

Pollution Prevention Assessment

Office of State Printing

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Executive Summary

This report is the result of a joint effort between the Department of Health Services Toxic Substances Control Program's Alternative Technology Division (ATD) and the Sacramento County Hazardous Materials Division (HMD). In January, 1991, these agencies combined resources to help the Department of General Services' Office of State Printing conduct a waste minimization assessment of their facility. This report presents the findings and recommendations of that assessment.

The purpose of the assessment was to identify viable waste minimization options for the Office of State Printing (OSP). Particular emphasis was put on pollution prevention of hazardous waste.

The findings from this assessment may also assist OSP in preparing the plan and report required by the Hazardous Waste Source Reduction and Management Review Act of 1989 (SB 14).

Procedure. In December, 1990, OSP provided background information to the assessment team made up of personnel from ATD and HMD. This background information consisted mainly of Material Safety Data Sheets describing the hazardous substances used onsite during the printing process. In addition, information was provided describing the industrial processes that generate waste at the facility. On January 7, 1991, the assessment team conducted an assessment tour of the OSP facility. On March 15, 1991, the assessment team returned to OSP again and gained additional information concerning the amounts of hazardous waste generated at the plant in 1990.

Findings. OSP is making an effort to minimize the generation of hazardous pollutants at the facility. Although large amounts of hazardous waste were manifested in 1990, it appears that the waste volume has been reduced in the first quarter of the current year.

The findings and recommendations for reducing the generation of waste at OSP are presented in detail in this report. Highlights of these findings are as follows:

- Make waste minimization an integral part of the daily activities at OSP.
- Replace petroleum-based inks with soybean oil-based inks on web and sheetfed presses.
- Replace particularly hazardous substances (i.e. solvents) with safer substitutes.
- Keep in the work area only the smallest quantities of solvents necessary to do the job. Make sure secondary containers are labeled.
- Modify management practices of empty ink containers at OSP to comply with emergency regulations (Title 22, CCR, section 66730) that establish a set of standards which, if met, exempt empty containers from further regulation as hazardous waste.
- Improve on waste segregation practices to enhance recycling opportunities.
- Make safety modifications to the hazardous waste storage area.
- Store solvent soaked rags in covered, metal, fireproof containers.

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Introduction

On January 7, 1991, the Department of Health Services Toxic Substances Control Program's Alternative Technology Division and the Sacramento County Hazardous Materials Division conducted an assessment of the waste generating practices at the Department of General Services Office of State Printing (OSP) for the purpose of identifying viable pollution prevention opportunities. This report presents the findings and recommendations of the assessment.

What is pollution prevention?

Pollution prevention is any activity that reduces' or eliminates the generation of a waste, emission or discharge of hazardous substances into the environment. It is the policy of the State of California and the County of Sacramento to encourage pollution prevention through source reduction activities and environmentally-sound recycling. These techniques are favored over traditional waste management practices, including waste treatment and disposal. The preferred hierarchy of waste management practices is as follows:

- Source Reduction
- Onsite Recycling
- Offsite Recycling
- Waste Treatment
- Residuals Disposal

A more complete definition of each pollution prevention approach, along with examples specific to OSP, are provided below.

Source Reduction

Source reduction is the elimination or reduction of hazardous pollutants at the point of generation. Common source reduction techniques include: process modifications; raw material (input) substitutions; and

operational improvements, including improved housekeeping measures.

At OSP, a possible process modification approach is:

- 1) Replace an outdated piece of equipment with a new, more efficient piece of equipment.

Possible *raw material substitution* approaches are:

- 1) Substitute soybean-based inks for petroleum-based inks.
- 2) Substitute non-hazardous cleaners for solvents.
- 3) Substitute non-hazardous solutions for the fountain and blanket solutions currently in use.

Possible *operational improvements* are:

- 1) Institute a facility-wide pollution prevention policy.
- 2) Increase maintenance of presses to reduce oil leakage.
- 3) Quantify press maintenance costs to determine if the purchase of new presses is warranted.
- 4) Restrict the use of solvents. Instead of using solvents for all shop cleanup, use solvents only to clean up inks and oil.
- 5) Review production scheduling to see if press cleaning between different colored print runs can be reduced.
- 6) Keep lids on partially used ink containers to prevent skin formation.

Onsite Recycling

Onsite recycling means the use, reuse or reclamation, of all or part of a hazardous waste onsite.

At OSP, possible *onsite recycling* options include:

- 1) Install a combined silver recovery and recirculating fixer solution unit.
- 2) Install a solvent recovery distillation unit to recycle solvents onsite.

Offsite Recycling

Offsite recycling means sending all or part of a hazardous waste offsite for use, reuse, or reclamation.

At OSP, possible *offsite recycling* options are:

- 1) Contract with a vendor to recycle or reuse ink containers.
- 2) Segregate inked and uninked paper waste from other trash and contract with appropriate vendors for recycling.

Plant and Printing Processes Description

The Office of State Printing (OSP) is a major division of the California State Department of General Services. It is probably the largest governmental printer in the world, excluding the federal printing office in Washington D.C.¹ OSP covers an area of more than 800,000 square feet, with hundreds of specialized machines for typesetting, printing, and binding operations. Approximately 520 skilled civil service employees work around the clock to produce an average of 2,000 jobs each month.

OSP's function is to provide printing services to all state agencies, including the executive, legislative, and judicial branches of the state government, the state universities and colleges, and other state agencies. OSP's workload includes almost every type of printing and binding, including business forms, brochures, books, magazines, and other materials used in the business of government. Only official state printing is done at OSP.

Approximately one-fifth of OSP's workload is printing for the California legislature alone. When the legislature is in session, OSP provides to both houses a complete record of the previous day's business and a file of the day's hearings. This demand has required the production of more than 4,000 typeset pages in a single night. Such production is made possible by the plant's modern data processing, typesetting, and platemaking equipment and techniques. Data for daily legislative printing are fed to the printing plant from the Legislative Counsel Bureau by means of on-line data transmissions.

