Material Safety Data Sheet

(1) PRODUCT INFORMATION

Common Chemical Name: **TM-80**
TOLUENE DIISOCYANATE/POLYMETHYLENEPOLYPHENYLISOCYANATE
Synonyms: TDI/MDI BLEND
Molecular Formula: MIXTURE

Chemical Family: Aromatic Isocyanates
Molecular Wt.: NOT ESTABLISHED

(2) INGREDIENTS /COMPOSITIONS

Chemical Name:			CAS	Amount
2, 4 TOLUENE DIISOCYANATE			584-84-9	64.0 %
ACGIH	TLV	STEL	0.02 PPM	
		TWA	0.005 PPM	
OSHA	PEL	CEIL	0.02 PPM	
4,4' DIPHENYLMETHANE DIISOCYANATE			101-68-8	8.0%
ACGIH	TLV	TWA	0.005 PPM	
OSHA	PEL	CEIL	0.02 PPM	
2,6-TOLUNE DIISOCYANATE			91-08-7	>15 %

PEL/TLV : Not Established
ACGIH: Not Established

MDI MIXED ISOMERS	26447-40-5	< 1.0 %
POLYMERIC MDI	9016-87-9	> 10.0 %

(3) HAZARDS IDENTIFICATION

Emergency Overview

DANGER! Toxic; Color: Amber-Brown; Form: Liquid; Odor: Sharp, Pungent; Causes respiratory tract irritation; May cause allergic respiratory reaction; Harmful if inhaled; Respiratory sensitizer; Causes skin irritation; Skin sensitizer; Causes eye irritation; Harmful if swallowed; May cause lung damage; Use cold water spray to cool fire-exposed containers to minimize the risk of rupture; Toxic gases/fumes are given off during burning or thermal decomposition; Closed container may explode under extreme heat.
Color: Dark
Form/Appearance: Liquid
Odor: Pungent

Warning Statement:

Danger: Poison Harmful if inhaled
Contains TOLUENE DIISOCYANATE (584-84-9; 91-08-7).

Contact with the eye and skin result in serious burn.

ROUTE(S) OF ENTRY: Inhalation of vapors or aerosols from TDI. Although MDI is low in volatility, an inhalation hazard can exist from MDI aerosols or vapors formed during heating, foaming or spraying.Skin contact from liquid, vapors or aerosols for both TDI and MDI.

Inhalation of vapors causes severe irritation to lung. Pulmonary edema may occur. Pulmonary sensitization can occur in some individuals. Leading to asthma like spasms of the bronchial tubes and difficulty breathing individuals with a history of respiratory illness, asthmatic conditions, eye damage or TDI sensitization should not be exposed to this product. TDI is included in the NTP annual report on carcinogens. Preliminary result from a TDI health study indicate that overexposure to a respiratory irritant (Chlorine or Phosgene for example), resulting in lower respiratory tract symptoms could increase the risk of developing asthma like reactions from subsequent TDI exposure.

Content MDI (CAS NO. 101-68-8) and TDI (CAS NO. 584-84-9; 91-08-7).

Inhalation of vapors causes severe irritation to lung, breathlessness, chest discomfort and reduced pulmonary function. Pulmonary edema may occur. Pulmonary sensitization may occur in some individuals leading to asthma like spasms of the bronchial tubes and difficult to breathing with a history of respiratory illness, asthmatic conditions, eye damage or TDI sensitization should not be exposed to this product. TDI is included in the NTP annual report on carcinogens.

Potential Health Effects

Primary Routes of Exposure:

Routes of entry for solids and liquids include eye and skin contact, ingestion and inhalation. Routes of entry for gases include inhalation and eye contact. Skin contact may be a route of entry for liquefied gases.

Acute Overexposure Effects:

Eye contact with TDI may result in conjunctiva irritation and mild corneal opacity. Skin contact may result in dermatitis, either irritative or allergic. Inhalation of the vapors may cause respiratory irritation, breathlessness, chest discomfort, difficult breathing and reduced pulmonary function. Acute overexposures above the PEL may result in eye and skin irritation, headache, bronchitis, bronchial spasms and pulmonary edema. Isocyanates have also been reported to cause hypersensitivity pneumonitis, which is characterized by flu-like symptoms which may be delayed.

