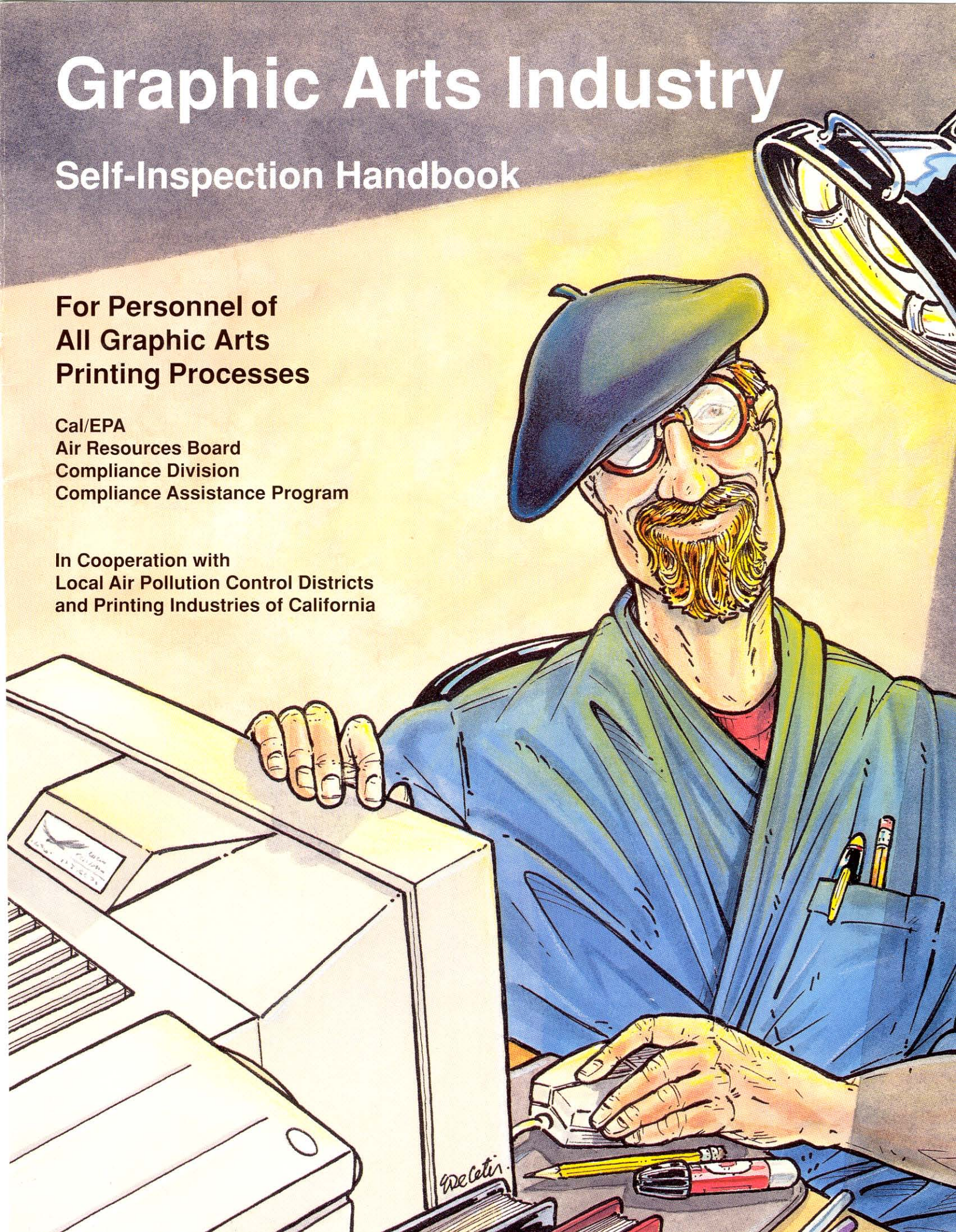
Graphic Arts Industry

Self-Inspection Handbook

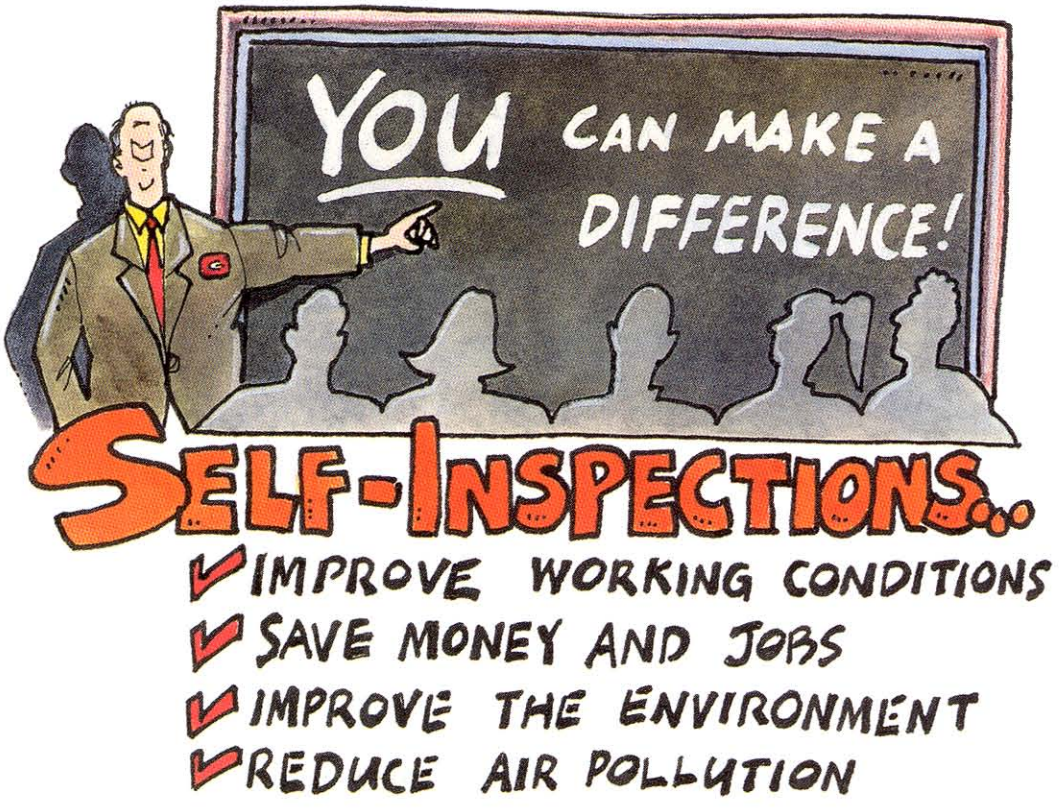
For Personnel of All Graphic Arts Printing Processes