All printing at OSP is performed using lithography or offset printing. In the total offset process, typeset material and artwork are first photographed, and then the images are transferred from the film negative to a flexible metal plate by a photochemical action. This metal plate, which is attached to the plate cylinder of the press, is inked. The inked image is transferred, or offset, onto the blanket cylinder. When the impression cylinder comes in contact with the blanket cylinder, the image is "pressed" onto the paper. The major advantages with offset

printing include the relatively low cost of production and the speed with which plates can be prepared for printing.

In general, offset lithography presses are rotary presses with three cylinders: a plate cylinder, a rubber-covered blanket cylinder, and an impression cylinder which presses the paper against the blanket cylinder. At OSP, a wide variety of offset lithography presses are used. The type of press used for printing a particular item depends on several factors, including the class of work (publication or commercial), the availability of presses, the type of stock, and color requirements. The following are the press types in use at OSP:

Envelope presses: Envelopes are currently produced on jet envelope presses, which can print one color on two sides or two colors on one side. A #10 envelope can be printed at a rate of 50,000 per hour.

Forms presses: In addition to single-sheet forms, OSP prints NCR and carbon interleaf sets as well as a variety of continuous forms for use in computer-driven printers. Typically, OSP forms presses run at 20,000 cutoffs (or as many as 80,000 forms) per hour.

Sheetfed presses: OSP has several sheetfed presses, which print one, two or four colors. The single color presses are used primarily for jobs unsuited to the forms or publication presses. The larger capacity sheetfed presses produce higher quality multi-color printing, such as brochures and book covers.

Publication web presses: Publication web (or roll-fed) presses produce primarily newsletters and books. These presses print as many as four colors on both sides of the sheets simultaneously, and can print at speeds four times greater than sheetfed presses. The paper is folded on the press and emerges as a signature (usually 16 or 32 pages in properly numbered sequence). As many as 25,000 signatures are produced per hour. To allow continuous operation, these presses utilize a "flyer paster", which attaches new rolls of paper as the press continues to roll.

At OSP, the pressroom is divided into two sections, one for sheetfed presses and the other for web presses. The section with the sheetfed

presses handles the low volume specialty jobs. There are three Heidelberg presses, one Aurelia H-240P press, one Miehle press, one Miller press, and one Harris press. In the web press section, there are four Hantscho form presses, three Mark 2 presses and one Mark 6 press. The envelope and forms presses are located in the section with the web presses.

All inks, fountain solutions, cleaning solutions, and other chemicals (including ammonia, kerosene, and Naphtha) used by the press operators are stored in the pressroom. A storage area for specialty inks is centrally located in the sheetfed section. Most other chemicals needed for a particular printing process are kept at the point of operation.

Web press inks are recycled in the pressroom using three parts new or virgin ink and one part old or reused ink. The recycling equipment is located in the middle of the hazardous waste storage area.

Printing and Press Maintenance

The presses are cleaned with a cleaning solution, or colored wash, and a cleaning solvent. The color wash and the cleaning solvents are used to clean the ink off the rubber press rollers. The mixture of cleaning solvents and inks forms a sludge that is collected in an open five-gallon plastic bucket. Rags are then used to wipe clean the rollers and any excess ink. The rags are sent to a commercial cleaner and returned. Ink skins are also produced when the upper layer of ink dries in the can. A mixture of water etchant and alcohol is also used in the printing process. This water mixture is used to wet the hydrophilic area of the printing plates.

A blanket wash agitator is located in the sheetfed section of the pressroom. This equipment consists of a container of bath solution, open on top, used for cleaning of the blankets from the presses between runs. When not in use, no lid covers the agitator solution bath. Not covering the agitator may contribute to fugitive air emission at OSP.

Several Safety-Kleen canisters are stationed around the pressroom.

Two containers, one with kerosene and one with an oil and kerosene solution, are used for parts degreasing.

Hazardous Materials Used

All of the products listed here are common industrial brand named products recorded on Hazardous Materials Inventory Forms by OSP. When appropriate, chemical names have been provided for additional hazardous substance identification. The hazardous materials used by OSP are as follows:

- 1) GPI heatset ink (carbon black)
- 2) saf Sol 20/20
- 3) Safety Kleen 105 Solvent-MS (petroleum naphtha mineral spirits)
- 4) Roller cleaner
- 5) Vam high-speed etch
- 6) Anchor-Lithkemko Emerald G.R. (butyl cellosolve)
- 7) Anchor-Lithkemko Emerald BRS/BRM (2-butoxyethanol)
- 8) Fuller PA-3788 (cold)
- 9) Fuller HM948/937 hot melt
- 10) Prisco One-Step Offset Wash (blanket wash)(aliphatic petroleum distillates)
- 11) Texaco, Unocal lubricating oils (petroleum hydrocarbon)
- 12) Amador VMP Naphtha (aliphatic petroleum distillate)
- 13) Amador Belzona (methyl chloroform)
- 14) Hunt Universal Micrograph Developer/Replenisher (potassium hydroxide)
- 15) Hunt Cine-2 Reversal Bleach Solution (sulfuric acid)
- 16) 3-M machine developer (propyl alcohol)
- 17) Kodak Ultratec fixer/replenisher (potassium hydroxide)
- 18) A-100 activator (potassium hydroxide)
- 19) Hunt copysset developer replenisher (potassium hydroxide)
- 20) Press Kleen One Step (methylene chloride/ cumene/xylene)
- 21) Flink Ink Corp Ink Tact Reducer (petroleum hydrocarbon/oil)
- 22) Flink ink, Western Sheet Fed Ink (carbon black extracts)
- 23) Isopropano199 (isopropyl alcohol)
- 24) Polychrome Plate Cleaner (naphthol spirits/phosphoric acid)
- 25) Rom Ink Co. SA toned black (carbon black extracts)

Hazardous Waste Generated-4990

On March 15, 1991, the assessment team met with OSP personnel and gained the following information concerning the amounts of hazardous waste generated at the plant in 1990. This information should be used as a baseline to measure the success of already-instituted waste minimization strategies, and identify fixture strategies.

