Paper Industry

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Industry Overview

Not all pulp and paper mills or converting operations generate hazardous waste. If, however, your facility uses strong acids and bases, toxic organic chemicals, paints and adhesives, ink, or solvents, the waste associated with using these materials might be hazardous waste. If you generate hazardous waste, you might be subject to Resource Conservation and Recovery Act (RCRA) requirements covering the generation, transportation, and management of hazardous waste.

The *paper industry* is composed of several sectors, including:

- Pulp and paper mills, which produce mechanical, thermomechanical, and chemical pulps and process these pulps to form paper, paperboard, or building papers
- Converting operations, which manufacture boxes, tablets, and other finished paper products.

Hazardous Wastes from the Paper Industry

Pulp is made by mechanically or chemically separating the fibers in wood or other cellulose materials from nonfibrous material. In the kraft pulping process, used to make most chemical pulp, a solution of sodium hydroxide and sodium sulfide dissolves the nonfibrous materials. The pulp is then bleached if white paper is being produced. Several chemicals can be used for bleaching, including chlorine gas, sodium hydroxide, calcium hypochlorite, chlorine dioxide, hydrogen peroxide, and sodium peroxide. After any fillers and coloring materials are added, the pulp slurry is made into paper. Certain coatings can also be applied to the paper.

The large-volume wastes produced by the paper industry are not often classified as hazardous under RCRA. Some wastewaters and wastewater treatment sludges might fail the Toxicity Characteristic Leaching Procedure (TCLP) test due to the presence of organic constituents such as chloroform or trichloroethylene. Several lower volume hazardous wastes are generated, including:

Spent halogenated solvents used in degreasing

Corrosive waste generated from the use of strong acids and bases

Paint waste containing solvents and paint waste with heavy metals

Ink waste, which can include solvents, metals, or ignitable materials

Petroleum distillates from cleanup operations.

Spills of hazardous substances might also generate RCRA-regulated hazardous waste. Certain paper manufacturing facilities have associated research laboratories, which might produce a variety of hazardous wastes. Table 1 lists some typical processes/operations that might produce hazardous waste. Table 2 lists Department of Transportation (DOT) shipping descriptions (required on the Uniform Hazardous Waste Manifest) for a number of wastes that might be generated by the paper industry. Table 1 and Table 2 are not comprehensive lists. If you do not find your waste here but suspect it is hazardous, contact your EPA Regional office or state hazardous waste management agency for additional information.

Waste Minimization

An effective waste minimization program can reduce the costs, liabilities, and regulatory burdens of hazardous waste management, while potentially enhancing efficiency, product quality, and community relations. Waste minimization techniques that can help you reduce the amount of hazardous waste that you generate include:

- Production planning and sequencing
- Process/equipment adjustment or modification
- Raw material substitution
- Loss prevention and housekeeping
- Waste segregation and separation
- Recycling.

Training and supervision of employees implementing waste minimization techniques is an important part of your successful program. Call the RCRA/Superfund Hotline toll-free at 800-424-9346 (or TDD 800-553-7672 for the hearing-impaired) for waste minimization information and publications.

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Table 1
Typical Paper Industry Operations: Materials Used and Hazardous Wastes that Might be Generated

Process/ Operation	Materials Used	General Types of Waste Generated
Chemical Pulping	Acids/alkalies, lime, sulfurous acid, sodium hydroxide, sodium sulfide	Acid/alkaline waste
Bleaching	Chlorine bleaches, sulfate bleaches, chloroform, solvents	Toxic wastewater and wastewater treatment sludge Acid/alkaline waste
Papermaking	Pigments	Wastewater treatment sludge
Sizing and Starching	Waxes, glues, synthetic resins, hydrocarbons	Toxic waste, including wastewaters and sludges
Coating, Coloring, and Dyeing	Inks, paints, solvents, rubbers, dyes	Solvent waste Ink waste Paint waste Ignitable waste Toxic waste
Cleaning and Degreasing	Tetrachloroethylene, trichloroethylene, methylene chloride, trichloroethane, carbon tetrachloride	Solvent waste Toxic rinse water

Table 2
Paper Industry Waste Descriptions[1]

