ENVIRONMENT
INFORMATION FROM KODAK

J-52
$1.00

Disposal of Small Volumes of Photographic-Processing Solutions

Between the photography enthusiast who processes two or three rolls of film a month in a one-pint tank and the commercial photofinisher who processes and prints thousands of rolls of film a day, there are many users of photographic-processing solutions who must discard a quantity of these solutions from time to time. Printers, hospitals, law-enforcement agencies, schools, portrait studios, serious amateurs, and many others fall into this category.

The size of an operation determines to a large extent the best method for disposing of the spent solutions. The casual user of a one-pint tank can usually pour the solutions down a household drain without causing a problem, while the large-scale processing laboratory may have to recover silver and regenerate processing solutions before discharging them into a municipal sewer facility. Between these extremes are the moderate-size users of photographic solutions. They must monitor the concentration of the chemicals and the volumes of the solutions and wash water they use in their processing operation before deciding how to dispose of them. The person using conventional black-and-white or color processing solutions faces a different situation from the one who processes x-ray film, which yields a large amount of silver compound as a by-product. The laboratory that uses trays or tube processors approaches the disposal problem differently from the laboratory with a $3^1/_2$-gallon sink line.

This pamphlet is for the processing operation that discharges less than 200 gallons (760 litres) of photographic-processing effluent, including wash water, each day. Since wash water makes up the largest part of photographic-processing effluent, you can use it to estimate your daily volume of processing effluent. Multiplying the water flow rate (in gallons or litres per minute) for each wash step by the time (in minutes) of the wash step gives the volume of effluent for each process.

For each process: total wash-water flow rate **x** wash time = effluent volume

Multiply this by the number of processes each day to get a rough estimate of your daily volume of processing effluent.

For more accuracy, you must add to this figure any solutions, such as developers, bleaches, and fixers, that you discard. If you use nonflowing washes, make your estimate by simply totaling the volumes of all the wash water and processing solutions you discard in a typical day. See KODAK Publication No. J-55, *Disposal and Treatment of Photographic Processing Solutions,* for information on disposing of volumes of effluents that are larger than 200 gallons a day.

Replenishment systems in sink lines and larger installations, which add fresh solutions regularly to replace the solution carried out by the film or paper, greatly reduce the amount of solution needing disposal. Only the small amounts of solutions carried by the film or paper into the wash water will enter the sewer or septic-tank system. If you have a replenishment system, replenish the processing solutions carefully to prevent them from becoming too concentrated or too dilute. Be sure to follow the replenishment instructions packed with the chemicals. Even in replenished systems, however, you will still have to dispose of solutions occasionally because of excessive dirt or sediment, contamination, or the need to clean or repair the processing equipment. When you do, follow the guidelines in this pamphlet.

EFFLUENT REGULATIONS

Photographic processors located in metropolitan areas can use municipal sewers for disposing of processing solutions. Municipalities usually have codes that specify what may be discharged into the sewer. The most frequently regulated parameters for effluents entering a sewer system and their *mean* limits are as follows:

Biochemical Oxygen Demand (BOD_5)	350 mg/L
Chemical Oxygen Demand (COD)	650 mg/L
Total Suspended Solids (TSS)	200 mg/L
Chlorine demand	25 mg/L
pH	5.6 to 9.4
Metals such as	
silver	1.2 mg/L
iron	17 mg/L

The BOD_5 value of a solution is determined by mixing the solution with water that has a known dissolved-oxygen content, and then determining the loss of oxygen content after five days. BOD_5 measurement is significant because the micro-organisms that are present in water gradually consume certain chemicals and use up the dissolved oxygen on which fish and other marine life depend.

A measurement frequently used in conjunction with BOD_5 is Chemical Oxygen Demand (COD). This is measured by determining what portion of an effluent potassium dichromate will oxidize under specific test conditions.

