

# Screen Printing Guidelines



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Revised: May 2020

# Guidelines for USF Screen Printing Facilities/Operations

May 2020

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## Introduction

This guide has been developed to assist USF screen printing facilities/operations in complying with environmental regulations. This material is derived from [Publication 459 - Preventing Pollution in Screen Printing](#), 2004, Missouri Department of Natural Resources. The publication is not copyrighted, but we wish to thank and acknowledge the source.

Please note the information provided in this guide is intended to provide general information regarding pollution prevention best management practices as well as hazardous waste considerations specific to screen printing facilities/operations. The State and Federal regulations regarding classifying, managing, and disposing hazardous waste and other waste streams can be highly complex and the fines and other legal implications for non-compliance are significant. Therefore, it is important that everyone working in USF screen printing facilities/operations understand and comply with the requirements as well as consult with Environmental Health & Safety (EH&S) regarding the proper classification, management, and disposal of all materials and associated waste streams.

## Injury and Illness Prevention

The common misperception that Art is not a hazardous activity can lead practitioners to endanger themselves in pursuit of their creative goals. With knowledge and application of how to protect

against injury from exposure to hazardous materials, artists can be assured of a long and productive career. The USF [Chemical Hygiene Plan](#) and [Safety & Compliance in the Arts](#) documents are important resources for more information about hazardous activities and the safe handling of hazardous materials, including chemical storage, safe behaviors, and proper personal protective equipment.

## **Pollution Prevention**

Screen printing facilities/operations deal with materials such as ink, haze removers, and solvents that can harm the environment if not properly managed. State and federal environmental regulations determine how these materials may be used and disposed. Preventing waste and/or pollution in the first place is a better strategy.

### *What is Pollution Prevention?*

Pollution prevention is not making the waste (or pollutant) in the first place. It means making efforts to reduce the amount and toxicity of the wastes generated. Preventing pollution may be as simple as using a catch basin to prevent spills, or as complex as redesigning an operation to increase efficiency and reduce waste. Simple things like choosing non-hazardous solvents can protect the environment and reduce environmental regulation. Pollution prevention means thinking about the environmental impact of an action, and trying to limit the resulting impact.

### *Why Prevent Pollution?*

When generated, waste or pollution must be managed safely and legally. Whether it is household trash or waste from a business, managing wastes costs money. Many purchased materials are used once and then disposed, which costs money. Reducing the amount of wastes generated saves money. Reducing costs is a major reason to prevent pollution. Here are a few others:

- Improved facility environment and student/employee safety.
- Reduced liability.
- Increased efficiency.
- Fewer regulatory requirements.
- Better environmental protection.
- Enhanced marketing and public relations opportunities.

### *What Can Be Done at Screen Printing Facilities/Operations?*

There are many ways to prevent pollution at screen printing facilities/operations. Here are a few general tips:

- Keep work areas clean and well organized to help prevent accidents.
- Use drip pans and splashguards where spills frequently occur.
- Fix leaks immediately.
- Don't buy more than needed... the leftovers may become waste.
- Purchase the least toxic or hazardous product available.
- Use the oldest items first (first-in, first-out).
- See if suppliers will take back excess or unneeded materials.
- Include the cost of disposal when making purchasing decisions. What looks like the cheapest option may cost more because of disposal or other management costs.
- Store materials in a way that keeps them from being damaged.
- Inspect storage areas regularly for leaks.

- Make sure all items are clearly labeled. Store products in original containers, whenever possible.
- Segregate wastes properly in appropriately labeled containers.
- Store items that could leak in a place where leaks will be contained and easily spotted.
- Make a list of wastes, and try to find a way to eliminate each of them. For example, use a rag service instead of throwing away paper towels.

## Hazardous Waste

Many screen-printing operations can generate hazardous wastes. It is a requirement to make waste determinations in order to manage wastes properly and in compliance with regulatory requirements.

