

**PROPOSED REGULATION TO REDUCE
VOLATILE ORGANIC COMPOUND EMISSIONS
FROM
CONSUMER PRODUCTS**

TECHNICAL SUPPORT DOCUMENT

**STATE OF CALIFORNIA
AIR RESOURCES BOARD
STATIONARY SOURCE DIVISION
AUGUST 1990**



**State of California
AIR RESOURCES BOARD**

**TECHNICAL SUPPORT DOCUMENT
FOR
A PROPOSED REGULATION TO REDUCE
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CONSUMER PRODUCTS**

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**Stationary Source Division
Air Resources Board**

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Technical Support Document

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This report has been prepared by the staff of the California Air Resources Board. Publication does not signify that the contents reflect the views and policies of the Air Resources Board, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

ACKNOWLEDGMENTS

This report and proposed regulation were developed by the Air Resources Board Solvent Control Section staff with the participation of industry representatives. We would particularly like to thank:

Air Resources Board Staff

Ed Wong	Tom Evashenk
Linda Clark	Floyd Vergara
Paul Milkey	Mike Jaczola

The Chemical Specialty Manufacturers Association, the Cosmetic Toiletries and Fragrance Association and the Soap and Detergent Association for facilitating discussion among industry and governmental representatives.

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I.

INTRODUCTION

A. OVERVIEW

The California State Legislature, aware of California's serious air pollution problems and the inability of many areas to meet the State and Federal ambient air quality standards, enacted the California Clean Air Act of 1988 (CCAA). The CCAA added Section 41712 (Appendix A) to the California Health and Safety Code, which requires the Air Resources Board (ARB) to adopt statewide regulations by January 1, 1992, to achieve the maximum feasible reduction in volatile organic compounds (VOC) emitted by consumer products. It was further stipulated that any regulation adopted by the ARB must be necessary, and commercially and technologically feasible.

As defined in Section 41712, consumer products are any chemically formulated product used by household and institutional consumers, including but not limited to, detergents; cleaning compounds; polishes; floor finishes; cosmetics; personal care products; home, lawn, and garden products; disinfectants; sanitizers; and automotive specialty products. The definition of consumer products specifically does not include paint, furniture coatings, or architectural coatings.

Consumer products comprise an important source of VOC emissions in California. Based on the ARB emissions inventory, consumer product VOC emissions were about 200 tons per day (T/D) in 1987. Consumer products are the second largest solvent-use category and the only one that is largely unregulated.

B. BACKGROUND

In July 1989, the ARB approved a Consumer Products Control Plan which outlined the regulatory strategy proposed for meeting the CCAA mandate to reduce VOC emissions from consumer products. The control plan outlined a schedule of projects that would be undertaken to support the regulation development process and established a set of priorities for regulation development. The schedule includes development of a regulation for

deodorants and antiperspirants in the fall of 1989 to be followed by four regulations at six month intervals for personal care products, household products, automotive and industrial products and pesticide products. The schedule also included an evaluation of the feasibility of adopting a generic aerosol regulation.

The ARB approved the regulation for control of VOC emissions from antiperspirants and deodorants in November 1989. An emissions reduction of 4.0 T/D is expected when the final compliance date becomes effective in 1995. In December 1989, staff completed the evaluation of the concept of establishing VOC content limits for all aerosol consumer products. Staff concluded that, rather than regulate one specific product form, it would be feasible and more effective in terms of resources to establish limits for consumer products in a comprehensive regulation that would address at least some of the individual products in each of the four major product categories and address multiple product forms. Subsequently, staff began preparation of a draft comprehensive regulation. In January 1990, a Court Order was issued to the Bay Area Air Quality Management District (BAAQMD) and/or the ARB to adopt, by July 1990, regulations designed to achieve at least a 4 ton per day emission reduction from consumer product solvents in the Bay Area. The ARB adopted a regulation in June 1990 to comply with the court order. The regulation set limits for the VOC content of air fresheners, engine degreasers, glass cleaners, hairsprays, oven cleaners, and automotive windshield washer fluids.

This technical support document (TSD) provides the technical information staff used in developing the comprehensive regulatory proposal to reduce emissions from consumer products statewide. The majority of the information contained in this TSD was obtained from members of the consumer product industry through five public workshops, VOC product surveys, individual meetings with representatives from consumer product companies and comments on distributed drafts of this report and regulation. This document presents an overview of the statewide consumer products regulation, a discussion of the ambient air quality and the need for emission reductions, solvent emissions for the regulated categories, descriptions of the regulated categories and the strategies to reduce consumer solvent emissions, and a discussion of the economic, environmental and lifestyle impacts resulting from the proposed regulation.

II.

CONSUMER PRODUCT REGULATION

A. STANDARDS

The proposed statewide comprehensive consumer products regulation is a regulation that would establish VOC content standards for 16 different consumer products. The effective date for six of the product categories is January 1, 1993. These products were also regulated under the regulation adopted by the Air Resources Board in June 1990 for the Bay Area Air Quality Management District. Because the Bay Area Regulation is no longer necessary, staff is proposing that it be repealed. The effective date for the remaining categories is January 1, 1994 with the exception of FIFRA-registered products which are described below. Future effective standards have also been proposed for engine degreasers, hairsprays, nail polish removers and single phase aerosol air fresheners. Table 1 lists the 16 consumer products and the recommended standards.

The standards prohibit the sale, supply, offer for sale, or manufacture for sale in California of any consumer product which, at the time of sale or manufacture, contains any VOC in excess of the limits specified. Also, the standards are set on the basis of the percentage VOC by weight and apply to the product only after the minimum recommended dilution has taken place. An exemption has been provided for incidental, "spot" use of a product in concentrated form. This will make allowance for infrequent uses of small amounts of concentrated products such as general purpose cleaners in cases where a higher VOC content is desired.

TABLE 1

Proposed Consumer Product VOC Standards
Percent by Weight

<u>Product Category</u>	<u>1/1/93</u>	<u>1/1/94</u>	<u>Future Effective (Date)</u>
Air Fresheners			
Single Phase Aerosols	70		30 (1/1/96)
Double Phase Aerosols	30		
Liquids/Pump Sprays	18		
Solids/Gels	3		
Dual-Purpose Aerosol Air Freshener/Disinfectant		60	
Automotive Windshield Washer Fluids			
Type A Areas *	35		
All Other Areas	10		
Bathroom and Tile Cleaners		5	
Engine Degreasers	75		50 (1/1/96)
Floor Polishes (Waxes)			
Products for Flexible Flooring Materials		7	
Products for Nonresilient Flooring		10	
Wood Floor Wax		90	
Furniture Maintenance Products			
Aerosols		25	
All Other Forms except solid/paste		7	
General Purpose Cleaners		10	
Glass Cleaners	6		
Hairsprays	80		55 (1/1/98)

* For automotive windshield washer fluids, "Type A" areas include only the following areas where winter temperatures between 20°F and -25°F can be reasonably expected to occur: Del Norte, Shasta, and Trinity Counties, and the Lake Tahoe, Mountain Counties, Great Basin Valleys, and Northeast Plateau Air Basins.

TABLE 1 (Con't)

Proposed Consumer Product VOC Standards Percent by Weight			Future Effective (Date)
<u>Product Category</u>	<u>1/1/93</u>	<u>1/1/94</u>	
Hair Styling Gels		6	
Hair Mousses		16	
Insect Repellents Aerosols		65	
Laundry Prewashes Aerosols/Solids		22	
All Other Forms		5	
Nail Polish Removers		85	75 (1/1/96)
Oven Cleaners Aerosols/Pump Sprays	8		
Liquids	5		
Shaving Creams		5	

A one year sell through period has been provided for retailers and suppliers to clear out non-complying products after the effective date of the standard. This does not apply to products in the Bay Area that have effective standards January 1, 1993 (air fresheners, automotive windshield washer fluid, glass cleaners, hairspray, oven cleaners, and engine degreasers). Because the court order specified that the emission reductions must occur by February 1, 1993 it is necessary to prohibit the sale of any non-complying product after the January 1, 1993 effective date.

1. **FIFRA Products:** For those consumer products registered under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), the effective date of the VOC standards is one year after the effective date listed in the Table of Standards for the product category which contains the FIFRA product. This provision will allow additional time for companies to re-register any of their reformulated FIFRA products with EPA. FIFRA requires the registration of pesticide products, and defines "pest" as any insect, rodent, nematode, fungus, weed, or any form of terrestrial or aquatic plant or animal life or virus, bacteria, or other micro-organism (except viruses, bacteria, or other micro-organisms on or in living man or other living animals)(7 U.S.C., Section 136(u)). By virtue of this definition, FIFRA-registered products generally tend to fall under the product categories of air fresheners (dual-purpose aerosol air freshener/disinfectants), bathroom

and tile cleaners, general purpose cleaners, and insect repellents, based on any disinfectant or pesticide claim made by the manufacturer for the product.

2. Ozone-Depleting Compounds: Another provision stipulates that, effective January 1, 1993 any consumer product listed in the table of standards that is sold or manufactured in California cannot contain any ozone-depleting compound which is regulated by the EPA or with an ozone-depleting potential of greater than 0.00. This provision only applies to new product formulations introduced to the market after the effective date of the regulation and will not apply to any product formulation which is sold, supplied, or offered for sale in California prior to the effective date of the regulation. In addition, the provision does not apply to any ozone-depleting compounds that may be present as an impurity in a consumer product in an amount equal to or less than 0.01% by weight. This provision was established to limit the amount of exempt ozone-depleting compounds used in consumer products to ensure that manufacturers do not switch to ozone depleting compounds when they are reformulating current products to lower VOC content. This is generally the same as a similar provision in the antiperspirant and deodorant regulation that the Board adopted in November 1989.

B. INNOVATIVE PRODUCTS

A consumer product can be exempted from the VOC standards in the regulation if it can be classified as innovative. An innovative product is a product which may have a VOC content greater than the applicable VOC standard, but which emits less VOC emissions than a representative consumer product which does meet that standard. To be eligible for this exemption, a manufacturer must demonstrate that use of the product will result in less emissions than a complying product, due to some characteristic of the product formulation, design, delivery system, or other factors. The manufacturer must also identify the VOC content and, if appropriate, test methods that can be used to enforce the innovative product exemption.

C. EXEMPTIONS

1. Vapor Pressure: The proposed regulation exempts any VOC which either, 1) has a true vapor pressure of less than 0.1 mm Hg at 20 degrees Centigrade (C) or, 2) consists of more than 12 carbon atoms, if the vapor pressure is unknown. Those VOCs with vapor pressures less than 0.1 mm Hg have very low volatility and due to the product formulation characteristics are less emissive than higher volatility products. Examples of the exempt VOCs are the high molecular weight resins used in hairsprays and floor polishes, surfactants used in cleaners and the heavy oils used in furniture polishes.

2. Fragrance and Colorants: The VOC standards do not apply to fragrances and colorants up to a combined level of 2 percent by weight contained in any consumer product. This exemption was established to allow manufacturers a

de minimus level of these substances in various products such that the products may be marketed in an appealing manner to consumers.

3. **Insect Repellants:** The VOC standards do not apply to 2-ethyl-1,3-hexanediol contained in personal insect repellents. This compound, found in small quantities, is considered essential ingredients in a few insect repellents. In addition, the market share for products based on 2-ethyl-1,3-hexanediol is very small when compared to the dominant repellent ingredient, N,N-diethyl-m-toluamide (DEET). DEET is exempt because it has a vapor pressure less than 0.1 mm Hg.

4. **FIFRA Products:** The labeling requirements for consumer products do not apply to those products registered under FIFRA. Section 24(b) of FIFRA prevents the state from requiring any labeling or packaging in addition to or different than that required under FIFRA.

5. **Air Fresheners:** The VOC standards do not apply to air fresheners that are comprised entirely of fragrance not including exempt VOCs. This is to allow the use of air fresheners such as those used in cars, which consist of fragrance impregnated on a cardboard symbol or fragrance oils that are impregnated on potpourri. Excluding the weight of the cardboard substrate, the VOC content of the fragrance substance would be 100%. The active ingredient (e.g. the fragrance) is present in a more concentrated form, resulting in less VOC emissions over the life of the product.

6. **Paradichlorobenzene:** An exemption is allowed for air fresheners comprised of at least 98 percent paradichlorobenzene. Staff are unaware of technology currently available to allow for the reduction of VOCs in air fresheners formulated at high concentrations of para-dichlorobenzene.

D. ADMINISTRATIVE REQUIREMENTS

1. **Most Restrictive Limit:** Many consumer products can serve several functions, i.e., a bathroom and tile cleaner can also be used as a general purpose cleaner in the kitchen. In cases of such potential overlap between product categories, if the product is labeled or advertised as suitable for use as a consumer product for which a lower VOC standard is specified, then the lowest applicable standard shall apply. This provision does not apply to general purpose cleaners that by their very nature have multiple uses.

2. **Code-Dating:** No later than three months after the effective date of the regulation, consumer products subject to the VOC standards shall display the date of manufacture either on the container or on the packaging. If the manufacturer uses a code to indicate the date of manufacture, an explanation of the code must be filed with the Executive Officer of the ARB no later than 3 months after the effective date of the regulation. This will aid in enforcement of the regulation by allowing inspectors to verify that only complying products are being sold in California after the effective date of the regulation. There is, however, a one-year sell-through period allowed for non-compliant products manufactured prior to the effective date of the standards.

3. Registration: Each manufacturer of consumer products that are sold in California, must register such products with the ARB no later than March 1, 1991, and no later than March 1 of every third year thereafter. All registration material will be handled in accordance with the confidentiality protection procedure specified in Title 17, California Code of Regulations, Sections 91000-91022. Registration items must include the following information:

- the brand name for each consumer product;
- the owner of the trademark or brand name;
- the product category to which the consumer product belongs;
- the product forms (aerosol, liquid, etc.);
- the California annual sales in pounds per year and the method used to calculate it;
- the total VOC content in percent by weight which (a) has a vapor pressure of greater than or equal to 0.1 mm Hg at 20 degrees Centigrade, or (b) consists of 12 or less carbon atoms, if the vapor pressure is unknown;

Products subject to registration include those products listed in the Table of Standards, products exempted under the 100% fragrance exemption, and an additional 23 products that are being evaluated and considered for future regulation.

This information will aid staff in developing additional standards for consumer products, and will eliminate the need for administering product surveys. It will also allow staff to track emissions from consumer products and to evaluate the effectiveness of the consumer product regulations.

E. VARIANCES

Any person who cannot comply with the requirements set forth in the section on standards, because of reasons beyond the person's reasonable control may apply in writing for a variance. The variance application shall state the specific reasons why a variance is sought, the proposed date(s) by which compliance with the standards will be achieved, and the methods by which compliance will be achieved.

Upon receipt of a variance application, the Executive Officer will hold a public hearing to determine whether, under what conditions, and to what extent, a variance from the standards is necessary and will be permitted. All of the following findings must be made in order to grant the variance:

1. Compliance with the standards would result in extraordinary economic hardship, due to reasons beyond the reasonable control of the applicant.

2. The public interest in mitigating the hardship to the applicant outweighs the public interest in avoiding any increased emissions which would result from issuance of the variance.
3. The methods to achieve compliance can reasonably be implemented, and will achieve compliance as expeditiously as possible.

If a variance is granted, the variance order will specify a final compliance date by which compliance with the standards will be achieved, and the increments of progress necessary to assure timely compliance. The order may also contain any other conditions that the Executive Officer deems necessary to carry out the purposes of Division 26 of the Health and Safety Code. A variance's duration will be determined by the Executive Officer, and can also be terminated, upon failure to comply with any condition of the variance. Upon application of any person, the Executive Officer may hold a public hearing to review a variance, and for good cause may modify or revoke a variance.

F. TEST METHODS

Testing to determine the VOC content of a consumer product, or to determine compliance with the standards, shall be done using one or more of the following methods: (1) Method 24-24A, Part 60, Title 40, Code of Federal Regulations, Appendix A, July 1, 1988; (2) Method 18, Federal Register 48, no. 202, October 18, 1983; (3) Method 1400, NIOSH Manual of Analytical Methods, Volume 1, February 1984; or (4) Environmental Protection Agency Method 8240 "GC/MS Method for Volatile Organics," September 1986. The methods referenced in the regulation are not intended to be used by everyone. Their successful use requires someone thoroughly familiar with the use of the methods. Each method is designed for certain applications. Before a product can be tested, an evaluation of the nature and chemical properties of the product must be made. Based on the results of this evaluation, a method or combination of methods is selected for the use in determining the VOC content of the product. In recognition that other methods may be available to determine the VOC content, the proposed regulation would allow the use of alternative methods which can be shown to the satisfaction of the Executive Officer to accurately determine the concentration of nonexempt VOCs in a product, upon approval of the Executive Officer.

Staff is working to develop new test methods and improvements to existing methods. This work is being done both independent of and in cooperation with industry. Also, EPA is beginning to work toward development of new test methods for consumer products. Staff will follow and take advantage of EPA's efforts.

Compliance can also be demonstrated through calculation of VOC content from records of amounts of constituents making up the product.

The results of tests conducted to determine the VOC content of consumer products shall be subject to verification by the Executive Officer. The

results of such tests as conducted by the Executive Officer or the Environmental Protection Agency shall take precedence over results of tests conducted by other parties when determining compliance with the regulation.

G. SEVERABILITY

Each section of the regulation is deemed severable, and if any part of the regulation is held to be invalid, the remainder of it will continue in full force and effect.

III.

AMBIENT AIR QUALITY AND THE NEED FOR EMISSION REDUCTIONS

To protect the public health and welfare, ambient air quality standards have been established on both the national and state level for ozone and particulate matter of aerodynamic equivalent diameter less than or equal to 10 microns (PM-10). These standards are shown in Table 2. The state hourly ozone standard is 0.09 parts per million (ppm) and the national hourly ozone standard is 0.12 ppm. The state PM-10 standard was established by the ARB in August 1983. The standard is 50 micrograms per cubic meter determined over a 24-hour period.

Volatile organic compound (VOC) emissions contribute to the formation of both ozone and PM-10. Ozone formation in the lower atmosphere results from a series of chemical reactions between VOCs and nitrogen oxides in the presence of sunlight. PM-10 levels are the result of both direct and indirect emissions. Direct sources include emissions from fuel combustion and wind erosion of soil. Indirect sources result via the chemical reaction of VOCs, nitrogen oxides, sulfur oxides and other chemicals in the atmosphere.

Ozone is a strong respiratory irritant that can impair the normal function of the lungs, especially during vigorous physical activity. This health effect is particularly acute in children, the elderly and people with respiratory conditions. Ozone levels also damage some types of vegetation, reducing the yields from some crops.

Particulate matter with diameters smaller than or equal to 10 microns equivalent aerodynamic diameter (PM-10) have the greatest impact on the respiratory system because they can reach deep into the lungs. PM-10 causes irritation of the respiratory tract and may contain toxic compounds which adhere to the particle surfaces and can enter the lungs. Because it is visible in the atmosphere, PM-10 also contributes to reduced visibility.

TABLE 2

Ambient Air Quality Standards for Ozone and PM-10

<u>Pollutant</u>	<u>Average Time</u>	<u>State Std.</u>	<u>National Std.</u>
Ozone	1 hour	0.09 ppm (180 ug/m ³)	0.12 ppm (235 ug/m ³)
PM-10	Annual Geometric Mean	30 ug/m ³	-----
	24 hour	50 ug/m ³	150 ug/m ³
	Annual Arithmetic	-----	50 ug/m ³

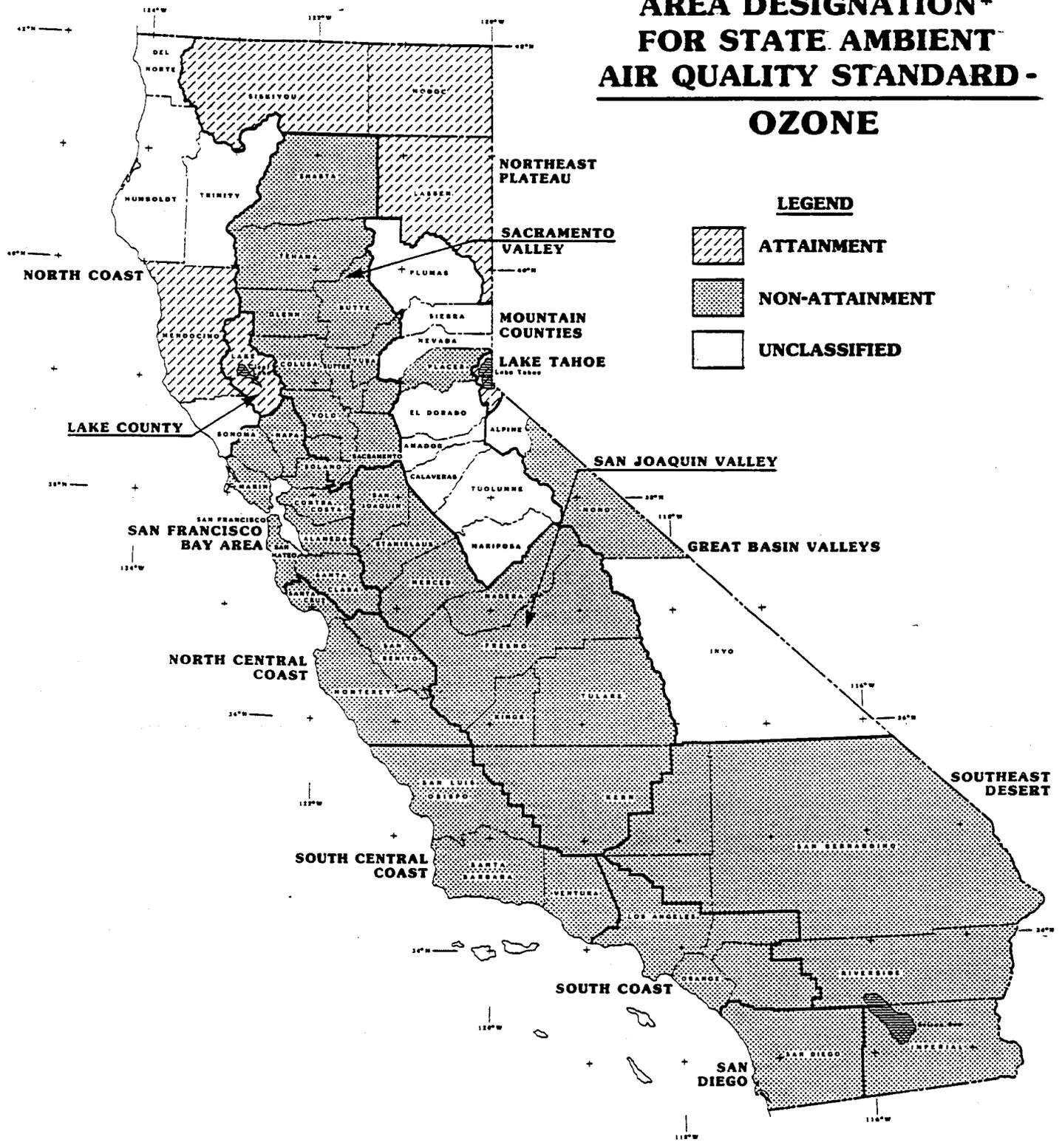
Figures 1 and 2 show the attainment status for California air basins and counties with regard to the national and state standards for ozone and the state standard for PM-10. As shown on the map, most areas of California have been designated nonattainment for ozone and PM-10. Over 90 percent of California's population live in nonattainment areas for these pollutants.

To ensure adequate progress toward the state and federal ozone and PM-10 standards, the California Clean Air Act requires California's nonattainment districts to achieve an average 5 percent annual reduction in emissions from each nonattainment pollutant and their precursors.

Volatile organic compound emissions from most consumer products are not currently regulated. Although emissions from individual products seem small, when taken collectively they are significant. VOC emissions from the solvents and propellants in consumer products are estimated to be over 240 tons per day based on the 1987 ARB Emissions Inventory. A regulation limiting emissions from this source is necessary to help California meet the state and federal ambient air quality standards and to help nonattainment districts achieve the required 5 percent annual emissions reduction from ozone and PM-10 precursors.

Figure 1

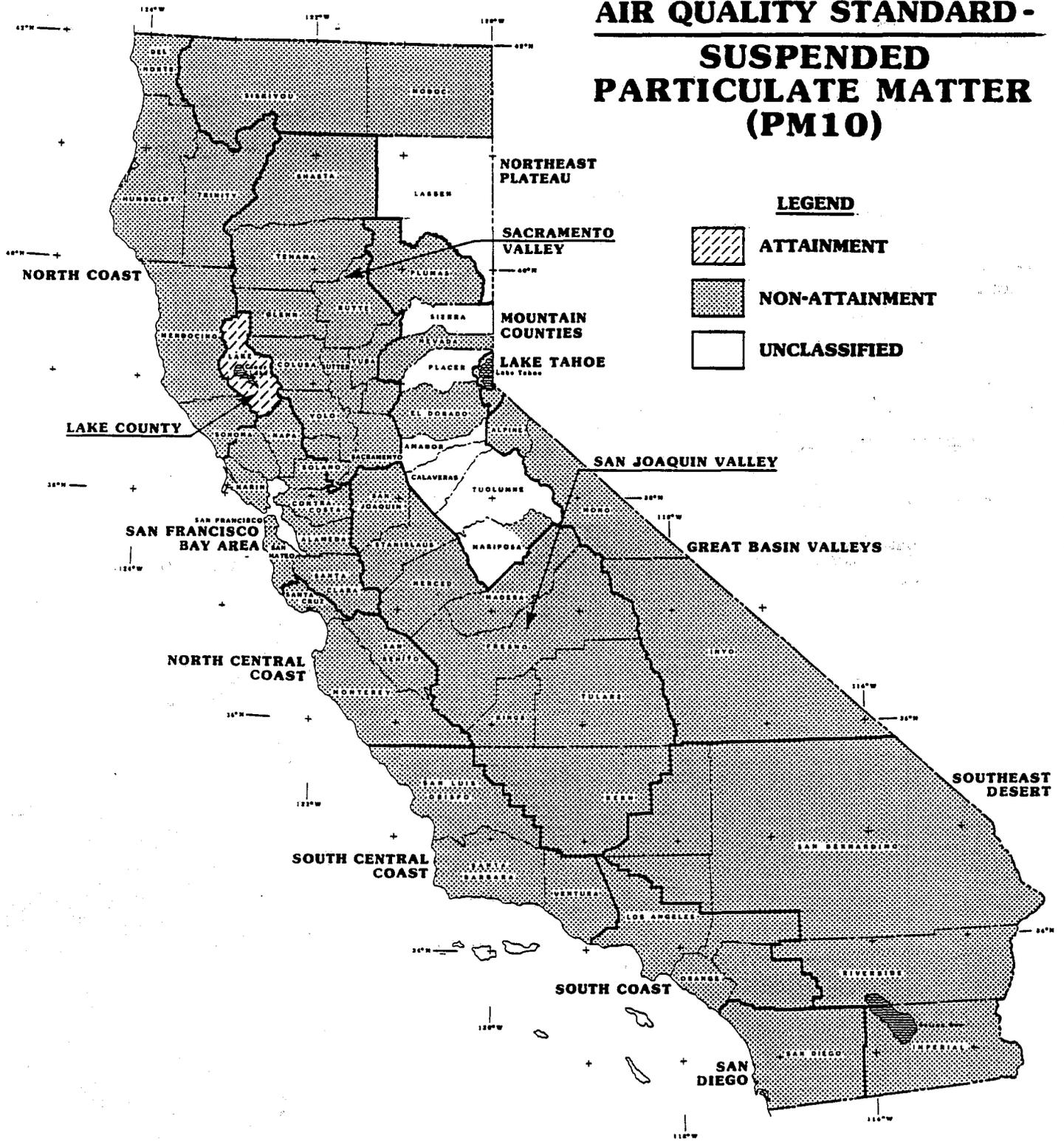
AREA DESIGNATION* FOR STATE AMBIENT AIR QUALITY STANDARD - OZONE



* PURSUANT TO SECTION 39608 OF THE CALIFORNIA CLEAN AIR ACT.

