

Bay Area Air Quality Management District
939 Ellis Street
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Staff Report

Proposed Amendments to BAAQMD Regulation 8, Rule 50: POLYESTER RESIN OPERATIONS



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STAFF REPORT
Regulation 8, Rule 50: Polyester Resin Operations

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I. Executive Summary

This staff report summarizes information regarding proposed amendments to Bay Area Air Quality Management District (District) Regulation 8, Rule 50: *Polyester Resin Operations*, which limits emissions of volatile organic compounds (VOC) from polyester resin operations during manufacturing and repair of composite products. A composite product is made of polyester resin, gel coats, and reinforcing materials or fillers such as crushed stone to create synthetic marble. Examples of other composite products include tools (molds) to make composite products; watercraft; recreational vehicle bodies; automotive and aerospace parts; bathware products; musical instrument parts; gardening tools; architectural facades; personal computer board parts; pipes; storage tanks and secondary containment for chemicals, sewage and petroleum products.

VOCs contribute to the formation of ground-level ozone, which is the primary ingredient in smog. Ozone is formed from the photochemical reaction of oxides of nitrogen (NO_x) and VOCs. Ozone can result in reduced lung function, increased respiratory symptoms, increased airway hyper-reactivity, and increased airway inflammation. In addition, VOCs can contribute to the secondary formation of particulate matter (PM). Currently, the San Francisco Bay Area is not in attainment of the State air quality standards for ozone and PM, and the Air Resources Board (ARB) has determined that ozone and ozone precursors are sometimes transported from the Bay Area to neighboring air basins. As a result, the District is required to implement all feasible measures to reduce emissions of ozone precursors, including VOCs. The proposed amendments are consistent with limits established in other air districts. The predominant VOC emitted by polyester resin operations is styrene, which is a toxic air contaminant (TAC).

The proposed amendments to this rule will fulfill Control Measure SS 4 of the 2005 Ozone Strategy, which directed the District to examine potential further reduction of VOC from polyester resin operations. The proposed amendments would reduce VOC and TAC emissions by establishing monomer content limits for gel coats, by lowering existing monomer content limits for resins, by requiring the use of non-atomizing spray guns when polyester resins are applied to open molds, and by lowering the VOC content limits for polyester resin and gel coat cleaning products. Currently, Bay Area polyester resin operations emit approximately 1.3 tons per day (TPD) of VOC and 0.8 TPD of TAC into the region's atmosphere.

District staff also proposes a number of other amendments that include the modification of definitions and the addition of several new definitions in order to clarify the scope and applicability of the rule. In addition, staff has corrected and updated other provisions, including modifications to Recordkeeping Requirements (Section 8-50-501) and the Determination of Emissions from Operations with a Control Device (Section 8-50-602).

The proposed amendments for Regulation 8, Rule 50 will reduce VOC emissions by 0.46 tons per day (TPD), approximately a 35% reduction from this source category. TAC emission reductions from resin and gel coat usage will be 0.37 TPD. The estimated emission reductions are mainly attributable to changes in chemistry for resin and gel coat materials, and the use of non-atomizing application technologies. The VOC emission

reduction from cleaning product usage will be 0.09 TPD. Non-atomized applications enhance spray equipment transfer efficiencies, thus reducing VOC and TAC emissions and the amount of overspray waste. The amendments for the controls on polyester resins, gel coats, cleaning products would take effect on October 1, 2010. The amendment for the requirement of non-atomizing spray technology for resins applied to open molds would take effect on October 1, 2011.

The proposed amendments have been found to be cost-effective and a socio-economic analysis has determined that these amendments can be implemented without significant economic dislocation or loss of jobs. A California Environmental Quality Act (CEQA) Initial Study has determined that there are no significant adverse impacts associated with this project.

II. Background

A. Introduction

The District adopted Regulation 8, Rule 50 on December 5, 1990 and amended it three times thereafter. The most recent amendments in 1996 addressed the definition of a VOC, the method of analyzing polyester resin material samples, and the method of determining emissions from polyester resin operations.

Since 2001, the South Coast AQMD has worked with industry association trade groups, polyester resin formulators and composite product manufacturers to develop and conduct testing of lower monomer content resins. As a result, three California air districts have subsequently adopted lower monomer content limits for resins and gel coats.

Rule 50 limits emissions from polyester resin operations in at least three ways. The owner/operator can comply with monomer content limits for uncured resins; the owner/operator can use vapor suppressants that minimize emissions from polyester resin operations; and/or the operator may use a closed mold system to minimize emissions from polyester resin operations. In addition, the rule sets application requirements to limit overspray and has a VOC content limit for gel coats, which is a type of polyester resin that is often applied as the surface of a polyester resin product to provide a smooth, attractive finish.

There are approximately 60 permitted polyester resin operations in the Bay Area that range in size from single-person shops to shops with 10 or more employees. Most facilities have less than 10 employees. Approximately half of the polyester resin operations in the Bay Area specialize in cast polymer operations. A cast polymer resin operation applies polyester resin to a mold to make a casting. Examples of finished castings include shower enclosures and bathroom vanity countertops.

There are several classes of gel coats and resins that are used in the industry. Each class is formulated for specific performance characteristics. In the case of gel coats, their appearance, in addition to performance factors, will determine how and when they are used. Because most Bay Area polyester resin facilities fabricate a narrow range of products, they use a limited variety of resins and gel coats.

B. Composite Products Overview

Products manufactured from polyester resins are termed “composite products.” Finished composite products are composites of polyester resins, gel coats, monomers, catalyzing agents, binders, fillers, promoters, molding compounds, reinforcement fibers, adhesives and other materials and chemicals which are added to a polymer mix. The ingredients in the polymer mix impart desired properties such as a specific appearance and/or performance standard of each cured composite product. Resins and gel coats are applied to molds that are either open or closed which provide the desired shape for finished products.

Components of Polyester Resin Composites

Resins and Monomers

Resins are the backbone of a composite product. Resins polymerize, or react with, other polyester resin molecules to bind fibers and other materials in a composite product, thus allowing the product to tolerate more stress and other forms of tension. Resins also provide a barrier to weather, water or chemicals. Thermosetting resins polymerize when exposed to heat or certain chemicals. Once cured, they cannot be reheated and re-shaped due to the molecular cross-linking process that has occurred, unlike thermoplastic resins that can be reheated and reshaped.

Polyester resins are polymers of ester molecules that are chained together in a particular order called ester linkages. Ester monomers are formulated by the reaction of acid and alcohol molecules. Polyester resins include isophthalic resins, orthophthalic resins, halogenated/clorendic resins, bisphenol-A resins, and furan resins. Polyester resins are used to manufacture a variety of products including but not limited to bathroom cabinet countertops, shower enclosures, automotive body parts, boat hulls, housing for electronic components, aerospace parts, chemically resistant storage tanks, and computer circuit boards.