### *What is a Hazardous Waste?*

A waste is a material that is no longer wanted or needed, and which will be discarded. It can be a solid, liquid, or gas. A waste is hazardous if it has properties that could be dangerous to human health and the environment. Solvents, screen reclamation chemicals and inks are examples of wastes that could be hazardous wastes.

Waste generators must determine if a waste is a hazardous waste. A waste is a hazardous waste if:

- It is listed as a hazardous waste in the Federal regulations,
- It exhibits a hazardous characteristic, or
- It is a mixture of a listed hazardous waste and any other waste.

### Listed Hazardous Waste

The Federal government publishes lists of hazardous wastes. There are four different lists: The F list, the K list, the P list, and the U list. Wastes that are on the P list are called "acutely hazardous wastes" and are regulated more strictly than the other types.

### Characteristic Hazardous Waste

Some wastes that are not specifically listed by name may still be regulated hazardous wastes because they have characteristics that make them hazardous. There are four characteristics:

- Ignitable – A waste with a flashpoint of less than 140 °F, or solids that catch fire easily and burn so rapidly they create a hazard. Some solvents are ignitable.
- Corrosive – A waste with a pH less than or equal to 2.0 or greater than or equal to 12.5. Some haze removers are corrosive.
- Reactive – Wastes that are normally unstable, react violently with water, can explode or release poisonous gases. All pressurized aerosol cans are considered reactive.
- Toxic – Wastes with defined concentrations of certain organic chemicals, heavy metals, or pesticides when tested by the toxicity characteristic leaching procedure (TCLP). Federal regulations contain a list of toxic chemicals (D List). Some inks and paints are toxic due to the presence of heavy metals.

## Mixed Waste

Any waste mixed with a waste that is on the F, P, K, or U lists becomes hazardous waste, even if there is only a very small amount of listed hazardous waste in the mixture.

### *Is the Waste Hazardous Waste?*

To find out if a waste is a hazardous waste, check to see if it is on the lists of hazardous wastes. If it is not, find out if it exhibits one or more of the hazardous characteristics. Check the safety data sheet (SDS) or contact the supplier for information. If you are not 100% sure if a waste is not a hazardous waste, contact EH&S to assist with a determination.

## **Hazardous Waste Management**

### Containers

Hazardous waste containers must be in good condition. If a container leaks, transfer waste to a new container immediately.

- Do not store containers outside, unprotected from the weather.
- Containers must be closed, except when adding waste.
- Use self-closing funnels, if the funnel will remain attached to the container when not adding waste.
- Use containers that are compatible with the waste. For example, use HDPE (high-density polyethylene) plastic containers for corrosive wastes.
- Never place incompatible wastes, such as wastes that react with each other (acids and bases) in the same container.

### Storage

- Keep adequate aisle space around containers to allow inspection for leaks and damage.
- Store containers of incompatible wastes in separate areas.
- Store liquids in secondary containment.
- Store no more than 55 gallons of hazardous waste or 1 quart of acutely hazardous waste.

### Labels

Containers of hazardous waste must be labeled with:

- The words "Hazardous Waste,"
- The contents, including percentages for mixtures, and
- An indication of the hazard(s) of the contents (i.e. flammable, corrosive, toxic, etc.).

### Training

- Train all individuals to identify, reduce, and properly handle wastes.
- Train new individuals before they handle hazardous waste.
- See the [EH&S training web page](#).

### Post Emergency Information

Small quantity generators must post the following information near every telephone:

- Fire department phone number.
- Emergency coordinator's name and phone number.
- Fire alarm and extinguisher locations.
- Locations of spill control materials.

## Solvent-Contaminated Shop Towels

Discarded shop towels or rags, whether cloth or paper, may be contaminated with hazardous chemicals. If they are, the towels or rags may be hazardous waste. Recall from the [Hazardous Waste section](#) that any waste mixed with a listed hazardous waste becomes a hazardous waste. A waste is also a hazardous waste if it meets the definitions of toxic, ignitable, reactive, or corrosive characteristic hazardous wastes. See the [Hazardous Waste section](#), for more information.

