Product Safety Assessment

*Trichloroethylene*

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**Names**
- CAS No. 79-01-6
- Trichloroethylene
- 1,1,2-trichloroethylene
- Ethylene Trichloride
- Trichloroethene
- Ethynyl trichloride
- Acetylene trichloride
- TCE
- Tri
- Trichlor
- Tric
- HI-TRI* Solvent
- HI-TRI SMG Solvent
- NEU-TRI* Solvent
- NEU-TRI E Solvent
- NEU-TRI L Solvent

**Product Overview**
- Trichloroethylene is a nonflammable, colorless liquid with a sweet odor.¹ See Product Description.
- Trichloroethylene is used mainly as a solvent to remove grease from metal parts. It is also used as a general solvent and as an intermediate to make other chemicals.¹ See Product Uses.
- Persons working with trichloroethylene should be provided with and instructed in the use of appropriate personal protective clothing and equipment, as required. Adequate ventilation should be provided in the workplace to minimize the possibility of inhalation, which may be hazardous. See Exposure Potential.
- Trichloroethylene is moderately toxic if swallowed. Due to trichloroethylene’s volatility, inhalation is the principal route of exposure. The initial effects of excessive inhalation exposure are dizziness, loss of coordination, sleepiness and symptoms of anesthesia. Excessive exposure may cause systemic injury or even death. The National Toxicology Program (NTP) has classified trichloroethylene as “reasonably anticipated to be a human carcinogen” and in 2013 the International Agency for Research on Cancer (IARC) changed the classification from “probably carcinogenic to humans” to “carcinogenic to humans”²,³ See Health Information.
- Because trichloroethylene evaporates easily, if it is released to the environment during production and use, most of it eventually reaches the air. Trichloroethylene that reaches groundwater may be difficult to remediate. Trichloroethylene is moderately toxic to aquatic organisms and does not bioaccumulate. See Environmental Information.

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²,³
- Trichloroethylene may thermally decompose upon exposure to open flames or hot surfaces. Involvement of trichloroethylene in a fire can result in the formation of toxic gases, including hydrogen chloride, chlorine, and phosgene. See Physical Hazard Information.

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**Manufacture of Product**

- **Capacity** – Dow is one of two companies that produce trichloroethylene in the United States. Dow produces trichloroethylene in Freeport, Texas. In 2011, global consumption of trichloroethylene was 429,500 metric tons (947 million pounds) versus global production capacity of 547,000 metric tons (1,206 million pounds).
- **Process** – Dow produces trichloroethylene by a direct chlorination process, in which ethylene dichloride or other C2 chlorinated hydrocarbons are reacted with chlorine to form trichloroethylene and tetrachloroethylene, which are then separated by distillation. The “TRI/PER” process uses the light fractions of the residues from the manufacture of vinyl chloride as its major raw material.

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**Product Description**

Trichloroethylene is a clear, heavy liquid with excellent solvency. Trichloroethylene has no flash point as determined by standard test methods. Its stability in the presence of common chemical stabilizers and low boiling point permit vapor degreasing with low heat input. Easily recycled, the solvent combines outstanding cleaning power with greater economy.

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**Product Uses**

Trichloroethylene is an excellent solvent for greases, oils, fats, waxes, and tars. Therefore most of its global use is as a solvent for metal cleaning (degreasing) and across many other applications such as nonflammable adhesive formulations, as a low-temperature heat-transfer medium, and as a solvent in waterless dying and finishing operations. Trichloroethylene is also used in the production of lithium ion batteries, polychlorinated aliphatics and certain flame-retardant chemicals. In the manufacture of polyvinyl chloride (PVC), trichloroethylene is used as a molecular weight control agent. Trichloroethylene is also used extensively as a chemical intermediate in the synthesis of hydrofluorocarbon (HFC) refrigerants, blowing agents, and some agricultural chemicals.

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**Exposure Potential**

Trichloroethylene is used in the production of industrial products and in industrial processes. The people most likely to be exposed to increased levels of trichloroethylene in the air are those who work in chemical facilities where it is made or used. Inhalation of vapors from trichloroethylene or products containing trichloroethylene should be minimized. Based on the uses for trichloroethylene, the public could be exposed through:
• **Workplace exposure** – Exposure can occur either in a trichloroethylene manufacturing facility or in the various industrial or manufacturing facilities that use trichloroethylene. Trichloroethylene should be produced, distributed, stored, and used in closed systems. Those working with trichloroethylene in manufacturing operations could be exposed during maintenance, sampling, testing, or other procedures. Each manufacturing facility should have a thorough training program for employees and appropriate work processes and safety equipment in place to limit unnecessary trichloroethylene exposure. Persons working with trichloroethylene should be provided with and instructed in the use of appropriate personal protective clothing and equipment, as required. Adequate ventilation should be provided in the workplace to minimize the possibility of an inhalation hazard. Clothing items that cannot be decontaminated—such as shoes, belts, and watchbands—should be removed and disposed of properly after exposure. See Health Information.

• **Consumer exposure to products containing trichloroethylene** – Dow does not sell trichloroethylene for direct consumer use. See Health Information.

• **Environmental releases** – In the event of a spill, focus on containing the spill to prevent contamination of soil, surfaces or ground water. Mop or soak up the material immediately. Absorb with vermiculite or sawdust. Respiratory protection is necessary for cleaning up spills and leaks. Eliminate all sources of ignition immediately. Although trichloroethylene itself does not have a flash point, it can burn at room temperature. Ventilate the area of the leak or spill. Isolate the area until the vapor has dispersed. See Environmental Information, Health Information, and Physical Hazard Information.