Just before sewage-treatment plants discharge treated effluent, they add chlorine to the effluent to destroy any remaining pathological organisms. If the level of chemicals that react with chlorine in solution, such as ammonium, is too high in the effluent, the chlorine will be used up before it can make the effluent completely safe for discharge. Chlorine demand is the amount of chlorine needed to provide a certain residual chlorine content (usually 0.5 milligram per litre) after a specific time (such as 15 minutes). If your effluent has a very high chlorine demand, which a secondary-treatment plant could not handle, you may need some sort of pretreatment such as chemical oxidation or biological treatment to meet effluent regulations.

You can measure the quantity of a substance in an effluent by either its concentration or its load. *Concentration* is the amount of a substance in a certain volume of liquid and is expressed in milligrams per litre (mg/L), parts per million (ppm), or other appropriate weights and volumes. *Load* is given in grams or pounds per day and is the actual amount of a substance discharged in a specific period of time. Sometimes the concentration may exceed the code; but because the volume is so small, the load is within prescribed limits. You should be aware of this distinction when you are checking for compliance with local sewer codes.

CHARACTERISTICS OF PHOTOGRAPHIC-PROCESSING EFFLUENTS

Effluents from moderate-size photographic-processing operations seldom exceed the limits imposed by effluent regulations; however, keep in mind that there is no such thing as a "typical" photographic-processing effluent, and yours may be the exception that exceeds the limits.

The temperature of a "typical" processing effluent is usually below 90°F (32°C), and the pH generally falls within the typical code range of 6.5 to 9.0. Normally, no lubricating oils, greases, or flammable or explosive materials are present, and suspended solids are less than 20 mg/L. The odor and the color of processing effluents are very slight. While detergents may be used for cleaning, they are rarely used in processing solutions. More specific information on the components of processing solutions appears in the Material Safety Data Sheets available from your photographic-chemical dealer or from Eastman Kodak Company.

Significant amounts of silver are present in processing effluents. *Free* silver ions are toxic to micro-organisms; however, **the silver in photographic-processing effluents exists as silver thiosulfate, which is not toxic.** Nevertheless, most sewer codes regulate the total silver concentration. You should therefore recover the silver from your effluent not only for the economic return but also to meet the sewer codes. For more information, see KODAK Publication No. J-51, *Silver in Photoprocessing Effluents.*

BOD_5 (Five-day Biochemical Oxygen Demand) is another frequently regulated effluent component. The BOD_5 of photographic effluent depends on the amount of processing solution and wash water present; typical concentrations range from 100 to 1000 mg/L. In extreme cases, effluents with high BOD_5 concentrations may require some form of pretreatment before you discharge them to a septic-tank system. Regulatory officials may require you to use a rotating biological contactor or an activated-sludge unit to reduce the BOD_5 concentration. (See pages 5 and 6.)

Other chemicals are present in processing solutions but usually not in sufficient amounts to have an adverse effect on sewage treatment. If you are concerned about the quality of your effluent, have a reputable analytical laboratory analyze a sample. Your local sewer authority may request that you do this anyway. Take your samples at a representative point where the effluent has mixed with other processing effluents, wash waters, and other waste water from the building.

SILVER RECOVERY

Silvery recovery is an integral part of photographic processing. Not only does it remove silver from the effluent, but you can also sell the recovered silver. Small processing operations can use a holding tank to collect the fixes and bleach-fixes until there is enough to warrant recovering the silver. If you have a large operation with a continuous processing machine, you can connect a silver-recovery unit directly to the overflow from the fixer (or bleach-fix) tank.

Probably the most convenient way to recover silver from fixers and bleach-fixes in small-scale operations is to use metallic replacement. (KODAK Publication No. J-10, *Recovering Silver from Photographic Materials,* discusses metallic replacement and other silver-recovery methods.) Metallic replacement occurs when a solid metal, such as iron, comes into contact with a solution containing dissolved ions of a less active metal, such as silver. The dissolved silver ions react with the solid metal (iron), and the more active metal (iron) goes into solution as ions. Ions of the less active metal then become solid metal (silver) and settle to the bottom. For economy and convenience, steel wool is the metal most often used in this type of silver recovery.