### *“Solvent-Contaminated Wipes” Exclusion*

Before disposing of any shop rags (reusable or disposable), determine if they are hazardous waste. Rags that contain listed hazardous wastes (other than solvents) or exhibit the characteristic of corrosivity, reactivity or toxicity due to contaminants other than solvents are a hazardous waste. Rags that are contaminated with ONLY solvents are not considered hazardous waste provided the conditions of the exclusion are met. These are called “Solvent-Contaminated Wipes.”

### *What are Solvent-Contaminated Wipes?*

- Wipes containing one or more F001-F005 listed solvent or the corresponding P- or U-listed solvents (see the example list below).
- Wipes that exhibit a hazardous characteristic resulting from a listed solvent.
- Wipes that exhibit only the hazardous characteristic of ignitability when containing one or more non-listed solvents.

### *Examples of F001-F005 Listed Solvents*

- Acetone
- Ethyl benzene
- Isobutyl alcohol
- Methanol
- Methyl ethyl ketone (MEK)
- Methylene chloride
- Tetrachloroethylene
- Toluene
- Trichloroethylene (for reusable wipes only)
- Xylenes

### *To Meet the Conditions of the Exclusion*

Wipes must be:

- Contained in non-leaking, closed containers.
- Void of free liquids.
- Labeled “Excluded Solvent Contaminated Wipes.”
- Accumulated for less than 180 days onsite.

The generator is required to retain the following documentation: Name and address of laundry, dry cleaner, landfill or incinerator, documentation that the 180-day accumulation time limit is being met, and a description of the process used to meet the “no free liquids” condition.

No Free Liquids Condition: Use mechanical wringers, solvent extraction technologies or process knowledge to ensure that if the Paint Filter Liquids Test (EPA Methods Test 9095B) were performed, the wipes would pass. **Air-drying (evaporation) of shop rags is not allowed.**

### *Disposal Options for Shop Rags*

#### Non-hazardous rags

- Dispose in the trash or launder at a commercial laundry facility or dry cleaner.

#### Hazardous rags

- Dispose through a licensed hazardous waste storage, treatment, and disposal facility.

#### Solvent-contaminated reusable wipes

- Launder at a properly permitted commercial laundry facility or dry cleaner.

#### Solvent-contaminated disposable wipes

- Dispose at a County Solid Waste Facility.\*

\* Note: County Solid Waste Facilities may have additional requirements for acceptance. For example, in addition to being labeled with the words “Excluded Solvent-Contaminated Wipes” and not containing any free liquids, Pinellas County requires the rags to be in a clear, 6-Mil or thicker sealed plastic bag, and disposed by appointment.

### *Managing Shop Rags as Hazardous Waste*

USF screen printing facilities/operations may wish to manage and dispose of their shop rags as hazardous waste since the regulatory burdens and costs, other than complying with training and satellite accumulation area requirements, are borne by EH&S. Assume all rags contaminated with solvents, inks, degreasers, haze removers, etc. are hazardous waste and manage according to the [Hazardous Waste Management section](#).

#### *Remember*

- Use the least amount of solvent needed. Use a wringer, centrifuge, or similar device to remove excess the liquid from towels. Reuse the collected solvents, if possible.
- Determine if contaminated shop towels are hazardous waste prior to disposal, and follow the regulations that apply.
- Shop towels contaminated with listed hazardous wastes other than those covered by the “Solvent-Contaminated Wipes” Exclusion are hazardous waste.
- Shop towels used to clean up spills of listed hazardous waste must be managed as hazardous waste. They may not be laundered or sent to the sanitary landfill; they must be disposed of at a permitted hazardous waste treatment, storage, and disposal facility.
- If dirty shop towels are laundered and reused, they are not waste. Let the laundry know what type of solvents or other material is on the dirty towels.
- Remember that oily or solvent-soaked towels can catch fire easily. Store them in a self-closing, flame-resistant can in a well ventilated area.