Figure 2

AREA DESIGNATION* FOR STATE AMBIENT AIR QUALITY STANDARD - SUSPENDED PARTICULATE MATTER (PM10)



* PURSUANT TO SECTION 39608 OF THE CALIFORNIA CLEAN AIR ACT.

IV.

EMISSIONS ESTIMATES FOR THE REGULATED CATEGORIES

To quantify emission reductions and monitor the effectiveness of the regulations, it is important to determine the VOC emissions that each category of consumer products emits. To do this, ARB staff compiled data from various sources in an attempt to quantify the magnitude of emissions from each product category. Staff initially used ARB's 1983 Emissions Inventory to get a first approximation of statewide emissions from consumer products. Extrapolated to 1987 levels, this emissions inventory showed that approximately 200 tons/day of VOCs were emitted in California.

Although the existing emission inventory proved valuable in determining the magnitude of emissions from the different categories, it nevertheless needed improvement. Various changes in the market from 1983 to 1988 may have significantly affected the estimated emissions. To alleviate this problem, staff designed a comprehensive consumer products VOC survey which they distributed to product manufacturers and distributors on February 9, 1990 (modified on March 6, 1990).

A. METHODOLOGY FOR ESTIMATING EMISSIONS

ARB's 1983 Emission Inventory, updated in 1985 and extrapolated to 1987 levels, generally combined estimated average VOC contents for various product categories along with their respective California production figures to arrive at an estimated 200 tons/day emissions in 1987. ARB staff used California- or regional-specific sales data whenever possible. If these were not available, national sales figures were proportioned to California levels according to population and geographical use factors.

The recent consumer products VOC survey, distributed in February 1990, was designed to give ARB staff comprehensive data on formulations and production figures. The survey was distributed and collected by ARB staff and three other firms: (1) Heiden Associates, a law firm contracted by the Chemical Specialties Manufacturers Association (CSMA), (2) Baker and

Hostetler, a law firm contracted by the Soap and Detergents Association (SDA), and (3) the Cosmetics, Toiletries and Fragrances Association (CTFA). Data that were submitted by these firms or submitted directly to staff were screened for obvious errors. Subsequently, data that were deemed by staff to be representative and accurate were used to improve the existing inventory; otherwise, the data found in the updated 1983 emission inventory were used as default values.

Survey submissions that did not include VOC content or production data were eliminated unless they represented a large fraction of the market. In these cases, efforts were made to find the missing data or to take the results (e.g. complying market share) from the evaluation of the complete data and apply them to the incomplete data. In general, most of the incomplete data was found in the survey responses submitted by small manufacturers. Since their production figures were generally small, staff did not expect the elimination of these incomplete data to significantly affect the data analysis. A summary of the VOC Survey data for the products being proposed for regulation is included in Appendix C.

Using data that were found to be accurate and representative, ARB staff found that the 16 products proposed for regulation are responsible for approximately 102 tons/day of VOC emissions. This is of the same order of magnitude as the existing inventory, which tends to support the accuracy of the inventory. However, since the product categories reviewed to date represent only a fraction of all existing product categories, the existing inventory of 200 tons VOC/day may be a gross underestimation.

Table 3 shows the results of the analysis of the survey data submitted to ARB on a per-product-category basis. The survey results were compiled to report the following values: per-product emissions, the sales-weighted average VOC per product category, and the expected emission reduction associated with the proposed VOC standards. The emissions from each product reported in the survey responses were calculated using the following equation:

$$VOC_e = VOC_c * Prod / 2000 / 365 / 100 \quad (1)$$

where,

VOC_e = VOC emissions (per product) [=] ton VOC/day

VOC_c = VOC content of product [=] wt%

Prod = 1988 California production (except otherwise specified) [=] lb product sold in California/year

2000 = conversion factor for lb to tons [=] 2000 lb/ton

365 = conversion factor for year to day [=] 365 day/year

100 = conversion factor for wt% to fractional weight, no units

The sales-weighted average VOC content per product category was calculated using the following equation:

$$VOC_{avg} = \frac{VOC_{c1} * Prod_1 + VOC_{c2} * Prod_2 + \dots + VOC_{cn} * Prod_n}{Prod_1 + Prod_2 + \dots + Prod_n} \quad (2)$$

where,

VOC_{avg} = sales-weighted average VOC content [=] wt%

$VOC_c, Prod$ = as defined in Equation (1)

1,2,...,n = total number of products in category

The emission reductions associated with each proposed standard were calculated for each reported product using the following equations:

$$VOC_{ern} = VOC_{en} * \left[\frac{VOC_{cn} - Std_n}{VOC_{cn}} \right] \quad (3)$$

where,

VOC_{er} = VOC emission reductions [=] ton VOC reduced/day

VOC_e, VOC_c = as defined in Equation (1)

Std = proposed VOC standard [=] wt% VOC

1,2,...,n = individual products, same as above

TABLE 3

VOC Emissions by Product Category
(1989)

<u>Product Category</u>	<u>VOC Emissions lbs/Day</u>
Air Fresheners (including dual-use disinfectants)	17,300
Automotive Windshield Washer Fluid	48,000
Bathroom and Tile Cleaner	900
Engine Degreaser	9,000
Floor Polish	5,200
Furniture Maintenance	5,600
General Purpose Cleaner	9,800
Glass Cleaner	4,600
Hair Spray	92,000
Hair Styling Gels	820
Hair Mousse	1,160
Insect Repellent (aerosols)	880
Laundry Prewash	4,000
Oven Cleaner	2,000
Nail Polish Remover	2,200
Shaving Cream	<u>520</u>
	Total: ~ 204,000 lbs/Day (102 Tons/Day)

Source: ARB 1990 Consumer Product Survey

V.

SUMMARY OF PROPOSED STANDARDS

The proposed statewide consumer product regulation contains VOC standards for 16 consumer products. The proposed standards were selected after review of the ARB VOC survey responses, numerous meetings with industry representatives and after analyzing the technological and commercial feasibility of each standard. Based on the survey results, there are complying products for each product category currently being sold in California that can meet the proposed standard and, in many cases, in each product form.

The proposed windshield washer fluid standard was not based on the VOC survey data, but based on the physical need for VOCs used in windshield washer fluids to provide a freezing point depression for the fluid. Two standards are proposed for windshield washer fluid based on the wintertime temperatures found in California. For those areas that experience temperatures below freezing, the standard is set at 35 percent VOC which will provide anti-freezing protection to -25 degrees Fahrenheit, and for the majority of Californians who live in the more temperate regions of the state the standard is 10 percent which will provide anti-freezing protection to 20 degrees Fahrenheit.

The proposed standards and the number of complying products currently being sold in California that comply with the standard are summarized in Table 4. The number of complying products being sold in California are based on the responses to the ARB VOC survey.

TABLE 4
Summary of Complying Products

Product Category	Product Form	Proposed Standard, Wt % VOC	Number of Complying Products Currently Being Sold in CA
Dual-Use Aerosol Air Freshener/ Disinfectants*	Aerosol	60	1
Air Fresheners	Aerosol-Single Phase	70	0**
"	Aerosol-Double Phase	30	20
"	Liquids/Pumps	18	84
"	Solids/Gels	3	33
"	Other	3	9
Automotive Windshield Washer Fluid	All Forms (A Areas)	10 35	UTQ*** UTQ***
Bathroom & Tile	All Forms	5	44
Engine Degreasers	All Forms	75	4
Floor Polishes Flexible Floor Materials	All Forms	7	115
Nonresilient Flooring	All Forms	10	UTQ***
Wood Floor Wax	All Forms	90	5
Furniture Maintenance Product	Aerosols	25	22
"	Solids	87	1
"	All Other	7	15

* "Dual-Use" and "Dual-Purpose" are interchangeable

** The standard proposed for single phase aerosol air freshener is based on a recommendation by CSMA. According to CSMA, even though there are currently no complying products on the market, the technology is available to formulate a single phase aerosol air freshener at the 70% VOC limit.

*** UTQ - Unable to quantify

TABLE 4 (con't)

Summary of Complying Products

Product Category	Product Form	Proposed Standard, Wt % VOC	Number of Complying Products Currently Being Sold in CA
General Purpose Cleaners	All Forms	10	160
Glass Cleaners	All Forms	6	32
Hair Mousses	All Forms	16	66
Hairsprays	All Forms	80	66
Hair Styling Gels	All Forms	6	58
Insect Repellants	Aerosols	65	4
Laundry Prewash	Aerosol/Solids	22	4
"	All Other Forms	5	9
Nail Polish Remover	All Forms	85	11
Oven Cleaners	Aerosols/Pump Spray	8	13
"	Liquids	5	8
Shaving Creams	All Forms	5	5

For four product categories, staff is proposing to have future effective standards. Future effective standards are proposed for engine degreasers, hairsprays, nail polish remover, and air fresheners ("single phase aerosols"). Table 5 below summarizes the product categories with future effective standards. Engine degreasers, hairspray and nail polish remover products are currently being sold in California that can meet the proposed future effective standards. However, these products do represent newer technologies in the market place and in each case the products have a smaller percent of the market. To allow for other manufacturers to develop complying products, the standard will not become effective until 1996 for nail polish removers and engine degreasers, and 1998 for hairsprays. Due to the complexity of hairspray resin development, additional time was provided for manufacturers to meet the future effective standard for hairspray. Staff is unaware of any products for single phase aerosols that are currently being marketed in California, however, conversations with industry representatives have indicated that the technology is developing in this area that will allow for the production of a single phase aerosol at the lower limit.

TABLE 5

Proposed Future Effective Standards

<u>Product Category</u>	<u>Future Effective Date</u>	<u>Proposed Standard (% VOC)</u>	<u>Emission Reductions (lbs/day)</u>
Air Fresheners, Single Phase Aerosol	1/1/96	30	620
Engine Degreasers	1/1/96	50	2,340
Hairsprays	1/1/98	55	24,160
Nail Polish Removers	1/1/96	75	220
TOTAL:			27,340 (13.7 T/D)

VI.

DESCRIPTION OF THE CATEGORIES

This section contains a description of the 16 consumer products that were chosen for the comprehensive statewide consumer product regulation.

A. AIR FRESHENERS

Product Description: The proposed definition for air fresheners includes products for the purpose of masking odors, providing a scent, or deodorizing. Not included in the definition are personal bodily hygiene products, rug deodorizers or products that function primarily as cleaning products as indicated on a product label or in any advertising.

Dual-purpose aerosol air freshener/disinfectants which claim to freshen or deodorize air are also included under the air freshener category. However, since these products have two purposes, staff has provided a separate product description and analysis of health concerns for these products. The product description for these dual purpose products follows the description for air fresheners and the analysis of these products is presented in Issues, Chapter VIII.

Product Forms: Air fresheners are available in a wide variety of forms including, but not limited to, aerosol sprays, liquids (alone or within absorbing materials such as pads and wicks), gels, powders, crystals and blocks. Also included in the air freshener category are dual-purpose aerosol air freshener/disinfectants which claim to freshen air. The emissions from all forms of air fresheners, excluding dual-purpose aerosol air freshener/disinfectants, are estimated at 4.4 tons per day based on the ARB survey. Including dual-purpose aerosol air freshner/disinfectant sprays, the emissions are estimated at about 8 tons per day. Table 6 shows the percentage of emissions from each subcategory.

TABLE 6

Air Fresheners Emission Summary*
(Total Emissions 4.35 T/D)

<u>Product Form</u>	<u>Percent of Market</u>	<u>Emissions (T/D)</u>	<u>Percent of Emissions</u>
Aerosol-2 phase	45	2.72	63
Aerosol-1 phase	4	0.77	18
Liquids/Pumps	20	0.64	14
Solids	29	0.15	3
Other	2	0.07	2

* Numbers do not include dual-purpose aerosol air freshener/disinfectants and may not add up to 100% due to rounding.

Aerosol air fresheners (both single and double phase) make up the largest segment of the air freshener market at about 50% and contribute about 80% of the emissions from air fresheners, not including dual-purpose aerosol air freshener/disinfectant sprays. Aerosol sprays include both single phase and dual phase aerosol products. Single phase products make up less than 5% of the air freshener market yet contribute nearly 20% of the emissions from air fresheners. With single phase aerosol products, the liquid components of the product are present in a single, homogeneous phase. These aerosol products have a high VOC content. The VOCs evaporate as the product is sprayed, resulting in a fine "dry" mist. According to industry representatives, single phase products are preferred when spraying furniture, drapes, or near surfaces where the "wetter" sprays may leave moisture spots. Also, single phase aerosol air fresheners do not have to be shaken before use. This feature of single phase products is apparent in a wall-mounted aerosol air freshener enclosed in a housing that is pushed whenever a "shot" of the product is desired.

According to the ARB survey, dual phase aerosol air fresheners make up the majority of the air freshener market at 45% and contribute over 60% of the emissions from air fresheners. With dual phase aerosol products, the liquid contents of the product are present in more than one phase. Generally, a water based phase and a solvent based phase are present, resulting in products with lower VOC content than the single phase aerosol products. These products must be shaken before use to mix the phases into a homogeneous emulsion.

According to the ARB survey, liquid air fresheners make up about 20% of the air freshener market and contribute about 15% of the emissions. Although a few products are marketed as liquids in containers that are exposed directly to open air, most are available within specialized packaging to control the release rate (evaporation) of the product. Most liquid products use a wick, pad, or other barrier between a liquid reservoir and open air to control the evaporation of the fragrance and any solvents.

A more elaborate example by one marketer consists of a felt soaked material enclosed in a plastic bag to control the release rate. The plastic bag is held within a plastic housing with a small, battery-operated fan to deliver the scented air.

Other liquid products include pre-soaked materials without a liquid reservoir. These products are classified as liquids although they are absorbed within a solid, inert material. An example of these products is a fragrance impregnated paper air freshener for use in automobiles.

Liquid products delivered by pump spray make up a very small percentage of the air freshener market.

Solid air fresheners include powders, crystals, blocks and gels. According to the ARB survey, these products make up about 30% of the air freshener market, but contribute only about 3% of the emissions from air fresheners due to their low VOC content. This diverse category of products includes such products as a gel in the shape of a cone that is enclosed in a plastic enclosure. Another example is the solid "block" products which include toilet bowl deodorizers and closet fresheners. Rug deodorizers are not included in the air freshener category.

Dual-purpose aerosol air freshener/disinfectants contribute 4.3 tons per day VOC emissions, making this subcategory the largest source of emissions under the air freshener category. While these products may be used as surface disinfectants, the aerosol forms are often promoted as air fresheners to be sprayed into the air rather than on a specific surface. This product is discussed under Sections V.B. and VIII.E., which are both titled "Dual-Purpose Aerosol Air Freshener/Disinfectants."

Product Content Formulation: The formulations and VOC content used in air fresheners vary widely with the product form. The VOC content ranges from an average of 3.5% for solid air fresheners to 96% for single phase aerosol products.

Aerosol air fresheners are the highest VOC product forms. These formulations may be single phase or dual phase. The majority of aerosol air fresheners are dual phase products. According to the ARB survey these products have an average VOC content of approximately 40%. Dual phase products contain two liquid phases and a propellant. The liquid phases consist of a water phase and a solvent phase which contains a small amount of fragrance. The two phases are mixed when the product container is shaken, producing an emulsion that is sprayed. The solvent phase is generally made up primarily of liquid hydrocarbon propellant although other solvents may also be included in the formulation. The propellants are typically butanes and propane. As in most other aerosol products, the propellants in aerosol air fresheners are present in both a liquid and gas state. In the liquid phase the propellant functions as a solvent and reservoir to replenish propellant in the gas phase. The gas phase provides the pressure that expels the product.

Single phase aerosol air freshener formulations average 96% VOC content according to the ARB survey. These products contain a small amount of fragrance with the balance consisting of solvents and the propellant. Often the propellant in liquid form is the primary solvent although other solvents may also be included in the formulation. The propellants are typically hydrocarbons such as butanes and propane.

Liquid air freshener formulations vary widely. The average VOC content according to the ARB survey is 20%. Formulations typically contain water, alcohols and other solvents, and fragrance. Some liquid air fresheners contain 100% fragrance.

Solid air fresheners contain an average VOC content of 3% according to the ARB survey. These formulations typically contain water, various solvents, and a thickener such as silica. The solid "block" closet fresheners and toilet bowl fresheners often contain 100% paradichlorobenzene and a small amount of fragrance. Many other toilet bowl fresheners are composed primarily of surfactants and fragrance.

Dual-purpose aerosol air freshener/disinfectant sprays are typically composed of a large percentage of ethanol, hydrocarbon or carbon dioxide propellant and water. Small amounts of disinfectant agents may also be added to the formulation.

Product Use: Air fresheners are used in household, automotive, institutional, and commercial settings to treat unpleasant odors. This is accomplished by masking the odor with a pleasant scent or removing the odor. While most air fresheners mask odors, a few claim to remove the offending odors by chemically reacting with them.

Household air fresheners are used to treat bathroom and kitchen odors, pet odors, garbage odors, smoke, and odors caused by moisture. Common household products include aerosol sprays and solid or liquid products which evaporate from a dispenser. Aerosol air fresheners, which make up the majority of the market, are generally sprayed as needed with the user controlling the amount of product emitted. Aerosol disinfectants that also function as air fresheners are either sprayed on specific surfaces such as bathroom fixtures or in the air.

Automotive air fresheners consist mainly of liquids. These products include paper and other materials soaked with the liquid product and small containers with wicks.

Air fresheners are used in institutional and commercial settings to control odors from bathrooms, laundry areas, food preparation areas and specific industries such as diaper services. Most air fresheners used in this segment of the market are self-dispensing products with the product emissions generally controlled by the chemical and physical characteristics of the product as well as the ambient temperature and humidity. These products are described as "maintenance" air fresheners and are designed to maintain a constant scent over a long period of time. A number of products are available including mostly liquid and solid products. Some products are

available within an enclosure with a fan to distribute the fragrance while others are designed to be placed in the ductwork of ventilation systems. Another common product is the solid toilet bowl fresheners used to deodorize bathrooms. Some specialized liquid products include a product designed to be added to cleaning solutions, a product that can be added to sewage treatment tanks, and a product designed to be sprayed after extensive fire damage to eliminate smoke odors.

Manufacturing Process: The manufacture of air freshener products with liquid ingredients (aerosols, liquids and pump spray products) begins with the purchase and storage of chemical ingredients in bulk. The ingredients are generally added to stainless steel vessels where they are mixed. The ingredients are then transferred to individual containers on an automated filling line. Propellants are added to aerosol products during filling. Solid/gel products may be produced by a variety of methods.

Health and Safety Concerns: Health and safety considerations include the effects of ingestion by infants and the inhalation toxicity of aerosol products. The closet fresheners and toilet bowl fresheners composed of paradichlorobenzene are of special concern since paradichlorobenzene is considered a possible carcinogen by EPA.

Another concern is the storage and use of highly flammable aerosols such as single phase air fresheners.

Recommended VOC Standard: Five separate VOC content limits have been established for air fresheners. Individual limits apply to the following categories: (1) single phase aerosols, (2) dual phase aerosols, (3) liquids and pump sprays, (4) solids and gels, and (5) disinfectant aerosol sprays. The limits are shown along with other information in Table 7 below.

Two separate limits have been established for aerosol air fresheners. The proposed limits of 70% for single phase aerosols and 30% for dual phase products are both based on a CSMA proposal. According to the ARB survey, 20 of the 65 dual phase aerosol products reviewed currently comply with the limit. No single phase product currently complies with the proposed 70% limit, but based on discussions with CSMA and the industry, reformulation to the limit is feasible.

A future effective standard of 30% has been set for all aerosol air fresheners in 1996. Single phase aerosols contribute a disproportionately high amount of emissions based on their share of the market. This segment of the market could also possibly grow if not regulated. This limit will help to phase out the the high VOC single phase aerosol category and force technology to be developed that would allow for the production of a single phase aerosol at a lower VOC content. Based on discussions with industry representatives, technology is developing in this area and may allow for a 30% single phase product to be marketed in the future.

TABLE 7

Air Fresheners Standard Summary

<u>Product Form</u>	<u>Proposed Standard % VOC</u>	<u>Number of Complying Products</u>	<u>Percent of Market Complying</u>	<u>Emission Reduction T/D</u>
Aerosol-2 phase	30	20	4	0.38
Aerosol-1 phase	70	0	0	0.23
Liquid/Pump	18	84	61	0.17
Solid	3	33	98	0.10
Other	3*	9	84	0.06

* It is assumed that most of the air freshener products under the "other" category actually fall under the "solid" category since 84% of the market complies with the 3% standard. Therefore a 3% standard was used to calculate the emission reduction.

The VOC limits for liquid and solid air fresheners at 18 and 3 percent respectively, are based on the sales weighted average VOC contents from the survey. These limits are intended to bring the higher VOC products into compliance with the standard.

An exemption from the VOC limits in the regulation has been provided for air fresheners containing 100% fragrance, less non-VOC's such as water. Staff is aware of products containing only fragrance both absorbed in inert materials and in liquid and pump form. Since the fragrances used generally fall under the VOC definition, dilution is the only direct means of reformulation. Staff believes that simple dilution would not lead to emission reductions. Since these concentrated products result in a minimum of emissions of nonfragrance VOCs, staff believes that these products may result in low overall emissions per application. Fragrances have been defined in the regulation as substances or complex mixtures of aroma chemicals, natural essential oils and other functional components with a combined vapor pressure not in excess of 2 mm Hg at 20 degrees Celsius, the sole purpose of which is to impart an odor or scent, or to counteract a malodor. According to discussions with the fragrance industry, the definition will include the majority of available fragrances while limiting the potential for inclusion of nonfragrance components to fragrances.

An exemption has also been provided for air fresheners containing at least 98% paradichlorobenzene (PDCB). This exemption was provided for closet fresheners and toilet bowl deodorizers. We are not aware of a means of reformulating these products since they are almost entirely composed of PDCB, a VOC.

Compliance with the Standard: The primary method of complying with the regulation is expected to be replacement of VOC solvents with water or other exempt VOCs. In some cases, this may require other adjustments in the formulation. For instance, in the case of single phase aerosols, the introduction of water into the formulation may require that the hydrocarbon propellant/solvent be replaced by dimethyl ether. The exemption for 100% fragrance products may also encourage new designs. Also, the innovative products exemption may provide a means for the development of low emitting products that cannot meet the VOC content standard.

B. DUAL-PURPOSE AEROSOL AIR FRESHENER/DISINFECTANTS

Product Description: For the purposes of this regulation, dual-purpose aerosol air freshener/disinfectants are aerosol products that are claimed to clean, freshen or deodorize air and disinfect hard surfaces. Since these products are designed to kill certain microbes, they are classified by EPA under the general category of pesticides and registered under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA). This regulation does not apply to either aerosol products that only claim to be disinfectants or to any liquid products that are claimed to be air fresheners/disinfectants.

Product Forms: The regulation applies only to the aerosol form of products which are claimed to freshen air and disinfect hard surfaces. The aerosol form of air freshener/disinfectants account for approximately 4.3 tons per day of VOC emissions.

Product Content Formulation: The major ingredient in dual-purpose aerosol air freshener/disinfectants is ethanol, comprising approximately 45% to 80% by weight of these products. The next largest fraction of the product weight is comprised of propellant (either hydrocarbon or compressed carbon dioxide), water and fragrances. Other ingredients found in small quantities may include certain active ingredients such as phenols (e.g., ortho-phenyl phenol) and quaternary ammonium compounds. Dual-purpose aerosol air freshener/disinfectants have a sales-weighted average VOC content of approximately 80% VOC by weight.

Product Use: These products are used for their air freshening and disinfecting benefits. Ideally, these products should be used only when the transmission of health-threatening diseases through contact with hard surfaces is a major concern. However, ARB staff believes that consumers may be significantly misusing these products as air fresheners, a function for which there are many alternative lower-VOC products. It is important to note that these products are efficacious only when applied to hard surfaces. Spraying into the air does not "clean", "disinfect" or "purify" the air any more than regular air fresheners.

Manufacturing Process: Staff has no specific data on the manufacturing process for this product category; however, staff expects the manufacturing process to be similar to those used for manufacturing other aerosol products.

Health and Safety Concerns: The major safety concern with any aerosol is the flammability of that product. Therefore, flammability concerns that apply to other aerosol products also apply to dual-purpose aerosol air freshener/disinfectants.

Industry representatives have expressed concern that the proposed standard of 60% VOC by weight would result in a reduced efficacy product. To address these concerns, staff has prepared an analysis of the feasibility of limiting the VOC content of dual-purpose aerosol air freshener/disinfectants to 60% (See Issues, Chapter VIII). From this analysis, staff has determined that the standard of 60% VOC can be achieved while still allowing efficacious disinfectant products to be available to consumers.

Product Emissions: The current estimate for emissions from dual-purpose aerosol air freshener/disinfectants is 4.3 tons VOC per day.

Recommended VOC Standard: Staff recommends a 60% VOC limit by weight for dual-purpose aerosol air freshener/disinfectants. Compliance with this standard will result in 1.1 tons VOC per day emission reductions.

Compliance with the Standard: ARB staff believes that compliance with the standard could be achieved through at least four different options: (1) sell, advertise and market these products only as hard surface disinfectants and not as air fresheners, in which case the product would not be subject to the standard, (2) reformulate the products to reduce the VOC content and use an exempt VOC or non-VOC propellant, (3) reformulate the products to reduce the VOC content and use it in a pump, and (4) redesign the products into an innovative package such that it emits fewer emissions. Of these, options 1, 2 and 3 are believed to be the most cost-effective and easiest options to implement. Note that option 1 requires only a labeling and marketing change. The timeframe that is proposed in the regulation allows for additional time to reformulate and reregister the reformulated product under FIFRA.

C. AUTOMOTIVE WINDSHIELD WASHER FLUIDS

Product Description: Automotive windshield washer fluid means any liquid designed for use in a motor vehicle windshield washer fluid system for the purpose of cleaning, washing, or wetting the windshield(s). This definition does not include any fluid found in a new motor vehicle at the time the vehicle is manufactured.

Product Forms: Because the washer system is designed to spray the fluid onto the windshield(s) through a pump, windshield washer fluids are sold exclusively as liquids.

Product Content Formulation: Methanol comprises the majority of the VOCs found in washer fluids. A small fraction of the market is based on isopropanol. The remaining VOCs found in washer fluids are detergents and possibly colorants.

Windshield washer fluids are generally sold in two types of formulations: (1) "ready-to-use" requiring little or no dilution and (2) "concentrated" generally requiring some dilution by the consumer, the degree of dilution depending on the ambient temperatures to be encountered by the consumer. ARB's shelf survey revealed that ready-to-use formulations have VOC contents that generally range from 23% to 40% VOC by weight. The sales-weighted VOC content of ready-to-use fluids in California is believed to be 35% VOC by weight. Concentrated formulations typically range from 35% to 80% methanol by weight.

