

## Technical Information

## Film Processor Chemicals

When you are in the business of high resolution imagesetting, film processing plays an important role in the quality of the work you do. But how do you handle these film processor chemicals safely? And what do you do when you are through with them? Chemical handling and chemical waste are difficult topics to address because many of the issues hinge on state and local regulations that aren't the same for everybody. We can, however, give you some information that will help you determine what you need to do.

Note: This document is specifically addressed to imagesetter film processing issues. Many of the topics discussed here also apply to high-end scanner film and processing, however there are differences, particularly in the area of silver recovery.

### The material data safety sheet

U.S. DEPARTMENT OF LABOR Occupational Safety and Health Administration MATERIAL SAFETY DATA SHEET			
<b>SECTION I</b>			
MANUFACTURERS NAME		EMERGENCY TELEPHONE	
ADDRESS (Number, Street, City, State and ZIP Code)			
CHEMICAL NAME AND SYNONYMS		TRADE NAME AND SYNONYMS	
CHEMICAL FAMILY		FORMULA	
<b>SECTION II • HAZARDOUS INGREDIENTS</b>			
CAS REGISTRY NO.	%	HAZARDOUS COMPONENT(S)	TLV (Units)
<b>HAZARDOUS MATERIALS IDENTIFICATION SYSTEM</b>			
HEALTH	#	(See Hazard Index)	
FLAMMABILITY	#	(See Hazard Index)	
REACTIVITY	#	(See Hazard Index)	
PROTECTION	X	(See Personal Protection Index)	
<b>SECTION III • PHYSICAL DATA</b>			
BOILING POINT	SPECIFIC GRAVITY		
VAPOR PRESSURE	PERCENT VOLATILE		
VAPOR DENSITY	EVAPORATION RATE		
SOLUBILITY IN WATER	PH		
APPEARANCE AND ODOR			
<b>SECTION IV • FIRE and EXPLOSION DATA</b>			
FLASH POINT	FLAMMABLE LIMITS		
EXTINGUISHING MEDIA			
SPECIAL FIREFIGHTING PROCEDURES			
UNUSUAL FIRE and EXPLOSION HAZARDS			
PREPARATION DATE	PREPARED BY		

Figure 1 - Page one of a sample material data safety sheet.

Film processing chemicals come with a material data safety sheet. This document (see Figure 1) is required by OSHA (the Occupational Safety and Health Administration) and includes information grouped in twelve sections. The material data safety sheet supplies information that you will need to discuss handling and disposal of chemicals with local environmental authorities. The information included in these sheets should be carefully reviewed.

Some of the most important things to note are:

- Section I - An 800 number to call in emergency situations.
- Section II - The list of ingredients along with a code that rates their health, flammability, reactivity, and protection requirements.
- Section V - Emergency and first aid procedures in case the chemical is inhaled, ingested, or splashed in the eyes.
- Section VII - Protective garments required to handle the chemical.

Much of the information that you need is spelled out by the hazardous materials identification system. This information is included in a box in Section II of the material data safety sheet and is repeated on the labels of the containers the chemicals come in. (See an example in the box below.)

#### Hazardous Materials Identification System

Health	3	Serious
Flammability	0	Minimal
Reactivity	1	Slight
Protection	D	Goggles, Gloves, Apron

Note: Reactivity is the susceptibility of materials to release energy either by themselves or in combination with other materials.

The Hazardous Materials Identification System has two scales, a hazard index (in numbers) and a personal protection index (in letters). (See below.)

#### Hazard Index

- 4 - Severe Hazard
- 3 - Serious Hazard
- 2 - Moderate Hazard
- 1 - Slight Hazard
- 0 - Minimal Hazard

#### Personal Protection Index

- |  |  |
|--|--|
| <b>A</b> - safety glasses                  | <b>H</b> - splash goggles + gloves + apron     |
| <b>B</b> - safety glasses + gloves         | + vapor respirator                             |
| <b>C</b> - safety glasses + gloves + apron | <b>I</b> - safety glasses + gloves             |
| <b>D</b> - face shield + gloves + apron    | + combination dust and vapor respirator        |
| <b>E</b> - safety glasses + gloves         | <b>J</b> - splash goggles + gloves + apron     |
| + dust respirator                          | + combination dust and vapor respirator        |
| <b>F</b> - safety glasses + gloves + apron | <b>K</b> - airline hood or mask + gloves       |
| + dust respirator                          | + full protective suit + boots                 |
| <b>G</b> - safety glasses + gloves         | <b>X</b> - Ask your supervisor for specialized |
| + vapor respirator                         | handling directions.                           |

Employees who do nothing but load or unload film in the processor do not come in direct contact with the chemicals. However, employees who clean or maintain the processor should take the recommended precautions as shown in the personal protection index. You will find that film processor chemicals are rated a serious health hazard in the hazardous materials identification system. This is because of the harm that may result from getting them in your eye or ingesting them. Firefighters also make use of this system to know if chemicals on the site of a fire may pose potential hazards.

