Product Safety Assessment

Ethylene Dichloride

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Names
- CAS No. 107-06-2
- Ethylene dichloride
- EDC
- 1,2-dichloroethane
- DCA

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Product Overview

- Ethylene dichloride is a clear, colorless liquid with a sweet odor.¹ For further details, see Product Description.
- Over 97% of ethylene dichloride is used as a chemical intermediate in the manufacture of vinyl chloride monomer, which is used to make polyvinyl chloride (PVC). The remainder is used to make ethyleneamines and other specialty chlorinated compounds.²³⁴ For further details, see Product Uses.
- Dow does not sell ethylene dichloride for direct consumer use. Industrial operations use ethylene dichloride in closed systems that are designed to minimize the potential for personnel and environmental exposures. The general public is not likely to be exposed to large amounts of ethylene dichloride.⁵⁶ For further details, see Exposure Potential.
- Ethylene dichloride is harmful if inhaled or swallowed. Eye contact may result in irritation. Repeated skin contact may result in absorption of harmful amounts. Excessive inhalation of ethylene dichloride may cause serious injury, even death. Exposure to ethylene dichloride has caused cancer in laboratory animals, but it is not believed to present a cancer risk to humans when handled as recommended.⁷ For further details, see Health Information.
- Ethylene dichloride is not readily biodegradable. However, numerous studies have shown it is biodegradable under both aerobic and anaerobic conditions. Ethylene dichloride does not accumulate in the aquatic food chain and is practically nontoxic to fish and aquatic organisms on an acute basis.⁸⁹ For further details, see Environmental Information.
- Both the liquid and vapor are flammable. Although ethylene dichloride is thermally stable at typical use temperatures, exposure to elevated temperatures can cause the product to decompose.¹⁰ For further details, see Physical Hazard Information.

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Manufacture of Product\textsuperscript{11,12}

- **Capacity** – In 2011, the global consumption of ethylene dichloride was estimated to be nearly 46,238 metric kilotonnes (102 billion pounds). The Dow Chemical Company produces ethylene dichloride at facilities in Freeport, Texas, Oyster Creek, Texas, and Plaquemine, Louisiana, USA, and through its global affiliates at facilities in Stade and Schopau, Germany.

- **Process** – Ethylene dichloride is produced by the chlorination of ethylene through one of two processes: direct chlorination or oxychlorination. In the direct chlorination process, ethylene is reacted with chlorine. In the oxychlorination process, ethylene is reacted with dry hydrogen chloride and oxygen to produce ethylene dichloride. As shown in the diagram below, processes to make ethylene dichloride are often integrated with processes to make vinyl chloride monomer (VCM).

\begin{center}
\includegraphics[width=\textwidth]{edc_vcm_production_processes.png}
\end{center}

Product Description\textsuperscript{13,14}

Ethylene dichloride is a clear, colorless liquid with a pleasant smell and sweet taste. It is a manufactured chemical that is not found naturally in the environment.

Product Uses\textsuperscript{15,16,17}

Over 98% of ethylene dichloride is used as a chemical intermediate in the manufacture of vinyl chloride monomer (VCM), which is used to make polyvinyl chloride (PVC) resins. PVC resins are fabricated into a variety of rigid and flexible products, which are used primarily in construction applications, such as pipe. Flexible PVC is used primarily in packaging, medical, furniture, and automotive applications. The remainder is used to produce ethyleneamines and other specialty chlorinated compounds.

\begin{center}
\includegraphics[width=\textwidth]{uses_for_ethylene_dichloride.png}
\end{center}

Exposure Potential\textsuperscript{18,19}

Ethylene dichloride is used in the production of industrial and consumer products. Based on the uses for this product, the public could be exposed through:

- **Workplace exposure** – Exposure can occur either in facilities that manufacture ethylene dichloride or in the various industrial or manufacturing facilities that use ethylene dichloride. It is produced, distributed, stored, and consumed in closed systems. Those working with ethylene dichloride 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, ventilation, and safety equipment in place to limit exposure. See Health Information.

- **Consumer exposure to products containing ethylene dichloride** – Dow does not sell ethylene dichloride for direct consumer use, but it consumed as a raw material for vinyl chloride monomer, which is used to make polyvinyl chloride. The general population is not likely to be exposed to significant amounts of ethylene dichloride. See Health Information.

- **Environmental releases** – The potential for environmental release of ethylene dichloride is low since it is principally utilized as a chemical intermediate in closed systems. If released to soil or water, the majority of ethylene dichloride will evaporate rapidly into the air. In the air, ethylene dichloride is slowly degraded by photochemically generated hydroxyl radicals. Since ethylene dichloride is heavier than water, it has the tendency to collect at the bottom of a water body. Traces of ethylene dichloride remaining in soil or water may be biodegraded slowly under both aerobic and anaerobic conditions. Ethylene dichloride that remains in soil from a spill or improper disposal can travel through the soil into groundwater. In the event of a spill, the focus is on containing the spill to prevent contamination of soil, surface water, or groundwater. For small spills, ethylene dichloride should be absorbed with materials such as sand or soil, and then collected in properly labeled containers for disposal. Respiratory protection may be necessary for cleaning up spills and leaks. Ventilate the area of the leak or spill and isolate the area until vapors have dispersed. Eliminate all sources of ignition immediately. See Environmental, Health, 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 an approved full-face mask is recommended for emergency work. Eliminate all sources of ignition immediately. Use only explosion-proof equipment; ground and bond all containers and handling equipment. See Environmental, Health, and Physical Hazard Information.

