and compare the information presented on the safety data sheets and labels, and should discuss the product’s chemical and physical properties with the supplier’s product safety representative.

II

Physical Properties of Isocyanate Products

1. Question: *How do the various isocyanate products compare with regard to speed of evaporation (also called volatility)?*

Answer: Isocyanate products evaporate relatively slowly. In fact, they evaporate at rates hundreds to thousands times slower than other liquids, such as water or organic solvents. Among isocyanates, HDI and TDI evaporate faster than the other isocyanates listed below. Isophorone diisocyanate evaporates more slowly. Products classified as very slow to evaporate are MDI (Mondur[®] M), polymeric MDI (e.g., Mondur[®] MR and MRS), MDI polyisocyanates (e.g., Desmodur[®] E-28 and E-23), Desmodur[®] W diisocyanates, HDI polyisocyanates (Desmodur[®] N products) and TDI polyisocyanates (Desmodur[®] L products). In fact, the HDI- and TDI-based polyisocyanates originally were developed to reduce the evaporation rate and thus decrease the inhalation hazard during handling and use.

To illustrate the great difference in speed of evaporation, one can compare the room temperature (20° C) vapor pressures of various materials. On a relative scale, if MDI is assigned a value of 1, the relative vapor pressure numbers would be:

Desmodur® N Polyisocyanate	
Isocyanurate trimer	0.00052
Biuret.....	0.93
Mondur® M (MDI)	1
Mondur® MR (polymeric MDI)	1
Desmodur® W diisocyanate (HMDI).....	1
Desmodur® I diisocyanate (IPDI).....	48
Desmodur® H diisocyanate (HDI)	1,100
Mondur® TD-80 diisocyanate (TDI)	2,500
Water	1,800,000
Solvent (Methyl ethyl ketone)	9,100,000
Methyl isocyanate*	34,800,000

(*NOT used in polyurethanes or polyurethane coatings)

2. Question: Are isocyanates dangerous when they are carried about in open containers at room temperature or during room-temperature pouring or mixing operations?

Answer: From the standpoint of inhalation potential, a lower degree of hazard exists when the isocyanates involved are those which evaporate slowly, such as MDI, MDI-based polyisocyanates, Desmodur® W, or low free monomer polyisocyanates such as Desmodur® N. In addition, air sampling during many such operations has shown a low probability of airborne isocyanate concentrations exceeding the applicable TLV, PEL or Covestro guideline. However, if the materials involved are the more volatile TDI (Mondur® TD, Mondur® TD 80 or Mondur® TDS) or HDI (Desmodur® H), open transfer of these materials at room temperature can result in airborne concentrations above the TLV or PEL. Therefore, care must be taken to prevent inhalation overexposure.

Care must also be taken to prevent splashing onto the skin or into the eyes when handling open containers or during open processing conditions.

3. Question: Are isocyanates dangerous when spilled?

Answer: Yes. Care must be taken to prevent skin or eye contact. This is especially true with Desmodur® W and Desmodur® I diisocyanate, which are strong skin irritants and sensitizers. In addition, spills of monomeric TDI or HDI are particularly hazardous with regard to inhalation because even at room temperature such spills can result in airborne concentrations above the TLV or PEL. Inhalation hazard varies depending on many factors, including how easily that particular isocyanate evaporates, the volume of material spilled, the size of the spill area, the temperature of the spilled material, and the amount of ventilation.

Since it is difficult to predict all of these factors, it is best to institute a standard spill cleanup procedure for all isocyanate spills. (See Section VII).

Health Effects of Isocyanate Overexposure

1. Question: What are the primary health effects of overexposure to isocyanate products?

Answer: Overexposure to isocyanate products can cause skin, eye, nose, throat, and lung irritation. It also can lead to skin or respiratory sensitization. A third effect for which there is some evidence is a chronic (long-term) loss of lung function. For a more complete list of health effects and symptoms of the specific product in question, consult the product specific SDS.

