What is a Hazardous Waste?

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As a result of conducting its business, a printer may generate wastes that are considered hazardous or otherwise regulated by EPA, state, and local agencies including the Department of Transportation. If not handled and disposed of properly, these wastes can cause serious problems, injury or death of humans, animals, and/or plant life; or damage or pollute land, air, or water. In addition, improperly handled and disposed wastes expose the printer to liability ranging from possible enforcement actions including but not limited to fines, cleanup costs associated with Superfund liability, and, in extreme cases, criminal enforcement.

This fact sheet is designed to provide information on how to determine if a waste is classified as hazardous under the federal regulations. The federal regulations were developed as a result of the passage of the Resource Conservation and Recovery Act signed into law in 1976. It is important to recognize that some states have differing definitions of hazardous or other regulated wastes. These additional and other wastes include more wastes than those covered by EPA's regulations. However, all states must, as a minimum, include all of the wastes defined as hazardous under the federal regulations.

Waste Determination

The first and most important step is to determine if a spent material is in fact a waste. While this may seem to be obvious, the regulation's definition of a waste is quite detailed and somewhat confusing. Essentially, a waste is any solid, liquid, or contained gaseous material that is no longer used and is either recycled, thrown away, or stored until sufficient quantities are accumulated for treatment or disposal. If a "waste" is used as a raw material in a subsequent process within the printer's facility or other manufacturers, process, it is not considered a waste and therefore it does not have to be manifested. However other regulations, such as Department of Transportation hazardous material shipping requirements still, apply.

After the material is determined to be a waste, it must be evaluated relative to its ingredients and physical characteristics. A waste is classified as a hazardous waste in one of two ways:

I. It exhibits any of the characteristics specified by EPA regulations or;
II. It is specifically listed as a hazardous waste in EPA regulations

Characteristic Wastes

A waste is considered hazardous if it exhibits one or more characteristics identified in the federal regulations. The characteristics are:

- Ignitability
- Corrosivity
- Reactivity
- Toxicity

Attached Chart A describes the four characteristics along with examples of waste characteristics possibly generated by printers. In reviewing hazardous wastes generated by printers, the most common wastes generated exhibit one or more of the four characteristics. Of the characteristic wastes, D001 or ignitables are the most prevalent waste due to spent cleaning solvents with flashpoints below 140°F.

Listed Wastes

A waste is considered hazardous if it appears on any one or more of the four hazardous waste lists (F, P, K, or U) contained in the federal regulations. Wastes falling on one of the four lists have been classified as hazardous because they contain any of a number of toxic constituents that have been shown to be harmful to health and/or the environment. EPA regulations specifically list over 400 hazardous wastes, including specific wastes derived from manufacturing processes and discarded commercial chemical products.

The next most common wastes generated by printers, after characteristic wastes, are F-listed ones. The F-listed wastes apply to those wastes that are considered used or spent. Understanding the F-listed category can be somewhat challenging and confusing. Attached Chart C contains the list of F categories. In order for a waste to be classified as F001, F002, F004, or F005, it must contain a total of 10% or more (by volume) of one or more of the chemicals listed in that category. For example, a waste solvent blend containing 10% methylene chloride and 90% water would be classified as an F002 waste.

For the F003 category, a waste must either be 100% of any of the chemicals in the F003 category or contain one of the chemicals in the category and 10% or more of any chemicals in F001, F002, F004, or F005 categories. Any waste chemical in the category originally used as a "technical grade" is also considered 100%. For example, a waste solvent blend containing 5% xylene, 15% methylene chloride, and 80% water would be classified as an F003 and F002 hazardous waste. Likewise, a waste solvent blend containing 15% xylene, 15% methylene chloride, and 70% water would also be classified as F002 and F003. However, a waste solvent blend containing 25% xylene, 5% methylene chloride, and 70% water would not be classified as an F-listed waste. Depending upon the flashpoint of the waste, it could be still classified as a hazardous waste. If the flashpoint is below 140Â° F, then it would be a D001 or ignitable hazardous waste. It should also be noted that the waste could be characteristically toxic, depending on the cleaner and/or residues removed by the cleaner.

The U and P listed wastes are for those discarded, unused commercial chemical products that are either 100% pure, technical grade, or any formulation where the chemical is the active ingredient. K-listed wastes are those from specific industrial manufacturing processes such as lead or chrome pigment manufacturing. Few if any printers generate P or K listed wastes. Attached Chart D contains several U-listed chemicals that could be generated by a printer.

