



Safety Data Sheet

The Dow Chemical Company

Product Name: TRICHLOROETHYLENE INDUSTRIAL

Revision Date: 2007/08/20

Print Date: 21 Aug 2007

The Dow Chemical Company encourages and expects you to read and understand the entire (M)SDS, as there is important information throughout the document. We expect you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

1. Identification of the substance/preparation and of the company/undertaking

Product Name

TRICHLOROETHYLENE INDUSTRIAL

Use of the substance/preparation

Industrial solvent.

COMPANY IDENTIFICATION

The Dow Chemical Company
2030 Willard H. Dow Center
48674 Midland, MI
USA

Customer Information Number: 800-258-2436

For questions about this SDS, contact: SDSQuestion@dow.com

EMERGENCY TELEPHONE NUMBER

24-Hour Emergency Contact:

989-636-4400

Local Emergency Contact:

00 44 155 37 61 251

2. Hazards Identification

May cause cancer.

Possible risks of irreversible effects.

Irritating to eyes and skin.

Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Vapours may cause drowsiness and dizziness.

3. Composition/information on ingredients

| Component | Amount | Classification: | CAS # | EC # |
|---------------------------------------|----------|--|---------|-----------|
| Trichloroethylene; trichloroethene | > 99.0 % | Carc.Cat.2: R45; Mut.Cat.3: R68; R67; Xi: R36/38; R52, R53 | 79-01-6 | 201-167-4 |

* Indicates a Trademark

| | | | | |
|-------------------------------------|---------|---|----------|-----------|
| 1,2-Epoxybutane (butylene oxide) | < 1.0 % | F: R11; Carc.Cat.3: R40; Xn: R20/21/22; Xi: R36/37/38; R52, R53 | 106-88-7 | 203-438-2 |
|-------------------------------------|---------|---|----------|-----------|

See Section 16 for full text of R-phrases.

4. First-aid measures

Eye Contact: Flush eyes thoroughly with water for several minutes. Remove contact lenses after the initial 1-2 minutes and continue flushing for several additional minutes. If effects occur, consult a physician, preferably an ophthalmologist.

Skin Contact: Wash skin with plenty of water.

Inhalation: Move person to fresh air. If not breathing, give artificial respiration; if by mouth to mouth use rescuer protection (pocket mask, etc). If breathing is difficult, oxygen should be administered by qualified personnel. Call a physician or transport to a medical facility.

Ingestion: Do not induce vomiting. Call a physician and/or transport to emergency facility immediately.

Notes to Physician: Because rapid absorption may occur through the lungs if aspirated and cause systemic effects, the decision of whether to induce vomiting or not should be made by a physician. If lavage is performed, suggest endotracheal and/or esophageal control. Danger from lung aspiration must be weighed against toxicity when considering emptying the stomach. Exposure may increase "myocardial irritability". Do not administer sympathomimetic drugs such as epinephrine unless absolutely necessary. Alcohol consumed before or after exposure may increase adverse effects. No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient.

Medical Conditions Aggravated by Exposure: Skin contact may aggravate preexisting dermatitis.

5. Fire Fighting Measures

Extinguishing Media: Water fog or fine spray. Dry chemical fire extinguishers. Carbon dioxide fire extinguishers. Foam. Water fog, applied gently may be used as a blanket for fire extinguishment.

Fire Fighting Procedures: Keep people away. Isolate fire and deny unnecessary entry. Stay upwind. Keep out of low areas where gases (fumes) can accumulate. Burning liquids may be moved by flushing with water to protect personnel and minimize property damage. Water fog, applied gently may be used as a blanket for fire extinguishment. Contain fire water run-off if possible. Fire water run-off, if not contained, may cause environmental damage. Review the "Accidental Release Measures" and the "Ecological Information" sections of this (M)SDS.

Special Protective Equipment for Firefighters: Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots, and gloves). If protective equipment is not available or not used, fight fire from a protected location or safe distance.

