

Pollution Prevention Checklist For Lithographic Printers

By Wayne Pferdehirt, Tom Blewett, and Bob Gifford

Instructions

This checklist contains a menu of pollution prevention activities for you to consider applying at your shop, organized by printing operation, e.g., film developing, plate processing, etc. Within each of these categories, basic recommended practices are given in bold, followed by intermediate recommended practices which require operating changes or some modest investment. Alternative technologies, in italics, cover practices that require investment in new equipment.

The range of ideas presented in this checklist acknowledges the diversity that exists in the lithographic printing industry. Also, due to rapid changes in technology, some of the ideas may not be applicable to your shop. This checklist is intended as a tool to stimulate ideas about potential opportunities for reducing wastes and emissions in your shop, and reducing associated costs. Because other innovative options exist beyond this list, the last line of every category includes space for your ideas.

The first step in completing this checklist is to move through the list in each category, placing checks in the appropriate boxes. After you have reviewed the entire checklist, go back and identify activities or projects you would like to do now and develop plans for implementation and follow-up.

Company: _____ Completed by: _____

Date: _____

Pollution Prevention Opportunities: Film Developing

| Best Management Practice | Done | Needs Attn. | Does Not Apply |
|---|------|-------------|----------------|
| Recycle scrap film. | | | |
| Keep chemical baths covered to prevent oxidation and contamination of chemicals and to reduce emissions. | | | |
| Ensure that no photo chemicals are discharged to a septic system. These should either be: | | | |
| 1. Collected and sent off-site for treatment and disposal; or | | | |
| 2. Treated as necessary and discharged to a sanitary sewer system. | | | |
| Properly mix developer and fixer chemistry according to the manufacturer's specifications. | | | |
| Recover silver from used fixer by either: | | | |
| 1. Installing equipment to recover silver from pre-press wastewater discharge on-site; or | | | |

| | | | |
|--|--|--|--|
| 2. Contracting with a service for shipment and treatment of silver-containing wastewater. | | | |
| Properly calibrate and maintain film developing units. | | | |
| Install squeegees (cannot be installed on all developers) to remove excess chemicals prior to immersing film in a different chemical bath. This will reduce a chemical carryover and extend bath life. | | | |
| Maintain squeegees. Periodically check and replace as necessary. | | | |
| Avoid chrome-based film cleaners. | | | |
| Use chemicals as long as they are active rather than disposing routinely. See A and B below. | | | |
| Examine the use of fixer, developer, and washwater recycling units or services. | | | |
| <i>Consider direct-to-plate (computer-to-plate) systems. Be aware of wastewater issues with these technologies, particularly high solids content and high oxygen demands.</i> | | | |
| <i>Consider digital proofing technology.</i> | | | |
| Add your idea here: | | | |
| <p>A. Standard Image:</p> <ol style="list-style-type: none"> 1. Start with fresh chemistry. 2. Expose an image onto film using a 50% patch and a clear image area such that the image quality measure D-max = 4.0. 3. Each day develop this standard image and measure D-max and D-min. 4. D-max less than 4.0 indicates spent developer 5. D-min greater than 0.04 indicates that the fixer needs to be changed <p>B. Change the fixer when a silver test strip shows a silver concentration greater than 6g/l, or pH increases from 4.0 to 5.5, or the image area is milky or cloudy.</p> | | | |

The following assume that you recover silver on-site:

| Best Management Practice | Done | Needs Attn. | Does Not Apply |
|---|-------------|--------------------|-----------------------|
| Check that your installation and operation meet the practices recommended by the Silver Council in the Code of Management Practice Guide for Commercial Imaging. (Contact them at 202-793-8117, info@silvercouncil.org, or www.silvercouncil.org) | | | |
| Verify that the flow rate through your silver recovery system does not exceed the flow rate recommended by the manufacturer. | | | |
| Implement procedures to ensure that discharge from on-site silver recovery system meets sewer code requirements including: | | | |
| 1. Employees are trained on proper system operation and maintenance, | | | |

