

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

5.1 PRODUCTION

The production volume of asbestos mines in the United States has decreased substantially from a peak of over 299 million pounds (136,000 metric tons) in the late 1960s and early 1970s (SRI 1982) to 112 million pounds (51,000 metric tons) in 1987, 37 million pounds (17,000 metric tons) in 1989, and 14,000 metric tons in 1993 (U.S. Bureau of Mines 1994; USGS 1998). Production dwindled to 15.4 million pounds (7,000 metric tons) in 1997, 13.2 million pounds (6,000 metric tons) in 1998, and was estimated to remain at 13.2 million pounds (6,000 metric tons) in 1999 (USGS 2000).

While the production and use of asbestos in the United States and Western Europe has declined in recent years as a result of health concerns and bans on many of its uses, there continues to be extensive sales and use of asbestos in South and Central America, Asia, and Africa. World production was estimated as 1.9 million metric tons in 1996. The leading producers in order of declining production volumes were Russia, Canada, China, Brazil, Zimbabwe, and Kazakhstan (Anonymous 2000; Karnak Corporation 1998; Nicholson and Landrigan 1996; USGS 1999b). Nearly all of the asbestos produced worldwide is chrysotile; over 99% of asbestos used in the U.S. has been chrysotile (USGS 2000).

In the past, asbestos was produced by companies in California, Arizona, North Carolina, and Vermont, but many of these companies suspended asbestos mining operations in the 1970s. In 1985, three U.S. companies produced asbestos fibers: Calaveras Asbestos, Ltd., Calaveras County, California; KCAC, Inc., San Benito County, California; and Vermont Asbestos Group, Orleans County, Vermont. By 1997, only one company was mining asbestos in the United States, KCAC Inc., San Benito County, California (USGS 1997, 1999b). The company mines a highly sheared serpentinite composed of matted short fiber chrysotile and unfractured serpentinite (also called a mass fiber deposit). The U.S. resources of serpentinite asbestos, while large, are mostly composed of short fibers. The chrysotile with the longest fibers comes from Zimbabwe.

In the United States, asbestos was mainly mined in open pits in which ore was blasted or drilled from the pit, crushed, dried, and stored until milling. The milling process removes asbestos fibers from the ore by a series of crushing, fiberizing, screening, aspirating, and grading operations. More recently, an alternative method of mining was developed in order to reduce fiber air emission. This method uses bulldozers and scrapers (rather than blasting) to remove the ore from the pit. The ore is watered down to

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

prevent air dispersion of the fibers, and is crushed, sized, and screened while wet. After being dewatered, the fibers are pelletized, dried, and prepared for shipment either as pellets or further processed to yield open fibers (EPA 1988i).

Table 5-1 lists the number of facilities in each state that reported producing, processing, or using asbestos (friable), the intended use, and the range of maximum quantity of asbestos that is stored on site. The data listed in Table 5-1 are derived from the Toxics Release Inventory (TRI99 2001). Only 'friable' asbestos is required to be reported. Starting in 1998, seven new industrial sectors were required to report their releases to the TRI. One of these new industrial sectors, Resource Conservation and Recovery Act (RCRA) hazardous waste treatment and disposal facilities, often has large amounts of asbestos on site. The TRI data should be used with caution since only certain types of facilities are required to report (EPA 1999b). Therefore, this is not an exhaustive list.

5.2 IMPORT/EXPORT

Most of the asbestos used in the United States is imported; domestic production is mostly exported. Imports from 1950 to 1974 varied from about 1,287 million pounds to 1,580 million pounds (585,000–718,000 metric tons) per year. During the late 1970s, imports began decreasing, with a sharp drop after 1980. By 1984, imports declined to 462 million pounds (210,000 metric tons) and in 1997 and 1998 they had dipped to 46.2 million pounds (21,000 metric tons) and 35.2 million pounds (16,000 metric tons), respectively. Imports for 1999 are estimated to be 33 million pounds (15,000 metric tons) (USGS 2000). Between 1995 and 1998, 99% of imports came from Canada. In 1999, Canada supplied 91% of imports (USGS 1999b). The United States also imported approximately 60,100 metric tons of asbestos- and cellulose-fiber cement products in 1999. These products were in the form of flat sheets and panels (93%), corrugated sheets (4%), and pipes (1%).

Exports of asbestos were low until the mid-1960s when a significant increase in exports occurred. In recent years, export volumes have generally decreased from 132 million pounds (60,000 metric tons) in 1987 to 48 million pounds (22,000 metric tons) in 1991 and 39.6 million pounds (18,000 metric tons) in 1994. In 1999, exports of unmanufactured asbestos were approximately 47.7 million pounds (21,700 metric tons), of which approximately 15.4 million pounds (7,000 metric tons) were of domestic origin. These exports included asbestos crudes, fiber, stucco sand, and refuse. Re-exports of Canadian fiber probably accounted for the bulk of the remaining exports. Exports and re-exports of friction products—brake linings, disk pads, and mounted disk linings accounted for 81% of the values of all

