PR3 Petroquímica en evolución	**MATERIAL SAFETY DATA SHEET** **TDI 80** **Toluene Diisocyanate 80/20**	Sheet **Code** **ET-72-151-i** Revision 06 Validity 20/02/24

SECTION 1 – CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product name:
TDI 80 – Toluene Diisocyanate 80/20.

Product codes:
100001 (bulk) – 100002 (barrel).

Company information:
Petroquímica Río Tercero SA.
Ruta Panamericana - Ramal a Pilar - Km. 49,5.
Edificio Bureau Pilar - Piso 3º.
(B1629GVP) Pilar – Buenos Aires – Argentina.
Tel.: (54) (11) 4006-7000.
Fax: (54) (11) 4006-7026.
E-mail: pr3@pr3.com.ar.

Emergency telephone numbers (24 hrs.):
From República Argentina: 0-800-777-4773
(03571) 438444
For International Calls: (54)(9)(3571) 581787
(54)(9)(11) 60527694
(54)(9) (3571) 566271

Recommendations and usage restrictions:
Manufacture of flexible and rigid foam, paintings, varnish and elastomers. Its usage is recommended for the listed applications. Contact your sale representative or technical service if you expect to use this product for other applications.

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SECTION 2 – HAZARDS IDENTIFICATION

For the different types and categories of physical, human health and environmental hazards, and label elements, check the following charts:

Physical hazards.	GHS Category	Pictogram	Warning word	Hazard indication	Precaution advice			
					Prevention	Intervention	Storage	Disposal
Flammable liquids	N/A							
Pyrophoric liquids	N/A							

Hazards for human health.	GHS Category	Pictogram	Warning word	Hazard indication	Precaution advice			
					Prevention	Intervention	Storage	Disposal
Acute toxicity through ingestion.	N/A							
Acute toxicity through skin	N/A							
Acute toxicity through inhalation (vapors)	2		Hazard	H330	P260 P271 P284	310 320 P304+P340	P405 P403+P233	P501
Skin corrosion/irritation	2		Warning	H315	P264 P280	P321 P302+P352 P332+P313 P362+P364		

Severe eye damage / ocular irritation	2A		Warning	H319	P264 P280	P305+P351+P338 P337+P313		
Breathing sensitivity	1		Hazard	H334	P261 P284	P304+P340 P342+P311		P501
Skin sensitivity	1		Warning	H317	P261 P272 P280	P321 P302+P352 P333+P313 P362+P364		P501
Germ cell mutagenicity	N/A							
Carcinogenicity	2		Warning	H351	P201 P202 P280	P308+P313	P405	P501
Toxicity for reproduction	N/A							
Systemic toxicity specific for target organs – unique exposition.	3		Warning	H335	P261 P271	P312 P304+P340	P405 P403+P233	P501
Systemic toxicity specific for target organs – repeated exposition.	N/A							
Hazards for aspiration	N/A							

Environmental hazards.	GHS Category	Pictogram	Warning word	Hazard indication	Precaution advice			
					Prevention	Intervention	Storage	Disposal
Hazards for the aquatic environment – short-term hazard (acute).	3			H402	P273			P-501
Hazards for the aquatic environment – long term hazard (chronic)	3			H412	P273			P-501
Hazardous substances and mixes for the ozone layer.	N/A							

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Hazards Identification

H315: Causes skin irritation.
H317: May cause an allergic skin reaction.
H319: Causes serious eye irritation.
H330: Fatal if inhaled.
H334: May cause allergic symptoms, such as asthma or respiratory difficulties if inhaled.
H335: May cause respiratory irritation.
H351: Suspected of causing cancer.
H402: Harmful to aquatic life
H412: Harmful to aquatic life with long-lasting effects

Warning advice
Precaution

P201: Obtain special instructions before use.
P202: Do not handle until all safety precautions have been read and understood.
P260: Do not breathe dust/fume/gas/mist/vapours/spray.
P261: Avoid breathing dust/fume/gas/mist/vapours/spray.
P264: Wash your hands thoroughly after handling.
P271: Use only outdoors or in a well-ventilated area.
P272: Contaminated work clothing should not be allowed out of the workplace.
P273: Avoid release to the environment.
P280: Wear protective gloves/protective clothing/eye protection/face protection.
P284: Wear respiratory protection.

