5. PRODUCTION, IMPORT/EXPORT, USE, AND DISPOSAL

5.1 PRODUCTION

1,1,2,2-Tetrachloroethane as an end-product was formerly produced in the United States only by the Specialty Materials Division of Eagle-Picher Industries in Lenexa, Kansas (SRI 1988). By the late 1980s, this facility had been sold to the Vulcan Materials Company, and production was discontinued at the Kansas facilities (Montgomery and Welkom 1990; SRI 1992, 1993). Approximately 440 million pounds (199.5 million kg) of 1,1,2,2-tetrachloroethane were produced in the United States in 1967 (Konietzko 1984). Production declined markedly thereafter, falling to an estimated 34 million pounds (15.4 million kg) by 1974. The production volumes of 1,1,2,2-tetrachloroethane reported by U.S. manufacturers in 1986, 1990, 1994, and 1998 have fluctuated within a range of <1 million to 50 million pounds (IUR 2002). The production volume reported in 2002 was within the range of <1 million to 10 million pounds (IUR 2002).

Commercial production of 1,1,2,2-tetrachloroethane as an end-product has apparently ceased in the United States. This parallels patterns in Canada, where the last plant to manufacture 1,1,2,2-tetrachloroethane as an end-product ceased operations by 1985 (CEPA 1993). Any remaining production in the United States or Canada at the present time would involve 1,1,2,2-tetrachloroethane generated for on-site uses as a chemical intermediate, as a trace constituent with other chemicals, or as part of a waste stream in releases to the environment.

1,1,2,2-Tetrachloroethane can be produced by the catalytic addition of chlorine to acetylene (Rossberg et al. 2005); it may also be produced by the direct chlorination or oxychlorination of ethylene or 1,2-dichloroethane (Archer 1979; Rossberg et al. 2005). In most cases, 1,1,2,2-tetrachloroethane was not isolated to form an end-product, but was immediately thermally cracked to yield desired chemicals such as trichloroethylene, tetrachloroethylene, and 1,2-dichloroethylene (Archer 1979). 1,1,2,2-Tetrachloroethane may be produced as a by-product in the manufacture of chemicals such as 1,1,1- and 1,1,2-trichloroethane (Rossberg et al. 2005). Section 5.3 summarizes information on several chemicals with which 1,1,2,2-tetrachloroethane can appear as a trace constituent.

Table 5-1 lists the facilities in each state that process 1,1,2,2-tetrachloroethane, the intended use, and the range of maximum amounts of 1,1,2,2-tetrachloroethane that are stored on site. Current production is for

Table 5-1. Facilities that Produce, Process, or Use 1,1,2,2-Tetrachloroethane

State[a]	Number of facilities	Minimum amount on site in pounds[b]	Maximum amount on site in pounds[b]	Activities and uses[c]
AR	3	1,000	99,999	10, 12
CA	2	100	999,999	9, 11
CO	7	1,000	99,999	1, 2, 5, 6, 11, 12, 13
CT	1	1,000	9,999	12
FL	2	100	99,999	12
KS	3	100	9,999	1, 5, 9, 12
KY	4	10,000	9,999,999	1, 3, 5, 6
LA	29	100	49,999,999	1, 2, 3, 4, 5, 6, 12, 13
MI	2	0	99,999	5, 7, 12
MN	1	10,000	99,999	11
MO	1	1,000	9,999	12
NC	1	100,000	999,999	7
NE	2	1,000	99,999	12
NJ	2	1,000	99,999	10
NY	1	10,000	99,999	12
OH	2	1,000	999,999	7, 9, 12
PA	1	10,000	99,999	10
SC	3	10,000	99,999	2, 3, 4, 7, 9
TN	6	10,000	99,999	2, 3, 4, 7, 8, 10, 12
TX	25	0	9,999,999	1, 2, 3, 5, 6, 11, 12, 13, 14
VA	1	100	999	12
AR	3	1,000	99,999	10, 12
CA	2	100	999,999	9, 11
CO	7	1,000	99,999	1, 2, 5, 6, 11, 12, 13
CT	1	1,000	9,999	12
FL	2	100	99,999	12
KS	3	100	9,999	1, 5, 9, 12
KY	4	10,000	9,999,999	1, 3, 5, 6
LA	29	100	49,999,999	1, 2, 3, 4, 5, 6, 12, 13
MI	2	0	99,999	5, 7, 12
MN	1	10,000	99,999	11
MO	1	1,000	9,999	12
NC	1	100,000	999,999	7
NE	2	1,000	99,999	12
NJ	2	1,000	99,999	10
NY	1	10,000	99,999	12
OH	2	1,000	999,999	7, 9, 12
PA	1	10,000	99,999	10

Table 5-1. Facilities that Produce, Process, or Use 1,1,2,2-Tetrachloroethane

State[a]	Number of facilities	Minimum amount on site in pounds[b]	Maximum amount on site in pounds[b]	Activities and uses[c]
SC	3	10,000	99,999	2, 3, 4, 7, 9
TN	6	10,000	99,999	2, 3, 4, 7, 8, 10, 12
TX	25	0	9,999,999	1, 2, 3, 5, 6, 11, 12, 13, 14
VA	1	100	999	12

[a]Post office state abbreviations used
[b]Amounts on site reported by facilities in each state
[c]Activities/Uses:

1. Produce
2. Import
3. Onsite use/processing
4. Sale/Distribution
5. Byproduct
6. Impurity
7. Reactant
8. Formulation Component
9. Article Component
10. Repackaging
11. Chemical Processing Aid
12. Manufacturing Aid
13. Ancillary/Other Uses
14. Process Impurity

Source: TRI05 2007 (Data are from 2005)

on-site uses or as a by-product, so that the phrase "manufacture" in the table heading does not imply production for sale as a commercial end-product. The data listed in Table 5-1 are derived from the Toxics Release Inventory (TRI) and refer to facilities operating in 2005 (TRI05 2007). Only certain types of facilities are legally required to report, and therefore, this is not an exhaustive list (TRI05 2007).

