

Rule 1162

Polyester Resin Operations

(A) Purpose

(1) Purpose

- (a) The purpose of this rule is to limit the emissions of Volatile Organic Compounds (VOCs) from Polyester Resin Operations.

(2) Applicability

- (a) This rule is applicable to the manufacture of products from, or the use of, polyester resin material, including repair, rework, or touch-up activities for commercial, military, or industrial use.
- (b) This rule is applicable to all new and existing operations.

(3) Exemptions

- (a) The provisions of this rule, other than the record keeping requirements of section (D)(1), shall not apply to any polyester resin operation where the volume of polyester resin materials used is less than 20 gallons per month.
- (b) The requirements of section (C)(1) and (C)(2) shall not apply to pin-striping provided that the total amount of the gel coat materials sprayed does not exceed one (1) gallon per day per facility.

(B) Definitions

For the purpose of this rule the following definitions shall apply:

- (1) Air-Assisted Airless Spray – A coating application system in which the coating fluid is supplied to the gun under fluid pressure and air is combined at the spray cap.
- (2) Atomized Resin Application – A resin application technology in which the resin leaves the application equipment and breaks into droplets or an aerosol as it travels from the application equipment to the surface of the part. Atomized resin application includes, but is not limited to, resin spray guns and resin chopper spray guns.
- (3) Boat – Any type of vessel, other than a seaplane, that can be used for transportation on the water.

- (4) Boat Manufacturing Facility – A facility that manufactures the hulls or decks of boats from fiberglass or aluminum or assembles boats from premanufactured hulls or decks, or builds molds to make fiberglass hulls or decks. A facility that manufactures only parts of boats (such as hatches, seats, or lockers) or boat trailers, but no boat hulls or decks or molds for fiberglass boat hulls or decks, is not considered a boat manufacturing facility for the purpose of this rule.
- (5) Closed Molding System – A method of fabricating composite parts by placing composite materials in a confining mold cavity and applying pressure and/or heat.
- (6) Corrosion-Resistant Materials – Polyester resin materials used to make products for corrosion resistant applications such as tooling, fuel or chemical tanks, boat hulls, pools and outdoor spas.
- (7) Cure – To transform or polymerize material from a liquid state to a solid or semi-solid state in which the desired physical properties, including hardness, are achieved.
- (8) Electrostatic Application – Charging of atomized coating droplets for deposition to a grounded substrate by electrostatic attraction.
- (9) Exempt Compound – Those compounds listed in 40 CFR 51.100(S)(1).
- (10) Fiber Reinforced Plastic or Composite (FRP/C) Materials – A mixture of polyester resin and fiber reinforcement materials.
- (11) Fiber Reinforcement Materials – Multifilament of glass or other fibrous materials such as, carbon, boron, metal and amid polymers, which are used to reinforce plastic.
- (12) Filled Polyester Resin Material – A material formulated by adding compatible filler(s) to polyester resin material(s).
- (13) Filler – A finely divided inert (non-VOC) material, which may be added to the resin to enhance its mechanical properties and extend its volume. Resin fillers include, but are not limited to, silica, carbon black, talc, mica and calcium carbonate.
- (14) Fire Retardant Materials – Polyester resin materials used to make products that are resistant to flame or fire.
- (15) Flowcoater – A non-atomizing application technique of applying resins and gel coats to an open mold with a fluid nozzle in a fan pattern with no air supplied to the nozzle.
- (16) Gel Coat – A thermosetting polyester resin surface coating, either pigmented or clear, that provides a cosmetic enhancement and improves resistance to degradation from exposure to the elements.