The acidity of the fixer is an important factor when you use steel wool for silver recovery. A fixer that is too alkaline (pH of 6.5 or higher) will slow the reaction; a fixer that is too acidic (pH of 4 or lower) will dissolve the steel wool and make it unavailable for silver replacement.

Most fixers, however, are within the pH range for good utilization of steel wool (4 to 6.5). With bleach-fixes, you can recover the silver at a higher pH (7 to 8). The flow rate of the solution through the silver-recovery cartridge also affects the efficiency of silver recovery.

One metallic replacement unit is the KODAK Chemical Recovery Cartridge. KODAK Publication No. J-9, *Silver Recovery with the KODAK Chemical Recovery Cartridge, Type P,* describes this cartridge. Several sizes of silver-recovery cartridges are available; choose an appropriate size for the volume of solution you need to treat.

TREATMENT AND DISPOSAL OF SMALL AMOUNTS OF PHOTOGRAPHIC EFFLUENTS

Municipal Sewers

Most photographic solutions are biodegradable and therefore compatible with municipal secondary (biological) waste-water treatment systems. The list on page 1 gives mean sewer code requirements for effluents discharged into municipal sewers. If your effluent does not meet the code, you can contract with a qualified chemical-disposal company or use a holding tank.

A holding tank is particularly appropriate when your effluent load is within the sewer code, but the concentration is too high. The tank should be large enough to hold process wash waters as well. If you then discharge the collected contents slowly into the sewer system, the effluent should meet sewer code requirements.

Septic Tanks and Untreated Effluent

Septic-tank systems can efficiently treat a combination of sanitary wastes and a wide variety of photographic effluents (including wash water) up to a ratio of 3 to 1. For example, a family of four would produce on the average about 200 gallons of sanitary, kitchen, and washing effluent per day. A septic tank and leach field for this family, if correctly designed, would be able to handle approximately 50 gallons of photographic effluent, including wash water, per day.

Take extreme care to prevent solutions that contain sodium or potassium dichromate from entering a septic tank. They are hazardous to the bacteria in the septic tank. KODAK Liquid Developer System Cleaner and the bleach used in some black-and-white reversal processes contain these compounds. Sufficient quantities of these substances may retard or stop the biochemical reactions. You can reduce dichromate in a solution to a less troublesome form by first adding reducing agents such as sulfite or thiosulfate (used black-and-white fixer). You can then add any alkaline material (including used black-and-white developer) to neutralize the acidity and precipitate the chromium. Filter out the solid chromium compound or allow it to settle before disposing of the solution. Contact a licensed waste-disposal service to dispose of the solid material. See page 7.

A second precaution is to avoid a sudden release of photographic solutions into the septic system, although pint-size amounts are not likely to be harmful. Combine your processing solutions (after silver recovery) in a holding tank and slowly discharge them to the septic tank over several days.

Septic Tanks and Pretreated Effluent

If the local authorities require you to pretreat photographic effluents before discharging them into your septic-tank system, you can purchase a rotating biological contactor (RBC) or build an activated-sludge waste-treatment system.

Rotating Biological Contactors. RBCs are commercially available and are very effective in treating photographic effluents biologically. They consist of closely spaced discs attached to a shaft. As the shaft rotates (at 3 to 12 rpm), the bottom part of each disc passes through the effluent while the upper part is in the air. The micro-organisms that grow on the discs absorb food from the effluent and then pick up oxygen from the air when they are out of the effluent. See Figure 1.

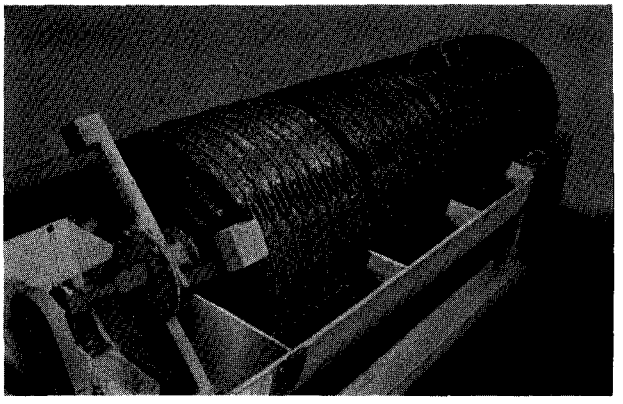

FIGURE 1
You can treat your photographic effluent with a rotating biological contactor (RBC) before discharging it to a septic tank.