2. Question: What is sensitization?

Answer: As a result of previous repeated overexposures or a single large dose, certain individuals may develop respiratory (asthma or asthma-like symptoms) or skin sensitization to diisocyanates that may cause them to react to a later exposure to diisocyanates at low levels (well below the TLV or PEL, in the case of respiratory sensitization). Respiratory symptoms can include chest tightness, wheezing, cough, shortness of breath or asthmatic attack. Extreme asthmatic reactions can be life threatening. Similar to many nonspecific asthmatic responses, there are reports that once sensitized an individual can experience these symptoms upon exposure to dust, cold air or other irritants. This increased lung sensitivity can persist for weeks and in severe cases for several years. Sensitization can be permanent. Chronic overexposure to diisocyanates has also been reported to cause lung damage (including fibrosis, decrease in lung function) that may be permanent. Skin sensitization symptoms can include reddening, swelling, rash and in severe cases blistering and hives. Animal tests and other research indicate that skin contact with diisocyanates can play a role in causing isocyanate sensitization and respiratory reaction. Both respiratory and skin sensitization symptoms can be immediate or delayed up to several hours after exposure.

3. Question: *If people become sensitized, can they lose their isocyanate sensitivity after being removed from further exposure?*

Answer: Sensitization can be either permanent or non-permanent. There have been documented cases in which individuals have lost their sensitivity to isocyanates based on direct challenge testing at levels below allowable limits. However, since such individuals may have an increased susceptibility to isocyanate sensitization, they should have no future contact with isocyanates.

4. Question: *Can sensitization be caused by skin contact or only by inhalation?*

Answer: Although not common, prolonged skin contact with diisocyanates can cause reddening, rash, swelling, and, in some cases, skin sensitization. In addition, animal tests and other research indicate that skin contact with diisocyanates can play a role in causing isocyanate sensitization and respiratory reaction.

5. Question: *Is there any way to prescreen individuals to determine if they are likely to become sensitized to isocyanates?*

Answer: There is no simple test which can be done to identify people most susceptible to sensitization. Applicants assigned to an isocyanate work area should undergo a preplacement physical evaluation. Special attention should be directed to diseases of the respiratory system or abnormal pulmonary function.

Each applicant should complete a medical, occupational and respiratory disease questionnaire. History of adult asthma, respiratory allergies such as severe hay fever, eczema, history of prior isocyanate sensitization, or lack of smell (anosmia) are possible reasons for medical exclusion from isocyanate areas.

In addition to the questionnaires, applicants should have a physical examination, including a thorough skin inspection, examination of the heart and lungs, and a baseline pulmonary function test.

While using or handling the diisocyanate products, emphasis should be placed on keeping all workers' exposure consistently below the TLV, PEL or manufacturers' guidelines. Workers also should be medically evaluated on an annual basis, with the frequency of pulmonary function testing dependent upon the workers' potential for isocyanate exposure.

6. Question: *If a sensitized person (respiratory sensitization) is exposed to isocyanates, will the reaction be immediate or delayed?*

Answer: Some can react immediately, some will not react until several hours after the exposure, and a third group can have both immediate and delayed reactions.

7. Question: *Can exposure to isocyanates cause an asthmatic reaction?*

Answer: Yes. Overexposure to isocyanates can result in sensitization which, in turn, can cause asthma. People who have been exposed to a single large concentration, or repeatedly exposed to levels above the TLV, PEL or manufacturers' guideline, may develop isocyanate sensitization. This, in turn, may cause a reaction to future exposures at very low levels, even below the levels that may be considered safe for others. In addition, reports have shown that sensitized persons can develop a reactive airways condition which can cause an asthma-like reaction from exposures to agents other than isocyanates. According to some reports, this condition may persist for several weeks, months or years after removal from further isocyanate exposure. There is some evidence that the earlier a sensitization condition is identified and the person is removed from work with isocyanate products, the less likely that individual will experience a long-term reactive airways condition.

8. Question: Can isocyanates cause sterility, birth defects or reproductive problems?

Answer: There is no scientific human evidence that isocyanates cause sterility, birth defects or reproductive problems. In addition, animal studies exposing rats to TDI, MDI or HDI by inhalation did not show any evidence of birth defects (teratology). Rats exposed, via inhalation, in a two-generation reproductive study for TDI and in a one-generation study for HDI did not show any effects on mating, gestation, or lactation. Tests using animals show no indication that inhalation exposure to diisocyanates can result in sterility or birth defects, and that reproductive problems in general can be avoided by preventing toxicity to the mother.

9. Question: Do isocyanates cause cancer?

Answer: There is no evidence that diisocyanates cause cancer in humans. Animal testing has shown that nearly lifetime inhalation exposure of rats to HDI vapor did not cause cancer. Similar studies in which rats were exposed to an aerosol of MDI at elevated levels resulted in a small number of lung tumors. For TDI, two types of cancer tests were conducted. The first study applied TDI liquid directly into the stomach of rats via a tube and tumors were found. Because the oral route is not the most relevant for human beings, another nearly lifetime study was conducted in rats using inhalation exposure to TDI vapor. This second study did not result in cancer. Other specialized studies to search for an explanation of the contradictory results of the two TDI cancer studies suggest that TDI given orally is converted, partly, to a known animal carcinogen.