5.2 IMPORT/EXPORT

Limited data pertaining to the import or export of 1,1,2,2-tetrachloroethane were located in the available literature. Imports in 1982 totaled 65,500 kg (144,100 pounds) (HSDB 1996). Present tariff-setting and record-keeping practices combine 1,1,2,2-tetrachloroethane with other chemicals (USITC 1994). Total U.S. imports and exports of hexachloroethane and tetrachloroethane combined were 128,865 kg (283,503 pounds) and 11,282,409 kg (24,821,300 pounds) in 2005, respectively (U.S. Department of Commerce 2006).

5.3 USE

In the past, the major use for 1,1,2,2-tetrachloroethane was in the production of trichloroethylene, tetrachloroethylene, and 1,2-dichloroethylene (Archer 1979). It was also used as a solvent, in cleaning and degreasing metals, in paint removers, in varnishes and lacquers, in photographic films, and as an extractant for oils and fats (Lewis 2001). Although at one time, it could be used as an insecticide, fumigant, and weed killer (Lewis 2001), it presently is not registered for any of these purposes. It was once used as an ingredient in an insect repellent, but registration was canceled in the late 1970s. With the availability of less toxic solvents and the development of new processes for manufacturing chlorinated ethylenes, the manufacture of 1,1,2,2-tetrachloroethane as a commercially marketed end-product has steadily declined in the United States and now appears to have ceased (HSDB 2006). A similar trend is reported in Canada (CEPA 1993).

1,1,2,2-Tetrachloroethane can still appear as a chemical intermediate in the production of a variety of other common chemicals. Trace amounts of 1,1,2,2-tetrachloroethane may be introduced into the environment as these other chemicals are produced, or it may appear as a minor impurity in the end-products. Therefore, it is helpful to know how some of these other chemicals are related to 1,1,2,2-tetrachloroethane (e.g., CEPA 1993; Harte et al. 1991). Several of these chemicals, including trichloroethylene (TCE); 1,1,2-trichloroethane; 1,2-dichloroethene (DCE or vinylidene chloride);

tetrachloroethylene (perchloroethylene, PCE, or PERC); vinyl chloride; 1,2-dichloroethane (ethylene dichloride [EDC]); and 1,1,1-trichloromethane (methyl chloroform), are the subjects of separate ATSDR profiles, which are available through the internet (http://www.atsdr.cdc.gov/toxpro2.html).

5.4 DISPOSAL

1,1,2,2-Tetrachloroethane disposal should follow the Resource Conservation and Recovery Act (RCRA) regulations appropriate for halogenated organic compound (HOC) wastes, which are likely to contain >1,000 ppm of HOCs (EPA 2006d, 2006e). Selection of an appropriate technology for waste treatment and disposal depends on the RCRA waste code number. RCRA defines five main categories of wastes. Waste code U209 is specifically assigned to 1,1,2,2-tetrachloroethane, but wastes containing 1,1,2,2-tetrachloroethane could be assigned to one or more of 25 halogenated organic wastes under the RCRA U and P waste series.

For these U and P series wastes, the EPA has proposed three treatment technologies as alternative Best Demonstrated Available Technology (BDAT) treatment standards: (1) wet air oxidation followed by carbon adsorption; (2) chemical oxidation followed by carbon adsorption; or (3) incineration of waste waters. The BDAT for these HOC waste types is incineration. Industrial boilers or furnaces that function like waste disposal incinerators (e.g., cement kilns) may also substitute the combustible wastes for their normal fuel stocks. However, EPA does not believe that fuel substitution is a viable alterative for the majority of class U ("off-spec" materials that may contain impurities or mixtures of other wastes) HOC products. Chapter 8 of this profile provides a comprehensive overview of federal or state laws and regulations related to 1,1,2,2-tetrachloroethane.

The following categories of hazardous wastes include 1,1,2,2-tetrachloroethane as a hazardous constituent:

- process waste from the production of certain chlorinated aliphatic hydrocarbons (containing chains of one to five carbons);
- distillation light ends, spent filters, and spent desiccant generated in the production of certain chlorinated aliphatic hydrocarbons;
- wastes from the production of ethylene dichloride, vinyl chloride, trichloroethylene, perchloroethylene, chlorine, and 1,1,1-trichloroethane; and

- off-specification 1,1,2,2-tetrachloroethane (i.e., 1,1,2,2-tetrachloroethane that does not meet desired chemical purity).

Only one of these categories of wastes (process waste from the production of chlorinated aliphatic hydrocarbons) has an EPA-prescribed treatment standard before land disposal. Such wastes must be treated by incineration to comply with the restrictions. The other waste categories have concentration-based standards that must be achieved before being sent to a RCRA-permitted land disposal facility (EPA 2006e). The waste streams generated from the manufacture of vinyl chloride and ethylene dichloride have been noted in studies in both the United States and Canada to contain high levels of 1,1,2,2-tetrachloroethane (CEPA 1993). These waste streams are currently treated to recover and recycle many types of organic products prior to incineration, but trace amounts of 1,1,2,2-tetrachloroethane will remain, contributing to atmospheric emissions during the incineration disposal process, even assuming rates of destruction in excess of 99% (CEPA 1993).