RBCs come in various sizes to accommodate different volumes of processing effluents. The larger the RBC, the more discs there are in series on the shaft. Here are some of the companies that make RBCs and other ready-made biological treatment plants:

Burgh Schoenenberger
10108 Starr Road
Wyoming, NY 14591
(716) 584-3768

EPCO-Hormel
P.O. Box 800
Austin, MN 55912
(507) 437-5766

EnviroDisc Corporation
20 Main Street
Beacon, NY 12508
(914) 831-8890

Dorr-Oliver, Inc.
77 Havemeyer Lane
Stamford, CT 06904
(203) 358-3800

TLB Corporation
160 Willard Avenue
Newington, CT 06111
(203) 233-5109

Jet Aeration Company
750 Alpha Drive
Cleveland, OH 44143
(216) 461-3100

Neptune Microfloc, Inc.
P.O. Box 612
1965 Airport Road
Corvallis, OR 97339
(503) 752-5501

Activated-Sludge Waste-Treatment Systems. You can build your own plant from inexpensive materials to pretreat photographic effluents before discharging them into your septic tank. In nature or in a secondary sewage-treatment plant, bacteria and other micro-organisms feed on (or decompose) wastes, consuming oxygen and releasing carbon dioxide and water in the process. An activated-sludge system duplicates and speeds up this breaking down or biodegrading of waste products by creating a more favorable environment for the micro-organisms.

Building a Unit. Figure 2 is a sketch of a small single-unit activated-sludge treatment plant, which will handle 25 gallons (95 litres) of typical effluents a day.

> **NOTE:** Do not use galvanized or copper materials in the unit because they may contaminate the system.

For each unit, use a 55-gallon (200-litre) steel drum with the top removed. You can also use drums made of plastic or plastic-lined steel, which will not corrode.

Make the baffle plate from a steel plate or from a polyethylene or stainless-steel bucket cut in half vertically with the bottom removed. You can fasten the plate or stainless-steel bucket to the inside wall of the drum by welding, bolting, or cementing with epoxy cement. If you use a polyethylene bucket, attach it with an epoxy cement such as Hysol 1C White cement.[1]

Drill a solution-exit port through the wall of the drum behind the baffle plate, about two inches from the top of the drum. Then drill a solution-entrance port on the opposite side of the drum at the same height or slightly higher.

Here is a convenient way to fasten flexible hoses to the entrance and exit ports:

1. Drill $1\frac{1}{8}$-inch-diameter holes for the entrance and exit ports.
2. Securely fasten a $\frac{3}{4}$-inch bulkhead fitting[2] to each hole.
3. Screw a pipe-to-hose reducer fitting[3] or a short length of threaded pipe into each bulkhead fitting.
4. Attach the hose to the reducer fitting or pipe.

Supply air to the solution through a length of pipe, metal tubing, or garden hose. Perforate it with holes, plug it at one end with something such as a piece of wooden dowel or a pipe cap, and coil it at the bottom of the drum as shown in Figure 2.[4] Attach the unplugged end to an air supply. If no supply is available, you can use a small air compressor such as one designed for spray painting. One air compressor can serve several units if you include tees or Y-tubes. Attach a timer switch to the air supply to provide periodic air flow. See Figure 3.

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[1]Available from Hysol Division, The Dexter Corporation, Olean, NY 14760.

[2]Such as the stock No. 15053 bulkhead fitting, available from United States Plastic Corporation, 1550 Elida Road, Lima, OH 45805, or the KODAK $\frac{3}{4}$-inch Fitting (CAT No. 154 4162), available from Eastman Kodak Company, Parts Services, 800 Lee Road, Rochester, NY 14650.