From a regulatory perspective, HDI is not classified as a carcinogen. TDI, based on the oral exposure study, is classified as an IARC Group 2B carcinogen (i.e., possibly carcinogenic to humans based on animal studies). MDI, based on a series of long-term inhalation studies (two years) at high concentrations of specially prepared aerosols, is listed by the European Commission (EU) as a Carcinogen Category 2 (i.e., suspected of causing cancer).

10. Question: *Is it true as a general rule that aliphatic diisocyanates are safer to work with than aromatic diisocyanates?*

Answer: Comparisons of relative toxicity and hazard among chemical groups are very complex. The answers depend on comparisons of innate toxicity (ability to harm under a given set of test conditions), risk (probability of injury in a particular type-of-use situation), end points (e.g., irritation, sensitization, oral toxicity, etc.), and physical properties (e.g., speed of evaporation). When all of these factors and others come into play, it cannot be stated generally that aliphatic isocyanates are safer than aromatic isocyanates.

Avoiding Isocyanate Overexposure

1. Question: How can isocyanate overexposure be controlled?

Answer: Good engineering controls such as exhaust ventilation and enclosure of the operation are the preferred methods of control. In some cases, however, additional precautions such as the wearing of personal protective equipment (PPE) may be necessary. Clothing and gloves (nitrile, neoprene or butyl rubber gloves are recommended), as well as respiratory protection, often are needed in addition to engineering controls. If workplace air has not been monitored and the isocyanate level is not known, then an air-supplied respirator with a full facepiece or hood that is operated in a positive-pressure, pressure-demand or continuous flow mode must be worn. Because respirator guidelines can differ somewhat depending on the product involved, refer to the product-specific safety data sheet for further guidance, or contact the Covestro Product Safety Department: Call 412-413-2835.

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2. Question: Are air-purifying respirators ever appropriate in isocyanate work areas?

Answer: Yes. Where airborne isocyanate concentrations do not exceed 10 times the appropriate guideline or standard, an air-purifying respirator (APR) with organic vapor cartridges and particulate prefilter (P100) can give good protection. Of course, care must be taken to provide adequate eye protection, to ensure a good fit, and to employ a cartridge change-out schedule or use a cartridge with an end-of-service-life-indicator (ESLI), as specified in a written respirator program (29 CFR 1910.134).

3. Question: How can fresh air be supplied to air-supplied respirators?

Answer: For large-volume, fixed-location uses, the best air source is probably compressed air made respirable by filtration through a filter system designed to deliver Grade D breathing air. This type is also advantageous in that the pressure is sufficient to operate an air-cooling device (vortex) to increase worker comfort. Contact the Covestro Product Safety department, 412-413-2835, for current vendor information. For intermittent uses where compressed air is unavailable, a free-air (ambient air) pump may be a better choice. Since the air is not compressed, oil mist and carbon monoxide are not present as long as the air inlet is in a clean air area.

4. Question: Where can air purifying and/or air-supplied respirators be obtained that are suitable for use with polyurethane applications?

Answer: There are a number of companies that sell these respirators. The Covestro Product Safety department can be contacted for current vendor information. However, the end user is responsible for determining whether a vendor's products are suitable for their particular use.

5. Question: If my clothing has been contaminated while working with isocyanates, should they be left at work and decontaminated/discarded?

Answer: Yes. Care depends on the type of isocyanate in question. Work clothes should be left at work and decontaminated or discarded. A clothing procedure such as this is a prudent precaution when working with any chemical. Work clothes with minimal isocyanate contact can be decontaminated by washing with soap and water. The water itself will react with the isocyanate to produce polyureas which have much lower toxicity than isocyanates. Large spills on clothing may result in a hard polyurea coating forming on the clothing. This may make the clothing unfit for reuse. **Under no circumstances should clothing or equipment contaminated or potentially contaminated by an isocyanate be taken home by a worker.**

Because of their strong skin irritation and sensitization potential, the aliphatic isocyanates (i.e., Desmodur® W, and Desmodur® I) should be handled even more carefully. After handling an aliphatic isocyanate, or applying systems which contain residual aliphatic isocyanates, all protective clothing must be carefully removed to avoid skin contamination. All reusable clothing and equipment must be decontaminated immediately. If the protective suit is reusable, a helper should decontaminate the suit prior to its removal. Any disposable protective equipment should be promptly and properly disposed of as contaminated waste. If personal clothing is contaminated, the clothing should be removed and carefully discarded as contaminated waste.