Other types of thermosetting resins include epoxies, phenolics, polyurethanes, and acrylics. Epoxy resins are typically used to fabricate marine craft parts, automotive parts, electrical composites, appliance parts, and aircraft components. Epoxy resins emit minimal amounts of VOC compared to polyester resins because they contain little to no monomer content. Phenolic resins are used primarily to fabricate products that can meet fire-resistant standards mandated by public transportation and aviation industries. They also are used to fabricate electrical switches, junction boxes, automotive parts, consumer appliance parts, handles for pots and pans, and billiard balls. Phenolic resins emit some VOC but the use of these resins is minimal. Polyurethane resins are used to manufacture products for the home-building industry, the ballistics industry, the sporting goods industry, the automotive industry, and to fabricate products used on highways. Typical polyurethane resin products include hockey sticks, bowling balls, automotive body and seat parts, laboratory equipment parts, highway sign posts, trusses, guardrails and light poles. Polyurethane resins emit little or no VOC. Acrylic resins are used to fabricate composite products requiring superior clarity and optical properties. Acrylic resins are typically used to fabricate lighting fixtures because they are slow-burning and do not

produce harmful smoke or gases in the presence of flame. Acrylic resins are also used as tooling resins because they can withstand exposure to high stress and heat. Acrylic resins contain methyl methacrylate (MMA) monomer and can emit significant amounts of VOC. There is minimal production of composites using acrylic resin in the District.

Vinyl ester resins, which are produced from the esterification of an epoxy with a monocarboxylic acid, are considered a type of polyester resin and are regulated under this rule.

Some thermosetting resins emit VOCs and TACs while others do not. Emissions depend on the resin's monomer type and content. Monomers are small molecules that partially combine with themselves and/or catalyzing agents to form the basic repeating unit of a polymerized resin. Monomers reduce a resin's viscosity and are the integral building blocks in the curing reaction which transforms the resin from a liquid to a solid.

Styrene is by far the most commonly used monomer in composite manufacturing, although many specialty resins and gel coats contain other monomers, such as Methyl Methacrylate (MMA) or vinyl toluene. Styrene and MMA, the second most commonly used monomer, are emitted into the air during the application of resins to molds, while rolling air bubbles out of composite materials, and during the curing phase. Styrene and MMA are TACs, so exposure to these emissions is an air quality concern. Because VOC emissions from composite products consist entirely of monomers, the monomer content of resin is regulated just as VOC content is regulated in coating rules. Polyester resins have the greatest emissions of all thermosetting resins because they are the most widely used and because emissions from polyester resins are the greatest per amount of resin used.

Gel Coats

Similar to thermosetting resins, different gel coats emit VOCs and TACs to varying degrees, depending on the type and amount of monomer on which the gel coat resin is based. Gel coats are modified polyester resins. When a resin and a gel coat are to be applied to a mold, the gel coat is applied first because it becomes the surface layer of the composite product. Gel coats have both decorative and protective features. A gel coat's surface is exposed to a variety of environments, so it must be able to resist UV light, chemicals, heat, discoloration, pock marks, and cracking.

Specialized gel coats, known as tooling gel coats, have high levels of durability and are resistant to heat. They are used to manufacture molds which in turn are used to fabricate composite products. Such gel coats must resist mechanical and thermal stresses encountered during the curing and de-molding processes. A primer gel coat is a specialized gel coat designed to protect the exterior of a composite product that is painted after the product is removed from the mold.

Additives to Resins

Reinforcement Materials

Fiber reinforcement materials (FRM) are used in the manufacturing of composite products to enhance a variety of desirable properties that are of a mechanical and/or structural nature. The desirable properties include tensile strength, tensile modulus (elasticity), flexural strength, flexural modulus, compressive strength, stiffness, fatigue endurance, and elasticity. FRM enhances thermal, protective, and other composite capabilities. FRM does not react with resins; however, they are an integral part of the composite matrix.

FRM includes multi-filaments of glass or other fibrous materials such as carbon, graphite, aramid, boron, metal, silicon carbide, kevlar, and natural fibers. Due to its low price and excellent performance, fiberglass is the most commonly used FRM in the industry; it is available industrially either as mats of woven cloth or as filaments.

Fillers

Fillers are solid, finely divided materials, such as carbon black, titanium dioxide, limestone, talc, mica, silica, clay, and calcium carbonate, as well as short fibers of a variety of materials. They are added to a polymer matrix for various reasons. Sometimes they are added to reduce the overall cost of the product by extending its volume.

Fillers are also added to enhance performance properties of a product. Fillers add a number of desirable properties to composite products, including flame retardation, heat resistance, optical clarity, color, thermal, magnetic or electrical properties, and lubricity.

Catalyzing Agents, Promoters and Inhibitors

Catalyzing agents, often called initiators in the composite industry, initiate monomer cross-linking reactions. Methyl ethyl ketone peroxide and benzoyl peroxide are the most commonly used catalyzing agents.

In order to initiate cross-linking reactions, in some circumstances, fabricators may heat catalysts or resins or add chemicals called promoters (sometimes referred to as “accelerators”). Promoters also affect color, odor, and reactivity with specific catalyzing agents. In the presence of a promoter, catalyzing agents are typically added separately, immediately prior to use.

Inhibitors are used to prolong the shelf life of resins and to adjust the cure rate of thermosetting resins to prevent cracking of thickly layered sections. Inhibitors prevent spontaneous cross-linking.

Suppressants

Suppressants are compounds that migrate to the surface resin to form a layer during the polymerization process, thus decreasing emissions into the ambient air. Consequently,

suppressants are one method of TAC and VOC control. Usually, suppressants are wax compounds.

Open Mold Applications

Open mold production, the simplest fabrication technique, has been the most prevalent polyester resin composite operation for decades. EPA data suggests that open mold fabrication accounts for approximately 80% of polyester resin emissions nationally. Composite materials can be applied to open molds either manually or via spray technology.

The manual application method, often referred to as a “hand lay-up”, involves a multi-step process. The mold’s surface is treated with a mold release agent in the form of an alcohol or paste wax to facilitate the removal of the cured composite. Next, a catalyzed resin mix is applied over the mold release agent. Before the resin cures, fiber-reinforced materials are applied by hand. Additional resin, catalyst, and reinforced material may then be added. Hand rollers, brushes, or squeegees are used to saturate, to smooth out, and compact each layer of the matrix as it is applied. Figure 1 is an illustration of a manual resin application method. Figure 2 is a photograph of a resin application using a manual method during the fabrication of a canoe.