## **Wastewater**

The screen printing process generates wastewater. Depending on the specific materials/chemicals and process generating the wastewater, the wastewater could potentially be hazardous waste. In the event that a waste determination indicates the wastewater is hazardous, the wastewater will have to be managed/disposed according to applicable regulations (no drain disposal; see [Hazardous Waste](#) and [Hazardous Waste Management Sections](#)). Contact EH&S if there are difficulties in determining whether the wastewater is hazardous waste.

With respect to non-hazardous wastewater, USF facilities are generally located in communities that provide sewer collection and wastewater treatment service. These publicly owned wastewater systems have discharge standards and industrial wastewater pretreatment standards. Pretreatment is the reduction, elimination, or alteration of pollutants prior to discharge to a publicly owned wastewater system.

Good waste management practices that reduce, reuse, and recycle wastewater can greatly reduce disposal costs. They will also help protect sewer systems and treatment plants. These waste management practices are called pollution prevention. Pollution prevention options for screen printers include management practices, equipment modifications, and process modifications.

#### *Remember*

- Contact EH&S to determine wastewater discharge limits and prohibitions. Pre-treatment of wastewater may be required before it goes to the treatment facility.
- Do not send wastewater to a septic system.
- Do not dispose of wastewater into storm drains, onto the ground, or into a body of water.

## **Materials**

### **Solvents**

Waste solvents used in cleaning make up a large part of the hazardous waste generated from screen printing. Reusing or recycling solvent and using the least hazardous solvent that will do the job help to protect the environment, protect individuals in the shop, and saves money. Reusing solvent can be easy and inexpensive. Use the dirty solvent as a first rinse for dirty equipment. Another method is to settle out the solids in used solvent. Put the used solvent in a closed container labeled "solvent for reuse," and leave it undisturbed until the solids settle out. Siphon off the liquid solvent and collect the sludge for proper disposal.

Usually the solvent as well as the sludge that settles out of used solvent is hazardous waste because it is ignitable, toxic, or corrosive or because the solvent is a listed hazardous waste. If the waste has a flash point of less than 140 degrees F, it is ignitable hazardous waste. If it contains toxic materials (usually metals like chromium or lead) over certain levels it is a toxic hazardous waste. Corrosive hazardous wastes have a pH of 12.5 or more or a pH of 2 or less. The safety data sheet (SDS) should indicate the flash point, the pH, and any toxic chemicals present. Common hazardous waste solvents include trichloroethylene, tetrachloroethylene, methylene chloride, xylene, acetone, methyl ethyl ketone, toluene, and others.

Contact EH&S if there are difficulties in determining whether the sludge is hazardous waste.

If the waste is non-hazardous, either from generator knowledge or by testing, it can go in the regular trash if the waste is dry. Non-hazardous liquid waste can be dried out by mixing it with an absorbent like kitty litter or drain disposed, if approved by EH&S.

## **Air Pollution from Solvents**

Many solvents contain volatile organic compounds (VOCs). VOCs are chemicals that evaporate into the air and then react with sunlight to form urban ozone (smog). Smog has serious health effects on the human respiratory system. Aside from coughing, headaches, and nausea, smog can cause permanent lung damage. Another category of hazardous chemicals used in printing activities are hazardous air pollutants (HAPs). HAPs are chemicals that are believed to cause cancer. Exposure to HAPs above certain concentrations can also cause health effects such as birth defects, nerve disorders, and other chronic and acute diseases. Many VOCs are also HAPs. VOCs and HAPs may also be regulated hazardous wastes.

The safety data sheet (SDS) will have information on the presence of VOCs and HAPs in the products. Always try to use the material with the lowest percentage of VOCs and HAPs possible.