Chronic Overexposure Effects:

As a result of previous repeated overexposures or a single large dose, certain individuals will develop Isocyanates sensitization (chemical asthma) which will cause them to react to a later exposure to Isocyanates at levels well below the PEL/TLV. These symptoms, which include chest tightness, wheezing, cough, shortness of breath, or asthmatic attack, could be immediate or delayed up to several hours after exposure. Similar to many non-specific 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.

Chronic overexposure to Isocyanates has also been reported to cause lung damage, including a decrease in lung function, which may be permanent. Sensitization may be either temporary or permanent. Prolonged contact can cause reddening, swelling, rash, scaling or blistering. In those who have developed a skin sensitization, these symptoms can develop as a result of contact with very small amounts of liquid material or even as a result of vapor-only exposure.

TDI was carcinogenic to rats and mice at maximum tolerated doses in a NTP feeding study; however, it was not carcinogenic in a lifetime inhalation study.
Based on the results of the feeding study, TDI is listed in the NTP Annual Report on Carcinogens and IARC included TDI in Group 2B (sufficient evidence of carcinogenicity in animals). Results from a lifetime inhalation study in rats indicate that MDI aerosol was carcinogenic at 6 mg/m3, the highest dose tested.
This is well above the recommended TLV of 5 ppb (0.05 mg/m3). Only irritation was noted at the lower concentration of 0.2 and 1 mg/m3. Minimal fetotoxicity and maternal toxicity were observed in rats exposed to 0.5 ppm of a mixture of 2,4 and 2,6-toluenediisocyanate. No effects were noted at the lower doses. No embryo toxicity or teratogenicity were noted in the study.

First Aid Procedures -Aggravated Medical Conditions:

Individuals who are sensitized to Isocyanates, or those with preexisting lung diseases or conditions, including non-specific bronchial hyper reactivity or asthma, must avoid skin contact or inhalation of even low levels of Isocyanates.

(4) FIRST AID MEASURES

General advice : Remove contaminated cloths.
First Aid Procedures -Skin: Wash affected areas with soap and water. Remove and launder contaminated clothing before reuse. Get immediate medical attention.
First Aid Procedures -Eyes: Immediately rinse eyes with plenty of running water for 15 minutes. Get immediate medical attention.
First Aid Procedures -Ingestion: If swallowed, dilute with water. DO NOT INDUCE VOMITING. Never give fluids or induce vomiting if the victim is unconscious or having convulsions. Get immediate medical attention.
First Aid Procedures -Inhalation: Move to fresh air. Aid in breathing, if necessary, and get immediate medical attention.

First Aid Procedures -Notes to Physicians: Specific antidotes or neutralizers to Isocyanates do not exist.
Care is supportive, based upon the chemical status of the patient as evaluated by the physician in attendance.
First Aid Procedures -Aggravated Medical Conditions: Individuals who are sensitized to Isocyanates, or those with preexisting lung diseases or conditions, including non-specific bronchial hyper reactivity asthma, must avoid skin contact or inhalation of even low levels of Isocyanates.

First Aid Procedures -Special Precautions: None Other First Aid Procedures:
Medical supervision of all employees who handle or come into contact with TDI is recommended. Pre employment and periodic medical examinations with respiratory function tests (FEV, FVC as a minimum are suggested. Persons with asthmatic conditions, chronic bronchitis, other chronic respiratory diseases, recurrent eczema or pulmonary sensitization should be excluded from working with TDI. Once a person is diagnosed as having pulmonary sensitization (allergic asthma) to TDI, further exposure is not permissible.

(5) FIRE FIGHTING MEASURES

Typical Low/High Deg. Method
Flash Point: 270 F TAG (OPEN CUP) 135 deg. C (CLOSE CUP)
Auto ignition: > 250 deg. C

Flammable Limits: 0.9 -9.5 % (TDI)

Extinguishing Media:
Use fog, foam, Dry powder or CO2 extinguishing media. Use water spray for large fires.