Response

P310: Immediately call a poison center/doctor/...
P312: Call a poison center/ doctor/…/if you feel unwell
P320: Specific urgent treatment is necessary (see Section 4 – First Aids on this label).
P321: Specific treatment (see Section 4 – First Aids on this label)
P320: Specific urgent treatment is necessary (see Section 4 – First Aids on this label).
P302+P352: If on skin: wash with plenty of soap and water.
P304+P340: If inhaled: remove victim to fresh air and keep at rest in a position comfortable for breathing.
P308+P313: If exposed or concerned, get medical advice/attention
P332+313: If skin irritation occurs: Get medical advice/attention.
P333+P313: If skin irritation or rash occurs, get medical advice/attention.
P337+P313: If eye irritation persists, get medical advice/attention.
P342+311: If experiencing respiratory symptoms: Call a poison center/doctor/…
P362+P364: Take off contaminated clothing and wash it before reuse.
P305+P351+P338: If eye contact occurs, carefully rinse your eyes with water during some minutes. If using contact lenses, take them off if possible. Continue washing.

Storage

P405: Store locked up.
P403+P233: Store in a well-ventilated place. Keep container tightly closed.

Disposal

P501: Dispose of contents/container in accordance with local/regional/national/international regulations.

Acute toxicity orally or by ingestion.
Low toxicity for ingestion. The accidental ingestion of small quantities should not cause any damage. However, bigger quantities may cause gastrointestinal irritation or ulcer.

Acute toxicity through skin.
It is practically not toxic if a unique skin contact occurs. It is not probable that a prolonged skin contact causes an absorption in damaging quantities.

Acute toxicity through inhalation.
TDI steam exposure can cause severe lungs and superior respiratory tracts irritation, neurologic disorders, cholinesterase inhibition and gastrointestinal afflictions. Effects can be severe and lead to causing death.

Corrosion / skin irritation.
A prolonged contact can cause severe skin irritation, local redness and pain.

Severe eye damage/eye irritation.
Steams can produce strong eye irritation – causing discomfort and redness – and moderate cornea damage.

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Respiratory sensitivity.
For sensitive and/or allergic people, a low TDI steam concentration may cause respiratory sensitivity and asthmatic symptoms (cough, respiratory difficulty and a chest tightness feeling). These symptoms can be delayed. Occasionally, the respiratory difficulty can be a threat for life.

Skin sensitivity.
Skin contact can produce a skin allergic reaction. Some studies made on animals have demonstrated that skin contact influence the respiratory sensitivity.

Mutagenicity of germ cells
In tests with lab animals, TDI did not produce congenital malformations.

Carcinogenicity.
TDI did not cause cancer in lab animals exposed through inhalation.

Toxicity for reproduction.
Light effects were observed in the fetus, only when the doses have caused toxic effects in the mother.

Systemic toxicity specific for target organs (unique exposure).
Respiratory apparatus: severe dry cough, sputum, dyspnea, nauseas, vomits, bronchitis associated to severe bronchospasm, lung edema, pneumonia. Central nervous system: headaches, amnesia, concentration loss, distraction, personality changes and depression.

Systemic toxicity specific for target organs (repeated exposure).
Repeated and prolonged exposures can damage the liver and the respiratory system.
Repeated and prolonged exposures can damage the liver and the respiratory system. (Report by the Ministry of Health, Labour and Welfare, 2001, Japan).

Inhalation hazards.
TDI 80 penetration in the respiratory tracts could be lethal.

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SECTION 3 – COMPONENTS/INFORMATION ON INGREDIENTS

Name	N° CAS	Composition
Toluene diisocyanate (mix)	26471-62-5	2,4 Toluene diisocyanate (80±1%) 2,6 Toluene diisocyanate (20±1%)
2,4 Toluene diisocyanate	91-08-7	80±1%
2,6 Toluene diisocyanate	584-84-9	20±1%

SECTION 4 – FIRST–AID MEASURES

Inhalation: Take the victims to an open-air place and keep them in a comfortable breathing position. If they do not breath, apply artificial respiration to them. If you practice mouth to mouth respiration to them, use protection of the kind of the rescue people (pocket facemask, etc.). If breathing is problematic, apply oxygen with qualified personnel. Seek/Obtain immediate medical assistance.

Skin contact: Immediately wash the affected area with plenty of soap and water. Take off contaminated clothing and shoes while washing. Seek immediate medical assistance. Wash clothing before using it again. Dispose the articles that cannot be decontaminated, including leather articles, such as shoes, belts and watchstraps.

Eye contact: Immediately wash your eyes with plenty of water for at least 15 minutes. If using contact lenses, take them off after the first 5 minutes and continue washing for at least 15 minutes. Seek immediate medical assistance, preferably ophthalmological assistance.