Aliphatic isocyanates are not as reactive as many of the other commonly used diisocyanates, and therefore, are more persistent on surfaces. They may remain in the work area and on protective clothing, equipment and other objects several hours, or even days, after completion of the operation.

V A commercially available surface contamination wipe test kit has been evaluated by Covestro for determining surface contamination for isocyanates. The kit may be useful in any situation where decontamination of a surface is necessary. When used according to the manufacturer's instructions, a chemical reaction, resulting in color development, takes place on a treated pad after it has been wiped on a surface. The color indicates that reactive isocyanate residue is present on the wiped surface. The kit may be purchased from Colorimetric Laboratories, Inc. (www.clilabs.com) or a CLI distributor, SKC, Inc. (www.skcinc.com). Additional information about the wipe test kit may be obtained by contacting a Covestro Product Safety Industrial Hygienist at 412-413-2835.

Anyone intending to use Covestro isocyanate-based products must read and become familiar with the safety data sheet and associated health and safety literature.

First Aid

1. Question: *What should be done if an isocyanate comes in contact with a person's eyes?*

Answer: Flush the eyes immediately with the contents of several sterile eye wash bottles or copious amounts of lukewarm water. Then remove contact lenses, if present and easily removable, and continue eye irrigation for not less than 15 minutes. Obtain medical attention.

2. Question: *What should be done if an isocyanate contacts a person's skin?*

Answer: Wash off thoroughly with large amounts of water and then wash well with soap and water.

- For severe exposures, the affected person should get under a safety shower after removing contaminated clothing, using the flushing action of the water to remove the bulk of the chemical, and then get medical attention.
- For lesser exposures, the individual should seek medical attention if irritation develops or persists after the skin is washed.
- If the isocyanate contacted was Desmodur® W or Desmodur® I, after the initial washing with soap and water, the affected skin should be covered with a polyethylene glycol (300-500 molecular weight), which will help with the removal of the isocyanate from the skin, and washed again immediately with soap and water to thoroughly remove the polyethylene glycol and residual isocyanate.

3. Question: *What should be done in case of inhalation overexposure to an isocyanate?*

Answer: The person affected should be removed from risk of further overexposure. The onset of symptoms may occur several hours after exposure has taken place. Obtain medical attention immediately.

4. Question: *What should be done if a person ingests (swallows) an isocyanate material?*

Answer: Do not induce vomiting. Wash out the mouth with water. The person affected should be made to rest. Obtain medical attention.

Spill Cleanup and Disposal of Isocyanate Wastes

1. Question: *What is the recommended cleanup procedure for spilled isocyanate material?*

Answer: Implement site emergency response plan. Evacuate non-emergency personnel. The magnitude of the evacuation depends upon the quantity released, site conditions, and the ambient temperature, since higher levels of airborne isocyanates may be expected as ambient temperatures increase. Isolate the area and prevent access of unauthorized personnel. Notify management. Call CHEMTREC at 800-424-9300 for assistance and advice.

Don appropriate personal protective equipment (PPE) as specified in Section 8 of the applicable Covestro SDS. Ventilate and remove ignition sources. Control source of the leak. Contain the released material by damming, diking, and retaining, or diverting into an appropriate containment area. Absorb or pump off as much of the spilled material as possible. When using absorbent, completely cover the spill area with suitable absorbent material (e.g., vermiculite, kitty litter, Oil-Dri®). Allow for the absorbent material to absorb the spilled liquid. Shovel the absorbent material into an approved metal container (i.e., 55-gallon salvage drum). Repeat application of absorbent material until all liquid has been removed from the surface. Do not fill the container more than 2/3 full to allow for expansion, and apply lid loosely. Proceed to decontamination of the spill surface.

