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

4.1 PRODUCTION

Sulfur dioxide has been produced commercially from the following raw materials: elemental sulfur; pyrites; sulfide ores of non-ferrous metals; waste sulfuric acid and sulfates; gypsum and anhydrite; hydrogen sulfide-containing waste gases; and flue gases from the combustion of sulfurous fossil fuels (IARC 1992). It is most commonly produced by burning sulfur but can also be produced by burning pyrites in a special furnace or by purifying and compressing sulfur dioxide gas from smelting operations.

Sulfur dioxide has been produced by burning molten sulfur in a special burner with a controlled amount of air. The burner gas, free of dust and cooled, is dissolved in water in a series of two towers. In a third tower, the solution is sprayed at the top and flows down while steam is injected at the base. The gas issuing from the third tower is then cooled to remove most moisture and passed up a fourth tower against a countercurrent of sulfuric acid. The dried gas is liquefied by compression (IARC 1992).

Sulfur dioxide can also be recovered commercially by liquefying gas obtained during smelting of non-ferrous metals such as lead, copper, and nickel. Much of this smelter by-product is recovered and oxidized to sulfur trioxide for producing sulfuric acid. Sulfur dioxide recovery, however, usually occurs only for environmental reasons (IARC 1992).

Sulfur dioxide was produced for sale at levels of 64,000 tons in 1960,99,000 tons in 1970, 124,000 tons in 1980, and 227,000 tons in 1987. Production was 1.39×10^{11} g in 1977, 1.18×10^{11} g in 1982, and 1.18×10^{11} g in 1985 (HSDB 1998). Most of the sulfur dioxide produced is for captive use in the sulfuric acid and wood pulp industries (IARC 1992). It is also used for refrigeration (HSDB 1998). The major producers of sulfur dioxide in 1989 included ChemDesign Corporation, Coulton Chemical Corporation, Dow Chemical, Hoeschst Celenese Corporation, Industrial Chemicals Corporation, Rhone-Poulenc, Inc., Tennessee Chemical Company, and Phelps Dodge Corporation (HSDB 1998).

4.2 IMPORT/EXPORT

Imports of sulfur dioxide were $5.17x10^{10}$ g in 1977, $2.26x10^{10}$ g in 1982,$2.33x10^{7}$ g in 1985, and $5.72x10^{7}$ kg in 1986 (HSDB 1998). The U.S. import of sulfur dioxide was 68,772,164 kg in 1994 (NTDB 1996).

Exports of sulfur dioxide were $1.62x10^{9}$ g in 1978, $5.38x10^{9}$ g in 1983, $1.60x10^{9}$ gin 1985, and $8.54x10^{7}$ g in 1987 (HSDB 1998). The U.S. export of sulfur dioxide was 1,173,002 kg in 1996 (NTDB 1996).

4.3 USE

Sulfur dioxide has numerous commercial uses which are based on its function as an acid, as a reducing or oxidizing agent, or as a catalyst. Sulfur dioxide is used in large quantities as a captive intermediate in the production of sulfuric acid and in the pulp and paper industry. Other common uses of sulfur dioxide include the following: fumigant, preservative, bleach, and steeping agent for grain in food processing; catalyst or extraction solvent in the petroleum industry; flotation depressant for sulfide ores in the mining industry; intermediate for bleach production; and reducing agent in several industrial processes (IARC 1992).

4.4 DISPOSAL

Sulfur dioxide is listed as a toxic substance under Section 3 13 of the Emergency Planning and Community Right to Know Act (EPCRA) under Title III of the Super-fund Amendments and Reauthorization Act (SARA) (EPA 19988). Disposal of wastes containing sulfur dioxide is controlled by a number of federal regulations (see Chapter 7).