Bay Area Air Quality Management District

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Proposed Amendments to BAAQMD Regulation 8, Rule 51: Adhesive And Sealant Products

Staff Report

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STAFF REPORT

REGULATION 8, RULE 51
ADHESIVE AND SEALANT PRODUCTS

EXECUTIVE SUMMARY

Regulation 8, Rule 51 was adopted in 1992 to implement a 1991 Clean Air Plan control measure and was intended to reduce volatile organic compound (VOC) emissions from adhesive and sealant use. The rule establishes VOC content limits for adhesives and sealants used by industrial and commercial facilities and by consumers. The major air districts in California have similar rules. In February 2002, the District rule was approved into the California State Implementation Plan (SIP) for the national ozone standard.

The proposed amendments would exempt methyl acetate from the rule's VOC definition. In 1998, EPA exempted methyl acetate from its VOC definition because methyl acetate is negligibly reactive in ozone formation. In a comment on the May, 2001 amendments to the Regulation 8, Rule 51, the National Paint and Coatings Association (NPCA) requested that the District exempt methyl acetate from the VOC definition. Later, in July 2001, TACC, a contact adhesive manufacturer, was granted a product variance by the BAAQMD Hearing Board for a product containing methyl acetate. The product would comply with the VOC limit in Regulation 8, Rule 51 only if the methyl acetate in the product was treated as a non-VOC. Because most other air districts with adhesive rules now exempt methyl acetate, the product is a complying product in, for example, the Sacramento and San Joaquin air districts.

At the time of the Regulation 8, Rule 51 amendments in 2001, the District had not reviewed methyl acetate for compliance with the Board's Stratospheric Ozone Policy, which requires the staff to evaluate whether exempting a compound is likely to increase emissions of stratospheric ozone depletors and toxics. As a result, staff recommended that it review information on methyl acetate and propose amendments to Regulation 8, Rule 51 if warranted.

District staff have reviewed information on methyl acetate prepared by EPA and ARB and have concluded that exempting methyl acetate would be in accord with Board policy and would probably reduce risks from the use of solvent-based contact adhesives because methyl acetate is less hazardous than most of the solvents it would replace. An exemption for methyl acetate in this rule is consistent with the Board's 2001 adoption of amended Regulation 8, Rule 3: Architectural Coatings, which also exempted methyl acetate.

BACKGROUND

Rule Background

Regulation 8, Rule 51 was originally adopted by the Board on November 18, 1992 and implemented control measure A11 of the Bay Area 1991 Clean Air Plan. Most of the rule's volatile organic compound (VOC) limits took effect in 1995. The rule is intended to reduce VOC emissions from the use of adhesives, either by encouraging a shift from solvent-based adhesives to other types of adhesives or through the reformulation of solvent-based adhesives. The Bay Area Base Year 1999 emission inventory prepared by the District in 2000 estimates that VOC emissions from adhesive use subject to the rule for 2000 were 8.9 tons per day. Most of the emission reductions from the rule have already occurred, as most of the VOC limits in the rule took effect in 1995.

Rule Structure

The rule applies to adhesives, sealants, and primers used by industrial facilities. It also applies to consumer use where the product is not subject to the California Air Resources Board consumer products regulation. The rule exempts extremely low-VOC products and products sold in small containers.

The rule contains two sets of standards. The first set, found in Section 301 of the rule, establishes VOC standards for various specific adhesive applications, such as flooring installation, roof installation, and tire retreading. The standard for a particular application is generally set at the VOC content of the lowest-VOC adhesive providing good performance for that application. However, because it was impossible to anticipate all adhesive applications, a second set of standards, found in Section 302, sets limits based on the type of materials being bonded. In addition, a small user exemption (Section 120) applies to this second set of standards, thus allowing use of special adhesives in special situations.

The VOC limits in the rule are stated in terms of the weight of VOCs, measured in grams, that are permitted in one liter of the adhesive or sealant product. The limits are written as "grams per liter" in the rule and are sometimes abbreviated as "g/l."