Unusual Fire and Explosion Hazards: Container may vent and/or rupture due to fire. Although this material does not have a flash point, it can burn at room temperature. Vapors are heavier than air and may travel a long distance and accumulate in low lying areas.

Hazardous Combustion Products: During a fire, smoke may contain the original material in addition to combustion products of varying composition which may be toxic and/or irritating. Combustion products may include and are not limited to: Hydrogen chloride. Carbon monoxide. Carbon dioxide. Combustion products may include trace amounts of: Phosgene. Chlorine.

6. Accidental Release Measures

Steps to be Taken if Material is Released or Spilled: Small spills: Contain spilled material if possible. Absorb with materials such as: Vermiculite. Bentonite. Sawdust. Collect in suitable and properly labeled containers. Large spills: Dike area to contain spill. Pump into suitable and properly labeled containers. Suitable containers include: Metal drums. See Section 13, Disposal Considerations, for additional information.

Personal Precautions: Evacuate area. Keep personnel out of low areas. Keep personnel out of confined or poorly ventilated areas. Keep upwind of spill. Ventilate area of leak or spill. Only trained and properly protected personnel must be involved in clean-up operations. Confined space entry procedures must be followed before entering the area. Use appropriate safety equipment. For additional information, refer to Section 8, Exposure Controls and Personal Protection. Refer to Section 7, Handling, for additional precautionary measures.

Environmental Precautions: Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section 12, Ecological Information.

7. Handling and Storage

Handling

General Handling: Handling in closed systems is recommended. Avoid breathing vapor. Do not swallow. Avoid contact with eyes, skin, and clothing. Wash thoroughly after handling. Keep container closed. Use with adequate ventilation. Containers, even those that have been emptied, can contain vapors. Do not cut, drill, grind, weld, or perform similar operations on or near empty containers. Do not enter confined spaces unless adequately ventilated. To avoid uncontrolled emissions, vent vapor from container to storage tank. Vapors of this product are heavier than air and lethal concentrations of vapors can collect in low, confined and unventilated spaces such as tanks, pits, small rooms and even in equipment (degreasers) that is used for degreasing metal parts. Do not enter these confined spaces where vapors of this product are suspected unless special breathing apparatus is used and an observer is present for assistance. When using do not eat, drink or smoke. See Section 8, EXPOSURE CONTROLS AND PERSONAL PROTECTION.

Storage

Store in a cool, dry place. Store away from direct sunlight. Do not store in: Zinc. Aluminum. Aluminum alloys. Plastic. Product should not be packaged in aluminum aerosol cans or with finely divided aluminum or its alloys in an aerosol can. Additional storage and handling information on this product may be obtained by calling your Dow sales or customer service contact. Ask for a product brochure.

8. Exposure Controls / Personal Protection

Exposure Limits

| Component | List | Type | Value |
|---|--------------|---------|---------------------------------------|
| Trichloroethylene; trichloroethene | Ireland OELV | TWA | 270 mg/m ³ 50 ppm SKIN |
| | Ireland OELV | STEL | 537 mg/m ³ 100 ppm SKIN |
| | UK WEL | TWA | 550 mg/m ³ 100 ppm SKIN |
| | UK WEL | STEL | 820 mg/m ³ 150 ppm SKIN |
| | ACGIH | TWA | 10 ppm |
| | ACGIH | STEL | 25 ppm |
| | Dow IHG | TWA | 5 ppm |
| Trichloroethylene; trichloroethene | Ireland OELV | HAZ_DES | C2 Regard as if carcinogenic for man. |
| 1,2-Epoxybutane (butylene oxide) | WEEL | TWA | 5.9 mg/m ³ 2 ppm |

A "skin" notation following the exposure guideline refers to the potential for dermal absorption of the material including mucous membranes and the eyes either by contact with vapors or by direct skin contact.

It is intended to alert the reader that inhalation may not be the only route of exposure and that measures to minimize dermal exposures should be considered.