In some instances, a waste may receive two designations or classifications. Generally the primary ingredients in the waste will be the primary classification, with the other classification being noted on the manifest. When there may be confusion with these types of wastes, it is best to consult the state agency, state technical assistance provider, or PNEAC. Multiple classifications of wastes are not common within the printing industry.

Hazardous Waste Determination

It is the**printer's**responsibility to determine whether the wastes generated at the facility are hazardous and the subsequent classification that is to be assigned to the waste. EPA allows for two approaches to determine if a waste is hazardous:

I. The generator can "apply knowledge" or;
II. The generator can test the waste using a variety of test methods.

Applying knowledge of the physical characteristics of a chemical or material and how it is used in a given process is the most cost-effective method of hazardous waste determination. Under this approach, the printer applies knowledge of the material's physical characteristics and its use to determine whether the waste is hazardous. For example, the generator would identify which purchased materials were combined in the generation of the waste. Those materials, plus any contaminants that the materials might have picked up during use, would have to be evaluated to determine if the resulting waste has, or might have, a listed hazardous constituent (see above) or exhibits a hazardous waste characteristic (i.e., ignitability, corrosivity, reactivity, or toxicity). Material safety data sheets (MSDSs) are a commonly used source of information for this analysis. If a material is chemically unchanged (e.g., uncontaminated ink), the MSDS would be representative of the material as a waste. Is the flash point of the cleaning solution 140°F or less? If so, the waste cleaning solution and ink mixture is ignitable and gets a designation of D001. Does the waste have a pH less than or equal to 2.0, or greater than or equal to 12.5? If so, it is corrosive and gets a designation of D002. The MSDS and other product information can also be used to compare "listed" hazardous wastes.

If the applying knowledge review is inconclusive, testing should be performed to be certain of the waste's classification. The "applying knowledge" approach is best used to document clear-cut cases where it is obvious that the materials used and the manner in which they are used would not result in a hazardous waste. Improper classification of a hazardous waste as non-hazardous does not relieve a generator of the liabilities that could result from improper disposal of the hazardous waste. In some cases where it appears likely but uncertain that a waste is non-hazardous, testing can be performed to verify the analysis. This testing could then be used as part of the data that is used in the "applying knowledge" review of subsequent wastes generated from the same input materials and processes.

In using the applying knowledge approach it is important to note that very few waste streams are solely composed of just the uncontaminated material itself. Typical waste streams are usually mixtures of several waste products. For example, waste press cleaning solvent will actually be a mixture of the solvent and the ink. Therefore, when the applying knowledge approach is used, remember the hazard classification needs to take into account the entire waste mixture and not just one of the ingredients.

When using MSDSs as part of the "applying knowledge" approach, recognize that MSDSs are not required to address all of the environmental concerns related to a product. MSDSs are not environmental data sheets, which means that although they do contain very important and useful information about a product, they are not required to detail all of the environmental concerns associated with a given product. MSDSs are mandated by OSHA, and their purpose is to provide information about the health and safety aspects associated with a particular chemical or product. MSDSs are prepared by manufacturers, suppliers, and importers to meet OSHA requirements regarding the health and safety aspects of a product. Helpful environmental information is often included on MSDSs, but this information should not be assumed to be exhaustive.

When in question, ask the supplier or manufacturer for more information. In some cases, testing may be appropriate to supplement or verify information from the manufacturer. To illustrate the limitation of MSDSs when making waste classification determinations, it should be recognized that MSDSs are only required to

report hazardous ingredients that are present in concentrations of at least 1%, or 0.1% for carcinogens. A 1% concentration translates to 10,000 parts per million (ppm).Likewise, a chemical present in a 0.1% concentration would be equivalent to 1,000 parts per million. The threshold quantities for several toxic criteria chemicals is substantially below 10,000 parts per million (see TCLP threshold levels in Chart A); for example, the hazardous waste threshold level for carbon tetrachloride is 0.5 parts per million. To address this inadequacy of MSDSs as a sufficient basis to make hazardous waste determinations, request that suppliers provide you with a written statement identifying any constituents in their materials that may cause the resulting waste to be classified as hazardous waste.

