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

5.1 PRODUCTION

Methoxychlor was first synthesized in 1893 by the reaction of chloral hydrate with anisole in the presence of acetic acid and sulfuric acid. It is produced commercially by the condensation of anisole with chloral in the presence of an acidic condensing agent (IARC 1979; Sittig 1980). Commercial production of methoxychlor in the United States was first reported in 1946. In 1975, three U.S. companies produced approximately 5.5 million pounds of methoxychlor (IARC 1979). U.S. production in 1982 was 3 million pounds (EPA 1988c). No data were found for current production volume levels for methoxychlor.

Methoxychlor is currently registered under the trade names of Prentox®, Methoxcide®, Marlate®, and Metox® (EPA 1988b; HSDB 1993). Currently, Kincaid Enterprises Inc. in Nitro, West Virginia is the sole producer and distributor of methoxychlor in the United States. Production volumes of the technical product in pounds were 631,550 in 1986, 672,000 in 1987, 584,000 in 1988, 476,000 in 1989, 301,235 in 1990, and 423,832 in 1991 (Kincaid Enterprises 1992). On January 14, 2000, EPA issued a suspension order to Kincaid enterprises, Inc. to prevent further manufacture and sale of their methoxychlor products (http://www.epa.gov/oppfead1/cb/csb_page/updates/methox.html). The order affects the technical product and three products manufactured by Kincaid, but does not directly affect other companies that manufacture methoxychlor products. The order was issued because the registrant failed to submit overdue (per an agreement signed in September of 1998) environmental fate studies. At the time of the writing of this profile (September 2002), EPA is in the process of issuing a notice of intent to suspend to all companies that use methoxychlor in their products.

A number of U.S. facilities use methoxychlor as a component in formulated pesticide products. Methoxychlor is produced commercially in the United States as a technical grade containing 88–90% of the pure chemical and 10–12% of impurities consisting of isomers and other reaction products (IARC 1979; Lamoureux and Feil 1980). Twenty-five of these impurities were characterized in studies conducted on technical methoxychlor; evidence for more than 50 impurities was obtained through gas chromatography/mass spectrometry (GC/MS) (Lamoureux and Feil 1980). Purification of technical grade (nominally 90%) 1,1,1-trichloro-2,2-bis(4-methoxyphenyl)ethane (*p,p'*-methoxychlor; *p,p'*-DMDT) by recrystalization gave 76% of *p,p'*-methoxychlor (99.8% pure by normal phase high performance liquid chromatography [HPLC]) and 24% impurities (West et al. 1982). The impurities were found to contain approximately 40 components. The major components were identified (HPLC and gas

chromatography/mass spectrometry [GC/MS]) using reference standards. Component identities and percent (w/w) in technical grade methoxychlor were found to be as follows: 1,1,1,2-tetrachloro-2-(4-methoxyphenyl)ethane (1.73%), 1,1,1-trichloro-2-(2-methoxyphenyl)-2-(4-methoxyphenyl)ethane (*o,p'*-methoxychlor; *o,p'*-DMDT; 4.03%), 1,1-dichloro-2,2-di(4-methoxyphenyl)ethene (DMDE; 0.39%), a condensation product of *p,p'*-methoxychlor (*p,p'*-DMDT; 0.48%), a condensation product of *o,p'*-methoxychlor (*o,p'*-DMDT; 0.4%), and 1,2,2,2-tetrakis(4-methoxybenzyl)ethene (0.5%). These percentages were calculated relative to the quantity of methoxychlor contained in technical grade material and were found to vary depending upon manufacturing conditions. Formulations of methoxychlor for various uses in the United States include wettable powders, dust, granules, emulsifiable concentrates, flowable concentrates, liquid soluble concentrates, ready-to-use products (liquids), and pressurized liquids (EPA 1988a, 1988b).

Table 5-1 lists information on U.S. companies that reported the manufacture and use of methoxychlor in 1999 (TRI99 2001). The TRI data should be used with caution since only certain types of facilities are required to report. This is not an exhaustive list.

5.2 IMPORT/EXPORT

Data on import and export volumes of methoxychlor are limited. In 1978, 17,700 pounds of methoxychlor were imported (HSDB 1993). There is no information on current import volumes (HSDB 2000). Kincaid Enterprises, Inc. reported information on export volumes of technical grade methoxychlor in pounds as 25,750 in 1986, 86,000 in 1987, 22,600 in 1988, 47,150 in 1989, 10,350 in 1990, and 49,750 in 1991 (Kincaid Enterprises 1992). However, there is no information on current export volumes of formulated products containing methoxychlor.

5.3 USE

Because of its low toxicity in animals and humans, methoxychlor has been viewed as an attractive replacement for DDT (EPA 1988b; IARC 1979). Methoxychlor is registered as an insecticide against a wide range of pests, including houseflies and mosquitos, cockroaches, chiggers, and various arthropods commonly found on field crops, vegetables, fruits, stored grain, livestock, and domestic pets (EPA

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

State[a]	Number of facilities	Minimum amount on site in pounds[b]	Maximum amount on site in pounds[b]	Activities and uses[c]
AR	1	10,000	99,999	13
OH	1	1,000	9,999	13
TX	1	10,000	99,999	13

Source: TRI99 2001

[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

1988b; Verschueren 1983). The EPA has approved the use of methoxychlor as a pesticide and fumigant on more than 85 crops, including cranberries (EPA 1988a, 1988b). This substance can be applied to large areas such as beaches, estuaries, lakes, and marshes for control of fly and mosquito larvae by aerial application (EPA 1988b). Other uses include the spray treatment of barns, grain bins, mushroom houses, and other agricultural premises and the spraying or fogging of garbage containers, sewer manholes, and sewage disposal areas (EPA 1988b).

Annual usage of methoxychlor in the United States was estimated to range from 500,000 to 900,000 pounds in 1986 (EPA 1988b). Use patterns for methoxychlor, which is a General Use Pesticide (GUP) that is available over the counter, have remained fairly constant since 1974. At that time, home and garden applications constituted 30% of usage; livestock and poultry, 15%; alfalfa, 10%; soybeans, 10%; forests, 10%; ornamental shrubs, 10%; deciduous fruits and nuts, 5%; and vegetables, 5% (IARC 1979). Likewise, in 1988, EPA reported that predominant use of methoxychlor in the United States was as an insecticide for alfalfa, livestock, home orchards, and ornamentals. These applications accounted for a total of 37.3% of the total U.S. annual usage (EPA 1988b). More recent information indicates that approximately 28% is used for home and garden purposes, 15% for industrial and commercial purposes, and 57% for agricultural purposes (Kincaid Enterprises 1992).

5.4 DISPOSAL

Methoxychlor and waste containing methoxychlor are classified as hazardous wastes by EPA. Generators of waste containing this contaminant must conform to EPA regulations for treatment, storage, and disposal (see Chapter 8). The recommended method for disposal of methoxychlor wastes is incineration with scrubbing (HSDB 1993; Sittig 1980). Empty containers may be returned to manufacturers for reuse or buried in designated landfills away from water supplies. Small quantities of waste methoxychlor may be landfilled (HSDB 1993).

According to the Toxics Release Inventory (TRI99 2001), about 14 pounds of methoxychlor were transferred to landfills and/or treatment/disposal facilities in 1999 (see Table 5-1). No information was located on disposal trends or past disposal methods.