Ingestion: Wash the mouth and give a glass of water or milk. Do not induce vomit. Do not give anything orally if the person is not completely conscious or is suffering convulsions. Seek/Obtain immediate medical assistance.

Notes to the Physician. There are not specific antidotes or neutralizers for TDI. The exposition treatment consists in the patients' symptoms and clinical conditions control.

Keep the patient in an appropriate ventilated and oxygenated place. Symptoms similar to asthma can appear in sensitive respiratory tracts. An excessive exposure can worsen the asthma and other preexistent respiratory disorders (eg. emphysema, bronchitis, dysfunction syndrome of sensitive respiratory tracts). Bronchodilators, expectorants, antitussives and corticosteroids can be a relief. Treat bronchospasm with beta 2 bronchodilator inhalation, or with corticosteroids orally or parentally administrated. Respiratory symptoms, including lung edema, can appear later. People who have had a meaningful exposure will be kept under observation during 24-48 hours to detect respiratory dysfunction signs.

Due to its irritating characteristics, ingestion can produce burnings/ulcers in mouth, stomach and inferior gastrointestinal tract with the resulting gravity. Vomit aspiration can damage lungs. If a gastric lavage is done, an endotracheal/esophageal control is recommended. Cholinesterase inhibition has been observed in exposed people, but it does not mean any kind of help to determine the kind of exposure and it is not correlated with the exposure signs.

Protection recommendations for first-aid rescuers. Rescuers must pay attention to their own protection and wear the recommended PPE (see Section 8 – Exposure Controls and Personal Protection).

SECTION 5 – FIRE-FIGHTING MEASURES

Specific extinguishing means: Mist / atomized water or mist. Chemical powder extinguishers. Carbon dioxide extinguishers. Alcohol resistant foam (ATC kind). General usage synthetic foams (including AFFF) or normal protein foams can be used, but they are less efficient.

Specific hazards: During a fire, dense fumes are released. These fumes can contain TDI along with toxic combustion products and/or irritants with a varied composition (nitrogen oxides, isocyanates, cyanhydric acid, carbon monoxide, carbon dioxide, etc.)

TDI can violently react with water, producing heat and/or gases. In a fire situation, gases generation can cause the container breakage. The direct water jet application to heated liquids can cause a violent steam or eruption generation.

Protection measures: Limit the fire and avoid unnecessary accesses. Keep people away from it. Keep yourself in a counter wind direction. Keep yourself away from low areas where gases (fumes) can be accumulated. Do not use water jet because fire may spread. Fight fire from a protected place or from a safe distance. Consider using hoses or monitors handled by a remote control. Immediately evacuate all the personnel from the area if the device safety valve sounds or if a color change is observed in the container. Remove the container from the fire zone if it means performing a safe maneuver. Use pulverized water to cold the containers exposed to fire and the zone affected for it until the fire has been extinguished. Consider that product containers may explode due to high temperatures. If possible, remove these containers from the fire zone performing a safe maneuver.

Contain water extinction spread because it can damage the environment if it is not contained. Consult Section 6 – Measures in case of accidental spills and Section 12 – Ecotoxicological information.

Special protective equipment required for firefighters. Use positive pressure autonomous respiratory equipment and fire protection clothing (helmet, jacket, trousers, boots and gloves). Avoid contact with the product during the fire-fighting operations. If product contact is foreseeable, equip firefighters with chemical product resistant suites and with autonomous respiratory equipment. If fire fighters equipment are not available, equip fire fighters with chemical product resistant clothing and autonomous respiratory equipment, and fight fire from a remote place.

SECTION 6 – MEASURES IN CASE OF ACCIDENTAL SPILLS

Personal precautions, protective equipment and emergency procedure. Evacuate and air the spill or leakage zone. Keep personnel away from low zones and in spill counter-wind sense. Eliminate ignition sources. If available, use foam for extinguishing steam. Use appropriate safe equipment (see Section 8 – Exposition controls/personal protection).

Environmental precautions. Avoid the entrance in soils, trenches, sewers, watercourses and/or subway water. Spills or unloadings in natural watercourses may kill aquatic organisms.

Methods and materials for contention and cleaning. If possible, confine the spilled material. For small quantities, absorb TDI with appropriate absorbent materials, such as vermiculite, sand or clay. Do not use cement powder as absorbent material since it may generate heat. Collect the waste in open metallic or plastic containers, or in cardboard boxes recovered by plastic sack, dully labeled. Move the container to a well-aired exterior zone. Do not close the container hermetically. Wash the spill zone with big amounts of water, and decontaminate it with a neutralizing solution in a 10 to 1 proportion, prepared with 90% of

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water, 8% of concentrated ammonia and 2% of detergent, ensuring a good airing to prevent expositions to ammonia steam. Let it stand for at least 48 hours to allow the carbon dioxide escape.

