



Best Management Practice (BMP) Program for Printing Industry

City of Tulsa Printer Pollution Prevention Program August 1, 2007

I. Introduction

This Best Management Practice (BMP) program is intended to assist different types of printers to stay in compliance with Federal, State, and Local Environmental regulations, specifically the City of Tulsa's Ordinances #19991 and #18588. The BMP contains ways to minimize the amount of waste generated by using good operating practices, process modifications, and material substitution. It also contains guidelines to protect storm water runoff from pollutants. It attempts to reduce the actual and potential release of pollutants into the environment. All of this can reduce operating costs and regulatory liability.

This guide was written for industries that commonly use ink to transfer onto material. This activity generally involves lithography, gravure, flexography, screen-printing, and/or digital printing. The waste produced from these methods may be hazardous because it commonly contains volatile organic compounds (VOCs), heavy metals, solvent-based inks, and film that contain traces of silver.

The BMP program attempts to assure regulatory compliance with the least burden to industries. It is also a key element in the Partners for a Clean Environment (PACE) program that educates consumers about the steps businesses are taking to protect and preserve our infrastructure and our natural environment. PACE also gives recognition to environmentally friendly businesses. Participation in this BMP program will result in the issuance of a certificate by the City of Tulsa and potential membership in the PACE program along with its associated benefits. Details of the PACE program can be found at: www.cityoftulsa.org/Environment/PACE/Business.asp.

II. Definitions

Definitions listed in this section apply throughout this document.

- A. Best Management Practices or BMPs** – Schedule of activities such as, prohibitions of practice, maintenance procedures, and other management practices to prevent or reduce pollution.
- B. Storm Sewer** – Conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs gutters, ditches, man-made channels or storm drains) that is owned or operated by the City of Tulsa and are designed or used for collection or conveying stormwater.
- C. Digital** – Any printing technique, which does not involve the generation of film to print (as in offset printing). Generally, digital printing uses high-end inkjet, laser and other printing presses.
- D. Lithography** – A planographic printing technique where the printing and non-printing surfaces on the plate are essentially in the same plane and is based on the principal that oil and water don't mix. Offset lithography means that a rubber blanket is used to transfer the image from the plate to the substrate. The fountain solution wets the non-image area so that the ink is maintained within the image area. It is a mixture of water, non-volatile additives, and volatile additives. Non-volatile additives include mineral salts and hydrophilic gums. Volatile additives include alcohol and alcohol substitutes, including isopropyl alcohol, glycol ethers, and ethylene glycol. Ink dries by either absorption and oxidation or evaporation.
- E. Gravure** – A type of intaglio printing process, in that it involves engraving the image onto an image carrier. The image is engraved onto a cylinder because it is a rotary printing press and prints on rolls of paper, rather than sheets of paper.
- F. Flexography** – A printing process that uses a soft and flexible printing plate made from rubber or elastomeric material. Plates are mounted on a rotary cylinder on a press equipped with anywhere from one to twelve color stations. Flexographic printing ink is liquid and fast drying. It can be solvent, water-based, or ultraviolet cured. An anilox roller delivers the ink to the printing plate from microscopic cells with uniform size and spacing. The printed image in flexo is transferred directly from the inked plate to the substrate.
- G. Screen Printing** – Formerly known as silkscreen, this method employs a porous screen of fine silk, nylon, Dacron, or stainless steel mounted on a frame. A stencil is produced on the screen, either manually or photo-mechanically, in which the non-printing areas are protected by the stencil. Printing is done on paper or other substrate under the screen by applying ink with a paint-like consistency to the screen, spreading and forcing it through the fine mesh openings with a rubber squeegee. Recently, rotary screen presses have been introduced which speed up production considerably.
- H. Hazardous Air Pollutants (HAPs)** – Also known as Toxic Air Pollutants. Pollutants that are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects. EPA to date has identified 188 of these pollutants. Examples are benzene, methylene chloride, and toluene.
- I. Volatile Organic Compounds (VOCs)** – Compounds that are capable of being evaporated or changed to a vapor at a relatively low temperature.

III. General BMP

Implementing the practices listed in this section is **required**, unless otherwise indicated, for participation in the Best Management Practice (BMP) Program.

A. Employee Training:

1. All facility employees, whose duties are directly related to the facility's printing process, are to be trained on and made aware of the requirements and recommendations of this BMP Program including goals, specifics required, and recommended practices.

2. Develop written procedures for the disposal of chemical wastes including solvents, ink, and silver. These written procedures should be posted in the areas of the facility where disposal activities are performed.
3. New employees shall be initially trained within 1 week of employment. Additionally, each employee shall receive periodic refresher training at intervals not to exceed one year. They should be allowed to have an input on procedures and practices.
4. Documentation of training shall be kept at the facility and readily available for review by authorized representatives of the City of Tulsa. The City of Tulsa may provide training or training guidance materials upon request.
5. Train employees on proper product-transfer techniques to minimize waste.