Rule VOC Definition

Regulation 8, Rule 51 includes a definition of "volatile organic compound" that is applicable only to the rule. The definition is as follows:

8-51-226 **Volatile Organic Compound (VOC) Content:** All organic compounds (excluding methane, carbon monoxide, carbon dioxide, carbonic acid,

metallic carbides of carbonates, and ammonium carbonate) which would be emitted during use, application, curing, or drying of an adhesive or sealant product.

226.1 For the purposes of calculating the VOC content of an adhesive, sealant, or primer, water and the following compounds:

acetone
parachlorobenzotrifluoride (PCBTF)
cyclic, branched or linear, fully methylated siloxanes (VMS)
difluoroethane (HFC-152a)

shall not be considered part of the product.

226.2 For the purposes of calculating the VOC content of low solids adhesives, sealants and primers, as defined in Section 8-51-234, any water shall be considered to be part of the product. The following compounds:

acetone
parachlorobenzotrifluoride (PCBTF)
cyclic, branched or linear, fully methylated siloxanes (VMS)

shall not be considered part of the VOC content of the product.

(Amended 6/2/93; 1/19/94; 11/16/94; 12/20/95, 1/7/98, 5/2/01)

The effect of the definition is to exclude from treatment as VOCs only four compounds or classes of compounds that would otherwise qualify as VOCs: acetone, PCBTF, VMS, and HFC-152a. These four have all been exempted by EPA from its definition of VOC (found in 40 C.F.R. §51.100).

The EPA VOC definition also exempts other compounds or classes of compounds. Though these other compounds are exempted because they have no significant ozone-forming potential, many of them are associated with other significant environmental or health problems. For example, EPA's exemptions include methylene chloride (a suspected human carcinogen) and many chlorofluorocarbons (stratospheric ozone depletors). The EPA list has never been a good guide to what the District should exempt from its VOC definitions because including all of the EPA exemptions could lead to product reformulations with unintended adverse impacts.

This concern over the potential for adverse impacts from reformulation led the BAAQMD Board to adopt a Stratospheric Ozone Policy (1991, Board Resolutions 2040 and 2053) that, among other things, directed District staff to carefully weigh the impact of VOC definition exemptions in District rules. The result of this policy has been that District rules exempt only a small subset of the compounds exempted by EPA. Additional exemptions are always weighed against the Board policy.

NPCA Comments on 2001 Amendments

In a comment on the May, 2001 amendments to the Regulation 8, Rule 51, the National Paint and Coatings Association (NPCA) requested that the District exempt methyl acetate from the VOC definition. Because District staff had not reviewed data on methyl acetate to determine whether its exemption might have

adverse impacts, staff did not propose the exemption at the time the rule amendments were adopted. However, staff did commit to perform a review to determine whether the exemption of methyl acetate would be appropriate.

TACC Product Variance

In July 2001, TACC, a contact adhesive manufacturer, was granted a product variance by the BAAQMD Hearing Board for a contact adhesive containing methyl acetate (Docket No. 3353). The product would comply with the VOC limit in Regulation 8, Rule 51 only if the methyl acetate in the product was treated as a non-VOC. At the hearing, the District indicated that it intended to conduct a review of methyl acetate to determine whether to exempt it in Regulation 8, Rule 51.

Methyl Acetate

Methyl acetate is a low boiling point ester solvent that rapidly evaporates. It is useful as a substitute solvent in coatings and adhesives because it is soluble in water, alcohol, acetone, and a variety of other solvents. It is not an ozone depleting chemical and has not been found to be toxic by the US EPA or state of California. It is flammable and has a fruity odor characteristic of esters. The odor threshold (that concentration at which the chemical can be detected) is 4.6 parts per million, just slightly lower than methyl ethyl ketone, a commonly used coating solvent. It is not considered to be a significant contributor to global warming.

In 1998, EPA exempted methyl acetate from its VOC definition because methyl acetate is negligibly reactive in ozone formation (63 Fed. Reg. 17331, April 9, 1998). In 1998, guided by the EPA decision and a review of methyl acetate by the California Office of Environmental and Health Hazard Assessment (OEHHA), ARB also exempted methyl acetate from the VOC definition found in its consumer products rule. Most air districts with adhesive rules have exempted methyl acetate from their VOC definitions.