1) 4.08 tons of solvent waste. This waste stream was recycled offsite by Safety Kleen.

a 2,475 gallons of a mixture of solvents and oil. The solvents included aliphatic petroleum distillates, TCE, methylene chloride, and others. This waste stream was sent offsite for incineration. This stream is no longer being generated because it has been substituted with another material.

3) 40,825 pounds of ink containers, ink/plastic liners, plastic pails, and steel cans. Management and disposal waste costs were \$69,108.

4) 990 gallons of perchlorethylene, which was recycled offsite. This material is no longer used at OSP. Originally, it was used in the platemaking process but has since been replaced with a water-based platemaking system.

5) 8,434 pounds of a mixture of solvents and absorbents, generated during spill cleanups and subsequently sent offsite for incineration.

Hazardous Air Emissions

For 1990, OSP emitted the following amounts of volatile organic compounds (VOCs), according to the Air Quality Management District:

<u>Type</u>	<u>Emissions (lb&r)</u>
Heat set ink	12,509
SAF solvent	193
Blanket wash	14,260
safety Kleen 105	36,036
Roller cleaner	44
Plate cleaner	38
Varn high speed etch 34	95
Anchor Emerald G.R.	154
Anchor Emerald BRS/BRM	370
Fuller PA-3788 (cold)	N/A
Fuller HM948/937 hot melt	N/A
	63,699
43,160* x 1/2** =	- 21,575
TOTAL =	42,124

* 43,160 pounds per year sent to recycle.

** From disposed (i.e., recycled) waste solvent (not evaporated).

Pollution Prevention Suggestions

OSP is in the process of instituting numerous waste minimization strategies. These strategies have already reduced the generation of hazardous waste at the plant.

Strategies that have already been implemented at OSP include:

1. Onsite recycling of waste ink. All web press waste ink is currently recycled onsite.
2. Replacement of a solvent-based platemaking system with a water-based platemaking system.
3. A silver recovery system that reclaims silver from photo-processing waste.
4. Offsite recycling of cleaning solvent via Safety Kleen.

Implementing A Pollution Prevention Program

The assessment team recommends that OSP continue its existing waste management program while at the same time instituting a policy to promote the waste minimization opportunities at the plant whenever possible. In order to institutionalize waste minimization, strong upper management support is imperative. The amount of waste generated at OSP can be further reduced through the combined effort of all personnel at the plant. A formal policy statement should be issued from OSP management declaring pollution prevention to be a goal for the plant.

Such a commitment from management should also include the allocation of additional resources to implement pollution prevention strategies. The following are elements or concepts that pertain to the “human aspect” of a possible pollution prevention program for OSP:

- 1) Employee performance should include a measurement of his/her contribution to minimizing waste. Every worker’s job description should include pollution prevention as an important aspect of the work (similar

to employees* responsibility for promoting worker safety on the job).

2) Employee training should include pollution prevention, as well as health and safety, and compliance with regulations (including emergency preparedness).

3) Include an employee incentives program. Encouraging all employees to participate in the pollution prevention program is essential for the success of the program. One way to get more employee involvement is through an incentives program. An incentives program can include: individual or group recognition for outstanding achievements, certificate or plaque awards for innovative ideas in pollution prevention, or a monetary award system that shares in a percentage of the costs savings derived from implementing a particular waste minimization suggestion.

4) Improve accounting procedures. OSP should quantify the cost of handling and disposing of its hazardous waste so that it will be in a better position to make decisions when considering pollution prevention options.

While planning for the future, OSP should also keep in mind the following requirements for a successful pollution prevention program:

- Increased awareness and attention to toxic chemicals;
- Increased awareness and training to change old work patterns;
- Willingness to experiment and to change;
- Management's willingness to provide resources for change; and
- Willingness to follow through, evaluate, and learn from such changes.²

More specifically, the assessment team recommends that OSP consider implementing the following to enhance pollution prevention opportunities at the facility:

1) Modify work procedures and operational practices to promote pollution prevention concepts. Such activities might include: resealing ink cans when not in use, scraping excess ink from empty cans before

disposal, and cleaning ink fountains only as needed.

2) Revise operation manuals and policies/procedures, when possible, to include pollution prevention activities and concepts. Old policies may serve as impediments to instituting pollution prevention strategies. Any such impediments should be identified and revised. In addition, new policies that specifically encourage or require the consideration of hazardous waste/emissions reduction should be identified and included in operation and policy/procedures manuals.

3) Rewrite job functions/ definitions to include responsibility for minimizing the generation of hazardous waste and emissions.

4) Clearly state hazardous materials handling policies and procedures and make them readily available to employees at all times.

5) Clearly state health and safety policies and procedures and make them readily available to employees at all times.

Waste Stream-Specific Pollution Prevention Suggestions

There are many pollution prevention opportunities at OSP for specific waste streams. The following suggestions are grouped according to those waste streams.

Alternatives to Petroleum-Based Inks

OSP is currently in the process of testing a soybean oil-based ink for its web and sheetfed presses. The assessment team strongly supports this endeavor. Soybean-based inks can not only simplify the offset printing process, but also pose fewer environmental risks than do petroleum-based inks.

Many factors contribute to the growing interest and use of soybean-based ink. Soybean-based ink is a domestically produced and processed product. Soybeans are a renewable resource, grown by American farmers. Using

soyil-based ink supports domestic agriculture and reduces dependence on imported petroleum products.