Here are some suggestions for reducing VOC and HAP use:

- Work with vendors to find products that contain little or no air pollutants. Look for low-VOC, HAP-free inks, adhesives, screen cleaners, haze removers, coatings, and other compounds. Do not forget about maintenance chemicals, paints, and cleaning chemicals.
- Recycle waste inks. Waste inks of different colors can be blended together to make black ink. A small amount of ink or black toner may be needed to obtain an acceptable color. Look for ink vendors who will take waste ink for re-blending.
- Store VOC-containing materials in closed containers. Open containers allow VOCs to evaporate, causing air pollution, potentially unhealthy work environment, and wasting solvent.
- Use closed containers for solvent at workstations.
- Add receiving funnels with automatically closing covers to storage containers to reduce spills and evaporation.
- Collect and store used rags in a self-closing, flame-resistant can. If the rags are regulated hazardous waste, be sure the containers are properly labeled. See the [Shop Towels section](#).
- Use the least amount of cleaner possible.
- Be sure everyone realizes the risks and costs associated with VOCs and HAPs. Train people to use good housekeeping and pollution prevention practices such as those described here. Ask for ideas on preventing pollution.

### *Reducing Solvent Waste*

Solvents can be expensive to purchase and to dispose. It makes good sense to try to reduce the amount of solvent used. Often, solvents can be reused or recycled, which allow the purchase of less new solvent. Reducing the amount of solvent used saves money and helps protect the environment.

Here are some ideas for reducing solvent waste:

- Keep solvent containers closed. Solvent that evaporates is solvent paid for and not used.
- Set up and follow a maintenance schedule for equipment. This can prevent leaks.
- Check regularly for leaks, drips, and spills. Repair leaks and clean up spills right away.
- Schedule jobs to reduce the need to clean between jobs.
- Use slightly dirty solvent for the first rinse of equipment.

- Use a scraper or spatula to remove ink from stir sticks and containers.

### *Remember*

- Waste solvent may be hazardous waste.
- Ask suppliers if non-hazardous solvents are available.
- Use the least toxic solvent that will do the job.
- Solvent that evaporates is solvent paid for and not used. Keep containers tightly closed and in good condition.
- Use the solvent with the lowest VOC content possible.

### **Inks**

Some inks contain chemicals that can cause harm to people and the environment if not properly managed. Solvents found in some inks can cause air pollution and may be hazardous waste when disposed. Pigments may also contain metals that can cause the ink to be hazardous waste. It is important to properly manage inks to protect employees, students, and the environment.

Whether a specific ink is hazardous waste depends on the amount and type of heavy metals, solvents and other chemicals it contains. Hazardous solvents commonly found in inks include ethanol, isopropanol, ethylene glycol, xylene, toluene, cyclohexanone, and petroleum distillates. These solvents also contain volatile organic compounds (VOCs). VOCs are chemicals that can cause indoor health problems such as lung irritation and outdoor problems such as smog.

Pigments containing lead, chromium, silver, cadmium, and barium may be hazardous wastes depending on the amount of heavy metals in the ink. Most inks used by textile printers don't contain heavy metals, but check the safety data sheet (SDS) or contact the ink supplier to be sure.

The SDS for the inks should contain information on what chemicals are in them, including the solvents, metals and amount of VOCs. The SDS may not contain enough information to decide if inks are hazardous wastes. The supplier should be able to provide this information.

If these sources do not help, contact EH&S and provide SDS.

If waste ink is a regulated hazardous waste, it is a requirement that it be managed properly.

If a waste ink is not a hazardous waste, check the SDS for recommended disposal methods. Do not put liquids in the trash. Non-hazardous inks can be mixed with an absorbent material such as kitty litter, and then disposed in the trash.

If the shop drains lead to a sewer and wastewater treatment plant, water-based inks may be able to go down the drain. Contact EH&S for a determination. Do not put ink, solvent or other chemicals down the drain unless EH&S has approved.

Never pour solvents or any other wastes onto the ground. Doing so can seriously harm people and the environment. There are also serious penalties for illegally disposing of waste.