Product Use: Windshield washer fluids are used to clean, wash, or wet windshields. The primary purpose of the methanol and isopropanol in washer fluids is to impart a freezing-point depression to the water used in the system, thereby preventing the water from freezing when low ambient temperatures are encountered. Methanol and isopropanol, like other organic materials such as the ethylene glycol found in engine cooling systems, provide freezing-point depression and boiling-point elevation to water in varying degrees, depending on the amount of organic material added to the solution. The methanol and isopropanol also provide some supplementary cleaning properties to the detergents to help clean insects and other soils from the windshields.

Manufacturing Process: Methanol or isopropanol, along with the appropriate detergents and colorants, are mixed in a relatively simple fashion in varying ratios, according to the amount of freezing protection required.

Health and Safety Concerns: Poisoning may occur from the inhalation or ingestion of either methanol or isopropanol. Ingestion of 100-250 milliliters of either methanol or isopropanol is usually fatal.

Since the methanol and isopropanol impart a freezing-point depression to water, concerns have been raised regarding the possible freezing of reformulated washer fluids if the organic content is too low. According to staff's analysis, the proposed standards should address these concerns adequately. First, the average VOC content of 35% by weight in currently available ready-to-use products is designed to provide freezing protection to -25°F . This amount of freezing protection appears to be significantly greater than what is required in California's generally temperate climate. ARB staff's analysis of mean minimum temperature isolines provided by the Meteorology Section shows that approximately 97% of the state's population encounter mean minimum temperatures in January above 20°F . Freezing protection to 20°F would only require a 10% methanol by weight washer fluid. Thus, if we assume that washer fluid use is proportional to population, it appears that approximately 97% of the total volume of washer fluid used in California contains more VOC than necessary. This is the basis for the proposed 10% by weight VOC standard.

For those areas where wintertime temperatures can be reasonably expected to stay below 20°F for appreciable lengths of time, staff has proposed a

standard of 35% VOC by weight. This standard would apply only to the counties in parentheses located within the following air basins: North Coast (Trinity, Del Norte), Northeast Plateau (Siskiyou, Modoc, Lassen), Mountain Counties (Plumas, Siskiyou, Nevada, Placer, El Dorado, Amador, Calaveras, Tuolumne, Mariposa), Great Basin Valleys (Alpine, Mono, Inyo) and the Sacramento Valley (Shasta County only).

The application of the 35% standard only to these areas, which are the regions which are most likely to encounter ambient temperatures below 20 °F, would allow residents in these areas to maintain the freezing-point protection they currently have while allowing emission reductions elsewhere in the state.

Product Emissions: Survey results from CSMA were not considered by staff to be accurate or representative of the windshield washer fluid market in California because of the insufficient response to the survey. Since these survey responses did not improve ARB's current emission estimates, staff assumed the emissions from the 1983 Emission Inventory were still correct, updated to 1988 levels. From the inventory, staff estimated that 24 tons per day of VOC were emitted in 1988 from windshield washer fluids.

Recommended VOC Standard: Staff proposes to limit the VOC content for windshield washer fluids to 35% by weight in Type A Counties (listed previously) and 10% in all other counties. Theoretically, all windshield washer fluids can comply with the standards either by: (1) using proper and clear dilution instructions on the label of the concentrated product and distributing the fluids properly, or (2) reducing the amount of VOC in the ready-to-use products to the specified limits. Appendix C presents staff's complete analysis and justification of the recommended standards for this product category.

Compliance with the Standard: Since no major process modifications are involved, the 1/1/93 compliance date should be adequate time for industry to comply with the standards. Staff expects that most of the time required to comply with the standards will be in redesigning the product labels.

D. BATHROOM AND TILE CLEANERS

Product Description: Bathroom and tile cleaners are defined in the regulation as cleaners specifically for the bathroom. Included are both all-purpose bathroom cleaners and hard surface bathroom cleaners.

Product Forms: Bathroom and tile cleaners are available in aerosol, liquid, pump spray and solid form. Collectively these products contribute

0.45 tons per day VOC emissions to the atmosphere. Table 8 below breaks down the percentage of emissions from each product form.

TABLE 8
Bathroom and Tile Cleaners Emission Summary*
(Total Emissions 0.45 T/D)

<u>Product Form</u>	<u>Percent of Market</u>	<u>Emissions (T/D)</u>	<u>Percent of Emissions</u>
Aerosol	37	0.29	65
Liquid	48	0.13	28
Pumps	13	0.01	2
Solids	2	0.02	5

* Numbers may not add up to 100% due to rounding.

Aerosol product forms such as foaming bathroom cleaners account for about 37 percent of the market, yet they contribute about 65% of the emissions from the bathroom and tile category. Liquid products including toilet bowl cleaners and liquid abrasives account for the majority of the market and about 28% of the VOC emissions from this category. Products available in pump or trigger spray forms, such as mold and mildew cleaners, contribute only about 2% of the emissions from the category due to low VOC content. Solid bathroom and tile cleaners make up a small segment of the market comprising about 2 percent of the market.

Product Content Formulation: The bathroom and tile cleaner category contains a wide spectrum of products including cleaners containing sodium hypochlorite (bleach) for mold and mildew stains, acidic formulations to remove stains and scale from water hardness, abrasive formulations for hard surfaces and disinfectant cleaners. Many of these products also contain surfactants and solvents for general cleaning.

Product Use: Bathroom and tile cleaners are used on tile, porcelain, and other hard surfaces on toilet fixtures, sinks, tubs and shower stalls. Aerosol and pump spray products are generally sprayed on, wiped, and rinsed away. Liquid products may be applied directly or wiped on. Solid products may include cleaning blocks that are placed in toilet tanks and abrasive powders that are rubbed on.

Manufacturing Process: Most bathroom and tile cleaners with liquid ingredients are produced by transferring the ingredients in bulk to stainless steel vessels for mixing operations. In most cases, the ingredients are purchased from chemical companies, although some large companies may produce some of their own ingredients. Solid or granular

products are produced by various specialized processes. The final product is generally introduced into the container on an automated filling line. Propellants are added to aerosol products after the product "concentrate" is added to the container.

Health and Safety Concerns: Health and safety concerns include accidental ingestion by infants, inhalation of aerosol or pump spray product ingredients, and eye and skin irritation. These concerns are especially important with highly acidic or caustic products, products with strong solvents, and disinfectant cleaners.

A specific safety concern whenever cleaning products are used is the possibility of forming toxic chlorine gas when products containing chlorine bleach come in contact with acidic products or products containing ammonia.

Recommended VOC Standard: The proposed VOC standard for bathroom and tile cleaners in all forms is 5 percent. According to the ARB consumer products survey, the average VOC content of bathroom and tile cleaners is about 3%. The sales-weighted average VOC content of liquid and pump spray bathroom and tile cleaners is well below the proposed 5% limit. According to the ARB survey, aerosol and solid forms both have sales-weighted average VOC contents of about 6%, just above the proposed limit. Table 9 summarizes the standard for bathroom and tile cleaners.

TABLE 9

Bathroom and Tile Cleaners Standard Summary

<u>Product Form</u>	<u>Proposed Standard (% VOC)</u>	<u>Number of Complying Products</u>	<u>Percent of Market Complying</u>	<u>Emission Reduction T/D</u>
Aerosol	5	5	7	0.05
Liquid	5	35	88	0.05
Pump spray	5	4	98	~ 0
Solid	5	0	0	0.01

Compliance with the Standard: The primary method of complying with the regulation is expected to be replacement of VOC solvents with water and other exempt VOCs. In some cases, this may require other adjustments in the formulation. Also, the innovative products exemption may provide a means for the development of low emitting products that cannot meet the VOC standard.

E. ENGINE DEGREASER

Product Description: Engine degreasers are specialty cleaning products designed to remove grease, grime, oil and other contaminants from the external surfaces of engines and other mechanical parts.

Product Forms: Engine degreasers are manufactured and marketed only in the aerosol form, thus, emissions in this category come from the use of the aerosol sprays and account for 100 percent of the total market and 100 percent of the total emissions. Based on the ARB VOC Survey, VOC emissions from engine degreasers were 4.5 tons per day. The survey may not have reached all companies, therefore, the emissions may be underestimated.

Product Content Formulation: Engine degreasers contain VOCs which are used as propellants and as solvents to dissolve the contaminants before they are rinsed away. Based on the survey, the VOC content ranges from 23 to 95 percent by weight with most being above 80 percent. Engine degreasers may contain 1,1,1 trichloroethane, kerosene, petroleum distillates, xylene, water, chlorodifluoromethane (HCFC 22), butane, propane, detergents, and surfactants. The amount of propellant may be as high as 25 percent. Some products use non-hydrocarbon propellants such as carbon dioxide.

The 1,1,1 trichloroethane, kerosene, xylene, and other petroleum distillates are solvents that are used to remove the grease, dirt, and other contaminants. HCFC 22, butane, propane, and carbon dioxide are propellants used to expel the ingredients from the container. The detergents are used as cleansing agents and the surfactants help to emulsify the grease and grime and prevent redeposition of the contaminants.

Product Use: Depending on the product, the spray is applied on either hot or cold engines, and may be foamy. A 10 to 15 minute waiting period is required to allow the degreasing components to penetrate the contaminants. The contaminants are rinsed off with a water jet or hose. The engine is then started and allowed to idle for 10 to 15 minutes to assure drying. The process may be repeated if the engine is especially dirty. Engine degreasers are most commonly used on motor vehicles in a household or commercial fleet setting. Other cleaning uses include driveway and garage oil spots, charcoal grills, lawn mowers, marine engines and boats, industrial machinery, and other items that collect oil, grease and dirt.

Manufacturing Process: Generally, each ingredient is weighed and added into a large vat. After the solution is thoroughly mixed, it is injected into aerosol containers by either of two processes, "under the cap" or "through the nozzle".

Health and Safety Concerns: Current formulations contain petroleum distillates and aromatic solvents which are highly flammable. Many of these products need to be kept away from heat and direct sunlight and are to be used in well ventilated areas. In addition, prolonged contact with the skin should be avoided. There are some engine degreasers that are water-based which would reduce the flammability and health hazards.

Recommended VOC Standard: The recommended VOC standard for engine degreasers is 75 percent beginning in 1/1/93. At least four products listed in the survey can meet the 75 percent limit. These products make up 2 percent of the current market. Staff's contact with industry representatives indicate that water-based formulations are currently on the market which can meet the proposed limit. The estimated emission reductions

are 0.93 tons per day in 1993. A future effective standard of 50% VOC is also being proposed for 1/1/96. At this VOC content level there are at least 3 products currently available that can meet the standard. Manufacturers who do not have products that can meet the 50% limit have almost 6 years to develop and market a lower VOC engine degreaser. This future effective standard will achieve an additional 1.2 T/D emission reduction by 1996.

Compliance with the Standard: Information received by ARB staff indicate that reformulation to water-based products and the reduction or elimination of propellants is possible within the timeframe proposed in the regulation. The market share for complying products may increase as compensation for a decrease in the market share for non-complying products. Subsequently, noncomplying products may be reformulated and re-enter the market as complying products. In some of the products the VOC propellants have been replaced by compressed gases such as carbon dioxide. Alternative packaging such as hand pumps and the Airspray system are also available because a fine spray is not needed for a great majority of the cleaning jobs. In addition, there are a number of all purpose cleaners on the market which contain significantly lower amounts of VOC which may perform as well or better than the aerosol sprays. Furthermore, steam cleaning an engine is still possible. This method was the most widely used method before aerosol engine degreasers were marketed. This alternative is still available at a reasonable cost and eliminates the need for aerosol engine degreasers thereby eliminating VOC emissions.

F. FLOOR POLISH (WAX)

Product Description: Floor waxes and polishes are defined in the regulation as waxes, polishes, finish restorers or any other products for the purpose of polishing, protecting or enhancing the surfaces of floors. Excluded are products only for the purpose of cleaning floors, sealants for unfinished wood floors or other products falling under district architectural coating rules, and industrial spray buff products.

The vast majority of floor waxes and polishes are used on flexible flooring materials such as vinyl and vinyl composite. These products include both "dry bright" products used mainly in households and products that must be buffed with a buffing machine. Products requiring buffing are typically used on flooring in institutions and business with heavy traffic such as supermarkets, department stores and hospitals.

A small number of floor products are available for nonresilient flooring such as marble and for wood floors.

Product Forms: Emissions from the floor polish category total 2.6 tons per day. According to the ARB consumer products survey, about 99% of the market is made up of products for use on nonwood surfaces, primarily on flexible flooring materials. These products contribute about 82% of the emissions from the floor wax/polish category. Product for use on nonwood floors are primarily liquids although a few aerosol products are available.

Liquids, solids, and other forms for use on wood floors make up less than 2% of the market, but contribute about 18% of the emissions due to high VOC content.

Emissions estimates for wood and nonwood (flexible flooring material and nonresilient flooring) products were based on product descriptions and VOC content information in the ARB survey. Products with VOC contents in the 80 to 100% range were assumed to be solvent based products for wood floors. No information was available to determine the emissions from nonresilient flooring. Therefore it was assumed that 10% of the emissions and emission reductions from nonwood floor products was contributed by product for nonresilient flooring, the remaining 90% from products for flexible flooring. Table 10 below summarizes the standards for the floor polish subcategories.

TABLE 10
Floor Polish Emission Summary
(Total Emissions 2.60 T/D)

<u>Product Form</u>	<u>Percent of Market</u>	<u>Emissions (T/D)</u>	<u>Percent Emissions</u>
Products for Flexible Flooring	89	1.9	74
Products for Nonresilient Flooring	10	0.2	8
Wood Floor Wax	1	0.5	18

Product Content Formulation: The majority of floor polishes are water based products designed for vinyl or other flexible flooring. These products contain primarily water with various polymers or waxes that form the final hard surface layer. A number of other ingredients are typically included such as solvent coalescing agents, plasticizers, defoaming agents, and preservatives. Floor polishes and waxes for nonresilient flooring such as marble, ceramic tile and terrazzo usually have similar formulations with a slightly higher solvent content. Wood floor waxes are solvent based formulations containing waxes and solvents such as mineral spirits.

Product Use: The product typically used by the consumer is the "dry bright" type emulsion. This product is simply applied with a mop to a clean floor and allowed to dry. Commercial and institutional products designed

for high traffic areas usually require buffing with a special buffing machine that produces a hard, shiny surface.

Manufacturing Process: The manufacture of liquid floor polishes/waxes includes mixing and homogenization of the water, polymers, waxes, and other product ingredients in a stainless steel vessel. Homogenization is a process by which the solids in the product are broken down into fine particles that do not separate out from the liquid ingredients, creating a stable emulsion. The final product is packaged on an automated filling line.

Health and Safety Concerns: Little health risk has been identified in association with floor polishes or waxes. As with all consumer products, ingestion by infants is a potential hazard.

Recommended VOC Standard: Three limits have been established for floor polish/wax, a 7% VOC limit for products used on flexible flooring, a 10% limit for products used on nonresilient flooring and a 90% limit for wood floor waxes.

Floor polishes for flexible flooring such as vinyl make up the vast majority of the floor polish category. These products are almost entirely liquids with an average sales-weighted VOC content of about 5% according to the ARB survey. Aerosol floor polishes which make up only about 3% of the floor polish market, have an average VOC content of about 10%. We have not been able to locate any manufacturer of aerosol floor polishes.

The 7% standard was based on the 5% average VOC content in the ARB survey with some allowance for new technology polymers such as the replacements for the conventional zinc cross-linked polymers. According to information from Rohm and Haas, S.C. Johnson and others, the new technology polymers often require slightly higher concentrations of solvent coalescing agents, but have greater durability, allowing longer periods between recoating.

Floor polishes for nonresilient flooring make up a minor segment of the market. According to industry contacts, a higher VOC limit is necessary for waxes and polishes used on sealed wood floors and nonresilient flooring such as brick, marble, ceramic tile, and concrete. Based on discussion with industry, a limit of 10% has been set for waxes/polishes used on these surfaces.

A limit of 90% has been set for wood floor waxes. These products are currently in the 80% to 100% VOC range. These products make up less than 2% of the floor polish/wax market. According to industry, these high VOC products are used exclusively on wood floors. According to discussions with industry, these products are especially important for use on unsealed or poorly sealed wood floors which may be damaged by water based products. There are currently architectural coating regulations in California that have a VOC content limit of 350 grams per liter for general sealers. This may indicate the possibility of lower VOC wood floor waxes in the future.

However, we are not aware of any technology at the present time. Table 11 below summarizes the proposed standards and emission reductions.

TABLE 11
Floor Polishes Standard Summary

<u>Product Form</u>	<u>Proposed Standard (% VOC)</u>	<u>Number of Complying Products</u>	<u>Percent of Market Complying</u>	<u>Emission Reduction T/D</u>
Products for Flexible Flooring	7	115	78	940*
Products for Nonresilient Flooring	10	**	**	100*
Wood Floor Wax	90	5	100	- 0

* Emission reduction data was not available for nonresilient floor products. It was assumed that these products made up 10% of the emission reduction from the nonwood floor products.

** Data not available.

Compliance with the Standard: The primary method of complying with the regulation is expected to be replacement of VOC solvents with water, exempt VOCs, and/or increasing the solids content. In some cases, this may require other adjustments in the formulation.

G. FURNITURE MAINTENANCE PRODUCTS

Product Description: Furniture maintenance products (FMP's) are defined in the proposed regulation as waxes, polishes, conditioners, moisturizers and other products designed for the purpose of polishing, protecting or enhancing finished wood surfaces. Excluded from the definition are floor polishes and waxes, which are covered separately by the regulation, and products only for the purpose of cleaning.

Dusting aids make up a category of products similar to FMP's. Dusting aids are most often aerosol sprays that are applied to dust rags or floor dusting mops to aid in the removal of dust. A VOC standard has not yet been set for these products, however a standard may be established during the next update of the regulation.

Product Forms: Furniture maintenance products are available as aerosols, liquids, pump sprays, and in paste form. Collectively, these products contribute 2.8 tons per day VOC emissions. Table 12 breaks down the market share and emissions from each product form.

TABLE 12

Furniture Maintenance Products Emission Summary*
(Total Emissions 2.80 T/D)

<u>Product Form</u>	<u>Percent of Market</u>	<u>Emissions</u>	<u>Percent of Emissions</u>
Aerosol	72	2.44	87
Solid/Paste	2	0.14	5
All other forms**	26	0.22	8

* Numbers include dusting aid products. These products could not easily be separated from the other FMP's in the survey. Therefore, numbers may be slightly off.

** Products under the "All other forms" category consist primarily of liquid and pump spray products.

Aerosol spray products make up the majority of the market at about 72% and contribute about 87% of the emissions from the category. The "All other forms" category is made up primarily of liquids and pump spray products. These products make up an estimated 26% of the market. Due to low VOC content, these products contribute only about 8% of the emissions from the category. The solid or paste products make up only about 2% of the market and contribute about 5% of the emissions from the category.

Product Content Formulation: The liquid contents of aerosol FMP's are typically in two phases. One phase contains the solvents, liquified propellants (which also act as solvents), oils, waxes and silicones, while the other phase contains primarily water. The two phase products are shaken before use, producing an emulsion which is sprayed. The VOC content of aerosol FMP's is contributed by the solvents and propellants (in both gas and liquid form) such as propane and butanes. A small amount of fragrance and other agents may also contribute slightly to the VOC content. According to the ARB consumer products survey, the sales weighted average VOC content for aerosol products is about 27%.

Paste furniture maintenance products hold only about a 1% share of the market according the ARB consumer products survey. These solvent based products contain waxes, with the balance consisting of solvents such as mineral spirits. The average VOC content of these products is 87% based on ARB survey.

Liquid and pump spray products make up the "all other forms" subcategory in the regulation. These products are generally much lower in VOC content than their aerosol and paste counterparts. The ARB is aware of liquid and pump formulations in the 5% VOC range. According to the ARB consumer products survey, the sales weighted average VOC content is 5.6% for liquids and 7.3% for pump sprays.

Product Use: Furniture maintenance products are applied to finished wood surfaces such as furniture, paneling, wood trim and cabinetry. Most aerosol and pump spray products are described as waxes or polishes and are designed to leave a shiny protective coating on wood. Liquid products are more often oil based products described as preservatives or moisturizers. Solid (paste) forms are rubbed onto the furniture surface, then wiped off after the paste dries. Some products are designed to perform more than one function. For instance, one product available in aerosol and liquid form is described as a wood cleaner and preservative. Dusting sprays are used to aid the removal of dust. These products also clean wood surfaces.

Furniture maintenance products are emulsions that are either sprayed on the wood surface or applied with a cloth or pad. The product is then rubbed into the wood surface. During the wiping process the water phase is absorbed by the cloth while the solvent/wax/polish phase remains on the wood surface. The solvents eventually evaporate, leaving the wax/polish layer.

Manufacturing Process: The manufacture of liquid furniture maintenance products involves the mixing of the water, silicones, waxes, and other product ingredients in a stainless steel vessel. The final product is packaged on an automated filling line. Propellants are added to aerosol products during filling.

Health and Safety Concerns: Little health risk has been identified in association with furniture maintenance products. As with all consumer products, ingestion by infants is a potential hazard.

Recommended VOC Standard: Volatile organic compound content limits have been set for two furniture maintenance product categories: aerosols and all other forms (liquids and pumps). Solid/paste products make up a very small niche of the market preferred by some consumers. These solvent based, high VOC forms have been exempted from the all other forms category.

The average VOC content for aerosol FMP's based on the ARB survey is 27%. A 25% limit was proposed by CSMA for this category with the exception of dusting aids. Based on this information, the limit was set at 25% for aerosol FMP's excluding dusting aids. The 7% limit for all other forms covers liquid and pump spray products. The limit is based on the sales-weighted average VOC content of about 7% according to the ARB survey. Both limits are designed to require reformulation of the higher VOC products in

each category. Table 13 below summarizes the proposed standards for the furniture maintenance products subcategories.

TABLE 13

Furniture Maintenance Products Standard Summary*

<u>Product Form</u>	<u>Proposed Standard (% VOC)</u>	<u>Number of Complying Products</u>	<u>Percent of Market Complying</u>	<u>Emission Reduction T/D</u>
Aerosol	25	22	21	0.41
All other forms**	7	16	70	0.12

* Numbers include dusting aids although this product is exempt. Emission reduction figures may be slightly high.

** Products under the "all other forms" category consist primarily of liquids and pump sprays. This does not include paste wax.

Compliance with the Standard: The primary method of complying with the standards is expected to be replacement of VOC solvents with water, exempt VOCs, and/or increasing the solids content. In some cases, this may require other adjustments in the formulation. The innovative products exemption may provide a means for higher VOC products to comply with the regulation.

H. GENERAL PURPOSE CLEANERS

Product Description: General purpose cleaners have been defined in the proposed regulation as formulations designed for general, all-purpose cleaning. Specialty cleaning products for use in specific situations are not included in this category. Also excluded from the category are bathroom and tile cleaners which are regulated under a separate category.

Product Forms: The general purpose cleaner category covers a wide variety of products. These products may be categorized as liquids, aerosols, pump sprays, dissolvable powders and abrasive products such as scouring powders, creams and pads. These products contribute about 4.9 tons per day VOC emissions to the atmosphere. Market share and emissions information for each product form are provided below in Table 13. Liquid products make up the majority of the market at nearly 60% and contribute 93% of the emissions from this category. Solid products, primarily powders, make up over 40% of the market but contribute only about 4% of the emissions from the category due to low VOC content. Aerosol products make up less than one percent of the market, but contribute about 5% of the emissions

from general purpose cleaners. Table 14 is a summary of the proposed standards and emissions for general purpose cleaners.

TABLE 14
General Purpose Cleaner Emissions Summary*
(Total Emissions 4.90 T/D)

<u>Product Form</u>	<u>Percent of Market</u>	<u>Emissions (T/D)</u>	<u>Percent of Emissions</u>
Aerosol	< 1	0.03	3
Liquid/Pump	59	2.87	93
Solids	41	2.0	4

* Numbers may not add up to 100% due to rounding.

Product Content Formulation: Typical cleaning agents used in general purpose cleaners may be categorized as alkaline materials, surfactants, solvents and abrasives. Alkaline materials such as alkaline salts or builders perform many functions in cleaning formulations. They increase the efficiency of surfactants, prevent water hardness from combining with soils, help disperse and suspend dirt, saponify fatty or oily soils, maintain a desirable alkalinity, and aid in the removal of microorganisms. Surfactants (surface active agents) or soaps are used to lower water's surface tension, allowing cleaning solutions to penetrate soil more quickly. Surfactants also aid in the removal of soils, both fatty and particulate, and help keep them suspended so that settling back on the surface is minimized. Solvents such as glycol ether and pine oil are often included in formulations to dissolve greasy or oily matter. Water is the most widely used solvent. Abrasives are generally composed of small particles used to smooth, scour, rub, and clean surfaces by mechanical action.

From the ARB consumer products survey, the average VOC content of all forms of general purpose cleaners is about 3%. The sales-weighted average VOC content for liquids, pumps, and solids is 4.0%, 5.6% and 0.2%, respectively. The average VOC content for aerosols is 18%. However, aerosols make up less than 1% of the market based on the ARB survey.

The VOC content of general purpose cleaners is made up primarily by nonwater solvents such as petroleum distillates, pine oil and alcohols. Other agents such as fragrance may also add to the VOC content. At least one product contains a significant level of VOC due to an inorganic acid. While most products contain VOC levels below 10%, some products such as some pine oil cleaners contain higher VOC levels.

Product Use: As the definition suggests, general purpose cleaners are used for general, all-purpose cleaning as opposed to specialty applications. Liquid products are used either "straight" or diluted. These products are applied to many different surfaces, but especially to floors or other large surfaces with a mop, sponge or rag. Some scrubbing is usually required for the product to be effective. Rinsing may or may not be required after the use of these products.

Pump sprays are used without dilution on countertops, appliances and other small surfaces. Generally, the product is sprayed onto the soiled surface and wiped up with a rag or sponge. Few aerosol general purpose cleaners are on the market.

Solid cleaners include dissolvable powders and abrasive cleaners. Powdered cleaners designed to be dissolved in water are usually applied to large surfaces such as floors. Abrasive cleaners are used on a wide variety of scratch resistant hard surfaces such as ceramic tile, bathroom fixtures, kitchen countertops, and some metal surfaces. Most abrasives are in powder form although pads made of soap-impregnated steel wool and other materials are also available. Abrasives generally require more rubbing than other cleaners since they work primarily by physical means. However, some abrasives do contain surfactants or other cleaning agents.

Manufacturing Process: Most general purpose cleaners with liquid ingredients are produced by transferring the ingredients in bulk to stainless steel vessels for mixing operations. In most cases, the ingredients are purchased from chemical companies, although some large companies may produce some of their own ingredients. Solid or powder products are produced by various specialized processes. The final product is generally introduced into the container on an automated filling line. Propellants are added to aerosol products after the product "concentrate" is added to the container.

Health and Safety Concerns: Health and safety concerns include accidental ingestion by infants, inhalation of aerosol or pump spray product ingredients, and eye and skin irritation. These concerns are especially important with highly acidic or caustic products, products with strong solvents, and disinfectant cleaners.

A specific safety concern is the possibility of forming toxic chlorine gas when products containing chlorine bleach come in contact with acidic products or products containing ammonia. Many products have warning labels instructing consumers not to mix these products.

Recommended VOC Standard: The proposed 10% VOC level is currently met by most general purpose cleaning products. The sales-weighted average VOC content levels for the liquid/pump and solid general purpose categories are 6% and 0.36%, well below the standard. These product forms make up almost the entire general purpose category. Aerosol cleaning products have a sales-weighted average VOC content of 18%. However, these products make up less than 1% of the market. Also, half of the aerosol general purpose cleaners currently comply with the 10% standard. The 10% standard was set

based on the survey information and CSMA's proposal of a 10% limit. The standard is intended to require reformulation of some of the higher VOC cleaning products. Table 15 summarizes the proposed standards and emission reductions.