Decontaminate the spill surface area using a neutralization solution (**For the detailed information on recommended neutralization solutions, consult the applicable Covestro SDS**); scrubbing the surface with a broom or brush helps the decontamination solution to penetrate into porous surfaces. Wait at least 15 minutes after first application of the neutralization solution before applying absorbent. Cover the area with absorbent material and shovel this into an approved metal container. Check for residual surface contamination using a surface wipe method such as Colorimetric Laboratories, Inc. (CLI) Swype® test kits. If the Swype® test pad demonstrates that isocyanate remains on the surface (red color on pad), repeat applications of neutralization solution, with scrubbing, followed by absorbent until the surface is decontaminated (no color change on Swype® pad). Apply lid loosely to metal waste container (do not tighten the lid because carbon dioxide gas and heat can be generated from the neutralization process). With the lid still loosely in place, move the container to an isolated, well-ventilated area to allow release of carbon dioxide. After 72 hours, seal the container, and properly dispose of the waste material and any contaminated equipment (i.e., broom or brush) in accordance with existing federal, state and local regulations.

2. Question: Is spilled isocyanate material considered hazardous waste?

Answer: This waste material may or may not be considered a hazardous waste, depending upon the isocyanate and any process changes made to it by the product user (i.e., use of a solvent, etc.). Therefore, under RCRA, it is the responsibility of the product user to determine at the time of disposal, whether a material containing the product or derived from the product should be classified as a hazardous waste. (40 CFR 261.20-24).

3. Question: What disposal method does Covestro recommend for isocyanate product wastes?

Answer: Covestro recommends incineration as the most cost-effective, technically-feasible destructive technology.

4. Question: Is it true that drums which contain isocyanate products are themselves considered to be hazardous waste?

Answer: Drums that contain material which is a listed hazardous waste or is hazardous by characteristic are themselves considered hazardous wastes, unless they are deemed **legally "empty"** in accordance with 40 CFR Section 261.7. For example, a discarded drum that contained TDI and is not "empty," would be considered a hazardous waste.

5. Question: When is a drum that contained a hazardous waste considered empty?

Answer: An empty container is one that is “drip dry” (i.e., one that has been emptied of all materials) using the practices commonly employed to remove materials from that type of container (e.g., pouring or pumping). **NOTE:** The “one inch” residue rule for determining whether a drum is empty applies only to non-flowable products (e.g., viscous resins).

See 40 CFR Section 261.7 for the Environmental Protection Agency (EPA) definitions of empty containers. Applicable state laws and regulations should also be consulted.

6. Question: Should empty drums be given, donated or sold to anybody?

Answer: NO! It is the responsibility of the user to ensure that drums are transferred to a responsible party who will properly recondition or destroy the drum to prevent reuse. Indiscriminately discarded drums could be converted wrongfully into barbecues, trash-burning barrels, etc., and this could result in injury (for example, exposure to decomposition products (see section VIII, Thermal Decomposition or Burning)); therefore, Covestro supports the proper disposal of empty drums.

7. Question: Should a torch be used to destroy a drum?

Answer: NO! Applying a flame or heat to a drum may result in explosive and/or toxic decomposition of residues. Drums should be cut or destroyed by mechanical means only. (See Section VIII, Thermal Decomposition or Burning).

8. Question: How can a company that reclaims and reconditions drums be located?

Answer: A state-by-state list of drum reconditioners can be obtained from the Reusable Industrial Packaging Association (formerly the Association of Container Reconditioners); phone: (301) 577-3786; www.reusablepackaging.org.

It is important to remember that some isocyanate products are not hazardous by either listing or characteristic under the Resource Conservation and Recovery Act (RCRA) regulations, but are nevertheless still potentially dangerous if an unsuspecting employee of a disposal or reclamation facility comes in contact with them. Therefore, it is essential that the reclaimer or disposer be notified of the previous contents of the drums and of the hazards associated with those contents. In addition, state or local regulations and site restrictions may be more stringent than federal law. A regional EPA office or equivalent state agency may be helpful in interpreting local regulations.

9. Question: How can a copy of the current federal regulations on hazardous wastes be obtained?

Answer: Contact: U.S. Government Bookstore
<http://bookstore.gpo.gov/baskets/cfr-listing.jsp>

Order:

Title 40 Code of Federal Regulations
Parts 260-299 (RCRA)

An electronic version of the Code of Federal Regulations is available at: <http://www.ecfr.gov/cgi-bin/text-idx?tpl=%2Findex.tpl>.

10. Question: *How can EPA be contacted to request assistance/advice regarding disposal of hazardous waste?*

Answer: Call EPA's RCRA Hotline: 800-424-9346 (9:00 AM to 5:00 PM Eastern time, Monday to Friday).

