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EPA

Title III Section 313 Release Reporting Guidance

Estimating Chemical Releases From Printing Operations

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Printers may be required to report annually any releases to the environment of certain chemicals regulated under Section 313, Title III, of the Superfund Amendments and Reauthorization Act (SARA) of 1986. If your facility is classified under SIC codes 20 through 39 (facilities that apply printing inks generally fall under SIC code 27) and has 10 or more full-time employees, for calendar year 1987 you must report all environmental releases of any Section 313-listed chemical or chemical category manufactured or processed by your facility in an amount exceeding 75,000 pounds per year or otherwise used in an amount exceeding 10,000 pounds per year. For calendar years 1988 and 1989 (and beyond), the threshold reporting quantity for manufactured or processed chemicals drops to 50,000 and 25,000 pounds per year, respectively.

This document has been developed to assist printers in the completion of Part III (Chemical Specific Information) of the Toxic Chemical Release Inventory Reporting Form. Included herein is general information on toxic chemicals used and process wastes generated, along with several examples to demonstrate the types of data needed and various methodologies available for estimating releases. If your facility performs other operations in addition to printing, you must also include any releases of toxic chemicals from these operations.

Step One

Determine if your facility processes or uses any of the chemicals subject to reporting under Section 313.

A suggested approach for determination of the chemicals your facility uses that could be subject to reporting requirements is to make a detailed review of the chemicals and materials you have purchased. If you do not know the specific ingredients of a chemical formulation, consult your suppliers for this information. If they will not provide this information, you must follow the steps outlined to handle this eventuality in the instructions provided with the Toxic Chemical Release Inventory Reporting Form.

The list presented here includes chemicals typically used in printing that are subject to reporting under Section 313. This list does not necessarily include all of the chemicals your facility uses that are subject to reporting, and it may include many chemicals that you do not use. You should also determine whether any of the listed chemicals are created during processing at your facility.

Solvents: Acetone, methyl ethyl ketone, methyl isobutyl ketone, xylene, toluene, ethylbenzene, Michler's ketone, n-butanol, ethylene glycol, glycol ethers, methyl chloroform, methanol

Resins: Resins containing formaldehyde, zinc resinates

Antioxidants: Hydroquinone, catechol

Plasticizers: Dibutyl phthalate

Driers: Metallic soaps containing cobalt, lead, manganese, copper, or zinc

Pigments: Titanium dioxide, zinc sulfide, barium sulfate, lead chromates, hydrated alumina (pigment extender), aluminum powder

Step Two

Determine if your facility surpassed the threshold quantities established for reporting of listed chemicals last year.

You must submit a separate Toxic Chemical Release Inventory Reporting Form for each listed chemical that is "manufactured," "processed," or "otherwise used" at your facility in excess of the threshold quantities presented earlier. Manufacture includes materials produced as byproducts or impurities. Toxic compounds that are incorporated into your products (for example, inks applied to substrates) would be considered "processed" because they become part of the marketed finished product. Degreasing solvents, cleaning agents, and other chemicals that do not become part of the finished product would be considered "otherwise used."

The amount of a chemical processed or otherwise used at your facility represents the amount purchased during the year, adjusted for beginning and ending inventories. To ascertain the amount of chemical in a mixed formulation, multiply the amount of the mixture (in pounds) by the concentration of the chemical (weight percent) to obtain the amount of chemical processed.

Example: Calculating annual use of acetone through purchases and inventory changes.

Opening stock	*5,000 lb*
Plus purchases during year	*12,000 lb*
	17,000 lb
Less closing stock	*6,000 lb*
Total use	*11,000 lb*

