

RULE 4684 - POLYESTER RESIN OPERATIONS

(Adopted May 19, 1994)(Amended December 20, 2001; September 20, 2007)

1.0 Purpose

The purpose of this rule is to reduce emissions of volatile organic compounds (VOCs) from polyester resin operations, the organic solvent cleaning, and the storage and disposal of solvents and waste solvent materials associated with such operations.

2.0 Applicability

The provisions of this rule apply to commercial and industrial polyester resin operations, and to the organic solvent cleaning, and the storage and disposal of all solvents and waste solvent materials associated with such operations.

3.0 Definitions

The following definitions apply for the purpose of this rule.

3.1 APCO: as defined in Rule 1020 (Definitions).

3.2 Application Equipment: a device, including, but not limited to, a spray gun, brush, and roller, used to apply adhesives, coatings, or inks.

3.3 ARB: California Air Resources Board.

3.4 ASTM: American Society for Testing and Materials.

3.5 Bench Scale Project: a project (other than at a research and development facility) that is operated on a small scale, such as one capable of being located on a laboratory bench top.

3.6 Catalyst: a substance that is added to resin to initiate or promote polymerization.

3.7 CFR: Code of Federal Regulations.

3.8 Cleaning Materials: materials including, but not limited to, materials used for cleaning hands, tools, molds, application equipment, and work areas.

3.9 Closed Mold System: a method of forming objects from polyester resin materials in a confining mold cavity by applying heat and/or pressure.

3.10 Coating: a material applied onto or impregnated into a substrate for protective, decorative, or functional purposes. Such materials include, but are not limited to, paints, varnishes, sealers, and stains.

SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT

- 3.11 Cure: to polymerize, i.e., to transform from a liquid to a solid state or semi-solid state to achieve desired physical properties for the product, including hardness.
- 3.12 Cured Coating: a coating that is dry to the touch.
- 3.13 Degreaser: a tank, tray, drum or other container in which objects to be cleaned are exposed to a solvent or solvent vapor in order to remove contaminants. The objects to be cleaned include, but are not limited to, parts, products, tools, machinery, and equipment. An enclosed spray application equipment cleaning system is not a degreaser.
- 3.14 Dissolver: an organic solvent that is added to an adhesive, coating, or ink in order to melt or to liquefy solid particles.
- 3.15 EPA: United States Environmental Protection Agency.
- 3.16 Gel Coat: a polyester resin topcoat that provides a cosmetic enhancement and improves resistance to degradation from environmental exposure.
- 3.17 Grams of VOC per liter of material: grams VOC per liter of material is determined as follows:
- $$\text{Grams VOC per liter of material} = (W_s - W_w - W_{es}) / V_m$$
- Where:
- W_s = weight of all volatile compounds, in grams
 W_w = weight of water, in grams
 W_{es} = weight of exempt solvents, in grams
 V_m = volume of the material, in liters
- 3.18 High-Volume, Low-Pressure (HVLP) Spray Equipment: equipment used to apply materials by means of a spray gun which is designed and intended to be operated, and which is operated, between 0.1 and 10.0 psig of air atomizing pressure, measured dynamically at the center of the air cap and the air horns.
- 3.19 Liquid Leak: a visible solvent leak from a container at a rate of more than three drops per minute, or a visible liquid mist.
- 3.20 Maintenance Cleaning: the cleaning of tools, forms, molds, jigs, machinery, and equipment (except coating application equipment, ink application equipment, or adhesive application equipment), and the cleaning of work areas where maintenance or manufacturing occurs.
- 3.21 Manufacturing Process: the process of making goods or articles by hand or by machine.

SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT

- 3.22 Monomer: an organic compound, such as styrene, that reacts with unsaturated polyester resins to form a cured polyester resin.
- 3.23 Non-Absorbent Container: a container made of non-porous material that does not allow the migration of solvents through it.
- 3.24 Non-Atomized Solvent Flow: solvents in the form of a liquid stream without the introduction of any propellant.
- 3.25 Non-Leaking Container: a container without a liquid leak.
- 3.26 Normal Business Hours: Monday through Friday, 8:00 am to 5:00 pm.
- 3.27 Organic Solvent: the same as "Solvent."
- 3.28 Organic Solvent Cleaning: as defined in Rule 4663 (Organic Solvent Cleaning, Storage, and Disposal).
- 3.29 Polyester Resin Materials: materials including, but not limited to: unsaturated polyester resins such as isophthalic, orthophthalic, halogenated, Bisphenol-A, vinyl-ester, or furan resins; cross-linking agents; catalysts, gel coats, inhibitors, accelerators, promoters, and any other materials used in polyester resin operations.
- 3.30 Polyester Resin Operations: methods used for the production or rework of products by mixing, pouring, hand layup, impregnating, injecting, forming, winding, spraying, and/or curing with fiberglass, fillers, or any other reinforcement materials and associated cleanup.
- 3.31 Polymer: a chemical compound comprised of a large number of chemical units and which is formed by chemical linking of monomers.
- 3.32 Propellant: any gas, including air, in a pressure container for expelling the contents when the pressure is released.
- 3.33 Repair Cleaning: a solvent cleaning operation or activity carried out during a repair process.
- 3.34 Repair Process: the process of returning a damaged object or an object not operating properly to good condition.
- 3.35 Research and Development: a facility or portion thereof used to further the development of useful materials, devices, systems, or methods, including, but not limited to, design, development, and improvement of prototypes and processes. Research and development does not include the manufacturing process itself.

SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT

- 3.36 Resin: any of a class of organic polymers of natural or synthetic origin used in reinforced products to surround and hold fibers or filler particles, and is solid or semisolid in the cured state.
 - 3.37 SCAQMD: South Coast Air Quality Management District.
 - 3.38 Solvent: as defined in Rule 4663 (Organic Solvent Cleaning, Storage, and Disposal).
 - 3.39 Specialty Resin: any halogenated, furan, bisphenol A, vinyl-ester, or isophthalic resin used to make products for exposure to one or more of the following extreme environmental conditions: acute or chronic exposure to corrosive agents, caustic agents, acidic agents, or flame.
 - 3.40 Stationary Source: as defined in Rule 2201 (New and Modified Stationary Source Review Rule).
 - 3.41 Volatile Organic Compound (VOC): as defined in Rule 1020 (Definitions).
 - 3.42 Vapor Suppressant: a substance added to resin to minimize the transfer of monomer vapor into the atmosphere.
 - 3.43 Waste Materials: materials including but not limited to paper or cloth used for cleaning operations, waste resins, or spent cleaning materials.
- 4.0 Exemptions
- 4.1 The provisions of this rule, other than the recordkeeping requirements of Section 6.1, shall not apply to any polyester resin operation provided the volume of polyester resin materials used is less than 20 gallons per month.
 - 4.2 The provisions of Table 1 shall not apply to the following applications:
 - 4.2.1 Cleaning of solar cells, laser hardware, scientific instruments, or high precision optics.
 - 4.2.2 Cleaning in laboratory tests and analyses, or bench scale or research and development projects.
- 5.0 Requirements
- 5.1 Process and Control Requirements
 - 5.1.1 Each polyester resin operation shall comply with one of the following process or control requirements:

SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT

- 5.1.1.1 Use low-VOC polyester resins with the following monomer content: Low VOC resins, except for specialty resins and gel coats, contain no more than 35% monomer by weight. Low VOC pigmented gel coats contain no more than 45% monomer by weight. Low VOC specialty resins and clear gel coats, contain no more than 50% monomer by weight; or
 - 5.1.1.2 Use resin containing a vapor suppressant, such that the weight loss from the VOC emissions does not exceed 60 grams per square meter of exposed surface during resin polymerization; or
 - 5.1.1.3 Use a closed-mold system; or
 - 5.1.1.4 Install and operate a VOC emissions control system which meets the requirements of Sections 5.1.1.5 through 5.1.1.8 during periods of emission producing activities.
 - 5.1.1.5 The VOC emission control system shall be approved, in writing, by the APCO.
 - 5.1.1.6 During continuous operation, not to exceed 24 hours, the VOC emission control system shall have an overall capture and control efficiency of at least 85 percent by weight.
 - 5.1.1.7 The VOC emission control system shall reduce VOC emissions, at all times, to a level that is not greater than the emission which would have been achieved through the use of compliant materials, compliant equipment, or compliant work practices, as applicable.
- 5.1.2 Spray application of polyester resin shall only be performed using airless, air assisted airless, high-volume, low-pressure (HVLP) spray equipment, or electrostatic spray equipment.
- 5.1.2.1 High-Volume, Low-Pressure (HVLP) spray equipment shall be operated in accordance with the manufacturer's recommendations.
 - 5.1.2.2 For HVLP spray guns manufactured prior to January 1, 1996, the end user shall demonstrate that the gun meets HVLP spray equipment standards. Satisfactory proof will be either in the form of manufacturer's published technical material or by a demonstration using a certified air pressure tip gauge, measuring the air atomizing pressure dynamically at the center of the air cap and at the air horns.

SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT

5.1.2.3 A person shall not sell or offer for sale for use within the District any HVLP spray gun without a permanent marking denoting the maximum inlet air pressure in psig at which the gun will operate within the parameters specified in Section 3.0.

5.1.3 In lieu of complying with the applicable requirements of 5.1.2, an operator may install and maintain a VOC emission control system that meets the requirements of Section 5.1.1.4 around the coating application operation.

5.2 Organic Solvent Cleaning Requirements

5.2.1 An operator shall not use organic solvents for cleaning operations that exceed the VOC content limits specified in Table 1, in accordance with the corresponding effective date.

Table 1 VOC Content Limits for Organic Solvents Used in Cleaning Operations

Type of Solvent Cleaning Operation	Effective November 15, 2003 through September 20, 2008	Effective on and after September 21, 2008
	VOC Content Limit Grams of VOC/liter of material (lb/gal)	VOC Content Limit Grams of VOC/liter of material (lb/gal)
A. Product Cleaning During Manufacturing Process or Surface Preparation for Coating Application	50 (0.42)	25 (0.21)
B. Repair and Maintenance Cleaning	50 (0.42)	25 (0.21)
C. Cleaning of Polyester Resin Application Equipment	50 (0.42)	25 (0.21)

5.2.2 In lieu of complying with the VOC content limits in Table 1, an operator may control VOC emissions from cleaning operations with an APCO-approved VOC emission control system that meets the requirements of Section 5.1.1.4 for the solvent cleaning operations.

SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT

5.3 Solvent Storage and Disposal

An owner or operator shall store or dispose of all uncured polyester resin materials, fresh or spent solvents, waste solvent cleaning materials such as cloth, paper, etc., coatings, adhesives, catalysts, and thinners in self-closing, non-absorbent and non-leaking containers. The containers shall remain closed at all times except when depositing or removing the contents of the containers or when the container is empty.

6.0 Administrative Requirements

6.1 Recordkeeping

An operator subject to this rule shall maintain the following records:

6.1.1 Daily records of the type and quantity of all resins, catalysts, and cleaning materials (including cleaning solvents) used in each operation.

6.1.2 Records of the VOC content, in weight percent, of all polyester resin materials used or stored at the stationary source.

6.1.3 Records of the VOC content of all cleaning materials used and stored at the stationary source as specified in Section 5.2.

6.1.4 Records showing the weight loss per square meter during resin polymerization for each vapor-suppressed resin.

6.1.5 VOC Emission Control System Records

An operator using a VOC emission control system pursuant to Section 5.1.1.4 to comply with this rule shall maintain daily records of key system operating parameters to demonstrate continuous operation and compliance of the VOC emission control system during periods of emission-producing activities. Key system operating parameters are those parameters necessary to ensure compliance, including, but not limited to, temperature, pressure drop, and air flow rate.

6.1.6 An operator claiming exemption under Section 4.1 shall maintain records of polyester materials usage to support the claim of exemption.

6.1.7 The operator shall retain the records specified in Sections 6.1.1 through 6.1.6, as applicable, on site for a period of five years, make the records available on site during normal business hours to the APCO, ARB, or EPA, and submit the records to the APCO, ARB, or EPA upon request.

6.2 Test Methods

SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT

The analysis of cleaning materials, polyester resin materials and control efficiency shall be determined by the following methods:

6.2.1 The emission rate per square meter of exposed surface during polymerization of Polyester Resins is to be determined using: SCAQMD Method 309 (Static Method for Determination of Volatile Emissions from Polyester and Vinyl Resins Operations), Attachment A, 1/8/91.

6.2.2 Determination of Overall Capture and Control Efficiency of VOC Emission Control Systems

6.2.2.1 The capture efficiency of a VOC emission control system's collection device(s) shall be determined according to EPA's "Guidelines for Determining Capture Efficiency," January 9, 1995 and 40 CFR 51, Appendix M, Test Methods 204-204F, as applicable, or any other method approved by EPA, ARB, and the APCO.

6.2.2.2 The control efficiency of a VOC emission control system's VOC control device(s) shall be determined using EPA Test Methods 2, 2A, or 2D for measuring flow rates and EPA Test Methods 25, 25A, or 25B for measuring total gaseous organic concentrations at the inlet and outlet of the control device(s). EPA Method 18 or ARB Method 422 shall be used to determine the emissions of exempt compounds.

6.2.2.3 For VOC emission control systems that consist of a single VOC emission collection device connected to a single VOC emission control device, the overall capture and control efficiency shall be calculated by using the following equation:

$$CE_{\text{Capture and Control}} = [CE_{\text{Capture}} \times CE_{\text{Control}}] / 100$$

Where:

$CE_{\text{Capture and Control}}$ = Overall Capture and Control Efficiency, in percent

CE_{Capture} = Capture Efficiency of the collection device, in percent, as determined in Section 6.2.2.1.

CE_{Control} = Control Efficiency of the control device, in percent, as determined in Section 6.2.2.2.

6.2.3 The monomer content of uncatalyzed resin materials is to be determined using ASTM D2369-87 (Standard Test Method for Volatile Content of Coatings) or SCAQMD Test Method 312.

SAN JOAQUIN VALLEY UNIFIED AIR POLLUTION CONTROL DISTRICT

- 6.2.4 The VOC content of cleaning materials shall be determined using EPA Method 24 (40 CFR Part 60, Appendix A).
- 6.2.5 Determination of emissions of VOC from spray gun cleaning systems shall be made using SCAQMD "General Test Method for Determining Solvent Losses from Spray Gun Cleaning Systems," October 3, 1989.
- 6.2.6 The transfer efficiency of alternative coating application methods shall be determined in accordance with the SCAQMD method "Spray Equipment Transfer Efficiency Test Procedure for Equipment User," May 24, 1989.

6.3 Multiple Test Methods

When more than one test method or set of test methods is specified for any testing, a violation of any requirement of this rule established by any one of the specified test methods or set of test methods shall constitute a violation of this rule.

6.4 Version of Test Methods

All ASTM test methods referenced in Section 6.0 are the most recently EPA-approved version that appears in the CFR as Materials Approved for Incorporation by Reference.