

Best Management Practices



Screen & Lithographic Printer's Waste



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Introduction

Printers across the state regularly generate wastes that are of concern to the environment. Film developing, printing and cleanup operations in your shop generate wastes such as used fixer, waste ink, ink cleanup sludges, and shop towels. These wastes may pose solid waste, hazardous waste, or water quality concerns.

Silver has a very high aquatic toxicity and accumulates in the tissue of aquatic organisms. Because of concerns with silver, fixer is a state and federal hazardous waste. With thousands of businesses in Washington State generating used fixer; it's important that each one do their part to manage these wastes correctly and keep them out of the soils and waters of the state.

You play an important role. Used fixer and other hazardous wastes don't belong on the ground, untreated down the drain, or in the dumpster. Good waste management practices are important for the following reasons:

- You'll ensure that you're in compliance with federal, state and local waste management regulations and avoid costly penalties.
- You'll provide a safer, healthier workplace for you and your employees.

Water Quality Requirements

Local Sewer Discharge Limits

The LOTT Clean Water Alliance operates a "delegated" Pretreatment Program. This means that the Department of Ecology has granted LOTT regulatory authority to draft local ordinances, develop discharge permits, and regulate local businesses. LOTT has developed a local limit for silver for discharges less than 1,000 gallons a day of no more than 0.002 pounds per day. The following chart shows the maximum concentration (mg/L) that discharges less than 1,000 gallons per day can have and not exceed the 0.002 pounds per day silver limit.

Gallons Per Day	Local Limit (mg/L)	Pounds Per Day	Gallons Per Day	Local Limit (mg/L)	Pounds Per Day	Gallons Per Day	Local Limit (mg/L)	Pounds Per Day
up to 48	< 5.0	0.002	95	2.5	0.002	550	0.4	0.002
50	4.8	0.002	100	2.4	0.002	600	0.4	0.002
55	4.4	0.002	150	1.6	0.002	650	0.4	0.002
60	4.0	0.002	200	1.2	0.002	700	0.3	0.002
65	3.7	0.002	250	1.0	0.002	750	0.3	0.002
70	3.4	0.002	300	0.8	0.002	800	0.3	0.002
75	3.2	0.002	350	0.7	0.002	850	0.3	0.002
80	3.0	0.002	400	0.6	0.002	900	0.3	0.002
85	2.8	0.002	450	0.5	0.002	950	0.3	0.002
90	2.7	0.002	500	0.5	0.002	≥ 1,000	0.2	N/A

Any waste stream exceeding these limits is an illegal discharge and violators will be subject to a costly fine. The LOTT Clean Water Alliance Pretreatment Program hopes that through education and Best Management Practices about proper waste management, businesses will minimize the amount of wastes sent to the sanitary sewer. Utilizing waste minimization methods and centralized treatment and recovery of silver-bearing wastes are a few ways to accomplish this.

Managing Used Fixer and Silver Bearing Waste

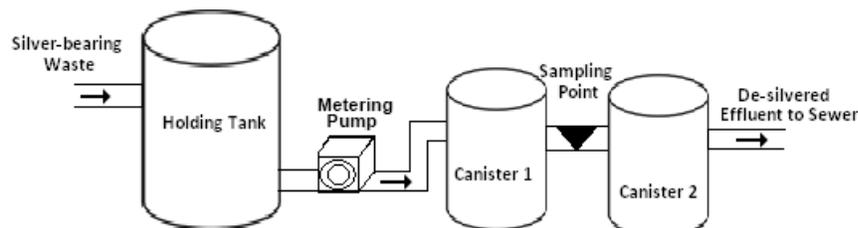
Printers generate used fixer as a normal part of doing business. Used fixer contains up to 4,000 mg/L silver. This number greatly exceeds LOTT Clean Water Alliance's hazardous waste limits for silver. Used fixer should never be discharged to the sanitary sewer without proper silver recovery, either at your place of business or through off-site management. And it should never be put into storm drains, septic systems or dry wells.

On-Site or Off-Site Management?