Fire Fighting Procedures:
Personnel engaged in fighting Isocyanates fires must be protected against nitrogen dioxide fumes as well as Isocyanates vapors, fumes/smoke. Fire fighters must wear self-contained breathing apparatus and turnout gear.
Unusual hazards: Reacts exothermically with water to form carbon dioxide gas, which may create excessive pressure in closed containers. Keep containers cool with spraying water if exposed to fire. Dispose of debris, contaminated extinguishing water in accordance with official regulations. **Reacts exothermically with polyol and alcohols. Reacts exothermically and possibly violently with acids, amines and alkaline solutions.**

Special fire fighting procedures: Full emergency equipment with self-contained breathing apparatus and full protective clothing (such as rubber gloves, boots, bands around legs, arms and waist) should be worn by fire fighters. No skin surface should be exposed.

During a fire, TDI and MDI vapors and other irritating, highly toxic gases may generated by thermal decomposition or combustion. At temperatures greater than 350 F (177 C) TDI and MDI form carbodiimides with the release of CO2 which can cause pressure build-up in closed containers. Explosive rupture is possible. Therefore use cold water spray to cool fire-exposed containers.

Unusual fire / explosion hazards: caution: Reaction between water or foam and hot Toluene Diisocyanate (TDI) can be vigorous.

(6) ACCIDENTAL RELEASE MEASURES
General:
Evacuate and ventilate spill area, dyke spill to prevent entry into water system, wear full protective equipment including respiratory equipment during clean up.
Major spill:
If temporary control of Isocyanates vapor is required a blanket of protein foam or other suitable foam (available at most fire departments), may be placed over the spill. Transfer as much liquid as possible via pump or vacuum device into closed but not sealed containers for disposal.

Minor spill:
Absorb the isocyanate with an acceptable absorbent. Shovel into open containers. Do not make pressure tight. Move to a well ventilated area (outside) and neutralize with a mixture of 90% water, 3-8% ammonia and 2-7% detergent. Add at 10 to 1 ratio. Let stand for 48 hours letting evolved CO2 escape. Proceed with final clean up of spill area.

Clean up: Decontaminate spill area using neutralizing solution and let stand for at least 10 minutes.

(7) STORAGE AND HANDLING

General:

Keep containers closed and store in well-ventilated area. Outage of container should be filled with dry inert gas at atmospheric pressure to avoid reaction with moisture. Contamination by moisture or basic compounds can cause dangerous pressure build up in closed containers. Store at 65-105 F to prevent freezing and isomer separation or discoloration and dimerization. If solidified, do not exceed 95 F while thawing to prevent discoloration. Mix before using.

Other Storage and Handling Data: If bulging of drum occurs, transfer to well ventilated area, puncture to relieve pressure, open vent and let stand for 48 hours before resealing.

Keep away from water. Segregate from foods and animal feeds. Segregate from acids and bases. Segregate from bases.

Suitable materials for containers: Carbon steel (Iron), High density polyethylene (HDPE), Low density polyethylene (LDPE), and Stainless steel.

Further information on storage conditions: Formation of CO2 and build up of pressure possible. Keep container tightly closed and in a well-ventilated place. Outage of containers should be filled with dry inert gas at atmospheric pressure to avoid reaction with moisture.

Storage stability:
Storage temperature: 32 - 110 °F
Protect against moisture.

SPECIAL SENSITIVITY.....: If container is exposed to high heat, 350 F (177 C) it can be pressurized and possibly rupture.TDI and MDI react slowly with water to form poly urea and will liberate CO2 gas (Carbon dioxide gas).This gas can cause sealed containers to expand and possibly rupture.

HANDLING/STORAGE PRECAUTIONS: Store in tightly closed containers to prevent moisture contamination. Do not reseal if contamination is suspected.

Prevent all contact. Do not breathe the vapors. Warning properties (irritation of the eyes, nose and throat or odor) are not adequate to prevent chronic overexposure from inhalation. This material can produce asthmatic sensitization upon either single inhalation exposure to a relatively high concentration or upon repeated inhalation exposures to lower concentrations. Exposure to vapors of heated TDI or MDI can be extremely dangerous. Employee education and training in safe handling of this product are required under the OSHA Hazard Communication Standard.