Figure 1

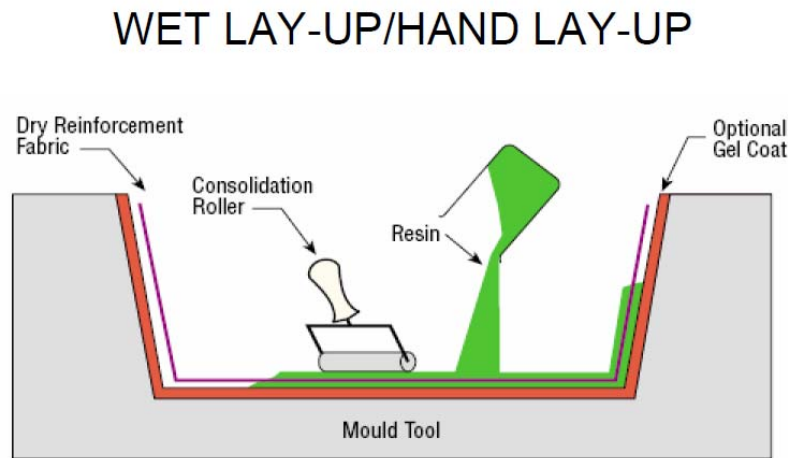


Image from Harveyscomposites.com

Figure 2
CANOE MANUFACTURING MANUAL APPLICATION



Image from Hemlockcanoe.com

Mass Production Open Mold Applications

In addition to the manual application technique described above, composite material fabrication includes the following mass production open mold techniques:

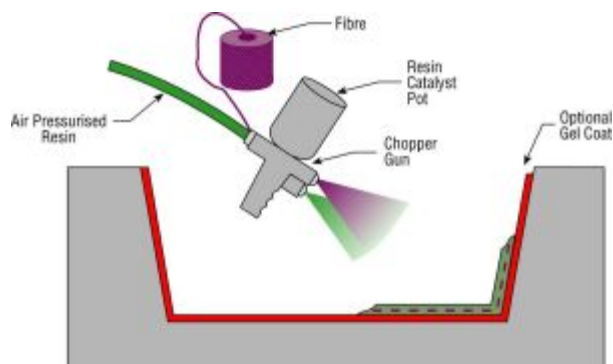
- Continuous Lamination is a fabrication technique that pulls reinforcement material through a resin bath, brings the material (plies) together (sandwiches) between cellophane sheets, and pulls it through a forming die into a curing oven. Squeeze rolls control thickness and resin content as the various plies are brought together. Products made from continuous lamination include wall panels and sheeting.
- Pultrusion Operations continuously pull fiberglass material, which are in the form of strands or mats, through a tension device and immediately immerses them in a resin bath. As they exit the resin bath, the joint glass/resin composite strands are pulled first through a forming die and then through a heated die which cures the composite matrix into a shape. Examples of pultruded products include round tube or round bar fiberglass, square bar or square tube fiberglass, or wide flange beam products.
- Filament Winding Operations are used to manufacture large pipes, storage tanks, and other hollow vessels that may be subject to elevated internal pressure. In this process, continuous fiberglass strands are pulled by a rotating mandrel through a strand-tensioning device into a resin bath. After emerging from the resin bath, uniformly-coated strands are wound onto a mandrel to the shape and pattern required for the finished product. The wound product is then cured in an oven or at room temperature.

Spray Technologies

Similar to the manual application method, spray-up methods also begin by treating an open mold's surface with a release agent. Over the release agent, reinforced material and a predetermined amount of resin and catalyst are applied with a spray gun. Industry representatives state that spray-up methods have several advantages over manual application techniques, including increased production rates, increased uniformity of products, the utilization of a greater variety of molds, and less time to produce a product. Atomization spray technologies separate resin and gel coat liquids into a fine mist by forcing the liquid under high pressure through an orifice, by bombarding a liquid stream with air jets, or by a combination of each technique. The net result is some overspray that reduces the transfer efficiency (percent of material sprayed that adheres to the intended surface) of the material sprayed onto molds, resulting in emissions of VOCs and TACs to the atmosphere. Open mold processes using air-atomized spray technology is the highest emitting method of creating a product. Figure 3 is an illustration of a spray-up method.

Figure 3

Illustration of a Spray-up Method



In order to minimize overspray, Regulation, Rule 50 currently allows only four types of spray gun technologies for the application of composite resins and gel coats.

- Airless Spray, which includes a pump to deliver the resin to the fluid tip at high pressure. As the high-pressure resin stream exits the small fluid tip (orifice), the stream's flow is reduced and the sudden reduction in pressure causes the fluid to atomize into a spray pattern.
- Air-assisted Airless Spray, which is a hybrid of airless and air-atomized spray gun technologies, uses a pump to deliver the resin to the fluid tip (orifice) with much less pressure than an airless gun. Low pressure air improves the resin spray pattern exiting the gun's tip.
- Electrostatic Spray, where an electric charge is imparted to the mold surface and an opposite charge is imparted to the spray droplets, which are attracted to the mold. This technology is rarely used.
- High-volume, Low-pressure Spray, which is similar to air-assisted guns. The spray gun operates with air atomizing pressures of 10 psi or less. High pressure air typical of an air spray gun is replaced by a high volume of low pressure air.

The type of spray gun selected for a given application is based on four primary considerations: how the material is delivered to the gun, how the catalyst is added, how the resin or gel coat is atomized, and the type of mold which is receiving the resin or gel coat.

According to industry sources, non-atomizing spray techniques have been used effectively in other air districts for the application of resins. The net results are enhanced transfer efficiencies and reduced emissions. Details of non-atomizing application techniques are discussed later in this document.

Closed Mold Applications

Closed mold processing methods are those in which all or part of the fabrication takes place in a closed vessel or chamber. Closed molds are used to manufacture products with one or two smooth surfaces or complex shapes. Reinforced glass fibers, carbon fiber reinforced materials, and kevlar fiber reinforced polymers are used in closed mold applications. In the closed mold process, fiber is applied by hand into a mold, the mold is closed, and catalyzed polyester resin is poured or injected into the mold cavity. Resin may be forced into a mold under pressure, drawn in with a vacuum, or a combination of the two.

These following processes are examples of closed mold applications:

- Resin Transfer Molding,
- Vacuum-assisted Resin Transfer Molding,
- Vacuum Bag Molding,
- Resin Film Infusion,
- Compression Molding,
- Reaction Injection Molding,
- Tube Rolling,
- Automated Fiber Placement,
- Automated Tape Laying, and
- Centrifugal Casting.

C. Cleaning Products

Cleaning products are materials used to clean equipment and parts associated with composite operations including operators' hands, tools, rollers, brushes, molds, work area, chopper guns, laminating equipment and other process-related equipment.

Acetone is the preferred cleaning product in the composite industry because it is the most effective product for cleaning cured resins and gel coats from application equipment. According to industry sources, other less flammable cleaning products are used (when possible) to enhance shop safety and to reduce the cost of property insurance. These cleaning products can only be used to clean non-cured composite materials.

Some Bay Area fabricators have had mixed results with aqueous cleaners, that combine water with an organic compound such as dibasic ester. Aqueous cleaners rely on mechanical action (such as brushing) to clean resin from contaminated applicators while

acetone and other solvents clean by dissolving the resin. The resin droplets are wetted by the aqueous cleaner and settle to the bottom of a cleaning tank. Although aqueous cleaners contain few VOCs, they create waste materials, such as the spent liquid solution and under-cured resins, just as acetone cleaners do.