• **Large release** – Industrial spills or releases are infrequent and generally contained. If a large spill does occur, the material should be captured, collected, and reprocessed or disposed of according to applicable governmental requirements. Positive pressure, self-contained breathing apparatus (SCBA) with a full-face mask approved by NIOSH is recommended for emergency work. Eliminate all sources of ignition immediately. Use only explosion-proof equipment; ground and bond all containers and handling equipment. In case of fire, deny any unnecessary entry into the area. Use water fog or fine spray. Avoid contact with this material during fire-fighting operations. If contact is likely, change to full chemical-resistant fire-fighting clothing with SCBA. During a fire, smoke may contain the original material in addition to combustion products of varying composition, which may be toxic and/or irritating. Clear non-emergency personnel from the area. Vapors are heavier than air and may travel a long distance and accumulate in low-lying areas. The public should be warned of downwind vapor explosion hazards. Keep vapors out of sewers. Follow emergency procedures carefully. See Environmental Information, Health Information, and Physical Hazard Information.

For more information, see the relevant Safety Data Sheet.

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**Health Information**¹ ² ³

Brief contact may cause moderate skin irritation with local redness. Lengthy or repeated exposure may cause irritation and drying or flaking of the skin. Prolonged or widespread 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.

Very low toxicity if swallowed. However, if swallowed, do not induce vomiting.

Inhalation is the principal route of exposure for trichloroethylene. The initial effects of excessive inhalation exposure are dizziness, loss of coordination, sleepiness, and symptoms of anesthesia. Nausea may accompany these signs and symptoms. Excessive exposure may cause systemic injury (even death) and may increase sensitivity to epinephrine and increase the probability of irregular heartbeats. Do not administer sympathomimetic drugs (like epinephrine) unless absolutely necessary. Trichloroethylene exposure may also cause alcohol intolerance, which often causes temporary reddening of the skin (“degreaser’s flush”). Health effects have been
reported when people are exposed to the level of trichloroethylene at which its odor is noticeable. Effects reported at high levels include liver and kidney damage and changes in heart beat.

Several studies with mice and rats have suggested that high doses of trichloroethylene may cause liver, kidney, or lung cancer. The National Toxicology Program (NTP) has classified trichloroethylene as “reasonably anticipated to be a human carcinogen” and the International Agency for Research on Cancer (IARC) has listed it as “carcinogenic to humans” or Group 1.

Trichloroethylene has not caused birth defects in animal studies. Male reproductive toxicity effects were observed in laboratory animals in the presence of systemic toxicity at high. In vitro genetic toxicity studies were negative, and animal genetic toxicity studies were predominantly negative. Pure trichloroethylene (without additives) lacks genetic toxicity potential in most test.

For more information, see the relevant Safety Data Sheet.

Environmental Information

Because it evaporates easily, most of the trichloroethylene released to the environment (either during production or use) reaches the air, where it is found mainly as a gas. Even material that is in water will readily evaporate into the air. However, trichloroethylene is moderately toxic to aquatic organisms. Trichloroethylene that reaches groundwater may be difficult to remediate.

Trichloroethylene is not considered readily biodegradable, although biodegradation may occur slowly under both aerobic and anaerobic conditions. The potential mobility of trichloroethylene in the soil is high. Very little trichloroethylene breaks down in soil, and it can pass through the soil into underground water. It does not bioaccumulate (build up in the food chain).

For more information, see the relevant Safety Data Sheet.

Physical Hazard Information

Trichloroethylene is thermally stable at typical use temperatures. Thermal decomposition may occur if the material is near open flames or hot sources. Toxic gases can be released during fire or decomposition. The decomposition products depend upon temperature, air supply, and the presence of other materials, but can include hydrogen chloride, chlorine, and phosgene.

Avoid contact of trichloroethylene with alkali metal hydroxides and strong bases. It can react to form dichloroacetylene, which can spontaneously ignite in air. Avoid contact of trichloroethylene with strong oxidizers.

For more information, see the relevant Safety Data Sheet.

Regulatory Information

Regulations may exist that govern the manufacture, sale, transportation, use, and/or disposal of trichloroethylene. These regulations may vary by city, state, country, or geographic region. Information may be found by consulting the relevant Safety Data Sheet or Technical Data Sheet.
Additional Information

- Safety Data Sheet (http://www.dow.com/webapps/msds/msdsssearch.aspx)
- Contact Us (http://www.dow.com/gco/contact/)

For more business information about trichloroethylene, visit Dow’s Chlorinated Organics web site. (www.dow.com/gco)

References

2 HI-TRI™ Solvent Material Safety Data Sheet, The Dow Chemical Company
3 Trichloroethylene ToxFAQs, U.S. Department of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, July 2003
5 “Trichloroethylene,” EuroChlor Risk Assessment for the Marine Environment OSPARCOM Region – North Sea, Eurochlor, June 1997
6 Dow Chlorinated Organics: Product website: (http://www.dow.com/gco/prod)
7 Linak, E., Global Solvent Report: The Green Impact, SRI Consulting, 2005
NOTICES:

As part of its 2015 Sustainability Goals, Dow has committed to make publicly available safety assessments for its products globally. This product safety assessment is intended to give general information about the chemical (or categories of chemicals) addressed. It is not intended to provide an in-depth discussion of health and safety information. Additional information is available through the relevant Safety Data Sheet, which should be consulted before use of the chemical. This product safety assessment does not replace required communication documents such as the Safety Data Sheet.

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