For big quantities, temporarily control the TDI steam emissions by applying a layer of protein foam or other appropriate compound over the spill. Transfer as many liquid as possible through a bomb or vacuum device to closed but not hermetic containers for its later elimination.

For waste disposal, see Section 13 – Considerations about final disposal.

SECTION 7 – HANDLING AND STORAGE

Handling. Avoid eye, skin and clothing contact. Avoid prolonged or repeated skin contact. Avoid breathing steams. Wash yourself thoroughly after handling it. Keep the containers closed and the working areas well-aired. Use appropriate protective equipment (see Section 8 – Exposure Controls and Personal Protection).

If a container swelling is observed, transfer it to an aired zone, puncture it to relieve the pressure, open the vent and let it stand for 48 hours before resealing.

Spills over fibrous insulating and warm materials may reduce auto ignition temperatures and provoke spontaneous combustion.

Storage. Conserve it inside closed containers in dry and well-aired environments, protected against atmospheric humidity and contamination. Store it at 18–40 °C to avoid freezing and isomers separation, or coloration and dimerization. Defrost the solidified product at 35 °C or lower temperature to avoid coloration. The product validity period is 12 months in appropriate handling and storage conditions.

Store it separated from alkali. Do not store TDI contaminated with water to avoid a potentially hazardous reaction due to CO2 overpressure. These conditions may alter the product quality.

SECTION 8 – EXPOSURE CONTROLS AND PERSONAL PROTECTION

Control parameters (acceptable concentrations):

Component	Regulation	Type	Value
2,4 TDI	Res. MTSS 295/03	CMP	0,005 ppm
	Res. MTSS 295/03	CMP-CPT	0,02 ppm
	OSHA	PEL	0,02 ppm (0,14 mg/m3)
	NIOSH	TWA	0,005 (0,036 mg/m3)
	NIOSH	STEL	0,02 ppm (0,14 mg/m3)
	ACGIH	TWA	0,005 (0,036 mg/m3)
	ACGIH	STEL	0,02 ppm (0,14 mg/m3)
2,6 TDI	Res. MTSS 295/03	CMP	0,005 ppm
	Res. MTSS 295/03	CMP-CPT	0,002 ppm
	OSHA	PEL	0,02 ppm (0,14 mg/m3)
	NIOSH	TWA	0,005 (0,036 mg/m3)
	NIOSH	STEL	0,02 ppm (0,14 mg/m3)
	ACGIH	TWA	0,005 (0,036 mg/m3)
	ACGIH	STEL	0,02 ppm (0,14 mg/m3)

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The acceptable concentrations are valid for 2,4 y 2,6 isomers as well as for the mixing of both isomers.

Appropriate engineering controls. Have local and general airing available in order to control that the steam levels in air are lower than the exposition limits, also have extraction systems available in the steam/aerosol generating source when people are working at this point. Odor and the irritating power are inappropriate to inform about an excessive exposure.

Respiratory protection. When the concentrations in air may be superior to the occupational exposition limits, wear an authorized air-purifying respirator with organic steam and particles filters. When the concentrations in air exceed the level at which air-purifying respirators are effective, wear authorized respiratory equipment with air supplies with autonomous or semiautonomous positive air pressure. For emergency cases or if the concentration in air is unknown, wear authorized autonomous equipment of positive pressure or autonomous respiratory equipment with pure air admission.

Hands protection. Wear protective globes resistant to chemical products. Appropriate materials: chloroprene rubber (Neoprene), chlorinated polyethylene, polyvinyl chloride (Pylox), butyl rubber, fluorine elastomer (Viton) y nitrile rubber (Buna N).

Face/Eye protection. Safety eyewear with hermetic closing (goggles). Wear a facemask if spraying risk exists.

Body and skin protection. To avoid contact, wear chemical resistant clothing preferably recovered with Saran. Safety eye washers and showers should be in an easily accessible place. Immediately take off the contaminated clothing and wash your skin with water and soap. The contaminated clothing must be eliminated or decontaminated and washed before reusing it. The items that cannot be decontaminated (shoes, belts, etc.) must be appropriately retired and disposed.