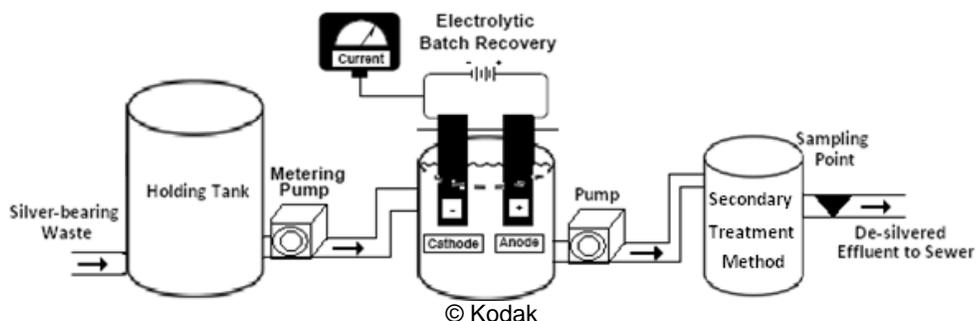
Silver-bearing wastes can have monetary value, and some businesses are using on-site technologies to reclaim their spent silver. These businesses should consider this option carefully as they will be fully responsible for proper management and results of the system they choose. Businesses can choose whether to use on-site treatment, off-site treatment, or a combination of both. While a business generating large volumes of used fixer may recover the costs of their on-site recovery system in a matter of months, smaller volume producers like grocery store minilabs may not see a similar payoff. It is important to remember that whichever strategy you choose, your business must meet hazardous waste and local sewer discharge limits for silver-bearing wastes.

Historically, on-site silver recovery has focused on economics rather than meeting hazardous waste and sewer discharge limits. On-site silver recovery designed to meet such limits is not as simple as plugging in a machine and walking away. It takes a lot of time, effort, and trial and error to do it right. There are currently several on-site recovery units on the market.

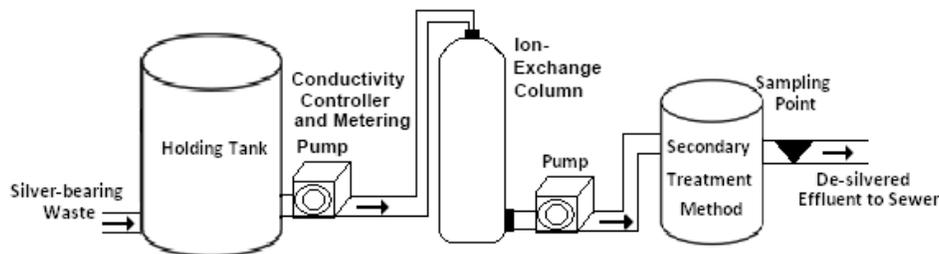
Chemical Recovery Cartridges (CRCs) are hollow canisters that contain steel fibers or fiberglass impregnated with iron filings. When the solution containing dissolved silver contacts the iron, the iron is dissolved and is discharged with the effluent while the silver stays in the steel fibers to be reclaimed. To meet local discharge limits, CRCs need to be used in a series of two canisters.



Electrolytic Recovery units work by attracting positively-charged silver ions to a negatively-charged cathode that is immersed in used silver-bearing waste. A disadvantage is that it can only reduce silver concentrations down to a range of 100 to 300 mg/L. Without further reclamation, your effluent will not meet hazardous waste or sewer discharge limits. Electrolytic units should be used in combination with another system, such as CRC or Ion Exchange, to meet local silver discharge limits.



Ion Exchange uses a resin that attracts negatively charged silver thiosulfate complex to positively charged sites on the ion exchange resin. When all the positively charged sites are filled, breakthrough occurs and the resin is regenerated and the silver recovered. Cost, space required, and technical requirements typically make ion exchange suitable only for larger photographic facilities. This system is generally considered suitable only for dilute solutions and should be used in combination with another system, such as CRC or Electrolytic Recovery, to meet local silver discharge limits.



Evaporation and Distillation units are used to reduce the volume of liquid waste that has been produced. If ammonia is present in the waste stream, as in the case of fixers and bleach-fixers, the ammonia must be removed prior to evaporation/distillation. This can be done using activated carbon. The sludges or solids that remain are typically hazardous because of the silver they contain, and must be disposed of accordingly. Your local air authority should be consulted if you use an evaporator that discharges into the air.

