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

5.1 PRODUCTION

DEHP is a member of a group of compounds commonly referred to as the phthalate esters, a group of related compounds whose predominant use is as plasticizers in flexible products made from polyvinyl chloride (Mannsville Chemical Products Corporation 1999). DEHP is produced by the esterification of phthalic anhydride with 2-ethylhexyl alcohol in the presence of an acid catalyst (Mannsville Chemical Products Corporation 1999; NTP 1989). Production volumes for DEHP alone are not available, but estimated production information is available for a group of phthalate esters referred to as the dioctyl phthalates (DOP) by Mannsville Chemical Products Corporation (1999). Dioctyl phthalates include di-ethylhexyl phthalate, diisooctyl phthalate, and di-n-octyl phthalate. According to Mannsville Chemical Products Corporation (1999), 1998 domestic production of DOP was 285 million pounds. Previous years showed domestic production volumes of 309, 258, 280, 280, and 287 million pounds for the years 1990, 1994, 1995, 1996, and 1997, respectively. Based on the demand for 830 million pounds of 2-ethyl-hexanol, and its use in the manufacture of plasticizers (48% of 2-ethylhexanol is used in the manufacture of plasticizers, of which 60% are dioctyl phthalates), it is projected that 241 million pounds of dioctyl phthalates were produced in the United States in 1999 (ChemExpo 1999).

Four companies operating five facilities appear to be the primary U.S. producers of DEHP. These are Aristech Chemical Company in Neville Island, Pennsylvania; Hatco Chemical Company in Fords, New Jersey; Teknor Apex Company in Brownsville, Tennessee and Hebronville, Massachusetts; and Tennessee Eastman Company in Kingsport, Tennessee (Mannsville Chemical Products Corporation 1999). SRI (1998a), however, lists only Tennessee Eastman and Aristech Chemical Company, as above, but also adds Velsicol Chemical Corporation in Chestertown, Maryland, which was not included in the above list. Table 5-1 summarizes the information on U.S. companies that reported the use and production of DEHP 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.

According to Mannsville Chemical Products Corporation (1999), production of DEHP is expected to grow at a rate less than the gross domestic product over the next few years due to limited growth in polyvinyl chloride (PVC) markets which have been the primary consumers of DEHP. In addition,

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

State[a]	Number of facilities	Minimum amount on site in pounds[b]	Maximum amount on site in pounds[b]	Activities and uses[c]
AL	1	0	99	13
AR	4	1,000	999,999	8, 9, 13
CA	16	1,000	999,999	2, 3, 8, 9, 10, 13
CO	1	10,000	99,999	8
CT	3	1,000	99,999	8, 9
FL	3	1,000	999,999	8, 9
GA	6	1,000	999,999	8, 9, 10, 12
IA	3	10,000	99,999	8, 9, 10
IL	17	1,000	999,999	7, 8, 9, 10, 11, 13
IN	7	100	999,999	2, 3, 7, 8, 9, 13
KS	6	100	99,999	2, 3, 8, 9, 10, 13
KY	3	1,000	99,999	8, 13
LA	2	1,000	99,999	7, 8
MA	15	1,000	999,999	1, 6, 8, 9, 10, 11
MD	3	10,000	999,999	1, 4, 8
MI	5	100	9,999,999	2, 3, 8, 9, 12, 13
MN	6	1,000	99,999	7, 8, 9, 13
MO	12	1,000	99,999	7, 8, 9, 10, 13
MS	4	10,000	999,999	8, 9
NC	14	100	9,999,999	8, 9, 10, 11, 12
NE	3	1,000	99,999	1, 5, 7, 8, 9
NH	2	1,000	9,999	9, 13
NJ	11	1,000	9,999,999	2, 3, 8, 9, 10, 11
NV	2	100,000	999,999	8
NY	6	1,000	999,999	8, 9
OH	24	1,000	999,999	2, 3, 7, 8, 9, 10, 11, 13
OK	3	10,000	999,999	2, 3, 8, 9, 12
PA	15	100	9,999,999	1, 4, 8, 9, 13
PR	6	10,000	999,999	8, 9
RI	3	1,000	999,999	8, 9
SC	7	1,000	999,999	8, 9, 12, 13
SD	1	1,000	9,999	9
TN	11	1,000	9,999,999	1, 3, 4, 5, 6, 7, 8, 9, 11
TX	15	1,000	999,999	2, 3, 7, 8, 9, 10, 12, 13
UT	2	1,000	9,999	2, 5, 8, 9, 12
VA	3	1,000	999,999	8, 13
VT	1	10,000	99,999	8

