Methodologies for Determining Fee Emissions for Consumer Products Manufacturers for Fiscal Year 2004-2005

- Fiscal Year (FY) 2004-2005 fees are determined using 2002 VOC emissions.

- ARB staff determined per-company 2002 VOC emissions using information gathered from the 1997 ARB Consumer and Commercial Products Survey and the 1997 ARB Aerosol Coating Survey (1997 surveys), except where a company elected to submit more recent information. If a company submitted comprehensive 2001 product sales and formulation information for the previous fiscal year's fee determination, this information is used.

- VOC emissions have been adjusted by California population growth, except for emissions from aerosol coating products (see additional discussion below on determining fee emissions from aerosol coating products). VOC emissions based on the 1997 survey information submittals have been adjusted by an approximate 8.89 percent increase in population in California between 1997 and 2002. VOC emissions determined using comprehensive 2001 information submittals have been adjusted by an approximate 1.76 percent increase in population between 2001 and 2002. These values have been updated since the June 21, 2004, preliminary draft of these methodologies. The population trend information used is available at http://www.arb.ca.gov/app/emsinv/trends/ems_trends.php. The California Department of Finance is the source for the population data.

- The previous FY 2003-2004 fee emissions reflected adjustments to the VOC content of products in categories with standards that took effect between 1997 and 2001. When products' VOC content are above these standards, they are adjusted to the VOC limit for their respective categories. These product categories and VOC limits are identified below:

Category	VOC Limit (% by Weight)
Carpet and Upholstery Cleaners	
Aerosols	7
Non-aerosols (ready to use)	3
Non-aerosols (dilutable)	0.1
Hair Sprays	55
Crawling Bug Insecticide (All forms)	20
Personal Fragrance Product	
With 20 percent or less fragrance	75
With more than 20 percent fragrance	65
Spot Removers	
Aerosols	25
Non-aerosols	8

(Source: ARB, Regulation for Reducing VOC Emissions from Consumer Products; available at http://www.arb.ca.gov/consprod/regs/Cpreg.pdf)

- For FY 2004-2005 fee emissions, adjustments have been made for additional standards that took effect in 2002, where applicable. When products' VOC content are above these standards, they are adjusted to the VOC limit for their respective categories. These product categories and VOC limits are identified below:

Category	VOC Limit (% by Weight)
Aerosol Adhesives	55
Mist Spray	65
Web Spray	55
Special Purpose Spray Adhesives Mounting Automotive Engine Compartment, and Flexible Vinyl Adhesives	70
Polystyrene Foam and Automobile Headliner	65
Polyolefin and Laminate Repair/Edgebanding	60
Bug and Tar Remover	40
General Purpose Degreaser: Aerosols	50
Non-selective Terrestrial Herbicide: Non-aerosols*	3
Undercoating: aerosols	40

*Note: For a FIFRA-regulated product, the limit is effective one year after the date specified in the Table of Standards.

(Source: ARB, Regulation for Reducing VOC Emissions from Consumer Products; available at http://www.arb.ca.gov/consprod/regs/Cpreg.pdf)

- Adjustments for aerosol coating standards that took effect in 2002 are described in the discussion below.

- Products that were within the 3-year, sell-through period were also adjusted to meet their respective limits if they appeared to be subject to the standard.

- Products that do not appear to be subject to the standard in a given category and were not in compliance with the limit were not adjusted. Such products were assumed to be exempt "specialty products."

- Very few products in the fragrance categories were adjusted since most were assumed to be exempt or "grandfathered" products. For a more detailed discussion, see the Initial Statement of Reasons for Proposed Amendments to the California Clean Air Act Nonvehicular Source Fee Regulations, June 2003, page 25, which is available at http://www.arb.ca.gov/regact/feereg03/isor.pdf.

- Paint thinners were included with the per-company emissions from consumer products manufacturers since the 1997 ARB Consumer and Commercial Products Survey is the only survey available on manufacturers of paint thinners. However, products used exclusively in multi-component automotive coating systems may be excluded. Please contact ARB staff for further information.

- Charcoal lighter fluids were assumed to emit 0.02 pounds VOC per start, with nine starts per quart at 6.9 pounds per gallon. These emissions were included in the per-company totals.

- The large-container adhesives and sealant (which weigh more than one pound and consist of more than 16 fluid ounces) that were reported in the 1997 ARB Consumer and Commercial Products Survey were not included in the per-company emissions. The large-container adhesives and sealant emissions are not included in the consumer products inventory and are regulated by local air agencies. Additionally, pipe cements of all sizes are not included in the per-company emissions as local air agencies regulate these products.