(8) PERSONAL PROTECTION/EXPOSURE CONTROLS

Clothing: Rubber gloves, coveralls, hard hat, boots and rubber apron to avoid skin contact. Contaminated equipment or clothing should be cleaned after each use or disposed of.

Eyes: Wear fitted chemical goggles or face shield and safety glasses.

Respiration: For situations where the airborne concentrations may exceed the level for which an air purifying respirator is ineffective, or where the levels are unknown or Immediately Dangerous to Life or Health (IDLH), select and use an appropriate positive pressure air supplying respirator (airline or self-contained breathing apparatus). When atmospheric levels may exceed the occupational exposure limit (PEL or TLV) approved air-purifying respirators equipped with an organic vapor sorbent and particulate filter can be used as long as appropriate precautions and change out schedules are in place.

Ventilation: Use local exhaust to control vapors/mists.

Explosion Proofing: None required.

Other Personal Protection Data: Eyewash fountains and safety showers must be easily accessible. Maintain work area below P.E.L

(9) PHYSICAL PROPERTIES

Color: Dark (Amber brown)
Form/Appearance: Liquid
Odor: Pungent
Odor Intensity: Strong Aromatic
Specific Gravity: 1.22 @ 25 DEG C
pH: NOT AVAILABLE
Typical Low/High Deg. @ Pressure
Boiling Pt: > 484 F 760 MM HG
Freezing Pt: ~ 52.6 51.8-53.6 F 760 MM HG
Flash Point: 220 deg. C (OPEN CUP)
Flammability: Not flammable
Auto ignition Temp. : >250 DEG C
Density: 1.22 gm/cm^3 (at 25 deg. C)
LEL: 0.9% UEL: 9.5 % (TDI)
Decomposition. Temp: NOT AVAILABLE
Solubility in Water Description: Water reactive
Vapor Pressure: 0.01 MM HG X 20 DEG. C XX
Vapor Density (Air = 1): 6.0

(10) STABILITY AND REACTIVITY

Stability Data: Stable.
Corrosion to metals: No corrosive effect on metal.

Oxidizing properties: Not fire-propagating

Chemical stability

The product is stable if stored and handled as prescribed/indicated.

Possibility of hazardous reactions.

Reacts with water, with formation of carbon dioxide. Risk of bursting. Reacts with alcohols, acids, alkalis and amines. Risk of exothermic reaction. Risk of polymerization. Contact with certain rubbers and plastics can cause brittleness of the substance/product with subsequent loss in strength.

Conditions to avoid

Avoid moisture.

Incompatible materials

Acids, amines, alcohols, water, Alkalines, strong bases, Substances/products that react with isocyanates.

Hazardous decomposition products

Decomposition products:
Hazardous decomposition products: carbon monoxide, carbon dioxide, nitrogen oxide, hydrogen cyanide, nitrogen oxides, aromatic isocyanates, gases/vapours

Thermal decomposition:
No decomposition if stored and handled as prescribed/indicated.

Incompatibility: Water, alcohols and strong bases. Reacts with acids, alcohols, alkalis and amines.
Conditions/Hazards to Avoid: Avoid temperatures >40 deg C for extended periods of time. Contamination with incompatible materials in a closed container may cause container rupture due to evolution of carbon dioxide gas.
Hazardous Decomposition/Polymerization: Hazardous decomposition products: TDI vapors, NOx, CO and HCN.
Hazardous Polymerization: May occur.
Corrosive Properties: Not Corrosive.
Oxidizer Properties: Not an oxidizer
Other Reactivity Data: Contact with certain rubbers and plastics can cause imbrittlement of the material with subsequent loss in strength.