[3]Such as the stock No. 24153 reducer fitting, available from United States Plastic Corporation (see footnote 2 for the address).

[4]An alternate method of aeration is to use a polyethylene gas-filter candle in the drum, such as the Labpor Model F-1267-18, available from Bel-Art Products, Pequannock, NJ 07440. If you use this method, use unperforated tubing or hose with one end attached to the gas-filter candle and the other to the air supply.

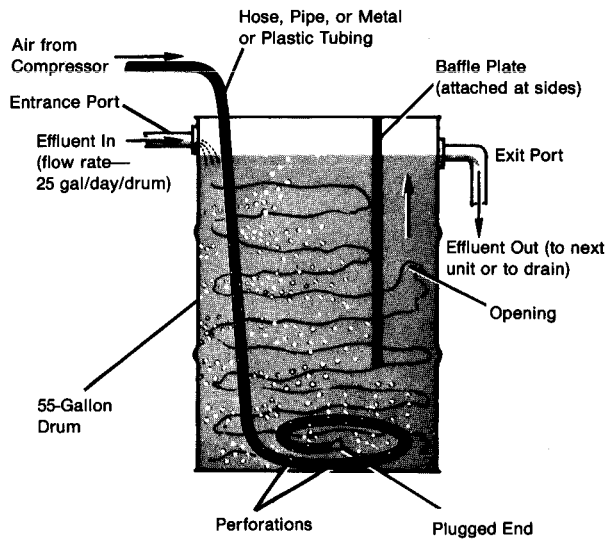

FIGURE 2
You can build an activated-sludge waste-treatment plant yourself to pretreat your photographic effluents. This unit, built from a 55-gallon drum, can treat 25 gallons of effluent per day.

Size of the System. For a larger system, connect several drums in series as shown in Figure 3. With a multiple-unit setup, elevate the drums with bricks or planks so that each drum is about two inches higher than the one that follows it in the series.

The number of units in the system depends on the volume of effluent generated per day, as well as its concentration. For typical photographic effluents, each drum in series will handle 25 gallons (95 litres) a day. A three-unit series, for example, will treat a total of 75 gallons (285 litres) of effluent per day.

By typical effluents we mean those having BOD_5 values between 200 and 600 mg/L. For nontypical effluents, you can calculate the number of drums required by multiplying the BOD_5 value of the effluent (in mg/L) by the number of gallons of effluent per day. Divide the result by 10,000 to determine the number of 55-gallon drums you need. If the number is a fraction, use the next higher whole number. (If you measure your effluent in litres, divide by 40,000.)

Using fewer than the required number of drums or a flow rate higher than that for which the system was designed will lower the efficiency of the system. Using the correct number of drums and flow rate should reduce the BOD_5 value by 90 to 95 percent when the system reaches equilibrium.

Operating the System. Figure 3 shows a system of five drums connected in series. Effluent first goes to a holding tank; the tank should have enough capacity to accumulate the solutions from 16 hours of operation before feeding them into the system. The effluent flows from the holding tank by gravity through a hose into the first drum. Equip the hose with a pinch clamp or valve or a small metering pump so that you can adjust the flow.

Take care that the holding tank feeds uniformly at all times into the first unit. Shutting down the system each night and starting it up again the next morning may impair the functioning of the micro-organisms and lower system efficiency.

To begin operations, adjust the flow rate of the solution. Determine the flow rate by measuring the amount of solution collected in one minute in a graduated cylinder or measuring cup.

If the volume collected in one minute is	The flow rate per day will be
2.2 fl oz (66 mL)	25 gallons (95 L)
4.4 fl oz (132 mL)	50 gallons (190 L)
6.7 fl oz (197 mL)	75 gallons (285 L)
8.9 fl oz (263 mL)	100 gallons (380 L)

To obtain other flow rates in gallons per day, multiply the number of fluidounces collected in one minute by 11.25, or divide the number of millilitres collected in one minute by 2.63.