- Emissions from liquid laundry detergents, hand dishwashing soap and heavy duty hand cleaners were not included. These categories were last surveyed in the Midterm Measures 1994/1995 Consumer Products Survey. The data is about 9 years old and there was poor market coverage of the soap categories.

- Cold process roof cements emissions are not included in the per-company emissions totals. Cold process roof cements were surveyed in the 1997 ARB Consumer and Commercial Products Survey but are actually an architectural coatings category. Their emissions are included in the architectural coatings inventory rather than the consumer products inventory.

- No down-the-drain factors were included. However, credit was given for combustion of charcoal lighter fluids as described above.

- The per-company emissions do not reflect market coverage adjustments. Adjustment factors are not applicable to individual companies.

- "Small" consumer product categories comprised of hundreds of minor product categories were not available on a per-company basis at this time. The small categories represent about 20 tons per day of VOC emissions.

- Low vapor pressure (LVP) VOCs are not currently included in the per-company emissions for consumer products. When LVP-VOC data is collected through future consumer product surveys, ARB staff intends to include in per-company emissions LVP-VOCs that are likely to see an atmospheric fate.

Additional Discussion on Determining Fee Emissions from Aerosol Coating Products

- No population growth adjustments have been made to aerosol coating product emissions. The control measures assume no growth until 2001 statewide and until 2010 in South Coast. Growth factors are not available at this time.

- New limits that took effect in 2002 and 2003 are reactivity-based, instead of mass-based VOC limits. Equivalent mass-based VOC reductions for general coating categories and specialty coating categories were determined per Table III-2, Summary of VOC Emissions and Target Ozone Reductions, which is found in the Initial Statement of Reasons for the Proposed Amendments to the Regulations for Reducing Volatile Organic Compound Emissions from Aerosol Coating Products and Proposed Tables of Maximum Incremental Reactivity (MIR) Values, and Proposed Amendments to Method 310, Release Date: May 5, 2000 (AC MIR ISOR). The table is provided in the attached excerpt of Chapter III of the AC MIR ISOR (See Attachment).

- For 2002 VOC emissions, emission reductions from the general aerosol coating categories were prorated by 7 of 12 months, as these limits did not take effect until June 1, 2002. "Prorated 2002 VOC Reductions" are identified in Table I: Aerosol Coating Products VOC Reductions Overview for Fee Emissions.

- VOC reductions for specialty coating categories will be credited when 2003 VOC emissions are determined because these limits did not take effect until January 1, 2003. VOC reductions for general coating categories will be fully credited when 2003 VOC emissions are determined. 2003 VOC Reductions are identified in Table I: Aerosol Coating Products VOC Reductions Overview for Fee Emissions.

- For each category, total reported 1997 sales were determined and are included in Table III-1: Summary of Data from the 1997 Aerosol Coating Survey in the AC MIR ISOR (See Attachment). Each company will be credited with VOC reductions in portion to its 1997 sales by category. "Total Category Sales" are identified in Table I: Aerosol Coating Products VOC Reductions Overview for Fee Emissions.

- If a company decides to submit updated sales information, the company's "Prorated 2002 VOC Reductions" and "2003 VOC Reductions" will be adjusted where applicable. If a decrease in sales is reported, the VOC reduction will be lower, in proportion to the sales change.

Table 1:
Aerosol Coating Products VOC Reductions Overview for Fee Emissions

Aerosol Coating Category	VOC Reduction (tons per day)1	Prorated 2002 VOC Reduction (tons per year)2	2003 VOC Reduction (tpy)3	Total Category Sales (tpy)4
General Categories				
800 Clear Coatings	0.17	36.20	62.05	580.35
801 Flat Paint Products	0.33	70.26	120.45	1109.6
802 Fluorescent Coatings	0.03	6.39	10.95	131.4
803 Metallic Coatings	0.21	44.71	76.65	850.45
804 Nonflat Paint Products	1.37	291.70	500.05	5522.45
805 Primers	0.41	87.30	149.65	1299.4
Totals	**2.52**	**536.55**	**919.8**	**9493.65**
Specialty Categories				
810 Art Fixatives or Sealants	0.04	N/A	14.60	120.45
820 Auto Body Primers	0.04	N/A	14.60	182.50
830 Automotive Bumper and Trim Products	0.04	N/A	14.60	127.75
860 Exact Match Finishes: Engine Enamel	0.01	N/A	3.65	138.70
861 Exact Match Finishes: Automotive	0.04	N/A	14.60	262.80
890 Ground/Traffic/Marking	0.28	N/A	102.20	1168.00
900 High Temperature Coatings	0.07	N/A	25.55	255.50
980 Vinyl/Fabric/Leather/ Polycarbonate	0.03	N/A	10.95	120.45
All Other Coating Categories	0.03	N/A	10.95	635.10
Totals	**0.58**	N/A	**211.7**	**N/A**