- (17) General Purpose Polyester Resins – Resin materials that are not corrosion resistant, fire retardant, high strength, or gel coats.
- (18) Grams of Voc Per Liter of Material – The weight of VOC per volume of material, calculated using the formula in subsection (E)(1)(a).
- (19) Hand Lay-Up – Hand application technique of composite materials using a bucket and a paint brush or a paint roller, or other hand held method of application.
- (20) High-Strength Materials – Polyester resins which have casting tensile strength of 10,000 psi or more and which are used for manufacturing of high performance boats and skis.
- (21) High-Volume, Low-Pressure (HVL P) – A coating application system which is operated at air pressures between 0.1 and 10 pounds per square inch gauge (psig) measured dynamically at the center of the air cap and at the air horns.
- (22) Lamination Resins – Orthophthalate, isophthalate and dicyclopentadiene (DCPD) resins which are used in composite system made of layers of reinforcement fibers and resins, such as in boat fabrication.
- (23) Marble or Cultured Resins – Orthophthalate and modified acrylic isophthalate resins, which are designed for the fabrication of cast products, such as vanities.
- (24) Monomer – A volatile organic compound that partially combines with itself, or other similar compounds, by a cross-linking reaction to become a part of the cured resin. Monomers include, but are not limited to, styrene and methyl methacrylate.
- (25) Monomer Percent by Weight of a Filled Resin as Applied – The weight of the monomer, divided by the weight of the polymer and filler(s).
- (26) Monomer Percent by Weight of a Resin – The weight of the monomer, divided by the weight of the polymer.
- (27) Non-Atomizing Spray Application – Any application technique in which resin flows from the applicator, in a steady and observable coherent flow, without droplets, for a minimum distance of three (3) inches from the applicator orifices. Non-atomized resin application technology includes, but is not limited to, flowcoaters, chopper flowcoaters, pressure fed resin rollers, resin impregnators, and hand application.
- (28) Open Molding System – A method of fabricating composite parts by applying gel coats, resins, fibers, and other composite materials on an open mold using either hand lay-up or spray-up applications.
- (29) Overall Control Efficiency (CE) – The ratio, expressed as a percentage, of the weight of VOC removed by the emission control system to the total weight of VOC emitted from the Polyester Resin Operation, both measured simultaneously, calculated pursuant to the formula found in subsection (E)(1)(b).

- (30) Pin-Striping – A spray application technique used to apply one or more narrow bands, marks, or streaks of gel coat onto the surface of an open mold of a composite product.
- (31) Polyester – A polymer of ester molecules, which are formulated by the reaction of an acid and an alcohol and linked together by the ester linkages.
- (32) Polyester Resin Materials – 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 material containing VOC used in s.
- (33) Polyester Resin Operations – Fabricate, rework, repair, or touchup products for commercial, military, or industrial use by mixing, pouring, hand lay-up, impregnating, injecting, forming, winding, spraying, and/or curing by using polyester resin materials.
- (34) Polymer – A chemical compound, such as polystyrene, comprised of a large number of chemical units (monomer) composed of identical crosslinking groups, such as styrene.
- (35) Pressure-Fed Roller – A fabric roller that is fed with continuous supply of catalyzed resins from a mechanical fluid pump.
- (36) Primer Gel Coat – Gel coat that is used to coat the surface of composite parts, prior to top-coat painting, for automotive, aerospace, marine and home building industries.
- (37) Pultrusion – A process where continuous roving strands are moved through a strand-tensioning device into a resin bath for impregnation and then passed through a heated die for curing.
- (38) Repair – That portion of the fabrication process that requires the addition of polyester resin materials to portions of a previously fabricated product in order to mend damage.
- (39) Resin – Any thermosetting polyester resin, which is used to encapsulate and bind together reinforcement fibers and/or fillers in the formulation of composite materials.
- (40) Resin Impregnator – A mechanical non-atomizing composite materials application technique in which fiber reinforcement is saturated with resins in a controlled ratio for each specific composite product.
- (41) Solid Surface Resins – Resins, which are used without gel coats to fabricate homogenous solid surface products.
- (42) South Coast Air Quality Management District (SCAQMD) – The air district created pursuant to Division 26, Part 3, Chapter 5.5 of the Health & Safety Code (commencing with §40400).