Possible specific benefits from using soyil-based inks are:

- 1) Emissions to the atmosphere are greatly reduced because the volatile organic compounds (VOCs) content of soyil-based ink is much lower than traditional petroleum oil-based inks.
- 2) Press washes for soyil-based inks can be water/detergent types, thus reducing or eliminating the need for high VOC solvent formulations.
- 3) Less paper waste from quicker start-ups, as water and ink balance is reached more easily. Spoilage during runs from color or variations in tracking is minimized.
- 4) Higher print quality, as soyil-based inks set quickly without tacking up, linting, piling or delivery problems. In addition, "soybean oil works as a better transfer agent than petroleum oil."³
- 5) Quicker and more even ink coverage to the press blanket.
- 6) Elimination of the need for alcohol or other substitutions in the dampening units.
- 7) Reduced need for skilled operator experience because soy-oil based inks are "forgiving" with their quality reproduction, water/ink consistency, and press run stability.
- 8) Less ink typically needs to be applied to the paper to complete a job. Soyil-based inks have high stability and water tolerance, which results in faster roll-up with almost immediate ink transfer, cutting downtime and paper waste.
- 9) Soyil-based inks have exceptional transfer properties, which permit retention of body and track. This feature minimizes plate scumming, which, in turn, saves on printing cleaner screens.

10) Brighter colors and darker blacks are produced, because soyoil-based inks have greater color rendition than do traditional petroleum-based inks.

OSP has tested alcohol substitutes, alcohol-free fountain solutions, and biodegradable blanket and roller washes in the past. But no substitutes to traditional solvents have been found to date. As one of the goals of the plant is to totally eliminate the need to use alcohol products, OSP may find that soyoil-based inks will help solve this problem.

In sheetfed presses, the major concern with replacing petroleum products with soyoil-based inks is drying time. Whereas with web presses, inks are heatset, drying by absorption and evaporation, sheetfed inks dry by oxidation. This can be a problem that needs to be addressed when testing and selecting a particular soyoil-based ink.

Another issue that must be considered is the total percentage of soyoil in a soyoil-based ink. Since there is currently no standards set, many ink manufacturers make up a blend of soyoil and petroleum oil and call it a soyoil-based ink. Thus a soyoil-based ink can contain a wide range of percent mixtures of soybean oil and petroleum oil. Most heatset-web soyoil-based inks contain between 20 and 25 percent soybean oil.⁴

Printers who continue to use traditional petroleum oil-based inks in the future will face increasing pressure to comply with more and more stringent air quality regulations. Already some printers in Southern California are being forced to curtail production schedules to meet new air emission quotas. By switching over to soyoil-based inks, fugitive emissions to the atmosphere can be reduced because the VOC content in the soy-oil based inks are much lower than petroleum oil-based inks. One report found that soyoil inks contain as little as 10% VOCs content, determined by ASTM D2369.⁵ When petroleum oil-based inks are not used, significant reductions in the amount of volatile emissions to the air can also be measured. One report noted a reduction in actual volatile emissions by as much as 65-85%.⁶

When selecting an acceptable soyoil-based ink, the VOC content in the ink itself should to be considered rather than the alleged reductions of VOC emissions gained by use of the product. The soyoil in ink is considered non-hazardous but there are still other ingredients in soyoil-based inks that are hazardous. Therefore, handling, use and disposal of these inks are the same as with conventional petroleum oil-based inks.

Soyoil-based inks are currently more expensive than petroleum-based inks. However, the price for soy inks is decreasing.

Used oil and lubricants from machinery maintenance

Reducing oil wastes from machinery maintenance is always difficult, since no non-hazardous substitutes are available. However, the following are a few options worth considering:

1. Increase maintenance. Many of the presses were leaking what appeared to be significant amounts of oil. This may be due to the age of the presses. Attention should be given to decreasing these leaks, if possible, through increased maintenance or modifications to the machines.
2. The costs of maintaining the old presses and handling the oil-soaked rags as a hazardous waste should be quantified. This will give OSP more information regarding cost-effective options.
3. At OSP, current practice is to wipe up excess lubricating oils leaking from the presses with rags. Alternatively, OSP could collect this oil in pans placed under the presses. The collected oil could then be sold to a commercial recycler for reuse.

Oil -soaked rags

Oil-soaked rags may or may not be a “characteristic” hazardous waste under RCRA. If non-RCRA, these rags could be sent to a commercial cleaner like solvent-soaked rags, rather than sent for disposal as a

hazardous waste. Without a waste determination, however, these rags need to be handled as a characteristic hazardous waste. Testing these rags to determine their waste classification is possible but probably not cost effective. Alternatively, OSP should try to minimize the generation of these rags altogether, largely through better machine maintenance, modified operational practices, and modified oil collection and recycling procedures.

Solvent Substitution

Several different types of hazardous solvents are used in this plant. Numerous less hazardous substitutes have been developed. Per vendor publications, comparable substitutes are listed below.

<i>Product</i>	<i>Substitute</i>
Aliphatic hydrocarbon	Nature Clean
Emerald BRS Fountain Sol'n	One Step/Prisco 2350 Series
Emerald JR Fountain Sol'n	
Isopropyl 99	
Press Kleen	Nature Clean P-100
Waterproof Blanket Remover	
Wash & Print A-60 Odorless	
Solvent Degreaser	PF
Enco Plate Cleaner	Web Klene
Image Remover	
W a s h V - 1 2 0	
Plastic Gloss Ink Base	Soy Bean
SA Toned Black	
105 Solvent	Nature Clean E-100
Double Play Hand Cleaner	Soap and Water

A citrus-based cleaner was tried at OSP. It's use was discontinued because of the strong odor. Citrus cleaners have not been found to be effective in other press shops.

The use of an oven degreaser is not recommended. This cleaning

method has not been found to be effective in other press shops.