Method	Advantages	Disadvantages	Effluent Concentration
CRC/Metallic Replacement	<ul style="list-style-type: none"> • Low investment • Low operating cost • Simplest operation 	<ul style="list-style-type: none"> • High iron content of effluent • Silver recovered as sludge • High silver concentration in effluent unless two units are in series. 	0.2 to 15 mg/L
Electrolytic Recovery	<ul style="list-style-type: none"> • Recovers silver as a pure metal • High silver recovery 	<ul style="list-style-type: none"> • Potential for sulfide formation • High silver concentration in effluent unless used in combination with another system 	50 to 250 mg/L
Ion Exchange	<ul style="list-style-type: none"> • Attains very low silver limits 	<ul style="list-style-type: none"> • High investment • Complex Operation • Only for dilute influent (wash water) 	0.1 to 2.0 mg/L
Evaporation	<ul style="list-style-type: none"> • Minimum to no aqueous effluent • Water Conservation 	<ul style="list-style-type: none"> • High energy requirement • Organic contaminant buildup • Silver recovered as a sludge • Potential air emissions 	No effluent

Businesses opting to use on-site silver recovery using Chemical Recovery Cartridges (CRCs) in a series of two canisters will be deemed as meeting LOTT's local limit. Businesses who do not install a silver recovery unit may need to prove compliance by testing their wastewater or may have no choice but to explore off-site options.

Off-site management of used fixer has certain advantages over on-site recovery. Capital, operation, and maintenance costs for equipment are non-existent. Administrative costs, such as analytical monitoring, are not incurred. If a business has space limitations, the off-site option may help ease crowding. Most importantly, having used fixer managed off-site will ensure that hazardous waste and local silver discharge limits for silver will not be violated at your facility.

The downside to off-site management may be in putting your hazardous waste into the hands of a third party. In addition, off-site hauling may create more air pollution due to increased trucking and transporting of wastes. If you choose an off-site option, carefully choose the company; you still have the ultimate responsibility for the proper management of your wastes.

Hazardous Waste Generated

Common products used in printing have the potential of generating hazardous waste. Knowing how to handle and dispose of these products will help you manage your wastes, prevent hazardous spills, make safer working conditions, and help your business achieve regulatory compliance. If possible, try to use products which do not contain 10% or more of the following hazardous chemicals. Products containing more than 10%, before use, are considered hazardous when disposed of. Look at your MSDS sheets to determine if you are using these chemicals. If you are, you can work with your vendors to find safer alternatives to help minimize the hazardous waste you generate.

acetone cresols and cresylic acid	ethyl benzene nitrobenzene
benzene n-butyl alcohol	ethyl ether 1,1,1-trichloroethane
carbon disulphide 2-nitropropane	isobutanol 1,1,2-trichloroethane
carbon tetrachloride ortho-dichlorobenzene	methanol 1,1,2-trichloro-1,2,2-trifluoroethane
chlorinated fluorocarbons pyridine	methyl ethyl ketone (MEK) xylene
chlorobenzene tetrochloroethylene	methyl isobutyl ketone (MIBK) ethyl acetate
cyclohexanone toluene	methylene chloride trichlorofluoromethane

Developer

Developers change silver halide into metallic silver. Most developers for black and white film contain a small percentage of hydroquinone. These developers, if disposed as an **unused** product, will be hazardous due to hydroquinone levels. However, hydroquinone is consumed during use and does not show up in used developer in concentrations that would be considered hazardous waste.

- If possible, purchase developer solutions that contain less than one percent hydroquinone—check with your supplier or look on your Material Safety Data Sheet.
- Never put used or unused developer into a septic system, storm drain, dry well, or onto the ground.
- Never dispose of unused or past shelf life developer to the sanitary sewer.

Emulsion and Ink Remover

Many of the ink and emulsion removers used to clean screens before and during screen reclamation contain hazardous chemicals, such as 1,1,1-trichloroethylene and xylene. The previous list of chemicals are always hazardous after being used for cleaning. Any ink or emulsion that comes in contact with one of these listed ink/emulsion removers will also be a hazardous waste when discarded.