Footnotes:

1. From Table III-2, May 5, 2000 AC MIR ISOR
2. For 2002, VOC reductions are prorated by 7 of 12 months, as these limits did not take effect until 6/1/02 and are multiplied by 365 days.
3. For 2003, VOC reductions are multiplied by 365 days.
4. From Table III-1, May 5, 2000 AC MIR ISOR and the total category sales data are multiplied by 365 days.

Note:

N/A=not applicable

Revised Total Category Sales Data, 4/9/04 CHS

ATTACHMENT

Excerpt from AC MIR ISOR:

Chapter III - Ozone Formation from Aerosol Coatings Emissions

(An excerpt from the Initial Statement of Reasons for the Proposed Amendments to the Regulations for Reducing Volatile Organic Compound Emissions from Aerosol Coating Products and Proposed Tables of Maximum Incremental Reactivity (MIR) Values, and Proposed Amendments to Method 310, Release Date: May 5, 2000. The complete document is available at http://www.arb.ca.gov/regact/conspro/aerocoat/aerocoat.htm under Public Hearing Notice and Related Material).

III.

Ozone Formation from Aerosol Coating Emissions

As stated in the previous Chapter, the proposed amendments present a new approach to regulate the emissions from aerosol coating products. Using the concepts of reactivity, staff is proposing to replace the January 1, 2002, volatile organic compound (VOC) content limits with reactivity limits that achieve an equivalent air quality result. To do this, it is necessary to quantify the ozone reduction that would be associated with the VOC limits and set reactivity limits that achieve that ozone reduction target. In this way the proposed reactivity limits should ensure an equal air quality benefit.

To set reactivity-based limits, information on the amounts and types of reactive organic compounds emitted, as well as aerosol coating product sales are needed. These data are readily available from the 1997 Aerosol Coating Survey (ARB, 1998b). These same data were used as the basis for setting the January 1, 2002, VOC limits. In this Chapter, we provide a summary of the data on the VOC emissions and sales of aerosol coatings. In addition, the product category reactivities, VOC reductions and the corresponding ozone reduction commitments are shown on a category-by-category basis.

A. Emissions from Aerosol Coating Products Contribute to the Formation of Ozone in the Troposphere

The use of aerosol coating products results in VOC emissions which originate from the propellants and solvents contained in them (Dunn, 1993; Fortmann *et al.,* 1998). Once in the air, these compounds, in the presence of sunlight, react with nitrogen oxides to form ozone. Hence, we have been regulating VOC emissions from aerosol coatings as part of our ozone control strategy.

When aerosol coatings are used outdoors or in well ventilated areas, the VOCs have a direct route to ambient air after they have vaporized. The propellants used in aerosol coatings, such as isobutane, propane, and dimethyl ether, are gases at room temperature. These gases are emitted when an aerosol coating is sprayed and are immediately available for transport to the atmosphere. The solvents used in aerosol coatings evaporate during the application and drying processes of the paint. Typically, a solvent-blend of fast evaporating and slow to medium evaporating solvents is used in the formulation, to provide the correct drying time for the paint film. The evaporation of the solvents takes place in two stages, with the initial loss of solvent (up to 80 percent) being dependent on the vapor pressure of the fast evaporating solvent. After the initial loss of solvent, the polymer film is formed. The remaining solvent loss is caused by a slower diffusion-controlled process (ICAG, 1987). The nonvolatile portion of the coating remains in the cured coating film and, under normal use conditions, is not emitted to the atmosphere.

B. Air Resources Board Emissions Survey

The emission inventory was developed for aerosol coatings based on a survey questionnaire sent out to 313 potential responsible parties and manufacturers of aerosol coatings. Among other information, manufacturers and responsible parties supplied information on product formulation and product sales. Data were received from 137 responsible parties and 53 manufacturers. These data accounted for at least 90 percent of the sales of aerosol paint in California during 1997. A further discussion of survey development and the information supplied is contained in the "Initial Statement of Reasons for the Proposed Amendments to the Regulations for Reducing Volatile Organic Compound Emissions from Aerosol Coatings, Antiperspirants and Deodorants, and Consumer Products" (ARB, 1998a).