Soy-based cleaning materials are currently in development according to the American Composites Manufacturing Association (ACMA). They can remove cured and uncured resins in an immersion cleaning process. The ACMA considers this an emerging technology with some promise and believes that soy-based cleaners are yet to be fully developed for all polyester resin manufacturing cleaning applications. Staff will work with industry to track the effectiveness of this emerging technology as cleaning product manufacturers endeavor to reformulate low-VOC soy-based cleaners.

D. Controlling VOC Emissions

Control of open molding VOC and TAC emissions can be achieved by pollution prevention and/or capture and control technologies. Pollution prevention involves modifications to the chemistry of the materials and to the application methods to minimize the release of VOCs and TACs at the source. Capture and control reduces emissions through abatement, such as carbon adsorption and incineration. Additionally, operator training and good operating practices can contribute toward significant emissions reductions.

Pollution prevention includes use of the following technologies:

- Non-atomizing Application Technologies
- Low Monomer Resins
- Vapor Suppressants
- Radiation Technology
- Fillers

Non-atomizing Application Technologies

Advancements in resin application technologies allow significant reductions in VOC and TAC emissions. For example, the replacement of atomized spray applications of gel coats and resins with non-atomized applications improves transfer efficiencies and reduces VOC and TAC emission significantly. Non-atomizing applications reduce the over-spray because of their greater transfer efficiency; they minimize the amount of waste; and they control styrene and other monomer emissions in the working area.

The following non-atomizing application technologies can offer significant emission reductions when compared with conventional atomizing application technologies:

- Impingement spray -- is a spray technique which applies resins onto open molds by using specialized fluid tips as the primary means to shape the fluid stream into a fan pattern, without the need of atomization.

- Flow coating -- is a technique in which reinforcement materials are impregnated with resins on an in-line conveyor system. The composite product is cured and trimmed as it passes through various conveyor zones.
- Pressure-fed roller -- is a technique in which fabric rollers, fed with a continuous supply of catalyzed resins through a hose from a mechanical fluid pump, apply resin to a mold.
- Resin impregnation -- is a mechanical application technique that uses a vacuum to draw resin into a mold to uniformly saturate (impregnate) fiber reinforcement material.

U.S. EPA (through its Research Triangle Institute and Comtech, Inc) conducted studies of non-atomizing application technologies and reduced styrene content to prevent pollution. U.S. EPA measured the average styrene emissions concentration (ppm) and percent emissions reduction during the application stage from airless air assist spray guns, flow coaters, and non-atomizing technology systems, and found that the non-atomizing spray systems reduced emissions significantly.

According to the 2008 EPA Control Technique Guidelines for fiberglass boat manufacturing materials, changing both the application method and reducing the monomer content of a resin can significantly reduce VOC emissions. For example, changing from an atomized application of resin with a monomer content with 40% styrene to a resin with 35% styrene content that is applied with non-atomizing technology may achieve a 58% emission reduction.

Low Monomer Resins

One way to minimize the loss of monomer from composite operations is to use resins formulated with less monomer. Low monomer resins can be formulated using non-styrene monomers such as vinyl toluene, which is less volatile when exposed to air. However, reducing the monomer content of the resin presents challenges. Lowering the monomer content typically tends to increase viscosity, which may adversely impact the resin application. Lowering the molecular weight of the resin to reduce its viscosity may also compromise its ability to resist corrosion.

Vapor Suppressants

Another way of reducing emissions is through the use of vapor suppressants, which are typically waxes. VOC emissions occur during three separate phases of a composite open molding process; the application phase, the rollout phase, and the curing phase. During the curing process of a resin, a vapor suppressant forms a layer on the surface of the resin and minimizes the outward diffusion of monomers into the atmosphere. Vapor suppressants may be blended into resin products at the resin-manufacturing site before packaging or shipment to the fabricators, or may be added just prior to fabrication.

Radiation Technology

Ultraviolet (UV) curing resins use a photo-sensitive curing mechanism where UV light serves as the catalyst. The curing process involves the decomposition of a photo-initiator by exposure to UV light. Once exposed, the decomposition produces free radicals, which in turn trigger the polymerization reaction of the resin.

In electron beam (EB) technology, the electron beam translates energy to the resin molecules, breaking the carbon-hydrogen links, thus initiating polymerization. To assess the feasibility of EB technology in curing composite materials, District staff contacted RadTech, the association for the EB and UV industry. A RadTech representative verified that EB technology has improved and is now used to cure some composite materials. Therefore, the use of EB curing technology in the composite industry appears to be a promising technology for some composite applications. Both UV and EB technologies emit VOC during the application step, but almost no VOC during the curing step.

Fillers

Fillers are finely divided materials, which are added to resins to enhance their mechanical properties, extend their volume and lower the cost of fabricating a composite product. According to industry sources, fillers are often added to enhance the fire-retardant performance of a composite product. Although fillers are an integral part of a product, and are not added for the sole purpose of emissions reductions, their use in resin matrices usually results in less resin and monomer content for the product, sometimes reducing emissions.

Cultured marble and cultured granite are cast polymer products which are comprised of approximately 25% polyester resin and 75% filler in the form of crushed stone, natural marble or granite. These marble or granite fillers chemically bond with resins that allow them to be molded into an infinite number of shapes and sizes. Marble and granite fillers are often used for the production of countertops, sinks, tubs, and showers.

Capture and Control Technology

Composite operations have the option of using abatement equipment (add-on controls) to control VOC emissions in lieu of using resin, gel coat and cleaning products which comply with specified VOC and monomer limits. The majority of VOC emissions from resins and gel coats occur in open molding processes which take place in an open shop environment. Some emissions occur in spray booths where gel coat spraying for smaller parts may be done. The volume of air exhausted from an open shop or from spray booths is typically high, and the VOC concentration is typically low. Therefore, due to the large volume of air that must be processed to control a small amount of VOC, it is rarely cost-effective to use add-on controls to reduce VOC emissions. Catalytic and thermal oxidizers are expensive to install, operate and maintain. Because of the wide availability and lower cost of low-monomer VOC content materials and alternative application methods, these materials and methods are used to reduce monomer VOC emissions from manufacturing facilities.

III. Proposed Rule Amendments

The proposed amendments to Regulation 8, Rule 50 will reduce VOC and TAC emissions from the Bay Area's composite manufacturing industry primarily in three ways: (1) by lowering monomer content limits for resins; (2) by establishing monomer content limits for gel coats; and, (3) by requiring the use of non-atomizing spray systems when resins are applied to open molds. In addition, VOC emissions from cleaning products used in the composite manufacturing industry will be reduced by lowering the allowable VOC content. The majority of the VOC emission reductions for this control measure will be achieved by establishing new monomer limits for resins and gel coats and through a requirement to use non-atomizing spray technology.