B. Cleaning & Maintenance:

1. Minimize the amount of ink returns by accurately estimating ink mileage. Keep a log of the amount of printing used to help determine the mileage of ink.
2. Minimize the use of rags when cleaning ink waste.
3. Recycle ink cans and drums.
4. Dispense solvent from containers that deliver a controlled amount of solvent to a shop towel and keep containers closed.
5. Use shop towel "fold and use" method. Fold towel into quarters and use each square.
6. Use parts washer with low-VOC emissions or use a low-vapor pressure solvent to clean removable press parts (e.g., trays).
7. Keep solvent parts washers in good condition, with lids that close easily and completely. Instruct employees on the importance of keeping lid closed to reduce evaporation.
8. Eliminate or minimize use of cleaners that contain HAPs.
9. Collect and reuse cleaning solvent. Used solvent may be perfectly acceptable for initial cleaning applications. After the heaviest cleaning is completed, new solvent may be used for final cleaning.
10. Recover solvent from shop towels for reuse or recycling. Use gravity draining through false bottom containers or hand wringing.
11. Ensure that used solvents and solvent-containing towels or wipes are not disposed with the trash.
12. Keep shop towels in closed containers while on site. Don't allow shop towels or other cleaning pads to air dry.
13. 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 pressure less than 10mm of Hg (millimeters of mercury as measured at 20°C or 68°F).
14. Conduct training on proper cleaning methods to assure success when using new material and practices.
15. If waste is being shipped out for recycling or reuse, fill drums as completely as possible prior to sealing to reduce number of drums shipped.
16. Recommend sending solvents that can't be reused off-site for recycling.
17. Recommend avoiding solvent cleaners with flashpoints lower than 140°F or those that contain listed hazardous waste solvents.
18. Recommend installing a mechanical wringer, centrifuge, or self-contained towel/wiper cleaning system to recover solvents from shop towels and wipes for reuse.
19. Recommend on-site distillation unit to recover solvent for reuse. Feasibility is dependent on amount of used solvent.
20. Recommend installing automated press wash system.

C. Inspections & Record Keeping

1. Inspection of work area is needed on a regular basis.

- Visual check around floor drains
 - Visual check of cleaning area
2. Develop and document procedures for disposal of inks, in a safe and environmentally responsible manner.

D. Housekeeping

1. Ensure Facility is clean, neat, and well lighted.
2. Keep garbage separate from recyclable materials.
3. Keep containers closed at all times when not in use.
4. Segregate hazardous waste from non-hazardous waste.
5. Keep all recyclable waste streams separate. Work with recycling markets to understand pricing and contamination limits, so that the most appropriate segregation strategies for collecting and storing recyclables can be selected.
6. Recommend recycling substrate cores, wraps, and packaging.
7. Recommend using returnable totes, drums, or other appropriately sized containers whenever possible, and return empties to supplier. If returnable containers are not available, recycle non-returnable containers.
8. Keep all waste drums properly labeled.
9. Filter and reuse waste oil.
10. Recommend installing and maintaining a system to prevent unintentional spills or leaks from entering sanitary sewers (for example, seal floor drains add/or install leak-proof berms around chemical storage areas.
11. Recommend centralizing the responsibility for ordering solvents, managing their distribution, and usage tracking at your facility.
12. Recommend tracking material purchases, maintaining good inventory practices (to facilitate reporting), and minimizing waste and spoilage.
13. Recommend check the product expiration date listed by the manufacturer and if it has passed, test materials to determine if they are still suitable for use.

E. Preventive Maintenance

1. Positively acknowledge pollution prevention initiatives by employees and the impact of those initiatives.
2. EH&S representative (or duly appointed person) needs to inspect all incoming material. Refuse delivery of damaged or improperly labeled containers or materials.
3. Limit samples to smallest required amount. Return unused portions of samples to suppliers to reduce waste costs.
4. Make sure materials are properly stored and managed to minimize the potential for damage to inventory resulting in additional wastes.
5. Provide ongoing education and training for employees to help see how printing process improve quality and reduce waste.
6. Require a review of all new material purchase requests to minimize or eliminate the use of materials that make it difficult to meet compliance requirements and your company's environmental health and safety goals. MSDS sheets are required and reviewed by an EH&S representative (or duly appointed person).
7. Recommend incorporating pollution prevention or environmental performance into performance standards and appraisals for managers and production personnel.
8. Recommend adapting an environmental management system (EMS) appropriate for your operation to focus and sustain environmental compliance and pollution prevention efforts.
9. Recommend reducing container waste by ordering bulk purchases (e.g., ink, solvent) if high volume usage is occurring.