Personal Protection

Eye/Face Protection: Use safety glasses. Safety glasses should be consistent with EN 166 or equivalent. If exposure causes eye discomfort, use a full-face respirator.

Skin Protection: Use protective clothing chemically resistant to this material. Selection of specific items such as face shield, boots, apron, or full body suit will depend on the task. Remove contaminated clothing immediately, wash skin area with soap and water, and launder clothing before reuse or dispose of properly.

Hand protection: Use chemical resistant gloves classified under Standard EN374: Protective gloves against chemicals and micro-organisms. Examples of preferred glove barrier materials include: Viton. Polyvinyl alcohol ("PVA"). Ethyl vinyl alcohol laminate ("EVAL"). Examples of acceptable glove barrier materials include: Butyl rubber. Neoprene. Nitrile/butadiene rubber ("nitrile" or "NBR"). Avoid gloves made of: Polyvinyl chloride ("PVC" or "vinyl"). When prolonged or frequently repeated contact may occur, a glove with a protection class of 4 or higher (breakthrough time greater than 120 minutes according to EN 374) is recommended. When only brief contact is expected, a glove with a protection class of 1 or higher (breakthrough time greater than 10 minutes according to EN 374) is recommended. **NOTICE:** The selection of a specific glove for a particular application and duration of use in a workplace should also take into account all relevant workplace factors such as, but not limited to: Other chemicals which may be handled, physical requirements (cut/puncture protection, dexterity, thermal protection), potential body reactions to glove materials, as well as the instructions/specifications provided by the glove supplier.

Respiratory Protection: Atmospheric levels should be maintained below the exposure guideline. When respiratory protection is required, use an approved air-purifying or positive-pressure supplied-air respirator depending on the potential airborne concentration. For emergency and other conditions where the exposure guideline may be exceeded, use an approved positive-pressure self-contained breathing apparatus or positive-pressure air line with auxiliary self-contained air supply. In confined or poorly ventilated areas, use an approved self-contained breathing apparatus or positive pressure air line with auxiliary self-contained air supply. Use the following CE approved air-purifying respirator: Organic vapor cartridge, type A (boiling point >65 °C)

Ingestion: Avoid ingestion of even very small amounts; do not consume or store food or tobacco in the work area; wash hands and face before smoking or eating.

Engineering Controls

Ventilation: Provide general and/or local exhaust ventilation to control airborne levels below the exposure guidelines. Lethal concentrations may exist in areas with poor ventilation.

9. Physical and Chemical Properties

| | |
|--|---|
| Physical State | Liquid |
| Color | Colorless |
| Odor | Characteristic |
| Flash Point - Closed Cup | Tag Closed Cup ASTM D56 (none) |
| Flammable Limits In Air | Lower: 8.0 %(V) <i>Literature</i> Upper: 44.8 %(V) <i>Literature</i> |
| Autoignition Temperature | 420 °C <i>Literature</i> |
| Vapor Pressure | 7.233 kPa @ 20 °C <i>Literature</i> |
| Boiling Point (760 mmHg) | 87 °C <i>Literature</i> . |
| Vapor Density (air = 1) | 4.5 <i>Literature</i> |
| Specific Gravity (H2O = 1) | 1.46 <i>Literature</i> |
| Freezing Point | -87 °C <i>Literature</i> |
| Melting Point | Not applicable |
| Solubility in Water (by weight) | 0.1 % @ 25 °C <i>Literature</i> |
| pH | Not applicable |
| Molecular Weight | 131.4 g/mol <i>Literature</i> |
| Dynamic Viscosity | 0.58 mPa.s @ 20 °C <i>Literature</i> |

10. Stability and Reactivity

Stability/Instability

Stable under recommended storage conditions. See Storage, Section 7.

Conditions to Avoid: Exposure to elevated temperatures can cause product to decompose. Avoid open flames, welding arcs, or other high temperature sources which induce thermal decomposition. Avoid direct sunlight or ultraviolet sources.