Monomer Limit Requirements

Presently, Regulation 8, Rule 50 requires that Bay Area polyester resin operations use gel coats, a specialized form of resin, with a maximum VOC content of 250 grams per liter. Polyester resin operations must use resin materials with a maximum monomer content of 35% by weight, except for corrosion-resistant polyester resins which have a monomer content limit of 50%. The polyester resin rules of several California air pollution control districts currently regulate VOC emissions from composite manufacturing operations by limiting monomer content for both resins and gel coats. Staff proposes to define several subcategories of resins and gel coats and to impose specific monomer content limits on these subcategories. Staff has identified studies and field testing that have established maximum monomer content for polyester resin and gel coat subclasses that enable them to work effectively while reducing VOC and TAC emissions. Staff proposes that monomer limits, rather than VOC content limits, apply to gel coats used in Bay Area composite operations. The new monomer limits for Regulation 8, Rule 50 are proposed to become effective on October 1, 2010.

Table 1 lists the proposed limits for resin and gel coat materials.

Table 1
Proposed Monomer Limits for Resin and Gel Coat Materials

<u>Gel Coats and Resins</u>	<u>Monomer Percentage by Weight</u>
<u>Gel Coats</u>	
<u>Clear Gel Coats</u>	
<u>Marble Resin Gel Coats</u>	<u>42%</u>
<u>Boat Manufacturing Gel Coats</u>	<u>48%</u>
<u>All Other Clear Gel Coats</u>	<u>44%</u>
<u>Pigmented Gel Coats</u>	
<u>White and Off-White Gel Coats</u>	<u>30%</u>
<u>Non-White Boat Manufacturing Gel Coats</u>	<u>33%</u>
<u>Other Non-White Gel Coats</u>	<u>37%</u>
<u>Primer Gel Coats</u>	<u>28%</u>
<u>Specialty Gel Coats</u>	<u>48%</u>
<u>Resins</u>	
<u>Marble Resins</u>	<u>10% with fillers or 32% without fillers</u>
<u>Solid Surface Resins</u>	<u>17%</u>
<u>Tub/Shower Resins</u>	<u>24% with fillers or 35% without fillers</u>
<u>Boat Manufacturing (atomized)</u>	<u>28%</u>
<u>Boat Manufacturing (non-atomized)</u>	<u>35%</u>
<u>Lamination Resins</u>	<u>31% with fillers or 35% without fillers</u>
<u>Fire Retardant Resins</u>	<u>38%</u>
<u>Corrosion Resistant, High Strength, and Tooling Resins</u>	
<u>Mechanical (non-atomizing) Application</u>	<u>46%</u>
<u>Filament Application</u>	<u>42%</u>
<u>Manual Application</u>	<u>40%</u>
<u>Other Resins</u>	<u>35%</u>

Monomer percent by weight includes the addition of any VOC-containing materials added.

Spray Technology Requirements

Non-atomizing (fluid impingement) spray guns that effectively apply polyester resins have been available for several years. This spray technology provides the best transfer efficiency in the polyester resin industry. Staff recommends requiring non-atomizing

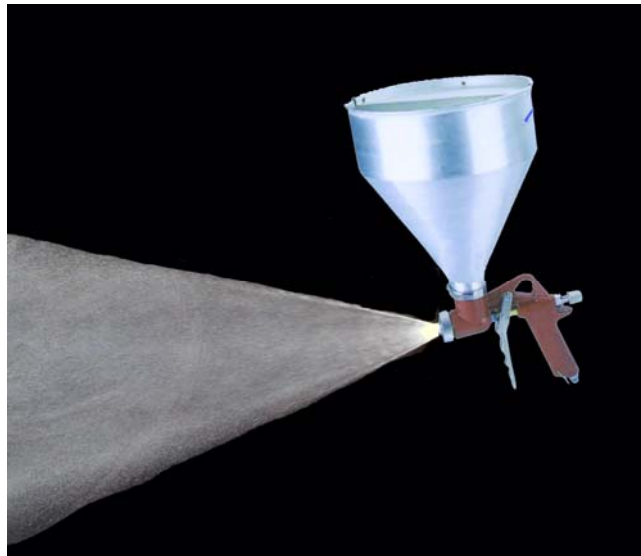
spray guns as the only type of spray application technique allowed for the application of polyester resins to open molds. Staff proposes setting the implementation date for non-atomizing spray guns at October 1, 2011, one year after the new resin and gel coat monomer content limits are effective. This compliance deadline is proposed in response to comments received during the public workshop and review process. Staff also recommends re-naming Section 8-50-302, currently entitled “Spray Operations” to “Application Requirements.”

The proposed amendments do not require that the application of gel coats to open molds use non-atomizing spray guns. A study has shown that there are no significant differences between the VOC emission rates between air-assisted airless and non-atomizing applications when the non-atomizing spray gun is used at a pressure high enough to achieve an acceptable surface quality. Due to the results of that study, other California air districts that had previously required non-atomizing spray application techniques for gel coats have deleted the requirement.

The proposed amendments also allow the use of air spray hopper guns for the application of viscous blends of resin or gel coat to open molds. A hopper gun is an air-atomized spray gun connected to a large upright gravity-fed hopper. The underside of the gun’s nozzle is connected to a specialized hose which is connected to an air compressor. When the gun’s trigger is pressed, it expels the contents from the hopper through the nozzle in a thick, viscous mixture of catalyzed resin (or gel coat) and rock crushed to the consistency of sand in a stream or spray. The hopper gun uses high air pressure (30 psi – 40 psi) but does not atomize the mixture because it is too heavy. Hopper guns are typically used in the composites manufacturing industry to spray mixtures of crushed stone and resin into a mold to create architectural facades. The monomer emissions from hopper guns are minimal compared to other spray guns that use air pressure. Thus, amendments to the rule will allow the use of hopper guns. Figure 4 is a picture of a hopper gun.

Figure 4

Hopper Gun



Wipe Cleaning

Wipe cleaning involves wetting a rag or cloth with solvent or an aqueous solution and wiping an equipment part to free it of contaminants. Currently, the VOC limit for wipe cleaning products used in Bay Area composite operations is 200 grams per liter. Cleaning products that comply with a VOC limit of 25 grams per liter have been used in other California air districts for several years and are effective for certain applications. Other air districts have confirmed that, to date, they have not received complaints from the composite industry about the restriction to use low-VOC products for wipe cleaning. Staff recommends lowering the VOC limit for cleaning products used in Bay Area composite operations from 200 grams per liter to 25 grams per liter. Staff believes this limit is feasible because owners/operators generally rely on acetone (a solvent determined by the EPA to be negligibly photochemically-reactive) which is exempt as a VOC for the majority of their equipment cleaning needs and because cleaning products that meet the 25 gram/liter limit are available.