10. Work with vendors to explore how they can help reduce VOCs, HAPs, hazardous waste, and other waste materials.

F. Management and Communication

1. Develop communication/education strategy to help top management understand importance and value of pollution prevention as a sound business strategy and engage their support for pollution prevention efforts.
2. Positively acknowledge pollution prevention initiatives by employees and the impact of those initiatives. Reward employees both individually and/or as a group.
3. Provide ongoing education and training for employees to help employees see how understanding and controlling print processes improve quality and reduce wastes.
4. Recommend linking environmental performance and quality team objectives; find and pursue common ground.

G. Customer Relations

1. Review and maintain clear communication, both internally and externally; know what customers want in order to get the order right the first time and minimize waste.
2. Work with customers during the job design to show how to modify layout to minimize substrate and trim wastes.
3. Work with customers in the selection of substrate to increase recycled content of substrate, increase selection of environmentally preferable (e.g., reduced chlorine) substrate, and reduce weight.
4. Whenever using alternative materials, follow up on customer jobs to sample satisfaction with products.
5. Recommend encouraging customers, through use of incentives (e.g., price, time, or services), to make choices that help your facility achieve its environmental objectives. For example, provide incentives that encourage use of: existing inventory of ink; inks re-blended from stock; recycled ink; substrate left over from other jobs; soft proofing technologies; inks, coatings, or adhesives that reduce VOCs.
6. Provide training to staff to help them recognize the opportunities working with customers to reduce wastes and emissions.
7. Recommend telling customers about adopting BMP program, PACE membership, and continuing environmental improvement efforts.

IV. Requirements for Compliance with Pollution Ordinance #18588

Title 11-A, Chapter 5 "Pollution" Ordinance (Ordinance #18588) regulates the discharge of pollutants to the City of Tulsa's storm sewer. By Ordinance, only storm water runoff can be discharged to the storm sewer. The following BMPs are required to insure compliance with the "Pollution" Ordinance.

- A. Spills** – Spills must be cleaned up immediately. Clean up options should include absorbing the spilled pollutant. Dry pollutant must be disposed of into the trash (if not hazardous) and liquid waste into the sanitary sewer (if allowed by Ordinance #19991). If pollutants entered the storm sewer, notification must be made to the City of Tulsa's Quality Assurance Group at 591-4378 or 591-4379.
- B. Outside washing** - At no time shall pollutants, including wastewater, be discharged to the storm sewer as a result of outside washing.

- C. Outside washing** can only be conducted on those items that cannot be moved inside, such as parking lots, sidewalks and buildings. All other items, such as printing press or parts, must be washed inside or at another appropriate location with the discharge directed to the sanitary sewer.
- D. If outside washing** is conducted, one of the following options must be used.
1. **Use water only** (within 10 degrees of ambient air temperature) - The runoff must be filtered through an absorbent boom prior to entering the storm sewer. This prevents oils and other hydrocarbons from entering the storm sewer. Prior to outside washing, free liquids (anti-freeze, oil, gasoline) or solid pollutants (cigarette butts, trash, sediment) must be removed from the wash area. This can be accomplished through the use of absorbent materials for liquids and by dry sweeping or vacuuming for solids.
 2. **Use chemicals with water and/or hot water** - The runoff must be captured and disposed of into the sanitary sewer. This discharge must comply with Ordinance #19991. Chemicals include those considered biodegradable.
 - If a contractor conducting outside washing for the printer establishment violates the ordinance, the printer establishment also is operating in violation of the "Pollution" Ordinance. The printer establishment is responsible for the action taken on their property. The City of Tulsa retains the right to take enforcement action against both the contractor and the printer establishment.
 - Areas used for outside trash containers must be kept clean and free of pollutants. All spills, overflows, and trash must be cleaned up immediately. As specified previously, the printer establishment is responsible for any activity that occurs on their property that results in the potential discharge of pollutants into the storm sewer system. The City of Tulsa retains the right to take enforcement action against printing establishments.
 - Lids for dumpster/trash receptacles are to be closed at all times, except during the disposal of trash.

V. Specific Category BMPs

The composition of wastes from each printing type varies, but overall, source reduction of these wastes will benefit printers by reducing raw material needs and disposal costs, and by lowering the long-term liabilities associated with waste disposal.

A. Lithography:

1. Pre-Press - Image Carrier

a. Required:

1. Extend life of plate developer through monitoring and replenishing.
2. Use recycling service for depleted plate developer.
3. Use countercurrent rinsing techniques.
4. Recycle aluminum plates.
5. Use squeegees to remove excess chemicals.
6. Recycle or treat metal etching developer to remove metals.
7. Use water-based plate developers.
8. Use presensitized aqueous plates.
9. Ensure that no photochemicals are discharged to septic system. Collect and send off-site for treatment and disposal or treat as necessary and discharge to sanitary sewer system.

b. Recommend:

1. Save water by using "intermittent" rinse-water flow (no flow when processor is on idle).
2. Transition to direct-to-film system.

3. Use digital systems (direct-to-press) that eliminate plate processing and associated chemicals.

2. Pre-Press - Proofing

a. Recommend:

1. Transition to water-based, ink jet or dry sublimation digital proofing system.
2. Transition to soft (on-screen) proofing.
3. Transition to direct-to-screen system.