- (43) Specialty Gel Coats – Gel coats which are used in conjunction with fire retardant, corrosion resistant or high-strength materials.
- (44) Thermoset Polyester Resin – A resin material that undergoes a chemical reaction during curing and cannot be reshaped.
- (45) Touch-Up – That portion of the process that is necessary to cover minor imperfections.
- (46) Tub/Shower Resins – Dicyclopentadiene (DCPD) resins, along with orthophthalate and isophthalate resins, which are used to fabricate bathware products.
- (47) Vapor Suppressed – A polyester resin or gel coat material which contains additives to reduce VOC evaporation loss to less than fifty (50) grams per square meter of surface area as determined and certified by resin and gel coat manufacturers.
- (48) Volatile Organic Compound (VOC) – Any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, which participates in atmospheric photochemical reactions and those compounds listed in 40 CFR 51.100(s)(1).

(C) Requirements

- (1) Application Technique
 - (a) Except for gel coats, a person shall not apply any resin materials to an open mold surface subject to the provisions of this rule unless one of the following non-atomizing application techniques is used and operated according to the manufacturer's specifications:
 - (i) Non-atomizing Spray Application technique;
 - (ii) Flowcoaters;
 - (iii) Pressure-Fed Rollers;
 - (iv) Resin Impregnators;
 - (v) Hand Lay-Up applications; or
 - (vi) Other non-atomizing application techniques which have transfer efficiencies at least equal to one of the above methods, and which are used in a manner that the parameters under which they were tested are permanent features of the method. Prior to their use, such application shall be approved in writing by the APCO, CARB, and the USEPA.

- (b) An operator shall not apply gel coat materials to any open mold surface subject to the provisions of this rule unless one of the following application techniques is used and operated according to the manufacturer's specifications:
- (i) Any non-atomizing application technique listed in (C)(1)(a);
 - (ii) Air-Assisted Airless Spray;
 - (iii) Electrostatic Attraction; or
 - (iv) High-Volume, Low-Pressure (HVLP).

(2) Material Requirements

- (a) A person shall not use polyester resin material in an Open Molding System that has a monomer content in excess of the limits specified in Table 1.

**Table 1
Polyester Resin Materials**

Polyester Resin Material	Monomer Content
Clear Gel Coat	
For Marble Resins	40
For Other Resins	44
Boat Manufacturing	48
Pigmented Gel Coat	
White and Off-White	30
Non-White – Boat Manufacturing	33
Non-White – Other	37
Primer	28
Specialty Gel Coats	48
General Purpose Resin	
Marble Resins	10 or (32% as supplied, no fillers)
Solid Surface Resins	17
Tub/Shower Resins	24 or (35% as supplied, no fillers)
Lamination Resins	31 or (35% as supplied, no fillers)
Fire Retardant Resin	38
Corrosion Resistant and/or High Strength Resin	
Mechanical (non-atomizing)	46.2
Filament application	42
Manual application	40
Other Resins	35
Boat Manufacturing (Atomized)	28
Boat Manufacturing (Non-atomized)	35