Cold Cleaning

Cold cleaning refers to soaking a piece of equipment in a solvent or aqueous solution. The solution dissolves cured or partly cured resin so that it can be easily removed by brushing or wiping. Particularly, equipment with inaccessible components or narrow crevices needs to be soaked. Cold cleaning is subject to the provisions of Regulation 8, Rule 16: Solvent Cleaning Operations, which does not exempt acetone or any other solvent. Acetone has a low reactivity but a high evaporation rate, so an exemption for acetone in Rule 16 would create more ozone than regulated, but lower evaporating solvents. Because acetone is the most effective cleaning solvent, industry has requested the District consider amending Rule 50 to allow the use of acetone in cold cleaners. Staff proposes to allow the use of acetone in cold cleaners for the composite industry provided that steps are taken to minimize evaporation. These include use of a self-closing cover and the prohibition of brushing and the wipe cleaning of parts while they are in the cold cleaner. Requirements to minimize evaporation are included in the amendments.

Additional Amendments

To clarify the scope and to enhance the enforceability of Regulation 8, Rule 50, District staff also proposes a number of other changes in the form of modifications and additional amendments. They include:

- an expansion to the rule's description;
- modifications to the section exempting touch-up and repair and the inclusion of a limited exemption for field installation of composite products;
- new and modified definitions throughout;
- enhanced recordkeeping requirements;
- clarification for emission control systems;
- new monitoring requirements for emission control equipment;
- a prohibition of specification section, consistent with other District rules, that makes it a violation to specify the use of non-compliant materials; and,

- o a new compliance statement requirement for manufacturers of resins and gel coats to reflect monomer content.

IV. Emissions and Emission Reductions

A. Emissions Inventory

Total VOC emissions from the Bay Area polyester resin industry are estimated at 1.3 TPD. This figure is derived from the 2005 Base Year inventory, adjusted downward to account for the recent closings of the Hubbel-Lenoir Company and the Isola Corporation, two large sources of polyester resin emissions in the Bay Area. VOC emissions from the application of polyester resin and gel coat are estimated to be 0.8 TPD, roughly half from resin application and half from gel coat application. The VOC emissions from the use of cleaning products for polyester resin operations are estimated to be 0.5 TPD. TAC emissions from polyester resin and gel coat operations are also estimated to be 0.8 TPD because styrene, the monomer which according to industry is typically emitted from polyester resin operations, is both a TAC and a VOC.

B. Emissions Reductions

The calculations for the estimated emission reductions are based on the emission inventories and reports from permitted Bay Area polyester resin operations. For VOC emissions from gel coats, District staff calculated the estimated emission reductions based on the anticipated switch from a maximum allowable VOC content to a maximum allowable monomer content. VOC emission reductions from gel coats with lower monomer content will be 0.12 TPD. For VOC emissions from polyester resins, District staff calculated the estimated emission reductions based on the anticipated reduction of maximum allowable monomer content. Emission reductions will be 0.2 TPD from resins with lower monomer content. After the new monomer content limits are implemented, the VOC and TAC emissions from resin and gel coat monomers will total approximately 0.32 TPD.

The additional VOC emission reduction from resin application operations that must switch to non-atomization spray application equipment is difficult to quantify. The number of facilities that must make the switch is approximately 15. Because most polyester resin facilities in the Bay Area are small facilities, staff assumed one non-atomizing spray system will need to be implemented per facility with the exception of one large facility. Staff conservatively estimates an additional 0.05 TPD in VOC emission reductions from the requirement to use non-atomizing spray systems. The VOC emission reduction from cleaning product usage will be 0.09 TPD. When fully implemented, the amendments to Regulation, Rule 50 will result in a total VOC emission reduction of 0.46 TPD and a TAC emission reduction of 0.37 TPD.

V. Economic Impacts

A. Compliance Costs

The proposed amendments have costs associated in three areas.

1. Higher Resin and Gel Coat Costs: According to several composite product distributors in the Bay Area, the cost to operators to purchase gel coats and resins that have been reformulated with less monomer content will increase by approximately 5 cents per pound of material. District staff has confirmed that for the past couple of years, a majority of facilities in the region that are “laminators”, or not cast polymer operations, are already using resins that comply with the proposed monomer limits. Thus, they will not incur any additional costs to be in compliance with the proposed resin limits. For the same reasons, gel coat users, with the exception of clear marble resin gel coats, are also not going to incur any additional costs to be in compliance.

Bay Area cast polymer fabricators will be switching from clear marble resin gel coats that currently have a maximum monomer content of 44% to a maximum monomer content of 42%, which has yet to be formulated for the Bay Area’s industry. Industry assures staff that it can be formulated successfully. The cost for cast polymer fabricators to make the switch, which represents approximately 50% of the Bay Area’s polyester resin industry, is a 5 cent increase from a price list of \$2.28 to \$2.33 per pound of material.

Table 2 illustrates the increase in cost for resins and gel coats for operators who have not switched to lower monomer materials.

Table 2 - Prices for Gel Coats and Resins, Current and Future*

	Current List Pricing	Estimated Pricing
Clear Gel Coats		
Marble Resin	\$2.28/lb	\$2.33/lb
Other Resin	\$4.00/lb	\$4.05/lb
Boat Manufacturing	\$4.00/lb	\$4.05/lb
Pigmented Gel Coats		
White and Off-White	\$3.54/lb	\$3.59/lb
Non-White Boat Manufacturing	\$4.00/lb	\$4.05/lb
Other Non-White	\$5.73/lb	\$5.78/lb
Primer	\$3.65/lb	\$3.70/lb
Specialty Gel Coats	\$4.25/lb	\$4.30/lb
Resin Materials		
Marble Resins	\$2.23/lb	\$2.28/lb
Solid Surface Resins	\$2.25/lb	\$2.30/lb
Tub/Shower Resins	\$2.25/lb	\$2.30/lb
Boat Manufacturing (atomized)	\$2.29/lb	\$2.34/lb
Boat Manufacturing (non-atomized)	\$2.29/lb	\$2.34/lb
Lamination Resins	\$2.29/lb	\$2.34/lb
Fire Retardant Resins	\$2.44/lb	\$2.49/lb
Corrosion Resistant and/or High Strength Resins		
Mechanical (non-atomizing)	\$3.47/lb	\$3.52/lb
Filament Winding Application	\$3.47/lb	\$3.52/lb
Manual Application	\$3.47/lb	\$3.52/lb
Other Resins	\$3.40/lb	\$3.45/lb

*Maximum estimated increased cost. Some operations have already switched to materials that meet the proposed limits.

2. Cost for Non-atomizing Spray System: Industry sources indicate that the cost for a new, basic non-atomizing spray system ranges from \$9,000.00 to \$11,000.00 per system. It includes a spray gun, pump, hoses, and a cart. Staff has identified only one facility that might need more than one non-atomizing spray gun. The cost estimates include the costs of the new equipment and the costs for installation, maintenance and operations.

3. Cost for Low-VOC Cleaning Products: The costs for low-VOC cleaning products that will comply with the recommended VOC limit of 25 grams per liter are negligible because the technology isn't new. Some industry representatives have indicated that petroleum-based cleaning products that meet the current VOC limit of 200 grams per liter cost more than non-petroleum-based, low-VOC cleaning products.