TABLE 15

General Purpose Cleaners Standard Summary

<u>Product Form</u>	<u>Proposed Standard (% VOC)</u>	<u>Number of Complying Products</u>	<u>Percent of Market Complying</u>	<u>Emission Reduction T/D</u>
Aerosol	10	13	20	0.07
Liquid/Pump	10	139	86	1.6
Solid	10	8	~100	- 0

Compliance with the Standard: The primary method of complying with the standard is expected to be replacement of VOC solvents with water or other exempt solvents. In some cases, this may require other adjustments in the formulation. Also, the innovative products exemption may provide a means for the development of complying products that cannot meet the VOC standard.

I. GLASS CLEANERS

Product Description: Glass cleaners are any specialty cleaning product designed primarily for cleaning surfaces made of glass.

Product Forms: Product forms include aerosol and liquid/pump spray, with market shares of 6% and 94%, respectively. There is also a relatively new product available which consists of cloth wipes impregnated with glass cleaner. Table 16 is a summary of the proposed standards and emissions.

TABLE 16

Glass Cleaners Emission Summary
(Total Emissions 2.3 T/D)

<u>Product Form</u>	<u>Percent of Market</u>	<u>Emissions (T/D)</u>	<u>Percent of Emissions</u>
Aerosol Sprays	6	0.3	12
Liquid/Pumps	94	2.0	88

Total emissions from the product category are 2.3 tons per day. Emissions from the respective product forms are 0.3 tons per day for aerosols and 2.0 tons per day for liquid/pumps. The emissions for liquid/pumps include concentrated products, representing approximately 2% of the liquid/pumps surveyed. No allowance was made for dilution when reporting the VOC content for the survey, however, the sales-weighted average VOC content for this product form was essentially unaffected by this due to the small portion represented by concentrates.

Product Content Formulation: The sales-weighted average VOC product content for aerosols is 13% and 6% for liquid/pumps. The typical combined VOC content for fragrance and colorant is less than 0.1%. Glass cleaners typically do not use fragrance, since the unmasked ammonia odor of the product is associated by the consumer with cleanliness. Blue and green dyes are often used, for color.

Glass cleaners typically have a high water content, with short carbon chain alcohols such as isopropyl alcohol or ethyl alcohol used to dissolve oily soils, and surfactants to loosen soil. Mild alkalies such as ammonia are sometimes added as a cleaning booster. There are also acid-based formulations containing vinegar as the cleaning agent, which is not as efficacious as ammonia, and therefore has a higher solvent (VOC) content to boost the efficacy. The propellant in the aerosol form is typically an isobutane/propane mixture, and mixes with the product to produce a foam. The propellant comprises 3% to 7% of the total VOC content in the product. For concentrated liquid glass cleaners, dilution ratios (product to water) are usually 1:2 or 1:6.

Product Use: The primary use is in the household, with some institutional and commercial use. The specific market shares for these are not currently known. The product can be applied by aerosol, pump, or hand wiping, and is then wiped off. Advantages of the aerosol form include better visibility of the product on the glass, so the consumer can more easily see what remains to be wiped off, and better adhesion of the product to the glass due to the foam produced by the propellant. There are also claims that it takes a lesser amount of an aerosol form than a pump form to clean the same surface area of glass.

Manufacturing Process: The product is made using a "wet blending" process, with no heat used. The product is blended in large mixing tanks, adding the ingredients in specific order, letting them dissolve, and then mixing them together. No production changes are foreseen due to the effect of the regulation.

Health and Safety Concerns: The alcohols contained in glass cleaners are irritants to the skin and eyes. If using the product with prolonged exposure, wear gloves, and if handling in large quantities, wear goggles.

Recommended VOC Standard: The current proposed standard being recommended for this category is 6%. This standard was selected based on the VOC survey data submitted by industry and chosen such that complying products in both the aerosol and liquid/pump forms would be available, yet

still achieve emission reductions. Industry had requested a 10% standard, stating that the 6% standard would essentially ban the aerosol form, however, the 6% standard will in fact allow all product forms to remain on the market. Estimated emissions reductions for glass cleaners, based on this standard, are 0.61 tons per day. Table 17 is a summary of the proposed standards and emission reductions.

TABLE 17

Glass Cleaners Standard Summary

<u>Product Form</u>	<u>Proposed Standard (% VOC)</u>	<u>Number of Complying Products</u>	<u>Percent of Market Complying</u>	<u>Emission Reduction T/D</u>
Aerosol Sprays	6	6	8	0.15
Liquid/Pumps	6	26	73	0.46

Compliance with the Standard: Compliance can possibly be achieved through lowering the alcohol (solvent) content and modifying the surfactant. To avoid streaking problems, other changes to the formulations, such as the type of surfactant may need to be made.

J. HAIRSPRAY

Product Description: Hairsprays are consumer products designed primarily for dispensing droplets of resin (film forming polymer) on and into the hair coiffure (hair style) to enable users keep their hair in position for a period of time, unaffected by the weather and atmospheric humidity.

The key ingredient in all hairsprays is the resin. The holding of the hair is carried out by a spot welding of one hair to another. When the product is sprayed on the hair, it collides in the form of droplets. The volatile nature of the droplet allows it to dry rapidly, and create an invisible bond to the hair and its neighbor. Hence, the resin must have good adherent strength. Its adhesive quality must be such that it can be readily removed by shampooing, i.e., water soluble.

Product Forms: Hairspray products are packaged in aerosol or pump form. The market shares for aerosol and pumps are 74 percent and 26 percent respectively. The current estimate for emissions from aerosol and pump hairspray products is 46 Tons/Day. Aerosol hairspray emissions are 36.8 Tons/Day and pump hairspray emissions are 9.2 Tons/Day. Table 18 summarizes the emissions from the various product forms.

TABLE 18

Hairspray Emissions Summary
(Total Emissions 46.0 T/D)

<u>Product Form</u>	<u>Percent of Market</u>	<u>Emissions (T/D)</u>	<u>Percent of Emissions</u>
Aerosol	74	36.8	80
Pump	26	9.2	20

Product Content Formulation: The sales weighted average VOC content for hairspray formulations currently available is 94% for aerosols and 70% for pumps. (Heiden Associates)

The key ingredients in hairspray formulations are: resins, solvents, propellants (aerosol only), neutralizers, co-solvents, plasticizers and other additives.

The active ingredient in all hairspray formulations, which holds the shape of the hair, is the resin (film forming polymer). There are many resins employed in today's hairspray formulations including polyvinylpyrrolidone (PVP), methyl vinyl ether-maleic anhydride copolymer (PVM-MA), polyvinylpyrrolidinone-co-vinyl acetate (PVP-VA), Gantres ES resins, Amphomer and Resyn 28-1310 & 28-2930. Since most hair fixative resins contain carboxyl groups, neutralizers are a major component in hairspray formulations. The neutralizer acts to adjust the solubility of the resin in both the alcohol vehicle and for shampoo removal. Some examples of neutralizers are: morpholine, 2-amino-2-methyl-1-propanol (AMP), 2-amino-2-ethyl 3-propanediol (AEPD).

Solvents are used to carry the film (resin) onto the hair, and then evaporate to leave the film behind. Ethanol is used exclusively in the United States as the major solvent in hairspray formulations. Other solvents include: isopropyl alcohol, propylene glycol, glycol ethers and water.

Aerosol hairsprays contain propellant. The purpose of the propellant is to deliver the active ingredients to the hair. Today's propellants are generally a blend of butane and propane. The most common blend is an 80/20 mix of isobutane and propane. Another propellant that has found wide acceptance in the European hair care market is dimethyl ether (DME). DME can be used in formulating water-based hairsprays, which are becoming increasingly popular. The solubility of hydrocarbon propellants in a hydroalcoholic system limits the amount of water that can be used, but DME shows very good solubility in water and alcohol.

Co-solvents many uses include: reducing the flammability rating of the product, reduce the vapor pressure of the propellant or reduce the cost in some formulations. Examples of co-solvents are: dimethyl ether (DME), methylene chloride and water. Because of toxicity concerns, the FDA has

prohibited the use of methylene chloride in hairsprays. This ban became effective August 28, 1989.

Plasticizers are added to modify hardness and the degree of flexibility of the resin film. Some commonly used plasticizers are: dimethyl phthalate, diethyl phthalate and acetyl triethyl citrate.

Other additives used such as silicones, lanolin derivatives, various oils, and protein hydrolyzates improve appearance or feel, ease of combing, rewetting properties, water sensitivity and ease of removal.

Product Use: Hairsprays are for personal use, although they are also used in commercial establishments such as hair styling salons. The primary reason for using hairspray is to enable users to maintain a desired hair style for a period of time. It can be applied by aerosol or pump form directly to the hair coiffure.

There are different formulations for hairspray users. The types range from soft to hard to hold formulas. The degree of hold is controlled by the amount of resin present in the formula. The resin employed and its level, together with the propellant ratio (if aerosol), solvent, valve design and other additives determine the performance of the hairspray, and the properties it confers to the hair.

A test used by manufacturers to determine the ability of a hairspray formulation to "hold" a curl is determined by a curl retention test. This test evaluates the ability of a formulation to hold a curl under conditions of high humidity. This procedure uses hair swatches of a consistent length and weight which are rinsed with water, uniformly curled on mandrels and dried. The curls are removed from the mandrels and treated with a formulation. Swatches are then suspended by clamps on vertical, graduated boards which are placed in a humidity chamber maintained at constant temperature and humidity. Periodic curl length measurements are then recorded and percent curl retention values are calculated. Curl retention charts give a graphic representation of the percentage of curl retention versus time in hours. There is no standard procedure for curl retention tests, so procedures will vary. Curl retention tests are one method of measuring product efficacy. The swatches are also evaluated in the areas of stiffness, compatibility, flaking, gloss and static charging.

Manufacturing Process: Manufacturing processes vary, but usually involve a mixing process while adding the various contents.

Health and Safety Concerns: The solvents, propellants and other ingredients contained in hair spray are skin and eye irritants. Inhalation of hairspray particles are of concern. A particle less than ten microns in diameter is respirable. The percentage of particles which are smaller than five microns varies in each product. Pump sprays can have droplets as small as aerosols, but the proportion of particles may be less. Some individuals who have been repeatedly exposed to hairspray have developed respiratory ailments. It is recommended to use hairspray products in well ventilated areas.

Recommended VOC Standard: The standard being recommended for this category is 80 percent VOC content by weight for aerosols and pumps. Based on ARB product surveys and industry contacts, an 80 percent VOC content by weight is commercially and technologically feasible. There are at least 666 hairspray formulations currently available on the market (pump & aerosol) that have VOC contents below the recommended standard, but these represent a small percent of the hairspray market. The total estimated emission reductions for aerosols and pumps with an 80 percent VOC content by weight is 7.2 Tons/Day. In addition, a future effective standard of 55% VOC is being proposed for January 1, 1998. According to the ARB VOC survey, there are at least 30 hairspray formulations that are currently available that can meet this future standard. This future effective standard will result in an additional 12 T/D emissions reduction by 1998. A summary of the proposed standard and the complying products is presented in Table 19 below.

TABLE 19
Hairspray Standards Summary

<u>Product Form</u>	<u>Proposed Standard (% VOC)</u>	<u>Number of Complying Products</u>	<u>Percent of Market Complying</u>	<u>Emission Reduction T/D</u>
Aerosol	80	25	2	6.4
Pump	80	41	32	0.8
Aerosol (1998)	55	6	< 1	9.6*
Pump (1998)	55	24	24	2.5*

* Represents additional emission reductions in 1998.

Compliance With The Standard: Information received by the ARB staff indicate that compliance with the recommended standard is feasible within the time frame proposed in the regulation. The 80% VOC content has been suggested by industry as a feasible limit providing the innovative product provision is contained in the regulation. Compliance with the standard could be achieved through product reformulation or through modifications to the hairspry product that would allow for an innovative product exemption. The May, 1990 issue of Aerosol Age, has aerosol hair spray formulations that have water content levels ranging from 30 to 68 percent. Increasing the water content in the formulation and using DME (Dimethyl ether) as a propellant may be one method of complying with the standard. The major advantage of using DME is its high degree of water solvency. This permits the formation of aqueous single phase solutions, which are difficult to achieve with other propellant systems. In containers constructed of tin-plated steel, a corrosion inhibitor and removal of the air from the aerosols headspace may be required in aerosols that have a high water content. Many pump sprays are constructed of plastic, and this may be one way of avoiding container corrosion. Other alternatives include: compressed gases

(nitrogen, carbon dioxide & nitrous oxide), self generating carbon dioxide can and elasticized bag in the can. Valve design will also play an important role in the reformulation of aerosol and pump hairspray products. Increasing transfer efficiency through valve design will decrease overspray, and deliver more product to its intended target (less product is wasted).

Current market trends would seem to indicate that in the 1990's there will be greater use of styling products, and a change in the way we use hair care products. Communication with industry representatives have revealed that perms are dying out with the younger generation, and styling products are becoming more important. Styling will be done using liquid styling products, as opposed to blow dryers. Consumers are starting to use a mix of products and they prefer the softer not the stiff or crisp look. There will likely be more styling gels and fewer finishing sprays. One industry representative feels the move will be toward hydroalcoholic systems first, with lower and lower levels of alcohol, eventually getting, with advances in technology, to water-based products.

The staff is proposing a 55% VOC future effective standard for hairsprays with a compliance date of January 1, 1998. Information received by the ARB staff indicate that technology is already being developed to comply with the future limit. Also, information supplied by the survey indicates that there are 6 aerosol and 24 pump hairsprays currently on the market that can comply with the 55% standard. One product recently introduced to the California market has a VOC content below 40 percent. This product utilizes a water based resin and dimethyl ether propellant. Also, in the May and August 1990 issues of Aerosol Age, an industry trade journal, several hairspray formulations were listed with VOC contents ranging from 32% to 70% VOC. The accompanying descriptions for one of the formulations stated that the new resin allows tack free drying even when dispensed from a 100% aqueous solution. It can be used with hydrocarbon or DME propellants, pentane and water.

K. HAIR MOUSSE

Product Description: Hair mousse is a hair styling foam which facilitates styling of a coiffure and provides limited holding power.

Product Forms: Hair mousses are available in aerosol form only. The current estimate for emissions from aerosol hair mousse is 0.6 tons per day.

Product Content Formulation: The sales weighted average VOC content of hair mousse is 11.8 percent. The basic components of the aerosol styling mousse are: solvent, propellant, emulsifier, conditioner and polymer.

The solvent base for these products is water containing a certain amount of alcohol (hydralcoholic). Typical alcohol contents lie in the range of 10-15 percent. The solvent can also be water alone.

The propellant normally used is a propane/isobutane mixture at a level of 5-15 percent. The proportions of the blend must be shifted in favor of the more volatile propane, in order to obtain the lighter, less dense foam.

The emulsifier is one of the most critical materials in the mousse. An emulsifier must insure a good dispersion of propellant in the concentrate and good foam formation with the valve actuation. It must provide initial stability upon application of the foam to the palm of the hand, and collapse when worked into the hair.

The incorporation of a conditioner, such as Solulan 16 or Glucams imparts desirable properties to the hair. These ethoxylates contribute to wet and dry comb, luster and feel, reduce flyaway and enhance foam stability. The Glucam type derivatives are effective additives for moisture retention and foam wetting.

The polymer can be considered the active ingredient in the mousse formulation. The polymer should give the desired hold and yet leave the hair with a soft, natural feel.

Product Use: Hair mousses are for personal use, although they are also used in commercial establishments such as hair styling salons. They provide setting and/or conditioning benefits to the user. One reason for hair mousse popularity is the ease of application.

A hair mousse is applied by first discharging the foam into the palm of the hand an amount indicated by the directions. The stiff foam retains its shape, making measurement easy and fairly precise. The foam is then spread evenly through the towel dried, shampooed hair before combing and styling by any conventional technique (rollers, blow-waving, finger drying, etc.).

One of the main advantages that aerosol mousse offers is that it can be applied on dry or wet hair. It also allows the hair to be re-combed or restyled several times without a repeat application.

Manufacturing Process: Manufacturing processes vary, but usually involve a mixing process while adding the various ingredients prior to filling the aerosol container.

Health and Safety Concerns: The solvents and propellants contained in hair mousses are skin and eye irritants. Since hair mousse is applied as a foam, the risk of inhalation is reduced.

Recommended Standard: The standard being proposed for this category is 16 percent VOC content by weight. Based on ARB product surveys and industry contacts, a 16 percent VOC content by weight is feasible. There are 66 products currently available on the market that meet or exceed the recommended standard. The total estimated emission reductions for hair mousses with a 16 percent VOC content by weight is 0.03 tons per day.

Compliance With Standard: Information received by the ARB staff indicate that compliance with the recommended standard is feasible within

the timeframe proposed. Compliance with the standard could be achieved through product reformulation. Increasing the water content and eliminating the alcohol does have its obvious cost benefits, but may affect the "hold." This, however, could be compensated by increasing the resin level or by modifying the type of resin used.

L. HAIR STYLING GEL

Product Description: Hair styling gel is a high viscosity, (often gelatinous) substance containing a fixative that is applied to the hair to aid in styling and sculpting of the hair coiffure.

Product Forms: Hair styling gels are packaged in pump and liquid/gel form. The estimated emissions from pump and liquid/gel is 0.02 and 0.38 Tons/Day respectively. Table 20 is a summary of the emissions from hair styling gels.

TABLE 20

Hair Styling Gel Emissions Summary
(Total Emissions 0.40 T/D)

<u>Product Form</u>	<u>Percent of Market</u>	<u>Emissions (T/D)</u>	<u>Percent of Emissions</u>
Pump	4	0.02	5
Liquid/gel	96	0.38	95

Product Content Formulation: The sales weighted average VOC content for hair styling pumps and liquid/gels is 15.9% and 10.5% respectively.

A basic hair styling gel contains at least nine ingredients: water, hair fixative polymer, gelling agent, neutralizing base, nonionic surfactant, fragrance, preservative, ultraviolet screen and chelating agent. When the solvency power of the water is insufficient, SD alcohol may be added to the formulation.

The hair fixative polymer is a film forming resin which is soluble in the gel solvent (usually water or dilute aqueous alcohol). The polymer must dry quickly, with no residual tacky feel, to give a cohesive film with adequate adhesion to the hair.

Hair styling gels are almost exclusively thickened by carbomer resins (gelling agent). Carbomer 940 is generally preferred for its rheology and crystal clarity which it confers on the gel product. Other carbomer resins may be used, but they do not offer the same benefits as carbomer 940.

Fragrances used in hair styling gel are oils which are insoluble in water. If these oils are not solubilized in the water, the oil droplets would separate from the continuous gel phase and this would cause the gel to lose clarity. The fragrances may be solubilized by a suitable nonionic surfactant. The amount of surfactant required depends on the formulation.

Methylparaben, propylparaben, DMDM hydantoin, imidazolidinyl urea, quaternium-15, methylchloroisoethiazolinone and methylisothiazolinone are all found as preservatives in commercial hair styling gels.

Carbomers are degraded by ultraviolet light, and in the absence of a UV screen, the gel would progressively lose viscosity upon storage in day light. To prevent the loss of viscosity, an ultraviolet screen is added to the formulation. Trace amounts of transition metal ions, particularly iron, also causes a reduction in viscosity. The chelating agent is added to stabilize the product from viscosity loss.

Product Use: Hair styling gels are for personal use, although they are also used in commercial establishments such as hair styling salons. This product confers hair holding properties and provides some degree of conditioning. The hair styling gel is applied by placing a small amount onto the hand and then massaging it into the hair. The main advantage of hair styling gels is that it allows the user to apply it to wet or dry hair, and it allows the hair to be recombbed or restyled several times.

Manufacturing Process: Manufacturing processes vary, but usually involve a mixing process while adding the various contents.

Recommended VOC Standard: The standard being recommended for this category is 6 percent VOC content by weight for all forms. Based on ARB surveys and industry contacts, the recommended standard is feasible within the timeframe proposed in the regulation. The proposed standard of 6 percent would eliminate current pump forms, but industry contacts have suggested that these forms are really hairspray products that are labeled as gels for marketing purposes. The pump forms are modified hairspray formulations, not as viscous as hair styling gels, and are intended to be used as a hair styling product. There are 58 products in the liquid/gel form currently on the market that meet or exceed the recommended standard. The estimated emission reductions for this category with 6 percent VOC content by weight is 0.28 tons per day. A summary of the proposed standard and the complying products is presented in Table 21 below.

TABLE 21

Hair Styling Gel Summary

<u>Product Form</u>	<u>Proposed Standard (% VOC)</u>	<u>Number of Complying Products</u>	<u>Percent of Market Complying</u>	<u>Emission Reduction T/D</u>
Pump	6	0	0	0.01
Liquid/gel	6	58	73	0.26

Compliance With The Standard: Information received by the ARB staff indicate that compliance with the standard is feasible within the timeframe proposed in the regulation. Compliance could be achieved through product reformulation. Increasing the water content or using other exempt VOCs in the formulation may be one method of complying with the standard. Another would be the reduction, substitution or elimination of propellants in aerosol formulations.

M. INSECT REPELLENT

Product Description: For the purposes of this regulation, "insect repellent" shall apply only to those products which are used on humans. Insect repellents are classified under the general category of pesticides which are registered under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA). Insect repellents do not kill insects; rather, they prevent biting insects such as mites, chiggers, deerflies, and mosquitos from making contact with human skin or clothing.

Product Forms: Insect repellents come in a variety of forms: aerosol sprays, pump sprays, liquids, creams, lotions, gels, sticks, towlettes and foams. Of these, the California market for insect repellents is dominated by aerosol and pump sprays. Table 22 is a summary of the emissions from insect repellents.

TABLE 22

**Insect Repellents Emissions Summary
(Total Emissions 0.45 T/D)**

<u>Product Form</u>	<u>Percent of Market</u>	<u>Emissions (T/D)</u>	<u>Percent of Emissions</u>
Aerosol	91	0.45	99.0
Liquid/Pump/Cream	8	< 1*	< 1
Solid (Stick)	< 1	< 1	< 1
Other	< 1	< 1	< 1

* < = less than

Product Content Formulation: In the majority of current insect repellents, the main active ingredient is N,N-diethyl-m-toluamide. In at least one product, the main active ingredient is 2-ethyl-1,3-hexanediol (Rutgers 612). However, this ingredient is believed to be less efficacious at repelling insects than is DEET and will probably be phased-out gradually. Insect repellents based on R-11 (2,3:4,5-Bis (2-butylene) tetrahydro-2-furaldehyde), were recently pulled off the market because of health and safety concerns. With the decreasing use of Rutgers 612, it is expected that the dominant active ingredient for at least the next five years will be DEET. Other ingredients found in small quantities in insect repellents

include: synergists such as MGK 264, which help to improve product efficacy; resins such as Carbopol 934 (for use in gels and creams); and antioxidants such as butylated hydroxyl toluene.

For aerosol spray repellents, there are two types of formulations: solvent-based and water-based. Solvent-based formulations contain mostly DEET, hydrocarbon solvents and propellents, with various other organics found in small quantities. The hydrocarbon solvents are usually some type of alcohol or alcohol-like isoparaffinic petroleum distillate (e.g. isopropanol or Isopar E). Hydrocarbon propellents used in repellents are usually isobutane or an isobutane/propane mixture. Water-based aerosol spray repellents contain the same types of propellents and solvents as in solvent-based repellents but in smaller quantities, making up the remainder of the formulation with water. As a category, aerosol spray insect repellents have a sales-weighted average VOC content of 95% VOC by weight for solvent-based formulations and 15% VOC by weight for water-based formulations, respectively.

Liquids, pumps and creams comprise the next largest group of insect repellents. These products tend to be highly concentrated products of DEET, with many products comprised entirely of 100% DEET. These concentrated products usually are marketed for people who spend a great deal of time outdoors (e.g. hunters, lumberjacks).

Sticks, gels, towlettes and foams are relatively rare in California. These products do not have a significant share of the market and are not expected to increase their share in California dramatically within the near future.

Product Use: Insect repellents are for personal use. They contribute to the comfort and safety of people who live, work or play outdoors. They are used to help prevent the transmission of diseases such as Lyme's disease. The products are either applied directly to the skin and clothes or are applied to the hands and spread onto skin and clothing.

Manufacturing Process: Staff has no specific data on the manufacturing process for this product category; however, staff expects the manufacturing process to be similar to those used for manufacturing other aerosol, pump, cream, solid and towlette products.

Health and Safety Concerns: The major safety concern with an aerosol insect repellent is the flammability of the product. Flammability concerns that apply to other aerosol products also apply to aerosol insect repellents. However, there have been only rare cases where aerosol repellents caused damage when applied near a flame (e.g., campfire). Staff expects the water-based aerosol products to have reduced flammability potential because of the water content.

Insect repellents based on DEET have been used successfully for many years. Only recently have there been cases where over-application of the product has resulted in adverse reactions, especially in children. Because of this, industry representatives have expressed the desire to formulate

lower-DEET products to avoid applications of high levels of DEET. From discussions with industry representatives, ARB staff believe that the 65% limit on VOC in aerosol repellents can be met while satisfying current health concerns.

Product Emissions: The current estimate for emissions from the insect repellent category is 0.45 tons/day. Staff has high confidence in this data since all of the major insect repellent marketers responded to the survey.

Recommended VOC Standard: Since aerosol insect repellents account for approximately 99% of the emissions from this category, staff elected to set a VOC limit only for the aerosol products. Staff recommends a 65% VOC limit by weight for aerosol insect repellents. According to the survey responses, there are at least four aerosol repellents that currently meet this standard. Compliance with these standards will result in 0.13 tons VOC per day emission reductions. Table 23 summarizes the proposed standards and emissions reductions for various product forms.

TABLE 23

Insect Repellents Standard Summary				
<u>Product Form</u>	<u>Proposed Standard % VOC</u>	<u>No. Complying Products</u>	<u>Percent of Market Complying</u>	<u>Emission Reduction (T/D)</u>
Aerosol	65	4	32	0.13

Compliance With The Standard: Compliance with the standard could be achieved through product reformulation. The timeframe that is proposed in the regulation allows for additional time to reformulate and reregister the reformulated product under FIFRA.

N. LAUNDRY PREWASH

Product Description: Laundry prewash means a specialty product that is applied to a fabric prior to laundering and that supplements and contributes to the effectiveness of laundry detergents and/or provides specialized performance.

Product Forms: Laundry prewashes are sold in aerosol, pump, liquid, and solid product forms. Results from the survey show that emissions for laundry prewashes are 2 tons per day. Liquids and pump sprays account for most of the market share (85%) and almost half of the total emissions. Table 24 below summarizes the market share and percent of total emissions for the product forms.

TABLE 24

**Laundry Prewash Emissions Summary
(Total Emissions 2 T/D)**

<u>Product Form</u>	<u>Percent of Market</u>	<u>Emissions (T/D)</u>	<u>Percent of Emissions</u>
Aerosols	14	1.04	52
Pumps	55	0.51	26
Liquids	30	0.38	19
Solid Sticks	1	0.07	4

Product Content Formulation: Results from the survey showed the VOC content for aerosols ranged from 21% to 74% by weight with a sales weighted average of 35%. For liquids, the VOC content ranged from 0.2% to 63% and a sales weighted average of 4%. Only one manufacturer submitted data for pumps. The sales weighted average is 6%. For solid sticks, the VOC content ranged from 5% to 36% with a sales weighted average of 24%.