(Note: PRISCO, a southern California company, will work with clients to reduce or eliminate alcohol from a printer's fountain solution, thus reducing volatile air emissions through using a modifiedpropyl alcohol, and fine tuning press operations.)

Onsite silver recovery

Currently, a photoprocessing solution is treated onsite for silver recovery. A vendor picks up the recovered silver for reclamation.

OSP might consider using a combined silver recovery and recirculating fixer solution unit. Fixer solution has the most recoverable silver in photoprocessing systems. This type of unit runs the used fixer through an electric electrolytic silver recovery unit that removes approximately 90% of the recoverable silver and feeds the remaining fixer back into the fixer bath. ("Silver Lab" company has a unit that recovers 95% pure silver, and it guarantees 25% more recovery of silver verses a non-recirculating system.) Possible benefits include:

- increased return on recovered silver.
- 20% reduction in fixer replenishment/lower raw material costs.
- no longer any requirements for TSDf permits (this would not fall under Permit-By-Rule), because the unit puts recycled waste back into the system. This could save OSP a minimum of \$1,000/year.
- lowered discharges to the sewer. This might also save OSP from future discharge requirements that may be imposed.

Containers

Newly enacted "emergency" regulations provide relief for the generator of containers that contained hazardous materials or wastes. Found in Section 66730 of Title 22, California Code of Regulations (CCR), the new

regulations exempt, except as noted in the regulations, any “empty” container, or inner liner removed from a container, which previously held a hazardous waste or a hazardous materials from regulation under chapter 30 of the CCR and chapter 6.5 of division 20 of the Health and safety Code if it is managed by one of the following methods:

1) For a container of five gallons or less in capacity, or inner liner removed from a container five gallons or less in capacity, by puncturing, shredding, crushing, or otherwise changing the container or inner liner to prevent subsequent use or reuse, and disposing of it at a solid waste facility, so long as the container or inner liner is packaged and transported in accordance with applicable U.S. Department of Transportation regulations; or

2) For any container or inner liner, by puncturing, shredding, crushing, or otherwise changing the container or inner liner to prevent subsequent use or reuse, and reclaiming its scrap value onsite or shipping the container or inner liner to a person who reclaims its scrap value, so long as the container or inner liner is packaged and transported in accordance with applicable U.S. Department of Transportation regulations, or

3) For any container or inner liner, by reconditioning or remanufacturing the container or inner liners onsite pursuant to 49 CFR section 173.28(c) and (d) for subsequent reuse, *or* shipping the container or inner liner to a person who reconditions or remanufactures the container or inner liner pursuant to 49 CFR section 173.28(c) and (d).

“Empty” is defined as follows:

A container, or an inner liner removed from a container, which previously held a hazardous waste or a hazardous material is empty if its meets the criteria below:

1) The container or the inner liner removed from a container is empty as defined in 40 CFR section 261.7(b), and

2) The container or the inner liner removed from a container has

been emptied by the generator as much as possible using methods commonly employed to removed waste or materials from containers or inner liners, so that:

A) If the material which the container or inner liner held is pour-able, no material can be poured or drained from the container or inner liner when the container or inner liner is held in any orientation (e.g., tilted, inverted, etc.); or

B) If the material which the container or inner liner held is not pourable, no material or waste remains in the container or inner liner that can be feasibly removed by scraping and chipping.

These regulations are currently in place; however, because they were emergency regulations, they are currently going through the regular legislative process (i.e., public hearings and comment periods, etc.) and are subject to revision due to public comments. Be aware that some revisions are possible.

The above regulations notwithstanding, the assessment team does not wish to encourage the wasteful disposal of useful material; i.e., empty ink containers. It is our understanding that OSP is in the process of seeking a vendor that will take back ink containers for recycling or reuse.

Reduce Paper Use and Recycle Waste Paper

The single biggest supply item and most expensive component of OSP activities is paper. Paper waste, therefore, although not hazardous in nature, should also be considered for cost savings. Segregating and recycling paper according to grade can be a very cost effective waste prevention approach. Inked paper is one grade that should be recycled separately. Unprinted white paper is another grade that, if kept separated, has greater cost recoverability and worth to the recycler. Wrappers for paper are of a lower grade that should be disposed of in the trash

Additional Recommendations

There are also opportunities for improved housekeeping at OSP. By improved housekeeping, we mean simple modifications to daily operational practices that result in either a reduction in waste generation or some improvements to health and safety conditions at the plant.- Suggestions are as follows:

- 1) Rags and gloves contaminated with solvents should be kept in covered, metal, fireproof containers before being sent offsite to an industrial laundry service. This will reduce volatile air emissions inside the plant .
- 2) Spills should be cleaned up with a wet vacuum process rather than with rags, vermiculite or mops. This will facilitate reuse of the spilled solvent and reduce the volume of contaminated vermiculite requiring disposal .
- 3) Solid wastes should be better segregated. Many different types of waste were observed in the garbage cans around the plant (i.e., white paper, ink cans, plastic, lunches, etc.). Recyclable paper should be placed in wire bins. This would make it easy to see the contents and reduce the probability that people will put the wrong kind of waste in a bin.
- 4) Many partially-used ink cans did not have lids. Lids should be kept on the cans to keep the ink from drying and forming skins, which will reduce waste and material costs.
- 5) Paper rolls should be stored away from the hazardous waste storage area.
- 6) In the bindery area (next to the door to the pressroom), the 55-gallon drum labeled "Presto Kleen" was leaking from a spigot onto the floor. All equipment should be periodically checked and repaired as needed.
- 7) The Presto Kleen Material Safety Data Sheet (MSDS)

recommends the use of safety goggles, face shields, and gloves. Used gloves were seen at the work stations, but we saw no evidence of safety goggles or face shields. OSP should examine its use of Presto Kleen, and formulate and implement proper procedures for its use, to avoid possible accidents and improve worker safety.