C. Summary of the Data from the 1997 Aerosol Coatings Survey

To interpret the data in the following tables, we begin by defining some reactivity-related terms. It is also important to note the distinction we are making between VOC and reactive organic compound (ROC). "VOC," as defined in the mass-based regulation does not include the exempted compounds such as acetone. In our reactivity-based regulation, we are proposing to use the term "ROC" to clarify that all VOCs, including exempt compounds such as acetone, are considered for evaluating products' reactivities. This distinction explains the difference between VOC and ROC emissions reported in Table III-1.

Reactivity related terms used in the following tables:

- SWA-MIR_{prod} is the sales-weighted average maximum incremental reactivity (MIR) of the products reported in an aerosol coating category.

- SWA-MIR_{VOC} is the sales-weighted average maximum incremental reactivity of the products (SWA-MIR_{prod}) divided by the sales-weighted average VOC content of the product category, as explained in Chapter IV. The SWA-MIR_{VOC} is used to calculate the equivalent ozone reduction. The tpd VOC reduction commitment is based on reductions of VOCs (not including acetone).

- Total Ozone Formation is the potential amount of ozone (reported here in tpd) formed from emissions of the VOCs in the aerosol coating category.

- Unadjusted Equivalent Ozone Reduction is the equivalent ozone reduction expected to be achieved from the tpd VOC reduction commitment. The unadjusted ozone reduction is calculated by multiplying the tpd VOC reduction by the SWA-MIR_{VOC}.

- Adjusted SWA-MIR_{VOC} is the SWA-MIR_{VOC} adjusted for mechanistic uncertainty of ingredient MIR values.

- Adjusted Equivalent Ozone Reduction is the ozone reduction calculated by multiplying the tpd VOC reduction commitment by the adjusted SWA-MIR_{VOC}.

This is the amount of ozone reduction that needs to be achieved by the proposed reactivity limit.

Table III-1 summarizes product sales and VOC and ROC emissions calculated from the survey data. As shown from Table III-1, sales from all coating categories were about 34.3 tpd, with VOC emissions of 19 tpd. Adjusting for survey coverage (which is an approximate 10 percent adjustment), VOC emissions were estimated to be 21 tpd in California in 1997. Data shown in Tables 1and 2 are based on actual reported emissions. Total ROC emissions were reported as 26.5 tpd. Based on the survey data, the six "general" aerosol coating categories account for approximately 77 percent of the total ROC emissions and 78 percent of the total amount of ozone formed from aerosol coating emissions in California in 1997. The remaining 23 percent of ROC emissions and 22 percent of total ozone formed can be attributed to the combined emissions from the 29 "specialty" aerosol coating categories. Among all categories, nonflat ("glossy") coatings are 43 percent of the ROC emissions and represent almost 46 percent of the total ozone formation.

Table III-2 summarizes our estimates of VOC emission reductions and the corresponding ozone reduction (i.e. unadjusted equivalent ozone reduction) that would have occurred upon implementation of the VOC standards adopted by the Board on November 19, 1998. As detailed in Chapter IV, not all VOC have been thoroughly studied. In these instances, uncertainty factors are applied to the ingredient MIR values prior to determining what the "ozone reduction target" should be. After accounting for MIR value uncertainty, the adjusted SWA-MIR_{VOC} is multiplied by the VOC reduction commitment (in tpd). This ozone reduction target is shown in Table III-2 as "adjusted equivalent ozone reduction." Nevertheless, these adjustments are rather insignificant (up to 10 percent), suggesting that the compounds used in aerosol coating products are reasonably well studied (see also Chapter IV).

As shown in Table III-2, the VOC standards would have achieved reductions of 3.1 tpd from VOC emissions totaling 19 tpd. The total VOC emissions and VOC emission reductions shown in Tables III-1 and 2 are different from those reported in the October 2, 1998, staff report (ARB, 1998a). Upon further quality checks of the data, data entry errors were found in the ground traffic and marking coating category. After correcting the data, the VOC emissions and VOC reductions from the ground traffic and marking category are 1.7 tpd and 0.28 tpd, respectively. Previously we reported emissions of 2.83 tpd and a reduction of 0.74 tpd.