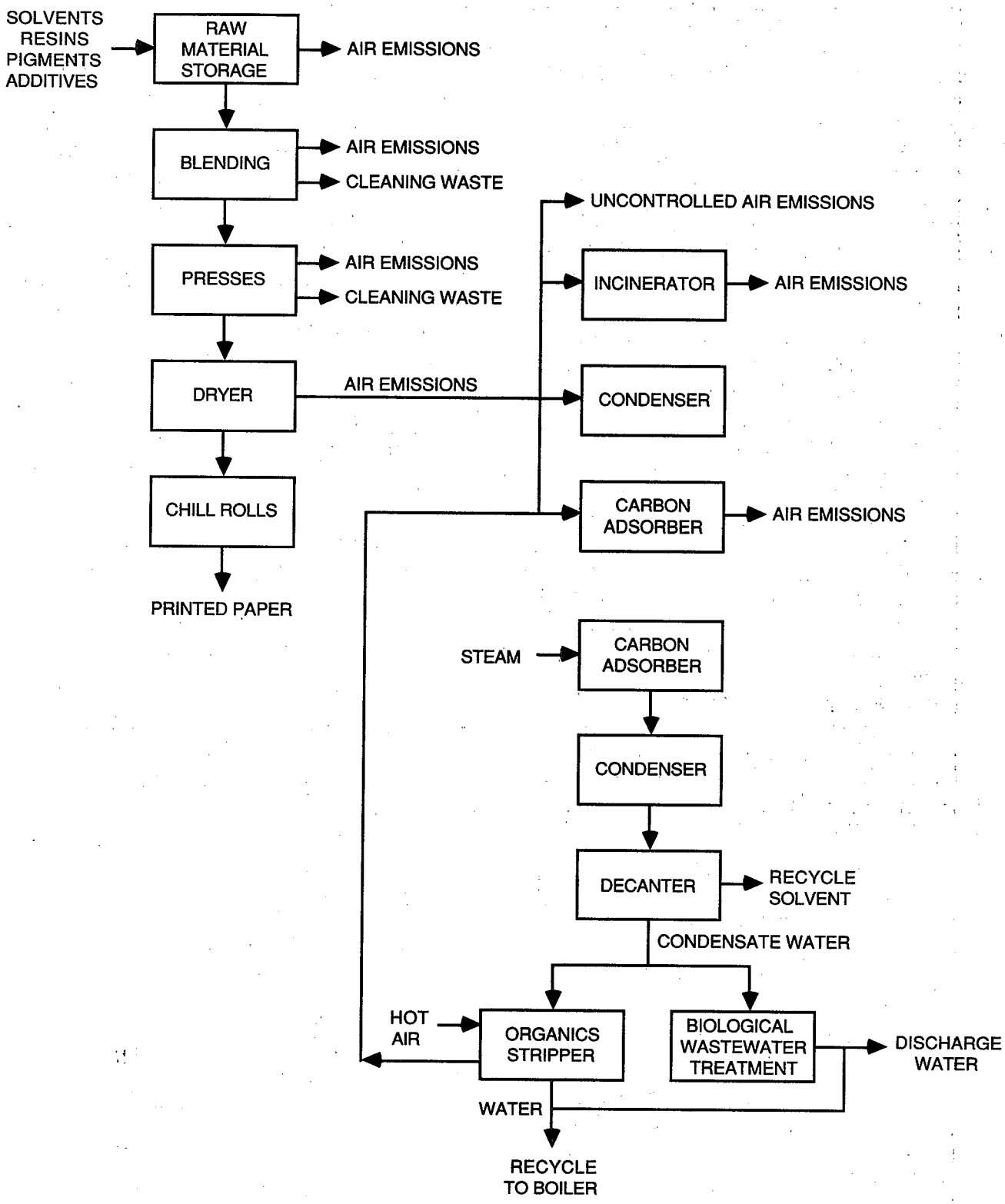
A listed chemical may be a component of several formulations you purchase, so you may need to ask your supplier for information on the concentration (percentage) of the chemical in each. For chemical categories, your reporting obligations are determined by the total amounts of all chemicals in the category.

You must complete a report for each chemical for which a threshold is exceeded. The thresholds apply separately; therefore, if you both process and use a chemical and either threshold is exceeded, you must report for both activities. If neither threshold is exceeded, no report is needed.

Step Three

Identify points of release for the chemical(s) subject to reporting.

An effective means of evaluating points of release for listed toxic chemicals is to draw a process flow diagram identifying the operations performed at your facility. The figure on the next page is an example flow diagram of printing operations. Because each facility is unique, you are strongly urged to develop a flow diagram for your particular operations that details the input of materials and chemicals and the waste sources resulting from the operation of each unit.



Example Flow Diagram of Printing Operations

Solvents present in the ink are likely to be emitted to the air. Ink solids, such as pigments and driers, may end up as solid waste. Other potential sources of release include waste printed items, "empty" containers, and wastes from pollution control devices. Your reporting must account for all releases.