Cal/EPA
Air Resources Board
Compliance Division
Compliance Assistance Program

In Cooperation with
Local Air Pollution Control Districts
and Printing Industries of California



Compliance Assistance...

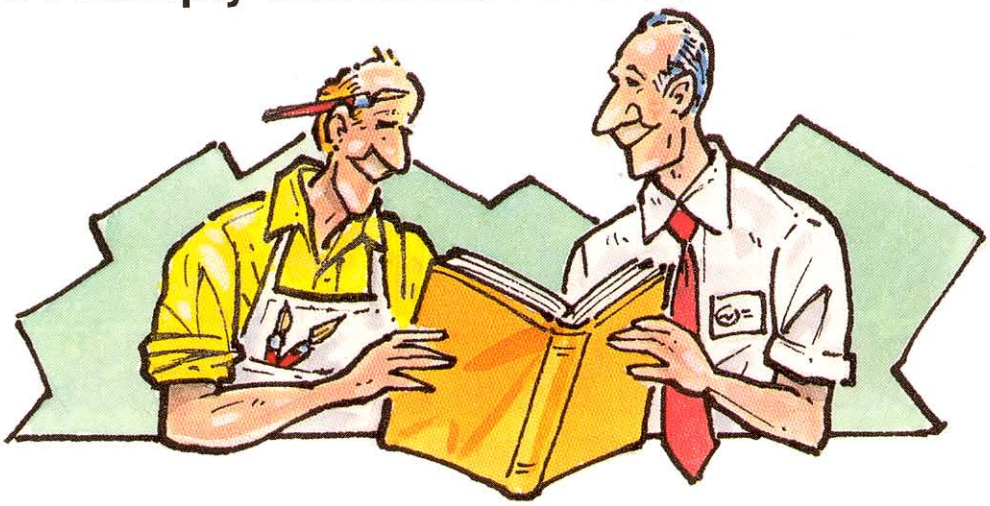


This handbook is designed to help you understand the air pollution control laws dealing with the graphic arts industry and its operations. It illustrates how to comply with these laws by using self-inspections. Read on and see how you can comply with the law, avoid penalties, improve your working conditions, keep your customers and neighbors satisfied, and have a healthy working environment. Self-inspections can even help you save money!

District Inspections Help You

At regular intervals, an inspector from the local air pollution control district will conduct a complete inspection of your facility. Your graphic arts printing facility will be examined to see that you are in compliance with the local regulations.

How Do I Comply and Avoid Penalties?



- ✓ Understand VOCs (Volatile Organic Compounds)
- ✓ Know Your Permit Limits
- ✓ Use Compliant Materials
- ✓ Maintain Your Equipment
- ✓ Store Materials Properly
- ✓ Practice Proper Waste Storage and Disposal

VOCs Produce Ozone

Organic solvents, known as Volatile Organic Compounds (VOCs), used in inks, cleaning solvents, and consumer products, cause greater VOC emissions than all the oil refineries in California combined. In the presence of sunlight, VOCs participate in a complex reaction with oxides of nitrogen in the air to produce ground level ozone, a pollutant that causes lung, crop, and property damage.