B. Cost Effectiveness

District staff analyzed the cost-effectiveness for the proposed resin and gel coat monomer limits. In doing so, staff multiplied the costs from Table 2 by each facility's throughput, considering that an estimated 75% of the cast polymer sold in the Bay Area is already in compliance with the future monomer content limits. The cost of using higher priced resins and gel coats throughout the Bay Area polyester resin industry is expected to be \$102,000 per year. Expected emission reductions are 116 tons per year (TPY). This results in a cost-effectiveness of \$874 per ton of VOC emissions reduced for this requirement.

Staff also analyzed the cost-effectiveness for the proposed adoption for the requirement of non-atomizing spray application systems for the polyester resin industry. Only the shops that apply resins to open molds with spray guns will be subject to this requirement. This represents approximately half of the composite manufacturing industry in the Bay Area. The cost to purchase a non-atomizing system is approximately \$10,000. Assuming each shop will purchase one system, the yearly overall cost (including operations and maintenance) is \$1,393 per facility (amortized over 10 years at 7% interest). Staff has estimated that there are potentially 15 facilities in the Bay Area that might be subject to this requirement, but from an analysis of the permits, one shop may need to purchase two systems. Thus, the total yearly cost (industry-wide) to purchase 16 non-atomizing systems is \$22,288. Non-atomizing systems will achieve a yearly VOC emissions reduction of 13 TPY. The cost effectiveness for industry to comply with this requirement is \$1,714 per ton of VOC reduction. The cost effectiveness for the combined requirements is \$974 per ton VOC reduced.

C. Socioeconomic Impacts

Section 40728.5 of the California Health and Safety Code requires an air district to assess the socioeconomic impacts of the adoption, amendment or repeal of a rule if the rule is one that "will significantly affect air quality or emissions limitations." Bay Area Economics of Emeryville, California has prepared a socioeconomic analysis of the proposed amendments to Regulation 8, Rule 50. In order to assess the maximum potential impact of the October 1, 2011 requirement for polyester resin operations to use non-atomizing spray systems for the application of resin to open molds, it was assumed that a total of fifteen Bay Area facilities would be required to purchase a total of sixteen non-atomizing spray systems. The analysis concludes that the proposed amendments would not have a significant economic impact or cause regional job loss. District staff have reviewed and accepted this analysis. The socioeconomic analysis is attached as Appendix II.

D. Incremental Cost Analysis

Health and Safety Code Section 40920.6 requires an air district to assess the incremental cost-effectiveness analysis for a regulation that identifies more than one control option to meet the same emission reduction objectives. Incremental cost-effectiveness is defined as the difference in costs divided by the difference in emission reductions between one level of control and the next. As discussed above, the cost-effectiveness of the requirement to use lower monomer content resins and gel coats is \$874 per ton of VOC reduced and the cost of the next increment, to use non-atomizing spray equipment, is \$1714 per ton of VOC reduced. These are, individually and in aggregate, very cost-effective controls.

VI. Environmental Impacts

A. California Environmental Quality Act

Pursuant to the California Environmental Quality Act, the District has caused an initial study for the proposed amendments to Regulation 8, Rule 50 to be prepared by Environmental Audit, of Placentia, CA. The assessment concludes that the proposed amendments would not result in adverse environmental impacts. A copy of the study and draft Negative Declaration is provided in the appendix of this staff report. The study and draft Negative Declaration will be circulated for comment prior to the public hearing.

B. Greenhouse Gas Emissions

In June, 2005, the District's Board of Directors adopted a resolution that recognizes the link between global climate change and localized air pollution impacts. Climate change, or global warming, is the process whereby emissions of anthropogenic pollutants, together with other naturally-occurring gases, absorb infrared radiation in the atmosphere, leading to increases in the overall average global temperature.

While carbon dioxide (CO₂) is the largest contributor to global warming, methane, halogenated carbon compounds, nitrous oxide, and other greenhouse gas (GHG) species also contribute to climate change. Gases in the atmosphere can contribute to the greenhouse effect both directly and indirectly. Direct effects occur when the gas itself is a GHG. While there is relative agreement on how to account for these direct effects of GHG emissions, accounting for indirect effects is more problematic. Indirect effects occur when chemical transformations of the original compound produce other GHGs, when a gas influences the atmospheric lifetimes of methane, and/or when a gas affects atmospheric processes that alter the radiative balance of the Earth (e.g., affect cloud formation).

VOCs have some direct global warming effects; however, they may also be considered greenhouse gases due to their indirect effects. VOCs react chemically in the atmosphere to increase concentrations of ozone and may prolong the life of methane. This effect is not well quantified. Consequently, global warming not only exacerbates ozone formation, but ozone formation exacerbates global warming because ozone absorbs

infrared radiation. Consequently, reducing VOCs to make progress towards meeting California air quality standards for ozone will help reduce global warming.

Adoption and implementation of the proposed amendments to Rule 8-50 should not result in any adverse impact on the emissions of greenhouse gases. The proposed methods of control include the reduction of monomer content for various polyester resins and establishing monomer content limits for gel coats and lowering the VOC limits for products which clean equipment used in polyester resin and gel coat operations. The requirement to use non-atomizing spray equipment should reduce the amount of resin used to some extent, resulting in a small net reduction of GHGs from the use of resins to manufacture composite products.

Abatement equipment can be used to control emissions; however, staff is not aware of any operations in the Bay Area that utilize abatement equipment. Consequently, there would be no increase in energy demand to implement these amendments and, therefore, the proposal is neutral with respect to the generation of greenhouse gases.

VII. Regulatory Impacts

A. California Health and Safety Code 40727.2 Impacts

Section 40727.2 of the Health and Safety Code requires an air district, in adopting, amending, or repealing an air district regulation, to identify existing federal and district air pollution control requirements for the equipment or source type affected by the proposed change in district rules. The district must then note any differences between these existing requirements and the requirements imposed by the proposed change.