The Hazardous Material Identification system recommends splash goggles, gloves and apron for many film processing chemicals. Since there is no specific category for this in the personal protection index, the letter D is chosen because it most closely approximates those requirements.

**Regulation and enforcement**

To find out what you have to do to meet standards in your area, it is best to contact the agencies that deal with chemical waste. These agencies exist on the national, state, county, and local levels. The list below will give you an idea of the agencies involved. (See box below.)

<b>Agency:</b>	<b>Stands for:</b>	<b>Operates at:</b>
OSHA	Occupational Safety and Health Administration	Federal and state levels
EPA	Environmental Protection Agency	Federal level
DEC	Department of Environmental Conservation <sup>1</sup>	State level
DEHS	Division of Environmental Health Services <sup>1,2</sup>	County

<sup>1</sup>Names of county and state agencies may vary from state to state.  
<sup>2</sup>Where county environmental services do not exist, look for the county health department.

OSHA and the EPA will probably refer you to your state level environmental department (in New York, that's the DEC), so your best bet is to start with the DEC (look in the blue pages of your phone book in the state section under Environmental Conservation, Dept of.) Since Linotype-Hell has offices in many states, we may be able to help you in understanding some of your local laws and finding out who you should contact. Please contact Kathy Hadden of Linotype-Hell for details. (See address at end of document.)

Finding the proper listing can sometimes be difficult. You may have better luck looking in the phone book of the largest community near you. The blue pages in a U.S. phone book have local, county, state, and US government offices. Be aware that department names may be different from state to state. Try looking under Health, Environment, or Labor. If you have difficulty finding any of these places, there is usually a general information number in the blue pages that you can call for help.

**Chemical waste disposal**

Chemical waste disposal companies can be found in the yellow pages under "Waste Reduction, Disposal & Recycling Svce. - Industrial". They will be able to give you specific estimates on cost to remove waste chemicals. To help them estimate, you should have prepared an estimate of the type and amount of waste you expect in a given period of time. If you can't find a local waste disposal company, consider talking to your state level environmental department for recommendations.

If you recirculate the chemicals in your processor (see box on next page) you can calculate the amount of waste chemicals by figuring out the size of the tanks that contain your developer, fixer, and wash (and water filter if you use one), and determining how frequently you will change chemicals. (See the box at the top of the next page.)

The frequency with which you change chemicals depends on the amount of material you will be sending through the processor. Increasing the amount of material accelerates the exhaustion of chemicals. You may want to estimate using a weekly, twice a month or once a month change schedule.

**ESTIMATION OF AMOUNT OF WASTE FOR A RECIRCULATING PROCESSOR**

Processor	Developer (In gallons)	Fixer (In gallons)	Wash (In gallons)	Total <sup>1</sup> (Gallons per change)
LP-1400	2	2	2	6
LP-1400B	7	7	2	16
LP-2300	9.2	9.2	4.2	22.6 <sup>2</sup>
LP-2500	12.8	12.8	5.3	30.9 <sup>2</sup>

<sup>1</sup> These numbers may be slightly high because they don't take evaporation or usage of chemicals into account.

<sup>2</sup> If a water purifier is used with the LP-2300 or 2500 it can add as much as 10 gallons per change.

**Linotype-Hell's procedure**

Linotype-Hell Company has a single chemical waste disposal company that handles all of our chemicals and recycles them. Regional offices ship their chemicals directly to the waste disposal company in approved containers. The quantities are small enough that the shipping charges are minimal.

Linotype-Hell does not do any silver recovery within its imagesetter sites<sup>1</sup>. We have not found it to be cost-effective to do the recovery ourselves. Our chemical waste disposal company handles the silver recovery for us and as a result, charges us less to remove our waste chemicals. If you already own silver recovery equipment, you will want to continue using it. However the current price of silver makes it difficult to recover the cost of new silver recovery equipment. If you are interested in silver recovery, we have information on file. Please contact Kathy Hadden. (See address at the end of this document.)