Emulsion and ink removers can also contain volatile organic compounds (VOCs) that evaporate into the air causing potential health and environmental problems including lung irritation and outdoor smog formation.

- Remove extra ink from screens with a scraper or spatula before using ink remover.
- Return excess ink to marked containers
- Attach labels to waste solvent containers, identifying them as hazardous waste.
- Never dispose of cleaning solvents to a sanitary sewer, storm drain, septic system, dry well, or onto the ground.
- Use a solvent pump-can instead of pouring the solvent out of a jug. This will protect your employees from possible spills and will minimize exposure.

- If you mix a non-hazardous solvent with a hazardous solvent, then the entire mixture will be considered a hazardous waste.
- Never store solvents near a heat source

Fixer

Fixing sets the image areas and removes the light sensitive silver halides that could cause the photo image to darken with time. Fixer allows silver to dissolve out of the film and paper into the solution. As a result, used fixer contains up to 4,000 parts per-million (ppm) silver. Because of these high silver levels, used fixer is a hazardous waste.

- Never put used fixer into the sanitary sewer unless it meets the LOTT Clean Water Alliance local sewer discharge limits. LOTT has a local silver discharge limit based on the concentration, pounds, and gallons of wastewater discharged from your business each day. Refer to the chart on page 3 to determine your business's silver limit. A discharge higher than what your waste-stream allows will be subject to a costly fine.
- Attach labels to your used fixer containers, identifying them as hazardous waste.
- Count the volume of used fixer generated during the month toward your hazardous waste total if accumulated or stored prior to discharge.
- Never put used fixer into a septic system, storm drain, the ground, surface water, or any other drain.

Fountain Solutions

Although fountain solution is composed mainly of water, some chemicals that are added to increase wetting ability can create health and environmental problems. The most common additive, isopropyl alcohol, is a volatile organic compound (VOC). VOCs are highly evaporative compounds that can cause health problems such as lung irritation. Certain alternatives to alcohol, such as ethylene glycol at greater than 10 percent concentration, could make fountain solutions a hazardous waste.

- Consider changing to an alcohol free fountain solution. Look for a substitution that is not a hazardous waste.
- Consider using a recirculating chiller unit that keeps the fountain solution clean and will also reduce evaporation.
- Never dispose of waste fountain solution that contains hazardous chemicals down the drain. And never dispose of it to a septic system, storm drain, dry well, or onto the ground.

Haze Remover

Haze removers can have a pH high enough to cause them to be a hazardous waste. If the pH of a material is over 12.5 when it is disposed, it is a hazardous waste and should be disposed of accordingly.

Parts Washer Solvent

Printers sometime use parts washer solvent tanks for cleaning parts and tools. Solvents used include mineral spirits, Stoddard solvent, petroleum naphtha, and xylene. They typically become hazardous wastes when they can no longer be used. These used solvents are hazardous because they are ignitable and/or toxic, and may contain some of the previously listed wastes on page 6.

- Never dispose of spent solvents to drains, the air or the ground.
- Never evaporate solvents as a means of disposal as this creates volatile organic compounds (VOCs).

- Never mix solvents with any other waste and keep the different types of solvents in separate, labeled, and closed containers.

PMT Activator

Creating a photo mechanical transfer (PMT) requires an activator solution. Used activator may contain up to 20 mg/L silver, making it a hazardous waste.

- Never put activator into the sanitary sewer unless it meets the hazardous wastes and sewer discharge limits. Refer to the chart on page 3 to determine your business's silver limit. A discharge higher than what your waste-stream allows will be subject to a costly fine.
- Never put activator into a septic system, storm drain, dry well, or onto the ground.

Plate Developing Solutions

In the past, plate developers were solvent based and potentially hazardous. Some also had a high enough pH to make them a hazardous waste. Today, water-based or aqueous plate developing solutions contain little or no solvent. These developers are plate specific, so changing developers also means changing to aqueous plates. The change can yield many advantages including increased quality and durability, shorter exposure times, and decreased fogging. Aqueous plates also cost about the same as solvent-based plates, require no procedural changes, and since less chemicals are used in the developer; the developers are generally less expensive. Activator solutions for "silver master" plates will contain some silver; consult the MSDS sheet to verify whether it will be a hazardous waste when disposed. During development, electrostatic plates are often treated with a cyanide solution. This solution is considered hazardous, and should be disposed of properly.