| | | | |
|--|--|--|--|
| <p>2. Discharge from system is checked at least weekly with a test to detect failures, (e.g. paper test strips), and</p> | | | |
| <p>3. Discharge from system is analyzed with accurate laboratory tests to verify removal efficiency.</p> <ul style="list-style-type: none"> • For in-line electrolytic recovery: every three months • For terminal electrolytic recovery: every six months • For chemical recovery cartridges: every year. | | | |
| <p>4. A log is maintained documenting system checks and results.</p> | | | |
| <p>If you use chemical recovery cartridges (CRCs):</p> <p>1. Verify that you have two cartridges, installed in series, and clear tubing between units (brown liquid in tubing indicates need to change first unit).</p> | | | |
| <p>2. Compare pH of solution entering CRCs with pH operating range recommended by the CRC manufacturer (usually 4.5 to 5.5 for B/W imaging, 6.8-8 for color). A typical fixer may not need adjustment, depending on CRC specifications . Provide a direct plumbing connection to the overflow rather than manually dumping batches into the CRC.</p> | | | |
| <p>3. Train employees for proper changeout of CRC units.</p> <ul style="list-style-type: none"> ◦ Second unit should be moved to the first position. ◦ New unit installed in the second position (after filling the new CRC unit with water to prevent channeling and premature failure). ◦ Back flush the spent unit three times to eliminate free silverbearing liquid. ◦ Record the switch date in the log and write the date on the CRCs. ◦ Ship the spent CRC unit to a refiner who will extract the silver. | | | |
| <p>Use a terminal electrolytic silver recovery unit in front of CRC units for initial silver recovery and then pump to a holding tank where the partially desilvered solution can be metered into the CRC system.</p> | | | |
| <p>Use in-line electrolytic silver recovery to permit reuse of fixer in addition to developer reuse with replenishers and bath extenders, each mixed according to supplier recommendations.</p> | | | |
| <p>Make certain that automated processing equipment is properly maintained to ensure maximum life of chemicals and minimal waste.</p> | | | |
| <p>Save water by using intermittent rinse water flow (no flow when processor is on idle).</p> | | | |
| <p>Add your idea here:</p> | | | |

Pollution Prevention Opportunities: Plate Processing

| | | | |
|--|--|--|--|
| | | | |
|--|--|--|--|

| Best Management Practice | Done | Needs Attn. | Does Not Apply |
|--|-------------|--------------------|-----------------------|
| Recycle aluminum plates. | | | |
| Recycle metal etching developer. | | | |
| Extend life of plate developer through use of monitoring and replenishing. | | | |
| Use a recycling service for depleted plate developer. | | | |
| Use presensitized aqueous plates. | | | |
| Use nonhazardous plate developers. | | | |
| Save water by using intermittent rinse water flow (no flow when processor is on idle). | | | |
| Properly maintain and adjust equipment. | | | |
| Properly calibrate replenisher and washwater using a fixed volume container and a stopwatch. | | | |
| Use chemicals as long as they are sufficiently reactive. Use a plate control target to measure activity. Some manufacturers recommend testing conductivity as a means to define reactivity. | | | |
| Visually inspect the plate for a high quality image. | | | |
| <i>Consider digital printing systems (direct-to-press).</i> | | | |
| Add your idea here: | | | |

Pollution Prevention Opportunities: Make-ready

| Best Management Practice | Done | Needs Attn. | Does Not Apply |
|---|-------------|--------------------|-----------------------|
| Set goals to minimize make-ready waste. Regularly track and compare make-ready wastes (as a percentage of acceptable printed product) with goals. | | | |
| Establish and follow standard procedures for checking plate-to-press registration | | | |
| Record paper, ink, press, and press settings for all possible re-run jobs, to reduce make-ready on subsequent runs. | | | |
| Establish and follow standard procedures for mixing fountain solution. Check concentration by measuring pH and conductivity prior to use and throughout the press run. | | | |
| Implement an effective program to ensure that color requirements of the customer are thoroughly understood and can be tracked throughout prepress and production. | | | |
| Check paper and ink for compatibility before initiating make-ready. Record problems and solutions with ink/paper matches to reduce future problems and wastes. | | | |
| <i>Use industry-standard light sources for checking color match, and change lights at manufacturer-prescribed intervals.</i> | | | |
| <i>Check color during make-ready and production with spectro-photometer and</i> | | | |

| | | | |
|----------------------|--|--|--|
| <i>densitometer.</i> | | | |
| Add your idea here: | | | |