SECTION 9 – CHEMICAL AND PHYSICAL PROPERTIES

Physical state: Liquid (293 K / 101,3 KPa)
Color: Colorless to pale yellow
Odor: Pungent
pH: Not applicable
Fusion/Freezing Point: 282,5 K (9,5 °C).
Boiling Point: 526 K (253 °C) (101,3 KPa).
Initial Boiling Point: 525 K (252 °C) (101,3 KPa).
Boiling Interval: 525 / 527 K (252 / 254 °C) (101,3 KPa).
Inflammation Point: 405 K (132 °C).
Inflammability Superior Limits: 9.5 % (V)
Air Inflammability Inferior Limits: 0,9 % (V)
Vapor Pressure: 1,5 Pa (293 K / 20 °C).
Vapor Density (air = 1): 6,0
Density: 1220 Kg/m3 (293 K / 20 °C).
Relative Density (water = 1): 1,22
Solubility: 124 mg/L (298 K / 25 °C) (West et al, 2008) (insoluble in water; it reacts with CO2 formation and solid polyureas)
Coefficient of participation in n-octanol/water: log Pow 3,43 (295 K / 22 °C).
Auto ignition Temperature: > 868 K (595 °C)
Decomposition Temperature: > 523 K (250 °C)
Odor range: 0,17 – 0,20 ppm (smell perception indicates superior than allowed TDI concentrations)
Evaporation Speed: Not available
Dynamic Viscosity: 0,003 Pa.s (298 K)
Kinematic Viscosity: Not available

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SECTION 10 – STABILITY AND REACTIVITY

Chemical stability: stable in the recommended storage conditions (see Section 7- Handling and Storage).

Reactivity: TDI has elevated reactivity and its reaction speed increases with temperature and contact. Contact may increase due to agitation and for mixing the product with TDI. These reactions can be exothermic, violent and explosive.

Possible hazardous reactions: TDI is insoluble in water, sinks in water, but reacts slowly at the interface, generating carbon dioxide, warm release and a polyurea solid layer. The released carbon dioxide may cause a pressure increase and break closed containers.

Elevated temperatures can cause a dangerous polymerization that can be catalyzed by strong bases.

Conditions to avoid: Avoid moisture. TDI reacts slowly with water releasing carbon dioxide that may cause a pressure increase and closed containers breakages.

Exposure to elevated temperatures may cause product decomposition generating gases that can originate pressure in closed systems.

Incompatible materials: Avoid contact with wet air, water, acids, alkali, ammonia, alcohol, amines, strong oxidants or reductors, metals (aluminum, zinc, tin, copper, brass) and galvanized metals and wet organic absorbents. Avoid every unintentional contact with polyols.

Hazardous decomposition products: Thermic decomposition products depend on temperature, air supply and the presence of other materials. During decomposition, gases/vapors are released (TDI, carbon monoxide, hydrocyanic acid, nitrogen oxides, aromatic isocyanates, etc.).

SECTION 11 – TOXICOLOGIC INFORMATION

Acute Toxicity

Acute toxicity by ingestion.

The studies carried out according to an OECD Guideline 401 (NTP, 1986 y Woolrich, 1982) estimated the DL_{50} in 4130 mg/kg/bw and 5110 mg/kg/bw in male and female rats respectively, and in 4130 mg/kg/bw in male mice. According to other studies (Wazeter et al, 1964 y Ministry of Health, Labour & Welfare, Japan, 2001) the values obtained of DL_{50} did not result in a classification in relation to a severe oral toxicity. These evaluation evidences provide a consistent evidence of the low TDI toxicity after an oral administration.

DL_{50} (oral / rats and mice): > 2000 mg/kg/bw OECD TG 401 or equivalent.

Classification: Not classifiable.

Acute toxicity by skin.

Studies carried out by Wazeter et al (1964) and Woolrich (1982) in accordance to a method equivalent to an OECD Guideline 402, estimated DL_{50} > 9400 mg/kg/bw in male and female rabbits. Consequently, TDI has a low severe toxicity through skin.

DL_{50} (dermic / rabbits): >2000 mg/kg (rabbits) OECD TG 402 or equivalent.

Classification: not classifiable.

Severe toxicity through inhalation.

Some studies carried out (Doe and Horpool, 1980 and MacKay, 1992) estimated the CL_{50} between 0,46 mg/l and 0,1-0,14 mg/l for female and male rats respectively. According to the classification criteria, TDI is very toxic through inhalation.

CL_{50} (vapor inhalation / 1 hour / rats): 0,47 mg/l (66 ppm) (Doe and Horpool, 1980) OECD TG 403 or equivalent.

Classification: category 2 (lethal if inhaled)

Skin corrosion and irritation.

