Air Resources Board

Alan C. Lloyd, Ph.D.
Chairman
1001 I Street • P.O. Box 2815
Sacramento, California 95812 • www.arb.ca.gov

Terry Tamminen
Agency Secretary

Arnold Schwarzenegger
Governor

TO: Alan C. Lloyd, Ph.D., Chairman
Honorable Board Members

FROM: Catherine Witherspoon
Executive Officer

DATE: January 15, 2004

SUBJECT: UPDATE ON THE SUGGESTED CONTROL MEASURE (SCM) FOR ARCHITECTURAL COATINGS

As part of its approval of the architectural coatings SCM on June 22, 2000, the Board directed staff to provide three updates. Our June 2001 report covered the availability of exempt solvents; the feasibility of modifying the calculation of reportable volatile organic compound (VOC) content; the feasibility of a small volume exemption; and an interim status report on the feasibility of a reactivity-based control strategy for architectural coatings. The December 2002 update covered district adoption of the SCM; the averaging compliance option; progress on the 2001 architectural coatings survey; technology assessments for categories with limits effective January 1, 2003; and the feasibility of a reactivity-based control strategy for architectural coatings. In this update, staff is documenting progress on the following topics:

- district adoptions;
- averaging compliance option;
- 2001 architectural coatings survey;
- technology assessment for the industrial maintenance category limit effective January 1, 2004; and
- assessment of the feasibility of reactivity-based limits.

District Adoptions

To date, 18 districts have adopted or amended their architectural coatings rules to reflect the SCM. Thirteen districts amended existing rules: Sacramento, San Joaquin Valley, Ventura, Santa Barbara, Bay Area, San Diego, Placer, Monterey, Butte, Colusa, Feather River, Antelope Valley, and Mojave Desert. Five districts adopted an architectural coatings rule for the first time: Yolo-Solano, San Luis Obispo, Northern Sonoma, Shasta and Tehama. In addition, the Glenn, Imperial, and El Dorado Districts are working on adopting or amending an architectural coatings rule based on the SCM.

On December 5, 2003, the South Coast Air Quality Management District (SCAQMD) adopted additional amendments to its architectural coatings rule that go beyond the state SCM. These amendments lowered the VOC limits on several coating categories, including varnishes, roof coatings, stains, and waterproofing sealers. This action suggests the current statewide SCM could be improved and made more stringent. Accordingly, staff has begun work on a revised SCM, beginning with an updated product survey to provide the necessary data.

Several states in the Ozone Transport Region, made up of the 12 eastern seaboard states from Virginia to Maine and the District of Columbia, are also in the process of adopting rules based on the California SCM. Delaware, the first state to adopt a rule, was legally challenged by the National Paint and Coatings Association. Delaware's rule was upheld in an Environmental Appeals Board hearing, but is now being challenged in the Delaware Superior Court. New York, Pennsylvania, and the District of Columbia are in the process of adopting rules, with final rulemakings expected in late 2003. New Jersey and Maryland are also proceeding with rulemaking.

Averaging Compliance Option

Averaging is a voluntary provision that sunsets on January 1, 2005, in local district architectural coatings rules based on the SCM. This provision allows manufacturers to average, on a volume-weighted basis, emissions of higher-VOC products with those of lower-VOC products, as long as the allowable emissions are not exceeded. Averaging gives manufacturers more flexibility to comply with VOC limits. The SCAQMD rule has a similar averaging provision; however, it does not sunset. Non-SCAQMD districts are participating in a statewide averaging program, managed by ARB staff, which allows manufacturers to submit one averaging plan for all non-SCAQMD districts. For the calendar year 2003, five manufacturers are taking part in the averaging program. We expect all of these companies to renew their programs for 2004.

On September 20, 2002, the U.S. Environmental Protection Agency (U.S. EPA) published a proposed limited approval and limited disapproval for the San Joaquin Valley, Ventura, and Santa Barbara Districts' architectural coatings rules, based primarily on averaging issues. ARB staff disagrees with these stated deficiencies and, along with several districts and industry, provided comments to the U.S. EPA. There has been no further official action by U.S. EPA on these rules; however, the U.S. EPA has recently indicated that it still has many of the same concerns and is in the process of finalizing action on these rules.

On a related front, the U.S. EPA and ARB staff are participating with SCAQMD staff as the District performs an audit on its 2001 averaging program.

2001 Architectural Coatings Survey

The staff periodically surveys manufacturers of architectural coatings. The 2001 survey includes data from over 180 companies that sell products in California and is the most rigorous completed to date. Manufacturers submitted, under confidentiality agreements, a detailed listing of the volatile ingredients used in their products. The speciated VOC data will provide a baseline for evaluating the potential for a reactivity-based control strategy. A draft report was posted on ARB's website in April 2003. A final report on the survey was published in October 2003 and is also available on our website.

