

PRINTING PROCESSES

Date Initiated:

December 14, 1992

Dates Modified / Updated:

February 16, 1994

December 30, 1997

PROCESS DESCRIPTION:

Several types of printing processes exist throughout San Diego County. Each type of printing process typically involves unique products, equipment, inks, solvents, application methods, and drying procedures. The most common process types are flexographic, gravure, silk-screening, lithographic heatset, lithographic nonheatset (newspaper), and letterpress. All printing operations emit some volatile substances into the atmosphere by evaporation. Actual emission rate are, however, highly dependent upon process type.

While significant improvements have been made in reformulating inks and solvents to reduce reactive organic compound concentrations and eliminate toxic ingredients, some materials still contain small quantities of such substances. Emissions of the volatile ingredients in inks, thinners, and cleanup solvents can be estimated with mass balance techniques, usage records, estimated substrate retention efficiencies, and estimated control efficiencies. Substances of concern may include acetone, alcohols, ammonia, benzene, glycol ethers, methylene chloride, toluene, 1,1,1-trichloroethane, and xylenes. Standard emission estimation techniques used by the District are as follows:

$$Ea = Ua \times Ci \times (1 - R) \times (1 - e)$$

$$Eh = Uh \times Ci \times (1 - R) \times (1 - e)$$

Where:

Ea = Annual emissions of each listed substance, (lbs/year)

Eh = Maximum hourly emissions of each listed substance, (lbs/hour)

Ua = Total usage of each material containing a listed substance, (lbs/year)

Uh = Maximum hourly usage of each material containing a listed substance, (lbs/hour)

C_i = Concentration of each listed substance in each material used, (lbs/lb)

R = VOC retention efficiency of specific printing process, (%)

e = Control equipment VOC collection and removal efficiency, (%)

EMISSIONS INFORMATION:

Information regarding material composition can be obtained from product specification sheets and MSDS documentation. Glycol ethers may be present in the inks under a wide variety of names and synonyms. The following estimates will be used to predict VOC retention rates on the substrate for each type of printing process:

Process Type	% VOC Emitted	% VOC Retained
Letterpress	60%	40%
Lithographic - heatset	80%	20%
Lithographic - non-heatset	5%	95%
Flexographic	95%	5%
Gravure	95%	5%
Silk screen	100%	0%
Other	100%	0%

ASSUMPTIONS / LIMITATIONS:

- The percent VOC retention on substrate materials is based upon EPA documentation in Section 4.9 of AP-42 (4/81) and a subsequent analysis of this data by Barney McEntire dated 10/23/91.
- The same retention efficiency is assumed for each volatile ingredient since compound specific information is unavailable. Volatile ingredients include ammonia for printing processes.
- All pigment emissions are assumed to be negligible since ink spraying does not occur. Pigments are expected to remain either on the product or in any waste generated on site.
- The same retention, capture, and control efficiencies are assumed for each volatile ingredient since compound specific values do not usually exist.
- VOC retention factors are not applied to emissions from clean-up solvents if the calculation procedure description is specified as "clean up solvents". The factors will be applied if the calculation procedure description for these materials is listed as a specific printing process.

- Waste generated from inks and printing solvents are expected to be negligible. If the waste volumes are significant, material usage should be adjusted appropriately.

FORMS:

A separate reporting form must be completed for EACH material used in the printing process. Inventory data should be submitted and processed in a manner similar to surface coating operations.