Step Four

Estimate releases of toxic chemicals.

After all of the toxic chemicals and waste sources have been identified, you can estimate the releases of the individual chemicals. Section 313 requires that releases to air, water, and land and transfers to offsite facilities be reported for each toxic chemical meeting the threshold reporting values. The usual approach entails first estimating releases from waste sources at your facility (that is, wastewater, air release points, and solid waste) and then, based on the disposal method used, determining whether releases from a particular waste source are to air, water, land, or an offsite disposal facility.

In general, there are four types of release estimation techniques:

- **Direct measurement**
- **Mass balance**
- **Engineering calculations**
- **Emission factors**

Descriptions of these techniques are provided in the EPA general Section 313 guidance document, Estimating Releases and Waste-Treatment Efficiencies for the Toxic Chemical Release Inventory Form.

Provisions of the Clean Air Act, Clean Water Act, Resource Conservation and Recovery Act, and other regulations require monitoring of certain waste streams. If available, data gathered for these purposes can be used to estimate releases. When only a small amount of direct measurement data is available, you must decide if another estimation technique would give a more accurate estimate. Mass balance techniques and engineering assumptions and calculations can be used in a variety of situations to estimate toxic releases. These methods of estimation rely heavily on process operating parameters; thus, the techniques developed are very site-specific. Emission factors are available for some industries in publications referenced in the general Section 313 guidance document. Also, emission factors for your particular facility can be developed in-house by performing detailed measurements of wastes at different production levels.

Toxic Releases to Air

1) Uncontrolled Emissions

Most, if not all of the organic solvents used in inks will be emitted to the air as a result of evaporation in the ink application area, the press, the dryer, and the chill rolls. Therefore, if there are no control devices to reduce emissions, the simplest approach may be to use a mass balance to estimate total uncontrolled emissions rather than measuring or estimating the emissions from each source.

Total uncontrolled emissions can be calculated as follows:

Amount of chemical released =

amount of fresh and recycled chemical used per year –

chemical remaining in product –

chemical disposed of in solid/liquid waste

Emissions from the dryer would be considered stack emissions. If possible, you should estimate these separately, based either on measurements or estimated dryer capture efficiencies:

Amount of chemical released through dryer stack =

total emissions x

(1 - capture efficiency)

Press type	Dryer capture efficiency
Publication rotogravure	85%
Packaging rotogravure	75%
Flexographic	70%

Fugitive emissions can then be calculated as:

Amount of fugitive emissions =

total emissions -

stack emissions

2) Controlled Emissions

The amount of stack emissions from controlled dryers (or other equipment) can be calculated by multiplying the air flow rate from the control device (condenser, carbon adsorber, or incinerator) by the average chemical concentration, if known. Alternatively, these "uncontrolled" emissions can be estimated by applying a control device efficiency:

Amount of device emissions =

dryer stack emissions x

(1 - control device efficiency)

Report these emissions as stack emissions on the form. If you do not have data on the effectiveness of your control device, use the following information, which was taken from the EPA publication, Compilation of Air Pollutant Emission Factors:

Control	Control device efficiency
Cooler/condenser	85-90%
Carbon adsorber	90-95%
Incinerator	95%

Example: Estimating air releases from a dryer with carbon absorption.

In 1987, a plant released 10,000 pounds of toluene from a dryer equipped with carbon absorption. The total emissions were as follows:

Amount of toluene released to air =

10,000 lb x (1 - 0.95)

= 500 lb

The material captured by a carbon adsorber must be accounted for in release estimates; for example, it could be part of the "solid waste" sent offsite for treatment or disposal.

Toxic Releases Via Wastewater

Releases of solvent to water can occur when the carbon beds are regenerated by steam stripping followed by condensation and decantation of the solvent and water. To estimate the amount of a solvent released to water, multiply the flow rate of water from the decanter times the concentration of chemical in the water. This loss is usually less than 1 percent of all the solvent used at the printing press. If the concentration is unknown, you can estimate it by using the water solubility of the chemical at the proper water temperature. For publication rotogravure printing, the solvent content of the condensate is typically 130 to 200 ppm, but it could be as much as 1900 ppm. The actual concentration will depend on the specific

chemical used and its solubility. You should keep in mind that the water solubility of most organic liquids increases with temperature. If hot air is used to strip condensate, the solvent concentration in the water will be considerably lower (usually less than 5 ppm organic content). In this case, water solubility should not be used as a measure of concentration.