TABLE III-1
SUMMARY OF DATA FROM THE 1997 AEROSOL COATING SURVEY

Aerosol Coating Category	California Sales (tons per day)	VOC Emissions (tons per day)	ROC Emissions (tons per day)	SWA-MIR_{prod} (g O_3/g product)	Total Ozone Formation (tons per day)
General Categories					
Clear Coatings	1.59	0.96	1.36	1.66	2.64
Flat Paint Products	3.04	1.54	2.36	1.52	4.62
Fluorescent Coatings	0.36	0.24	0.25	1.63	0.59
Metallic Coatings	2.33	1.65	1.88	2.09	4.87
Nonflat Paint Products	15.13	8.13	12.09	1.62	24.51
Primers	3.56	1.82	2.59	1.33	4.73
Specialty Categories					
Art Fixatives or Sealants	0.33	0.23	0.28	1.56	0.51
Auto Body Primers	0.50	0.25	0.37	1.69	0.85
Auto Bumper and Trim	0.35	0.30	0.32	1.59	0.56
Exact Match Finishes: Engine Enamel	0.38	0.18	0.32	1.52	0.58
Exact Match Finishes: Automotive	0.72	0.39	0.64	1.68	1.21
Ground/Traffic/Marking	3.20	1.70	1.81	1.35	4.32
High Temperature Coatings	0.70	0.48	0.60	2.04	1.43
Vinyl/Fabric/Leather/ Polycarbonate	0.33	0.25	0.31	1.67	0.55
All Other Coating Categories	1.74	0.89	1.36	N/A	1.66
Totals	34.25	18.99	26.54	N/A	53.63

N/A : not applicable

TABLE III-2
SUMMARY OF VOC EMISSIONS AND TARGET OZONE REDUCTIONS

Aerosol Coating Category	VOC Reduction (tons per day)	Unadjusted [a]SWA-MIR$_{VOC}$ (g O_3/g VOC)	Adjusted [a]SWA-MIR$_{VOC}$ (g O_3/g VOC)	Unadjusted Equivalent Ozone Reduction (tons per day)	Adjusted Equivalent Ozone Reduction (tons per day)
General Categories					
Clear Coatings	0.17	2.75	3.00	0.47	0.52
Flat Paint Products	0.33	3.00	3.21	0.99	1.06
Fluorescent Coatings	0.03	2.45	2.63	0.07	0.07
Metallic Coatings	0.21	2.95	3.07	0.62	0.66
Nonflat Paint Products	1.37	3.01	3.26	4.12	4.46
Primers	0.41	2.60	2.77	1.07	1.13
Specialty Categories					
Art Fixatives or Sealants	0.04	2.24	2.35	0.09	0.10
Auto Body Primers	0.04	3.35	3.62	0.13	0.13
Auto Bumper and Trim	0.04	1.89	1.97	0.07	0.08
Exact Match Finishes: Engine Enamel	0.01	3.13	3.42	0.03	0.04
Exact Match Finishes: Automotive	0.04	3.11	3.17	0.12	0.14
Ground/Traffic/Marking	0.28	2.54	2.78	0.71	0.78
High Temperature Coatings	0.07	3.01	3.15	0.21	0.22
Vinyl/Fabric/Leather/ Polycarbonate	0.03	2.27	2.34	0.07	0.08
All Other Coating Categories*	0.03	N/A	N/A	0.04	0.06
Totals	3.11	N/A	N/A	8.82	9.56

[a]SWA-MIR$_{VOC}$ = SWA-MIR$_{prod}$ / SWA-VOC
N/A : not applicable

REFERENCES

Air Resources Board. (1998a), Initial Statement of Reasons for the Proposed Amendments to the Regulations for Reducing Volatile Organic Compound Emission from Aerosol Coatings, Antiperspirants and Deodorants, and Consumer Products. October 2, 1998.

Air Resources Board (1997). (1998b), Aerosol Coating Product Survey. November 25, 1997.

Dunn, D.P. (1993), Propellants-their role in meeting VOC regulations. *Spray Technology. & Marketing*, November, 30-37.

Fortmann, R., Roache, N., Chang, J.C.S., and Guo, Z. (1998), Characterization of emissions of volatile organic compounds from interior alkyd paint. *Journal of Air & Waste Management Association*, 48, 931-940.

Industrial Colloid Advisory Group (ICAG) (1987), Paint and Surface Coatings: Theory and Practice. Ed. R. Lambourne. p. 207.