Staff have examined the “de-listing” or de-regulation of methyl acetate and found that, even if usage increases as a substitute for non-exempt VOCs that are ozone forming, it should not present any potential adverse air quality impacts. Typically, the odor of esters is not found to be unpleasant to most people compared to a variety of other solvents. Many coatings have other esters in the solvent mixture so it is not expected that the addition or substitution of methyl acetate will result in the creation objectionable odors. In addition, many of the solvents that methyl acetate would replace are toxic air contaminants.

Contact Adhesives

The proposed amendments will primarily affect contact adhesives. Contact adhesives are based on an elastomeric polymer, which may be natural rubber or a synthetic rubber, carried in a solvent solution or in water as a latex. Contact adhesives are applied to both surfaces to be joined. After the carrier evaporates, the two surfaces are brought together and the adhesive bonds to itself.

The polymer most commonly used in contact adhesives is polychloroprene (often called Neoprene, a common trade name). Solvent-based contact adhesives generally consist of polychloroprene dissolved in a solvent mixture. The most commonly used solvents are hexane, toluene, methyl ethyl ketone (MEK), acetone, and naptha, a mixture of aliphatic hydrocarbons. In most other air districts, including the Sacramento and San Joaquin districts, methylene chloride, a toxic air contaminant and suspected carcinogen, is treated as an exempt compound and is commonly found as a solvent in contact adhesives. For those districts, the use of methylene-chloride-based contact adhesives has been a primary means of compliance. In the Bay Area, methylene chloride is not exempted, and these adhesives may not be used to comply with Regulation 8, Rule 51.

Contact adhesives are used in the bonding of plastic laminates to wood composites in making countertops and furniture, the bonding of foam to wood in making upholstered furniture and packaging, and the bonding of skins to honeycomb panels. Of these three major uses, only the first involves a significant number of sources. There are thousands of Bay Area users in this category, from homeowners and building contractors fabricating countertops in homes, to local kitchen and bath cabinet shops, to fixture and countertop manufacturers serving regional and national markets.

The VOC limits in Regulation 8, Rule 51 for contact adhesives are 400 grams per liter for "special substrates" and 250 grams per liter for all other bonding. The rule defines special substrate bonding as the bonding of two nonporous materials or the bonding of any material to metal, rubber, flexible vinyl, rigid plastic, thin wood veneer, or melamine-covered board. This special substrate bonding generally requires the use of solvent-based contact adhesives rather than water-based adhesives. Solvent-based adhesives are also required in certain applications and shops where the slower drying time of water-based adhesives makes their use infeasible.

In making solvent-based products, contact adhesive formulators have taken two approaches to meeting the Regulation 8, Rule 51 VOC limits. One approach has been to produce "high-solids" adhesives by reducing the quantity of solvent in the products. These products can have over 50% by weight solids content, rather than the typical 20% of older solvent-based products. However, when solvent content is reduced, viscosity increases, potentially to a point where the adhesive

can no longer be sprayed. To overcome this problem, manufacturers have developed specialized processing that cuts long polymer chains and reduces viscosity. However, these high solids products are still quite viscous and have not been readily accepted in the market.

The second approach to meeting the VOC limits has been the replacement of some of the hexane, toluene, and MEK in an adhesive with acetone. Since acetone is not counted as a VOC, this lowers the VOC content of the adhesive. However, there are limits to how much acetone can be substituted because acetone is not as good a solvent for polychloroprene as the solvents traditionally used and it evaporates too quickly, creating drying time problems. Several manufacturers have developed products that rely on solvent substitution, including the use of methyl acetate, to reduce VOC content. As discussed above, one manufacturer has obtained a product variance that allows it to sell its methyl-acetate-based product in the Bay Area.

Effect of Amendments

The amendments would have the effect of legalizing the contact adhesive product currently being sold under a variance so that there would be no further need for the variance. In addition, manufacturers of high-solids contact adhesives would be likely to halt polymer processing and reformulate their products using solvent substitution. For this product class, the likely result is that methyl acetate will replace toluene, cyclohexane, or naptha in the solvent mix. All of these solvents are considered to be more hazardous than methyl acetate.