Testing the waste, although incurring more cost than applying knowledge, can provide specific results to determine if a waste is hazardous. The types of tests commonly used are flashpoint, pH, and toxicity characteristic leaching procedure (TCLP). TCLP contains specific testing procedures that must be followed, and the ones used depend upon the physical state of the particular waste being analyzed. TCLP will be used to determine heavy metal content and the concentration of certain other organic chemicals. Chart B contains the complete list of chemicals regulated under TCLP and a list of possible TCLP wastes generated by printers.

The first step in testing involves obtaining two samples of the waste. One waste sample is sent to a testing laboratory to conduct an analysis of the waste. The other sample is retained in case the first sample becomes lost, contaminated, or if the results of the first sample are questionable. Samples should be representative of the waste chemical, meaning the waste material should be collected at the point of generation (e.g., cleaning solvents used after cleaning, used fountain solutions including additives, etc.). Once the samples are collected, they should be sealed in a clean, durable, and compatible container, dated, and either shipped immediately to the laboratory or refrigerated until shipment can be made. To ensure that the samples remained untampered, a chain of custody should accompany them from the moment it was collected until it is received at the laboratory. The chain of custody is used to show when the sample was passed along to other parties, identifying everyone who had access to the sample.

Documentation

It is very important that you can prove that all waste streams have been properly classified. Whether you apply knowledge or test the waste, some form of documentation is necessary. Attached is a waste profile sheet that should be used for classifying each waste stream. The sheet should be kept on file along with copies of MSDSs and any results of tests conducted on the wastes. In many instances, vendors who transport/dispose your waste typically conduct these tests. Depending upon the particular waste, tests for pH, flashpoint, and TCLP should be conducted. These test results should be attached to the profile sheet. As long as the wastes remain the same, retesting or reprofiling is not required.

Liability Management

Because hazardous waste is generated as a result of an industrial manufacturing process, it is subject to strict government disposal regulations. Under the current environmental laws and regulations, all industrial waste streams generated by a printer are that printer’s responsibility forever, even if the printer follows all applicable regulations. Hazardous waste that is improperly disposed or was once legally disposed that eventually causes environmental contamination can result in Superfund liability for the printer. Therefore, it is imperative that all wastes, including nonhazardous ones, be properly handled and disposed of in as

permanent fashion as feasible.

The best approach to ink waste disposal is to not generate it in the first place. Several techniques can be used to reduce, recycle, or reuse materials. Several fact sheets addressing this subject for various products used by printers can be found on PNEAC's web page at www.pneac.org. Printers who have adopted some or all of these approaches have reduced the amount of waste generated. Since disposal of waste is inevitable, preferred methods include neutralization, stabilization, solidification, incineration, or other appropriate treatment methods. Landfilling of hazardous waste should not be considered. In fact, it is illegal to landfill hazardous waste without first treating it. Landfills should be avoided for chemical nonhazardous wastes as they only represent long-term storage. They do not offer a permanent means of disposal, and printers have been caught in Superfund cleanup actions because they had landfilled ink waste.

Summary and Conclusion

It is the printer's responsibility to properly characterize and manage their waste streams, including hazardous waste. This is why it is critical that the printer understands the definition of a hazardous waste so that all wastes generated can be properly classified. Classifying nonhazardous wastes as hazardous increases a printer's liability and disposal costs, and can cause the printer to be classified as a larger generator than it actually is, which results in increased compliance requirements. Most importantly, all wastes must be properly identified, managed, and disposed, or the printer can face cleanup liability concerns. Hazardous waste carries additional concerns in that improper classification, management, and disposal can lead to enforcement actions. It is also essential to recognize that some states regulate certain wastes as hazardous per state waste regulations. For example, although EPA does not consider used oil being recycled to be a hazardous waste, many states regulate used oil as hazardous waste. Accordingly, the printer needs to understand both the federal definition of waste (as presented in this fact sheet) and what additional wastes the state defines as hazardous. Adoption of appropriate reduction, reuse, and recycling techniques and employing permanent treatment methods will help reduce liability to the greatest possible extent. In all but very limited circumstances, a printer's liability for waste can never be completely eliminated.