The 2001 survey reports that over 98 million gallons of architectural coatings were sold in California in 2000. This represents about a 13 percent increase in reported volume and a 10 percent increase in emissions since 1996. Of the 2000 sales, 83 percent were water-borne and 17 percent were solvent-borne. The total estimated emissions from these coatings are about 128 tons of VOC per day, including about 18 tons per day of emissions from thinning and clean-up solvents. Nearly 70 percent of the architectural coatings sold in California in 2000 complied with the 2003/2004 VOC limits in the SCM. In addition, the volume of compliant coatings sold in most of the major coating categories remained the same or increased between 1996 and 2000.

Technology Assessments

Technology assessments were conducted in 2002 for category limits effective on January 1, 2003, and were included in the December 2002 update to the board. This update includes a technology assessment for the industrial maintenance category limit, which becomes effective on January 1, 2004. The 2001 survey data (2000 sales) formed the primary basis for this 2003 technology assessment. In addition, data from studies by the Southern California Alliance of Publicly Owned Treatment Works (SCAP), SCAQMD-sponsored performance tests by National Technical Systems (NTS), and SCAQMD's annual technology assessments were considered. Staff also considered whether the limit was deleterious to small business. Staff found that the limit is technically feasible with no inequitable impacts on small business.

Industrial Maintenance Coatings

The 2004 VOC limit for industrial maintenance coatings in the SCM is 250 grams per liter (g/L). The following table summarizes the 2001 survey data that form the basis of the technology assessment.

	# Products	Sales (Gallons)	Sales Weighted Average VOC (g/L)	Emissions (Tons per Day)	# Complying Products	Complying Marketshare
Solvent-borne	3,092	3,920,156	308	13.8	683	21%
Water-borne	659	606,951	179	.6	506	90%
Overall	3,751	4,527,107	293	14.5	1,189	30%

Note: For the purposes of this analysis, sales of small containers (e.g., one quart or less) have been excluded, since they are exempt from the SCM VOC limits. The data presented in this table are based on sales of containers that are larger than one quart.

Industrial maintenance coatings is a generic term for a variety of high performance coatings used in areas with harsh environmental conditions. Typical users include onshore and offshore oil and gas production, refineries, petrochemical production and processing, marine, pulp and paper mills, bridges, manufacturing facilities, water supply facilities, and waste water treatment facilities. Many of the coatings in this category are multi-component, and are professional coatings intended for use in an industrial setting. Overall, the 2001 survey showed that the complying marketshare for the 250 g/L limit increased between 1996 and 2000. In addition, the number of complying products increased from 958 to 1,189 between 1996 and 2000. Nearly 50 manufacturers make compliant industrial maintenance coatings, including Dunn-Edwards, Sherwin Williams, Triangle Coatings, Coatings Resource Corporation, and Tremco Incorporated. Two of these companies are small businesses.

The rust preventative category contains coatings that are similar to industrial maintenance coatings, but are applied in a non-industrial setting. Non-industrial use generally includes residential, light commercial, and institutional use. The rust preventative coating category allows residential users and painting contractors to use single-component rust preventative coatings that are user-friendly. This category has a VOC limit of 400 g/L. Rust preventative coatings that comply with the industrial maintenance VOC limit of 250 g/l may be used at industrial facilities. For the rust preventative category, 64 percent of the market complies with the 400 g/L VOC limit, based on the 2001 survey.

In recent years, two separate studies have examined the performance of industrial maintenance coatings. These studies compared systems that comply with a 250 g/L VOC limit with existing systems with VOC contents over 250 g/L.

SCAP conducted a two-year study of the performance of industrial maintenance coatings which ended in February 2003. The study concluded that complying industrial maintenance systems with a VOC content from 100 to 250 g/L performed similarly to existing coating systems with VOC contents from 250 to 340 g/L when exposed to the atmosphere. When exposed to wastewater, all complying industrial maintenance systems below 250 g/L performed similarly to existing systems with VOC contents from 250 to 340 g/L. No clear trends were found based on the VOC content of the coating system. Performance varied by coating chemistry, manufacturer and product.

From 1998 to 2002, SCAQMD funded a study by NTS that compared the performance of industrial maintenance coatings in laboratory tests, accelerated weathering and outdoor exposure. The first portion of this study consisted of laboratory tests on test panels to which the industrial maintenance systems had been applied. The results show that overall, complying systems performed equivalently to non-complying systems. These results are summarized in ARB's 2000 Staff Report for the Proposed Suggested Control Measure for Architectural Coatings.