Laundry Prewash formulations generally contain surfactants, solvents, whitening agents, propellants (aerosol forms), proteolytic enzymes and fragrances and dyes.

Nonionic surfactants (e.g. alcohol polyglycol ethers, fatty acid ethanalamides, fatty acid esters), as the name implies, contain neither positively charged or negatively charged functional groups. Nonionic surfactants have favorable detergency properties which are derived largely from having low micelle concentration, very good detergency performance, and soil antideposition characteristics with synthetic fibers. They are particularly effective in removing oily soil and some function as form boosters. Anionic surfactants (alkylaryl sulfonates) may also be used to solubilize the active ingredients in the liquid.

Hydrocarbons and halogenated hydrocarbons (e.g. naphtha, perchloroethylene, 1,1,1-trichloroethane) may be used as solvents and aid the surfactant in penetrating the surface of the soil. Water is also sometimes used as a solvent.

Fluorescent whitening agents (FWA), also known as optical brighteners, are organic compounds that convert a portion of the invisible ultraviolet radiation in sunlight into longer wavelength blue light in the visible region. This improves the brightness as well as the shade of white articles. Nearly all white fabrics now have been treated with FWAs during manufacture, therefore, the function of FWAs in laundry prewashes is to maintain or build-up the fluorescent whitening effect.

Proteolytic (protein cleaving) enzymes help to break down protein stains derived from sources such as milk, cocoa, blood, egg yolk, and grass, which may normally be resistant to removal by simple detergents.

Propellants (e.g. carbon dioxide, butane, propane) are used in the aerosol laundry prewashes help to expel the ingredients onto the fabric or article.

Fragrances impart an agreeable odor as well as help to mask unpleasant odors arising from the wash liquor during washing. Fragrances are also intended to confer a fresh, pleasant lingering scent on the skin or laundry itself. To help make the product more visually pleasing and to give a distinctive appearance to a particular brand, dyes are often used.

Product Use: Depending on the product form, the product is sprayed, poured, or rubbed directly onto the fabric until the soiled area is saturated. After the product is applied, the fabric is rubbed together in the treated area by hand. The product is allowed to soak into the fabric for one to three minutes. Then the fabric is laundered in the regular machine wash cycle at a water temperature recommended for the fabric using regular laundry detergent.

Some laundry prewashes can be used in hot or cold water. In the case of solid sticks, the product may be applied on a soiled area up to one week prior to laundering. Extra tough stains may require a second treatment and rewashing.

Manufacturing Process: This description is limited to liquids, pump sprays, and aerosol sprays since they comprise 99% of the market. Each ingredient is weighed and added into a large vat. The solution is thoroughly mixed. For liquids and pump sprays, the solution is poured into the containers. For aerosol sprays, the solution is pressure injected with a propellant into the container.

Health and Safety Concerns: Current formulations of aerosols contain hydrocarbon propellants that are volatile and flammable and need to be kept away from an open flame and stored at temperatures below 120° F. Aerosols, pumps, and liquids may contain naphtha which is flammable. Perchloroethylene is an eye irritant and 1,1,1-trichloroethane is a possible carcinogen.

Allergic skin reactions to surfactants vary widely and vary by individual. But surfactants can emulsify lipids, so repeated or prolonged exposure to detergents can cause lipid damage to the lipid skin layer of the skin. Consequently, the barrier function of the lipids is impaired, leading to increased permeability and loss of moisture from the skin, as evidenced by dryness, roughness, and flaking of the skin. Very prolonged exposure to concentrated surfactants solutions may lead to serious damage and even necrosis.

Mucous membranes are much more sensitive to surfactants than the skin. Minor eye irritation to surfactants is sometimes unavoidable because of the widespread availability and use of detergents, but is normally reversible. However, serious damage can occur if the eye comes in direct contact with a

concentrated surfactant solution and this contact is not followed by immediate and intensive flushing with water. High doses of surfactants in the gastrointestinal tract can lead to vomiting and diarrhea. If a surfactant reaches the circulatory system, it can cause damage even in very low concentrations because of interactions with erythrocyte cell membranes, ultimately resulting in hemolysis of the cells.

Enzymes are complex nitrogenous substances of proteinaceous type which catalyze various reactions of a biochemical nature. As with all proteins, human allergenic reactions are possible. In the past, some detergent factory workers have had asthmatic reactions to enzymatic dust. Some of the problems have been remedied by the manufacture of encapsulated enzyme types rather than powders. Some consumers are allergic to enzymes and may encounter problems from the use of enzymatic powders in the home.

Recommended VOC Standard: The recommended VOC standard for aerosols and solids is 22% by weight, beginning in 1/1/94. Staff expects the proposed limit to be achievable and that a greater portion of the emission reductions will come from the aerosols. The recommended VOC standard for all other forms (pumps and liquids combined) is 5% by weight, beginning in 1/1/94. Because the sales weighted average for pumps and liquids is 6% and 4%, respectively, staff also expects the proposed limit to be achievable. Table 25 below summarizes the proposed standards and emission reductions.

TABLE 25

Laundry Prewash Standards Summary

<u>Product Form</u>	<u>Proposed Standard (% VOC)</u>	<u>Number of Complying Products</u>	<u>Percent of Market Complying</u>	<u>Emission Reduction T/D</u>
Aerosols	22	1	45	0.39
Solids	22	3	41	0.026
All Other Forms	5	9	36	0.19

Compliance with the Standard: It is expected that compliance with the regulation will be achieved by reformulation with water and other exempt VOCs. Staff contact with industry representatives indicate that reformulation is possible within the timeframe established.

0. NAIL POLISH REMOVER

Product Description: Nail Polish Remover means a product primarily used to remove nail polish and coatings from fingernails or toenails.

Nail polish removers are generally solvents or mixtures of solvents which help remove nitrocellulose, a primary constituent in nail polish. They are often modified by the inclusion of such constituents as oils, emollients, or other agents that are designed to reduce the defatting action of the solvents.

Product Forms: Nail polish removers are manufactured in liquid, cream, sponge, and towelette forms. Creams and sponges were not reported in the survey and only one company reported the manufacture of towelettes. According to the literature, cream nail polish removers afford a wider scope of formulation than liquids, but maintenance of the desired consistency is not always easy. That is perhaps why cream nail polish removers are not generally popular.

Based on the survey, emissions from nail polish removers are estimated to be 1.1 tons per day. Liquid nail polish removers account for nearly 100% of the total market share and nearly 100% of the total emissions. Currently, staff is unable to assess the contribution of emissions from the other product forms, but since liquid nail polish removers make up the majority of the sales and emissions, the primary discussion will concern this product form.

Product Content Formulation: Based on the survey, the VOC content for liquids range from 76% to 98% by weight with the sales-weighted average at 91%. The VOC content for the towelettes are also in this range. In addition, information obtained from the shelf survey and literature search indicate that the VOC content of sponges and creams is similar to that of the liquids.

Depending on the manufacturer and their particular products, nail polish removers contain a wide variety of ingredients. Nail polish removers may contain such ingredients as acetone, ethyl acetate, amyl acetate, butyl acetate, fragrances and colorants. The fragrances and colorants are added to provide a pleasing color and smell during use. Acetone, ethyl acetate, amyl acetate, and butyl acetate are primary solvents which help dissolve the nitrocellulose in nail polish. Other solvents include diacetone alcohol, ethyl lactate, glycols and glycol ethers.

The lubricant-emollient agents include castor oil, soluble lanolin derivatives and butyl stearate. These agents are designed to prevent or reduce the drying of the skin and nails which may be due to the oil extraction properties of the solvents. Small amounts of humectants may be added, up to about 10% of water in certain types of formulation based on water-miscible solvents (e.g. methyl ethyl ketone, acetone, gamma-valeractone, alcohol and glycol ethers).

Some types of nail polish removers are so-called "non-smearly" removers because they claim to remove the nail polish without smearing the nails or the adjoining skin. These products may consist of a mixture of water and water-miscible solvents such as ethyl acetate and may have a water content of approximately 8-9%. Other types of nail polish removers contain no acetone. In these cases, the primary solvent may be ethyl acetate.

Product Use: Liquid, sponge, and cream nail polish removers are sold in plastic or glass containers. When not in use, the containers need to be closed to prevent evaporative loss. For liquids and creams, the solution is applied by first dipping a cotton swab or soft tissue paper into the container and then rubbing the swab or tissue paper onto the nail. Removal time will depend on the amount of solution used, the time the solution is exposed to the environment, and the amount and type of nail polish being removed.

For sponge products, the nail is dipped into the container and swirled around the sponge. The sponge is immersed in solution and provides the rubbing surface for the nail while the solution helps dissolve the nail polish. In this case, removal time should be minimal. Use of this product form may be an inconvenience because the toenail must be positioned in an awkward position in order to be dipped into the container.

The towelettes are probably the most convenient to use because each towelette is individually wrapped in a sealed foil wrapper. To apply, the wrapper is torn and the towelette is removed and rubbed onto the nail.

Manufacturing Process: Generally, explosion-proof, grounded equipment is used. Each ingredient is weighed and added into a suitably sized tank equipped with an explosion-proof stirrer. After the batch is thoroughly mixed, it is filtered directly into appropriately sized containers.

Health and Safety Concerns: Current formulations contain solvents that are volatile and flammable and need to be kept away from an open flame. Of primary concern is the solvent, acetone, which is a highly flammable liquid that can dissolve fats, oils, resins, rubbers, plastics, and the like. Although acetone is not a primary skin irritant, it may result in dermatitis in persons who use it frequently. The result is the removal of the normal fatty sebaceous secretion of the skin. Removal of this secretion faster than it can be formed results in the skin becoming dry and cracked thus affording the ingress of bacteria and irritants encountered during ordinary work. Acetone may also remove oil from the nails so they cannot retain moisture.

Nail polish removers need to be used in ventilated areas since the inhalation of acetone (and perhaps other solvents) can cause headache, fatigue, or bronchial irritation.

Recommended VOC Standard: The recommended VOC standard for nail polish removers is 85% beginning in 1/1/94 with a future effective limit of 75% beginning in 1/1/96. At least 11 products or 13% of the market listed in the survey can meet the 85% limit. With the sales-weighted average at 91%, staff expects the proposed limit to be achievable. At least one product contains 75% VOC indicating that further reductions are possible. Staff is also aware of an achievable formulation that contains no acetone and no ethyl acetate with a VOC content of 73-74%. The estimated emission reductions for this category are 0.07 T/D in 1994 and an additional 0.12 T/D in 1996.

Compliance with the Standard: Compliance with the proposed standard of 85% may be achieved by replacing VOCs with water and other exempt VOCs. In addition, staff contact with industry representatives indicate that the future reduction of acetone and ethyl acetate from current formulations and the reduction of VOC content to below 75% may be achievable.

According to the literature, gamma-valeractone has been suggested as a possible solvent in nail polish remover. It is colorless, almost odorless, and is completely miscible with water. A 50% solution in water may be used as a nail polish remover. The compound is stated to be non-irritating to the skin. According to industry representatives, there is at least one product currently on the market which contains gamma-valeractone. The product consists of pads in a container.

P. OVEN CLEANER

Product Description: Oven cleaners are any specialty cleaning product designed to clean and to remove dried food deposits from interior oven surfaces. This does not include microwave ovens, which use a different cleaning formulation, similar to a glass cleaner.

Product Forms: Product forms are aerosol, liquid, and pump. Total emissions from this product category are 1 ton per day. The emissions from different product forms are 0.6 ton per day for aerosols, 0.1 ton per day for liquids, and 0.3 ton per day for pumps. A CSMA spokesperson indicated that the low VOC contents for oven cleaners listed in the Heiden data may be due to those products being microwave cleaners, which are light-duty surface cleaners, more similar in nature to glass cleaners or general-purpose cleaners, than actual oven cleaners. Table 26 below is a summary of the emissions for the subcategories.

TABLE 26

**Oven Cleaners Emissions Summary
(Total Emissions 1 T/D)**

<u>Product Form</u>	<u>Percent of Market</u>	<u>Emissions (T/D)</u>	<u>Percent of Emissions</u>
Aerosol Sprays	55	0.62	63
Liquids	22	0.12	12
Pumps	23	0.25	25

Product Content Formulation: The sales-weighted average VOC product content is 9.8% for aerosols, 4.9% for liquids, and 9.8% for pumps. Typical total VOC content for this product category ranges from 10 to 17%. The typical combined VOC content for fragrance and colorant is less than 0.1%.

Oven cleaners consist of both caustic and non-caustic formulations. Caustic formulations typically contain 4% to 20% caustic (potassium or sodium hydroxide) as an alkaline agent, with surfactants and solvents suspended in an emulsion. The solvent solubilizes grease deposits and allows the caustic to penetrate and saponify the grease to a soap form. Baked-on food deposits are also dissolved. Caustic formulations can be used without applying any oven heat, and left on overnight, or they can be left on the oven interior for 10 to 20 minutes after heating the oven to 200 degrees F. The application of heat speeds up reaction between the caustic and the fatty acids contained in grease deposits.

Non-caustic formulations contain weakly alkaline salts, and are used with the oven heated to 475 degrees for 30 minutes. These formulations are lower in VOC content than the caustic ones. The aerosol form ranges from 5-8% in total VOC content, with more propellant than the caustic formulations, and no grease-cutting solvents. The caustic aerosol formulations range from 7-11% in total VOC content. Propellants are typically butane or propane. Oven cleaners are made in ready-to-use form, so there is no product concentration and required dilution.

Product Use: Oven cleaners are used in the household sector primarily. They are also used in the institutional (ie.--hospital ovens) and commercial (ie.--pizza ovens) sectors. The market shares for the institutional and commercial sectors are not specifically known, but they are both smaller than the household sector. The product is typically applied in aerosol form; liquid forms are applied by either pump spray or as a paste. Thickening agents are added to the liquid forms to promote adhesion of the cleaner to vertical oven surfaces. Another non-aerosol form is a pad of synthetic abrasive, which contains a reservoir holding sodium or potassium hydroxide and surfactant. Before use, the reservoir is punctured, releasing the formulation, which is then spread over oven surfaces. The aerosol form is regarded as easier to use, since it is easier to spray hard-to-reach areas than hand-wipe them. The non-caustic formulation has less safety hazard associated with it, since it contains no caustic.

Manufacturing Process: The product is made using a "wet blending" process, with no heat used. The product is blended in large mixing tanks, adding the ingredients in specific order, letting them dissolve, and then mixing them together. No production changes are foreseen due to the effect of the regulation.

Health and Safety Concerns: Gloves and possibly goggles should be used with the caustic formulations. Sodium hydroxide is an irritant to the skin and eyes, and the cleaner should be used with adequate ventilation to avoid inhaling excessive fumes.

Recommended VOC Standard: The current proposed standard being recommended for this category is 8% for aerosols and pumps, and 5% for liquids. This standard was selected based on the VOC survey data submitted by industry, and was set to allow complying products in both the aerosol, liquid, and pump forms, yet still achieve emission reductions. Industry had requested a standard of 9% for aerosol/pump oven cleaners in order that the

aerosol form not be banned from the market, however, based on the survey results, the recommended standard of 8% will allow both the aerosol and pump product forms to remain on the market. The 5% standard, as requested by industry, will also allow the liquid form to remain on the market. Estimated emissions reductions for this category, based on this standard, are 0.2 ton per day. Table 27 below summarizes the proposed standards and emissions reductions.

TABLE 27
Oven Cleaners Standards Summary

<u>Product Form</u>	<u>Proposed Standard (% VOC)</u>	<u>Number of Complying Products</u>	<u>Percent of Market Complying</u>	<u>Emission Reduction T/D</u>
Aerosol Sprays/ Pumps	8	13	13	0.18
Liquids	5	8	93	0.02

Compliance with the Standard: Compliance can possibly be achieved by lowering the solvent content and raising the surfactant and caustic contents. Formulation data found in product formularies include several oven cleaners, including those for heavy duty use, that contain no solvents (ie.--0% VOC). The range of caustic for these formulations, in % by weight, is 10% for sodium hydroxide, and 20% for potassium hydroxide. Surfactant content ranges from 1% to 10%, and water content ranges from 15% to 82%.

Q. SHAVING CREAM

Product Description: Shaving cream is an aerosol product which dispenses a foam lather intended to be used with a blade, cartridge razor or other wet shaving system, in the removal of facial or other bodily hair.

Product Forms: Shaving cream is packaged in aerosol form only. This represents 100% of the market. The estimated emissions from this category is 0.26 tons per day.

Product Content Formulation: The sales weighted average VOC content for shaving creams is 7.3%. Some of the ingredients used in shaving creams are: anionic surface active agents, nonionic surface active agents, molecular complexes, humectants, superfatting agents, synthetic and natural gums, preservatives, special additives, fragrances, colors and propellants.

Anionic surface active agents are soaps or salts of fatty acids that are found in shaving cream formulations. Animal fats such as tallow is rich in stearic acid and commercial stearic acid are used to form soaps which are finely textured foams that dry out quickly. Nonionic surface active agents

are used to form emulsions and increase the wetting power of the product. Polyoxyethylene sorbitan esters, alkyl phenoxyethoxy ethanols and polyoxyethylene ethers are some examples of these agents. Molecular complexes are formed with surface active agents and fatty agents or fatty alcohols. The most common molecular complex is the sodium stearate-stearic acid complex.

Humectants are used to impart a smoothness and softness to the shaving products. Also, they help prevent water loss by evaporation and contribute to the stability of the foam. Glycerin is probably the most popular of the polyhydric alcohol humectants.

Synthetic and natural gums are employed to stabilize the viscosity of the liquid, cream and gel formulations. Gums contribute both lubricity and texture to the foam. Salts and derivatives of alginic acid, tragacanth, pectins and methylcellulose are some examples.

Preservatives include both microbiological and chemical types. It is important that no human pathogens be present in the formulation. Microbiological screening of the effectiveness of the bactericide or bacteriostat used is mandatory. Methyl, ethyl, butyl and propyl parahydroxybenzoates are used in many formulations.

Propellants are used to expel the product from the container and to create a foam by expanding in the product after it is expelled. They should be odorless, low-boiling, compatible and nontoxic. Hydrocarbon compounds such as propane, butane and isobutane can be used. Isobutane is the most commonly used propellant in shaving creams today.

Product Use: Shaving creams are for personal use. Shaving cream contributes to the comfort, safety and speed of a shave. It wets the hair and maintains it in this state throughout the shave. It also lubricates the skin so the razor and blade glide smoothly over the surface being shaved. The product is applied by dispensing a small amount of the product into the palm of the hand and then distributing the foam on the skin surface to be shaved.

Manufacturing Process: Manufacturing processes vary, but usually involve a mixing process while adding the various contents.

Recommended VOC Standard: The standard being recommended for this category is 5% VOC content by weight. Based on ARB surveys and industry contacts, a 5% VOC content by weight is being proposed. There are five products currently available on the market that meet this standard. The estimated emission reductions for this category is 0.08 tons per day.

Compliance With The Standard: Compliance with the standard could be achieved through product reformulation using water and other exempt solvents and propellants. The timeframe proposed in the regulation is accepted as adequate time for reformulation. Increasing the water content in the formulation may be one method of complying. Another method may be reducing or substituting the propellants currently being used.

VII.

IMPACTS

A. ECONOMIC IMPACTS

1. Economic Impact on Industry

Manufacturers of noncomplying consumer products have several options available to them to meet the requirements of the proposed regulation. These options include reformulation of existing products, changing product forms, development of new technology that allows the products to qualify for the innovative products exemption, and withdrawal from the California market. Reformulation is the most likely means of meeting the VOC standards in the regulation since in most cases there are already complying products available.

Staff performed an economic analysis to determine the cost impact of the regulation. In conducting this analysis, staff assumed that the primary impact of the regulation would be on consumer product manufacturers. ARB staff believe that, based on the data presented in the New York Pacific Environmental Services report, the impact to "upstream" suppliers such as chemical companies supplying solvents and propellants should be minimal. It was also felt that product distributors, due to their regional and multi-product nature, should not experience a significant economic impact from the regulation. It was further assumed that manufacturers would comply with the regulation by reformulating existing products to meet the VOC standards.

The analysis was a before tax study although there may be tax advantages that could significantly reduce the costs associated with reformulation. These factors are difficult to estimate and were beyond the scope of this analysis.

Based on the assumptions below, the analysis resulted in an estimate of the average annual cost to reformulate a typical product formulation, the total annual cost to the consumer products industry, and the cost effectiveness of the regulation.

Assumptions

To estimate the cost of reformulation, a number of assumptions were necessary. These assumptions are as follows:

- (1) Reformulation of products will not result in a change from one product form to another (e.g. aerosol to a pump spray product form).
- (2) No major retooling of manufacturing equipment will be necessary.
- (3) No significant change in marketing costs will be required.
- (4) No increase in raw materials cost will occur.
- (5) Reformulated products will be marketed nationally.

The first assumption was that reformulation will not require a change in the product form. While some companies may choose to change product forms, the regulation is generally not designed to require a change in product form.

Since the product form is not expected to change, it is further assumed that major retooling of production lines will not be necessary. However, industry has pointed out that some equipment may have to be purchased to accommodate changes in the formulation. Industry also pointed out that training of employees would generally be required if new equipment is purchased. These costs are very difficult to estimate since it is not known what reformulations will result from the regulation or whether equipment purchases will be necessary. Some of the cost estimates provided to staff by industry considered these elements while most did not.

It is also assumed that marketing costs will remain unchanged. Some industry contacts have noted that consumer acceptance studies will be desired for reformulated products. It has also been pointed out that modifications to trade show displays will have to be made. These costs were not considered since staff cannot quantify these. Also, staff believes that market studies are often ongoing and in many cases would be performed even in the absence of the regulation.

Staff assumed that there will be no increase in the cost of raw materials. In general, solvents will be replaced by water, which represents a cost savings. Increasing the water content will in some cases require changes in the solvents, active ingredients and packaging. These costs are difficult to quantify and have not been considered.

Finally, from discussions with industry, staff found that the majority of consumer product companies market their products nationally. Most of these companies plan to market products reformulated for California in the rest of the country.

Annual Cost

The first step in the economic analysis was the determination of the average annual cost to reformulate a typical consumer product. Due to the number of products covered by the regulation, an individual analysis of each product category was not possible. This analysis is shown in Appendix E.

As shown in Appendix E, the analysis determined the annual cost of reformulating a typical product to range from a low of about \$16,000 to a high of over \$500,000. The annual cost figures were calculated based on four scenarios with total reformulation costs of 100,000 and two million dollars and amortization periods of five and ten years. Total reformulation cost estimates were based on discussions with industry. According to the information gathered, the significant costs associated with reformulating a product to meet the requirements of the proposed regulation include research and development, efficacy testing, stability testing, safety testing, and modifications to labels. An interest rate of 10% was assumed.

Total cost to industry

The total annual cost to the consumer products industry to reformulate all noncomplying products was estimated. The estimate is based on the range of annual costs per product formulation described above and the total number of noncomplying products. Based on the estimated 681 noncomplying product formulations from the ARB consumer products survey, the total cost to the consumer products industry is estimated to be between 11 and 360 million dollars. The wide range in cost is due to the range in the annual cost figures

Cost effectiveness

Cost effectiveness ratios are used to compare the cost of a regulation to the benefits in terms of reduced emissions. The cost effectiveness ratios used for this regulation are expressed in dollars required per pound of VOC reduced. These ratios were determined by dividing the total annual cost figures by the estimated emission reductions due to the regulation. It was assumed that the reformulated products will be marketed nationally, resulting in emission reduction benefits throughout the nation.

In some cases, the regulation may result in a net savings to industry. For instance, it is estimated that reformulation of automotive windshield washer fluid to the 10% VOC limit could result in an annual cost savings to industry of \$800,000. This estimate is based on the replacement of methanol (at \$0.41/gallon) with water to meet the 10% standard. This represents a cost savings of 5 cents per pound of VOC reduced. This figure does not include any costs associated with relabeling or distribution changes.

The cost effectiveness ranged from about -\$0.05 to \$1.70 per pound of VOC reduced. This range in the cost effectiveness estimates reflects the uncertainty in the cost to reformulate the wide variety of products covered under the regulation. The cost effectiveness ratios, summarized in Table 28, compare favorably with other VOC regulations considered by the ARB.

TABLE 28

**Cost-Effectiveness Comparison of the Proposed
Consumer Product Regulation with
Other Recently Adopted SCM's and Regulations**

<u>Measure</u>	<u>Cost-Effectiveness \$/lb VOC Reduced</u>
Consumer Products (1990)	-0.05 to 1.70
Anti-perspirants (1989)	0.50 to 1.20
Architectural Coatings (1989)	-4.30 to 6.40
Marine Vessel Operations (1984)	0.00 to 18.75
Sumps, Pits, Ponds (1988) in Oil Production Operations	0.07 to 10.00

ARB staff believes that the economic burden on industries as determined with a cost-effectiveness ratio (e.g. dollars required per pound of VOC reduced), would be favorable when compared to impacts on other industries from recently approved regulations that cover such categories as anti-perspirants and deodorants, architectural coatings, and loading, ballasting and lightering operations on crude oil and gasoline cargo tankers. In some cases there may even be cost savings to industry due to replacement of solvents with water. For most categories listed in the proposed regulation, there are products currently in the market which can meet the proposed standards for each product form.

Reformulation costs and cost effectiveness ratios may also be lower than predicted due to the transfer of research and development costs to other products. Many companies have many similar products in their product lines. In these cases, research and development costs could be applied to several products, reducing the cost per product.

2. Impact on Consumers

A large portion of the costs incurred by industry may be passed on to the consumer. However the extent to which this will occur is difficult to predict. It is also possible that the cost of the regulation will be passed on to products not covered by the regulation. Due to these uncertainties, the increase in the cost of consumer products cannot easily be predicted. However, staff has developed some estimates based on the the following information: (1) the annual cost figures per product formulation given in Appendix E; (2) information on the total number of aerosol product formulations; and (3) the total number of aerosol units sold annually. The analysis assumes that all reformulation costs are passed on to the consumer and does not consider any other factors such as expected difficulty of reformulation. Only aerosol products were examined since they are expected

to experience the greatest impact. This analysis showed the average increase in cost for a typical aerosol product to vary from a low of about 1 cent per product using the annual cost figures from cases 1 and 2 in Appendix E, to a high of 23 cents per product using the annual cost figure from case 3. This analysis is also shown in Appendix E.

B. ENVIRONMENTAL IMPACTS

The primary environmental impact from the proposed regulation is expected to be a decrease in VOC emissions to the atmosphere from consumer products. Since VOCs are precursors to ozone, a decrease in VOC emissions will result in a decrease in tropospheric ozone. From the previous discussion, emission reductions are estimated to be 45 tons per day by 1998 in the state of California for the product categories in the proposed regulation. Emission reductions are shown in Table 29.