If you need assistance, call one of the sources of information listed below:

- Printers' National Environmental Assistance Center (888-US-PNEAC), www.pneac.org
- Printing Industries of America/Graphic Arts Technical Foundation (412/741-6860)
- Your local PIA affiliate office
- RCRA/Superfund Hotline (800/424-9346), Washington, DC (703/557-1938)
- Your state hazardous waste management agency
- Your EPA regional office

Chart A

Characteristics of *Hazardous Waste*

- Waste bleaches and oxidizers

Characteristic	Criteria Of Characteristic Waste	Possible Printing-Related Sources	Waste Code

Ignitability	• A liquid (expect solutions containing less than 24% alcohol) that has a flash point below 140° (60°C); or • A non-liquid capable of spontaneous and sustained combustion under normal conditions; or • An ignitable compressed gas (as defined by DOT); or • An oxidizer (as defined by DOT)	• Chemical products such as blanket and roller washes, cleanup solvents, isopropyl alcohol, and inks. • Shop towels being thrown out for disposal	D001
Corrosivity	• An aqueous material with a pH less than 2.0 or greater than or equal to 12.5; or • A liquid that corrodes steel at a rate greater than ¼ inch per year at a temperature of 130°F (55°C)	• Plate and film processing chemicals, particularly etching chemicals. Acids, waste battery acid, and alkaline cleaners, depending on their pH.	D002
Reactivity	• Normally unstable and reacts violently without detonating; or • Reacts violently or forms an explosive mixture with water; or • Generates toxic gases, vapor, or fumes when mixed with water; or • Contains cyanide or sulfide and generates toxic gas vapors or fumes at a pH between 2 and 12.5.	D003	
Toxicity	• Contains specific toxic contaminants above threshold levels; • Waste needs to be tested2 using specific test method(s); List of some common printing contaminants and threshold levels are provided on the following pages.	• Waste fixer, plate processing chemicals, ink, and cleanup solvents, and specific pesticides. **Please see next chart for specific toxic contaminants.**	D004-D043

Notes:

1. For solvents, check the MSDS. Normally the product's flash point will be provided as "Physical Data."
2. Testing is normally done by an outside laboratory or through a disposal company.

Chart B

List of Chemicals Regulated by TCLP

Organics	Regulatory Levels	Waste Code	Metals	Regulatory Levels	Waste Code
Benzene	0.50 ppm	D018	Arsenic	5.0 ppm	D004
Carbon tetrachloride	0.50 ppm	D019	Barium	100.0 ppm	D005
Chlordane	0.03 ppm	D020	Cadmium	1.0 ppm	D006
Chlorobenzene	100.0 ppm	D021	Chromium	5.0 ppm	D007
Chloroform	6.0 ppm	D022	Lead	5.0 ppm	D008
Cresol	200.0 ppm	D026	Mercury	0.2 ppm	D009
m-Cresol	200.0 ppm	D024	Selenium	1.0 ppm	D010
o-Cresol	200.0 ppm	D023	Silver	5.0 ppm	D011
p-Cresol	200.0 ppm	D025			
1,4-Dichlorobenzene	7.5 ppm	D027			
1,2-Dichloroethane	0.50 ppm	D028			
1,1-Dichloroethylene	0.70 ppm	D029			
2,4-Dinitrotoluene	0.13 ppm	D030			
Heptachlor (and its epoxide)	0.008 ppm	D031			
Hexachlorobutadiene	0.5 ppm	D033			
Hexachlorobenzene	0.13 ppm	D032			
Hexachloroethane	3.0 ppm	D034			
Methyl ethyl ketone	200.0 ppm	D035			
Nitrobenzene	2.0 ppm	D036			
Pentachlorophenol	100.0 ppm	D037			
Pyridine	5.0 ppm	D038			

Tetrachloroethylene	0.7 ppm	D039			
Trichloroethylene	0.5 ppm	D040			
2,4,5-Trichlorophenol	400.0 ppm	D041			
2,4,6-Trichlorophenol	2.0 ppm	D042			
Vinyl chloride	0.20 ppm	D043			
Endrin	0.02 ppm	D012			
Lindane	0.4 ppm	D013			
Methoxychlor	10.0 ppm	D014			
Toxaphene	0.5 ppm	D015			
2,4-Dichlorophenoxyacetic acid	10.0 ppm	D016			
2,4,5-Trichlorophenoxypropionic acid	1.0 ppm	D017			

Possible EPA Toxic Characteristic Contaminants Found in Printing Waste

Contaminant	Waste Code	Regulatory Threshold	Contaminant	Waste Code	Regulatory Threshold
Barium	D005	100.0 ppm	Silver	D011	5.0 ppm
Benzene	D018	0.5 ppm	Trichloroethylene	D039	0.5 ppm
Chromium	D007	5.0 ppm	Vinyl chloride	D043	0.2 ppm
Carbon tetrachloride	D019	0.5 ppm			
Methyl ethyl ketone	D035	200.0 ppm			