Incompatible Materials: Avoid contact with: Strong bases. Strong oxidizers. Reaction with strong alkali metal hydroxides will form dichloroacetylene which can spontaneously ignite in air. Avoid contact with metals such as: Zinc powders. Aluminum powders. Magnesium powders. Potassium. Sodium. Avoid prolonged contact with or storage in aluminum or its alloys. Avoid unintended contact with: Amines.

Hazardous Polymerization

Will not occur.

Thermal Decomposition

Decomposition products depend upon temperature, air supply and the presence of other materials. Decomposition products can include and are not limited to: Hydrogen chloride. Decomposition products can include trace amounts of: Chlorine. Phosgene.

11. Toxicological Information

Acute Toxicity

Ingestion

Low toxicity if swallowed. Small amounts swallowed incidentally as a result of normal handling operations are not likely to cause injury; however, swallowing larger amounts may cause serious injury, even death. Aspiration into the lungs may occur during ingestion or vomiting, resulting in rapid absorption and injury to other body systems.

LD50, Rat 4,920 mg/kg

Eye Contact

May cause pain disproportionate to the level of irritation to eye tissues. May cause slight eye irritation. Corneal injury is unlikely. Vapor may cause eye irritation experienced as mild discomfort and redness.

Skin Contact

Prolonged or repeated contact may cause skin irritation. May cause drying and flaking of the skin. May cause more severe response on covered skin (under clothing, gloves).

Skin Absorption

Prolonged skin contact is unlikely to result in absorption of harmful amounts. Trichloroethylene may be absorbed through the skin and may cause numbness in fingers immersed in the liquid.

Approximate. LD50, Rabbit 10,000 mg/kg

Inhalation

In confined or poorly ventilated areas, vapor can readily accumulate and can cause unconsciousness and death. Excessive exposure may cause irritation to upper respiratory tract (nose and throat). Excessive exposure may increase sensitivity to epinephrine and increase myocardial irritability (irregular heartbeats). May cause alcohol intolerance often manifested by temporary reddening of the skin called 'degreaser's flush'. Minimal anesthetic or irritant effects may be seen around 200-400 ppm trichloroethylene. Levels in the range of 1000-2000 ppm may rapidly cause dizziness and drunkenness. Progressively higher levels or longer exposure may cause unconsciousness and death and may be immediately hazardous to life.

LC50, 4 h, Rat 12,500 ppm

Repeated Dose Toxicity

For the major component(s): In animals, effects have been reported on the following organs: Kidney. Liver. Central nervous system. Peripheral nervous system. Alcohol consumed before or after exposure may increase adverse effects. Trichloroethylene is reported to have caused hearing loss in laboratory animals upon repeated exposure to 2500 ppm or higher (orders of magnitude greater than the current occupational exposure standards). However, the relevance of this to humans is unknown.

Chronic Toxicity and Carcinogenicity

Tumors were observed in mice given large doses of trichloroethylene. Data suggest a nongenotoxic mechanism for tumor formation that implies that nontoxic doses of trichloroethylene should pose little or no carcinogenic hazard. A very low incidence of tumors has been observed in male rats at high levels of trichloroethylene which caused reduced survival, rendering these studies inadequate. Limited epidemiology data have shown a weak association between trichloroethylene exposure and renal cancer. Butylene oxide has been shown to produce benign and malignant tumors in rats but not mice. These tumors occurred only following high exposure levels which first produced chronic upper respiratory tract irritation. Butylene oxide is not believed to pose a carcinogenic risk to man when handled as recommended.

Developmental Toxicity

For the major component(s): Did not cause birth defects in laboratory animals. Has been toxic to the fetus in lab animals at doses toxic to the mother.

Reproductive Toxicity

For the major component(s): In animal studies, did not interfere with reproduction.

Genetic Toxicology

Trichloroethylene is classified as a mutagen category 3 in the EU. For the major component(s): Trichloroethylene. In vitro genetic toxicity studies were negative. For the minor component(s): 1,2-Butylene oxide. In vitro genetic toxicity studies were positive. For the major component(s): Trichloroethylene. Animal genetic toxicity studies were predominantly negative. Pure trichloroethylene (without additives) lacks genetic toxicity potential in most tests. For the minor component(s): 1,2-Butylene oxide. Animal genetic toxicity studies were negative.