The second portion of this study consisted of accelerated weathering exposure and subsequent performance tests in a laboratory. Non-complying systems may have performed better than complying systems in yellowing tests, and marginally better in color retention tests, gloss tests and visual comments. However, the exclusion of three industrial maintenance coatings systems that may not have been applied properly or may not have been suitable for outdoor exposure changes the overall performance of the complying systems. If those three coatings systems are excluded, the performance of complying and non-complying systems is very similar in all tests.

The third part of this study involved real time outdoor exposure of test panels at two locations in Southern California. A committee comprised of industry members and staff from ARB and SCAQMD evaluated these test panels. The contractor also tested these panels. After 24 months of exposure, non-complying systems generally performed slightly better than complying systems.

Excluding the three systems mentioned above that may have been applied improperly or were unsuitable for outdoor exposure, complying systems overall performed equivalently to non-complying systems.

A detailed analysis by ARB staff of the NTS accelerated weathering and real-time outdoor exposure tests is available upon request.

ARB staff has spoken with manufacturers and end users of industrial maintenance coatings regarding their experiences with coatings that meet the upcoming 250 g/L limit. Most manufacturers felt that light duty industrial maintenance coatings will perform fine under the new limits. The heavier duty industrial maintenance coatings will place more demands on the users, such as requiring them to use a multi-component system instead of a single-component system. They may also cost more in some cases. Manufacturers also have the option of using exempt compounds in their coatings. While more expensive and not suitable in every case, they can be used in complying coatings that perform well. As the water-borne technology matures, manufacturers predict that performance will continue to improve.

The end users that ARB staff spoke with are preparing to comply with the upcoming 250 g/L limit. Complying immersion coatings are performing well, but they believe there is a lack of good heavy duty water-borne industrial maintenance topcoats. Coatings with exempt compounds such as Oxsol 100 have shown good performance, but these technologies are new and are more expensive. Using coatings with exempt compounds and coatings in the metallic pigmented coatings category for some of their uses, end users generally felt ready for the upcoming limit.

In conclusion, the 250 g/L limit for industrial maintenance coatings is feasible based on the complying marketshare, the number of manufacturers that make complying products, the performance of complying industrial maintenance coatings in recent studies, manufacturer and end-user readiness, and the availability of rust preventative coatings for residential and commercial uses. There are no inequitable impacts on small businesses. Therefore, no modification to the SCM industrial maintenance limit is needed at this time.

Feasibility of Reactivity-Based Limits

The ARB has funded many research projects to further the scientific knowledge of photochemical reactivity. Traditionally, environmental chamber experiments have been used to predict ozone impacts of individual VOCs. However, the smaller chambers used to date have limitations on the variety of environmental conditions that can be tested. In addition, low volatility VOCs are difficult to test in small chambers because they tend to stick to the chamber walls. Under U.S. EPA funding, Dr. William P. L. Carter has developed a large, “next generation” environmental chamber facility at the University of California, Riverside, that will allow experiments to be conducted under more varied environmental conditions. The Board recently funded a $300,000 architectural coatings research contract with Dr. Carter, due to be completed in early 2005, with the objectives described below.

Petroleum distillates, or mineral spirits, are key ingredients in solvent-borne architectural coatings. There are dozens of different blends of these petroleum by-products from a variety of manufacturers, with wide variations in chemical composition and properties. Dr. Carter will attempt to characterize the reactivity of several of these distillate mixtures. The ARB, in consultation with the Reactivity Research Advisory Committee (RRAC), has chosen the following six petroleum distillates that Dr. Carter will test in the next generation environmental chamber.

- VM&P Naptha
- Odorless Mineral Spirits
- Mineral Spirits, 0-2% Aromatics
- Mineral Spirits, 2-8% Aromatics
- Mineral Spirits, 8-22% Aromatics
- Aromatic 100

Another key ingredient used in water-borne coatings is Texanol® (Eastman Chemical), a coalescing solvent that helps the resin form a film. One of Dr. Carter's objectives is to use the next generation chamber to analyze the photochemical reactivity of Texanol®. The SCAQMD is also sponsoring research to test up to four additional compounds in the new chamber. A decision on which additional compounds will be tested is expected very soon, in consultation with ARB staff and the RRAC. In addition, the ARB staff has evaluated the final 2001 survey data to determine baseline reactivity values by coating category. A draft reactivity analysis report was released for public review and comment in November 2003, and is available on our website. The research to improve the reactivity estimates for VOCs used extensively in architectural coatings is scheduled for completion in 2005. At that time, we will assess the feasibility of developing a reactivity-based SCM.

If you have any questions about this status report, please contact me at (916) 445-4383, or Mr. Peter D. Venturini, Chief, Stationary Source Division, at (916) 445-0650.

cc: Mr. Peter D. Venturini, Chief
Stationary Source Division