3. Pre-Press - Film Developing

a. Required:

1. Recycle scrap film.
2. Keep chemical baths covered to prevent oxidation, contamination of chemicals, and to reduce emissions.
3. Ensure that no photochemicals are discharged to septic system. Collect and send off-site for treatment and disposal or treat as necessary and discharge to sanitary sewer system.
4. Recover silver from used fixer by either:
 - Installing equipment to recover silver from pre-press wastewater discharge on-site; or
 - Contracting with a service for shipment and treatment of silver-containing wastewater.
5. If silver is recovered on-site, it is required that the "Silver and X-Ray Photo Processing" BMP be followed.

4. Press - Make-Ready and Process Control

a. Required:

1. Set goals to minimize make-ready waste. Regularly track and compare make-ready wastes (as a percentage of acceptable printed product) with goals.
2. Establish and follow standard procedures for checking on-press registration.
3. Develop and document recommended press settings for each press, for most common substrate and ink combinations.
4. Record substrate, ink, press, and press settings for all possible re-run jobs to reduce make-ready on subsequent runs.
5. Implement an effective program to ensure that color requirements and other job specifications are thoroughly understood and can be tracked throughout prepress and production.
6. Check substrate, coatings, adhesives, ink, and other input materials, (such as fountain solution) for compatibility before initiating make-ready. Record problems and solution with ink/substrate matches to reduce future problems and wastes.
7. Use industry-standard light sources for checking color match and change lights at manufacturer-prescribed intervals.
8. Establish a regular system for cleaning dampening fountains and recalculation systems.
9. Establish and follow standard procedures for mixing fountain solution. Check concentration by measuring pH and conductivity prior to use. Periodically measure pH and conductivity during the course of the run or day to ensure they stay within acceptable parameters. Incoming water pH and conductivity should also be measured and recorded to predict printing problems.

b. Recommended:

1. Keep all equipment maintained to avoid oil leaks and minimize equipment wear.

2. Use job scheduling to reduce press cleanup by running lighter colors, then darker colors, whenever possible.
3. Attempt to dedicate a press to run the same type of products to reduce press cleanup.
4. Develop a checklist to detail requirements for basic press maintenance, including what should be done, when it will be done, who should do it, and procedures for documenting that it has been done.
5. Check color during make-ready and production utilizing a spectrophotometer and densitometer.
6. Implement a comprehensive roller maintenance program that includes recorded regularly scheduled visual inspections, checks on roller durometer, deglazing, and reconditioning.
7. Equip presses with automatic registration systems to reduce make ready waste.
8. Equip presses with web-break detectors to reduce scrap material.

5. Press - Ink

a. Required:

1. Review ink estimation methods to ensure they are as accurate as possible, reducing ink waste.
2. When adding ink to press, add only enough ink as is required to complete the scheduled job (reduces waste and cleanup).
3. Schedule work on presses with a goal to minimize color changes and print station cleanups.
4. Evaluate waste ink management practices to assure that no inks are improperly disposed and that potential liabilities are minimized.
5. Eliminate lead, mercury, cadmium, and chromium-based pigments.
6. Maintain and use accurate, current, and readily accessible inventory of ink stock, including partially used containers. Use current ink stock whenever possible.
7. Return unused ink to supplier, if possible.
8. Keep good records on stock for recall and reuse, and maintain a "First-In, First-Out" (FIFO) use plan.
9. Contact supplier to determine if off-spec or obsolete inks can be re-blended instead of being discarded.
10. Re-blend inks to black (either on-site or off-site) for internal or external use.
11. Properly cover, seal, and store partially used containers.
12. Train employees on proper product-transfer techniques to minimize waste.

b. Recommend:

1. Increase use of low-VOC inks. Consult your supplier to determine if you are using ink with the lowest VOC content to achieve desired results.
2. Blend leftover inks to required colors using software designed to generate colors from existing inventory.
3. Consider using "stay open" (non-skin forming) sheet fed inks.
4. Consider computer-controlled ink mixing with digital scales.
5. Consider automatic ink levelers for even distribution and in agitators to help reduce oxidation of inks in the tray.
6. Consider ultraviolet (UV) curable inks.
7. Consider electron beam (EB) curable inks.
8. Consider cartridge ink delivery system.

6. Finishing

a. Required:

1. Replace solvent-based adhesives with water-based adhesives when possible.

2. Avoid or minimize use of coatings and adhesives that interfere with recyclability of the finished product.
3. Use mechanical binding in place of chemical adhesives when acceptable to the customer.
4. Optimize size and layout of substrate to minimize waste. Segregate and recycle trim cuttings.
5. Maintain good inventory practices, including use of older binding material first to avoid waste from outdated or unusable materials.

b. Recommend:

1. Investigate use of dry, rather than wet, laminate system.
2. Investigate use of solid-based laminate system.
3. Bale and recycle scrap and production waste. Baling will decrease shipping cost, improve marketability of material, and reduce storage requirements.
4. When using inkjet printing for address labels, etc., use water-based inkjet inks whenever possible.