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

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

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	100	999	13
AZ	1	100,000	999,999	2, 3, 8
CA	7	1,000	9,999,999	2, 3, 8, 13
FL	2	10,000	99,999	2, 3, 8, 9
IL	2	10,000	99,999	2, 3, 8, 13
IN	2	10,000	999,999	2, 3, 8
KS	1	10,000	99,999	2, 3, 12
KY	3	1,000	99,999	1, 5, 9, 13
LA	8	1,000	999,999	1, 2, 3, 5, 8, 9, 10, 11, 12, 13
MD	1	10,000	99,999	9
MI	1	1,000	9,999	13
NC	1	10,000	99,999	13
NJ	2	10,000	999,999	8, 9
NV	2	10,000	99,999	12, 13
NY	3	10,000	999,999	2, 3, 8, 9, 13
OH	3	1,000	999,999	1, 2, 3, 4, 5, 8
OK	1	1,000	9,999	13
OR	2	10,000	999,999	2, 3, 8, 13
PA	3	10,000	999,999	2, 3, 8, 13
SC	2	10,000	99,999	1, 2, 3, 5, 8
TN	2	10,000	999,999	8, 9
TX	7	100	999,999	1, 2, 3, 5, 8, 9, 12, 13
UT	3	1,000	9,999,999	1, 5, 13
VA	2	10,000	99,999	1, 2, 3, 5, 9
WA	1	10,000	99,999	12
WV	1	10,000	99,999	11
WY	1	10,000	99,999	1, 5, 10

Source: TRI99 2001

^aPost office state abbreviations used^bAmounts on site reported by facilities in each state^cActivities/Uses:

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

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

manufactured asbestos products. The quantity of these exports and whether they were produced in the United States was not reported (SRI 1982; U.S. Bureau of Mines 1992, 1994; USGS 1997, 1999a, 1999b).

5.3 USE

Asbestos has been used in a broad variety of industrial applications which draw upon its low cost and desirable properties such as heat and fire resistance, wear and friction characteristics, tensile strength, heat, electrical and sound insulation, adsorption capacity, and resistance to chemical and biological attack. At the peak of its demand, about 3,000 applications or types of products were listed for asbestos. In most of its applications, asbestos is bonded with other materials such as Portland cement, plastics, and resins. In other applications, asbestos is used as a loose fibrous mixture or woven as a textile.

Consumption of asbestos in the United States has been declining for two decades. Reported consumption of asbestos in the United States was 790 million pounds (359,000 metric tons) in 1980, 497 million pounds (226,000 metric tons) in 1984, 185 million pounds (84,000 metric tons) in 1987, 81 million pounds (35,000 metric tons) in 1991, 73 million pounds (33,000 metric tons) in 1994, and 46 million pounds (21,000 metric tons) in 1997. By 1998 and 1999, U.S. consumption of asbestos had declined to 34.8 million pounds (15,800 metric tons) per year. The 1999 domestic consumption pattern was 61% for roofing products, 19% for gaskets, and 13% for friction products (automobile clutch, brake, and transmission components). Roofing products, gaskets, and friction products will continue to be the only significant domestic markets for asbestos in the foreseeable future. Only chrysotile is presently used for manufacturing in the United States (USGS 1999b). Ninety-four percent of chrysotile consumed was grade 7, a short (3 μm) fiber. Only 0.4% of the asbestos used were long fibers (6–9.5 μm); these were mostly used in plastics (Chissick 1985; Jolicoeur et al. 1992; SRI 1982; USGS 1997, 1999b; U.S. Bureau of Mines 1992, 1994).

In 1973, EPA prohibited the spraying of asbestos-containing material on buildings and structures for fireproofing and insulation purposes. The ban on the use of spraying was later expanded to include applications for decorative purposes. The Consumer Product Safety Commission banned other uses including its inclusion in patching compounds and asbestos heat shields in hair dryers. In October 1991, a United States federal court overturned an EPA regulation (1989f) known as the 'Asbestos Ban and Phase Out Rule' that would have prohibited the manufacture, importation, processing, and distribution in commerce of asbestos and most asbestos-containing products by 1997 under the Toxic Substances

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

Control Act (TSCA) (U.S. Bureau of Mines 1992; Vu 1993). At present, only asbestos-containing products that were not being manufactured, imported, or processed on July 12, 1989 remain subject to the prohibition requirements of the EPA regulation (EPA 1992a). Specific products which remain subject to the rule will be documented by EPA.

Substitutes for asbestos are constantly being developed (EPA 1989f). Nonasbestos friction materials are currently being used in disc brake pads, and substitutes have been developed for drum brake linings. Substitutes include fibers made of carbon, steel, cellulose, ceramics, glass, and wollastonite and organic fibers made from aramid, polyethylene, polypropylene, and polytetrafluoroethylene (USGS 2000). No single substitute was as versatile and as cost effective as asbestos.

5.4 DISPOSAL

Currently, friable asbestos-containing wastes may only be deposited in landfills that are approved and regulated by the federal government. Regulations include wetting or using dust suppression agents, covering with at least 15 cm (6 inches) of nonasbestos-containing material, and deterring public access with a fence or natural barrier (EPA 1990a). These regulations are intended to ensure that asbestos at these sites is not dispersed into the environment. No data were located on amounts of friable asbestos in such sites. Nonfriable asbestos waste is considered to be a nonhazardous waste and can be disposed of in any landfill. There is no significant recycling of asbestos (USGS 2000). However, Cassiar Mines and Metals, Inc., a Canadian company that owns a mine in British Columbia, is currently producing chrysotile from its stockpiles and mine tailings (USGS 1999b). It is also developing a magnesium plant using stockpiled chrysotile and serpentinite as a source material.

According to the TRI, in 1996, an estimated 750 pounds of asbestos (friable) were released to publicly owned-treatment works (POTWs) by facilities producing, processing, or using asbestos, and an estimated 3.3 million pounds were transferred off-site (TRI96 1999). In 1999, 4.8 million pounds of friable asbestos was transferred off-site, presumably for disposal (TRI99 2001). Starting in 1998, seven new industrial sectors were required to report their releases to the TRI. Asbestos was transferred off-site from only one of these industrial sectors, RCRA hazardous waste treatment and disposal facilities; the amount transferred was 2.4 million pounds.