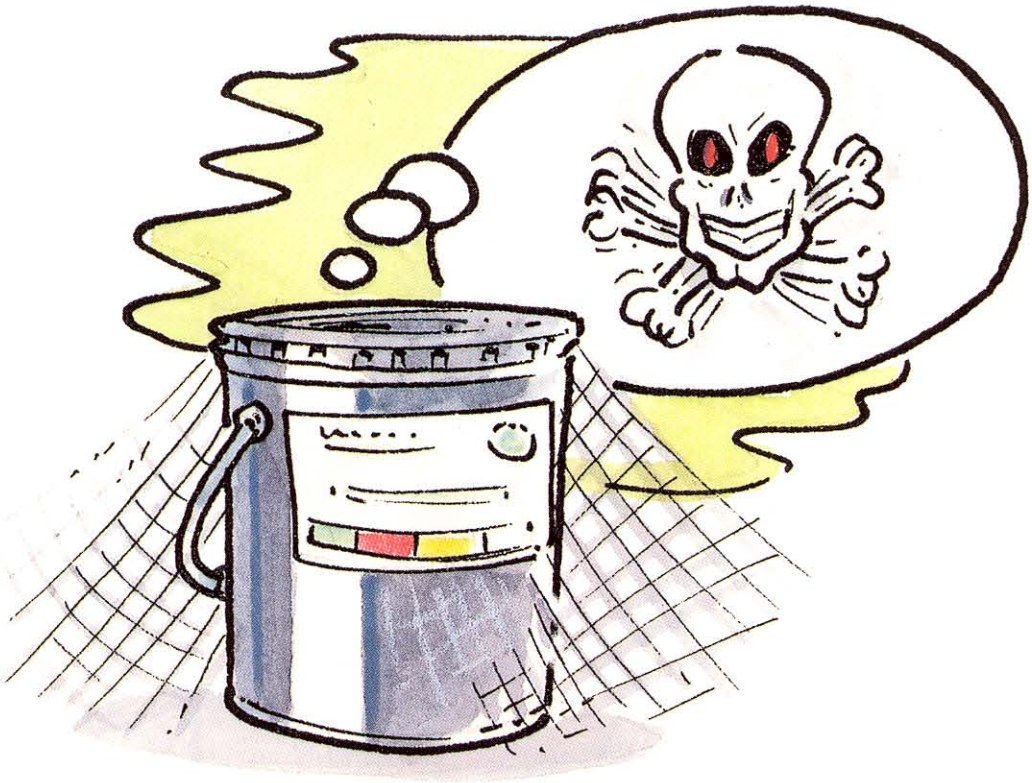
Air Emissions

The major causes of air emissions in the printing industry are the VOC's in inks, coatings, fountain solutions, and blanket and roller washes. High VOC, high vapor pressure solutions evaporate quickly at room temperature, thus resulting in excess air emissions and greater material consumption. Considering a switch to low VOC, low vapor pressure solutions will reduce air emissions and also result in decreased material consumption. There are a number of low VOC or non-VOC, low vapor pressure products available. It is highly recommended that you work with your vendors to identify these more environmentally friendly products.

Let's Talk About Some Approaches to a Successful Pollution Prevention Program

Inventory control, recordkeeping, employee training, and good housekeeping are keys to a printing company's environmental success.

Inventory Control



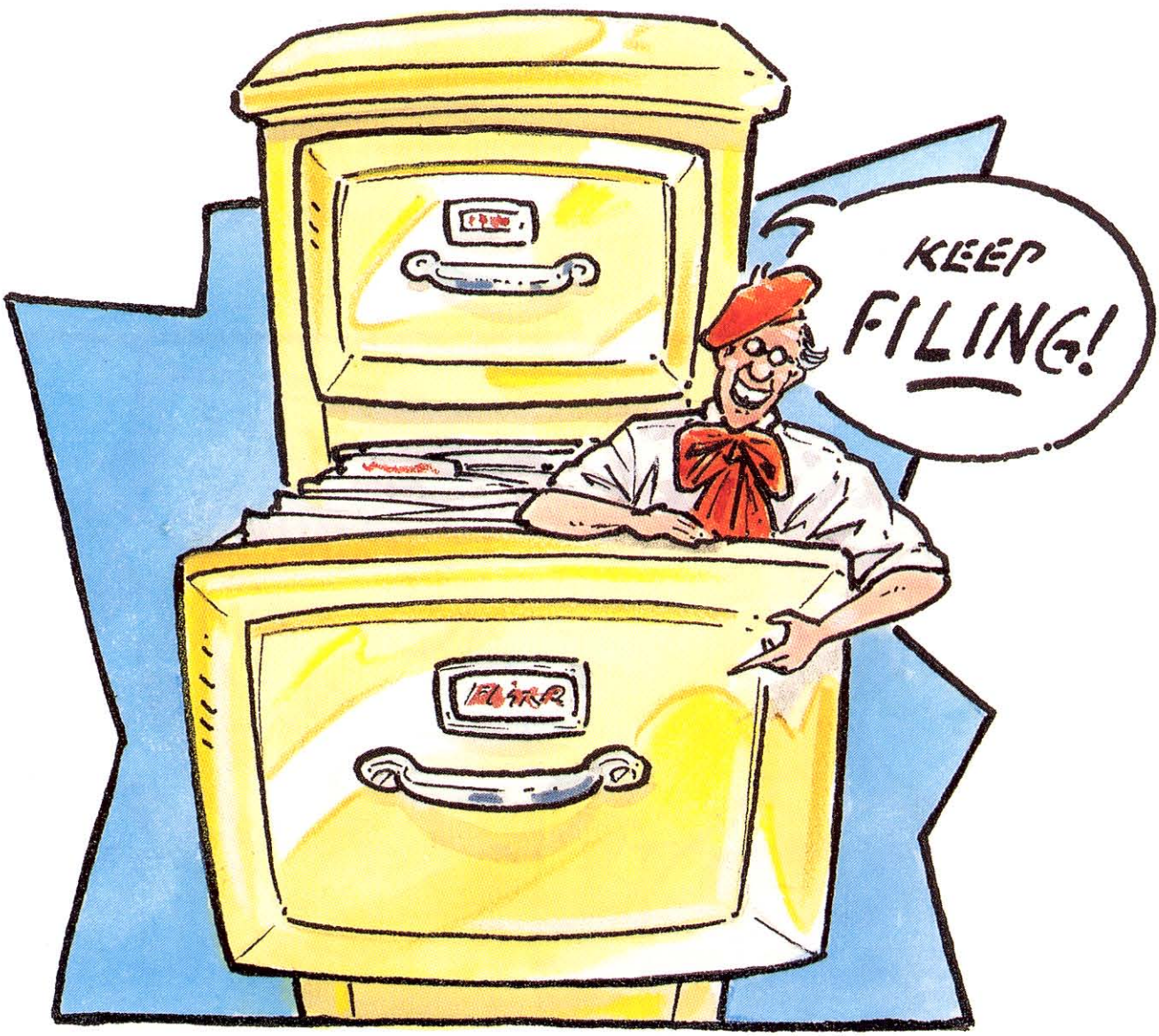
There are often instances where materials break down during extended storage time and become hazardous wastes. To avoid having to dispose of unused materials, incorporate the following steps into your inventory control procedures:

- ✓ Order materials on an as-needed basis.
- ✓ Mark purchase date on containers and monitor inventory to assure that older materials are used first.
- ✓ Consider substituting non-hazardous materials in place of hazardous materials.
- ✓ Purchase the smallest amount of solvents and other chemicals to do the job; waste disposal costs for unused chemicals may be higher than the savings of buying materials in bulk quantities.
- ✓ Seek a multi-purpose solvent or cleaning chemical rather than several different solvents; this will increase the chances of getting your waste recycled.

Record Keeping

Keeping accurate records is an important tool of environmental compliance. Keep track of every receipt, bill, and all manifests everytime you dispose of waste. Keep records of the waste hauler company, recycler, and storm water permits (if applicable) always on file. Material Safety Data Sheets (MSDS) of all chemicals used in the facility must be readily available for reference.