TABLE 29
Summary of Emissions and Emission Reductions
from the Proposed Standards

<u>Product Category</u>	<u>Proposed Standard Percent VOC by Wt.</u>	<u>Emissions lbs/Day</u>	<u>Emission Reductions lbs/Day</u>	<u>Percent Reduction</u>
Air Fresheners				
Aerosol-2 phase	30	5,450	760	14
Aerosol-1 phase	70	1,550	460	30
	(30%-1996)		(620-1996)	40
Liquid/Pump	18	1,270	340	27
Solid/Gels	3	300	200	67
Dual Purpose Aerosol				
Air Freshener/				
Disinfectant	60	8,600	2,200	26
Other	3	140	120	86

TABLE 29 Con't

Summary of Emissions and Emission Reductions
from the Proposed Standards

<u>Product Category</u>	<u>Proposed Standard Percent VOC by Wt.</u>	<u>Emissions lbs/Day</u>	<u>Emission Reductions lbs/Day</u>	<u>Percent Reduction</u>
Automotive Windshield Washer Fluids				
Type A Areas	35 (1993)	1,600	0	0
All Other Areas	10 (1993)	46,400	33,200	72
Bathroom & Tile Cleaners				
All Forms	5	900	220	24
Engine Degreasers	75 (1993) (50 - 1996)	9,000	1,860 (2,340-1996)	21 26
Floor Polishes (Waxes)				
Flexible Flooring Polishes	7	3,780	940	25
Nonresilient Floor Polishes	10	420	100	24
Wood Floor Wax	90	1,000	1	-0
Furniture Maintenance				
Aerosol	25	4,870	820	17
All Other	7	730	240	33
General Purpose Cleaners				
All Forms	10	9,800	3,320	34
Glass Cleaners				
All Forms	6 (1993)	4,600	1,220	27
Hairsprays				
All Forms	80 (1993) (55 - 1998)	92,000	14,400 (24,160 -1998)	16 26
Hair Mousse				
All Forms	16	1,160	70	6
Hair Styling Gel				
All Forms	6	820	550	67

TABLE 29 Con't

Summary of Emissions and Emission Reductions
from the Proposed Standards

<u>Product Category</u>	<u>Proposed Standard Percent VOC by Wt.</u>	<u>Emissions lbs/Day</u>	<u>Emission Reductions lbs/Day</u>	<u>Percent Reduction</u>
Insect Repellents Aerosol Sprays	65	880	260	30
Laundry Prewashes Aerosols/Solids	22	2,220	830	37
All Other Forms	4	1,780	380	21
Nail Polish Removers	85 (75-1996)	2,200	140 (220 -1996)	6 10
Oven Cleaners Aerosol Sprays/ Pumps	8	1,750	360	21
Liquids	5	250	40	16
Shaving Creams All Forms	5	520	160	31
Total Cumulative Emission Reductions:			1993 ~ 53,000 (26 TPD)	
			1994 ~ 63,000 (32 TPD)	
			1996 ~ 66,000 (33 TPD)	
			1998 ~ 91,000 (45 TPD)	

* Emission Reduction in parenthesis represent additional emission reductions after future effective VOC limits take effect.

The proposed regulation prohibits any new uses of compounds which have an ozone depletion potential (ODP) greater than 0.00. Industry has proposed reformulating their products with HCFCs and 1,1,1-trichloroethane to comply with the standards. However, new uses of HCFCs and 1,1,1-trichloroethane, which have small but definite ODPs, will be prohibited under the regulation. As a result, staff anticipates no adverse impacts to stratospheric ozone from the regulation.

The impact on the emission of greenhouse gases is more difficult to accurately predict at this time. For instance, industry may use carbon dioxide (a greenhouse gas) as a replacement for hydrocarbon propellants in some products. There are two types of propellant systems currently available which use carbon dioxide: (1) those using compressed carbon dioxide in gaseous form, and (2) those employing a chemical reaction separate from the product which generates the carbon dioxide as the product

is used. The first system uses compressed carbon dioxide which is a by-product of many petroleum and chemical refining processes. If this by-product is not condensed and subsequently used in consumer products, it would normally be emitted to the atmosphere. Using by-product carbon dioxide from other man-made sources would therefore recycle carbon dioxide that otherwise would have been emitted to the atmosphere.

On the other hand, the second propellant system generates its own carbon dioxide, which technically would increase the load of greenhouse gases to the atmosphere. However, this propellant system has very limited and specialized uses and generally does not lend itself to widespread applications. Moreover, replacing solvents with carbon dioxide would reduce the amount of VOCs in the environment which react with oxides of nitrogen to form ozone. Since ozone itself is a greenhouse gas, a reduction of ozone would at least partially negate any unexpected increase of greenhouse gases from the use of carbon dioxide in this propellant system.

To assess other potential environmental impacts resulting from the regulation, staff made the following assumptions:

- o Product efficacy before and after the regulation is implemented will remain approximately the same
- o Most reformulation will involve the use of water-borne and more concentrated products
- o Industry will manufacture a greater percentage of products in concentrated forms

A decrease in the amount of VOCs in "down the drain" consumer products could reduce VOC emissions to the atmosphere. Industry representatives have argued that the VOCs in "down the drain" products are biodegraded in the sewer system and not emitted to the atmosphere. However, EPA has estimated that between 14 to 25 percent of the organic compounds in the sewer system are emitted to the atmosphere before reaching publicly-owned treatment works (POTW). Thus, any reduction in VOC content for these consumer products would likely decrease the amount of VOCs which normally volatilize to the atmosphere before treatment at a POTW.

Reformulation using water-borne technology may also impact landfill space. To prevent corrosion, water-borne products are typically packaged in lined metal containers which can make recycling difficult. New innovative delivery forms such as Exxel, which contain no metals, would also be difficult to recycle. The potential impact on future recycling programs and landfill space cannot be accurately predicted. However, since there are no programs which currently recycle aerosol containers, lined or unlined, staff anticipates no major changes to landfill space as a result of products using water-borne technology or new systems.

An increase in concentrated products may reduce the amount of landfill space needed. Since the concentrated products would be sold in smaller containers, the amount of necessary packaging would decrease, reducing the

demand on landfill space. In addition, concentrating products will result in a decrease in vehicular transport emissions since fewer units per required application are necessary. Thus, while the total impact on landfill space cannot be predicted at this time, staff anticipates no significant negative impact on landfill space and a possible decrease in vehicular transport emissions as a result of the regulation.

C. CONSUMER IMPACTS

One important consideration regarding the proposed statewide regulation is the impact on the consumer. Not only may manufacturers need to change formulations, product forms, and product costs, but consumers as well may need to change their preferences, purchases, and uses for some products. Staff believes, however, that the impact to the consumer will be minimal since for each product category there is a product currently available in the market place that can meet the proposed standard. Product costs may increase as manufacturers seek to recover any costs associated with developing a reformulated product that complies with the VOC limits. Staff estimates that increased costs for all products will range from 1 to 23 cents per unit.

VIII.

ISSUES

A. COLLECTION OF VOC SURVEY DATA

The ARB consumer products survey was designed to gain information on VOC emissions, current preferences for the various product forms available (e.g. aerosol sprays, solids, pump sprays), product brand names, and market distribution. This survey was intended to be distributed and implemented by one agency for the sake of expediency, consistency, and the minimization of errors. However, because of concerns regarding the treatment of confidential data, many of the product manufacturers who are members of the Chemical Specialties Manufacturers Association (CSMA) elected to submit their survey data to one of three entities: (1) Heiden Associates, a law firm based in Washington, D.C., (2) Baker and Hostetler, another law firm in Washington, D.C., and (3) the Cosmetics, Toiletries and Fragrances Association (CTFA), a consortium of specialty consumer product manufacturers. To maintain confidentiality, the information submitted by these entities to ARB did not include company names or brand names associated with the data.

Problems with this approach arose soon after the survey forms were submitted. It became apparent that this multi-agency process for collecting the survey data introduced several sources of uncertainty into the survey data: (1) misinterpretation by the manufacturers of the survey requirements, and (2) misinterpretation and miscategorization of submitted survey data by the staff of at least one of the law firms, and (3) typographical errors made by either the survey respondents or the law firms. ARB staff detected at least one example of each error type in the data submitted by both Heiden Associates and Baker and Hostetler. Examples of the errors that were found were blanks or obvious discrepancies in the VOC and propellant content data fields and miscategorization of various products into inappropriate categories. Review of the compiled data submitted by the Heiden Associates indicated that these errors were not uncommon. To be fair, Heiden Associates corrected and resubmitted data on several occasions. Even with this effort, staff had to exclude a portion of the submitted data from the survey analysis because the data were incomplete or because the data were inconsistent with other known information. In addition, since company names

were kept confidential it was difficult for ARB staff to validate the information.

Using various sources of information on the different product categories, ARB staff attempted to correct obvious errors in the data. For instance, if an entry for the propellant weight percentage (PVOC) was greater than the entry for VOC, then the VOC entry was generally modified to be at least the same value as the PVOC entry. Exceptions to this would be cases where staff had high confidence that the VOC value was greater than even the modified value. In these cases, the VOC entry was remodified on a case-by-case basis depending on the particular product category.

In spite of the uncertainties in the survey, the remaining data proved worthwhile and revealing. For many of the products in the proposed regulation, the sales-weighted average VOC content proved to be less than what ARB staff had originally estimated. This resulted in staff's lowering of the VOC standards to the levels now shown in the regulation. Moreover, over 50% of the available products in some selected categories comply with the proposed standards. These complying products, which are often made by independent manufacturers, generally do not represent as large a market share as that represented by the major manufacturers. Nevertheless, the number of complying products within these product categories indicates that the technology to make complying products is reasonably available.

B. VOC CONTENT VERSUS VOC EMISSIONS

In the consumer products VOC survey, ARB staff requested information on the VOC content of the products and not the actual VOC emissions resulting from the use of those products. Some industry representatives who attended the first three workshops questioned whether VOC content will yield accurate estimates of actual VOC emissions. ARB staff's analysis of the numerous forms and application techniques associated with the various product categories indicates that actual VOC emissions are very difficult, if not impossible, to accurately determine. For example, in order to accurately report VOC emissions from consumer products, a manufacturer or distributor would need to know the following:

- 1) the total amount of VOC in the product (VOC content),
- 2) the total annual usage rate (annual sales) of the product, and
- 3) the percentage of the total VOC content that volatilizes into the atmosphere (indicated by vapor pressure).

For the purposes of this discussion, the terms "volatile organic compounds (VOC)" and "reactive organic compounds (ROC)" are essentially equivalent and shall be used interchangeably. A VOC is defined as any compound containing at least one atom of carbon, except methane, carbon monoxide, carbon dioxide, carbonic acid, metallic carbides, or carbonates, ammonium carbonate, 1,1,1-trichloroethane, methylene chloride, trichlorofluoromethane (CFC-11), dichlorodifluoromethane (CFC-12), chlorodifluoromethane (HCFC-22), trifluoromethane (HFC-23), trichlorotrifluoroethane (CFC-113), dichlorotetrafluoroethane (CFC-114),

chloropentafluoroethane (CFC-115), dichlorotrifluoroethane (HCFC-123), tetrafluoroethane (HFC-134a), dichlorofluoroethane (HCFC-141b) and chlorodifluoroethane (HCFC-142b). As written, this definition is consistent with the Environmental Protection Agency's (EPA) definition of a VOC, with the exception that EPA does not recognize ethane as a VOC.

The VOC content and annual sales should be readily available to the product manufacturers and/or distributors. Thus, a conservative estimate of the actual VOC emissions from consumer products would require simply taking the VOC content and multiplying it by the usage rate (i.e., the entire VOC content of a product evaporates). For a more accurate estimate of actual VOC emissions, the percentages of organic compounds that volatilize into the atmosphere need to be determined. However, this may fluctuate significantly under real world conditions.

ARB staff realizes that many of the compounds that have low vapor pressure or have high polar attraction for water do not volatilize immediately when applied. However, these compounds may become volatile under certain conditions. For instance, as a result of overspray or during the intended application, many of these compounds are deposited onto surfaces within the home or in other structures. Over time, these compounds offgas and are released into the air.

Products designed to be applied to people or objects and then washed into the sewage system can also be sources of emissions. These compounds, which can be semi-volatile or highly polar, may be emitted into the atmosphere through at least three possible mechanisms: (1) physiochemical- or bio-degradation into simpler, more volatile compounds, (2) stripping into the air during sparging and aeration caused by turbulence in the sewer stream, or (3) adsorption onto wastewater solids and subsequent offgassing during dewatering and landfilling of those solids. EPA has estimated that between 14 and 25 percent of the pollutants discharged to publicly-owned treatment works (POTWs) may be emitted into the atmosphere.

In light of the uncertainties concerning the final fate of so-called "nonvolatile" organic compounds from consumer products, the ARB staff has taken the position that almost all volatile organic compounds found in consumer products can be assumed to eventually volatilize into the atmosphere. However, implementing this view in the real world of consumer products quickly becomes impractical when all the various VOCs present in consumer products are considered for regulation. To streamline the regulatory development process and to minimize the impacts on industry, ARB staff has limited the applicability of the regulation to those VOCs which are thought to contribute the largest portion of the ambient VOC loading. This streamlining was accomplished by qualifying a VOC with the provision that it either has (a) a vapor pressure greater than 0.1mm Hg at 20 degrees Celsius or (b) less than thirteen carbon atoms, if the vapor pressure is unknown. ARB staff chose these qualifiers based on the relative volatilities of known organic compounds which are found in consumer products. Staff believes that these provisions will enable the regulation to cover most, if not all, of the major contributors to VOC emissions from consumer products. This approach has another practical benefit as most of

the active ingredients tend to be low vapor pressure compounds and exempting compounds based on vapor pressure avoids the necessity of identifying individual active ingredients.

During the regulatory development process, ARB staff indicated they would consider on a product-by-product basis any incontrovertible documentation that shows negligible volatilization for VOCs found in consumer products. Such documentation provided to the ARB needed to address the entire lifespan of the organic compounds in question, from its initial application to its final destruction or conversion. Without this documentation, ARB staff estimated the VOC emissions from consumer products using the VOC content and usage rates for those VOCs which meet the criteria described above.

C. TIME FOR INDUSTRY TO COMPLY

There have been concerns raised regarding the ability of manufacturers to develop complying products by the product standard effective dates. The predominant objection is that there is not enough time to reformulate existing products to the VOC levels required by the regulation. Objections have also been raised to the future effective dates, which industry says will require them to reformulate more than once, taking more time and money.

There are five basic steps involved in reformulating a product:

- (1) Product Formulation Development,
- (2) Packaging Development (Can/Valve, Label etc.),
- (3) Safety and Efficacy Testing,
- (4) Consumer Marketing Tests, and
- (5) Production

Product formulation development includes modifying an existing formulation to meet the VOC standard. During this stage of development, manufacturers may conduct numerous laboratory tests to evaluate and adjust the physical attributes of the new formulation such as the odor, viscosity and color prior to developing the final formula specifications. Industry estimates for formulation development range from 6 to 18 months.

Package development includes choosing an acceptable packaging system and labeling design for the reformulated product. This may include tests to determine the compatibility of the container with the new formulation, stability testing to determine that the product will be stable and not undergo chemical reaction within the container, and modifications to can and valve design for aerosol packages. Package development may take anywhere from 2 to 18 months depending on the changes made to the formulation and the choice of package.

Safety and efficacy testing generally take 6 to 18 months, depending on the product and how extensive the safety testing must be. Safety testing consists of toxicity tests of various types, used to determine the sub-acute, sub-chronic exposure effects of the product. Sub-acute tests generally take 3 to 6 months; sub-chronic test take 3 to 12 months; and chronic tests take from 6 months to 24 months. Efficacy testing is done to determine how well the product performs its intended function, and the amount of time and cost to do them varies from product to product.

Once the safety and efficacy testing is complete, if the product is a FIFRA regulated product the necessary government registration process can begin. Products which must be registered with state and federal agencies are predominantly those which make a pesticide claim. This includes insecticides and disinfectants. The FIFRA registration is initiated first with EPA, then the product must also be registered with the California Department of Food and Agriculture (CDFA). These registration processes cannot be done simultaneously; the FIFRA registration must be done first. Staff contacted EPA and CDFA to determine typical timeframes for registration. The FIFRA amendments enacted in 1988 require EPA to respond to applicants within specified timeframes. For products containing an active ingredient that has been previously registered in another product, the response time is 90 days. For active ingredients that are new, the registration process can take up to one year or longer. Every distinct product subject to FIFRA must be registered, even if the formulation is identical to another product that is already registered. The CDFA registration takes approximately 3 to 5 months.

Consumer marketing tests may take from 3 to 6 months to complete. Time for production startup will also vary from product to product, with a range of 9 to 30 months identified given by industry as typical.

Assuming the development process is sequential, based on the time frames indicated by industry, the total time for reformualtion to market ranges from 3 to 10 years. However, staff beleives that this is an overestimate. In the the Aerosol Handbook, 2nd Edition, an estimate of 1 to 4 years was given for introducing a new product to the consumer; and in discussions with private consultants to the consumer product industry, for some products it may only take from 1 to 2 years to develop and market a new product. Also, many of the above steps can be done concurrently, thus saving time in the reformulation process. Much of the laboratory work involved in formulation development can be eliminated or reduced through the use of library resources, in-house files of previous laboratory experience, and manufacturers' product literature. Cosmetic products, in particular, use standard formulations which contain substances that are "generally recognized as safe" (GRAS), for which the physical, chemical, and compatibility behaviors are well known. One method for formulation screening, which is widely used and may provide significant savings in time to reformulate, is fractional-order randomized block design. This method is used to study different formulation variables, allowing two or more factors to be investigated concurrently. This avoids the "one-factor-at-a-time" approach, which does not allow the detection of interactions of factors.

At the same time that formulation development is being done, container and closure systems should be undergoing evaluation under stress conditions to eliminate those systems that adversely affect product stability. Many companies also begin preliminary or pre-market testing of the proposed product's safety and efficacy at this time as well. The various safety tests can be done concurrently with each other, as well as concurrently with efficacy testing.

Consumer marketing tests are generally done after safety and efficacy testing. However, these can be done concurrently with government agency filings, and initial production steps can also be started at this time. Many of the production processes involve simple blending of ingredients, and industry in general indicated that they did not anticipate extensive process or equipment changes in order to reformulate.

In response to industry's concerns, it must be emphasized that industry is not being asked to develop completely new technology or products in order to comply. The VOC standards have been set such that there are existing complying products in every product category for every product form. It should be possible for industry to utilize technology transfer from these existing products in their pursuit of compliance. The extent to which this occurs is subject to the extent of industry interaction and cooperation and may be affected by patents and licensing agreements.

Industry has also indicated that they typically experiment with product components and formulations on an ongoing basis. Some companies have begun reformulation efforts already, in response to the initiation of regulation development in Fall 1989. This essentially provides three years to reformulate until the first standards become effective in 1993, four years until the 1994 standards, and 1 additional year after the effective date for those products registered under FIFRA. Because many of the steps involved in product reformulation can be overlapped in time, such as various kinds of testing, we believe that compliance by the effective date of the standards is possible.

D. LIQUID LAUNDRY DETERGENTS

Liquid laundry detergents ("down-the-drain" products) contain VOCs, including ethanol, which may be released into the atmosphere during and after use. Ethanol, a low-molecular weight compound, has a high volatility and high water-solubility. It is used as a formulation aid in liquid laundry detergents because of its hydrotropic characteristics. The compound helps to ensure that other detergent components can be combined in a stable way in an aqueous environment. Primarily, it helps prevent phase separation and precipitation from occurring as a result of shifts in temperature.

Because liquid laundry detergent is used in a highly agitative wash environment (e.g. washing machines), the potential for ethanol release into the atmosphere is great. Aware of this possibility and the possibility that

VOC standards may be established for liquid laundry detergent, the Soap and Detergent Association (SDA) sponsored two studies. The studies involved two central issues: (1) what amount of ethanol is emitted into the atmosphere during the wash cycle, and (2) what amount of ethanol is emitted during transport to publicly-owned treatment works (POTWs).

The first study was conducted by the University of California, Berkeley. In this study, the release of ethanol to the atmosphere during simulated household use of liquid laundry detergent (hand dishwashing detergent was also measured but is not relevant to this discussion) was measured. Two conditions of wash were established: (1) "typical" laundry (characteristics selected to represent the most prevalent use habits), and (2) "high release" laundry (characteristics selected to increase the potential for ethanol release while remaining within the range of consumer habits).

The second study was conducted by Engineering-Science of Berkeley, CA. The study makes an analysis of the environmental fate of ethanol in down-the-drain household cleaning products. In this study, no measurements or experimental work were performed. Instead, the study makes use of existing calculations and models taken from the scientific literature. The release of ethanol was estimated in six areas: (1) open bottles during use or storage of dishwashing product, (2) household kitchen sinks during washing of kitchenware, (3) clothes washing machines, (4) sewer lines, (5) publicly-owned treatment works (POTWs), and (6) surface waters. (Areas (1) and (2) are not relevant to this discussion.)

Staff received copies of both studies from SDA representatives. Results from the studies indicated that ethanol release during and after the use of liquid laundry detergent was very small compared to the total VOC emissions from all sources in California. Staff is currently reviewing the methods, data, and results given in both studies. Additionally, staff will review other studies and literature relevant to ethanol release. Due to the time needed to evaluate both studies, review other literature, and determine the potential applicability of a VOC standard for liquid laundry detergent, staff is withholding any comments regarding ethanol release until a later date.

E. DUAL-PURPOSE AEROSOL AIR FRESHENER/DISINFECTANTS

ARB staff proposes to limit the VOC content of dual-purpose aerosol disinfectants that are also used as air fresheners to 60% by weight. This proposed standard is based on staff's analysis of aerosol air fresheners, current disinfectant technology, marketing trends, data provided by industry representatives, and the use of disinfectants as air fresheners. The following will discuss the need for and the feasibility of reducing the VOC emissions from these dual-purpose disinfectants.

1. What are dual-purpose aerosol air freshener/disinfectants?

Dual-purpose aerosol air fresheners/disinfectants (henceforth "aerosol air freshener/disinfectants" or "dual-purpose products"), as defined in the proposed Consumer Products regulation, are pressurized spray disinfectants which are also claimed to freshen or deodorize air. Since disinfectants are designed to kill microbes, they are required to be registered as pesticides with EPA pursuant to the Federal Insecticide, Fungicide, Rodenticide Act (FIFRA).

The proposed VOC standard does not apply to liquid or pump disinfectants since these products have a sufficiently low VOC level after the recommended dilution to meet the proposed standard without requiring reformulation. However, the discussion will include liquid disinfectants which make deodorizing claims since these products are viewed by ARB staff as viable alternatives to aerosol air freshener/ disinfectants.

2. Who will be affected by the proposed VOC standard for dual-purpose aerosol air freshener/disinfectants?

The regulation will affect only aerosol products which are claimed to freshen or deodorize air and to disinfect hard surfaces. Note that products that are sold and advertised only as hard surface aerosol disinfectants would not be affected by the proposed standard. In addition, liquid and pump spray disinfectants that are claimed to deodorize would also not be affected by the standard. Products sold to the consumer market as well as the commercial/institutional markets will be subject to the regulation and proposed standard.

It is interesting to note that the aerosol air freshener/disinfectant products sold to the consumer market generally have much higher VOC levels than the products sold to the commercial/institutional market. Intuitively, one would expect commercial/institutional users to need higher VOC products to inactivate the wider variety and greater concentrations of microbes encountered by these users. This apparent anomaly will be further discussed in subsequent sections of this report.

Previous studies indicate that one brand of dual-purpose aerosol air freshener/disinfectants accounts for over 90% of the consumer retail market and, consequently, over 90% of the emissions from this category (Soap/Cosmetics/Chemical Specialties, December 1988). In contrast with the consumer market, the commercial/institutional market for disinfectants is much more fragmented, with the largest market share for any one company probably not exceeding 20%.

3. Why are we proposing to regulate the VOC content from dual-purpose air freshener/disinfectants?

The California Clean Air Act of 1988 authorizes the ARB to regulate the VOC emissions from consumer products if it is necessary and commercially and technologically feasible. This paper will discuss the feasibility of regulating dual-purpose aerosol air freshener/disinfectants in subsequent

sections. As for the necessity of regulating this product category, ARB staff believes that the VOC emissions associated with this product (approximately 4.3 tons/day), along with the availability of viable alternatives, justify the proposed VOC standard. Compliance with the 60% standard will result in 1.1 tons per day of VOC emission reductions.

Staff proposes regulating the VOC content of these products because, for spray disinfectants, the VOC emissions are assumed to be directly proportional to the VOC content. Since these products are meant to be either sprayed into the air or sprayed onto a hard surface and evaporated, essentially all of the VOC contained in the package is eventually released into the atmosphere. Thus, for the purposes of this discussion, the terms "VOC content" and "VOC emissions" are used interchangeably.

It is important to note that ARB staff does not question the need for disinfectants in the home and in commercial/institutional applications. Staff recognizes that current health concerns and consumer preferences require disinfectants in the home and commercial/institutional applications that are effective and useful. However, given the market and product efficacy data currently available on alternatives to current dual-purpose spray disinfectants, ARB staff believes that the VOC emissions from these products can be reduced while maintaining current levels of anti-microbial protection.

Staff believes that this position can be supported by the following reasons. First, the spray disinfectants which are sold mainly in the retail (consumer) market are advertised or marketed such that consumers may significantly misuse these products as air fresheners. Television commercials and other advertisements involving these disinfectants clearly place a heavy emphasis on the deodorizing and room-freshening properties rather than the hard surface disinfecting properties of these products. ARB staff's shelf survey revealed that these air freshener/disinfectants are very often sold along with other air fresheners instead of other disinfectants.

Dual-purpose aerosol air freshener/disinfectants have an average VOC level of 80% by weight. For comparison, the air freshener category has an average VOC content of 25% by weight, excluding dual-purpose products. Since the dual-purpose products compete directly with other air fresheners, ARB staff believes that the standards for all similar air fresheners should be roughly equivalent. Staff also believes that many consumers spray these products into the air in the mistaken belief that they "disinfect" or "purify" the air. However, these products are not registered with EPA as "air sanitizers." Thus, spraying the products into the air provides only air freshening benefits without disinfecting benefits. It is important to note that the disinfecting benefits can only be achieved when the product is used as a hard surface disinfectant. When using these products correctly as hard surface disinfectants, the user must spray the product until a liquid film forms on the surface in accordance with the label instructions.

The 1990 CARB Consumer Products VOC survey shows that VOC emissions from these dual-purpose products (4.3 tons/day) are approximately equivalent to

those from the entire air freshener category (4.5 tons/day). This data indicates that dual-purpose spray disinfectants are among the highest-emitting product categories in the VOC survey. Because of the reasons cited previously and the following discussion, ARB staff has determined that the emissions from this category should be reduced if the reductions are technologically and commercially feasible.

4. What are disinfectants and what types of disinfectants are available?

The following, in order of ascending potency, are the three types of classifications the EPA assigns to microbially-inactivating products: sanitizers, disinfectants, and sterilants. Sanitizers include general housekeeping cleaners which reduce the number of some microbes on surfaces but are not rated for killing the prototype microbes used in classifying the different levels of disinfection. Sterilizers, on the other hand, must inactivate every microorganism on the surface, including high numbers of bacterial spores. Bacterial spores are among the most difficult of microorganisms to inactivate or kill. Disinfectants, therefore, fall between these two product extremes in terms of the microbes which they kill and the rate of kill provided by the product.

The efficacy of disinfectants is determined by the use of a set of rigidly controlled in vitro tests that are described in the Federal Register, the manual of the Association of Official Analytical Chemists (AOAC) and various EPA guidelines. Testing is conducted against various prototype microorganisms to achieve different disinfection designations. To be registered as a "hospital" disinfectant, complete kill in 10 minutes must be demonstrated against Staphylococcus aureus (S. aureus), Salmonella choleraesuis (S. choleraesuis), and Pseudomonas aeruginosa (P. aeruginosa). These tests must also demonstrate that the disinfectant acts in the presence of organic matter (5% serum) and that this activity is not diminished in the presence of hard water.

5. Against what types of microbes are hospital disinfectants active?

The EPA has chosen a strain of S. aureus as the prototype gram-positive organism because it is one of the more difficult of this group to kill when dried on an inanimate surface. Effectiveness against this organism tacitly presupposes effectiveness against other gram-positive bacteria, such as streptococci, micrococci, other staphylococci, and coryneform bacilli.