B. Flexography:

1. Pre-Press - Image Carrier

a. Required:

1. Extend life of plate developer through monitoring and replenishing once a month and documenting the information.
2. Use recycling service for depleted plate developer.
3. Use countercurrent rinsing techniques.
4. Use squeegees to remove excess chemicals.
5. Recycle plate-developing chemicals.
6. Collect and recycle any uncured portions of liquid photopolymer plates.
7. Use the smallest sheet plate possible to achieve the desired image.
8. Ensure that no photochemicals are discharged to septic system. Collect and send off-site for treatment and disposal or treat as necessary and discharge to sanitary sewer system.

b. Recommend:

1. Use perc-alternative solvent (PAS), water-washable, or dry plate development system.
2. Save water by using "intermittent" rinse-water flow (no flow when processor is on idle).
3. Transition to direct-to-film system.
4. Use digital systems (direct-to-press) that eliminate plate processing and associated chemicals.

2. Pre-Press - Proofing

a. Recommend:

1. Transition to water-based, ink jet, or dry sublimation digital proofing system.
2. Transition to soft (on-screen) proofing.

3. Pre-Press - Film Developing

a. Required:

1. Recycle scrap film.
2. Keep chemical baths covered to prevent oxidation, contamination of chemicals, and to reduce emissions
3. Ensure that no photochemicals are discharged to septic system. Collect and send off-site for treatment and disposal or treat as necessary and discharge to sanitary sewer system.
4. Recover silver from used fixer by either:

- Installing equipment to recover silver from pre-press wastewater discharge on-site; or
 - Contracting with a service for shipment and treatment of silver-containing wastewater.
5. If silver is recovered on-site, it is required that the “Silver and X-Ray Photo Processing” BMP be followed.

4. Press - Make-Ready and Process Control

a. Required:

1. Set goals to minimize make-ready waste. Regularly track and compare make-ready wastes (as a percentage of acceptable printed products) with goals.
2. Establish and follow standard procedures for checking on-press registration.
3. Develop and document recommended press settings for each press, for most common substrate and ink combinations.
4. Record substrate, ink, press, and press settings for all possible re-run jobs, to reduce make-ready on subsequent runs.
5. Implement an effective program to ensure that color requirements and other job specifications are thoroughly understood and can be tracked throughout prepress and production.
6. Check substrate, coatings, adhesives, ink, and other input materials, (such as fountain solution) for compatibility before initiating make-ready. Record problems and solution with ink/substrate matches to reduce future problems and wastes.
7. Use industry-standard light sources for checking color match and change lights at manufacturer-prescribed intervals.
8. Improve press-side housekeeping to prevent ink from drying on anilox rolls. To prevent: monitor and adjust ink viscosity and pH; correctly adjust doctor blade pressure; monitor ambient air humidity and adjust if necessary; maintain proper press speed.
9. Clean anilox rolls, rolls, gravure cylinders, and other press parts adequately and immediately to reduce amount of solvent needed for cleaning.

b. Recommend:

1. Keep all equipment maintained to avoid oil leaks and minimize equipment wear.
2. Consider alternate anilox cleaning methods such as blasting with baking soda-carbon dioxide.
3. Use job scheduling to reduce press cleanup by running lighter colors, then darker colors, whenever possible.
4. Attempt to dedicate a press to run the same type of products to reduce press cleanup.
5. Develop a checklist to detail requirements for basic press maintenance including what should be done, when it will be done, who should do it, and procedures for documenting that it has been done.
6. Check color during make-ready and production utilizing a spectrophotometer and densitometer.
7. Store and organize anilox rolls and gravure cylinders so that they are not damaged or misplaced.
8. Equip presses with automatic registration systems to reduce make-ready waste.
9. Equip presses with web-break detectors to reduce scrap material.

5. Press - Ink

a. Required:

1. Review ink estimation methods to ensure they are as accurate as possible.
2. When adding ink to press, add only enough ink as is required to complete the scheduled job (reduces waste and cleanup).