Though no other adhesive products regulated by Rule 51 currently appear likely to be reformulated using methyl acetate, it is possible that makers of other types of products will substitute methyl acetate for other solvents. Because the organic solvents most commonly used in adhesives of all kinds are aliphatic hydrocarbons like hexane, a toxic air contaminant, and aromatic hydrocarbons like toluene and xylene, both toxic air contaminants, use of methyl acetate in other products is also likely to lead to a reduction in hazards.

PROPOSED AMENDMENTS TO RULE

Section 8-51-226, Volatile Organic Compound (VOC) Content

This definition would be amended to add methyl acetate to the list of chemicals that are exempted from treatment as VOCs in calculating the VOC content of an adhesive or sealant product:

8-51-226 Volatile Organic Compound (VOC) Content: All organic compounds (excluding methane, carbon monoxide, carbon dioxide, carbonic acid, metallic carbides ~~of~~for carbonates, and ammonium carbonate) which would

be emitted during use, application, curing, or drying of an adhesive or sealant product.

226.1 For the purposes of calculating the VOC content of an adhesive, sealant, or primer, water and the following compounds:

- acetone
- parachlorobenzotrifluoride (PCBTF)
- cyclic, branched, or linear~~,~~ ~~fully~~ completely methylated siloxanes (VMS)
- difluoroethane (HFC-152a)
- methyl acetate

shall not be considered part of the product.

226.2 For the purposes of calculating the VOC content of low solids adhesives, sealants and primers, as defined in Section 8-51-234, any water shall be considered to be part of the product. The following compounds:

- acetone
- parachlorobenzotrifluoride (PCBTF)
- cyclic, branched, or linear~~,~~ ~~fully~~ completely methylated siloxanes (VMS)
- methyl acetate

shall not be considered part of the VOC content of the product.

The reference to VMS is slightly amended to replace "fully" with "completely" to parallel the language used by EPA and ARB and in the reference to VMS in Section 601. In addition, a typographical error is corrected ("or" replaces "of").

Section 8-51-601, Analysis of Samples

This section is proposed to be modified to insert appropriate references to test methods for methyl acetate and volatile methylated siloxanes (VMS):

8-51-601 **Analysis of Samples:** The VOC content of adhesive and sealant products shall be analyzed for compliance with the limits specified in Sections 8-51-115, 125, 126, 301, 302, and 304 using Manual of Procedures, Volume III, Method 21 or 22. The VOC content of low solids adhesive, sealant products or primers as defined in Section 8-51-234 shall be analyzed using Manual of Procedures, Volume III, Method 31. Samples containing parachlorobenzotrifluoride shall be analyzed using Manual of Procedures, Volume III, Method 41. Samples containing cyclic, branched, or linear completely methylated siloxanes shall be analyzed using Manual of Procedures, Volume III, Laboratory Method 43: "Determination of Volatile Methylsiloxanes in Solvent-Based Coatings, Inks, and Related Materials." Samples containing methyl acetate shall be analyzed using ASTM Method D-6133-00: "Standard Test Method for Acetone, PCBTF, Methyl Acetate or t-Butyl Acetate Content of Solvent-Reducible and Water Reducible Paints, Coatings, Resins, and Raw Materials by Direct Injection Into a Gas Chromatograph."

EMISSIONS AND EMISSION REDUCTIONS

Emission Reductions Achieved by the Rule

The BAAQMD base year 1996 emissions inventory showed 1996 uncontrolled adhesive VOC emissions to be 17.45 tons per day and controlled emissions to be 11.15 tons per day. The emission reduction attributable to the rule was therefore 6.3 tons per day in 1996. The base year 1999 emissions inventory shows 2000 controlled emissions to be 8.9 tons per day. The proposed amendments would have no effect on these emission reductions.

Emission Impacts of the Proposed Amendments

The proposed amendments are expected to slightly reduce VOC and toxic emissions in the District. These reductions would come from the substitution of methyl acetate, which would become a non-VOC, for hexane and toluene, which are VOCs and toxic air contaminants.