12. Ecological Information

CHEMICAL FATE

Data for Component: **Trichloroethylene; trichloroethene**

Movement & Partitioning

Bioconcentration potential is low (BCF less than 100 or log Pow less than 3). Potential for mobility in soil is high (Koc between 50 and 150).

Henry's Law Constant (H): 1.03E-2 atm*m3/mole Measured

Partition coefficient, n-octanol/water (log Pow): 2.42 Measured

Partition coefficient, soil organic carbon/water (Koc): 41 - 150 Estimated

Bioconcentration Factor (BCF): 17 - 90; fish; Measured

Persistence and Degradability

Based on stringent OECD test guidelines, this material cannot be considered as readily biodegradable; however, these results do not necessarily mean that the material is not biodegradable under environmental conditions. Biodegradation rate may increase in soil and/or water with acclimation. Biodegradation may occur under both aerobic and anaerobic conditions (in the presence or absence of oxygen).

Indirect Photodegradation with OH Radicals

| Rate Constant | Atmospheric Half-life | Method |
|----------------|-----------------------|-----------|
| 8.05e-13 cm3/s | 13 d | Estimated |

OECD Biodegradation Tests:

| Biodegradation | Exposure Time | Method |
|----------------|---------------|----------------|
| 2.4 % | 14 d | OECD 301C Test |

Theoretical Oxygen Demand: 0.55 mg/mg

Data for Component: **1,2-Epoxybutane (butylene oxide)**

Movement & Partitioning

Bioconcentration potential is low (BCF less than 100 or log Pow less than 3). Potential for mobility in soil is very high (Koc between 0 and 50).

Henry's Law Constant (H): 2.02E-4 atm*m3/mole; 25 °C Estimated

Partition coefficient, n-octanol/water (log Pow): 0.68 Measured

Partition coefficient, soil organic carbon/water (Koc): 3 Estimated

Persistence and Degradability

Based on stringent OECD test guidelines, this material cannot be considered as readily biodegradable; however, these results do not necessarily mean that the material is not biodegradable under environmental conditions. Material is ultimately biodegradable (reaches > 70% mineralization in OECD test(s) for inherent biodegradability).

Stability in Water (1/2-life):

11 d

OECD Biodegradation Tests:

| Biodegradation | Exposure Time | Method |
|----------------|---------------|----------------|
| 90 % | 28 d | OECD 301A Test |
| 100 % | 6 d | OECD 302B Test |

Theoretical Oxygen Demand: 2.44 mg/mg

ECOTOXICITY**Data for Component: Trichloroethylene; trichloroethene**

Material is toxic to aquatic organisms (LC50/EC50/IC50 between 1 and 10 mg/L in most sensitive species).

Fish Acute & Prolonged Toxicity

LC50, fathead minnow (*Pimephales promelas*), 96 h: 41 - 67 mg/l

Aquatic Invertebrate Acute Toxicity

LC50, water flea *Daphnia magna*, 48 h: 2.2 - 100 mg/l

LC50, grass shrimp (*Palaemonetes pugio*), 96 h: 2 mg/l

Aquatic Plant Toxicity

EC50, algae, 24 h: 410 mg/l

Toxicity to Micro-organisms

EC50; activated sludge, respiration inhibition: 260 mg/l

Data for Component: 1,2-Epoxybutane (butylene oxide)

Material is harmful to aquatic organisms (LC50/EC50/IC50 between 10 and 100 mg/L in most sensitive species).

