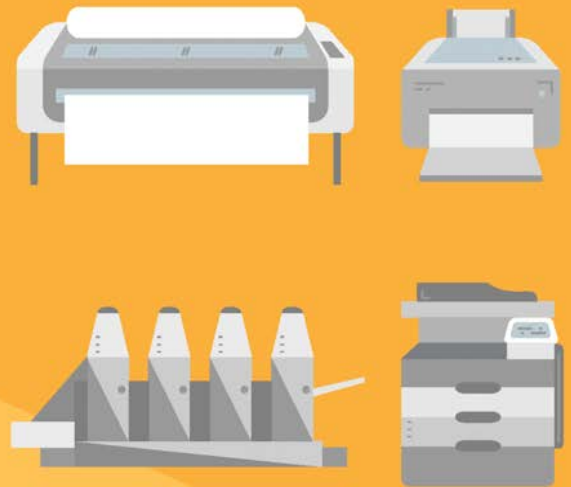


## Pollution Prevention (P2) for the Printing Industry

Printing services can range from small family-owned businesses to large commercial enterprises and use at least one of five dominant printing processes: offset lithography, digital, screen printing, flexographic, and electrostatic printing.

Whatever the process used, printers should construct a color-managed flow diagram that will identify each stage of the process. Ensure that inputs, outputs and waste streams based on hazard and risk are identified and conduct a root cause analysis to determine their source.



### Inventory and Planning

Purchase raw materials as needed for just-in-time delivery. Implement 'first-in, first-out' (FIFO) material usage to avoid the accumulation of expired ink and materials. Utilize an inventory system that can be designed in-house to track printing progress as well as ink and paper usage in order to reduce waste.

Pre-emptively plan jobs in such a way to ensure efficient use of materials (e.g., to reduce press cleanup, run lighter colors prior to darker colors whenever possible or dedicate presses to particular colors on certain days). Institute Best Management Practices (BMPs) so workers are trained on ways to reduce raw materials used in the different processes. Consider closed-loop technologies to reuse fixers, with silver recovery, to reduce waste.<sup>1</sup> Obtain ink manufacturer's specifications for optimum use of raw materials.<sup>2</sup>

### Pre-Press and Graphic Design

Prepare layouts that make the best use of both the image size and canvas size to reduce paper waste and ink waste. Research the use of non-toxic

ink alternatives to decrease the amount of inks containing toxic chemicals. Set up and edit jobs digitally to obtain final customer review before printing. Verify how much ink is needed for a specific print job and utilize computer based mixing programs equipped with a digital scale in order to reduce ink waste.

Use automatic registration systems that allow the precise fitting of two or more printing images on paper for proper alignment. Use technology such as direct-to-plate (computer-to-plate) process free technology to reduce silver and chemical use.<sup>3</sup>

Switch from rubber to photopolymer plates. Photopolymer plates eliminate the traditional nitric acid baths used to etch designs into metal plates that creates wastewater with a low pH and metals.<sup>3</sup>

### Dampening Fountain

Extend the useful life of the fountain solution by reducing the temperature and installing filters on the recirculating fountain. Run similar jobs simultaneously to reduce cleanup. Use parts washing equipment with controlled spray nozzles to wash press trays. Clean ink fountains only

when changing color. Consider using ultraviolet light to reduce algae and bacterial growth in fountain solutions so they can be used again. Try fountain solutions that don't contain isopropyl alcohol to reduce volatile organic compounds (VOC) emissions. Rather than disposing aluminum plates, recycle or reuse them and make it a best practice.<sup>4</sup>

### Image and Plate Processing

Use silver-less film or recover silver. If you cannot replace silver use, consider installing silver recovery units. Reduce process solution and water use by using counter current rinsing techniques. Consider re-using rinse water or implementing waste water recovery techniques that are cost effective such as ion recovery, low flow nozzle sprays, and automatic flow controls in the photo processing department.

Use non-hazardous developers and finishers. Reduce drag-in of contaminants, and reduce drag-out of solutions by adding drip boards and extending drip time. Use squeegees or rollers between baths to remove residual fluid from the film before it is placed in a second bath.

## Printing

Install computerized software that helps blend ink, reduce surplus ink or re-use press return ink. Install ink agitators on the ink tray to prevent premature oxidation of ink. Consider installing automatic ink levelers to ensure that ink is evenly distributed. Review ink estimation methods to ensure minimal ink waste.

Eliminate lead, mercury-, cadmium- and chromium-based pigments by using more environmentally friendly alternatives. Consider substituting petroleum- based inks with low VOC, electron beam curable (EBC), UV curable, soy/vegetable, water-based and/ or waterless inks depending on the process and application.<sup>5</sup>

Use date labels on open ink containers to label when opened and expiration date. Re-blend/recycle inks (e.g., consider mixing used colors for black ink or donate inks for reuse by printing schools or for house paint if appropriate). Properly store inks to prevent unnecessary evaporation and wastage. Implement loss prevention practices such as spill and leak prevention. Install enclosed doctor blade chambers for flexographic printing. This reduces ink evaporation which results in better control of ink usage and more consistent color rendition.<sup>3</sup>

## Press Cleaning

Replace solvents with alternatives that are less toxic such as ones with low or no VOCs. Select cleaners that work best with the process and are non toxic. Implement recycling and control technologies to capture and destroy emissions. Limit solvent use by using pumps or squeeze bottles rather than pails or buckets. Minimize solvent applied to a rag by using plunger cans or squeeze bottles.

Use on-press cleaning systems and solvent recovery to reduce the amount of cleaning solution used.<sup>3</sup> Avoid delays in cleaning and reclaiming screens for



screen printing applications. Consider using a high pressure water blast for ink removal for applications such as screen printing.

## Finishing

Properly size paper to reduce waste from cutting. Replace solvent-based adhesives with water-based adhesives when possible.<sup>6</sup> Minimize coatings that can hinder recycling.<sup>1,2</sup> Use mechanical binding methods instead of glues or adhesives where appropriate. Consider reusing and reclaiming materials such as screens. Recycle items such as cuttings, cardboard, packaging, pallets, scrap paper, etc.

## References

- 1 [University of Illinois. \*Printing -- Lithography Topic Hub: P2 Opportunities.\*](#)
- 2 [University of Illinois. \*Printing -- Flexography Topic Hub: P2 Opportunities.\*](#)
- 3 [Printers' National Environmental Assistance Center. \*Fact Sheet.\*](#)
- 4 [Journal of Engineering Research and Studies. \*Fountain Solution in Lithographic Offset Printing.\*](#)
- 5 [Monadnock. \*A Field Guide: Eco-Friendly, Efficient, and Effective Print.\*](#)

## Additional Resources

[Great Lakes Regional Pollution Prevention Round-table. \*Sector Resources: Printing.\*](#)