Record keeping can also become an integral part of any pollution prevention program. After implementing your program, evaluate records to identify source reductions.



Employee Training

Even the best waste handling arrangements can fail unless workers are involved in and committed to carrying out the plans. It is important that employees are aware that the cost of a job or project is influenced by how they handle materials that will become hazardous wastes when used. Employee training should include:

- ✓ The need to use a minimal amount of solvents or other chemicals.
- ✓ The importance of reading MSDS. These sheets give key environmental, health and work place safety information. Reading an MSDS before making a purchase could help avoid problems down the road.
- ✓ Proper training can provide a safer and healthier workplace.
- ✓ An employee training program will also enhance the public image of your business and reduce liability as well as show your customers and employees that you are taking extra steps to make your workplace better.

Good Housekeeping

Good housekeeping includes spill prevention as well as efficient use of raw materials. The following are good housekeeping practices:

- ✓ Always segregate wastes to increase recycling potential. By mixing hazardous wastes with non-hazardous wastes, the entire volume may be considered hazardous waste, which increases disposal costs.
- ✓ Designate one person to manage raw materials and to ensure that hazardous waste materials are properly controlled.
- ✓ Keep equipment in good working condition. Preventive maintenance and regular inspections for proper operation will reduce the likelihood of a bad job. Minimize spills and use dry methods for cleanup whenever possible.
- ✓ Always keep containers with processing materials and solvents closed when not in use to prevent valuable materials from evaporating.
- ✓ Be innovative, try new procedures and products. For example, reuse waste paper by making it into notepads.

Prepress: Image Processing and Transfer

Prepress can be divided into two steps: image processing and image transfer. Image processing involves photoprocessing while image transfer involves preparation of a plate from a photographic negative or positive. The primary wastes are processing chemicals, silver and waste water. Some of the pollution prevention options are as follows:

1. **Material Substitutions**

   Discontinue use of etched plates. Use dry positive proofs, aqueous developed proofs, or water developed plates.

   Eliminate the use of silver by switching to silverfree films such as diazo, photopolymer, electrostatic, or selenium based films.

   Ask vendors for non-hazardous chemical substitutes to replace intensifiers and reducers that contain cyanide salts. Also use non-hazardous developers and finishers.

2. **Silver Recovery**

   Recover silver from fixing baths and have a commercial recycler pick it up.

   Install an electrolytic deposition for silver recovery from fix solutions. For large volumes, install an ion exchange unit.

   Add ammonium thiosulfate to silver contaminated baths to extend the allowable build up of silver (consult the chemical manufacturer first).

3. **Process Baths**

   Use an acid bath prior to a fixing bath. This reduces the effect of alkaline developer on the fixing bath pH. Add acetic acid to the fixing bath, keeping the pH low to maximize soluble complexes.

   Use floating lids on bleach and developers to keep them fresh. Adding marbles to bring the level of partially used chemicals to the top will lessen chemical oxidation.

   Substitute non-hazardous raw material in place of hazardous whenever possible. Segregate fixer waste from developer waste.

4. Wastewater Reduction

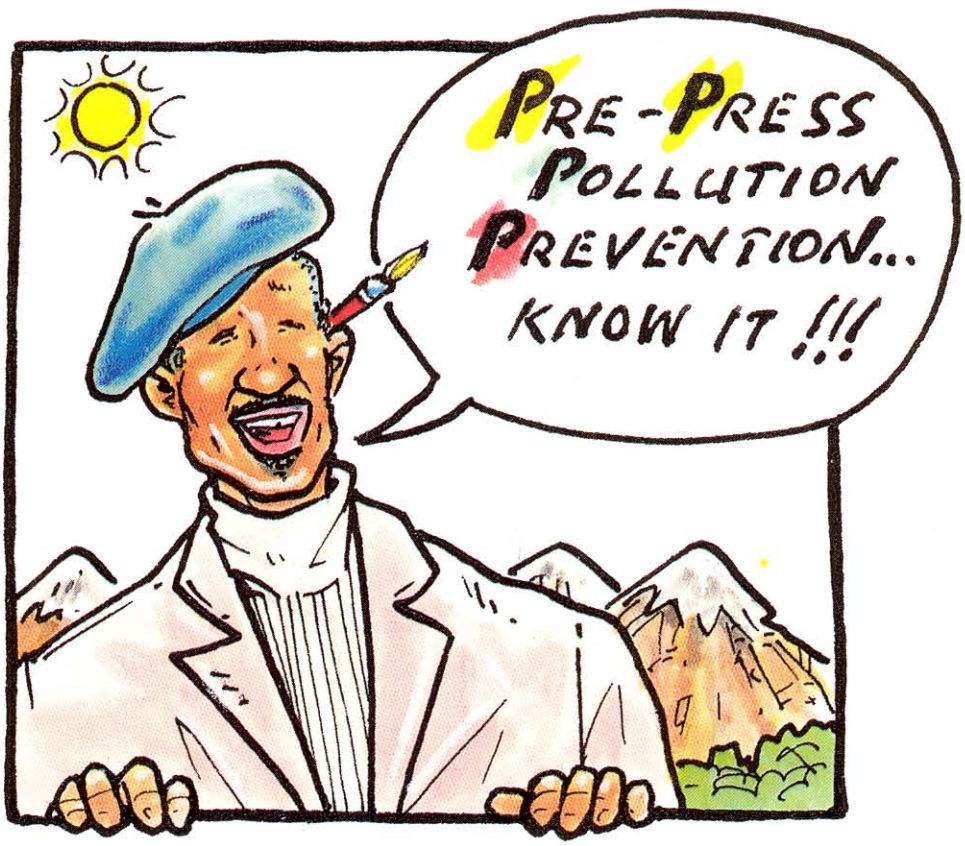
Employ countercurrent rather than parallel rinse techniques. Countercurrent rinsing means water from previous rinsing is used in the initial film washing stage. Fresh water enters the process at the final rinse stage, at which point many of the contaminates are already rinsed off the film.

