

4. PRODUCTION, IMPORT, USE, AND DISPOSAL

4.1 PRODUCTION

2-Nitrophenol was produced commercially in the United States by Monsanto Co. in Sauget, Illinois (SRI 1989; USITC 1989). According to TR189 (TRI 1989), between 1 and 9 million pounds of 2-nitrophenol was produced in the United States in 1989. 4-Nitrophenol is currently manufactured in the United States by DuPont Co. in Deepwater, New Jersey, and Monsanto Co. in Anniston, Alabama (SRI 1989; USITC 1989). The yearly production capacity is 10 million pounds for the former and 36 million pounds for the latter (CMR 1987; SRI 1989). According to SRI (1989), Monsanto Co. captively (used on-site) uses part of the 4-nitrophenol that it produces. The U.S. demand for 4-nitrophenol, including exports, was 23 million pounds in 1987 and the projected demand is 25 million pounds in 1991. If Hoechst-Celanese commercializes an alternate acetaminophen (N-acetyl-4-aminophenol) production process, it could reduce the consumption of 4-nitrophenol toward the end of the decade (CMR 1987). Besides the facilities that manufacture the nitrophenols, the companies that process these compounds are listed in Table 4-1. Table 4-1 also shows the intended use and the maximum amounts of each chemical stored on site.

2-Nitrophenol is produced either by the catalytic hydrolysis of 2-nitrochlorobenzene with NaOH or by the action of dilute HNO₃ on phenol with subsequent steam distillation for separation from 4-nitrophenol (EPA 1985; HSDB 1989). 4-Nitrophenol is produced either by the catalytic hydrolysis of 4-nitrochlorobenzene or by the reaction of dilute HNO₃ on phenol and subsequent steam distillation to separate the 4- from the 2- isomer (EPA 1985; HSDB 1989).

4.2 IMPORT/EXPORT

In 1977, FMC Corp. and Rhone-Poulenc, Inc. imported between 1 and 11 million pounds of 2-nitrophenol into the United States (TSCAPP 1989). Imports of 2-nitrophenol through principal U.S. customs districts in 1983 were 3.56 million pounds (EPA 1985). Imports of 4-nitrophenol into the United States are negligible. Export of 4-nitrophenol in 1987 was 35% of its United States demand of 23 million pounds (CMR 1987).

4.3 USE

2-Nitrophenol is used mainly as an intermediate for the production of dyestuffs, pigments, rubber chemicals, and fungicides. Small amounts are used as an acid-base indicator and as a reagent for glucose (EPA 1985; HSDB 1989). The current use pattern of 4-nitrophenol is as follows: production of N-acetyl-4-aminophenol, 55%; exports, 35%; miscellaneous other uses including leather tanning, insecticides (methyl and ethyl parathion), dyestuff and oxydianiline manufacture, 10% (CMR 1987; HSDB 1989). Small amounts of 4-nitrophenol are used as a laboratory reagent (e.g., phosphatase and

TABLE 4-1. Facilities that Manufacture or Process Nitrophenols^a

Facility	Location	Maximum amount on site (lbs)	Use	Isomer ^b
Monsanto Company	Anniston, AL	1,000,000-9,999,999	Produce for sale/ distribution	4-NP
Monsanto Company	Sauget, IL	1,000,000-9,999,999	Produce for sale/ distribution	2-NP
Monsanto Company	Sauget, IL	1,000-9,999	Produce; as a byproduct	4-NP
Monsanto Company	Luling, LA	100,000-999,999	As a reactant	4-NP
Ciba-Geigy Corporation	St. Gabriel, LA	10,000-99,999	As a reactant	2-NP
FMC Corporation-Baltimore plant	Baltimore, MD	100,000-999,999	As a reactant	2-NP
Mallinckrodt, Inc.	St. Louis, MO	10,000-99,999	As a byproduct; as a reactant	4-NP
Monsanto Company	St. Louis, MO	100-999	Produce; as an impurity	4-NP
Kollsman	Merrimack, NH	0-99	As a manufacturing aid	2-NP
Tennessee Eastman Company	Kingsport, TN	10,000-99,999	As a reactant	4-NP

^aProduction information for 1989 derived from TRI 1989

^b4-NP = 4-nitrophenol; 2-NP = 2-nitrophenol

4. PRODUCTION, IMPORT, USE, AND DISPOSAL

carboxyesterase determinations) and as a fungicide in military footwear. It is registered with the EPA for fungicidal use (Angerhofer 1985; HSDB 1989).

4.4 DISPOSAL

Incineration under controlled conditions (to attain complete combustion) appears to be the best method of disposal for both the nitrophenols (HSDB 1989; OHM/TADS 1989). The waste containing nitrophenols can be incinerated either with a rotary kiln incinerator at 820-1600°C with a residence time of hours or in a fluidized bed incinerator at 450-980°C with a residence time of seconds for liquids and gases, longer for solids. Incineration of large quantities may require scrubbers to control the emission of NO_x gases (HSDB 1989). Biological treatment with powdered activated carbon and activated sludge has been used for liquid wastes (HSDB 1989). Oxidation by passing air at 275°C through the aqueous waste destroys 99.6% of 4-nitrophenol (Heimbuch and Wilhelmi 1985). A resin absorption (Ambelite XAD-7) method for the removal of 4-nitrophenol has been used for industrial waste water. Waste residues including waste sludge can be disposed of by land treatment or burial in specified landfills (HSDB 1989).

A guideline for maximum daily effluent discharge of 2.13 mg of total toxic organics (including both nitrophenols) per liter of waste water was set for electroplating plants that discharge less than 10,000 gallons of waste water per day (EPA 1988a). Similarly, the limitations for daily effluent discharge from electrical and electronic industries is set at 1.37 mg/L of total toxic organics (EPA 1988a). Information regarding pretreatment standards and effluent guidelines and standards may be found in Section 7.