8) There were many bottles near both the sheet-fed and web presses that were poorly labeled (or not labeled at all). These appeared to be chemicals of some kind. Many of these bottles also did not have caps. Containers should be properly labeled and stored so as to prevent inappropriate use and promote worker safety.

9) Although OSP does not print on glossy (coated) paper at its facility, it does subcontract for this type of printing. Because coated paper is not recyclable, OSP should work with its clients to discourage the use of glossy paper.

10. Aprons and splash goggles, glasses, or face shields should be worn when working with chemicals that could be spilled or splashed.

Hazardous Waste Storage Area

The assessment team recommends that alterations to the hazardous waste storage area be made. A concrete berm could be built around the area to protect against uncontrolled spills. The ink recycling unit could be relocated and the ink that is collected and stored for batch recycling could be kept separate from the ink being stored for ultimate disposal. Rearrangement of the storage area could also take into consideration traffic flow and limit unnecessary traffic if possible.

In addition, OSP can better assure compliance with hazardous waste storage regulations by making sure that all labels and dates on waste ink containers are prominently displayed and kept legible. Also, the accumulating waste ink must be shipped offsite as soon as the 90-day accumulation limit has been reached regardless of the quantity collected.

Production Scheduling

A common operational improvement for print shops, and one that OPS might benefit from, is improved production scheduling. Improved production scheduling includes the modification to the sequence of print runs so as to limit the need for changing ink colors on sheetfed presses. For instance, the same colored inks can be run back-to-back on the same press. This cuts down not only on the generation of waste ink, but on the time and materials needed to clean the press.

References

- 1 Brochure: California Office of State Printing, published by OSP, 1988.
- 2 Waste Reduction Assessment and Technology Transfer, Second edition, 1989, published by The University of Tennessee, Center for Industrial Services, Knoxville, Tennessee, p. -65.
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1. Waste Audit Study: Commercial Printing Industry prepared by Jacobs Engineering Group, Inc. for California Department of Health Services, Toxic Substances Control Program, Alternative Technology Division, Revised 1989
2. Working Safely Print Shop Chemicals: A Guide for Print Shop Owners and their Employees, Printing Industries of Northern California, no date
3. Case Studies: Printing, U.S. Environmental Protection Agency, Office of Environmental Engineering and Technology Demonstration and the Office of Pollution Prevention, November, 1989

Appendices

Waste Audit Study: Commercial Printing Industry

Table 4-1 List of Waste Minimization Assessment Worksheets

Number	Title	Description
1.	Waste Sources	Typical wastes generated at commercial printing plants.
2A.	Waste Minimization: Material Handling	Questionnaire on general handling techniques for raw material handling.
2B.	Waste Minimization: Material Handling	Questionnaire on procedures used for handling drums, containers and packages.
3.	Option Generation: Material Handling	Waste minimization options for material handling operations.
4.	Waste Minimization: Material Substitution/Image Processing	Questionnaire on material substitution and on image processing operations.
5.	Option Generation: Material Substitution/Image Processing	Waste minimization options for material substitution and options for image processing.
6.	Waste Minimization: Plate Processing	Questionnaire on plate processing.
7.	Option Generation: Plate Processing	Waste minimization opportunities for plate processing.
8.	Waste Minimization: Printing and Finishing	Questionnaire on printing and finishing.
9.	Option Generation: Printing and Finishing	Printing and finishing waste minimization options.
10.	Waste Minimization: Good Operating Practices	Questionnaire on use of good operating practices.
11.	Option Generation: Good Operating Practices	Waste minimization options for good operating practices.
12.	Waste Minimization: Reuse and Recovery	Questionnaire on opportunities for reuse and recovery of wastes.

Firm <u>Office of State Printers</u>	Waste Minimization Assessment	Prepared By <u>Moe/Wright/Barwick</u>
Site _____		Checked By _____
Date _____	Proj. No. _____	Sheet ___ of ___ Page ___ of ___

**WORKSHEET
1**

WASTE SOURCES

Waste Source: Material Handling	Significance at Plant		
	Low	Medium	High
Off-spec materials <u>no</u>	x		
Obsolete raw materials heat set adhesive/vendors take back ink	x		
Damaged paper <u>some onsite</u>	x		
Spills & leaks (liquids) <u>older presses leak, Spills--no procedures</u>			x
Spills (powders) <u>N/A</u>			
Empty container cleaning <u>"can't be done now"</u>			x
Container disposal (metal) <u>and plastic</u>			x
Container disposal (paper) <u>no haz mat in paper containers/cardboard</u>		x	
Pipeline/tank drainage <u>image processing sump/will be fixed</u>			x
Laboratory wastes <u>N/A</u>			
Evaporative losses <u>solvents/Safety-Kleen</u>		x	
Trash <u>need more segregation</u>			x
Other plastic containers, cardboard, wood pallets			x
Waste Source: Process Operations			
Used film <u>to recycler</u>			
Image processing baths <u>diluted; goes to sewer (test every mo.)</u>		x	
Etching and plating baths <u>N/A</u>			
Wastewater from rinsing <u>goes to drains (platemaking)</u>		x	
Damaged/used plates <u>recycled</u>	x		
Fountain solutions <u>usually evaporate off</u>		x	
Waste ink <u>recycled onsite</u>	x		
Cleaning solvents <u>Safety-Kleen; blanket/roller wash evaporates solids suspended in rags</u>			x
Cleaning rags <u>cleaning service/recycled offsite/evaporates</u>		x	
Lube oils <u>recycled offsite (Ramos)</u>	x		
Other containers			x

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WORKSHEET
2A

**WASTE MINIMIZATION:
Material Handling**

A. GENERAL HANDLING TECHNIQUES

Are all raw materials tested for quality before being accepted from suppliers? yes ? no
 Are expired age-dated materials tested for effectiveness before being disposed of? yes ? no
 Is obsolete raw material returned to the supplier? yes ? no

Is paper stored in a humidity and temperature-controlled area? No

Describe safeguards to prevent damage to paper in handling and storage: designated storage area; employee policies

Describe safeguards to prevent the use of materials that may generate off-spec product: none known.
For inks, they do a press (test) run. Vendors take back ink.