Chart C

Examples of F-Listed Wastes

F001	The following spent halogenated solvents used in degreasing: tetrachloroethylene, trichloroethylene, methylene chloride, 1,1,1-trichloroethane, and chlorinated fluorocarbons; all spent solvent mixtures/blends used in degreasing containing, before use, a total of 10% or more (by volume) of one or more of the above halogenated solvents or those solvents listed in F002, F004, and F005; and still bottoms from the recovery of these spent solvents and spent solvent

	mixtures.
F002	The following spent halogenated solvents: tetrachloroethylene, trichloroethylene, methylene chloride, 1,1,1-trichloroethane, chlorobenzene, 1,1,2-trichloro-1,2,2-triflouroethane, ortho-dichlorobenzene, trichlorofluoromethane, and 1,1,2-trichloroethane; all spent solvent mixtures/blends containing, before use, a total of 10% or more (by volume) of one or more of the above halogenated solvents or those solvents listed in F001, F004, and F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.
F003	The following ignitable non-toxic solvents: xylene, acetone, ethyl acetate, ethyl benzene, ethyl ether, methyl isobutyl ketone, n-butyl alcohol, cyclohexanone, and methanol; all spent solvent mixtures/blends containing, before use, only the above spent non-halogenated solvents; and all spent solvent mixtures/blends containing before use, one or more of the above non-halogenated solvents, and a total of 10% or more (by volume) of one or more of the above halogenated solvents or those solvents listed in F001, F002, F004, and F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.
F004	Toxic non-halogenated solvents: Aerosols, cresylic acid and nitrobenzene, all spent solvent mixtures/blends containing, before use, only the above spent non-halogenated solvents; and all spent solvent mixtures/blends containing, before use, one or more of the above non-halogenated solvents, and a total of 10% or more (by volume) of one or more of the above halogenated solvents or those solvents listed in F001, F002, F004, and F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.
F005	The following spent non-halogenated solvents: toluene, methyl ethyl ketone, carbon disulfide, isobutanol, pyridine, benzene, 2-ethoxyethanol, and 2-nitropropane; all spent solvent mixtures/blends containing, before use, a total of 10% or more (by volume) of one or more of the above non-halogenated solvents or those solvents listed in F001, F002, or F004; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.

Chart D

Possible U-Listed Wastes Found In Printing Waste

Name/Description	Waste Code	Name/Description	Waste Code
Acetone	U002	Methyl chloroform	U226
Benzene	U019	Methylene chloride	U080
Carbon tetrachloride	U211	Methyl ethyl ketone (MEK)	U159

Chromium	U007	Methyl isobutyl ketone	U161
Cumene	U055	Tetrachloroethylene	U210
Cyclohexane	U056	perchloroethylene)	
Dibutyl phthalate	U069	Toluene	U220
Ethyl acetate	U112	Toluene diisocyanate	U223
Ethanol, 2-ethoxy	U359	Trichloroethylene	U228
Ethylene glycol monoethyl ether	U359	Vinyl chloride	U043
Formaldehyde	U122	Xylene	U239
Methanol	U154		

Waste Profile Sheet

General Information

Department_____ Waste Coordinator _____

Waste Name

_____

Process Generating the Waste_____

_____

Waste Generation Rate (Gallons or pounds per month)_____

Current Disposal Procedure _____

_____

One-Time Disposal? Yes _____ No _____

Waste Classification

Nonhazardous _____ Residual Waste _____

Hazardous _____ If so, list the EPA Waste Codes: _____ _____ _____ _____

Waste Composition

Tests of Representative Sample	Yes _____No _____	(attach test results)
Process Knowledge	Yes _____No _____	(attach supporting documentation, e.g. MSDSs)

Waste Composition	Percent
1._____	_____
2._____	_____
3._____	_____
4._____	_____
5._____	_____
6._____	_____

General Parameters: Flash Point _____°F pH _____

Physical State at 70°F Solid ____ Liquid ____ Semi-Solid ____ Gas

Waste Packaging Type & Size (e.g., 55-gal, drum) _____

Waste Coordinator Signature _____ Date _____

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