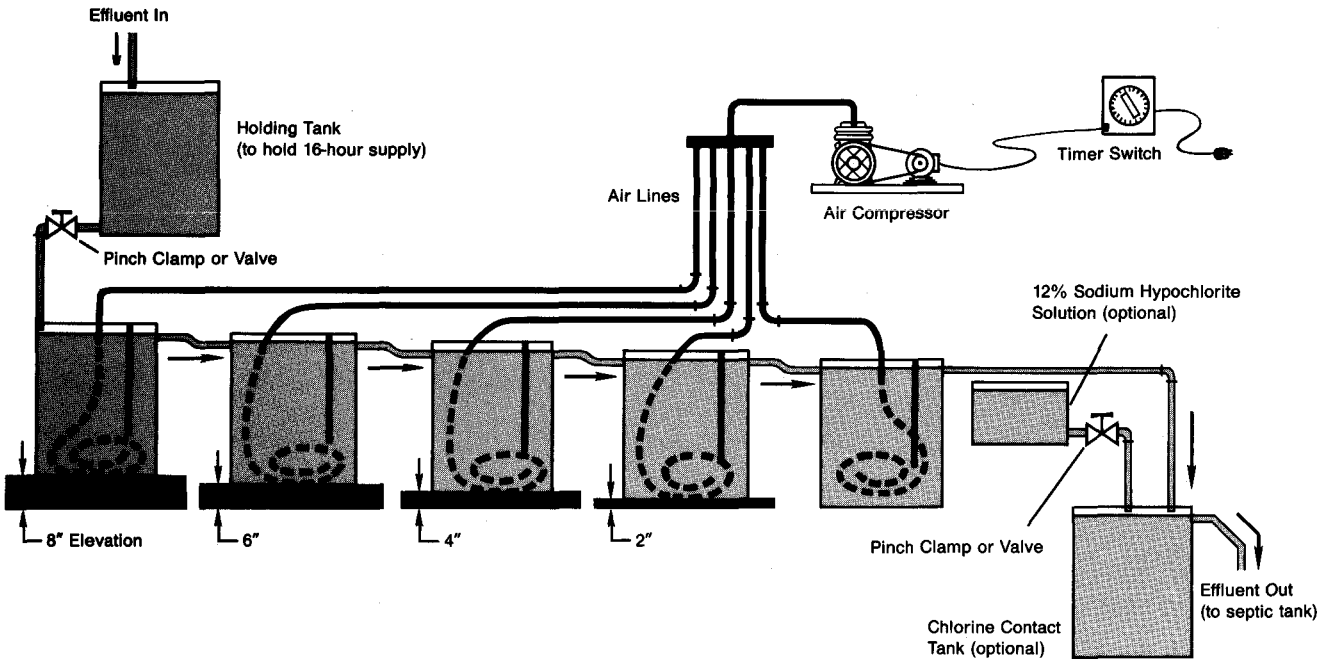

FIGURE 3
You can connect several activated-sludge waste-treatment units in series to handle a larger volume of effluent.

When you start up the system, aerate the solution for 30 minutes of each hour at an air-flow rate of 0.3 litre per minute. Increase the time or the air-flow rate gradually over the next few days until the liquid in the drum has a sludge buildup and the liquid leaving the system is relatively clear. It may take a week or more before the system reaches equilibrium and begins to operate efficiently. By this time, the aeration in the first unit should be approximately 30 litres per hour. The other units require less air. Determine these amounts by trial and error. Adding trace amounts of nutrients such as a few bouillon cubes or a pint of buttermilk to the first unit may help the system reach peak efficiency more quickly.

Control the air-flow rate so that the sludge produced is brown and fluffy. When the system is operating properly, the sludge in the first unit should have the appearance and consistency of individual flakes of oatmeal in a milky, brownish solution, and the unit should have a faint odor similar to that of freshly turned earth. If the odor becomes objectionable, the system is not receiving enough air. If the sludge breaks up into fine particles and tends to float easily out the exit port, the system may be receiving too much air. A small air-flow meter[1] is extremely useful in controlling the air-flow rate.

