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Title III Section 313 Release Reporting Guidance

Estimating Chemical Releases From Spray Application of Organic Coatings

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Spray applicators of organic coatings 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 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 appliers of organic coatings 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 spray application of organic coatings, 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 the spray application of organic coatings 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: Approximately 50 solvents are on the Section 313 list; these include, among others, methanol, n-butyl alcohol, methylene bromide, methyl ethyl ketone, 2-nitropropane, xylene, and toluene

Pigments: Primarily metal-containing compounds such as titanium dioxide, zinc chromate, zinc dust, lead flake, lead chromate, red lead, barium chromate, barium sulfate, and nickel titanate

Additives: Curing agents, flow control agents, surfactants, defoamers, film-building agents, and film-control agents (for example, melamine, MOCA, dibutyl phthalate, and diethanolamine)

Resin precursors (residues/impurities): Ethyl acrylate, formaldehyde, vinyl chloride, methyl methacrylate, and toluene-2,3-diisocyanate

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, a pigment coated onto a metal part) 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 toluene 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.

Example: Estimating usage of n-butyl alcohol (NBA) in coating formulations.

In 1987, a plant used from inventory 5,000 gallons of a clear topcoat containing 15 percent NBA by volume. The plant also purchased and used 15,000 gallons of a color topcoat containing 7 percent NBA by volume. In addition, it purchased 300 gallons of a formulation containing 95 percent NBA by volume, which was used for thinning and cleaning. Total annual usage of NBA was as follows:

Annual usage of NBA =

(5,000 gal x 0.15) +

(15,000 gal x 0.07) +

(300 gal x 0.95)

= 2,085 gal

The density of NBA is 0.810 kg/liter; therefore, the annual usage in gallons can be converted to pounds as follows:

Annual usage of NBA =

2,085 gal x

3.785 liters/1 gal x

0.810 kg/1 liter x

2.205 lb/1 kg

= 14,095 lb

The use threshold applies because the NBA is not incorporated into the final coated aticle. Because the plant uses more than 10,000 pounds per year of NBA, it must complete a Toxic Chemical Release Inventory Reporting Form.

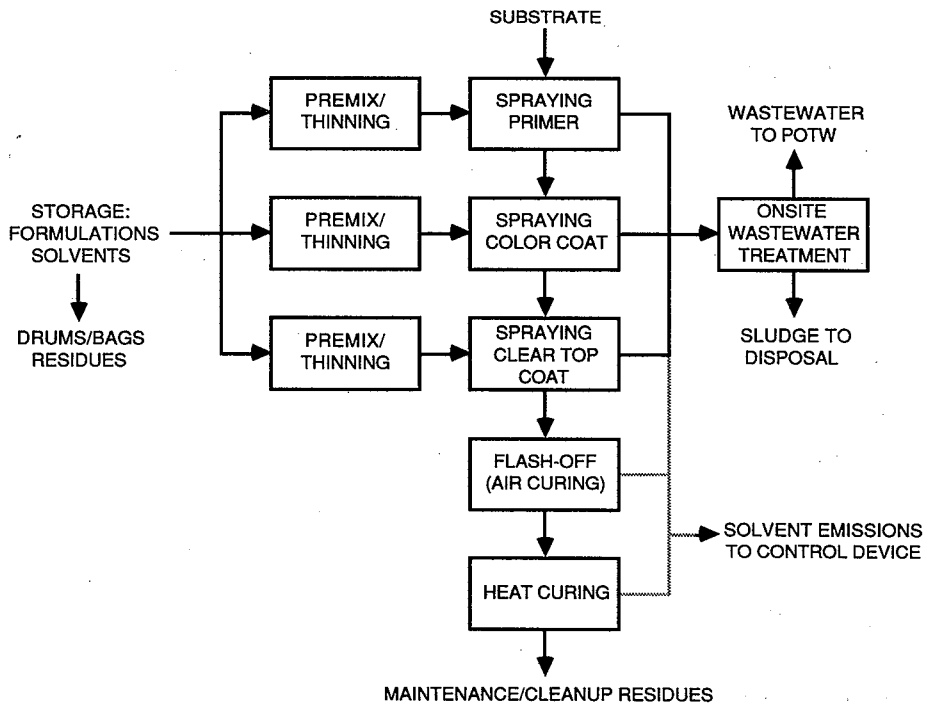
You must complete a report for each chemical for which a threshold is exceeded. The thresholds apply separately; therefore, if you both process and use a chemical and either threshold is exceeded, you must report for both activities. If neither threshold is exceeded, no report is needed.

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 below is an example flow diagram for spray application of organic coatings. 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.

The primary release of any of the chemicals you process is likely to occur during the spraying of the coating formulations. If your spraying operations take place in a spray booth, paint enclosure, or paint room in which controls are in operation, the overspray is probably collected in these



Example Flow Diagram of Spray Application of Organic Coatings

controls. If you have onsite wastewater treatment, you also might have wastewater sludge containing the chemical. Other releases may come from discarded shipping containers (drums, bags) or occur during cleanup operations. 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.

For spray coating operations, the amount of material oversprayed plays a major role in estimating releases. You can estimate this amount by considering the spraying method and the type of sprayed surface. The percentage of overspray will be needed in most types of release estimations. If data specific to your operations are not available, the following table provides some information you may use.