US EPA has promulgated a Control Techniques Guideline (CTG) and National Emission Standard for Hazardous Air Pollutants (NESHAP) for polyester resin operations that are associated with boat manufacturing (63 CFR Subpart VVV). A CTG is a guideline for states to use to develop State Implementation Plans; non-attainment areas' rules must be at least as stringent as the standards called out in the CTG. A NESHAP is a national standard that affects hazardous air pollutants. It has the force of law regardless of the District's action. Both of these documents specifically target the boat building industry. The NESHAP sets monomer limits for boat building operations at major sources, those that emit 10 tons per year of any hazardous air pollutant or 25 tons per year of all hazardous air pollutants combined. The NESHAP also contains recordkeeping requirements, reporting requirements, alternative compliance options and other requirements for operations like solvent cleaning and abatement device operations. Although there are some boat repair facilities in the Bay Area, there are no manufacturers that qualify as major sources, so there are no conflicts between the federal standards and the District's. The CTG, which is advisory, does contain some standards that appear to be more stringent than those in the proposed amendments to Rule 50. Specifically, for tooling resins used in boat manufacturing, the CTG recommends a monomer content limit of 39%. The District's proposed limit of 46% monomer limit is higher, but the CTG does not apply to any Bay Area sources. The CTG is for boat building, and specifically states that it is only applicable to boat manufacturers who emit at least 15 lbs of VOC emissions per day (about 2.7 tons/year) and does not apply to boat

parts, boat trailers or other polyester resin products, unless part of boat manufacturing. The CTG also exempts tooling resins and gel coats that are less than 1% of the total resin and gel coat used in a facility. Molds used to produce boats are open molds; the application is by hand or by spray technology. The molds are not subject to the heat, pressure and stress that closed molds and molds used for other products are sometimes subject to. Consequently, not only is the CTG not applicable to any Bay Area sources, the monomer limits in the CTG are not feasible to apply to non-boat building operations.

The EPA has also promulgated a NESHAP for polyester resin operations other than boat building operations (63 CFR Subpart WWWW). This NESHAP also only applies to major sources, of which there are none in the Bay Area. Subpart WWWW requires that some operations reduce TAC emissions by certain percentages, allows a monomer content as an alternative and provides emission averaging provisions. It also provides emission limits in terms of pounds TAC emissions per ton of resin for some types of operation such as open molding and specifies measurement methods and default emission factors to determine compliance with those limits. It also specifies work practice standards, such as keeping containers of resin and monomer covered, consistent with provisions in District rules.

Although the NESHAP does not apply to any District facilities, using the default emission factors indicates that the monomer content limits in the proposed amendments are at least as stringent as the limits in the federal rules.

Adoption of amendments to Regulation 8, Rule 50, would not conflict with any existing federal or District requirement. The District does not have any other rules that are applicable to polyester resin operations except those of general applicability such as Regulation 2, Rule 1: Permits.

VIII. Rule Development Process

District staff, including internal stakeholders from the Planning, Legal, Technical, Engineering, and the Compliance and Enforcement Divisions developed proposed amendments and documented rationale for them in the Regulation 8, Rule 50 workshop report. The proposals were based on several site visits to composite manufacturing facilities in the Bay Area; staff reports and regulations in the South Coast and Mojave Desert air districts; email and phone conversations with staff from both air districts; email exchange and telephone discussions with manufacturers and distributors of composite manufacturing products; phone conversations with manufacturers of cleaning products; email, phone conversations, and meeting with representatives of the ACMA were conducted to discuss technical issues, monomer limits, VOC limits, health effects, and future trends in the composite manufacturing industry.

Sources of technical and economic information include the American Composites Manufacturing Association (ACMA), Ashland Chemical, Interplastic Inc., Reichold Corp., North American Composites, Kreysler and Associates, R. A. Jenson Manufacturing, B&P Inc., Maier Racing Enterprises, Peterson Products, ITW Industrial Finishing/Binks/DeVilbiss, and the Western Fiberglass Company.

A workshop notice was posted on the District's web site on August 3, 2009, and the notice was mailed to 60 Bay Area businesses that conduct polyester resin operations. A public workshop was conducted at the District offices on August 19, 2009 and the second was held in Oakland in the evening on August 20, 2009 to solicit comments on the draft amendments. Twelve parties attended the workshops. A document which included written comments from the ACMA, two composite material distributors, and one manufacturing facility were submitted to staff following the July 2009 workshops. A meeting was held on September 1, 2009 with the parties who contributed to the written comments.

Comments were made with regard to the proposed 40% monomer content limit for clear marble resin gel coats, the financial impact of the requirement for non-atomizing spray technology on the laminating end of the composite industry; and on the use of an acetone cold cleaner. Staff met with three industry representatives two weeks later to discuss their comments.

Gel coats with lower monomer contents react differently in manufacturing locations with cooler temperatures. Because much of the year ambient temperatures are cool in the Bay Area, tiny air bubbles can be entrapped in gel coats during polymerization, an effect known as porosity. Porosity occurs when a cold gel coat is applied to a mold or when a warm gel coat is applied to a cold mold. Porosity damages the appearance of the composite product resulting in a hazy or opaque appearance. According to the Bay Area composite industry, when ambient shop temperatures are cool, the only way to prevent porosity on gel coat surfaces is to warm both the gel coat and the molds to which they are applied. Molds can be kept warm by warming the rooms where the composite fabrication takes place. However, staff does not believe the extra cost for the minor emission reduction is warranted. For this reason, staff recommends adopting a 42% monomer content limit for clear gel coat marble resins instead of the 40% monomer content limits that exist in southern California air districts.

Staff discussed the fundamental impact of using non-atomizing spray technologies with operators. There are approximately 15 facilities that may need to purchase equipment – cast polymer product manufacturers are not affected, nor are operations that apply gel coats. In discussions after the workshop, operators agreed that an additional year to implement the technology would allay their concerns about the capital expenditure during the recent economic situation. Staff recommends that this requirement become effective on October 1, 2011.

Staff also discussed the use of acetone in cold cleaners for polyester resin operators. The proposed amendments allow the use of acetone, provided evaporation is minimized as specified in Section 8-50-305.5.

A written comment from EPA Region 9 office asked whether or not the proposed monomer content limits for gel coats (expressed as % monomer) were an emission reduction from the current VOC standard of 250 grams per liter. Staff was able to show, through emission factors developed jointly by the ACMA and EPA, that the emissions from the proposed limits are substantially lower, and verified this with samples collected in Bay Area facilities and analyzed by the District's laboratory staff.

In addition, staff received comments related to definitions and language throughout the rule. Staff reviewed and considered all comments and revised the proposal as appropriate.

IX. Conclusions

Pursuant to Section 40727 of the California Health and Safety Code, the proposed rule amendments must meet findings of necessity, authority, clarity, consistency, non-duplication, and reference. The proposed Rule amendments are:

- Necessary to protect public health by reducing ozone precursors to meet the commitment of Control Measure SS 4 of the Bay Area 2005 Ozone Strategy;
- Authorized by California Health and Safety Code Sections 40000, 40001, 40702, and 40725 through 40728;
- Clear, in that the amended rule specifically delineates the affected industry, compliance options, and administrative requirements for industry subject to this rule, so that its meaning can be easily understood by the persons directly affected by it;
- Consistent with other California air district rules, and not in conflict with state or federal law;
- Non-duplicative of other statutes, rules, or regulations; and,
- Implementing, interpreting and making specific and the provisions of the California Health and Safety sections 40000 and 40702.

The proposed Rule amendments have met all legal noticing requirements, have been discussed with the regulated community and other interested parties, and reflect the input and comments of many affected and interested parties. District staff recommends adoption of proposed amendments to Regulation 8, Rule 50: Polyester Resin Operations; and adoption of the CEQA Negative Declaration.

X. References

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