- Manage cyanide developing solutions from electrostatic plates as a hazardous waste and never pour it down the drain.
- If you haven't done so already, switch to aqueous plates. These plates are usually 80 to 90 percent water which makes them less likely to be considered hazardous.

Press Washes

Volatile organic compounds (VOCs) are highly evaporative compounds that can cause health problems such as lung and nervous system irritation, and contribute to the formation of smog. Press washes have a very high VOC content, typically ranging from 80 to 100 percent VOC. Press washes may also contain chemicals that could cause them to be a hazardous waste when disposed. These used washes are hazardous because they are ignitable and/or toxic, and may contain some of the previously listed wastes on page 6.

- Work with your vendor to find the lowest VOC press wash that still works for you.
- Never saturate shop towels with too much press wash. Use the minimum amount needed to do the job.
- Never dispose of waste press washes that contain hazardous chemicals down the drain. And never dispose of it to a septic system, storm drain, dry well, or onto the ground.

Screen Degreasers

The degreasers used to clean screens during screen preparation and after screen reclamation have a wide variety of chemical properties. Some degreasers are mild detergent solutions which do not raise any hazardous waste or water quality issues. Other degreasers may contain chemical solvents that would be "listed" hazardous waste when disposed. Consult the MSDS sheet to verify if your product contains any of these chemicals.

- If your screen degreaser contains chemicals listed on page 6, or a chlorinated solvent, do not wash the screens over a sink, near a drain, or outside where runoff could come in contact with storm or sewer drains. Collect the rinsate and manage as a hazardous waste.

Shop Towels

Some solvents and inks are hazardous waste when thrown away. Because of this, shop towels are often hazardous waste when they are contaminated with these solvents and inks.

- Never dispose of waste solvent or ink by pouring or placing them into containers of used shop towels or individual shop towels
- Keep waste shop towels in a closed fireproof container marked "CONTAMINATED SHOP TOWELS ONLY!"
- Never throw contaminated towels into your dumpster.
- Never saturate towels with solvent or ink
- If you use disposable towels with hazardous solvents, dispose of them as a hazardous waste.

Waste Ink

Inks have three primary components: pigments which give color, solids which give body, and solvents which are the liquid portion of the ink. Two of these components, pigments and solvents, may make an ink a hazardous waste when disposed.

Heavy metals such as lead, chromium, silver, cadmium, and barium are used in some ink pigments to achieve their color. These metals can be harmful to the environment. Because of this, waste inks that contain heavy metals could be hazardous wastes. In general, inks used by textile printers don't contain heavy metals, but the solvent based inks (other than black) used by sign, poster, label, and electronic component printers may.

Solvents commonly found in inks, such as ethanol, isopropanol, ethylene glycol, xylene, toluene, cyclohexanone, and petroleum distillates can also make inks hazardous and contribute to air pollution by emitting volatile organic compounds (VOCs).

Whether a specific ink is hazardous waste depends on the amount and type of heavy metals, solvents, and other hazardous chemicals it contains.

- Never put inks that are hazardous in the garbage. If the ink is hazardous, handle and dispose of it as hazardous waste.
- Never put ink into a sanitary sewer, storm drain, septic system, dry well, or onto the ground.
- Make sure ink and mixing containers are empty before disposal. Scrape or drain cans until less than one inch covers the bottom, or less than three percent of the volume of the container remains.
- If using colored inks, ask your vendor for inks that contain little or no heavy metals.
- Ask your ink vendor if they can re-blend waste inks.
- Remove ink from stir sticks using a scraper or spatula instead of using solvent or shop towels.
- Non-hazardous inks that have dried out and solidified can be put into the garbage.

Ink Cleanup Sludges

Ink cleanup sludges come from press cleaning operations. Even if the ink itself is not hazardous, if it come in contact with a press wash that is, then the whole waste mixture could be hazardous waste.

Wash Waters

Wash waters may contain small amounts of film developing chemicals, including used fixer, that may exceed the local discharge limit. Therefore, even wash waters can present a concern.