- (b) Complying formulations shall not be thinned or diluted with any VOC containing material or changed in any manner that may increase VOC emissions after testing, but prior to or during application.
 - (c) In lieu of complying with the monomer percentage limitations in Table 1, air pollution control equipment with a capture and control system Overall Control Efficiency of at least 85 percent, as determined pursuant to subsections (E)(1)(b) and (E)(1)(d) of this rule may be used.
 - (d) A person shall not apply to an Open Molding System any Tub/Shower Resin material unless all the applied resin material is vapor suppressed.
- (3) Process Requirements
- (a) A person shall not operate a Closed Molding System, unless the weight loss of polyester resin materials during polymerization is less than four (4) percent.
 - (b) A person shall not perform a Pultrusion operation, unless wet-out baths are covered except for 18 inches from the exit of the bath to the die. The weight loss of polyester resin materials during polymerization shall be no less than three (3) percent in a pultrusion operation.
- (4) Notwithstanding the requirements specified in section (C)(1)(a), a person may perform touch-up and repair using a hand-held spray gun that has a container no larger than 1 quart for gel coat or resin as part of the gun.
- (5) Any person processing polyester resin materials and any other VOC containing materials shall keep these materials in closed containers except when filling or emptying the container.
- (6) A person shall not use VOC-containing materials for cleaning or clean-up, excluding coating stripping equipment cleaning, unless:
- (a) The VOC content composite partial pressure is 45 mm Hg or less at a temperature of 20 degrees C, or
 - (b) The material contains 200 grams or less of VOC content per liter of material, as applied.
- (7) Prohibition of Specification
- (a) No person shall solicit or require for use or specify the application of a polyester resin material, or part or component thereof, if such use or application results in a violation of the provision of this rule. The prohibition of this subsection shall apply to all written or oral contracts under the terms of which any polyester resin material, or any part or component, subject to the provisions of this rule is applied at any physical location within the District.

(8) Prohibition of Sale

- (a) A person shall not offer for sale or sell within the District any polyester resin material that does not meet the VOC content limits as set forth in Table 1 of this rule. The prohibition of this section shall apply to the sale of any polyester resin material which will be applied at any physical location within the District, except those materials specifically exempted in section (B)(9) and (C) of this rule.

(9) Compliance Statement Requirement

- (a) The manufacture of materials subject to this rule shall include a designation of VOC as supplied on data sheets; including material components, expressed in grams per liter or pounds per gallon, excluding water and exempt compounds.

(D) Monitoring and Records

(1) Material Records

- (a) A person subject to the provisions of this rule (or, A person subject to section (C) or claiming exemption under section (A)(3)) shall maintain daily records. Alternately, records may be kept on a monthly basis provided the polyester resin process or equipment is not subject to a daily production limit or daily VOC limit in any applicable district rule(s) or permit(s). The records shall contain the following information, if applicable:
- (i) The type of non-atomizing, or other in the case of gel coat, application technique(s) used, manufacturer's name, and records of the fluid tip pressure calibration as specified by the manufacturer;
 - (ii) A current list of polyester resin materials in use which provides the material data necessary to evaluate compliance, including the following information, if applicable:
 - 1. The manufacturer's name;
 - 2. The type and amount of each of the polyester resin materials used;
 - 3. The weight (in percent) of monomer for all polyester resin materials and filler(s);
 - 4. If VOC-containing materials are added to the polyester resin, the amount of VOC-containing materials, in liters, and the VOC content in grams per liter, of VOC-containing materials.
 - (iii) Certifications of analysis from the resin manufacturer(s) to verify that all applied tub/shower resin materials are vapor suppressed.
 - (iv) For closed mold and pultrusion systems, the weight loss (in percent) of polyester resin materials for each application.
- (b) Records for solvents used in cleanup and preparation.

(2) Compliance Assurance Monitoring

- (a) Each Coating Application Operation subject to subparagraph (C)(1) which is using air pollution abatement equipment to meet the control requirement shall:
- (i) Utilize Compliance Assurance Monitoring, as approved by the APCO. Each monitoring device(s), mechanism and/or technique shall be calibrated/maintained as recommended by the manufacturer; and
 - (ii) Maintain and produce daily records of key system operating parameters and maintenance procedures which will demonstrate continuous operation and compliance of the air pollution abatement equipment during periods of emissions-producing activities. Key system operating parameters are those necessary to ensure compliance with VOC content of coating requirements, such as temperatures, pressures and flow rates.
- (b) Compliance with subsection (C)(1) shall be determined by compliance testing as prescribed in subsection (E)(2) and/or by evaluating Compliance Assurance Monitoring data.
- (3) All records for the previous five (5) year period maintained and produced pursuant to this Section shall be retained and available for inspection by the APCO upon request.

(E) Compliance Procedures and Test Methods

(1) Calculation Methods

The following test methods and procedures shall be used to determine compliance with this rule. Other applicable test methods may be used if they are determined to be equivalent and approved in writing by the APCO, CARB and the USEPA.