- **In case of fire** – Keep people away. Deny any unnecessary entry into the area and consider the use of unmanned hose holders. Stay upwind. Use water spray or fog, carbon-dioxide or dry-chemical extinguishers, or foam to fight the fire. Use of a direct water stream may spread the fire. Firefighters should wear positive-pressure, self-contained breathing apparatus (SCBA) and protective firefighting clothing. The public should be warned of downwind vapor explosion hazards. Vapors are heavier than air and may travel a long distance and accumulate in low-lying areas. Keep vapors out of sewers. Follow emergency procedures carefully. See Environmental, Health, and Physical Hazard Information.

For more information, request the Safety Data Sheet from the Dow Customer Information Group.

**Health Information**

**Eye contact** – Contact may cause moderate irritation or moderate corneal injury. Vapor may cause tearing.

**Skin contact** – Brief contact may cause skin irritation with local redness. Prolonged contact may cause moderate skin irritation with local redness. May cause drying and flaking of the skin. Prolonged contact is unlikely to result in absorption of harmful amounts, but repeated contact can result in absorption of harmful amounts.

**Inhalation** – Prolonged, excessive exposure may cause serious adverse effects, even death. May cause central nervous system depression. Symptoms may include headache, dizziness and drowsiness, progressing to incoordination and unconsciousness. In humans, effects have been reported on the central nervous system and the lungs.
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**Ingestion** – Ethylene dichloride has moderate toxicity if swallowed. Small amounts swallowed incidental to normal handling operations are not likely to cause injury. Swallowing larger amounts may cause serious injury, even death. Based on physical properties, this material is not likely to be an aspiration hazard.

**Cancer Information** – Ethylene dichloride has caused cancer in laboratory animals. Carcinogenic effects in the animal study on ethylene dichloride are believed to be related to the oral route of exposure and the dose administered, which was greater than a dose the body can easily detoxify. Ethylene dichloride is not believed to present a risk of cancer to humans when handled as recommended.

**Other** – In animal studies, ethylene chloride did not interfere with reproduction or cause birth defects, but was toxic to the fetus at doses that were toxic to the mother.

For more information, request the Safety Data Sheet from the Dow Customer Information Group.

**Environmental Information**

Because ethylene dichloride is sparingly soluble and highly volatile, if introduced to soil or water, the compound will quickly volatilize to the atmosphere where it will be removed by reaction with photochemically generated hydroxyl radicals. Since ethylene dichloride is heavier than water, it has the tendency to collect at the bottom of a water body. Ethylene dichloride is expected to be mobile in soil, and has the potential to reach underground water supplies. Ethylene dichloride that reaches groundwater may be difficult to remediate. Ethylene dichloride is not considered readily biodegradable based on stringent test guidelines recommended by the Organization for Economic Cooperation and Development (OECD). However, numerous studies have shown it is biodegradable under both aerobic and anaerobic (in the presence and absence of oxygen) conditions in soil and groundwater.

Ethylene dichloride is not likely to accumulate in the aquatic food chain (low bioaccumulation potential) and is practically nontoxic to fish and aquatic organisms on an acute basis (LC$_{50}$ or EC$_{50}$ for most sensitive species > 100 mg/L).

The OECD SIDS Initial Assessment Profile for ethylene dichloride states that since the substance is mainly used as a chemical intermediate, and due to the low bioaccumulation potential and low toxicity, the substance is currently of low priority for further work.

For more information, request the Safety Data Sheet from the Dow Customer Information Group.

**Physical Hazard Information**

Ethylene dichloride liquid and vapor are flammable. This material should not be stored or used near open flames or excessive heat. During a fire, smoke may contain the original material in addition to combustion products of varying compositions, which may be toxic and/or irritating. Combustion products may include hydrogen chloride, carbon monoxide, and carbon dioxide.

Ethylene dichloride is stable at typical storage and use temperatures, but exposure to high temperatures can cause thermal decomposition. Decomposition products may be highly corrosive and toxic. Avoid storage in direct sunlight or near ultraviolet sources.

Avoid contact with oxidizing materials. Avoid contact with alkali-metal hydroxides, amines, and ammonia. Avoid contact with metals such as aluminum and aluminum alloys.

For more information, request the Safety Data Sheet from the Dow Customer Information Group.
Regulatory Information

Regulations may exist that govern the manufacture, sale, transportation, use, and/or disposal of ethylene dichloride. These regulations may vary by city, state, country, or geographic region. Information may be found by consulting the relevant Safety Data Sheet or Contact Us. Dow has filed a REACH dossier for this material and the public can access relevant information on the European Safety Data Sheet.

Additional Information

- Safety Data Sheet (request from the Dow Customer Information Group at www.dow.com/assistance/dowcig.htm)
- Dow has filed a REACH dossier for this material and the public can access relevant information on the European Safety Data Sheet
- Contact Us (www.dow.com/assistance/dowcig.htm)

For more business information about ethylene dichloride, contact the Dow Customer Information Group.

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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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