3. Schedule work on presses with a goal to minimize color changes and print station cleanups.
4. Evaluate waste ink management practices to assure that no inks are improperly disposed and that potential liabilities are minimized.
5. Eliminate lead, mercury, cadmium, and chromium-based pigments.
6. Use current ink stock whenever possible.
7. Return unused ink to supplier, if possible.
8. Keep good records on stock for recall and reuse, and maintain a "First-In, First-Out" (FIFO) use plan.
9. Contact supplier to determine if off-spec or obsolete inks can be re-blended instead of being discarded.
10. Re-blend inks to black (either on-site or off-site) for internal or external use.
11. Properly cover, seal, and store partially used containers.
12. Use press-return ink prior to using virgin ink, whenever possible, for job start-ups.
13. Keep ink sump lids intact and closed on press to minimize evaporation.
14. Train employees on proper product-transfer techniques to minimize waste.

b. Recommend:

1. Increase use of low-VOC inks. Consult your supplier to determine if you are using them.
2. Increase use of low-HAP inks. Work with supplier to select inks that have minimal HAP content.
3. Blend leftover inks into required colors using software designed to generate colors from existing inventory.
4. Consider computer-controlled ink mixing with digital scales.
5. Use a reverse-angle doctor blade to reduce ink consumption and improve print quality.
6. Use automatic ink delivery system to reduce the amount of waste ink generated.
7. Consider water-based inks.
8. Consider ultraviolet (UV) curable inks.
9. Consider electron beam (EB) curable inks.
10. Run ink sumps as low as possible at the end of a run to minimize press-return ink.
11. Use enclosed doctor blade chambers, which minimize ink evaporation and have automated cleaning to reduce solvent use.

6. Finishing

a. Required:

1. Replace solvent-based adhesives with water-based adhesives, when possible.
2. Avoid or minimize use of coatings and adhesives that interfere with recyclability of the finished product.
3. Optimize size and layout of substrate to minimize waste. Segregate and recycle trim cuttings.

b. Recommend:

1. Investigate and implement use of dry, rather than wet, laminate system.
2. Investigate use of solid-based laminate system.
3. Bale and recycle scrap and production waste. Baling will decrease shipping cost, improve marketability of material, and reduce storage requirements.
4. When using inkjet printing for address labels, etc., use water-based inkjet inks whenever possible.

C. Screen

1. Pre-Press - Image Carrier

a. Required:

1. Use squeegees to remove excess chemicals.
2. Ensure that no photochemicals are discharged into septic system. Collect and send off-site for treatment and disposal or treat as necessary and discharge to sanitary sewer system.

b. Recommend:

1. Transition to “Direct-to-Film” system.

2. Pre-Press - Proofing

a. Recommend:

1. Transition to water-based, ink jet, or dry sublimation digital proofing system.
2. Transition to direct-to-screen system.

3. Pre-Press; Film Developing

a. Required:

1. Recycle scrap film.
2. Keep chemical baths covered to prevent oxidation, contamination of chemicals, and to reduce emissions.
3. Ensure that no photochemicals are discharged to septic system. Collect and send off-site for treatment and disposal or treat as necessary and discharge to sanitary sewer system.
4. Recover silver from used fixer by either:
 - Installing equipment to recover silver from pre-press wastewater discharge on-site; or
 - Contracting with a service for shipment and treatment of silver-containing wastewater.
5. If silver is recovered on-site, it is required that the “Silver and X-Ray Photo Processing” BMP be followed.

4. Press: Make-Ready and Process Control

a. Required:

1. Set goals to minimize make-ready waste. Regularly track and compare make-ready wastes (as a percentage of acceptable printed product) with goals.
2. Establish and follow standard procedures for checking on-press registration.
3. Develop and document recommended press settings for each press, for most common substrate and ink combinations.
4. Record substrate, ink, press, and press settings for all possible re-run jobs, to reduce make-ready on subsequent runs.
5. Implement an effective program to ensure that color requirements and other job specifications are thoroughly understood and can be tracked throughout prepress and production.
6. Check substrate, coatings, adhesives, ink, and other input materials (such as fountain solution) for compatibility before initiating make-ready. Record problems and solution with ink/substrate matches to reduce future problems and wastes.
7. Use industry-standard light sources for checking color match and change lights at manufacturer-prescribed intervals.

b. Recommended:

1. Keep all equipment maintained to avoid oil leaks and minimize equipment wear.
2. Use job scheduling to reduce press cleanup by running lighter colors, then darker colors, whenever possible.
3. Attempt to dedicate a press to run the same type of products to reduce press cleanup.

4. Develop a checklist to detail requirements for basic press maintenance including what should be done, when it will be done, who should do it, and procedures for documenting that it has been done.
5. Check color during make-ready and production utilizing a spectrophotometer and densitometer.
6. Equip presses with automatic registration systems to reduce make ready waste.
7. Equip presses with web-break detectors to reduce scrap material.

