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

5.1 PRODUCTION

The Toxics Release Inventory (TRI) database contains no information on facilities that manufacture or process hydrogen sulfide because this chemical is not required to be reported under Section 313 of the Emergency Planning and Community Right-to-Know Act (Title III of the Superfund Amendments and Reauthorization Act of 1986) (EPA 1997).

Hydrogen sulfide is made commercially available by two typical approaches, recovery from gas mixtures and chemical means. Natural gas and gases associated with crude oil contain varying amounts of hydrogen sulfide from trace amounts to 70–80% (Pouliquen et al. 1989). Recovery of hydrogen sulfide from petroleum, natural gas, or manufactured gas operations is the main non-natural source of hydrogen sulfide. These recovery processes can be categorized into several methods, including chemical and physical absorption, dry oxidation to form sulfur or oxides (Clause process), and liquid oxidation to form oxides (Ferrox process) (Beauchamp et al. 1984).

Hydrogen sulfide production by chemical reaction can involve reacting sulfur either with hydrogen gas (H_2) or with a hydrocarbon (Pouliquen et al. 1989). It can also be produced by the hydrogen reduction or acid decomposition of a sulfide (Pouliquen et al. 1989). Another method of hydrogen sulfide production, which accounts for >90% of the sulfur in crude oil, is hydrodesulfurization, in which gas-oil and coke distillate fractions are passed through a fixed-bed catalyst in the presence of hydrogen. Approximately 80–90% of the sulfur-containing compounds, mostly acyclic and cyclic sulfides, are converted into hydrogen sulfide by this process (Beauchamp et al. 1984; Weil and Sandler 1997).

5.2 IMPORT/EXPORT

No data on import or export volumes for hydrogen sulfide are available.

5.3 USE

Hydrogen sulfide has a variety of industrial uses. Its major use is in the production of elemental sulfur and sulfuric acid. Sulfur recovered from the treatment of sour gas in 1986 accounted for 14 million tons, or 25% of the total world sulfur production. In 1995, the production of sulfuric acid was estimated to consume $1.1x10^5$ metric tons of hydrogen sulfide. More recent data on the consumption of hydrogen sulfide were not found. Hydrogen sulfide is used to prepare inorganic sulfides, such as sodium sulfide and sodium hydrosulfide, which are used in the manufacture of dyes, rubber chemicals, pesticides, polymers, plastic additives, leather, and pharmaceuticals. Hydrogen sulfide is also used in the manufacture of metal sulfides and thioorganic compounds and is an intermediate for sulfuric acid and elemental sulfur production. Hydrogen sulfide is used in the purification of nickel and manganese, in catalyst activation and poisoning, and in the treatment of metallic surfaces. It is used in metallurgy, in the production of heavy water for the nuclear industry, and as an analytical reagent. It is an additive in extreme pressure lubricants and cutting oils. Hydrogen sulfide is also used as an agricultural disinfectant. It is not registered as a pesticide in the United States (Beauchamp et al. 1984; Bingham et al. 2001; HSDB 2006; Sittig 2002; Weil and Sandler 1997).

5.4 DISPOSAL

Hydrogen sulfide is designated as a hazardous substance under Section 311(b) of the Clean Water Act (EPA 2004c). Disposal of wastes containing hydrogen sulfide is controlled by a number of federal regulations (see Chapter 8).

The EPA-assigned hazardous waste number for hydrogen sulfide is U135 (EPA 2004e). Generators of waste exceeding 100 pounds/month containing hydrogen sulfide must conform to the EPA regulations for the storage, transportation, treatment, and disposal of waste (EPA 2004c). Additional information concerning the accidental release of hydrogen sulfide and its reporting requirements is found in Chapter 8.