A strain of S. choleraesuis is accepted as the prototype enteric bacillus, and activity against it is generally assumed by the infection control community to predict effectiveness against members of the genera Escherichia, Proteus, Salmonella, Shigella, Serratia, Enterobacter, Citrobacter, Arizona, Providencia, Morganella and other members of the family Enterobacteriaceae, i.e., all gram-negative rods that ferment glucose, do not produce spores, and are negative in the cytochrome oxidase test.

A strain of P. aeruginosa is considered as the prototype aerobic bacillus. Action against it is assumed by the infection control community to predict effectiveness against oxidizing and nonoxidizing members of the large group collectively cited as nonfermenting bacilli. These include pseudomonads such as P. cepacia, P. putida, P. stutzeri, P. alcaligenes, P. paucimobilis, P. maltophilia, P. pseudoalcaligenes, as well as members of the genera Achromobacter, Flavobacterium, Acinetobacter, Moraxella and a variety of unnamed CDC strains.

Activity against S. aureus, S. choleraesuis and P. aeruginosa satisfies the minimum requirements for EPA registration as a hospital disinfectant. Additional tests conducted against viruses, pathogenic fungi, and other bacteria can be performed to improve the disinfection classification of the product or to improve the marketability of the product. For instance, if activity against pathogenic fungi is claimed, an additional test against Trichophyton mentagrophytes (interdigitale) is required. This microbe causes "athletes foot fungus." Furthermore, if activity against the tuberculosis bacteria is claimed, additional tests employing the BCG strain of Mycobacterium tuberculosis var. bovis must be performed. It must be noted, however, that activity against M. tuberculosis does not necessarily mean that the product will reduce the physical transmission of tuberculosis. The main vector for transmission of tuberculosis in humans is believed by the infection control community to be airborne particles breathed into the lungs and not through physical contact with a hard surface. Many products document activity against M. tuberculosis because it is regarded as one of the difficult-to-kill, benchmark microorganisms and not because they are trying to claim a reduction in the transmission of tuberculosis through hard surface contact.

6. What are the differences between the different brands of disinfectants?

Once a product passes the mandated AOAC tests against S. aureus, S. choleraesuis, P. aeruginosa, M. tuberculosis and I. mentagrophytes, it is tacitly accepted as an effective disinfectant in the hospital environment for all pathogenic microorganisms except protozoa and viruses. Therefore, the main differences in disinfectants which have claims against these five prototype organisms are the types of virucidal activity which the products claim. EPA registration requirements allow specific virucidal claims only if the activity data is provided for that specific viral strain. For instance, the label of an approved disinfectant can claim virucidal action against a specific virus or an array of viruses--influenza, herpes, and vaccinia, for instance-- but cannot make broad claims on the basis of predictive tests, as can antibacterial agents. A product with activity against rhinovirus will state the exact strain for which data have been submitted. In the case of myxoviruses, a manufacturer cannot claim activity against the myxovirus influenza B if it has submitted data that documents activity only against myxovirus influenza A.

Conversely, because a product does not make a claim against a particular strain of virus, it does not necessarily mean that the product has no activity for that virus. In these cases, the economics of documenting the

assays and test results for activity against certain viruses may not be favorable when competing products make these same claims and hold a very significant portion of the market. This may be the case for products competing with the one dominant product in the consumer retail market. As long as this product holds such a commanding and established share of this market, any competing products would not be able to justify the cost of documenting activity against additional microbes because any potential market gains would probably be insignificant.

With activity against all five prototype microbes, hospital disinfectants with tuberculocidal and fungicidal claims differ mainly by the activity claimed against different viruses. Some active ingredients in these products provide broad spectrum virucidal activity; others are fairly specific in the types of viruses against which they claim activity. The different active ingredients available in current formulations inactivate viruses through varying mechanisms. Table 30 lists the different formulation types, their range of virucidal activity, and the mechanisms by which they inactivate viruses.

As shown in Table 30, the ethanol (70%), glutaraldehyde, halogen (iodophors and hypochlorite) and hydrogen peroxide disinfectants provide the broadest-spectrum activity against viruses. Phenolic and quaternary ammonium products (quats) have narrow to moderate range in virucidal activity.

7. What types of disinfectants are recommended for use in hospital, dental, and other healthcare applications? What types of disinfectants are recommended for use on blood spills that may contain the human immunodeficiency virus (HIV) and hepatitis B virus (HBV)? How would the proposed standard affect the efficacy of the product in regard to preventing the transmission of these and other viruses?

Given currently available data, ARB staff do not believe that the proposed standard will adversely affect the efficacy of disinfectants against the viruses that cause AIDS and other diseases. Recent public concern has emphasized the prevention of the transmission of the AIDS virus. The human immunodeficiency virus (HIV) which causes AIDS is among the easiest of viruses to kill on environmental surfaces. At this time, no case of AIDS transmission through contact with environmental surfaces has been documented. Probably of greater concern to health-care officials is the transmission of the hepatitis B virus (HBV), which carries a greater probability of transmission within the health-care setting.

To address the public and health-care worker concerns about the transmission of these two viruses, the U.S. Department of Health and Human Services (Centers for Disease Control or CDC) recently published their "Guidelines for Prevention of Transmission of Human Immunodeficiency Virus and Hepatitis B Virus to Health-Care and Public-Safety Workers" (henceforth "CDC Guidelines"). Among other things, these guidelines recommend procedures for cleanup of environmental surfaces in the health-care setting.

Table 30

Effect of Virucidal Contact Disinfectants After 10 Minutes

<u>Agent</u>	<u>Spectrum</u>	<u>Use</u>	<u>Action</u>
Alcohol 70% (Ethanol ^a , Isopropanol)	Broad	Skin antiseptics, components of EPA disinfectants ^b	Denature protein
Formaldehyde Glutaraldehyde ^a	Broad	Preservatives, disinfectants, chemosterilizers	React with R-NH ₂ groups, protein inactivation
Halogens ^a I ₂ Iodophors Hypochlorite	Broad	Disinfectants, topical antiseptics	Oxidizing agents
Phenol and derivatives	Moderate (lipophilic viruses)	Preservatives, skin antiseptics, disinfectants	Solubilize and proteins, dissolve lipid envelope
Quaternary Ammonium Compounds (Quats) Chlorohexidine	Narrow (lipophilic viruses)	Skin antiseptics, disinfectants, preservatives	Dissolve lipid envelope of ether-sensitive viruses
Hydrogen peroxide ^a or organic peroxides	Broad	Skin antiseptics, disinfectants, chemosterilizers	Oxidizing agents

^aMost effective.

^bDisinfectant claims regulated by EPA, antiseptic claims by FDA.

(Reprinted from Particulate & Microbial Control, March/April 1983)

This document currently serves as the basis for operational guidelines used by hospital and dental associations, the Red Cross, and other health-care agencies.

In these guidelines, the CDC classifies disinfectants in terms of whether they achieve high-, intermediate-, or low-level disinfection, as shown in Table 31. As can be seen in Table 31, sterilants and high-level disinfectants are recommended for use on equipment and tools that are invasive to or otherwise used on the human body. Environmental surfaces (e.g., counter-tops, sinks, toilet seats), which are found in homes, hospitals, dental offices and other areas where infection control is important, generally require only low- or intermediate-level disinfection or even cleanup with water and detergent, depending on the degree of disinfection required and whether any soil is present.

As shown in Table 31, the CDC guidelines specify either low- or intermediate-level disinfectants for cleaning environmental surfaces. For surfaces where there is no significant amount of blood or blood-contaminated fluid, the CDC guidelines specify that low-level disinfection (i.e., hospital disinfectant without a tuberculocidal claim) will suffice. In those cases where there is a significant amount of blood or blood-contaminated fluid, the CDC guideline specifies the use of an intermediate-level disinfectant after precleaning of the visible material: that is, use of either a hospital disinfectant with a tuberculocidal claim or a solution containing at least 500 ppm free available chlorine (approximately 1/4 cup common household bleach per gallon of tap water). Intermediate-level disinfection is also recommended by the CDC for dental settings, where saliva containing blood may be present on the environmental surfaces.

From Table 31, it is apparent that hospital and dental hard surface disinfection requires only low- or intermediate-level disinfection. Products that perform intermediate-level disinfection are those with tuberculocidal claims. In addition to the 500 ppm chlorine solution noted in Table 31, other products are available which will meet the requirements for intermediate-level disinfection. To determine the number of hospital disinfectants with tuberculocidal claims (i.e., intermediate-level disinfectants), staff conducted searches through EPA's National Pesticides Information Retrieval System (NPIRS) and the pesticides database compiled by the California Department of Food and Agriculture (CDFA). From these searches, staff found 85 tuberculocidal hospital disinfectants registered with EPA. In addition, staff also found 101 EPA-registered products that claim activity against the HIV virus (AIDS). Note that the products with claims against the AIDS virus do not necessarily claim tuberculocidal activity, which indicates the relative ease at which the HIV virus is inactivated. Although there is some overlap between the results from these two searches, it can be clearly shown that there are numerous products which can meet the requirements of the Centers for Disease Control for the prevention of transmission of the HIV and HBV viruses.

TABLE 31

Reprocessing Methods for Equipment Used in the
Prehospital¹ Healthcare Setting

Sterilization:	Destroys:	All forms of microbial life including high numbers of bacterial spores.
	Methods:	Steam under pressure (autoclave), gas (ethylene oxide), dry heat, or immersion in EPA-approved chemical "sterilant" for prolonged period of time, e.g. 6-10 hours or according to manufacturers' instructions. Note: liquid chemical "sterilants" should be used only on those instruments that are impossible to sterilize or disinfect with heat.
	Use:	For those instruments or devices that penetrate skin or contact normally sterile areas of the body, e.g., scalpels, needles, etc. Disposable invasive equipment eliminates the need to reprocess these types of items. When indicated, however, arrangements should be made with a health-care facility for reprocessing reusable invasive instruments.
High-Level Disinfectant:	Destroys:	All forms of microbial life except high numbers of bacterial spores.
	Methods:	Hot water pasteurization (80-100 C, 30 minutes) or exposure to an EPA-registered "sterilant" chemical as above, except for a short exposure time (10-45 minutes or as directed by the manufacturer).
	Use:	For reusable instruments or devices that come into contact with mucous membranes (e.g. laryngoscope blades, endotracheal tubes, etc.).
Intermediate-Level Disinfectant:	Destroys:	<u>Mycobacterium tuberculosis</u> , vegetative bacteria, most viruses, and most fungi, does not kill bacterial spores.

TABLE 31 (Con't)

	<p>Methods: EPA-registered "hospital disinfectant" chemical germicides that have a label claim for tuberculoidal activity; commercially available hard-surface germicides or solutions containing at least 500 ppm free available chlorine (a 1:100 dilution of common household bleach—approximately 1/4 cup bleach per gallon of tap water).</p> <p>Use: For those surfaces that come into contact only with intact skin, e.g., stethoscopes, blood pressure cuffs, splints, etc., and have been visibly contaminated with blood or bloody body fluids. Surfaces must be precleaned of visible material before the germicidal chemical is applied for disinfection.</p>
Low-Level Disinfection:	<p>Destroys: Most bacteria, some viruses, some fungi, but not <u>Mycobacterium tuberculosis</u> or bacterial spores.</p> <p>Methods: EPA-registered "hospital disinfectants" (no label claim for tuberculosis activity).</p> <p>Use: These agents are excellent cleaners and can be used for routine housekeeping or removal of soiling in the absence of visible blood contamination.</p>
Environmental Disinfection	<p>Environmental surfaces which have become soiled should be cleaned and disinfected using any cleaner or disinfectant agent which is intended for environmental use. Such surfaces include floors, woodwork, ambulance seats, countertops, etc.</p>

IMPORTANT: To assure the effectiveness of any sterilization or disinfection process, equipment and instruments must first be thoroughly cleaned of all visible soil.

¹ Defined as setting where delivery of emergency health-care takes place prior to arrival at hospital or other health-care facility.

8. Why was 60% by weight VOC chosen as the standard for spray disinfectants?

ARB staff's analysis of current disinfectant technology indicated that 60% by weight VOC is adequate for products to meet hospital disinfection requirements. Staff has determined that alternative non-air freshener products are available which are EPA-registered hospital disinfectants. Moreover, these products can meet guidelines issued by the U.S. Department of Health and Human Services for the use of disinfectants in health-care and dental settings to help prevent the transmission of the AIDS and hepatitis B viruses. Because of the way these dual-purpose products are marketed and used, they may compete directly with two-phase aerosol air fresheners. Both products provide similar air freshening benefits. Therefore, ARB staff believes that the standards for these similar-use products should likewise be similar. The current standard for two-phase aerosol air fresheners is 30% VOC by weight. Staff therefore proposed the limit for these dual-purpose products as 60% to reflect the need for additional VOC for disinfection.

Dual-purpose aerosol air freshener/disinfectants, most of which are based on high levels of ethanol, contain propellents whose primary purpose is to deliver the ethanol and a small amount of other active ingredients in a convenient manner for the consumer. The difference between these products and a liquid disinfectant which has the same disinfectant classification then becomes a matter of convenience to the consumer. Staff set the standard at the minimum amount of ethanol required for an aerosol product to inactivate the five prototype organisms required for the hospital disinfectant classification with tuberculocidal and fungicidal activity. Staff expects most, if not all, liquid/pump spray disinfectants with this type of activity will easily comply with the standard after proper dilution.

9. If we limit the VOC content of these products, are we indicating that homeowners do not deserve the same antimicrobial protection as hospitals? What air freshener/disinfectants do hospitals really use?

As stated previously, the Centers for Disease Control recommends low- or intermediate-level disinfectants for hospital and dental hard surface disinfection. Although the ethanol-based aerosol products qualify as intermediate-level surface disinfectants, they are by no means the only products available that can satisfy the CDC recommendations. ARB staff's discussion with hospital personnel indicates that most hospitals and dental offices in California use commercially-available liquid disinfectants. With the help of the California Association of Hospitals and Health Systems (CAAHS), ARB staff found that none of the more than twenty-four hospitals and health clinics surveyed used aerosol disinfectants. Hospitals surveyed include Kaiser Permanente, Sutter Memorial, and various smaller establishments. The only aerosol product used by these hospitals was a spray lubricant for use on surgical equipment. The hospital personnel contacted by the CAAHS staff cited three reasons for not using aerosol spray disinfectants: (1) the individually-packaged aerosol disinfectants are not economical when compared to liquid disinfectants purchased in bulk, (2)

health and environmental concerns regarding spraying an aerosol product around sensitive patients, (3) the relative ease with which individually packaged aerosol products are stolen from health-care facilities. Of these, the main reason cited was economic; aerosol sprays cannot compete with bulk liquid disinfectants on a per volume basis.

A frequently overlooked but highly-effective alternative to consumer- and commercially-formulated disinfectants is common household bleach. When diluted to a 500 ppm solution, it will kill many, if not all, of the microbes against which currently available disinfectants claim activity. As previously stated, there are also numerous liquid disinfectants registered with EPA that will accomplish the same level of disinfection as the aerosol products but at a lower VOC content. Again, it should be noted that the standard would not apply to products sold or advertised solely as a hard surface aerosol disinfectant. Staff therefore believes that there will still be efficacious disinfectants available to the consumer.

10. If liquid disinfectants are used in place of spray disinfectants, will there be safety problems with children possible swallowing the liquid?

Industry representatives contend that, as alternatives to aerosol products, liquid disinfectants present a safety concern from the potential accidental swallowing by children. Although this is a legitimate concern, staff believes that properly-designed packaging will eliminate or significantly reduce this concern. ARB staff has identified from the NPIRS search at least 8 liquid/pump spray disinfectants which employ child-resistant packaging. Moreover, staff believes that the potential for accidental swallowing cannot be completely eliminated from either the spray or liquid packaging. Therefore, although the potential for accidental swallowing cannot be completely eliminated, ARB staff believes that packaging technology is currently available that will significantly reduce or eliminate this concern.

11. Will limiting the VOC content in dual-purpose aerosol air freshener/disinfectants reduce their efficacy against germ-causing odors?

As stated previously, spraying into the air provides only air freshening benefits and no documented disinfecting benefits. Thus, spraying a high-VOC disinfectant into the air to deodorize a room achieves only air freshening benefits, which could be similarly achieved with numerous low-VOC air fresheners. In addition, these products are often advertised as being capable of "clearing" the air of noxious cigarette smoke and similar fumes. Cigarette smoke, which is composed of minute particles of soot and ash, can be removed from the air by contacting the particles with sufficiently-sized droplets of liquid. This process, known as "scrubbing", forms the basis for wet scrubbing in particulate control systems and is the main reason why dirty air is cleaner after a rain storm. In the case of cigarette smoke removal in air, the size of the liquid droplet is the controlling factor. Thus, any liquid, including plain water, can "clear" a cigarette smoke-filled room if sprayed at the proper droplet size.

The germs that cause odors on hard surfaces in the household, such as E. coli, are relatively easy to kill when compared to the prototype organisms used in EPA disinfectant classifications. Staff believes that at 60% VOC, spray disinfectants should be able to retain activity against odor-causing germs. As in the previous discussion, there are alternative disinfectants that are able to kill the odor-causing organisms at lower VOC levels. Of course, these alternatives include properly-diluted common household bleach.

12. ARB staff appears to view household bleach as a viable alternative to spray disinfectants. Is a 500 ppm bleach solution corrosive in the household environment?

Because of its oxidizing properties, a 500 ppm bleach solution is considered by staff to be an inexpensive but highly effective disinfectant for household and institutional uses. A bleach solution at this concentration (approximately 1/4 cup household bleach in a gallon of water) is recommended by the U.S. Department of Health and Human Services for use in health-care and dental settings. A 500 ppm bleach solution is generally not considered to be corrosive in the household environment. For comparison, staff estimates that a typical load of laundry with bleach contains about 3700 ppm of bleach. In addition, the 5% bleach solution as sold in the package is rated as non-corrosive under Department of Transportation regulations for transport. This indicates that a 500 ppm bleach solution should not adversely affect hard surfaces found in the home.

13. How can an air freshener/disinfectant manufacturer comply with this standard?

There are essentially four ways for a manufacturer to comply with the 60% standard: (1) sell, advertise and market the product only as a hard surface disinfectant and not as an air freshener, in which case the product would no longer be subject to the regulation, (2) reformulate the product to reduce the VOC content and use an exempt VOC or non-VOC propellant, (3) reformulate the product to reduce the VOC content and use it in a pump, (4) redesign the product into an innovative package such that it emits fewer emissions. Of these, options 1, 2 and 3 are believed to be the most cost-effective and easiest options to implement. Note that option 1 requires only a labeling and marketing change.

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**WRITTEN COMMENTS ON PROPOSED CHANGES
TO THE STATEWIDE CONSUMER PRODUCTS RULE**

<u>Company</u>	<u>Letter</u>
Canberra Corporation	2-16-90
Ian Gecker & Associates (2 letters)	2-23-90
CCL Industries	3-01-90
JASCO Chemical Corporation	3-2-90
May Kay Cosmetics, Inc.	3-2-90
Sprayon Products	3-4-90
Blue Magic Products, Inc.	3-5-90
Ecolab Inc.	3-5-90
The Soap and Detergent Association	3-5-90
The Procter & Gamble Company	3-5-90
Chemical Specialties Manuf. Association	3-5-90
Halogenated Solvents Industry Alliance	3-6-90
Creative Products Inc.	2-26-90
Cardinal	3-12-90
Accra Pac, Inc.	3-12-90
Dupont	3-9-90
Environmental Protection Agency	3-15-90
Fairfield American Corp.	3-6-90
May Kay Cosmetics, Inc.	3-8-90
Cyclo Automotive Products	3-15-90
Justice Brothers, Inc.	3-14-90
BAF Industries	3-15-90
Major Paint Company	3-14-90
The Cosmetic, Toiletry, & Fragrance Association	3-6-90
Dow Corning Corporation	3-12-90
Chesebrough-Ponds USA	4-2-90
Cosmosol, Ltd.	4-4-90
Chemical Specialties Manufacturers Association	4-6-90
Portion Pac, Chemical Corporation	4-6-90
Car-Freshener Corporation	4-2-90
Dow Corning Corporation	4-2-90
Champions Choice, Inc.	4-11-90
Halogenated Solvents Industry alliance	4-12-90
The Aerosol Group	4-25-90
Apollo	4-26-90
The Procter & Gamble Company	4-27-90
Colgate-Palmolive Company	5-10-90
Paul, Hastings, Janofsky & Walker	5-10-90
Faultless Starch	5-17-90
The Soap and Detergent Association	5-21-90
Claire Manufacturing Company	5-21-90
Copper Brite, Inc.	5-22-90
CCL Industries, Inc.	5-22-90

Accra Pac Group	5-24-90
Kirkpatrick & Lockhart	5-30-90
Cyclo Automotive Products	5-31-90
Dow Corning, USA	6-1-90
The Clorox Company	6-5-90
Montfort A. Johnson & Assoc., LTD	6-7-90
Chemical Specialties Manufacturers Association	6-11-90
Dow Corning Corporation	6-14-90
Mary Kay Cosmetics, Inc.	6-19-90
Halogenated Solvents Industry Alliance	6-22-90
Creative Products, Inc.	6-28-90
The Procter & Gamble Company	6-29-90
The Soap and Detergent Association	7-3-90
Ecolab Inc.	7-5-90
The Procter & Gamble Company	7-6-90
Livingston & Mattesich Law Corporation	7-10-90
The Cosmetic, Toiletry and Fragrance Association	7-11-90
Paul, Hastings, Janofsky & Walker	7-12-90
First Brands Corporation	7-13-90
The Procter & Gamble Company	7-26-90
Accra Pac Group	7-30-90
Accra Pac Group	7-31-90
Claire Manufacturing Company	7-31-90
Radiator Specialty Company	8-1-90
KMS Research	8-3-90
Airwick Industries	8-3-90
Fragrance Materials Association of the United States	8-3-90
Sprayon Products	8-3-90
The Soap and Detergent Association	8-3-90
The Cosmetic, Toiletry and Fragrance Association	8-6-90
Sprayon Products	8-6-90
Radiator Specialty Company	8-6-90
Chemical Specialties Manufacturers Association	8-6-90
Ecolab Inc.	8-7-90
The Procter & Gamble Company	8-8-90
Environmental Protection Agency	8-10-90

REFERENCES (CON'T)

PHONE CONVERSATIONS

Company

CTFA
National Starch & Chemical Corp.
BASF
Cosmosol LTD.
Ecolab, Inc.
Unsmoke International
Amway
Sani Fresh International
J. Hubbard, Inc.
Willert Home Products
Air-Scent International
Boyle Midway (A/F)
Murphy - Phoenix Co.
Pioneer/Eclipse
Las - Stick Manufacturing Co.
Faultless Starch
Theochem
Pennzoil
Whink Products Company
Natal Industries Inc.
Colgate-Palmolive Co.
Sunshine Makers Inc.
McLaughlin Gormley King Co.
Meteorology Sect., Tech Sup. Div ARB
California Dept. of Food & Ag.
Infection Control, Sac. U.C. Med Ctr
Pfizer
Miles Inc.
Mearl Co.
Scotch Corporation
Certified Growers
Firman and Warren
Fleming Foods
Southern California Grocers Assoc.
American Hospital Association
California Dental Association
Calif. Assoc. of Health Facilities
Calif. Assoc. of Rehabilitation Fac.
Calif. Licensed Voc. Nurses Assoc.
Sullivan, Roche and Johnson
Medi-Cal
Demert and Dougherty, Inc.
John Paul Mitchell Systems
U.S. Dept. of Health and Human Services, Centers for Disease Control

Company

GAF Chemical Corp.
Stepan Chemical Company
Precision Valve Corp.
Mary Kay Cosmetics, Inc.
Steiner Co. Inc.
Car Freshner Corp.
Big "D" Industries, Inc.
Stanhome
Drackett Products Co.
Mil-Du-Gas Co.
Descale It
Blue Coral, Inc.
SC Johnson & Son, Inc.
Rohm & Haas
Scott's Liquid Gold
Howard Products, Inc.
Procter & Gamble
LPS Labs
Del Laboratories
Revlon, Inc.
CCL Industries Inc.
Summit Chemical
Chevron Chemical Co.
Texas Tech University Health Services
Environ. Protection Agency, FIFRA Reg.
EPA office of Pesticides (Disinf.Br.)
National Pesticide Info. Retrieval Sys.
Ohio Envir. Protection Agency
Dow Brands
E.I. Dupont De Nemours & Co.
Market Wholesale Grocery Co.
Northern California Grocers Assoc.
Emco
California Grocers Assoc.
Calif. Assoc. Hospitals & Health Syst.
California Assoc. of AIDS Agencies
Calif. Assoc. of Medical Products
Calif. Hotel and Motel Association
California Pharmacy Association
Calif. Assoc. of Catholic Hospitals
Aerosol Services Co., Inc.
Redken Laboratories, Inc.
Amer. Assoc. for Health Serv. at Home

REFERENCES (CON'T)

CONSULTATION MEETINGS

<u>DATE</u>	<u>Description</u>	<u>Location</u>
08/17/89	3M	Sacramento
08/31/89	Lehn & Fink	"
10/20/89	Cosmosol	"
01/22/90	Winzer Company	"
02/13/90	Procter & Gamble	"
02/13/90	Soap & Detergent Assoc.	"
02/22/90	Procter & Gamble	"
02/22/90	Vidal Sassoon	"
03/01/90	Sprayon Products	"
03/01/90	PMI	"
03/01/90	Johnson Wax	"
03/15/90	Johnson Wax	"
03/21/90	Sprayon	"
03/23/90	Lubrizol	"
03/26/90	Chemsicol	"
03/27/90	Chesebrough-Ponds	San Francisco
03/27/90	Gillette	"
04/10/90	CTFA	Sacramento
04/11/90	CSMA	"
04/12/90	Alberto Culver	"
04/26/90	EPA	Fairfield
05/08/90	Faultless Starch	Sacramento
05/16/90	Scotts Liquid Gold	"
05/17/90	Colgate-Palmolive	"
05/22/90	Procter & Gamble	"
05/22/90	Paradichlorobenzene Producers	"
06/01/90	CTFA	"
06/19/90	Drackett	"
06/20/90	Johnson Wax	"
06/22/90	Monsanto, Willert	"
06/25/90	Soap & Detergent	"
06/27/90	Lehn & Fink	"
06/28/90	McLaughlin Gormley King Co.	"
06/28/90	Sprayon	"
06/28/90	Chevron Chemical	"
07/03/90	Ecolab, Airwick, State Chemical Co.	"
07/03/90	CSMA - Engine Degreasers	"
07/11/90	CTFA - Hairspray Manufacturers	"
07/16/90	California Dental Association	"
07/18/90	California Association of Hospitals and Health Systems	"
07/25/90	Charcoal Lighter Fluid Industry Representatives	"
08/1/90	3M	"
08/1/90	CSMA - First Brands	"
08/7/90	Lehn and Fink	"

Appendix A

California Clean Air Act Section 26

AB 2595

SEC. 26. Section 41712 is added to the Health and Safety Code, to read:

41712. (a) On or before January 1, 1992, the state board shall adopt regulations to achieve the maximum feasible reduction in reactive organic compounds emitted by consumer products, if the state board determines that adequate data exists for it to adopt the regulations.

(b) The state board shall not adopt regulations pursuant to subdivision (a) unless the regulations are technologically and commercially feasible, and necessary to carry out this division.