All studies about skin irritation in rabbits show evidence of intense irritation of varied severity. In a dermic irritation study, (Knapp and Baker, 1974) severe edema and mild erythema were described. Both effects were totally reverted after 7 days. Severe dermic irritation, persistent erythema and edematous swelling were observed in a study carried out by Suberg (1984),and mild irritation in the skin of a guinea pig exposed to an undetermined quantity and period of time (Peschl, 1970). In DFGOT Vol. 20 (2005) there are irreversible effects suggested: on the surface of the skin as well as necrosis and the formation of granulomas (rabbit 24-hour skin irritation tests)" and "undiluted TDI 80/20 was evaluated as caustic. The skin was visibly healing, but the changes were not completely reversible within the follow-up period of 8 and 28 days ".

In a skin irritation test of 24 hours exposure, a reversible moderated erythema and an edema were reported. The histopathology revealed epidermis atrophy and dermis cellular infiltration 3-10 days after substance removal (Duprat, 1976). A bio test in rats demonstrated that with 8 hours exposure periods and the application of high volumes did not occur macroscopic necrosis signs (Gamer, 2007). The histopathologic test revealed necrosis of the complete dermic thickness.

Skin corrosion/irritation: irritating for rabbits (OECS TG 404).

Classification: category 2 (it causes dermic irritation).

Severe eye damages and eye irritation.

The TDI potential irritation test through the instillation of an isomers mix sample in rabbit's conjunctival sac showed that the product was eye irritating causing moderate to severe corneal opacity, severe conjunctiva irritation, purulent discharges and depilatory effects. Sitting (1981) y Woolrich (1982) noted tearing up and inflammation in human eyes after TDI exposure. "Irritation and mild damage to the corneal epithelium" in rabbit eye irritation tests (CERI Hazard Data 97-20, 1998) and effects in humans health were evidenced (CERI Hazard Data 97-20, 1998). These results show that TDI is a severe irritant (Wazater et al, 1964).

Severe damages / eye irritation: irritant for rabbits (Draize test).

Classification: category 2A (it causes severe eye irritation).

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Respiratory sensitivity.

TDI is a potential respiratory sensitivity in animals and humans. Inhalation exposures to high TDI concentrations may result in high asthma incidence, while there are fewer cases reported in relation to exposures to lower concentrations (U.S. EPA, 2011). TDI can cause allergic reactions to sensitive people exposed to extremely low concentrations. “Isocyanates may also sensitive workers, making them more likely to severe asthma attacks if they are exposed again, even in concentrations under the REL de NIOSH (NIOSH 1973, 1978). There are deaths reported due to severe asthma in sensitive persons” (Fabbri et al, 1988; Alerta de NIOSH: 1996 - Publicación de DHHS (NIOSH) No. 96-111).

Clinic studies in humans suggest that the total dose may be more important than the concentration for the TDI induced asthma (Vandenplas et al, 1993), while studies carried out with guinea pigs do not support this point of view (Karo, 1983). Nowadays, it is not possible to define a reliable quantitative relation between exposure (concentration, durability, speed and kind of exposure) and the answer in relation to the sensitization TDI risk. In rats, short exposures to high levels of diisocyanates are more effective in the induced respiratory sensitization than prolonged exposures (Pauluhn and Poole, 2011). On the other hand, most workers who have developed asthma due to diisocyanates have experienced long periods of exposure (U.S. EPA, 2011). Studies with animals have demonstrated that the respiratory hypersensitivity may be induced by skin contact with TDI, but it is not clear how this may be applied to asthma induction in humans.

Respiratory sensitization: adverse effect observed (sensitization).

Category: 1 (it may cause allergic symptoms, or asthma or respiratory difficulties if inhaled).

Skin sensitivity.

Information from animals provide a clear evidence about skin sensitization caused by TDI. There are positive results reported in skin sensitization tests carried out in animals’ skins (CERI Hazard Data, 97-20, 1998). Even though skin contact may produce a skin allergic reaction, dermic sensitization in humans is rarely reported due to the sensitization risk reduction by the use of extra protective measures, such as gloves and efficient airing.

Skin sensitization: adverse effect observed (sensitization).

Category: 1 (it may cause an allergic skin reaction).

Mutagenicity in germinal cells.

Scientific evidence supports the conclusion that TDI is neither mutagenic nor genotoxic. As TDI is unstable in organic solvents and it rapidly degrades to TDA, the results of most genotoxicity tests in vitro are inappropriate to evaluate the TDI genotoxic potential. TDI inhalation does not induce the formation of micronucleus or DNA damages (Deoxyribonucleic acid) as it is measured for not programmed DNA synthesis.