(11) TOXICOLOGICAL INFORMATION
Toxicology Test Data: Rat, Inhalation Hazard Test, 1 hour -@ 0.78, 0.63 MG/L No deaths occurred Rabbit, DOT Corrosivity Test, 4 hr patch -4.7 DRAIZE: MAX=8 Not Corrosive; Moderate Irritant Rat,
Oral LD50 -5.8 G/KG Slightly Toxic Rat,
Inhalation Teratology Study -0.02,0.1,0.5 PPM
Minimal feto/maternal toxicity @ 0.5 ppm
Rat, Inhalation 2-Gen Reproduction Study -.02,0.08,0.3 PPM
No effect on reproduction
Mouse, Inhalation Oncogenicity Study -@ 0.05, 0.15 PPM
No Compound Related Oncogenic Effects
Human Occupational Exposure Experience -Positive Respiratory Sensitizer

Primary routes of exposure

Routes of entry for solids and liquids are ingestion and inhalation, but may include eye or skin contact. Routes of entry for gases include inhalation and eye contact. Skin contact may be a route of entry for liquefied gases.

TOXICITY DATA FOR: Toluene Diisocyanate
ACUTE TOXICITY
ORAL LD50.....: Rat: males = 5110 mg/kg, females = 4130 mg/kg.; Mouse: males = 4130 mg/kg, females = 5260 mg/kg.
DERMAL LD50.....: Greater than 10,000 mg/kg (Rabbit)
INHALATION LC50....: LC50 (1 hr)-Rat: males and females - 480 mg/m3;LC50 (4 hr) - Rat: Males = 350 mg/m3, females = 360mg/m3;LC50 (6 hr) - Mouse: males = 138 mg/m3, females = 103 mg/m3;LC50 (4 hr) - Rabbit: 80 mg/m3; LC50 (4 hr) - Guinea pig: 92 mg/m3.
EYE EFFECTS.....: Rabbit: severe irritant, capable of producing corneal opacity.

SKIN EFFECTS.....: Rabbit: moderate irritant (3.6/8.0 with Draize scoring).
SENSITIZATION.....: Guinea pig: positive sensitizer via dermal and inhalation exposure. Cross sensitization with MDI.Mouse: positive sensitizer via dermal exposure. Cross sensitization with MDI, HDI, and HMDI. Rat: Positive sensitizer via dermal exposure.

OTHER ACUTE EFFECTS: SUBACUTE: Repeated inhalation exposure studies (2-30 days; doses of 0.03 - 10.6 ppm; 0.22 - 77 mg/m3 with rats, mice, and guinea pigs have shown that the effects of TDI are limited to the nasal passage and the pulmonary system. Pathological findings were peribronchitis, bronchitis, bronchopneumonia, rhinitis, eye irritation, tracheobronchitis, pulmonary fibrosis, severe lung damage with a marked increase in lung weight, infolding of the surface epithelium in the trachea and bronchus at the electron micros copic level (more apparent than control), and an increase in cyst-like structures in the bronchus.The LOEL was 0.03 ppm (10.6 mg/m3), based on infolding of the epithelium in the trachea and bronchus, and cyst-like structures in the bronchus. The NOEL was 0.2 ppm (1.5 mg/m3) for inflammation of the respiratory tract.
SUBCHRONIC TOXICITY...: Sub chronic inhalation toxicity studies (doses of 0.1 -1.5 ppm; 0.73 - 10.9 mg/m3) using rats, rabbits, guinea pigs, and dogs have shown that the effects of TDI via inhalation exposure are limited to the nasal passages and the pulmonary system. Pathological findings were rhinitis, bronchitis, bronchopneumonia, pneumonitis, pneumonia, mild congestion of the trachea, tracheitis, thick mucous plugs in bronchial branches. The LOEL = 0.1 ppm (0.73 mg/m3), based on bronchitis and bronchopneumonia.

CHRONIC TOXICITY.....: Chronic inhalation toxicity studies (doses of 0.05 -1.5 ppm; 0.36 - 10.9 mg/m3) using rats, mice, and rabbits have shown that the effects of TDI via inhalation exposure are limited to the nasal passages and the pulmonary system.Pathological findings were rhinitis, bronchitis, bronchopneumonia, pneumonitis, proliferation of fibrous tissue in the bronchioles. The low observable effect level (LOEL) = 0.05 ppm (0.36 mg/m3), based on rhinitis, bronchitis, and pneumonitis.