Use rinse bath agitators or automatic flow controls for the rinse water and recycle the rinse water.

5. Electronic Technology

Use computers with commercial publishing capabilities to allow the user to set up and edit jobs before printing. Materials, time and waste are reduced from draft to final product.

Use digital technology to eliminate even more prepress waste than desktop publishing by directly transferring a computer generated image to the plate. Contact vendors for more information.



Printing Inks

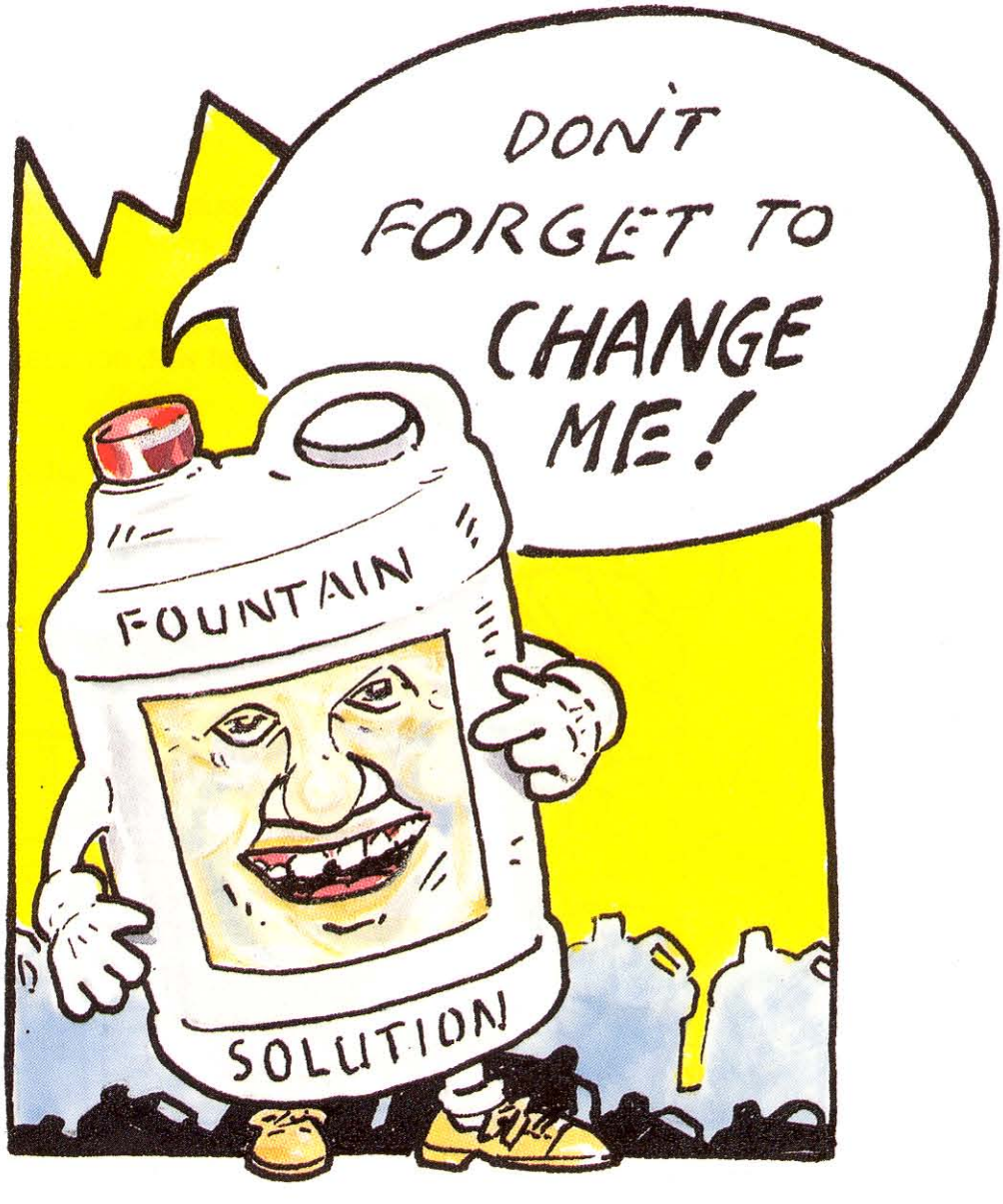
Inks that are petroleum based are a major source of hazardous waste. The composition of the ink varies widely. Some inks contain chemicals (metals) that would be classified as hazardous; others do not. Color changes, press cleaning and poor ink management generate waste ink. Good operating practices can decrease the amount of waste ink generated. Some good practices are:

- ✓ Keep ink containers sealed and contents leveled. Place plastic bags or waxed paper on top of the ink to prevent oxidation.
- ✓ Scrape as much ink as possible from empty cans prior to disposal or recycling.
- ✓ Use a standard ink sequence for process colors.
- ✓ Schedule runs from lighter to darker colors to decrease the amount of cleaning necessary.
- ✓ Recycle light colors into darker and specialty colors.
- ✓ Substitute petroleum-based inks with vegetable or soy inks, UV curable inks, or waterborne inks. Contact vendors for more detailed information.

Dampening System

Fountain solution is generally changed weekly (somtimes more frequently) to maintain the pH and conductivity needs of the solution.