ECONOMIC IMPACTS

Socioeconomic Impacts

The socioeconomic impacts of these amendments are expected to be beneficial. In general, the proposed amendments are likely to allow contact adhesive manufacturers to replace expensive processing of contact adhesives with less expensive solvent substitutions. They are also likely to make a broader range of products available to users of contact adhesives, thereby increasing competition and reducing adhesive costs. As a result, these limits cannot be said to "significantly affect air quality or emission limitations," and the District has therefore not prepared the socioeconomic analysis that would otherwise be required under Section 40728.5 of the Health and Safety Code.

Incremental Costs

Under Health and Safety Code Section 40920.6, the District is required to perform an incremental cost analysis for a proposed rule under certain circumstances. To perform this analysis, the District must (1) identify one or more control options achieving the emission reduction objectives for the proposed rule, (2) determine the cost effectiveness for each option, and (3) calculate the incremental cost effectiveness for each option. To determine incremental costs, the District must "calculate the difference in the dollar costs divided by the difference in the emission reduction potentials between each progressively more stringent potential control option as compared to the next less expensive control

option." Because these amendments are not expected to increase costs and because the District can identify no other control options that meet the emission reduction and policy aims of this proposal, no incremental cost analysis has been prepared.

ENVIRONMENTAL IMPACTS

Pursuant to the California Environmental Quality Act, the District prepared an initial study for the proposed amendments to Regulation 8, Rule 51. The initial study concludes that the proposed amendments would not result in any significant environmental impacts. In general, the amendments would reduce risks because methyl acetate is less hazardous than the solvents it would replace. The District is proposing to adopt a negative declaration for the amendments.

REGULATORY 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. Where the district proposal does not impose a new standard, make an existing standard more stringent, or impose new or more stringent administrative requirements, the district may simply note this fact and avoid the analysis otherwise required by the bill.

These proposed amendments to Regulation 8, Rule 51 do not impose more stringent requirements and are therefore exempt from analysis under the Health and Safety Code requirement. In any case, however, there are no comparable federal or district standards for the VOC content of adhesives. To comply with Health and Safety Code Section 40727.2, the District therefore simply notes that no other federal or District standards apply.

RULE DEVELOPMENT HISTORY

On May 24, 2002, a request for comments on the proposed amendments was mailed to interested parties on the Regulation 8, Rule 51 mailing list, subscribers to District rulemaking notices, and community and environmental groups. The rule mailing list includes cabinetmakers, packaging companies, adhesive manufacturers and distributors, and trade associations. The request for comments was also posted on the District website. Two comments supporting the proposal were received from adhesive manufacturers. No other comments were received.

COMMENTS AND RESPONSES

1. **Wilsonart supports the exemption of methyl acetate and concurs with the observation that hazardous air pollutant (HAP) levels in adhesive formulations will decrease when methyl acetate is used as a substitute. We welcome the additional [formulation] options that methyl acetate will offer. <Berry, Wilsonart International. Letter*. 5/29/02*>**

   Comments noted.

2. **TACC supports the exemption of methyl acetate and agrees that HAP levels in adhesives will decrease. TACC has developed a contact adhesive using methyl acetate that is in the process to be patented. That product is currently being sold in the District under a product variance. <Walnut, TACC. Letter 6/5/02>**

   Comments noted.

CONCLUSION

The proposed amendments to Regulation 8, Rule 51 are intended to exempt methyl acetate from the VOC definition found in the rule in order to offer greater formulation options to adhesive manufacturers and to reduce the use of hazardous air pollutants in products.

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

- Necessary to limit emissions of volatile organic compounds and hazardous air pollutants and to implement EPA and ARB decisions to exempt methyl acetate;
- Authorized by Sections 40000, 40001, 40702, and 40725 through 40728 of the California Health and Safety Code;
- Written or displayed so that meaning of the amendments can be easily understood by the persons directly affected by them;
- Consistent with other District rules, and not in conflict with state or federal law;
- Non-duplicative of other statutes, rules, or regulations; and

- Are implementing, interpreting, or making specific the provisions of California Health and Safety Code Sections 40000 and 40702.