Is inventory used in first-in first-out order? yes no
 Is the inventory system computerized? yes no
 Does the current inventory control system adequately prevent waste generation? unknown yes no

What information does the system track? item stock codes, stock classes, quantity used yr/date, quantity last ordered, and date. (This system identified the out-of-date heat set adhesive.)

Is there a formal personnel training program on raw material handling, spill prevention, proper storage techniques, and waste handling procedures? yes no
 Does the program include information on the safe handling of the types of drums, containers and packages received? yes no

How often is training given and by whom? unknown

Firm <u>OSP</u>	Waste Minimization Assessment	Prepared By _____
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**WORKSHEET
2B**

**WASTE MINIMIZATION:
Material Handling**

B. DRUMS, CONTAINERS, AND PACKAGES

- Are drums, packages, and containers inspected for damage before being accepted? ? yes no
- Are employees trained in ways to safely handle the types of drums & packages received? unsure yes no
- Are stored items protected from damage, contamination, or exposure to rain, snow, sun & heat? yes no
- Does the layout of the facility result in heavy traffic through the raw material storage area? yes no
(Heavy traffic increases the potential for contaminating raw materials with dirt or dust and for causing spilled materials to become dispersed throughout the facility.)
- Can traffic through the storage area be reduced? yes no
- Are employees properly trained in handling of spilled raw materials? unsure yes no

Describe handling procedures for damaged items: None. Ink still used. Paper/ink recycled.

What measures are employed to prevent the spillage of liquids being dispensed? No procedures.
On stands with spigots--no blatant problems.

When a spill of liquid occurs in the facility, what cleanup methods are employed (e.g., wet or dry)? Also discuss the way in which the resulting wastes are handled: Wet and dry methods employed.
Dry=vermiculite/rags.

Would different cleaning methods allow for direct reuse or recycling of the waste? (explain): Rags/recycle
Reuse solvents as much as possible.

- Do you try to order smaller containers of infrequently used materials to avoid disposing of large quantities of unused obsolete materials? (unsure) yes no
- Have you tried to order larger containers of frequently used materials to reduce the number of small containers that must be cleaned and disposed of? yes no
- Are all empty bags, packages, and containers that contained hazardous materials segregated from those that contained non-hazardous wastes? yes no

Describe the method currently used to dispose of this waste: _____

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WORKSHEET
4

**WASTE MINIMIZATION:
Material Substitution
Image Processing**

A. MATERIAL SUBSTITUTION

Do any of the inks or thinners used contain hazardous materials (i.e., chlorinated solvents, lead or chrome pigments, mercury, etc.)? yes no
 If yes, has material substitution been tried? yes no
 Sort of. _____

Discuss the results: Inks used previously had higher VOCs. (15-20% VOC content).
tried to substitute citrus-based cleaner--employees didn't like the smell.

B. IMAGE PROCESSING

Are electronic pre-press systems used to prepare copy? yes no
 If not, has their use been considered? yes no
 Is silver removed and recovered from photoprocessing waste streams? yes no
 Is silver recovery done onsite? yes no
 Has reuse of photoprocessing chemicals been attempted (after silver removal)? yes no

Discuss: _____

What other photographic wastes are recycled or recovered in some manner? fixer/developer solution
not recycled or recovered. To sewer.

Are any of the following techniques used to increase the life of the fixing bath?

Add ammonium thiosulfate		<input type="checkbox"/> yes	<input type="checkbox"/> no
Add acetic acid	N/A	<input type="checkbox"/> yes	<input type="checkbox"/> no
Use an acid stop bath		<input type="checkbox"/> yes	<input type="checkbox"/> no
Monitor temperature and pH		<input type="checkbox"/> yes	<input type="checkbox"/> no
Other		<input type="checkbox"/> yes	<input type="checkbox"/> no

Discuss: _____

Is countercurrent rinsing used to reduce wastewater volume? yes no
 Can processing equipment be modified to incorporate these features? yes no
Rubber stamp machine--being phased out

Discuss: _____

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WORKSHEET
6

WASTE MINIMIZATION:
Plate Processing/Makeready

ETCHING/PLATING

Are metal etching/plating operations performed at your plant? yes no
 (If yes, please see other EPA Waste Minimization Guides for metal parts cleaning, metal fabrication, and printed circuit board manufacturing for additional options.) N/A

Are metals recovered from solution bath dumps or waste streams? yes no
 If yes, describe the procedure: _____

Describe how etching/plating wastes are handled, treated, and disposed of: N/A

PROCESSING

Do you use presensitized plates? yes no

Does the plate processor have an automatic replenishment system for developer/finisher? yes no

Are plate processor conditions frequently monitored? yes no

Are spent plates recycled? yes no

Have water-based plate development systems been used or tested? yes no

Does the plant use a laser platemaking system? yes no

Discuss: _____

MAKEREADY

Which of the following press automation features have you added to reduce makeready times, improve quality control, and reduce paper waste?