- (a) Grams of VOC Per Liter of Material shall be determined by the following equation:

$$Gv = \frac{Ws - Ww - Wes}{Vm}$$

Where: Gv=Grams of VOC per liter of coating less water and less Exempt Compounds
Ws=weight of volatile compounds in grams
Ww=weight of water in grams
Wes=weight of Exempt Compounds in grams
Vm=volume of material in liters

- (b) Overall Control Efficiency shall be determined by the following equations

$$CE = \frac{(W_c - W_a)}{W_e} \times 100$$

$$CE = \frac{(\text{Capture Efficiency}) \times (\text{Control Device Efficiency})}{100}$$

Where: W_c = weight of VOC entering control device
 W_a = weight of VOC discharged from the control device
 W_e = weight of VOC emitted, determined by the appropriate USEPA calculation in 40 CFR 63, Subpart VVVV, or 40 CFR 63, Subpart WWWW, or any other method approved by the APCO, CARB, and the USEPA.

- (c) Determination of VOC content of VOC-containing materials

- (i) United States Environmental Protection Agency (USEPA) Reference Method 24 (40 CFR 60, Appendix A) for VOC content and ASTM D4457-85, or CARB Method 432 for determination of Exempt Compounds. The Exempt Compound content shall be determined by SCAQMD Method 303 *Determination of Exempt Compounds* contained in the SCAQMD "Laboratory Methods of Analysis for Enforcement Samples" manual; or,
- (ii) SCAQMD Method 302 and 303 – *Determination of Exempt Compounds*.
- (iii) SCAQMD Method 304 – *Determination of Volatile Organic Compounds (VOCs) in Various Materials*, or any other applicable method approved by the SCAQMD, CARB, and the USEPA.
- (iv) SCAQMD Method 309 – *Determination of the Weight Loss of Polyester Resin Materials*.
- (v) SCAQMD Method 312 – *Determination of Monomer Content of Polyester Resins*.
- (vi) SCAQMD Method 313 – *Determination of Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry*.

- (d) Determination of Efficiency of Emission Control System

- (i) The efficiency of the collection device of the emission control system as specified in paragraph (C)(2)(c) shall be determined by the USEPA method cited in 55 Federal Register 26865 (June 29, 1990), or any other method approved by the APCO, CARB, and the USEPA.
- (ii) The efficiency of the control device of the emission control system as specified in paragraph (C)(2)(c) and the VOC content in the control device exhaust gases, measured and calculated as carbon, shall be determined by USEPA Test Methods 25, 25A, or SCAQMD Method 25.1 (*Determination of Total Gaseous Non-Methane Organic Emissions as Carbon*) as applicable. USEPA

Test Method 18, or ARB Method 422 shall be used to determine emissions of Exempt Compounds.

(e) Determination of Transfer Efficiency

- (i) Demonstration of transfer efficiency of alternative application methods subject to subsection (C)(1)(a)(vi) shall be conducted in accordance with SCAQMDs "*Spray Equipment Transfer Efficiency Test Procedure for Equipment User*" (5/24/89).

(2) All test methods referenced in this section shall be the most recently approved version.

(3) Alternative Test Methods

- (a) Other test methods demonstrated to provide results that are acceptable for purposes of determining compliance with any provisions of this rule may also be used after review and approval in writing by the APCO, CARB and the USEPA.

(4) Alternative Compliance Methods

- (a) Alternative application processes and materials other than those listed in (C)(1) and (C)(2) may be used provided they result in an equivalent VOC emissions and are approved in writing by the APCO, CARB and the USEPA.

(F) Violations

- (1) Failure to comply with any provision of this rule shall constitute a violation of the rule.
- (2) A violation of the limits contained in this rule as determined by any one of these test methods shall constitute a violation of this rule.
- (3) When more than one test method or set of test methods are 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 the rule.

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