Table 5-1. Facilities that Produce, Process, or Use DEHP *(continued)*

State[a]	Number of facilities	Minimum amount on site in pounds[b]	Maximum amount on site in pounds[b]	Activities and uses[c]
WA	4	1,000	9,999,999	2, 4, 8, 9, 10, 13
WI	6	1,000	99,999	8, 9
WV	1	1,000	9,999	8

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

decreasing demand for DEHP due to continued concern over health effects might further impact production volume (Mannsville Chemical Products Corporation 1999).

5.2 IMPORT/EXPORT

Import quantities of dioctyl phthalates were about 4 million pounds in 1998. No data were located regarding past import volumes of DEHP or the dioctyl phthalates. Exports of dioctyl phthalates have been about 14–27 million pounds per year from 1994 to 1998 (Mannsville Chemical Products Corporation 1999). Import/export statistics specific for DEHP were not located.

5.3 USE

DEHP is principally used as a plasticizer in the production of flexible PVC products. According to Mannsville Chemical Products Corporation (1999), at least 95% of DEHP produced is used as a plasticizer for PVC. PVC is made flexible by addition of plasticizers and is used in many common items such as wall coverings, tablecloths, floor tiles, furniture upholstery, shower curtains, garden hoses, swimming pool liners, rainwear, baby pants, dolls, toys, shoes, automobile upholstery and tops, packaging film and sheet, sheathing for wire and cable, medical tubing, and blood storage bags. Polyvinyl chloride is also used to produce disposable medical examination and surgical gloves, the flexible tubing used to administer parenteral solutions, and the tubing used in hemodialysis treatment (Mannsville Chemical Products Corporation 1999; NTP 1989). DOP is also used as a plasticizer in products such as polyvinyl butyral, natural and synthetic rubber, chlorinated rubber, ethyl cellulose, and nitrocellulose (Mannsville Chemical Products Corporation 1999).

Numerous nonplasticizer uses of DEHP have been reported. However, it is not clear to what extent these uses are, or have ever been, important. These include the use of DEHP as a solvent in erasable ink, as an acaracide in orchards, as an inert ingredient in pesticide products, in cosmetics, in vacuum pump oil, as a component of dielectric fluids in electrical capacitors, to detect leaks in respirators, and for use in testing of air filtration systems (HSDB 1990; Mannsville Chemical Products Corporation 1990; NTP 1989).

Because of concerns regarding health effects from exposure to DEHP, many toy manufacturers have discontinued use of all phthalates in their products (Mannsville Chemical Products Corporation 1999; Wilkinson and Lamb 1999). The use of DEHP in domestically produced teethers and rattles has been discontinued (Consumer Product Safety Commission 1999d). DEHP is also no longer used as a

plasticizer in plastic food wrap products (Mannsville Chemical Products Corporation 1999). In addition, some applications, like automobile upholstery, might switch from DEHP to linear phthalates because of their superior performance and low toxicity, which will put further downward pressure on DEHP use (Mannsville Chemical Products Corporation 1999). Finally, in the future, polyolefin metallocene plastomers might replace flexible applications for PVC altogether because they provide flexibility without the need for plasticizers.

5.4 DISPOSAL

When DEHP (as a commercial chemical product or chemical intermediate) becomes a waste, its disposal is regulated by law (see Chapter 8). DEHP disposal is regulated under the Resource Conservation and Recovery Act (RCRA). Regulations promulgated under this Act control the treatment, storage, and disposal of waste DEHP. Land disposal restrictions are the responsibility of the EPA Office of Solid Waste. In 1998, it was estimated that about 0.96 million pounds of waste DEHP were transported from production facilities or points of usage for disposal, including publically owned treatment works (TRI98 2000). No data were located regarding the quantity of waste DEHP which was disposed of by any specific means. No data were located regarding trends in DEHP disposal.