Category: not classifiable.

Carcinogenicity.

Studies carried out in humans do not show neither evidence of carcinogenic risk, nor any association between cancer risk and occupational exposure. Studies carried out in animals do not show carcinogenic effects due to exposure for TDI inhalation.

NOAEC (path: inhalation): 1,086 mg/m3

Category: 2 (it is sensitive to causing cancer).

Toxicity for reproduction.

TDI toxicity about fertility was investigated in a study of two generations of rats (Tyl et al., 1989) carried out regarding the OECD 416 Guideline under GLP. Vapor atmospheres of 0,02, 0,08 y 0,3 ppm did not affect any of the evaluated reproductive parameters. The only toxicity signs were transitory irritations of the upper respiratory tract. Under this study conditions, there were no evidence of reproduction effects.

TDI toxicity on the development was investigated by exposing mated female rats to TDI vapors of 0,02, 0,1 y 0,5 ppm (Tyl et al., 1988) regarding the OECD Guideline 414 under GLP. No embrotoxicity or teratogenicity were observed in any exposure concentration used. TDI exposure by inhalation during the organogenesis in rats resulted firstly in respiratory tract irritation to the most elevated doses level (0,5 ppm), and secondarily, maternal toxicity and mild fetotoxicity were observed.

Toxicity for reproduction: without effect on fertility in a study of 2 generations (OECD Guideline 416, GLP); no effects on the development in the toxicity study (OECD Guideline 414, GLP)

Category: not classifiable.

Specific toxicity for target organs (simple exposure).

Acute and chronic inhalation studies in rodents revealed respiratory irritation signs such as wheezing and gasping (acute exposure) and rhinitis (chronic exposure). (Doe and Horsepool, 1980, y Owen, 1980). There is no available information for

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human beings. Henschler et al. (1962), Sitting (1981) y Woolrich (1982) described irritation symptoms of the respiratory tract (sneeze, dyspnea, cough and lungs inflammation) in persons exposed to a TDI concentration of 0,1 – 3,9 ppm. Additionally, and also based on human evidences, it is included “eyes, skin and respiratory system irritation, severe dry cough, sputum, dyspnea, nauseas, vomits, bronchitis associated to severe bronco-spasms, pulmonary edema, pneumonia; long term effects on the central nervous system include headaches, amnesia, loss of concentration, distraction, personality changes and depression "(CERI Hazard Data, 97-20, 1998).

Category: 3 (it may irritate respiratory tracts).

Specific toxicity for target organs (repeated exposure).

Repeated and prolonged exposures to TDI may cause damages to the liver and the respiratory system. (Report by the Ministry of Health, Labour and Welfare, 2001, Japan).

Aspiration danger. No available data.

SECTION 12 – ECOTOXICOLOGIC INFORMATION

Ecotoxicity.

Aquatic organisms.

Fishes: Brachydanio rerio CL50 (24 h) (acute) > 500 mg/l (practically not toxic).

Aquatic invertebrates: herb shrimp CL50 (96 h) (acute) approximately 508 mg/l (practically not toxic); freshwater snail CL50 (24 h) (acute) > 500 mg/l (practically not toxic); Daphnia magna CE (24 h) (chronic) > 500 mg/l (practically not toxic).

Terrestrial organisms.

No terrestrial mammals: Redwinges blackbirds DL50 100 mg/Kg = 100 (Directive 205 OCDE); European starling DL50 > 100 mg/kg = > 100.

Soil macro and microorganisms: adult red worms (Eisenia foetida) CL50 (14 days) > 1000 mg/kg.

Persistence and degradability.
In aquatic and terrestrial environments, TDI 80 is quickly hydrolyzed forming predominantly stable insoluble polyureas. In atmosphere, TDI 80 is estimated to have a slightly short tropospheric life.

Potential of bioaccumulation.

BCF (Bioconcentration Factor) carp (42 days) < 50.

Mobility in soil.

Diffusion in the terrestrial medium should be limited due to the reaction with water with the formation of insoluble polyureas. Coefficient of the participation organic carbon in soil / water (Koc): 9,114 (estimated).