### *Remember*

- Inks may be hazardous waste when discarded. Check SDS or ask the supplier/EH&S for a determination.
- See the [Hazardous Waste section](#) for more information.
- There are many non-hazardous inks on the market. Ask suppliers to help find inks that are not hazardous and that contain little or no VOCs.
- Find ways to reduce the amount of ink used. Reuse waste ink. Work with the supplier to have inks re-blended.
- Use a scraper or spatula to remove as much ink as possible from containers, stir sticks, adhesive tape, and screens and return ink to the container.

### **Screens**

In most cases, throwing away screens is much more expensive than reclaiming them. Some chemicals used in screen reclamation can harm the environment and pose a risk to public health. Ink remover, emulsion remover and haze remover have many different formulations, some of which may be regulated as hazardous wastes or they may cause problems for the wastewater treatment plant. Check the [Hazardous Waste section](#) or with EH&S to find out how the chemicals are regulated. Haze removers, in particular, often have a very high pH, causing them to be corrosive and potentially a hazardous waste.

Screen reclamation chemicals can be a hazardous waste due to the ink or other material cleaned from the screen. For example, if the ink contains heavy metals such as cadmium, lead, chromium, silver, and/or barium it could be hazardous waste. When mixed with screen reclamation chemicals, the mixture could also be hazardous waste depending on the concentration of the metals.

Never put screen reclamation chemicals that are considered hazardous waste down the drain. If the facility is connected to a sewer system leading to a wastewater treatment plant, check with EH&S to see if it is safe/compliant to discharge any chemicals down the drain. Some chemicals can harm the treatment plant, and they must be treated before going down the drain. For example, the high pH in some haze removers can damage sewer systems and treatment plants.

Never pour screen reclamation chemicals or any other wastes onto the ground. Doing so can harm people and the environment. There are also serious penalties for illegally disposing of waste.

Disposing of screens wastes money and precious natural resources. However, screens eventually become too worn or damaged to reclaim. There are some situations where screen reclamation is impractical. In these cases, waste screens must be properly disposed or recycled.

Be sure to remove as much ink as possible from the screen before discarding or recycling. This will save ink costs by allowing the ink to be reused.

If the ink on the screen is regulated hazardous waste, the screen itself may be hazardous waste. Avoid this problem by using non-hazardous inks and cleaning chemicals and by removing ink from the screen before disposal or recycling.

### *Remember*

- Reclaim screens when possible. Clean screens over a container so waste solvent can be captured and reused.
- Remove all excess ink or other chemicals from screens before disposal.
- A hazardous waste determination must be made prior to disposal and use the correct disposal process. Carefully follow the rules for managing hazardous waste. See the [Hazardous Waste section](#) for more information.
- Determine if screen reclamation chemicals contain volatile organic compounds (VOCs) or hazardous air pollutants (HAPs). See the [Air Pollution from Solvents section](#) for more information.
- Look for and use non-hazardous chemicals with little or no VOCs and no HAPS. Consider the expense of managing hazardous waste when buying chemicals.
- Don't mix chemicals together. Mixing hazardous waste with non-hazardous waste may make all of the waste hazardous waste.

### **Aerosol Cans**

Aerosol cans may contain hazardous chemicals, such as 1,1,1-trichloroethane or toluene. In some cases, an aerosol can may be hazardous waste because of what it contains or did contain. It is important to manage this waste carefully to protect human health and the environment.

If an aerosol can is completely empty (no pressure and no remaining product), it can be recycled or sent to a sanitary landfill for disposal. However, if it cannot be determined that an aerosol can is completely empty, such as when the spray nozzle is missing, the aerosol can must be collected as hazardous waste and picked up by EH&S.

### Remember:

- Unless an aerosol can is completely empty (pressure and product), it is regulated as a hazardous waste.
- Completely empty cans can be recycled with steel.
- Switch to non-aerosol products if possible, such as manual pump cans or bottles, especially if they can be refilled.
- Follow label directions to prevent clogging.