CARCINOGENICITY.....: No tumors were observed in carcinogenicity studies in which mice and rats were exposed to TDI via inhalation (doses of 0.05 and 0.15 ppm; 0.36 and 1.1 mg/m3; 10 and 30 times, respectively, the TLV for an 8-hr exposure). In carcinogenicity studies in which mice and rats were dosed via gavage (Rats: 0, 30, and 60 mg/kg for males, and 0, 60, and 120 mg/kg for females; Mice: 0, 120, and 240 mg/kg for males, and 0, 60, and 120 mg/kg for females), TDI caused an increase in the spontaneous tumor rate with both species for the following tumors: Rats (males and/or females)--benign and malignant subcutaneous tumors (fibroma and fibrosarcoma), benign pancreatic tumors (acinar and islet cell adenoma), benign liver tumors (neoplastic nodules), and benign mammary gland tumors (fibroadenoma). Mice(females only)--benign and malignant blood vessel tumors (hemangioma and hemangiosarcoma), benign liver tumors (hepatocellular adenoma). The NOEL for carcinogenicity in mice was 60 mg/kg.For rats, no NOEL was established for malignant or benign tumors. Although TDI induced tumors via gavages, no tumors were produced via inhalation, which is the relevant route of exposure for humans.

MUTAGENICITY.....: A number of in-vitro, in-vivo, and in-vivo/in-vitro mutagenicity assays have been conducted, with both positive and negative results being reported.
Mutagenic assay results: 1. Salmonella typhimurium assay (Ames assay)--positive

results with metabolic activation.2. Sister chromatid exchange assay using cultured human lymphocytes--positive. 3.Sister chromatid exchange assay using Chinese hamster ovary cells--negative.4. Micronucleus assay (mice and rats exposed via inhalation)--no biologically significant effect.5. Unscheduled DNA synthesis (UDS) assay (rats exposed via inhalation: hepatocytes and lungs evaluated)--negative.

DEVELOPMENTAL TOXICITY: TDI has been evaluated for developmental toxicity using rats. Pregnant dams were exposed via inhalation to TDI concentrations of 0, 0.02, 0.1, and 0.5 ppm (0.1, 0.73, and 3.6 mg/m3) .There were no teratogenic effects. At a dose of 0.5 ppm, which was maternally toxic (based on a reduction in body weight gain), there was an increase in the incidence of incompletely ossified centrum for the 5th cervical vertebra.This incomplete ossification indicates minimal feto toxicity at a dose of 0.05 ppm. For teratogenic effects the NOEL = 0.5 ppm, for fetal effects the NOEL = 0.1 ppm, and the maternal no observable effect level(NOEL) = 0.1 ppm.

REPRODUCTION.....: TDI has been evaluated for reproductive toxicity in a two-generation reproduction study using rats. Adults and offspring were exposed via inhalation to TDI at concentrations of 0, 0.02, 0.08, and 0.3, ppm (0.1, 0.6, and 2 mg/m3). There were no reproductive effects. The only neonatal effect was a reduction in body weight during the lactation phase for the F2 pups in the 0.08 and 0.3 ppm dose groups (Note: there was no effect on the F1 pup body weights).The NOEL = 0.3 ppm for reproductive effects and 0.1 ppm for pup effects.