5. Press - Inks

a. Required:

1. Review ink estimation methods to ensure they are as accurate as possible, reducing ink waste.
2. When adding ink to press, add only enough ink as is required to complete the scheduled job (reduces waste and cleanup).
3. Schedule work on presses with a goal to minimize color changes and print station cleanups.
4. Evaluate waste ink management practices to assure that no inks are improperly disposed and that potential liabilities are minimized.
5. Eliminate lead, mercury, cadmium, and chromium-based pigments.
6. Maintain and use accurate, current, and readily accessible inventory of ink stock, including partially used containers. Use current ink stock whenever possible.
7. Return unused ink to supplier, if possible.
8. Keep good records on stock for recall and reuse, and maintain a "First-In, First-Out" (FIFO) use plan.
9. Contact supplier to determine if off-spec or obsolete inks can be re-blended instead of being discarded.
10. Re-blend inks to black (either on-site or off-site) for internal or external use.
11. Properly cover, seal, and store partially used containers.
12. Train employees on proper product-transfer techniques to minimize waste.

b. Recommended

1. Increase use of low-VOC inks. Consult your supplier to determine if you are using ink with the lowest VOC content to achieve desired results.
2. Blend leftover inks into required colors using software designed to generate colors from existing inventory.
3. Consider computer-controlled ink mixing with digital scales.
4. Consider ultraviolet (UV) curable inks.

6. Finishing

a. Required:

1. Replace solvent-based adhesives with water-based adhesives when possible.
2. Avoid or minimize use of coatings and adhesives that interfere with recyclability of the finished product.
3. Optimize size and layout of substrate to minimize waste. Segregate and recycle trim cuttings.

b. Recommend:

1. Bale and recycle scrap and production waste. Baling will decrease shipping costs, improve marketability of material, and reduce storage requirements.
2. When using inkjet printing for address labels, etc., use water-based inkjet inks whenever possible.

D. Digital

1. Pre-Press - Proofing

a. Recommend:

1. Transition to water-based, ink jet, or dry sublimation digital proofing system.
2. Transition to soft (on-screen) proofing.

2. Press - Maker-Ready and Process Control

a. Required:

1. Set Goals to minimize make-ready waste. Regularly track and compare make-ready waste (as a percentage of acceptable printed product) with goals.
2. Develop and document recommended press setting for each press, for most common substrate and ink combinations.
3. Record substrate, ink, press, and press settings for all possible re-run jobs, to reduce make ready on subsequent runs.
4. Implement an effective program to ensure that color requirements and other job specifications are thoroughly understood and can be tracked throughout prepress and production.
5. Check substrate, coatings, adhesives, ink, and other input materials (such as fountain solution) for compatibility before initiating make-ready. Record problems and solutions with ink/substrate matches to reduce future problems and wastes.
6. Use industry-standard light sources for checking color match and change light at manufacturer-prescribed intervals.

b. Recommend:

1. Keep all equipment maintained to avoid oil leaks and minimize equipment wear.
2. Use job scheduling to reduce press cleanup by running lighter colors, then darker colors, whenever possible.
3. Develop a checklist to detail requirements for basic press maintenance including what should be done, when it will be done, who should do it, and procedures for documenting that it has been done.

3. Press - Inks

a. Required:

1. Evaluate waste ink management practices to assure that no inks are improperly disposed and that potential liabilities are minimized.
2. Eliminate lead, mercury, cadmium, and chromium-based pigments.
3. Maintain and use accurate, current, and readily accessible inventory of ink stock, including partially used containers. Use current ink stock whenever possible.
4. Keep good records on stock for recall and reuse, and maintain a "First-In, First-Out" (FIFO) use plan.
5. Follow manufacturers' recommendations for proper back flushing of digital print heads to ensure proper operation. When cleaning with solvent, minimize solvent use.

b. Recommend:

1. Increase use of low-VOC inks. Consult your supplier to determine if you are using ink with the lowest VOC content to achieve desired results.
2. Increase use of low-HAP inks. Work with supplier to select inks that have minimal HAP content.
3. Consider water-based inks.
4. Consider ultraviolet (UV) curable inks.

4. Finishing

a. Required:

1. Avoid or minimize use of coatings and adhesives that interfere with recyclability of finished product.
2. Optimize size and layout of substrate to minimize waste. Segregate and recycle trim cuttings.

b. Recommend:

1. Investigate use of dry, rather than wet, laminate system.
2. Investigate use of solid-based laminate system
3. Bale and recycle scrap and production waste. Baling will decrease shipping cost, improve marketability of material, and reduce storage requirements.

E. Gravure

1. Pre-Press - Image Carrier

a. Required:

1. Use squeegees to remove excess chemicals.
2. Recycle copper shavings from gravure cylinder sizing process.
3. Ensure that no photochemicals are discharged to septic system. Collect and send off-site for treatment and disposal or treat as necessary and discharge to sanitary sewer system.

b. Recommend:

1. Transition to direct-to-film system.

2. Pre-Press - Proofing

a. Recommend:

1. Transition to water-based, ink jet or dry sublimation digital proofing system.
2. Transition to soft (on-screen) proofing.

3. Pre-Press - Film Developing

a. Required:

1. Recycle scrap film.
2. Keep chemical baths covered to prevent oxidation, contamination of chemicals, and to reduce emissions.
3. Ensure that no photochemicals are discharged to septic system. Collect and send off-site for treatment and disposal or treat as necessary and discharge to sanitary sewer system.
4. Recover silver from used fixer by either:
 - Installing equipment to recover silver from pre-press wastewater discharge on-site; or
 - Contracting with a service for shipment and treatment of silver-containing wastewater.
5. If silver is recovered on-site, it is required that the "Silver and X-Ray Photo Processing" BMP be followed.