- automated plate bender
- automated plate scanner probably (maybe on computer feed)
- automated ink key setting system on some—to adjust ink flow/manually on sheet-fed
- computerized registration larger machines have it
- ink/water ratio sensor computerized

Firm _____	Waste Minimization Assessment	Prepared By _____
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WORKSHEET
7

**OPTION GENERATION:
Plate Processing**

Meeting format (e.g., brainstorming, nominal group technique) _____
 Meeting Coordinator _____
 Meeting Participants _____

Suggested Waste Minimization Options	Currently Done Y/N?	Rationale/Remarks on Option
Etching/Plating*		
Non-chromate Etchant		
Alternative Plating Baths		
Drag-out Reduction		
Bath-Life Extension		
Metal Recovery		
Store Plates at Recommended Conditions		
Maintain Plate Processing Baths		
Recycle Spent Plates		
Use Water-Based Developers		
Use Laser Platemaking System		
Processing		
Presensitized Plates		
Makerready		
Automated plate bender		
Automated plate scanner		
Automated ink key setting system		
Computerized registration		
Ink/water ratio sensor		

Additional information useful for minimizing waste in plate processing operations can be found in EPA's waste minimization guides for metal fabricators, metal parts cleaning, and printed circuit board manufacturing operations.

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WORKSHEET
8

**WASTE MINIMIZATION:
Printing & Finishing**

PRINTING & FINISHING

- Are ink containers properly resealed after use? yes no
- Do any of the inks contain hazardous materials such as solvents or heavy metals? yes no
- Has the use of less hazardous inks been attempted? yes no

Discuss the results: lowered VOC/fumes. Quality equivalent. Haven't heard of any OC problems. Tried soy-based inks--didn't like it.

- Are ink fountains filled according to expected need as opposed to routine filling? yes no
- Are automatic ink levelers employed? on some presses yes no
- Are ink fountains cleaned between runs? yes no
- Is a standard ink sequence used to reduce cleaning? huge runs (N/A) yes no
- Are measures employed to prevent drying ink or formation of skins inside the fountain? yes no
- Are waste inks recycled or returned to the manufacturer? yes no
- Have alternative fountain solutions been tried? yes no

Explain any measures employed or problems encountered with these options: VOC emissions with fountain solutions; runs too big for sequencing.

- Has the use of an automatic blanket cleaner been attempted? yes no
 - Has the use of less hazardous cleaning solvent been attempted? Citrus acid sol'n yes no
 - Can the waste solvent be collected and used as thinner? maybe yes no
 - Can the cleaning solvent be recycled? solvent evaporates/solids laundered w/rags yes no
 - Can soaps and detergents be used for cleaning? yes no
 - Is the roller blade kept in good condition and its angle checked for most effective cleaning? ? yes no
- Discuss: employees didn't like the smell of the citrus cleaner

- Is an automatic web splicer used to save time and paper waste? yes no
- Do the presses employ web break detectors to prevent damage to the press (tear-down and repair of equipment can produce large quantities of cleaning waste as compared to waste produced during normal operation)? yes no
- Is waste lube-oil sent to a recycler? yes no
- Is paper use minimized by proper pre-production planning and lay-out? yes no
- Is waste paper and trash sent to a recycler? yes no

Discuss these options: _____

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WORKSHEET
10

**WASTE MINIMIZATION:
Good Operating Practices**

GOOD OPERATING PRACTICES

- Are plant material balances routinely performed? yes no
- Are they performed for each material of concern (e.g. solvent) separately? yes no
- Are records kept of individual wastes with their sources of origin and eventual disposal?
(This can aid in pinpointing large waste streams and focus reuse efforts.) yes no
- Are the operators provided with detailed operating manuals or instruction sets? unsure yes no
- Are all operator job functions well defined? unsure yes no
- Are regularly scheduled training programs offered to operators? yes no
- Are there employee incentive programs related to waste minimization? yes no
- Does the facility have an established waste minimization program in place? yes no
- If yes, is a specific person assigned to oversee the success of the program? yes no

Discuss goals of the program and results: Goal: save \$. Short term: don't increase generation
of hazardous waste; medium term: 15% reduction; 5 year goal: completely
eliminate use of hazardous materials.

Has a waste minimization assessment been performed at the facility in the past? yes no

If yes, discuss: _____

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WORKSHEET
12

**WASTE MINIMIZATION:
Reuse and Recovery**

A. SEGREGATION

Segregation of wastes reduces the amount of unknown material in waste and improves prospects for reuse & recovery.

- Are spent processing baths segregated from wastewater streams? (image/plate processing) yes no
 - Are different solvent wastes due to equipment clean-up segregated? yes no
 - Are aqueous wastes from equipment clean-up segregated from solvent wastes? N/A yes no
 - Are different types of paper (colored paper vs. white) segregated to increase their resale value? yes no
 - Are different grades of paper (inked vs. clean, high quality vs. paper wrap) kept segregated for more effective recycling? don't know yes no
 - Is general trash segregated to maximize the amount of recyclable paper, film, aluminum, pallets, etc.? somewhat yes no
- If no, explain: bottles, lunch, polystyrene cups, ink cans, wood, plastic, paper cups, paper towels--all mixed together in garbage cans

B. CONSOLIDATION/REUSE/RECOVERY

- Do you return waste ink to the manufacturer for recycling? off-spec only yes no
- Do you recycle the ink onsite? yes no
- Have you contacted any large printers in your area to see if they want your ink for recycling? N/A yes no
- Have you contacted waste exchange services or commercial brokerage firms regarding waste ink or other wastes? not necessary yes no
- Are many different solvents used for cleaning? kerosene, haphtha, blanket wash yes no
- If too many small-volume solvent waste streams are generated to justify on-site distillation, can the solvent used for equipment cleaning be standardized? yes no
- Is spent cleaning solvent reused as ^{no} thinner or ^{yes} initial wash? solvent sink yes no
- Has on-site distillation of the spent solvent ever been attempted? (On-site recovery of solvents by distillation is economically feasible for as little as 8 gallons of solvent waste per day.) yes no
- If yes, is distillation still being performed? yes no
- If no, explain: might be too expensive

Discuss other wastes (tube oils, films, paper, etc.) that you are currently recycling and by which means: used oil, used film, paper, inks