

The Artwork Area and the Environment

Don't overlook film and chemistries when assessing your environmental needs.

Photographic films and the chemistry used to develop them are areas often bypassed when PCB facilities list their environmental concerns. Yet the by-products of the artwork department require consideration. The following information was provided by Kodak Magazine to assist film users in protecting the environment.

Nothing compares with silver as a light-sensitive material capable of forming a photographic image. But the tarnish on the surface is silver's classification as a heavy metal, which makes it subject to strict environmental controls. Under certain conditions, silver functions as a bactericide that can affect biological treatment systems.

For more than a decade, recovery methods have provided a means for reclaiming silver from processing solutions as well as from scrap film and paper. Increasing awareness of how responsible disposal of certain materials can protect the environment has made silver recovery more important.

PHOTO PROCESSES PRODUCE SILVER

Silver is a part of the emulsions on photographic films. The emulsions use an insoluble, light-sensitive silver halide to form a latent image. Light absorbed during exposure converts some of the silver halide into a developable form by changing it to metallic silver, which forms the final image. It is estimated that nearly 80% of the silver from emulsions is removed during processing. This silver can be recovered from solutions through two efficient and economical methods.

Silver can also be recovered from

scrap film. Because of the process's complexity, however, it is recommended that these scraps be given to a commercial recovery specialist.

COMMON RECOVERY METHODS

Two methods for recovering silver from chemistry are metallic replacement and electrolytic plating.

In the metallic replacement process, the solution is passed through a steel wool cartridge. The iron in the steel wool reacts with the silver in the solution and replaces it. The silver, in the form of sludge, settles to the bottom of the cartridge.

In an electrolytic recovery system, a controlled electrical current is passed between two electrodes. Nearly pure silver plates out on the negatively charged electrode.

Silver recovered with either of the processes can be sent to a refinery for reprocessing.

WASHING CARTRIDGES AND FLAKE SILVER

Unless properly washed, steel wool cartridges and flake silver may be considered hazardous under Subtitle C of the Resource Conservation and Recovery Act (RCRA).

The solution remaining in the steel wool cartridge during the metallic replacement process could possibly contain enough unrecovered silver to cause the contents to fail the test that characterizes material as hazardous.

Proper washing can remove the hazardous material. The procedure recommended is:

- Connect a cartridge in the series after the one to be washed.
- Attach a water line or use a

water reservoir tank connected to the inlet of the first unit.

- Run water through both cartridges at a rate not exceeding 300, ml per minute. Use a restricting orifice with a $\frac{1}{16}$ -diameter opening in the water supply tubing, or a metering pump. About 15 gallons of water will be needed.

After finishing this procedure, the tailing cartridge may be reused in many other conventional silver recovery operations.

To wash flake silver resulting from the electrolytic method, the following procedure is recommended:

- Break the silver flake into small pieces and place the pieces in a container of water (approximately five gallons).
- Occasionally stir or move the material gently so the water will contact all parts of it.
- After one hour, drain the solution through a usable steel wool silver recovery cartridge. Care should be taken to ensure that no silver solids are lost during the pouring operation.
- Repeat the process twice.

Following either of these procedures should eliminate the need for the material to be classified as hazardous. However, laboratory analysis would confirm the amount of silver in the final effluent. The silver concentration should not exceed five million grams per liter.

PROPER DISPOSAL OF OTHER BY PRODUCTS

The photographic process in a PCB facility can result in byproducts other

than silver that must be handled or treated with care. "Too often people see the cost of proper disposal rather than the cost of improper disposal," said Harvey Fowler, a Kodak environmental consultant who manages the Kodak Photoprocessing Environmental Hotline.

Although Fowler understands that the maze of regulation and legislation can be confusing, he recommends taking a proactive stance. "Environmental and right-to-know regulations should be taken seriously and should always be an integral part of an operation's business plan," he said. "Federal, state, and municipal authorities are really starting to enforce laws and regulations. It's essential to consider these regulations to remain profitable." Fowler points out that the fines for failing to comply with either health or environmental regulations can be as much as \$25,000 a day, depending on the severity of

noncompliance.

Fowler recommends that graphics operations use a checklist such as "Checklist for Maintaining Safe and Environmentally Sound Operations" to help them steer clear of potential problem areas. He also recommends that managers go over the checklist periodically to make sure that their operations are functioning properly.

RECOMMENDED PROCEDURES

For safe disposal of effluent from photographic processes, PCB fabricators should be aware of regulations and take steps to meet them, as well as file reports promptly when required.

There are several essential steps in meeting most local codes. First, each operation should have a discharge permit to dispose of effluents into a sewer system. Second, the operators should be aware of capacity limits that might affect the ability of their sewer system to handle specific levels

of certain by products, such as silver.

Third, a few of the local governments may require periodic checks of effluent levels by state or other certified labs. Some cities do lab spot checks or install monitoring devices on outflow pipes to measure levels of certain chemicals.

DISPOSAL REQUIREMENTS

If a graphics operation is disposing of spent chemicals off site, then it needs to have an Occupation Safety and Health Act (OSHA) communications and training program in place, as well as an identification number from the Environmental Protection Agency.

Familiarity with state and municipal solid waste disposal regulations is a necessity. Often local regulations are much more stringent than federal regulations and permit requirements.

In some locations, disposal firms require their customers to separate material and provide a list of waste products transported to a landfill.

Reporting procedures require that reproduction departments maintain an inventory of chemicals used or stored that could be classified as either hazardous, extremely hazardous, or toxic by OSHA standards.

OSHA requirements also stipulate that employees receive routine training on work materials. Clearly worded labels should be attached to all containers and storage tanks. These labels should list the name of the solution or the material, its chemical components, and any potential hazards. The Material Safety Data Sheet (MSDS) sent with products provides this information.

ENVIRONMENTAL HOTLINE

Environmental regulations can lead to questions concerning the safety and disposal of specific products. The Kodak Photoprocessing Environmental Hotline answers questions about Kodak photographic processing products. It receives approximately 5,000 calls a year. The number is 716/477-3194. ■

Checklist for Maintaining Safe and Environmentally Sound Operations.

The following checklist includes items and procedures that are necessary for maintaining operations in compliance with environmental safety regulations.

HAVE IN POSSESSION

- Public sewer discharge permit
- Copy of municipal sewer use code that lists discharge limitations
- Identification number from EPA for off-site disposal of potentially hazardous waste
- OSHA Hazardous Communications Program

STAY INFORMED ABOUT

- Local, state, and federal hazardous and solid waste disposal legislation
- State and local packaging recycling legislation
- Requirements of state and region on permissible air emissions
- Reporting requirements for materials deemed "hazardous," "extremely hazardous," and "toxic" to state and local emergency planning commissions

ROUTINE COMPLIANCE ACTIVITIES

- Use a silver recovery system that meets municipal use code
- Use licensed hazardous waste transportation and disposal company when sending potentially harmful materials off site
- Label containers, storage tanks, and processors with name of solution, its chemical components, and possible hazards
- Maintain current inventory of types and quantities of chemicals used or stored that could be classified as "hazardous," "extremely hazardous," and "toxic" by OSHA community standards or federal, state, regional, or local right-to-know regulations
- Conduct regular employee training on hazards of chemicals in the workplace