4. Press: Make-Ready and Process Control

a. Required:

1. Set goals to minimize make-ready waste. Regularly track and compare make-ready wastes (as a percentage of acceptable printed product) with goals.
2. Establish and follow standard procedures for checking on-press registration.
3. Develop and document recommended press settings for each press, for most common substrate and ink combinations.
4. Record substrate, ink, press, and press settings for all possible re-run jobs, to reduce make-ready on subsequent runs.

5. Implement an effective program to ensure that color requirements and other job specifications are thoroughly understood and can be tracked throughout prepress and production.
6. Check substrate, coatings, adhesives, ink, and other input materials (such as fountain solution) for compatibility before initiating make-ready. Record problems and solution with ink/substrate matches to reduce future problems and wastes.
7. Use industry-standard light sources for checking color match and change lights at manufacturer-prescribed intervals.

b. Recommended:

1. Keep all equipment maintained to avoid oil leaks and minimize equipment wear.
2. Use job scheduling to reduce press cleanup by running lighter colors, then darker colors, whenever possible.
3. Attempt to dedicate a press to run the same type of products to reduce press cleanup.
4. Develop a checklist to detail requirements for basic press maintenance including what should be done, when it will be done, who should do it, and procedures for documenting that it has been done.
5. Check color during make-ready and production utilizing a spectrophotometer and densitometer.
6. Equip presses with automatic registration systems to reduce make ready waste.
7. Equip presses with web-break detectors to reduce scrap material.

5. Press - Inks

a. Required:

1. Review ink estimation methods to ensure they are as accurate as possible, reducing ink waste.
2. When adding ink to press, add only enough ink as is required to complete the scheduled job (reduces waste and cleanup).
3. Schedule work on presses with a goal to minimize color changes and print station cleanups.
4. Evaluate waste ink management practices to assure that no inks are improperly disposed and that potential liabilities are minimized.
5. Eliminate lead, mercury, cadmium, and chromium-based pigments.
6. Maintain and use accurate, current, and readily accessible inventory of ink stock, including partially used containers. Use current ink stock whenever possible.
7. Keep good records on stock for recall and reuse, and maintain a "First-In, First-Out" (FIFO) use plan.
8. Contact supplier to determine if off-spec or obsolete inks can be re-blended instead of being discarded.
9. Re-blend inks to black (either on-site or off-site) for internal or external use.
10. Keep ink sump lids intact and closed on press to minimize evaporation.
11. Train employees on proper product-transfer techniques to minimize waste.

b. Recommend:

1. Increase use of low-VOC inks. Consult your supplier to determine if you are using ink with the lowest VOC content to achieve desired results.
2. Increase of low-HAP inks. Work with supplier to select inks that have minimal HAP content.
3. Blend leftover inks into required colors using software designed to generate colors from existing inventory.
4. Consider computer-controlled ink mixing with digital scales.
5. Use automatic ink delivery system to reduce the amount of waste ink generated.
6. Consider water-based inks.

7. Run ink sumps as low as possible at the end of a run to minimize press-return ink.

6. Finishing

a. Required:

1. Replace solvent-based adhesives with water-based adhesives when possible.
2. Avoid or minimize use of coatings and adhesives that interfere with recyclability of the finished product.
3. Use mechanical binding in place of chemical adhesives when acceptable to the customer.
4. Optimize size and layout of substrate to minimize waste. Segregate and recycle trim cuttings.
5. Maintain good inventory practices, including use of older binding material first to avoid waste from outdated or unusable materials.

b. Recommend:

1. Investigate use of dry, rather than wet, laminate system.
2. Investigate use of solid-based laminate system.
3. Bale and recycle scrap and production waste. Baling will decrease shipping cost, improve marketability of material, and reduce storage requirements.
4. When using inkjet printing for address labels, etc., use water-based inkjet inks whenever possible.

VI. Enforcement

Strict adherence to this BMP is intended to maintain compliance with Local regulations for printing establishment discharges to the sanitary and storm sewer. If the establishment can demonstrate adherence to the BMP, causes no deleterious effects to the sanitary sewer system, and no violation of the "Pollution" ordinance occurs; no enforcement action will be necessary.

The City of Tulsa retains the right of enforcement in Title 11-C of the Tulsa Revised Ordinances as specified in Ordinance Numbers 19991 and 18588 for any non-compliances of this BMP.

The City of Tulsa also has the right to suspend or cancel a business from BMP participation if warranted by compliance problems. Suspension/cancellation will include the elimination of the business from PACE membership.

When a facility has an industrial wastewater discharge permit with the City of Tulsa, participation in this BMP program does not relieve them from permit requirements (e.g. local limits, etc.).