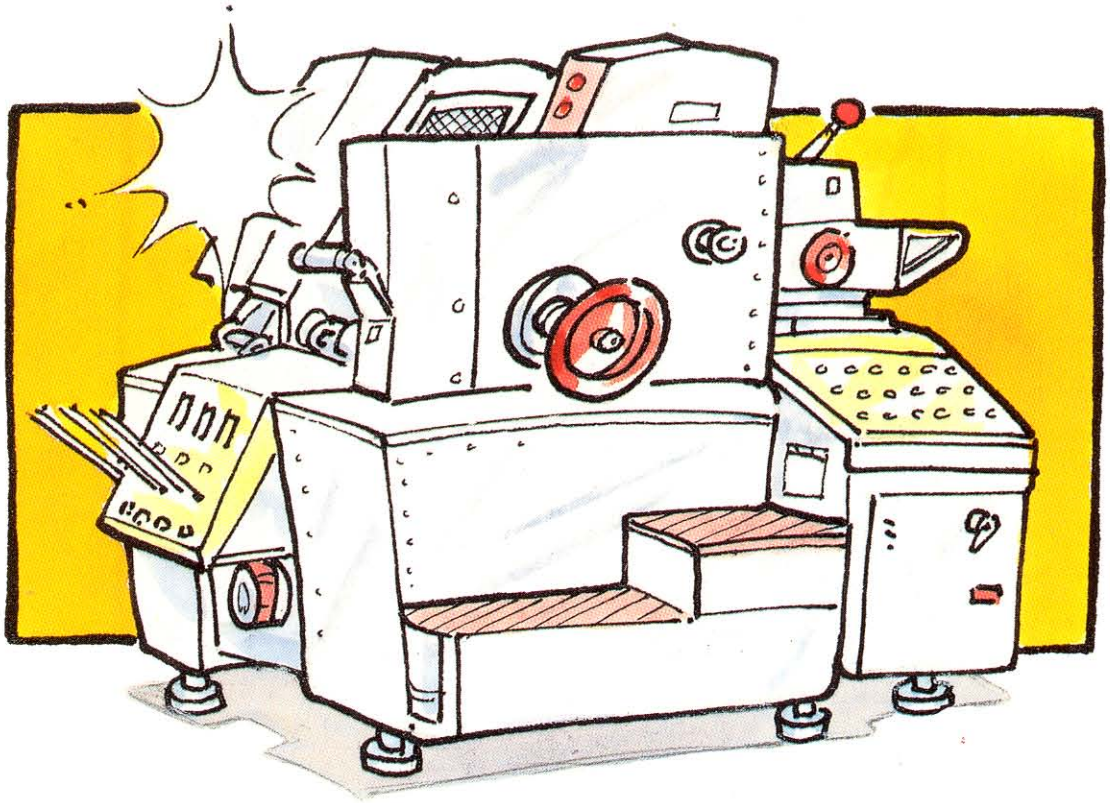
- ✓ Eliminate the use of alcohol-based fountain solution, such as IPA.
- ✓ Extend the life of the fountain solution by adding filters, chillers and recirculating systems.
- ✓ Keep the fountain solution tank covered.



Press Cleaning

Cleaning solvents are often petroleum based VOCs mixed with detergent and/or soaps and non-regulated materials, and contain up to 100 percent VOCs. Cleaning the press generates wastes such as waste cleaner with residual ink, waste ink from the ink fountains, rags containing the cleaner, and ink and air emissions from the cleaners. Some pollution prevention alternatives are:

- ✓ Substitute high VOC cleaners with low VOC cleaners and use those with a lower vapor pressure and higher flash point. Contact your local district and the manufacturer for more details.
- ✓ Automatic cleaning systems reduce cleaner consumption. These systems also prevent ink buildup which requires stronger cleaning solutions.
- ✓ Try to use one type of solvent for all purposes. This will improve recycling capabilities and decrease disposal costs.
- ✓ Collect used rags in a separate can. Use launderable rags instead of disposals. As long as the rags are just wet, not soaked, laundries will accept them for cleaning.
- ✓ Schedule jobs by color. Clean the ink tray only when changing colors.



Recycling

Waste can be recovered and reused in the same production process on site, as recycling is a form of pollution prevention. For instance, solvent recovered from the recovery system can be reused for various purposes. Also certain types of waste generated usually have good market demand. For example, there is steady demand in the market for waste signatures, millbroke, corrugated cardboard, precious metal, and spent negatives. Information on marketing wastes can be available from the yellow pages (generally under recyclers, metal collectors, precious metal collectors, solid waste brokers, etc.) various state solid waste agencies, regional and national waste exchange services, or through solid waste haulers.

10 Tips for Success in Environmental Management

1. Establishing a pollution prevention program

The first step is to recognize the need for waste reduction at your facility. It is essential that you and your employees have a common commitment to achieve source reduction and recycling goals. Each step can be as basic or complex as you feel is necessary to meet the environmental goals that you set for your facility. Emphasis should be placed on generating less waste, saving disposal costs, and being an environmentally friendly company.

2. Evaluating pollution prevention options

Identify the opportunities at your facility that can reduce or eliminate waste generation, emissions and environmental damage. Switching to electronic imaging, using squeeze bottles for solvent, changing over to low VOC washes and fountain solutions, are all examples of ways to prevent or reduce pollution. Also, look for options to recycle your scrap film, plates, make-ready inks and any other waste streams. Wastes that cannot be reduced at the source or recycled should be disposed of in accordance with your local air district and state regulations.

3. Segregate your facility's wastes

It is highly recommended that you keep hazardous and non-hazardous wastes separate. Do not mix solvents with other wastes generated in the facility. Mixing wastes increases treatment costs and makes recycling more difficult.

4. Dispose hazardous waste properly

Never put hazardous waste into the dumpster. Put all hazardous wastes in one area. Be sure to separate your waste storage area from your product storage area. Label each of your containers, for example: waste ink only, used towels only, used fixer only, etc. Do not discharge any wastes into the sewer system without proper approvals from your local sewer agency.

5. Prepress: Image Processing and Transfer

Waste associated with the prepress operations include damaged plates, developed film, acids, alkalis, solvents, plate coatings and developers, dated materials and rinse water. Therefore the primary pollution prevention program should focus on photographic chemistry management and on recycling used plates. Other options include proper material handling and storage, material substitutions, recovery of silver, waste water reduction or even process changes to electronic technology.

6. Replace High VOCs with Low VOC Substitutes

The major cause of air emissions in the printing industry is high VOC in inks, fountain solutions, solvents, cleaners and other materials. High VOC/high vapor pressure containing solutions evaporate very rapidly at room temperature, thus resulting in excess air emissions and increasing material consumption. Switching to low VOC containing solutions will reduce air emissions and also result in decreased material consumption. There are many low-VOC or non-VOC products available. It is highly recommended that you work with your vendors to find products with lower concentrations of VOC.