- Maintain your processing equipment and regularly check to ensure bleach, developer, and fixer are not being lost by being carried over into the wash water.
- Routinely test the silver levels in your wash water to ensure compliance with local discharge limits.
- Never dispose of wash water that contains silver down the drain or into the sanitary sewer as this may be an illegal discharge.

Hazardous Waste Requirements for Printers

Identify Your Waste and Generator Status

If your total monthly amount of hazardous waste totals over 220 pounds (about 26 gallons), which includes more than just used fixer, you are a regulated generator. Regulated generators need to “count” their different waste chemicals toward a monthly hazardous waste total. As a regulated generator, you are required to notify Ecology of your hazardous waste activities, and obtain a site-specific RCRA ID number. Call (360) 407-6170 or your nearest regional Ecology office for more information on obtaining the RCRA ID number and the compliance regulations you must follow. If you always generate less than 220 pounds (26 gallons) of hazardous waste per month and dispose of this waste without storing and accumulating more the 220 pounds, then you are a small quantity generator. Small quantity generators are required to comply with local and federal regulations and should follow these steps:

Step 1: Perform Preventive Maintenance

Hazardous wastes must be handled in a manner that prevents leaks, spills, fires, and explosions. Develop and follow a written inspection schedule for all hazardous waste storage areas, containers, and tanks. By sealing, or capping, floor drains you can help prevent accidental hazardous spills from entering the sewer. Always keep necessary emergency equipment, such as fire extinguishers and telephones, on hand and accessible to employees. You must regularly test and maintain all your emergency equipment in addition to keeping a log of inspection dates and comments.

Step 2: Properly Accumulate Hazardous Waste

Printers typically generate less than 220 lbs. per month. If so, they can accumulate their hazardous waste on site for up to 180 days from the date it is first generated before they must manage it on-site or send it to an appropriate facility. If you generate more than 220 lbs. per month you can only accumulate the waste up to 90 days. While accumulating wastes, you must follow certain requirements:

- Establish and clearly mark an accumulation area. It must have a containment system able to hold spills and leaks.
- Place the waste in an appropriate container and mark it with the words “Hazardous Waste”, the waste’s major risk (such as “Ignitable”), and the date you first put the waste in the container.

Step 3: Plan for Emergencies

There must be an emergency coordinator on the premises or on call at all times who is familiar with the operations and activities at the site and has the authority to commit the resources necessary to deal with a hazardous waste emergency. In a small shop, this will probably be the owner or manager. Make sure you train your employees to know how to react to different types of emergencies in your shop.

Step 4: Use Proper Containers

Many hazardous waste incidents and work related injuries are linked to improper or unsafe container management. To avoid such accidents:

- Accumulate your wastes in containers that are sturdy, leak-proof, properly labeled, and kept securely closed unless wastes are being added or removed.
- Use your empty product containers as convenient waste accumulation containers.
- Store reactive and ignitable wastes according to the uniform fire code.
- Maintain a minimum aisle space of 30 inches between container rows.
- Inspect containers at least once a week, keeping a log of inspections.
- Store waste filled containers in a secondary containment that will hold spills or leaks.

Step 5: Ensure Proper Transportation and Disposal

Small quantity generators can transport their own wastes to a legitimate recycler such as Hazo House or the LOTT Clean Water Alliance, or they can arrange to have them picked up by a hazardous waste hauler.

Step 6: Keep Records

There are a number of records that must be kept on the premises. These might include annual reports, manifest forms, notification reports, inspection records, results from waste analyses or tests, on-site recycling records, MSDSs, and hazardous waste management activities.

Businesses discharging reclaimed used fixer are responsible for knowing if they meet hazardous waste and sewer discharge limits. Sending a sample of waste to a accredited laboratory for analysis is the most accurate way to determine if the waste is hazardous or meets sewer discharge limits; and it's relatively inexpensive.

Closing

For additional information and assistance on regulatory concerns, contact the LOTT Clean Water Alliance at (360) 528-5708 or (360) 528-5725.

For additional information on Ecology's Pollution Prevention Program and Waste Reduction, visit the following website: <https://ecology.wa.gov/Waste-Toxics/Business-waste/Reduce-waste-pollution>

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