If the organic-contaminated condensate is treated biologically to meet local and State effluent limitations (for example, by use of activated sludge or a trickle filter), the amount released to water should reflect the percentage removal of the chemical from the wastewater, and the wastewater treatment efficiency should be reported on the Toxic Release Inventory Reporting Form.

Toxic Releases Via Solid Waste

Cleaning wastes and ink batches that fail to meet specifications may be sources of liquid/solid waste that your facility disposes of or incinerates on site. Whether disposal is on or offsite, you can estimate the amount of chemical released by multiplying the quantity of waste generated by the concentration of the chemical in the waste. Hazardous waste quantities may be available from shipping manifests or RCRA Biennial Reports.

If the solid waste is treated or incinerated on site, you should report the amount of chemical leaving the treatment under the appropriate media (air, water, solid waste) into which final disposal of the chemical is made. Solvent recovered from carbon adsorption systems and recycled is not considered a "release" and should not be reported as such.

Other Toxic Releases

Printing operations produce other wastes from which toxic chemicals may be released. These include:

- **Residues from pollution control devices**
- **Wash water from equipment cleaning**
- **Product rejects**
- **Used equipment**
- **Empty chemical containers**

Releases from these sources may already have been accounted for, depending on the release estimation methods used. These items (and any other of a similar nature) should be included in your development of a process flow diagram.

The contribution of sources of wastes such as cleaning out vessels or discarding containers should be small compared with process losses. If you do not have data on such sources (or any monitoring data on overall water releases), assume up to 1 percent of vessel content may be lost during each cleaning occurrence. For example, if you discard (to landfill) "empty" drums that have not been cleaned, calculate the release as 1 percent of normal drum content. If the drums are washed before disposal, this may contribute 1 percent of the content to your wastewater loading.

Step Five

Complete the Toxic Chemical Release Inventory Reporting Form.

After estimating the quantity of each chemical released via wastewater, solid waste, and air emissions, you must determine the amount of each chemical released to water, land, or air or transferred to an offsite disposal facility. This determination will be based on the disposal method you use for each of your waste streams. Enter the release estimates for each chemical or chemical category in Part III of the Toxic Chemical Release Inventory Reporting Form. Also enter the code for each treatment method used, the weight percent by which the treatment reduces the chemical in the treated waste stream, and the concentration of the chemical in the influent to treatment (see instructions). Report treatment methods that do not affect the chemical by entering "0" for removal efficiency.

For More Information

Emergency Planning and Community Right-to-Know Hotline	(800) 535-0202 or (202) 479-2449 (in Washington, D.C. and Alaska)
Small Business Ombudsman Hotline	(800) 368-5888 or (703) 557-1938 (in Washington, D.C. and Virginia)

The EPA brochure, Title III Section 313 Release Reporting Requirements (EPA 560/4-87-001) presents an overview of the new law. It identifies the types of facilities that come under the provisions of Section 313, the threshold chemical volumes that trigger reporting requirements, and what must be reported. It also contains a complete listing of the chemicals and chemical categories subject to Section 313 reporting. The EPA publication, Estimating Releases and Waste-Treatment Efficiencies for the Toxic Chemical Release Inventory Form (EPA 560/4-88-002), presents more detailed information on general release estimation techniques than is included in this document.

Additional Sources of Information on Releases From Printing Operations

U.S. Environmental Protection Agency. Compilation of Air Pollutant Emission Factors, Fourth Edition. AP-42. Research Triangle Park, North Carolina. September 1985.

U.S. Environmental Protection Agency. Publication Rotogravure Printing—Background Information for Proposed Standards. EPA 450/3-80-031a. NTIS PB 81-117145. Research Triangle Park, North Carolina. October 1980.

U.S. Environmental Protection Agency. Control of Volatile Organic Emissions From Existing Stationary Sources—Volume VII: Graphics Arts—Rotogravure and Flexography. EPA 450/2-78-033. NTIS PB 292490. Research Triangle Park, North Carolina. December 1978.

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