Pollution Prevention Opportunities: Process Control

| Best Management Practice | Done | Needs Attn. | Does Not Apply |
|---|------|-------------|----------------|
| Develop and document recommended press settings for each press, for most common paper and ink combinations. | | | |
| Establish a regular schedule for cleaning dampening and ink fountains. | | | |
| Implement a comprehensive roller maintenance program that includes recorded, regularly scheduled visual inspections, checks on roller durometer, deglazing, and reconditioning. | | | |
| Use job scheduling to reduce press cleanup by running lighter colors, then darker colors, whenever possible. | | | |
| Establish a checklist to spell out requirements for basic maintenance of all presses, including: what should be done, when it will be done, who should do it, and procedures for documenting that it has been done. | | | |
| <i>Consider dedicating a press or presses to running the same colors, as much as required colors for jobs permit, to reduce press cleanup.</i> | | | |
| Add your idea here: | | | |

Pollution Prevention Opportunities: Inks

| Best Management Practice | Done | Needs Attn. | Does Not Apply |
|---|------|-------------|----------------|
| Review ink estimation methods to assure minimal ink waste. | | | |
| When adding ink to fountain, add only enough ink as is required to complete the scheduled job (reduces waste and cleanup). | | | |
| Schedule work on presses with a goal to minimize color changes and print station cleanups. | | | |
| Evaluate waste ink management practices to assure that no inks are improperly disposed and that potential liabilities are minimized. | | | |
| Eliminate lead, mercury, cadmium and chromium-based pigments by using inks which comply with The Coalition of Northeastern Governors (CONEG) metals requirements. See www.coneg.org for details. | | | |
| Increase use of vegetable oil based inks (such as soy oils). Vegetable oils have lower VOC contents than petroleum oils. | | | |
| Keep ink kits sealed to prevent oxidation. | | | |
| Use date labels on opened ink containers. | | | |

| | | | |
|---|--|--|--|
| Reduce waste ink by increasing use of existing ink inventories whenever possible, especially for in-house jobs. | | | |
| Return unused ink to supplier, if possible. | | | |
| Keep good records on stock for recall and reuse, and maintain a first-in, first-out use plan. | | | |
| Reblend inks (either on-site or off-site) to black for internal or external use. | | | |
| Blend leftover inks into required or requested PMS colors using software designed to generate colors from existing inventory. | | | |
| <i>Consider automatic ink levelers for even distribution and ink agitators to help reduce oxidation of inks in the tray.</i> | | | |
| <i>Consider computer controlled ink mixing with digital scales.</i> | | | |
| <i>Consider ultraviolet (UV) and electron beam (EB) curable inks.</i> | | | |
| Add your idea here: | | | |

Pollution Prevention Opportunities: Fountain Solutions

| Best Management Practice | Done | Needs Attn. | Does Not Apply |
|---|-------------|--------------------|-----------------------|
| Reduce the concentration of IPA in your fountain solution. | | | |
| Carefully maintain proper conditions for the solution by checking pH and conductivity of fountain solution at least once per shift. | | | |
| If you are using IPA, refrigerate (to about 60 F or less) to reduce evaporative loss of isopropyl alcohol. | | | |
| Train all press operators in understanding how conductivity and pH relate to problems at press and how to maintain conductivity and pH within prescribed ranges for the fountain solution. | | | |
| Eliminate the use of IPA by switching to low-VOC alcohol replacements or substitutes for your fountain solution. | | | |
| When selecting your IPA substitute, minimize the concentration of hazardous air pollutants (HAPs) and SARA reportable chemicals. Check MSDS's and talk with your supplier to identify reportable chemicals. | | | |
| To facilitate IPA elimination, check roller durometers to make sure that they are appropriate for the fountain solution that you are using, and keep rollers maintained. | | | |
| Install recirculating and automatic mixing units for fountain solution. | | | |
| Use in-line filters in your recirculating units to reduce or eliminate the need to discharge or dispose of fountain solution prematurely. | | | |
| Monitor the consistency of the quality of your incoming makeup water over an extended period of time, since most fountain solutions are mixed to achieve a target conductivity and pH, swings in the incoming water's conductivity, pH, and mineral content can greatly affect the performance of your fountain solution. | | | |
| <i>Consider reverse osmosis or deionization system for source water.</i> | | | |
| Add your idea here: | | | |