<sup>1</sup> Silver recovery is more common in high-end scanner sites.

Although it may not always be feasible to recover it, silver does play a role in the classification of wash water as waste. This makes water conservation an important issue. If you continue to reuse wash water instead of changing it often, you can reduce your total amount of waste. (Chemicals to reduce the growth of algae can make this concept workable.) Evaporation can also be used to reduce your amount of waste. Many graphic arts dealers now sell evaporation units.

**Recirculation** - Recirculation (often referred to as batch) means that chemicals are pumped in from a supplementary tank. Used chemicals overflow into this same tank. Recirculation has the effect of enlarging the tank size. Almost immediately the new and old chemicals are intermixed, but the time that it takes to exhaust the chemicals is extended.

**Replenishment** - With replenishment, used chemicals overflow into a waste tank rather than being allowed to mix with fresh chemicals from the supplementary tank. Therefore more chemicals are used, but the processing is more consistent over time. The amount of chemicals used depends on the replenishment rate which is usually a function of the amount of film passing through the processor.

**Cleaning and maintenance**

If you prefer to have a consultant handle the cleaning and maintenance of your processors, the easiest way to find one is through local contacts. Ask your sales representative for recommendations from his/her customers. Also check the yellow pages under 'X-Ray Apparatus & Supls.' (Many people who service x-ray processors also service graphic arts film processors).

**Question and answer**

**a. What can I pour down the drain, and what needs special disposal?**

That depends on your local laws. Check with your state or county environmental organization for area regulations.

**b. What should I tell employees about exposure to chemicals?**

Any chemical (from the gas in your car to your oven cleaner to the chemicals in your processor) can be dangerous if mishandled. Therefore you should:

- Hold annual training sessions for employees who routinely use chemicals.

- See that your employees read and understand the appropriate material safety data sheets. (This is an OSHA requirement.)
- Be sure that those involved in cleaning and maintaining the processor wear appropriate protective clothing and understand proper clean-up methods.
- Be sure they know what to do in case a chemical comes in contact with their skin or eyes, and what to do if they should ingest some of the chemical. (See the appropriate MSDS for more information.)
- See that chemicals are transported properly. For example, container labels should never be removed, and chemicals should never be transferred to unmarked containers. (This will lessen the risk of accidental ingestion.)

**c. Since silver content is so important, why isn't silver listed among the ingredients of the liquid chemicals in the MSDS?**

Silver halide crystals are part of the emulsion of the film material. Exposed crystals turn black after processing. Crystals that are not exposed are removed in the fix bath and often carry over into the wash water.

**d. Are there any important considerations for the room that the film processor goes in?**

The room that the film processor goes in should have a ventilation fan that vents to the outside of the building. There should be no direct-to-sewer drainage in the floor (this is to prevent chemicals from entering the sewer in case of a spill). We also advise that the processor have a containment unit (this amounts to a pan that fits under the processor to prevent spills from spreading and to ease cleanup.) Check with state or county authorities for specific requirements. Also see the film processor manual for information on temperature, humidity, electricity and water requirements.

**e. What is the difference between a chemical product and a chemical waste?**

A chemical product is manufactured and is made up of well-defined components (see any MSDS). A chemical waste is a by-product (in this case, of film processing) and its contents are much harder to identify. As a result, the Department of Transportation has more stringent requirements for the transport of chemical waste.

**Further reading**

Business & Legal Reports publishes many documents concerning health and safety issues. Their booklet, *The MSDS —Your Guide to Chemical Safety* (#35P), may be ordered at 1-800-553-4569 (in CT call 203-245-7448).

**Conclusion**

You still have work to do to determine what is required in your own state and county. But we hope that the information supplied here will give you a good starting point for your own research. Please feel free to contact Kathy Hadden or Jim Hamilton for more information:

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 Jim Hamilton, Applications Analyst  
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**Disclaimer**

The information contained in this document is general and should be used only as a supplement to other information. The user must independently and from other sources determine how to properly use and dispose of waste material and protect the health and safety of employees and customers. The information and recommendations contained herein are based on data believed to be correct; however no guarantee or warranty of any kind expressed or implied is made with respect to the information contained in this document.