7. Emerging Technologies

New technologies are significantly changing the printing industry. Most processes these days can be controlled by computers. Developments such as waterless printing have been seen as a possible replacement to the dampening system. New digital presses no longer needing plate processing have also been developed. New technologies have the potential not only to provide a high quality product, but also can reduce printing waste significantly furthering the cost effectiveness. Other common control strategies include the collection and destruction, or recovery, of VOCs during the printing process. Absorbers, adsorbers, combustors (incinerators) and condensers are all used in this capacity.

8. Recycling the Waste

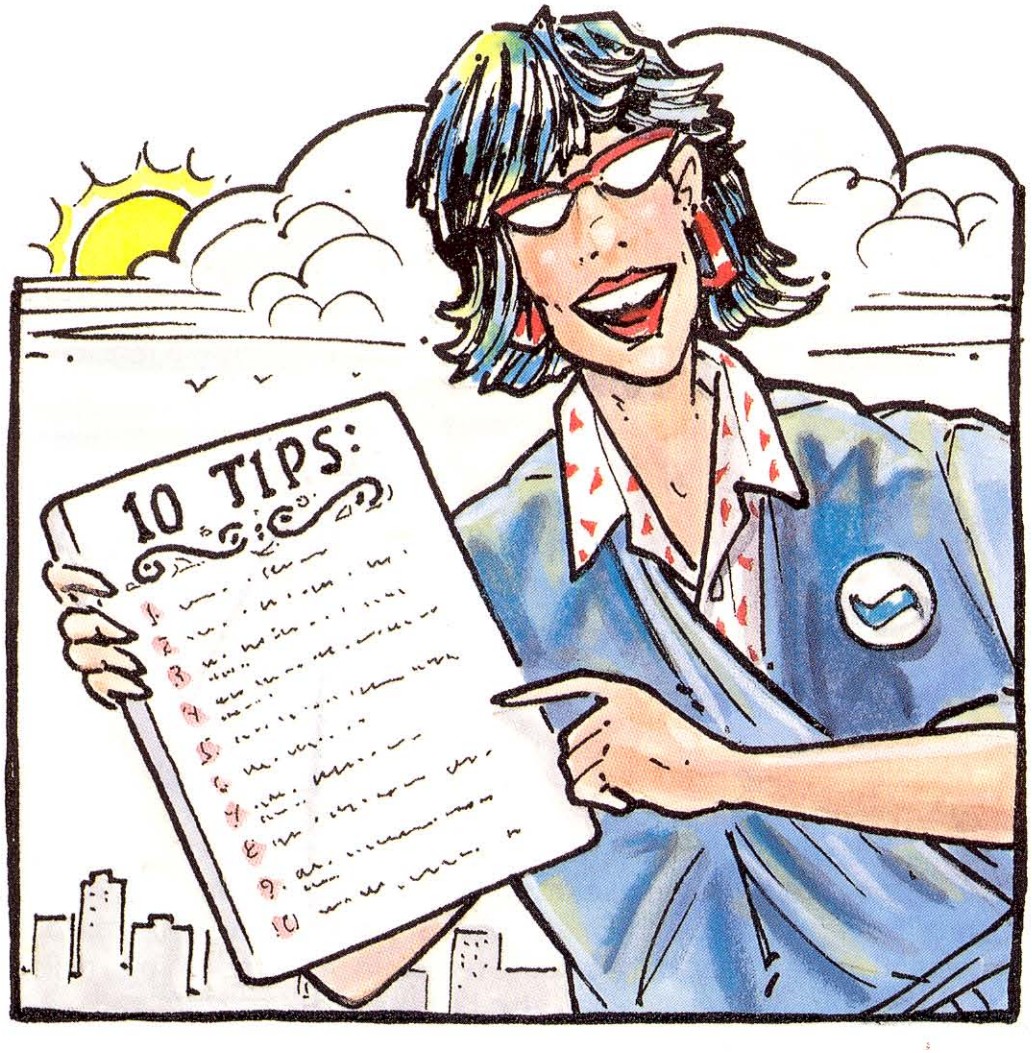
Although eliminating or reducing waste is always the best option, recycling the waste is also an important element in your effort in developing a pollution prevention or waste minimization program. Often recycling programs are instituted at a facility without clearly identifying where the recycled materials can be marketed. Sources for such information are located in the yellow pages under recyclers, metal collectors, solid waste brokers, etc. Information can also be obtained from state, regional and national waste exchange services.

9. Record Keeping

Record keeping is an important step in environmental compliance. Keep every record of any purchase, every receipt, bill of lading or manifest every time you dispose of your waste. Keep records of sewer discharge limits and how you are meeting them. A good record keeping system can help determine the various sources of waste generation and provide answers for implementing a pollution prevention program.

10. It's in Your Best Interest

Through the implementation of a pollution prevention program, you will be joining other printers who are taking pride in complying with district regulations, avoiding costly penalties and fees and helping to keep the environment cleaner for everyone. If you have any questions regarding the applicable requirements, call your local district.



The following "do's" and "don'ts" may save you money and help you achieve a better pollution prevention program:

Do:

Switch to non-aerosol products, such as manual squeeze bottles, especially if they can be refilled.

Return defective cans back to your supplier.

Purchase developer containing less than one percent hydroquinone. Check with supplier or look on your MSDS.

Make sure employees know that unused developer may be a hazardous waste. Make sure you use a waste hauler who has a valid Cal/EPA permit.

Consider changing to an alcohol-free fountain solution. Look for alcohol substitutes that are not hazardous waste when disposed. Ask your vendors or printing association for suggestions.

Consider switching from a petroleum oil-based ink to a vegetable oil-based ink such as soy or linseed oil.

If using colored inks, ask your vendor for inks that contain little or no heavy metals. Ask if your vendor can re-blend waste inks.