TOXICITY DATA FOR: Diphenylmethane Diisocyanate (Monomeric and Polymeric)
ACUTE TOXICITY
ORAL LD50.....: Greater than 10,000 mg/kg (Rat)
DERMAL LD50.....: Greater 6,200 mg/kg (Rabbit)
INHALATION LC50....: The 4-hour LC50 for polymeric MDI in rats ranges from 370 to 490 mg/m3.The 4-hour LC50 for monomeric MDI in rats was estimated to be between 172 and 187 mg/m3.The 1-hour LC50 for monomeric MDI aerosol was greater than 2240 mg/m3 (Rat).
EYE EFFECTS.....: Slight to moderate irritation (Rabbit). SKIN EFFECTS.....: Slight to moderate irritation (Rabbit).
SENSITIZATION.....: MDI has been shown to produce dermal sensitization in laboratory animals. Evidence of respiratory sensitization has also been observed in guinea pigs. In addition, there is some evidence suggestive of cross-sensitization between different types of diisocyanates.
CHRONIC TOXICITY.....: In a combined chronic inhalation toxicity/Oncogenicity study, rats were exposed to an aerosol of polymeric MDI for 6 hours per day, 5 days per week for one or two years. The exposure concentrations were 0, 0.2,1.0 and 6.0 mg/m3.Microscopic examination of tissues revealed the effects of irritation to the nasal cavity and lungs in animals exposed to 1.0 and 6.0 mg/m3.The No Observable Effect Level (NOEL) was 0.2 mg/m3.

CARCINOGENICITY.....: In the study described above (See CHRONIC TOXICITY), the occurrence of pulmonary adenomas and a single pulmonary adenocarcinoma was considered to be related to MDI. These tumors were observed only in rats exposed to the high concentration of 6.0 mg/m3.

MUTAGENICITY.....: Positive (Salmonella microsome test with metabolic activation; cell transformation assay) as well as negative (mouse lymphoma specific locus mutation test with or without metabolic activation) results have been observed "in vitro". The use of certain solvents which rapidly hydrolyze MDI is suspected of producing mutagenicity in some of these studies. MDI was negative in an "in vivo" (mouse micronucleus) assay.

DEVELOPMENTAL TOXICITY: Rats were exposed to polymeric MDI at air concentrations of 0, 1, 4 and 12 mg/m3 during days 6 - 15 of gestation. Maternal Toxicity (including mortality) was observed at the highest concentration of 12 mg/m3 accompanied by embryo and fetal toxicity .However, no teratogenic effects were observed even at this lethal concentration.

(12) ECOLOGICAL INFORMATION

ECOLOGY DATA FOR: Toluene Diisocyanate

AQUATIC TOXICITY.....: LC50 - 96 hr (static): 165 mg/liter (Fathead minnow) LC50 - 96 hr (static): Greater than 508 mg/liter (Grass shrimp) LC50 -24 hr (static): Greater than 500 mg/liter (Daphnia magna)

ECOLOGY DATA FOR: Diphenylmethane Diisocyanate (Monomeric and Polymeric)

AQUATIC TOXICITY.....: LC50 - 24 hr. (static): Greater than 500 mg/liter for Daphnia magna, Limnea Stagnalis, and Zebra fish (Brachydanio rerio) for both polymeric and monomeric MDI.

(13) DISPOSAL CONSIDERATION

Waste Disposal: Incinerate waste TDI in a permitted facility.

Container Disposal: Empty containers (as defined by RCRA, Section 261.7 and applicable state regulations) should be neutralized before leaving the generator facility and punctured or crushed to prevent reuse. TDI is listed as a hazardous waste and requires special handling for disposal. Also, under no circumstances should empty drums be burned or cut open with a gas or electric torch as toxic decomposition products may be liberated.

(14) TRANSPORTATION INFORMATION

TECHNICAL SHIPPING NAME.....: Toluene Diisocyanate Solution containing Methylene diphenyl diisocyanate

FREIGHT CLASS BULK.....: Chemicals, NOI (Toluene Diisocyanate)

FREIGHT CLASS PACKAGE.....: Chemicals, NOI (Toluene Diisocyanate), NMFC 60000

PRODUCT LABEL.....: Product Label Established

<u>DOT (DOMESTIC SURFACE)</u>

PROPER SHIPPING NAME.....: Toluene Diisocyanate Solution

HAZARD CLASS OR DIVISION .....: 6.1

UN/NA NUMBER.....: UN2078

PACKING GROUP .....: II, TOXIC

HAZARDOUS SUBSTANCE.....: Toluene Diisocyanate, Methylene diphenyl diisocyanate

DOT PRODUCT RQ lbs (kgs).....: 125 lbs (56.7 kgs) HAZARD

LABEL(s).....: Toxic

HAZARD PLACARD(s).....: Toxic

IMO / IMDG CODE (OCEAN)