Fish Acute & Prolonged Toxicity

LC50, fathead minnow (*Pimephales promelas*), 72 h: > 100 mg/l

LC50, golden orfe (*Leuciscus idus*), static, 96 h: 100 - 200 mg/l

Aquatic Invertebrate Acute Toxicity

EC50, water flea *Daphnia magna*, immobilization: 70 mg/l

Aquatic Plant Toxicity

EC50, alga *Scenedesmus* sp., biomass growth inhibition: > 500 mg/l

13. Disposal Considerations

DISPOSAL OF CONTACT WATER: Process water in contact with solvent and/or water separators of cleaning or distillation equipment should be treated as hazardous waste. Do not discharge water from water separators to drain. This product, when being disposed of in its unused and uncontaminated state should be treated as a hazardous waste according to EC Directive 91/689/EEC. Any disposal practices must be in compliance with all national and provincial laws and any municipal or local by-laws governing hazardous waste. For used, contaminated and residual materials additional evaluations may be required. Do not dump into any sewers, on the ground, or into any body of water.

14. Transport Information

ROAD & RAIL

Proper Shipping Name: TRICHLOROETHYLENE

Hazard Class: 6.1 **ID Number:** UN1710 **Packing Group:** PG III

Classification: T1

Kemler Code: 60
Tremcard Number: 61S1710
OCEAN
Proper Shipping Name: TRICHLOROETHYLENE
Hazard Class: 6.1 **ID Number:** UN1710 **Packing Group:** PG III
EMS Number: F-A,S-A
Marine pollutant.: No

AIR
Proper Shipping Name: TRICHLOROETHYLENE
Hazard Class: 6.1 **ID Number:** UN1710 **Packing Group:** PG III
Cargo Packing Instruction: 612
Passenger Packing Instruction: 605

INLAND WATERWAYS
Proper Shipping Name: TRICHLOROETHYLENE
Hazard Class: 6.1 **ID Number:** UN1710 **Packing Group:** PG III
Classification: T1
Kemler Code: 60
Tremcard Number: 61S1710

15. Regulatory Information

European Inventory of Existing Commercial Chemical Substances (EINECS)

All components in this product are in compliance with EINECS.

EC Classification and User Label Information

Hazard Symbol :

T - Toxic.

Risk Phrases :

R45 - May cause cancer.

R68 - Possible risks of irreversible effects.

R36/38 - Irritating to eyes and skin.

R52/53 - Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

R67 - Vapours may cause drowsiness and dizziness.

Safety Phrases :

S53 - Avoid exposure - obtain special instructions before use.

S45 - In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

S61 - Avoid release to the environment. Refer to special instructions/Safety data sheets.

Chemical Name Trichloroethylene; trichloroethene
(EC Label) (EC # 201-167-4)

Restricted to professional users.

16. Other Information

Risk-phrases in the Composition section

R11 Highly flammable.

R20/21/22 Harmful by inhalation, in contact with skin and if swallowed.

| | |
|-----------|---|
| R36/37/38 | Irritating to eyes, respiratory system and skin. |
| R36/38 | Irritating to eyes and skin. |
| R40 | Limited evidence of a carcinogenic effect. |
| R45 | May cause cancer. |
| R52/53 | Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment. |
| R67 | Vapours may cause drowsiness and dizziness. |
| R68 | Possible risks of irreversible effects. |

Revision

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Most recent revision(s) are noted by the bold, double bars in left-hand margin throughout this document.

The Dow Chemical Company urges each customer or recipient of this (M)SDS to study it carefully and consult appropriate expertise, as necessary or appropriate, to become aware of and understand the data contained in this (M)SDS and any hazards associated with the product. The information herein is provided in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ between various locations. It is the buyer's/user's responsibility to ensure that his activities comply with all federal, state, provincial or local laws. The information presented here pertains only to the product as shipped. Since conditions for use of the product are not under the control of the manufacturer, it is the buyer's/user's duty to determine the conditions necessary for the safe use of this product. Due to the proliferation of sources for information such as manufacturer-specific (M)SDSs, we are not and cannot be responsible for (M)SDSs obtained from any source other than ourselves. If you have obtained an (M)SDS from another source or if you are not sure that the (M)SDS you have is current, please contact us for the most current version.