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SECTION 13 – CONSIDERATION ABOUT FINAL DISPOSAL

TDI is considered a hazardous waste according to Annex II (code H 6.1) of the Law N° 24.051 about Hazardous Waste of Argentine Republic, and for the article 261.33 (f) of the RCRA regulation of EPA (Environmental Protection Agency) of the United States of America, among others. Consequently, the disposal of wastes that contain TDI 80, as well as containers, packaging and all the materials used to absorb its leakages, require a special handling, having to be stored, transported and disposed respecting the national, provincial or state, and/or local regulations currently applied. The applied regulation may vary according to the location. As manufacturer and distributor, PRIII does not have the control over the product management that the parts, which consume, commercialize and handle it, give to it. The information contained in this document does only refer to the product under the conditions described in Section 3- Components/Information on Ingredients. The TDI waste generator is the only responsible of the characterization of them, and the following of the corresponding regulations.

The incineration or other thermic destructive means of wastes that contain TDI must be only carried out in habilitated facilities. Do not throw TDI 80 or its wastes to drains, soil or water currents.

Barrels should be emptied and neutralized with a decontaminated. They cannot be refilled or reused. We recommend pressing or drilling them in order to prevent the usage of used containers. Under no circumstances, barrels that has contained TDI 80 will be burnt or opened with electric or gas blowtorches since toxic decomposition products may be released.

SECTION 14 – TRANSPORT INFORMATION

Land transport.

US DoT 49 CFR – US Department of Transportation 49 Code of Federal Regulations.
UN Number: UN 2078.
Transport official designation (UN): toluene diisocyanate.
Hazard class (UN): 6.1.
Packing group: II.
Transport pictogram:
Intervention card (Argentina): 156.

Ship transport.

IMDG – International Maritime Dangerous Goods Code.
UN Number: UN 2078.
Transport official designation (UN): toluene diisocyanate.
Hazard class (UN): 6.1
Packing group: II.
EMS Number: F-A, S-A.
Transport pictogram:
Marine pollutant: no.

Air transport.

IATA-DGR International Air Transport Association – Dangerous Goods Regulations. ICAO-TI International Civil Aviation Organization – Technical Instructions.
UN Number: UN 2078.
Transport official designation (UN): toluene diisocyanate.
Hazard class (UN): 6.1
Packing group: II.
Maximum liquid quantity in each container (cargo aircraft): 60 l.
Transport pictogram:

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SECTION 15 – REGULATORY INFORMATION

According to the current regulations in the south region of Latin America, TDI 80 is classified as hazardous substance according to the laws and regulations of the following countries:
MERCOSUR (Argentina, Brazil, Paraguay and Uruguay): Acuerdo de Facilitación para el Transporte de Mercancías Peligrosas (Facilitation Agreement for Hazardous Goods Transportation).
Brazil: Law 1.797 (1996).
Argentina: Laws 19.587 Decreto Reglamentario 351/79, 24.449 (1995) Decreto Reglamentario 779/95 y 24.051 Decreto Reglamentario 831/93.
Chile: Laws 298 (1994) y 198 (2000).

SECTION 16 – ADDITIONAL INFORMATION

NFPA Risks Classification.

Health: 3
Flammability: 1
Reactivity: 1
Special: ~~W~~ – Do not use water

This Safety Data Sheet (the “Document”, onwards) aims at communicating the information about the product security, effects on health and on the environment.

All the information, data, exams and/or recommendations that this Document contains (the "information" onwards) are included as a guide, and represent the best information now available in Petroquímica Río Tercero S.A. (PRIII onwards). However, PRIII does not guarantee nor affirm, explicitly or implicitly, the information accuracy, neither that this is the complete and full information about the product, and it is not obliged to update or complement the information.

The information included in this Document is not necessarily applicable when the Product is used as component or element of other product.

The reception of this Document by the receptor and/or third party implies its notification and/or understanding of the Information included in this Document, and obliges him/her to:

(i) comply with all the governmental requirements and regulations applicable to the Product or other related products, no matter which jurisdiction they belong to;

(ii) make their own determination about the convenience of use of the Product in relation to their applications prior to its use for a proposed aim, and no matter what the nature of it is; and

(iii) require prior opinion issued by a competent professional technician in order that he/she decides, recommends and expresses about the application of the information included in this Document to a particular situation.

Without prejudice to the conditions and methods of handling, storage, use and disposal of the Product by the receptor and/or third party, are not facts imputable to PRIII, PRIII reserves the right to inspect and audit the facilities of the receptor to identify and audit the level of compliance with the norms of security, occupational health and environment in relation to the Product storage and operational conditions by the receptor/third party.

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This Document is extended in Spanish and can be translated into English for a best understanding of the receptor and/or third party. Nevertheless, in case this Document is extended in English, such translation and text cannot affect in any way the interpretation of the Information included here. For any doubt about the significance and/or interpretation of the content of this Document, the version extended in Spanish must be of prevalence.

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