Pollution Prevention Opportunities: Blanket and Roller Wash

| Best Management Practice | Done | Needs Attn. | Does Not Apply |
|---|------|-------------|----------------|
| Dispense solvent from safety cans that deliver a controlled amount of solvent to a shop towel, and keep containers closed. | | | |
| Use pre-used shop towels for the initial cleaning, then use clean towels for the final cleaning. | | | |
| <p>Clean press trays by</p> <ol style="list-style-type: none"> 1. Scraping, 2. Soaking in reused dirty solvent, 3. Running through a parts washer, and 4. Final cleaning with clean solvent. <p>Do not line press trays with shop towels.</p> | | | |
| Eliminate (or use only on hard to clean spots) use of <i>type wash</i> cleaners or cleaners that contain hazardous air pollutants such as toluene, MEK, and xylene. | | | |
| Collect and reuse cleaning solvent. | | | |
| Recover solvent from shop towels for reuse or recycling using gravity draining in a false-bottom drum, a mechanical wringer or centrifuge equipment. | | | |
| Ensure that used solvents and solvent saturated towels or wipes are not disposed with the trash. | | | |
| Keep shop towels in closed containers while on-site. | | | |
| Check the condition of roller cleanup blades and ensure blade angles are properly set. | | | |
| Reduce the VOC emissions from cleanup solvents you use, by using reduced VOC content cleaners or by using lower vapor pressure solvents. Use solvents with vapor pressures of 10 millimeters of mercury or less, as measured at 20 C (Celsius) or 68 F (Fahrenheit). | | | |
| Send solvents that cannot be reused off-site for recycling. | | | |
| Conduct training on proper cleaning methods to assure success when using new materials and practices. | | | |
| <i>Consider installing automatic blanket washers.</i> | | | |
| <i>Consider installing a centrifuge to recover solvents from shop towels and wipes for reuse.</i> | | | |
| Add your idea here: | | | |

Pollution Prevention Opportunities: Finishing

| | | | |
|--|--|--|------|
| | | | Does |
|--|--|--|------|

| Best Management Practice | Done | Needs Attn. | Not Apply |
|---|-------------|--------------------|------------------|
| Properly size paper to reduce cutting waste and recycle cuttings and cardboard. | | | |
| Maintain good inventory practices including using older binding materials to avoid waste from outdated or unusable materials. | | | |
| Replace solvent-based adhesives with water-based adhesives when possible. | | | |
| Avoid or minimize use of coatings and adhesives that interfere with recyclability of the finished product. | | | |
| Use mechanical binding in place of chemical adhesives when acceptable to the customer. | | | |
| Recycle all possible solid wastes such as paper wraps and cores, corrugated paper, scrap paper, trimmed paper, pallets and packaging. | | | |
| Add your idea here: | | | |

The following topics apply to the operation of the printing plant rather than individual elements of the press. They are more general and every bit as important.

Pollution Prevention Opportunities: Customer Relations

| Best Management Practice | Done | Needs Attn. | Does Not Apply |
|--|-------------|--------------------|-----------------------|
| Review and maintain communications, both internally and externally, to know what your customers want so that you get the order right the first time and minimize waste. | | | |
| Work with customers during the job design to show how to modify layout to minimize trim wastes. | | | |
| Survey your customers to better understand their needs and expectations. You can avoid carrying excess options in inks, papers, and coatings that contribute to additional waste generation. | | | |
| Follow-up on customer jobs to sample satisfaction with products to help you better understand the perceptions and performance issues related to alternative inks and papers that will reduce waste and promote recycled-content usage. | | | |
| Work with customers (offer discounts) to encourage use of existing inventory of inks, inks rebled from stock, recycled ink, or stock that may be left over from other jobs. | | | |
| Work with customers to modify selection of ink, coatings or adhesives to reduce hazardous waste or VOCs. | | | |
| Work with customers in selecting paper type to increase recycled content of paper, increase selection of chlorine-free paper, and reduce paper basis weight, and use existing stock. | | | |
| Provide training to staff to help them recognize the opportunities in working with customers to reduce waste and emissions. | | | |
| Add your idea here: | | | |