Waste Type	Designations/Trade Names	DOT Shipping Name	Hazard Class	UN/NA ID Number
SPENT SOLVENTS AND OTHER TOXIC OR IGNITABLE WASTES CONTAINING:				
Carbon Tetrachloride*	Carbon Tetrachloride, Carbon Tet, Tetrachloromethane	Waste Carbon Tetrachloride	ORM-A	UN1846
Methylene Chloride	Methylene Chloride, Dichloromethane	Waste Dichloromethane	ORM-A	UN1593
Tetrachloroethylene*	Tetrachloroethylene, Perchloroethylene, PCE	Waste Tetrachloroethylene	ORM-A	UN1897
1,1,1-Trichloroethane	1,1,1-Trichloroethane, 1,1,1-TCA	Waste 1,1,1-Trichloroethane	ORM-A	UN2831
Trichloroethylene*	Trichloroethylene, TCE	Waste Trichloroethylene	ORM-A	UN1710
Chloroform*	Chloroform	Waste Chloroform	ORM-A	UN1888
Benzene*	Benzene	Waste Benzene (Benzol)	Flammable Liquid[2]	UN1114
Ethylene Dichloride*	Ethylene Dichloride, 1,2-Dichloroethane	Waste Ethylene Dichloride	Flammable Liquid	UN1184
Chlorobenzene*	Chlorobenzene, Monochlorobenzene, Phenyl Chloride	Waste Chlorobenzene	Flammable Liquid	UN1134
Methyl Ethyl Ketone*	Methyl Ethyl Ketone, Methyl Acetone, Meetco, Butanone, Ethyl Methyl Ketone, MEK, 2-Butanone	Waste Methyl Ethyl Ketone	Flammable Liquid	UN1193
Mixed Spent Halogenated Solvents		Hazardous Waste, Liquid, NOS[3]	ORM-E	NA9189
Petroleum Distillates	Petroleum Distillates	Waste Petroleum Distillate	Flammable Liquid Combustible Liquid[4]	UN1268 UN1268

Table 2 (continued)
Paper Industry Waste Descriptions[1]

Waste Type	Designations/Trade Names	DOT Shipping Name	Hazard Class	UN/NA ID Number
CORROSIVE WASTES				
Ammonium Hydroxide	Ammonium Hydroxide, Aqueous Ammonia, Ammonia Water, Spirit of Hartshorn	Waste Ammonium Hydroxide (containing not less than 12% but not more than 44% ammonia)	Corrosive Material	NA2672
		Waste Ammonium Hydroxide (containing less than 12% ammonia)	ORM-A	NA2672
Hydrobromic Acid	Hydrobromic Acid	Waste Hydrobromic Acid	Corrosive Material	UN1788
Hydrochloric Acid	Hydrochloric Acid, Muriatic Acid	Waste Hydrochloric Acid Mixture	Corrosive Material	NA1789
		Waste Hydrochloric Acid Solution	Corrosive Material	UN1789
Hydrofluoric Acid	Hydrofluoric Acid	Waste Hydrofluoric Acid	Corrosive Material	UN1790
Nitric Acid	Nitric Acid, Aquafortis	Waste Nitric Acid (over 40%)	Oxidizer	UN2031
		Waste Nitric Acid (40% or less nitric acid)	Corrosive Material	NA1760
Phosphoric Acid	Phosphoric Acid, Orthophosphoric Acid	Waste Phosphoric Acid	Corrosive Material	UN1805
Potassium Hydroxide	Potassium Hydroxide, Caustic Potash	Waste Potassium Hydroxide Solution	Corrosive Material	UN1814
		Dry Solid, Flake, Bead, or Granular	Corrosive Material	UN1813
Sodium Hydroxide	Sodium Hydroxide	Waste Sodium Hydroxide Solution	Corrosive Material	UN1824
		Dry Solid, Flake, Bead, or Granular	Corrosive Material	UN1823
Sulfuric Acid	Sulfuric Acid, Oil of Vitriol	Waste Sulfuric Acid	Corrosive Material	UN1832
OTHER WASTES AND GENERAL CLASSIFICATIONS				
Paint Waste with Heavy Metals	Paint Waste with Heavy Metals	Hazardous Waste, Liquid or Solid, NOS	ORM-E	NA9189
Corrosive Liquid	Corrosive Liquids	Waste Corrosive Liquid, NOS	Corrosive Material	UN1760
Corrosive Solid	Corrosive Solids	Waste Corrosive Solid, NOS	Corrosive Material	UN1759
Ignitable Wastes, NOS	Ignitable Wastes, NOS	Waste Flammable Liquid, NOS	Flammable Liquid	UN1993
		Waste Combustible Liquid, NOS	Combustible Liquid	UN1993
		Waste Flammable Solid, NOS	Flammable Solid	UN1325
Hazardous Wastes, NOS		Hazardous Waste, NOS	ORM-E	UN9189

* Toxicity Characteristic constituent. Any waste that results in a TCLP extract containing a Toxicity Characteristic constituent equal to or above regulatory levels is hazardous.

1 These descriptions may change given variations in waste characteristics or conditions. Note that the DOT name, hazard class, and UN/NA shipping ID number do not directly correspond to RCRA categories of hazardous waste.

2 A flammable liquid has a flash point below 100°F.

3 NOS -Not otherwise specified.

4 A combustible liquid has a flash point between 100°F and 200°F.

For further information call the RCRA/Superfund Hotline 1-800-424-9346