Percentage of Overspray Resulting From Three Spraying Methods

Spraying method	Percentage of overspray		
	Flat surfaces	Table leg surfaces	Bird cage surfaces
Air-atomized	50	85	90
Airless	20-25	90	90
Electrostatic			
• Disc	5	5-10	5-10
• Airless	20	30	30
• Air-atomized	25	35	35

When the amount of coating applied, the concentration of the chemical in the formulation, the type of substrate, and spraying method are known, the amount of oversprayed material can be estimated as follows:

Amount of chemical oversprayed =

amount of formulation applied x

weight percent of chemical x

percent overspray

Toxic Releases Via Wastewater

If you have monitoring data specific to the chemicals you process or use, you can use these data for reporting purposes. For example, if wastewater has been monitored prior to discharge, the amount of chemical released in wastewater can be calculated as follows:

Amount of chemical released to wastewater =

concentration in wastewater x

daily volume of wastewater x

days/year for which data apply

Review all available monitoring data to determine a representative concentration to use in this calculation. In the absence of such data, the following approaches can be used to estimate releases.

If a water curtain is installed as a control in your spray booth, most of the material lost through overspray will be collected in this water. Particulate collection efficiencies for water curtains vary among manufacturers and coating application facilities. If you have no data on your particular system, you can assume an efficiency of 95 percent, as water curtain system efficiencies are generally higher than 95 percent (that is, the water curtain will collect 95 percent of the oversprayed material). The amount of chemical collected by the water curtain can thus be calculated as:

Amount of chemical collected =

amount of overspray x

water curtain efficiency

If wastewater treatment occurs on site, the amount of chemical "lost" must be adjusted to yield the actual release. Use either actual plant operating data on removal efficiency or published data for treatment methods similar to those used at your site. If no data are available, assume the treatment does not remove the chemicals. The amount of chemical released in the wastewater can thus be calculated as:

Amount of chemical released in wastewater =

amount "lost" in wastewater x

(1 – removal efficiency)

Toxic Releases Via Solid Waste

If "solids" are removed from the water before it leaves the water curtain tanks (for example, by settling with or without the aid of chemical treatment), estimate the amount of chemical in these solids based on their volume and the concentration of the chemical. The amount of chemical collected in these solid wastes can thus be calculated as:

Amount of chemical collected =

amount of solid x

weight percent of chemical

Alternatively, the amount of chemical in the sludge may be estimated as the difference between overspray and the amount in discharged water, if the latter has been measured or can be estimated based on water solubility. Report the amount of chemical in the sludge in accordance with its disposal (for example, transfer to landfill).

If your spray booth, paint enclosure, or paint room is equipped with a dry particulate collection filter, you will need to estimate the amount of chemical captured in the filter medium. If collection efficiency data are not available, you may use the following information.

Collection Efficiencies for Several Types of Dry Particulate Collection Filters

Filter type	Collection efficiency, %
Metal panels and corrugated filters	90
Pleated kraft filters	93-95
Fiberglass filters	97-99
Expanded kraft, nonwoven cloth, and baffle-strainer combinations	98-99.8

The amount of chemical collected in the dry filter medium can thus be calculated as:

Amount of chemical collected =

amount oversprayed x

collection efficiency

This material is expected to be disposed of with the dry filter medium or removed from the filter during cleaning operations. These wastes are probably landfilled or incinerated, but they could be released to water if the filters are washed. Report the release under the appropriate category on the form.

During wastewater treatment the chemicals can be transferred to the sludge. Available data on the chemicals should be used for estimation purposes. For organic chemicals, some degradation usually occurs during treatment, so all of the chemical removed from the water does not end up in the sludge. You can estimate the amount of organic compounds in the sludge by using measured data or by subtracting the amount biodegraded from the total amount removed in treatment. Removal may be determined from operating data, and extent of biodegradation may be obtained from published studies. If the biodegradability of the chemical cannot be measured or is unknown, you should assume that all removal is due to adsorption to the sludge.

Toxic Releases to Air

Any overspray material not collected by spray booth controls (water curtains or dry filter media) will be released to the air unless some additional controls are in place for this section of your finishing operations. The amount of chemical released to air can thus be calculated as:

Amount of chemical released to air =

amount oversprayed x

(1 – collection efficiency)

Apply measured control efficiencies for control devices (for example, fabric filters) if they are used to reduce emissions of nonvolatile substances. The amount of chemical released to air after the overspray passes through the control device can thus be calculated as:

Amount of chemical released to air =

amount to the control device x

(1 - collection efficiency)

Volatile materials (such as solvents) in your coating systems are designed to facilitate the coating application and then to volatilize after the coating reaches the substrate. Approximately 70 percent of these materials are expected to volatilize during the actual spraying, 10 percent during the flash-off, and 20 percent during curing. You can assume all volatiles will be lost to air; therefore, to estimate amounts actually released, you only have to account for the effectiveness of any control device used.

Your facility probably has control devices for volatiles at the spraying stations, the flash-off stations, or the oven. When this is the case, you need to adjust your estimated "losses" to "releases." You should use removal efficiency data for your control device if available. By using the figures on volatilization from the preceding paragraph, you can estimate the actual release from each of the control devices as follows:

Amount of volatiles released to air =

(amount of volatiles x 0.7 x spray control efficiency) +

(amount of volatiles x 0.2 x flash-off control efficiency) +

(amount of volatiles x 0.1 x drying control efficiency)

Of course, if a control device transfers the chemical to another waste that is then released, that release must be reported.

Other Toxic Releases

Spray application of organic coatings produces 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 the development of your 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.

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