

Ink and Paint Manufacture

In Washington State there are about 47 companies manufacturing paint (SIC 2851), and about 12 manufacturing printing ink (SIC 2893) (Ecology, 1/20/98). Paint and ink manufacturing are grouped together because their manufacturing processes have a lot of similarities. Nationally, paint and ink manufacturing contributes an estimated 0.05% of total volatile organic compound (VOC) emissions. The application of these paints and inks accounts for an additional 13% of VOC emissions. (U.S. EPA, 1992)

Description of Process

The products of the paint manufacturing industry include architectural coatings, product coatings for original equipment manufacturers (OEM), and special-purpose coatings. The four primary types of inks are letterpress inks, lithographic and offset inks, gravure inks, and flexographic inks. All of these products are made with the same basic raw materials: pigments, solvents, resins (or binders), and other additives. In most cases, the manufacturing facilities purchase those raw materials and then formulate or blend, rather than react, to produce a finished product.

The batch process production of paint and ink involves four major steps:

- I. Preassembly and premix
- II. Pigment grinding/milling
- III. Product finishing/blending
- IV. Product filling/packaging

Some of the equipment used to accomplish these manufacturing steps include roller mills; ball and pebble mills; attritors; sand, bead, and shot mills; horizontal media mills; and high-speed disk dispersers. (U.S. EPA, 1992)

Methods of Determining Emissions

Paint Manufacturing

Paints are either solvent or water based. Most plants produce both. Solvent based paints are the source of most plant VOCs, but water based paint formulations do include VOCs. Mixing in open top drums and portable tanks (sized from 50 to 3,000 gallons) causes fugitive emissions. Lids are usually used, but fugitive evaporative emissions still occur when lids are open, through mixer openings or cracks, and when filling or emptying. Product packaging and equipment cleaning create emissions. Solvent storage tanks vent emissions when being filled, from day/night heating/cooling, or from simple diffusion.

Toxic emissions from Washington paint manufacturers may include xylene, toluene, methyl ethyl ketone, methyl isobutyl ketone, methanol, isopropyl alcohol, acetone, n-butyl acetate, ethyl acetate, iso-butane, methyl chloroform, and methylene chloride.

Information for emission estimates can be found in AP-42¹ and from the National Paint and Coatings Association.

Ink Manufacturing

Letterpress and lithographic inks are thick and viscous (paste-like). Gravure and flexographic inks are fluid and utilize a much lower viscosity vehicle. The letterpress inks and lithographic inks dry by oxidation (and polymerization) of the vehicle, or vehicle absorption into the printing surface, while fluid inks dry by solvent evaporation.

Many of the ink manufacturers are responding to pollution prevention pressures by formulating new inks based on low VOC vehicles like soy or other vegetable oils. Water-based formulations reduce VOCs quite a bit, but they still use some volatile solvents. Inks can be blended in quantities from 1 pound to several thousand gallons.

Washington ink manufacturers blend and formulate, but a cursory search has not found any that cook ink vehicles. (Grahm) If an ink manufacturer cooks an ink vehicle to make varnish, this can create VOC emissions of 40 - 160 pounds per ton vehicle cooked, which would probably be the plant's major source of VOCs. Most Washington ink manufacturers purchase pre-cooked vehicles if they need them for ink formulations.

All emission estimation methods need data on solvent purchases and usage, including the solvent type, pounds per year used in each usage, and MSDS or manufacturer's formulation data on any purchased blended materials (to determine the amount of solvents).

The Puget Sound Air Pollution Control Agency (PSAPCA) has a rule regulating Coatings and Ink Manufacturing. It requires VOC containing mixing vats to be covered, sets lid design and maintenance requirements, and requires solvent clean-up to be done in a manner that minimizes emissions of VOCs. These type of regulations are simple, sensible, and widely used throughout the nation.

Storage tank emissions could be better controlled if pressure/vacuum conservation vents and submerged fill pipe or bottom fill tanks were required, but this looks like a small HAP source at these plants.

Limits on VOC contents of specialty coatings, architectural coatings, and inks are lowering VOC emissions from manufacturing facilities. Whether these limits are placed by regulatory agencies, or the result of market forces driven by pollution prevention activities, product reformulation and substitution of lower VOC alternative products will be a strong future driving force to lower VOC emissions from both application and manufacturing of paints and inks.

¹ U.S. Environmental Protection Agency, *Compilation of Air Pollutant Emissions Factors Volume 1: Stationary Point and Area Sources*, Fifth Edition with Supplements, October 1997, Document No. AP-42.

References

Buonicore, Anthony J. and Wayne T. Davis. *Air Pollution Engineering Manual*, Air & Waste Management Association, VanNostrand Reinhold, New York, 1992, pp. 451-456.

Grahm, Andy, INX International, Seattle, WA. Personal communication.

Lilly, W. Donald, Vice-President, Quality Control & Environmental Management, United Coatings, Greenacres, WA. Personal communication.

National Paint & Coatings Association, *Emission Estimation Guidance Manual for the Paint and Coatings Industry*.

U.S. Environmental Protection Agency, *Compilation of Air Pollutant Emissions Factors Volume 1: Stationary Point and Area Sources*, Fifth Edition with Supplements, January 1995, Document No. AP-42. (Section 5.10, Paint and Varnish and Section 5.14 Printing Ink; May 1983). (available by section on Internet at <http://www.epa.gov/ttn/chief/ap42.html>)

U.S. Environmental Protection Agency, *Control of VOC emissions from Ink and Paint Manufacturing Processes*, April 1992, EPA-450/3-92-013.

Washington State Department of Ecology, *Facility/Site on the Web*, accessed 1/20/98. (<http://www.wa.gov/ecology/iss/fsweb/fshome.html>)