When storing cans of ink that have been opened, cover the ink surface with waxed paper, lids or other covers to reduce skinning and maintain ink quality.

Don't:

Don't buy aerosols containing "listed hazardous and toxic" compounds. Work with your vendor to find alternatives.

Don't throw non-empty cans into the garbage.

Don't dispose of unused or past shelf life developer to the sanitary sewer unless you have permission from your local sewer utility.

Don't give up. When trying a low or non-alcohol fountain solution, you may need to experiment to find the right product or formulation. If one doesn't work, try another. Keep with it until you find one that satisfies you.

Don't put hazardous inks in the garbage. Handle and dispose of them as hazardous waste.

Don't pollute the air by setting your ink cleanup trays out to dry. Put ink cleanup sludges into a container with the lid sealed when not in use.

Don't mix solvents with any other waste. Keep different types of solvents in separate, labeled, closed containers.

Don't saturate shop towels with too much press wash. Use the minimum amount needed to do the job. Excessive use increases the amount of wash that needs to be bought resulting in increased air pollution.

Definitions

Approved Emission Control System: A system for reducing emissions of VOC to the atmosphere, consisting of a control device and a collection system, which achieves the overall abatement efficiency specified in the applicable standards section at all times during operation of the equipment being controlled.

Extreme Performance Ink/Coating: An ink or coating used in screen printing on a non-porous substrate that is designed to resist or withstand any of the following: more than two years of outdoor exposure; exposure to industrial-grade chemicals, solvents, acids, or detergents, oil products, cosmetics, temperatures exceeding 76^{0}C (170^{0}F), vacuum forming, embossing or molding.

Flexographic Printing: The application of words, designs or pictures by roll printing technique in which the pattern to be applied is raised above the printing roll and the image carrier is made of rubber or other elastomeric material.

Fountain Solution: The solution applied to the image plate to maintain the hydrophilic properties of the non-image areas and to keep the non-image area free from ink.

Fugitive Emissions: Emissions of VOC from any portion of the printing, coating or laminating operation other than the drying oven.

Graphic Arts Line: Printing application equipment, coating equipment, laminating equipment, flash-off areas, ovens, conveyors or other equipment operating in a series in a graphic arts operation.

Graphic Arts Operation: Any gravure, publication gravure, flexographic printing, screen printing, letterpress, or lithographic printing operation, or any coating or laminating operation manufacturing converted flexible packaging materials for packaging of food or health care products for human or animal consumption.

Gravure Printing: An intaglio printing operation in which the ink is transferred from minute etched wells on a plate to the substrate, which is supported by an impression roller, with excess ink removed by a doctor blade.

Heat Shrinkable Tubing: Thermoplastic tubing, including but not limited to polyethylene, Kynar and mylar tubing that after printing is exposed to temperatures exceeding 100^{0}C (212^{0}F).

Heatset Ink: A quick drying ink in which the solvents are vaporized by passing the printed surface through an IR or UV dryer or gas oven.

Letterpress Printing: A method where the image area is raised relative to the nonimage area and the ink is transferred to the paper directly from the image surface.

Lithographic Printing: A planographic printing process in which the image and nonimage areas are on the same plane and are chemically differentiated. This printing process differs from other printing processes where the image is typically printed from a raised or recessed surface.

Metallic Ink: An ink that contains greater than 50 grams of metal per liter (0.4 lb/gal) or ink.

Non-Heatset Ink: Ink which dries by oxidation and absorption into the substrate without the use of heat from dryers or ovens.

Non-Porous Substrate: Any substrate whose surface prevents penetration by absorption, including but not limited to foil, polyethylene, polypropylene, cellophane, paper or paperboard coated with a non-porous surface, metalized polyester, nylon and polyethylene terephthalate (mylar).

Porous Substrate: A substrate whose surface does not prevent penetration by absorption, including but not limited to paper, paperboard, and any paper product that is coated with a porous material.

Publication Gravure: Gravure printing on paper which is subsequently formed into books, magazines, catalogues, brochures, directories, newspaper supplements or other types of printed material.

Screen Printing: A process where the printing ink passes through a web or a fabric to which a refined form of stencil has been applied. The stencil openings determine the form and dimensions of the imprint.

Sign Ink/Coating: An ink or coating used in screen printing indoor and outdoor signs (excluding structural components) and murals, including lettering enamels, poster colors, copy blockers, and bulletin enamels.

Solvent: Organic compounds which are used as diluents, thinners, dissolvers, viscosity reducers, cleaning agents or for other similar uses.

Volatile Organic Compounds: Any organic compound (excluding methane, carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates and ammonium carbonate) which would be emitted during use, application, curing or drying of a solvent or surface coating.

Water Slide Decal: A decal which is screen printed onto treated paper stock and is removable from the stock by the dissolution of an underlying, water-soluble adhesive or a similar carrier.

Web Splicing Adhesive: An adhesive used to join two continuous rolls of substrate.

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Need More Information?

Air Resources Board (800) 952-5588 **District: _____**

Multi-County Districts

1 - Bay Area (415) 749-5000
2 - Feather River (530) 634-7659
3 - Great Basin (760) 872-8211
4 - Monterey Bay (831) 647-9411
5 - North Coast (707) 443-3093
6 - Northern Sierra (530) 274-9360
7 - South Coast (909) 396-2000
8 - Yolo-Solano (530) 757-3650
9 - San Joaquin Valley (559) 230-6000

County Districts

Amador (209) 257-0112
Antelope Valley (661) 723-8070
Butte (530) 891-2882
Calaveras (209) 754-6504
Colusa (530) 458-0590
El Dorado (530) 621-6662
Glenn (530) 934-6500
Imperial (760) 482-4606
Kern (661) 862-5250
Lake (707) 263-7000
Lassen (530) 251-8110
Mariposa (209) 966-2220
Mendocino (707) 463-4354
Modoc (530) 233-5522
Mojave Desert (760) 245-1661
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Placer (530) 745-2330
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Santa Barbara (805) 961-8800
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