PROPER SHIPPING NAME.....: Toluene Diisocyanate Solution
HAZARD CLASS DIVISION NUMBER...: 6.1
UN NUMBER.....: UN2078
PACKAGING GROUP.....: II
HAZARD LABEL(s).....: Toxic
HAZARD PLACARD(s).....: Toxic

ICAO / IATA (AIR)

PROPER SHIPPING NAME.....: Toluene Diisocyanate Solution
HAZARD CLASS DIVISION NUMBER...: 6.1
UN NUMBER.....: UN2078
SUBSIDIARY RISK.....: None
PACKING GROUP.....: II
HAZARD LABEL(s).....: Toxic
RADIOACTIVE?.....: Non-Radioactive
PASSENGER AIR - MAX. QTY. .....: 5 Liters
PASSENGER PACKING INSTRUCTION..: 609
CARGO AIR - MAX. QTY. .....: 60 Liters
CARGO AIR PACKING INSTRUCTION..: 611

(15) REGULATORY INFORMATION (cont)

OSHA STATUS.....: This product is hazardous under the criteria of the Federal OSHA Hazard Communication Standard 29 CFR 1910.1200. MSHIC rules 1989,2000

TSCA STATUS.....: On TSCA Inventory
CERCLA REPORTABLE QUANTITY..: 100 lbs. for TDI; 1 lb. for MDI
Factory Act 1948, Factory Rules applicable. MSHIC rules 1989,2000,Environment protection act/rules applicable, EPPR-1996 applicable

SARA TITLE III:

SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES..: 2, 4-Toluene Diisocyanate (CAS# 584-84-9) 64%
2,6-Toluene Diisocyanate (CAS# 91-08-7) >15%
4,4' DIPHENYLMETHANE DIISOCYANATE (101-68-8)8.0%
MDI MIXED ISOMERS (26447-40-5) < 1.0 %
POLYMERIC MDI (9016-87-9) > 10.0 %

SECTION 311/312

HAZARD CATEGORIES.....: Immediate Health Hazard; Delayed Health Hazard; Reactive Hazard

SECTION 313
TOXIC CHEMICALS..... : 2,4-Toluene Diisocyanate (CAS# 584-84-9) 64%,
2,6-Toluene Diisocyanate (CAS# 91-08-7) 9-11%;
4,4'-Diphenylmethane Diisocyanate (CAS# 101-68-8) 8-15%

MDI MIXED ISOMERS	(26447-40-5)	< 1.0 %
POLYMERIC MDI	(9016-87-9)	> 10.0 %

RCRA STATUS.....: TDI is listed as a hazardous waste (No. U-223) under Title 40 Code of Federal Regulations, Section 261.33 (f).The residue from decontaminating a TDI spill is also classified as a hazardous waste under Section 261.3 (c)(2) or RCRA.

(16) OTHER INFORMATION

NFPA 704M RATINGS:	Health	Flammability	Reactivity	Other
	3	1	1	

0=Insignificant 1=Slight 2=Moderate 3=High 4=Extreme

HMIS RATINGS:	Health	Flammability	Reactivity
	3*	1	1

0=Minimal 1=Slight 2=Moderate 3=Serious 4=Severe
*=Chronic Health Hazard

This product is hazardous or contains components which are hazardous according to the OSHA Hazard Communication Standard.
Important: While the descriptions, designs, data and information contained herein are presented in good faith and believed to be accurate. It is provided for your guidance only. Because many factors may affect processing or applications/use. We recommend that you make tests to determine the suitability of a product for your particular purpose prior to use. No warranties of any kind, either expressed or implied, including warranties of merchantability or fitness for a particular purpose are made regarding products described or designs, data or information set forth or that the products designs data or information may be used without infringing, the intellectual property right of others. In no case shall the description, information, data or designs provided be considered a part of our terms and conditions of sale. the description, information, data or designs furnished by GNFC hereunder are given gratis and GNFC assumes no obligation of liability for the description, designs, data and information given or results obtained. All such being given and accepted at your risk.

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