Maintenance. Proper maintenance of the system is essential for good operation. We recommend checking the air-flow rate, dissolved-oxygen content, and appearance of the sludge daily.

You can measure the dissolved-oxygen content with a simple test kit.[2] Maintain the oxygen level between 2 and 4 mg/L. There are also test kits[3] available that approximate a BOD_5 test to check the effectiveness of the unit.

Scrape the inside walls of the drum occasionally, especially the baffled settling chamber, with a long-handled brush or scraper to break up any large clumps of sludge.

Chlorination. Regulations may require you to chlorinate your treated effluent before you discharge it into the septic tank. If so, the safest method is to send the effluent to a holding tank after it leaves the last activated-sludge unit and drip a 12% sodium hypochlorite solution (such as that sold by swimming-pool-supply houses) into the solution at a rate that will provide a residual chlorine content of 1 to 2 mg/L.[4]

Limitations of the System. As we mentioned earlier, the simple waste-treatment system described in this pamphlet is appropriate only for processing operations that discharge less than 100 gallons (380 litres) of processing wastes per day. Also, the system is effective only in treating chemicals that are biodegradable or oxidizable with aeration.

Before you install a waste-treatment system, it may be wise to contact a qualified engineering consulting firm to determine if the treated effluent will be acceptable for discharge. Also be sure to check your local regulations to find out if the system will comply with them.

While operating techniques for larger systems are similar to those described here, you must take other more complex factors into account. For this reason, we strongly recommend that you contact an engineering consulting firm before installing a larger system.

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[1] A meter with a range of 0 to 1.0 litre of air per minute, graduated in increments of 0.1 litre per minute, is best for this purpose. One such meter is available from Dwyer Instruments, Inc, P.O. Box 373, Michigan City, IN 46360.

[2] One such kit is the Dissolved Oxygen Test Kit, Model OX-2P, manufactured by Hach Chemical Company, P.O. Box 907, Ames, IA 50010.

[3] Such as the Relative Stability Test Kit, Model RS-1, manufactured by Hach Chemical Company (see footnote 2 for the address).

[4] You can measure residual chlorine content with a chlorine test kit such as the Model CN-46A, manufactured by Hach Chemical Company (see footnote 2 for the address) or the test kits manufactured by Salisbury Industries, Inc, 130 County Courthouse Road, Garden City, NY 11040.

Commercial Disposal Services

Some companies provide chemical-disposal services. You may decide to contract with one of them to pick up and dispose of your photographic effluent. Such an arrangement is especially useful when a photographic processor does not have the time, personnel, or equipment to treat processing effluents before discharging them into a septic tank. You may have to complete a uniform hazardous-waste manifest before you sign a contract to dispose of your photographic effluent off-site. Contact your Regional Environmental Protection Agency (EPA) office (listed below) for more information.

EPA Region 1
JFK Federal Building
Boston, MA 02203
(617) 223-7210
Connecticut, Massachusetts, Maine, New Hampshire, Rhode Island, Vermont

EPA Region 2
26 Federal Plaza
New York, NY 10007
(212) 264-2525
New Jersey, New York, Puerto Rico, Virgin Islands

EPA Region 3
6th and Walnut Streets
Philadelphia, PA 19106
(215) 597-9800
Delaware, Maryland, Pennsylvania, Virginia, West Virginia, District of Columbia

EPA Region 4
345 Courtland Street, NE
Atlanta, GA 30365
(404) 881-4727
Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee

EPA Region 5
230 South Dearborn Street
Chicago, IL 60604
(312) 353-2000
Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin

EPA Region 6
1201 Elm Street
Dallas, TX 75270
(214) 767-2600
Arkansas, Louisiana, New Mexico, Oklahoma, Texas

EPA Region 7
726 Minnesota Avenue
Kansas City, KA 66101
(913) 236-2800
Iowa, Kansas, Missouri, Nebraska

EPA Region 8
1860 Lincoln Street
Denver, CO 80295
(303) 837-3895
Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming

EPA Region 9
215 Freemont Street
San Francisco, CA 94105
(415) 974-8153
Arizona, California, Hawaii, Nevada, American Samoa, Guam, Trust Territories of the Pacific

EPA Region 10
1200 Sixth Avenue
Seattle, WA 98101
(206) 442-5810
Alaska, Idaho, Oregon, Washington

PRACTICES TO AVOID

Avoid the following practices in handling photographic-processing wastes:

- Never discard photographic effluent directly into a receiving body of water such as a stream or lake.
- Do not dispose of photographic-processing solutions in storm sewers. Most storm sewers are not intended for disposal. They merely carry surface water from rainstorms, etc, to the nearest stream or watercourse. Disposing of wastes in a storm sewer may harm the receiving body of water.
- Avoid large-scale or direct discharge of processing solutions. Whenever possible, use holding tanks that will bleed the solutions slowly into the sewer line.
- Do not attempt to dispose of spent solutions by pouring them back into the containers they came from and letting your usual refuse collector pick up the refilled containers. Most refuse trucks are compactors; stoppered plastic or glass bottles can burst under the great pressure exerted by the compactor. The solutions in the bottles, which might be irritating to skin and eyes—or even poisonous—could then squirt out on anyone standing near the open part of the compactor.

Disposal of Small Volumes of Photographic-Processing Solutions

MORE INFORMATION

Kodak has many publications to assist you with information on Kodak products, equipment, and methods. The publications mentioned in the text plus a few more that may be of interest to you are listed here. They are available from photo dealers or directly from Eastman Kodak Company.

J-8, The KODAK Silver Recovery Program

Describes the details of Kodak's silver recovery and refining services for users of the KODAK Chemical Recovery Cartridges.

J-9, Silver Recovery with the KODAK Chemical Recovery Cartridge, Type P

Describes the three 3 1/2- to 5-gallon KODAK Chemical Recovery Cartridges and the recommended operating conditions.

J-9A, Silver Recovery with the KODAK Chemical Recovery Cartridge, Type 3

Describes this model cartridge, which is intended for large-scale processing operations.

J-10, Recovering Silver from Photographic Materials

Discusses various methods of recovering silver from sensitized goods and used processing solutions.

J-10A, Potential Silver Yield from KODAK Photographic Products

A listing of potentially recoverable silver from various Kodak film and paper products. Includes figures for both silver recovered during processing and silver from scrap film.

J-10B, Directory of Silver Services

Contains the names and locations of 188 firms throughout the United States and Canada that supply silver-recovery services.

J-20, Disposing of Effluent from a Minilab

Describes how to dispose of processing solutions used in a minilab to meet local effluent regulations.

J-41, BOD_5 & COD of Photographic Chemicals

Presents Five-day Biochemical Oxygen Demand and Chemical Oxygen Demand values for Kodak photoprocessing chemicals.

J-51, Silver in Photoprocessing Effluents

Demonstrates that silver in photographic-processing effluents is compatible with waste-water treatment and does not present a risk for receiving water.

J-53, The Use of Water in Photographic Processing

Discusses the theory of photographic washing and describes how to improve washing efficiency and other water-conservation techniques.

J-54, Analysis, Treatment, and Disposal of Ferricyanide in Photographic Effluents—A Compendium

A comprehensive collection of definitive articles on the characterization, determination, regeneration, and treatment of photographic-processing effluents with particular emphasis on ferricyanide bleach and ferrocyanide.

J-55, Disposal and Treatment of Photographic Processing Solutions

Describes photographic-processing effluent and ways of reducing and treating volumes larger than 200 gallons a day.

The following publications are available from the National Association of Photographic Manufacturers, 600 Mamaroneck Avenue, Harrison, NY 10528. Single copies are free to NAPM members.

Environmental Effect of Photoprocessing Chemicals, Volumes I and II
Pathways of Photoprocessing Chemicals in Publicly Owned Treatment Works

Photographic Products Group
EASTMAN KODAK COMPANY • ROCHESTER, NEW YORK 14650

Disposal of Small Volumes
of Photographic-Processing Solutions
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