11. Question: *Where can information be obtained about companies that provide various types of waste treatment or disposal services?*

Answer: CHWMEG, Inc. is a non-profit trade association comprised of manufacturing and other "industrial" companies interested in efficiently managing the waste management aspects of their environmental stewardship programs. Through CHWMEG, Inc., a company can purchase a membership and then obtain reviews (audit reports) about waste Treatment, Storage, and/or Disposal Facilities (TSDF). <http://www.chwmeg.org/>

Another source that typically prints out an annual review of TSDFs and their capabilities is Waste & Recycling News. This is a weekly publication that can be obtained through purchase of a membership / subscription.

Other sources of information can include state and federal regulatory agencies and industrial trade associations.

Thermal Decomposition or Burning

1. Question: Do isocyanates present a fire risk?

Answer: HDI, HMDI, IPDI, TDI, and MDI and their prepolymers, have relatively high flash points and are not considered to be flammable; however, each will burn if heated sufficiently. Under the National Fire Protection Association (NFPA) they would be classified as Class III B combustible materials. This means that they may burn in the presence of an existing fire or heat source and adequate oxygen.

Any diisocyanate involved in a fire will evolve toxic gases / fumes. All personnel dealing with such incidents should wear complete emergency response equipment. The use of a self-contained breathing apparatus (SCBA) is essential.

To minimize the risk from rupture for containers exposed to the heat of a fire, spray water on the outside of the containers to aid in cooling. Suitable extinguishing agents include:

- Dry chemical powder
- Carbon dioxide
- Water
- Foam

After the fire has been extinguished, the area is not considered safe until a thorough inspection for residual isocyanates has been conducted by qualified persons wearing proper personal protective equipment. Decontaminate any suspect residues with a neutralizing solution. Refer to the SDS for neutralization formulations.

2. Question: *What gases can be generated during cutting or welding on a substrate, which is in contact with polyurethane foam or which has been coated with a polyurethane coating?*

Answer: Gases or vapors evolved can include the monomeric diisocyanate (e.g., HDI, TDI, MDI, etc.) in addition to:

- Carbon monoxide
- Carbon dioxide
- Hydrogen cyanide
- Oxides of nitrogen
- Hydrocarbons
- Isocyanic acid

When welding or cutting metal coated with a polyurethane system, the worker may be exposed to decomposition products (metal fumes, gases or vapors, and/or particulates) which vary depending on type of process being used to weld or cut, nature of the base metal, and type of coating system. One or more of the following control procedures should be used for welding or cutting steel that is coated or in contact with a polyurethane system.

- Use a power brush or grinding wheel to physically remove the coating from the metal in the vicinity where the cut or weld is being made. At a minimum, a well-fitted air-purifying respirator, equipped with organic vapor/N95 cartridges and eye protection, should be used while physically removing the paint.
- Use a local exhaust hood to remove fumes, gases or vapors and/or particulates during the welding or cutting operation.
- Use a fresh air supplied respirator during welding or cutting.

Training Resources

1. Question: *What assistance can Covestro offer to customers who wish to train their employees?*

Answer:

1. Product Safety Literature including Safety Data Sheets.
2. Customer-site seminar conducted by a Covestro Industrial Hygienist.
3. Phone Consultation: 412-413-2835
4. Covestro Product Stewardship website:
<http://www.productsafetyfirst.covestro.com/>

Covestro LLC
Product Safety and Regulatory Affairs Department

For more information, please visit us at:
www.productsafetyfirst.covestro.com



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The manner in which you use, and the purpose to which you put and utilize our products, technical assistance and information (whether verbal, written or by way of product evaluations), including any suggested formulations and recommendations, are beyond our control. Therefore, it is imperative that you test our products, technical assistance and information to determine, to your own satisfaction and requirements, whether our products, technical assistance and information are suitable for your intended uses and applications. This application-specific analysis must at least include testing to determine suitability from a technical as well as health, safety, and environmental standpoints. Such testing has not necessarily been done by us. Unless we otherwise agree in writing, all products are sold strictly pursuant to the terms of our standard conditions of sale which are available upon request. All information and technical assistance is given without warranty or guarantee and is subject to change without notice. It is expressly understood and agreed that you assume and hereby expressly release us from all liability, in tort, contract or otherwise, incurred in connection with the use of our products, technical assistance, and information. Any statement or recommendation not contained herein is unauthorized and shall not bind us. Nothing herein shall be construed as a recommendation to use any product in conflict with any claim of any patent relative to any material or its use. No license is implied or in fact granted under the claims of any patent.