

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

4.1 PRODUCTION

1,3-DNB and 1,3,5-TNB have both been prepared by the nitration of benzene with a mixture of nitric acid and sulfuric acid (HSDB 1994). However, 1,3-DNB is produced in a two-step nitration process under vigorous conditions, whereas 1,3,5-TNB has been produced from a single-step nitration process with a mixture of fuming nitric acid and fuming sulfuric acid (HSDB 1994; Mark et al. 1978).

1,3-DNB has been synthesized in small quantities as a by-product in the nitration of toluene to form TNT (Mitchell and Dennis 1982).

1,3,5-TNB has also been produced from TNT by removing a methyl group (Sax and Lewis 1987). Trinitrobenzoic acid, the result of oxidation of TNT, has also been decarboxylated to yield 1,3,5-TNB (Merck 1989).

Production volume figures for 1,3-DNB are not easily available because it is produced as a mixture with other nitrobenzene isomers during the manufacturing process. In the United States, DuPont alone reportedly generated 70,000-72,000 pounds of 1,3-DNB annually from production of dinitrobenzene and nitrobenzene (EPA 1991b). The production volumes for 1,3-DNB by other manufacturers are not known. Production data for 1,3,5-TNB by producers in the United States are unknown.

Table 4-1 reports the other facilities, besides DuPont, in the United States that produce and/or process 1,3-dinitrobenzene. The data reported in Table 4-1 are derived from the Toxics Release Inventory (TRI) of EPA (TR192 1994). Only certain types of facilities were required to report to the TRI databank of EPA. Hence, this is not an exhaustive list. The Aldrich Chemical Company (Milwaukee, Wisconsin) and Janssen Chimica (Gardena, California) also produced 1,3-DNB for commercial sale and use (Van et al. 1991). 1,3,5-TNB has been manufactured commercially by Kodak Park Division (Rochester, New York) (OHM/TADS 1991).

Since 1,3,5-TNB releases are not required to be reported under SARA Section 313, there are no data for these compounds in the 1992 Toxics Release Inventory (TR192 1994).

Table 4-1. Facilities that Manufacture or Process 1,3-DNB

Facility	Location ^a	Range of maximum amounts on site in pounds	Activities and uses
FIRST CHEMICAL CORP.	PASCAGOULA, MS	100,000-999,999	Produce; For on-site use/processing; As a reactant
DU PONT CHAMBERS WORKS	DEEPWATER, NJ	100,000-999,999	Produce; For on-site use/processing; As a reactant

Source: TRI92 1994

^aPost office state abbreviation used

4.2 IMPORT/EXPORT

In 1971, an estimated 10,100 pounds of 1,3-DNB were imported into the United States (EPA 1976). However, current import and export data for 1,3-DNB are not available (HSDB 1994). Data for import and export volumes of 1,3,5-TNB are also not available.

4.3 USE

Both 1,3-DNB and 1,3,5-TNB have been used for their explosive properties (HSDB 1994). 1,3-DNB has been suggested as a possible substitute for the explosive TNT (HSDB 1994). 1,3-DNB has been used as a camphor substitute in nitrocellulose, a compound used in explosives and propellants (HSDB 1994; Sax and Lewis 1987). 1,3-DNB was manufactured during both world wars as a component in the explosive roburite (EPA 1976). 1,3,5-TNB has been classified as a high explosive and has been used in military and commercial explosive compositions (Merck 1989; Sax and Lewis 1987). A more powerful explosive than TNT, 1,3,5-TNB is less sensitive than TNT to impact (Merck 1989). 1,3,5-TNB has also been used as an explosive for oil wells and mining operations (OHM/TADS 1991).

Commercially, 1,3-DNB has been used extensively as an organic intermediate for *m*-phenylenediamine, a chemical used in the synthesis of aramid fibers and spandex (HSDB 1994). 1,3-DNB is an industrial chemical used in organic synthesis and dyes (McFarlane et al. 1987a). In the medical field, 1,3-DNB has been used as an indicator in the detection of 17-ketosteroids. 1,3-DNB has acted as an electrolytic reducer in the preparation of aminocresols (HSDB 1994). Other uses for 1,3,5-TNB include use as a vulcanizing agent in the processing of natural rubber and as an indicator in acid-base reactions in the pH range of 12.0-14.0 (HSDB 1994).

DISPOSAL

1,3,5-TNB is classified as an EPA hazardous waste and disposal must be carried out according to EPA regulations (HSDB 1994). Wastes generated in the manufacture of explosive components such as 1,3-DNB and 1,3,5-TNB are also characterized as hazardous wastes and EPA regulations for disposal must be followed (EPA 1990a). For more information on the regulations that apply to 1,3-DNB and 1,3,5-TNB, see Chapter 7.

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Disposal of both 1,3-DNB and 1,3,5-TNB can be accomplished by high-temperature incineration in a device equipped with an afterburner and a scrubber (HSDB 1994). 1,3-DNB and 1,3,5-77VB have been incinerated by dissolution in a combustible solvent or inert material; the resulting mixture is then sprayed into an incinerator (HSDB 1994; OHM/TADS 1991). 1,3-DNB has also been incinerated after first being wrapped in paper to allow for burning of 1,3-DNB in an unconfined condition (HSDB 1994). 1,3,5-TNB has been classified as a potential candidate for both fluidized bed incineration at temperatures between 450 and 980 °C and rotary kiln incineration at temperatures between 820 and 1,600 °C (EPA 1981). Product residues and sorbent media remaining after high-temperature incineration and scrubbing of 1,3,5-TNB have been packaged in 17H epoxy-lined drums and transported to a RCRA-approved landfill for disposal (OHM/TADS 1991). If appropriate incineration facilities are not available for the disposal of 1,3-DNB, the compound may be buried in a chemical waste landfill, although this practice is not acceptable at municipal sewage treatment plants (OHM/TADS 1991).

Recently investigated methods of treating waste waters contaminated with 1,3-DNB or 1,3,5-TNB and related products include biological treatment, stripping, solvent extraction, and activated carbon adsorption (HSDB 1994).