Pollution Prevention Opportunities: Facility Management

| Best Management Practice | Done | Needs Attn. | Does Not Apply |
|--|------|-------------|----------------|
| Establish, communicate, and demonstrate to employees a management commitment to the concept of pollution prevention. | | | |
| Have a clearly defined, written pollution prevention policy that is accessible to every employee. | | | |
| Positively acknowledge pollution prevention initiatives by company personnel. | | | |
| Positively acknowledge personnel interest and achievement in pollution prevention activities. | | | |
| Provide ongoing education and training for employees to enhance both quality and environmental performance. | | | |
| Incorporate pollution prevention or environmental performance into performance standards and appraisals for managers and production personnel. | | | |
| Link environmental performance and quality team objectives; recognize the common attributes. | | | |
| Add your idea here: | | | |

Pollution Prevention Opportunities: General Raw Materials

| Best Management Practice | Done | Needs Attn. | Does Not Apply |
|--|------|-------------|----------------|
| Recycle waste (and scrap) paper. | | | |
| Work with one or more vendors to see how they can help you reduce VOC's, hazardous waste, and other waste materials. | | | |
| Reuse returnable containers or drums when possible. | | | |
| Recycle paper cores, pallets, corrugated cardboard, trimmed paper, packaging, etc. | | | |
| Require a review of all new material purchase requests to minimize or eliminate the use of hazardous materials. | | | |
| Add your idea here: | | | |

Pollution Prevention Opportunities: Good Housekeeping

| Best Management Practice | Done | Needs Attn. | Does Not Apply |
|---|------|-------------|----------------|
| Segregate hazardous wastes from nonhazardous waste. | | | |
| Ensure facility is clean, neat and well lighted. | | | |

| | | | |
|--|--|--|--|
| Install and maintain a system to prevent unintentional spills or leaks from entering sanitary sewers (for example, seal floor drains and/or install leakproof berms around chemical storage areas). Use secondary containment such as false-bottom pallets or solvent storage cabinets. | | | |
| Add your idea here: | | | |

Pollution Prevention Opportunities: Chemicals

| Best Management Practice | Done | Needs Attn. | Does Not Apply |
|--|-------------|--------------------|-----------------------|
| Use oldest materials first, (first-in-first-out). | | | |
| Limit samples to smallest required amount. Ask supplier to take back unused trial chemicals. | | | |
| Inspect incoming materials. Refuse delivery of damaged or improperly labeled containers or materials. | | | |
| Make sure materials are properly stored and managed to minimize the potential for damage to inventory resulting in additional wastes. | | | |
| Reduce container waste by ordering bulk purchases (e.g. ink, solvent) if high volume usage is occurring. | | | |
| Centralize responsibility for ordering and distributing solvents. | | | |
| Track chemical purchases and maintain good inventory records to facilitate reporting and identification of material use reduction opportunities. | | | |
| Add your idea here: | | | |

Primary Authors

- Wayne Pferdehirt
- Tom Blewett
- Bob Gifford

Other PNEAC Contacts

- Debra Jacobson, University of Illinois Sustainable Technology Center
- Gary Jones, Graphic Arts Technical Foundation

Written: July 1999

Updated: June 8, 2011

Information Sources: Printing Industry of Ohio, PrintWi\$er and 'Green and Profitable Printing Training Video Series' produced by the University of WI-Extension's Solid and Hazardous Waste Education Center.

Note: Reasonable effort has been made to review and verify information in this document. Neither PNEAC and its partners, nor the technical reviewers and their agencies, assume responsibility for completeness and accuracy of the information, or its interpretation. The reader is responsible for making the appropriate decisions with respect to their operation, specific materials employed, work practices, equipment and regulatory obligations. It is imperative to verify current applicable regulatory requirements with state and/or local regulatory agencies.

© 1999 PNEAC