(c) For purposes of this section, a "consumer product" means a chemically formulated product used by household and institutional consumers, including, but not limited to, detergents; cleaning compounds; polishes; floor finishes; cosmetics; personal care products; home, lawn, and garden products; disinfectants; sanitizers; and automotive speciality products but do not include paint, furniture coatings, or architectural coatings.

(d) Prior to January 1, 1994, a district shall adopt no regulation relating to a consumer product which is different than any regulation adopted by the state board for that purpose.

Appendix B

Proposed Consumer Product Regulation

**PROPOSED
REGULATION FOR REDUCING VOLATILE ORGANIC COMPOUND
EMISSIONS FROM CONSUMER PRODUCTS**

Adopt new Article 2, Consumer Products, Sections 94507-94516, Title 17, California Code of Regulations, to read as follows:

SUBCHAPTER 8.5 CONSUMER PRODUCTS

Article 2. Consumer Products

94507. Applicability

Except as provided in Section 94510, this article shall apply to any person who sells, supplies, offers for sale, or manufactures consumer products in the state of California.

NOTE: Authority cited: Sections 39600, 39601, and 41712, Health and Safety Code. Reference: Sections 39002, 39600, 40000, and 41712, Health and Safety Code.

94508. Definitions

For the purpose of this article, the following definitions apply:

- (1) Aerosol Food Product means any food product dispensed from an aerosol container.
- (2) Aerosol Product means a pressurized spray system that dispenses product ingredients by means of a propellant or mechanically induced force.
- (3) Air Freshener means any consumer product including, but not limited to, sprays, wicks, powders, and crystals, designed for the purpose of masking odors, providing a scent, or deodorizing. This category includes disinfectant aerosol spray products that are sold or advertised for dual use as air fresheners and hard surface disinfectants. "Air freshener" does not include products that are used on the human body, or products that function primarily as cleaning products as indicated on a product label or advertisement.

- (4) Antiperspirant means any product including, but not limited to, aerosols; roll-ons, sticks, pumps, pads, creams, and squeeze-bottles, that is intended by the manufacturer to be used to reduce perspiration in the human axilla by at least 20 percent in at least 50 percent of a target population.
- (5) Architectural Coating means coatings applied to stationary structures and their appurtenances, to mobile homes, to pavements, or to curbs.
- (6) Automotive Bug and Tar Remover means a specialty cleaning product used primarily to remove materials such as bugs, road tars, and oil which have adhered to a motor vehicle's body.
- (7) Automotive Chrome Polish means a specialty maintenance product used to clean and polish a motor vehicle's chrome components.
- (8) Automotive Leather/Vinyl Cleaner means a specialty cleaning product used to clean the leather or vinyl components of a motor vehicles's interior.
- (9) Automotive Tire Dressing means a specialty product designed to provide lustre and/or protect a motor vehicle tire.
- (10) Automotive Wheel Cleaner means a specialty product used to remove materials such as dirt and grime from a motor vehicle's wheels.
- (11) Automotive Windshield Washer Fluid means any liquid designed for use in a motor vehicle windshield washer fluid system for the purpose of cleaning, washing, or wetting the windshield(s). Automotive windshield washer fluid does not include any fluid which is placed in a new motor vehicle at the time the vehicle is manufactured.
- (12) Bathroom and Tile Cleaner means a specialty cleaner formulated specifically for bathroom and/or tile cleaning.
- (13) Brake-Cleaner means a specialty cleaning product designed to remove oil, grease, or brake fluid from motor vehicle brakes without leaving a residue.
- (14) Carburetor - Choke Cleaner means a product designed to remove dirt and other contaminants from a carburetor and its components.
- (15) Charcoal Lighter fluid means any combustible organic liquid used to ignite charcoal.
- (16) Colorant means any pigment or coloring material used in a consumer product for an aesthetic effect, or to dramatize an ingredient.

- (17) Consumer Product means a chemically formulated product used by household and institutional consumers including, but not limited to, detergents; cleaning compounds; polishes; floor finishes; cosmetics; personal care products; home, lawn, and garden products; disinfectants; sanitizers; and automotive specialty products but do not include paint, furniture coatings, or architectural coatings.
- (18) Deodorant means any product including, but not limited to, aerosols, roll-ons, sticks, pumps, pads, creams, and squeeze-bottles, that is intended by the manufacturer to be used to minimize odor in the human axilla by retarding the growth of bacteria which cause the decomposition of perspiration.
- (19) Disinfectant means any product intended to destroy or irreversibly inactivate infectious or other undesirable bacteria, pathogenic fungi, or viruses on surfaces or inanimate objects and whose label is registered under the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA, 7 U.S.C. 136, et seq.)
- (20) Distributor means any person who transports or stores or causes the transportation or storage of consumer products at any point between any consumer product manufacturing plant and any retail outlet or whole-sale-purchaser-consumer's facilities.
- (21) Double Phase Aerosol Air Freshener means an aerosol air freshener with the liquid contents in two or more distinct phases and requiring that the product container be shaken before use to mix the phases, producing an emulsion.
- (22) Dusting Aid means a spray product designed to assist in removing dust and other residuals from finished wood surfaces, including floors, and which after drying leave behind no film or other residuals on such surfaces.
- (23) Engine Degreaser means a specialty cleaning product designed to remove grease, grime, oil and other contaminants from the external surfaces of engines and other mechanical parts.
- (24) Executive Officer means the Executive Officer of the Air Resources Board, or his or her delegate.
- (25) Fabric Protectant means a product specially designed to be applied to fabric substrates to protect the surface from soiling from dirt and other impurities.
- (26) Flexible Flooring Material means asphalt, cork, linoleum, no-wax, rubber, seamless vinyl and vinyl composite flooring.

- (27) Floor Polish (Wax) means waxes, polishes, finish restorers or any other products for the purpose of polishing, protecting or enhancing the surfaces of floors and excluding products only for the purpose of cleaning floors, products formulated for unfinished wood floors, and coatings subject to architectural coatings rules.
- (28) Food means (1) articles used for food or drink for man or other animals, (2) chewing gum, and (3) articles used for components of any such article.
- (29) Fragrance means a substance or complex mixture of aroma chemicals, natural essential oils, and other functional components with a combined vapor pressure not in excess of 2 mmHg at 20 C, the sole purpose of which is to impart an odor or scent, or to counteract a malodor.
- (30) Furniture Maintenance Product means a wax, polish, conditioner, moisturizer or any other product designed for the purpose of polishing, protecting or enhancing finished wood surfaces other than floors and excludes products only for the purpose of cleaning. Furniture maintenance product does not include dusting sprays.
- (31) Furniture Coating means any paint applied to room furnishings which include cabinets (kitchen, bath and vanity), tables, chairs, beds, and sofas.
- (32) General Purpose Cleaner means a formulation designed for general all-purpose cleaning, in contrast to specialty cleaning products made to clean in certain situations.
- (33) Glass Cleaner means a specialty cleaning product designed primarily for cleaning surfaces made of glass.
- (34) Hairspray means a consumer product designed primarily for the purpose of dispensing droplets of a resin on and into a hair coiffure which will impart sufficient rigidity to the coiffure to establish or retain the style for a period of time.
- (35) Hair Mousse means a hairstyling foam which facilitates styling of a coiffure and provides limited holding power.
- (36) Hair Styling Gel means a high viscosity, often gelatinous, product that contains a resin and is applied to hair to aid in styling and sculpting of the hair coiffure.
- (37) Household Adhesive means any substance that is used to bond one surface to another by attachment.

- (38) Household Consumer means any person who uses consumer products in his or her daily activities including, but not limited to, personal care; cooking; cleaning; laundering; or home and auto maintenance.
- (39) Household Pesticide means any pesticide product distributed to the retail market.
- (40) Household Sealant and Caulking Compound means any product designed to fill in cracks, close or secure an object, or to prevent seepage of moisture or air.
- (41) Industrial Spray Buff means a liquid or aerosol product mixture of polymer, resins, waxes and solvents that is used in conjunction with a floor machine and special pad for restoring worn floor polishes.
- (42) Insect Repellent means a compound or combination of compounds which are applied to human skin, hair or clothing in order to prevent contact with or otherwise repel biting insects and pests.
- (43) Institutional Consumer means an organization, business, or establishment engaged in either the nonprofit promotion of a particular public, educational, or charitable cause, or the transfer of commodities or services for profit. Institutional consumer includes but is not limited to government agencies, schools, hospitals, sanitariums, prisons, restaurants, stores, automobile service centers, health clubs, theatres, or transportation companies. This does not include private residences.
- (44) Laundry Detergent means a product containing a surfactant and other ingredients, formulated to clean and care for fabric articles.
- (45) Laundry Prewash means a specialty product that is applied to a fabric prior to laundering and that supplements and contributes to the effectiveness of laundry detergents and/or provides specialized performance.
- (46) Laundry Starch Product means a product that is applied to a fabric after laundering to impart and prolong a crisp, fresh look and retain the shape of the garment and that may act as an aid to make ironing of the fabric easier. Such products include, but are not limited to, fabric finish, sizing, and starch.
- (47) Lubricant means any liquid or solid that reduces friction, heat, and wear when applied as a surface coating to a moving part.

- (48) Manufacturer means any person or business entity that produces, packages, repackages, or relabels a consumer product for sale in California.
- (49) Nail Polish Remover means a product primarily used to remove nail polish and coatings from fingernails or toenails.
- (50) Nail Polish means any clear or colored coating applied to the fingernails or toenails and includes lacquers, enamels, acrylics, base coats and top coats.
- (51) Nonresilient Flooring means flooring of a mineral content which is not flexible. Nonresilient flooring includes terrazzo, marble, slate, brick, stone, ceramic tile and concrete.
- (52) Oven Cleaner means any specialty cleaning product designed to clean and to remove dried food deposits from oven walls.
- (53) Paint means any pigmented liquid, liquefiable, or mastic composition designed for application to a substrate in a thin layer which is converted to an opaque solid film after application and is used for protection, decoration or identification, or to serve some functional purpose such as the filling or concealing of surface irregularities or the modification of light and heat radiation characteristics, etc.
- (54) Paint Stripper means any product formulated to strip or remove paint from a substrate without markedly affecting the substrate itself.
- (55) Percent-By-Weight means the total weight of VOC except those VOCs exempted under Section 94510, expressed as a percentage of the total net weight of the product exclusive of the container or package as calculated according to the following equation:

$$\text{Percent-By-Weight} = \frac{B - C}{A} * 100$$

where,

A = net weight of unit (excluding container and packaging)
 B = weight of VOCs, as defined in Section 94508, per unit
 C = weight of VOCs, exempted under Section 94510, per unit

- (56) Pesticide means and includes any substrates or mixture of substances labeled, designed, or intended for use in preventing, destroying, repelling or mitigating any pest, or any substance or mixture of substances labeled, designed, or intended for use as a defoliant, desiccant, or plant regulator,; provided that the term "pesticide" will not include any substance or mixture of substances which the Environmental Protection Agency does not consider to be a pesticide.

- (57) Propellant means a liquified or compressed gas that is used in whole or in part to expel from the same self-pressurized container or from a separate container a liquid or solid material different from the propellant.
- (58) Pump Spray Dispenser means a non-pressurized dispenser that dispenses product ingredients by means of a mechanical force induced by the hand of the operator.
- (59) Retailer means any person who owns, leases, operates, controls, or supervises a retail outlet.
- (60) Retail Outlet means any establishment at which consumer products are sold, supplied, or offered for sale.
- (61) Rug Deodorizer means any product designed to mask odors, provide a specific desired scent, or to deodorize carpets, rugs, or other floor coverings. This does not include products that function as cleaning products.
- (62) Shaving Cream means an aerosol product which dispenses a foam lather intended to be used with a blade or cartridge razor, or other wet-shaving system, in the removal of facial or other bodily hair.
- (63) Shaving Gel means an aerosol product which dispenses a gel capable of being formed into a foam lather intended to be used with a blade or cartridge razor, or other wet-shaving system, in the removal of facial or other bodily hair.
- (64) Single Phase Aerosol Air Freshener means an aerosol air freshener with the liquid contents in a single homogeneous phase and which does not require that the product container be shaken before use.
- (65) Volatile Organic Compound (VOC) means any compound containing at least one atom of carbon, except methane, carbon monoxide, carbon dioxide, carbonic acid, metallic carbides, or carbonates, ammonium carbonate, 1,1,1-trichloroethane, methylene chloride, trichlorofluoromethane (CFC-11), dichlorodifluoromethane (CFC-12), chlorodifluoromethane (HCFC-22), trifluoromethane (HFC-23), trichlorotrifluoroethane (CFC-113), dichlorotetrafluoroethane (CFC-114), chloropentafluoroethane (CFC-115), dichlorotrifluoroethane (HCFC-123), tetrafluoroethane (HFC-134a), dichlorofluoroethane (HCFC-141b), and chlorodifluoroethane (HCFC-142b).
- (66) Water Proofing Products means a product applied to fabric to reduce absorption of water.
- (67) Wood Floor Wax means wax-based products for use solely on wood floors.

NOTE: Authority cited: Sections 39600, 39601, and 41712, Health and Safety Code. Reference: Sections 39002, 39600, 40000, and 41712, Health and Safety Code.

94509. Standards for Consumer Products

- (a) Except as provided in Sections 94510, 94511, and 94514, no person shall sell, supply, offer for sale, or manufacture for sale in California any consumer product which, at the time of sale or manufacture, contains volatile organic compounds in excess of the limits specified in the following Table of Standards after the specified effective dates.

Table of Standards

Percent Volatile Organic Compounds by Weight

<u>Product Category</u>	<u>1/1/93</u>	<u>1/1/94</u>	<u>Future Effective (Date)</u>
Air Fresheners			
Single Phase Aerosols	70		30 (1996)
Double Phase Aerosols	30		
Liquids/Pump Sprays	18		
Solids/Gels	3		
Dual Purpose Air Freshener- Disinfectant Aerosol Sprays		60	
Automotive Windshield Washer Fluids:			
Type A Areas*	35		
All Other Areas	10		
Bathroom and Tile Cleaners		5	
Engine Degreasers	75		50 (1996)
Floor Polishes/Waxes			
Products for Flexible Flooring Materials		7	
Products for Nonresilient Flooring		10	

Table of Standards
(continued)

Percent Volatile Organic Compounds by Weight

<u>Product Category</u>	<u>1/1/93</u>	<u>1/1/94</u>	<u>Future Effective (Date)</u>
Wood Floor Wax		90	
Furniture Maintenance Products			
Aerosols		25	
All Other Forms except Solid or Paste Forms		7	
General Purpose Cleaners		10	
Glass Cleaners	6		
Hairsprays	80		55 (1998)
Hair Mousses		16	
Hair Styling Gels		6	
Insect Repellents			
Aerosols		65	
Laundry Prewash			
Aerosols/Solids		22	
All Other Forms		5	
Nail Polish Removers		85	75 (1996)
Oven Cleaners			
Aerosols/Pump Sprays	8		
Liquids	5		
Shaving Creams		5	

* Type A Areas include only the following: Del Norte, Shasta and Trinity Counties; the Great Basin Valley, Lake Tahoe, Mountain Counties, and Northeast Plateau Air Basins, as defined in Title 17, California Code of Regulations, Sections 60105, 60108, 60111, and 60113.

- (b) For consumer products for which the label, packaging, or accompanying literature specifically recommends dilution prior to use, the limits specified in subsection (a) shall apply to the product only after the minimum recommended dilution has taken place. For purposes of this subsection (b), "minimum recommended dilution" shall not include recommendations for incidental use of a concentrated product to deal with limited special application such as hard-to-remove soils or stains.
- (c) Notwithstanding the provisions of Section 94509(a), a consumer product manufactured prior to the earliest effective date specified for that product in the Table of Standards may be sold, supplied, or offered for sale for up to one year after the earliest specified effective date. This subsection (c) does not apply to any product with a specified effective date of 1/1/93 that is sold, supplied, or offered for sale in the Bay Area Air Quality Management District.
- (d) For those consumer products that are registered under the Federal Insecticide, Fungicide, and Rodenticide Act, (FIFRA; 7 U.S.C. Section 136-136y), the effective date of the VOC standards specified in subsection (a) is one year after the date specified.
- (e) Effective January 1, 1993, for any consumer product for which VOC standards are specified under subsection (a), no person shall sell, supply, offer for sale, or manufacture in California any consumer product which contains any ozone-depleting compound regulated by the U.S. Environmental Protection Agency (EPA) under its final rule "Protection of Stratospheric Ozone" (Published at 53 Federal Register (FR) 30566-30602 (August 12, 1988) or with an ozone-depleting potential of greater than 0.00 as listed in the appendix entitled "AFEAS Report" of the United Nation's Environmental Panel Integrated Report "Scientific Assessment of Stratospheric Ozone: 1989". Before using any halogenated compound as a replacement for a VOC in consumer products whose ozone-depleting potential is not addressed in the AFEAS Report, the manufacturer or user of that compound must determine the compound's ozone-depleting potential using one of the full atmospheric models described in the AFEAS Report, or any other method determined by the Executive Officer to give equivalent results.
- (f) The requirements of subsection (e) shall not apply to:
- 1) any existing product formulation that complies with the Table of Standards which is sold, supplied, offered for sale in California prior to the effective date of this article, or any existing product formulation that is sold, supplied, offered for sale in California prior to the effective date of this article that is reformulated to meet the Table of Standards as long as the ozone depleting compound content does not increase; and

- 2) to any ozone-depleting compounds that may be present as an impurity in a consumer product in an amount equal to or less than 0.01% by weight.

NOTE: Authority cited: Sections 39600, 39601, and 41712, Health and Safety Code. Reference: Sections 39002, 39600, 40000, and 41712, Health and Safety Code.

94510. Exemptions

- (a) This article shall not apply to any consumer products manufactured in California for shipment and use outside of California.
- (b) The provisions of Section 94509(a) do not apply to a manufacturer who sells, supplies, or offers for sale in California a consumer product that does not comply with the VOC standards specified in Section 94509(a), as long as the manufacturer can demonstrate both that the consumer product is intended for shipment and use outside of California, and that the manufacturer has taken reasonable prudent precautions to assure that the consumer product is not distributed to California.
- (c) The requirements of Section 94509(a) shall not apply to fragrances and colorants up to a combined level of 2 percent by weight contained in any consumer product.
- (d) The requirements of Section 94509 shall not apply to paint, furniture coatings, or architectural coatings including aerosol (spray) paints.
- (e) The requirements of Section 94509(a) shall not apply to any VOC which either:
- (1) has a vapor pressure of less than 0.1 mm Hg at 20 degrees Centigrade, or
 - (2) consists of more than 12 carbon atoms, if the vapor pressure is unknown.
- (f) The requirements of Section 94509(a) shall not apply to the following organic compound in insect repellents:
- (1) 2-ethyl-1,3-hexanediol (Rutgers 612).
- (g) The requirements of Section 94512(b) shall not apply to consumer products registered under FIFRA.
- (h) The requirements of Section 94509(a) shall not apply to air fresheners that are comprised entirely of fragrance, less

compounds not defined as VOCs under Section 94508 or exempted under Section 94510(e).

- (i) The requirements of Section 94509(a) shall not apply to air fresheners containing at least 98% paradichlorobenzene.

NOTE: Authority cited: Sections 39600, 39601, and 41712, Health and Safety Code. Reference: Sections 39002, 39600, 40000, and 41712, Health and Safety Code.

94511. Innovative Products

- (a) The Executive Officer shall exempt a consumer product from the requirements of Section 94509(a) if a manufacturer demonstrates by clear and convincing evidence that, due to some characteristic of the product formulation, design, delivery systems or other factors, the use of the product will result in less VOC emissions as compared to emissions from a representative consumer product of the same product category or, if the innovative product is a modification to an existing product, the use of the product will result in less VOC emissions as compared to the reductions in emissions that would have occurred from that existing product had it been reformulated to meet the Table of Standards and retained the same product efficacy as the original formulation.
- (b) For the purposes of this section, "representative consumer product" means a consumer product which meets the VOC standards specified in Section 94509(a) and, based on tests generally accepted by the consumer products industry and concurred with by the Executive Officer, has similar efficacy as other complying consumer products in the same product category.
- (c) For the purposes of this section an "existing product" is any formulation of the same product category and form sold, supplied manufactured, or offered for sale in California prior to the effective date of this article.
- (d) A manufacturer shall apply in writing to the Executive Officer for any exemption claimed under this subsection (a). The application shall include the supporting documentation that demonstrates the reduction of emissions from the innovative product, including the actual physical test methods used to generate the data and, if necessary, the consumer testing undertaken to document product usage. In addition the applicant must provide necessary information to enable the Executive Officer to establish enforceable conditions for granting the exemption including, but not limited to, the VOC content for the innovative product, test methods for determining the VOC content and other parameters identified as necessary for the performance of the product. All information submitted by a manufacturer pursuant to this section shall be handled in accordance with the procedures specified in Title 17, California Code of Regulation, Sections 91000-91022.

- (e) Within 30 days of receipt of the exemption application the Executive Officer shall determine whether an application is complete. If the Executive Officer determines there are deficiencies in the application, the manufacturer shall be notified in writing of the decision, specifying the reasons for denial.
- (f) Within 90 days after an application has been deemed complete, the Executive Officer shall determine whether, under what conditions, and to what extent, an exemption from the requirements of Sections 94509 will be permitted. The applicant and the Executive Officer may mutually agree to a longer time period for reaching a decision, and additional supporting documentation may be submitted by the applicant before a decision has been reached. The Executive Officer shall notify the applicant of the decision in writing and specify the reasons for approving or denying the exemption. An exemption granted by the Executive Officer pursuant to this section may specify such terms and conditions that are necessary to insure that emissions from the product will meet the emissions reductions specified in subsection (a), and that such emissions reductions can be enforced.
- (g) In granting an exemption, the Executive Officer shall establish, for the product, conditions that are enforceable. These conditions shall include the VOC content of the innovative product, dispensing rates, application rates or other products deemed necessary. The Executive Officer shall also specify the test methods for determining conformance to the conditions established. The test methods shall include criteria for reproducibility, accuracy, and sampling and laboratory procedures.
- (h) For any product for which an exemption has been granted pursuant to this section, the manufacturer shall notify the Executive Officer in writing within 30 days of any change in the product formulation or recommended product usage directions, and shall also notify the Executive Officer within 30 days if the manufacturer learns of any information which would alter the emissions estimates submitted to the Executive Officer in support of the exemption application.
- (i) If VOC standards are lowered for a product category through any subsequent rulemaking, all innovative product exemptions granted for products in the product category, except as noted in this subpart, shall have no force and effect as of the effective date of the modified VOC standard. This subpart shall not include those innovative products the VOC emissions of which are less than the appropriate lowered VOC standard and for which a written notification of such emissions' status versus the lowered VOC standard has been submitted to and approved by the Executive Officer at least 60 days before the effective date of such standard.
- (j) If the Executive Officer believes that a consumer product for which an exemption has been granted no longer meets the criteria for an innovative product specified in subsection (a), the Executive Officer may hold a public hearing in accordance with the procedures specified in Title 17, California Code of Regulations, Part III, Chapter 1,

Subchapter 1, Article 4 (commencing with Section 60040), to determine if the exemption should be modified or revoked.

NOTE: Authority cited: Sections 39600, 39601, and 41712, Health and Safety Code. Reference: Sections 39002, 39600, 40000, and 41712, Health and Safety Code.

94512. Administrative Requirements

- (a) Most Restrictive Limit If anywhere on the container of any consumer product, on any sticker or label affixed thereto, or in any sales or advertising literature, any representation is made that the product may be used as, or is suitable for use as a consumer product for which a lower VOC standard is specified in Section 94509(a), then the lowest VOC standard shall apply. This requirement does not apply to general purpose cleaners.
- (b) Code-Dating No later than three months after the effective date of this article, each manufacturer of a consumer product subject to Section 94509 shall clearly display on each consumer product container or package, the date on which the product was manufactured, or a code indicating such date. If a manufacturer uses a code indicating the date of manufacture, an explanation of the code must be filed with the Executive Officer of the ARB no later than three months after the effective date of this article.

NOTE: Authority cited: Sections 39600, 39601, and 41712, Health and Safety Code. Reference: Sections 39002, 39600, 40000, and 41712, Health and Safety Code.

94513. Registration

- (a) On or before March 1, 1991, and no later than March 1 of every third year thereafter, each manufacturer of consumer products for which a VOC standard is specified in Section 94509(a) or approved as an innovative product under Section 94511, must register such products with the Executive Officer. The registration shall include, but not be limited to, the following information:
- (1) the brand name for each consumer product;
 - (2) the owner of the trademark or brand name;
 - (3) the product category to which the consumer product belongs;
 - (4) the product forms (aerosol, pump, liquid, solid, etc.);
 - (5) the California annual sales in pounds per year and the method used to calculate California annual sales;

- (6) the total VOC (as defined in Section 94508) content in percent by weight which: (a) has a vapor pressure of greater than or equal to 0.1 mm Hg at 20 degrees Centigrade, or (b) consists of 12 or less carbon atoms, if the vapor pressure is unknown;
- (b) Manufacturers shall also provide the registration data specified in subsection(a) for the following consumer products: automotive cleaners (bug and tar removers, brake cleaners, chrome polishes, leather/vinyl cleaners, tire dressings, wheel cleaners), dusting sprays, industrial spray buff products, insect repellents (creams, pump sprays, solids/sticks), laundry detergents, laundry starch products, rug deodorizers, shaving gels, paint strippers, household, lawn and garden, pesticides, household adhesives and sealants, lubricants, carb and choke cleaners, aerosol food products, charcoal lighter fluid, fabric protectants, water proofing products and air fresheners comprised of 100% fragrance. Upon 90 days written notice, the Executive Officer may also require a manufacturer to supply the registration data listed in subsection (a) for any consumer product that the Executive Officer may specify. If the Executive Officer determines that the registration data is no longer necessary for any consumer product in this section, he or she shall notify manufacturers that data submission is no longer necessary.
- (c) All information submitted by manufacturers pursuant to Section 94513 shall be handled in accordance with the procedures specified in Title 17, California Code of Regulations, Sections 91000-91022.

NOTE: Authority cited: Sections 39600, 39601, 41511, and 41712, Health and Safety Code. Reference: Sections 39002, 39600, 40000, 41511, and 41712, Health and Safety Code.

94514. Variances

- (a) Any person who cannot comply with the requirements set forth in Section 94509, because of extraordinary reasons beyond the person's reasonable control may apply in writing to the Executive Officer for a variance. The variance application shall set forth:
- (1) the specific grounds upon which the variance is sought;
 - (2) the proposed date(s) by which compliance with the provisions of Section 94509 will be achieved, and
 - (3) a compliance report reasonably detailing the method(s) by which compliance will be achieved.
- (b) Upon receipt of a variance application containing the information required in subsection (a), the Executive Officer shall hold a public hearing to determine whether, under what conditions, and to what extent, a variance from the requirements in Section 94509 is

necessary and will be permitted. A hearing shall be initiated no later than 75 days after receipt of a variance application. Notice of the time and place of the hearing shall be sent to the applicant by certified mail not less than 30 days prior to the hearing. Notice of the hearing shall also be submitted for publication in the California Regulatory Notice Register and sent to every person who requests such notice, not less than 30 days prior to the hearing. The notice shall state that the parties may, but need not, be represented by counsel at the hearing. At least 30 days prior to the hearing, the variance application shall be made available to the public for inspection. Interested members of the public shall be allowed a reasonable opportunity to testify at the hearing and their testimony shall be considered.

- (c) No variance shall be granted unless all of the following findings are made:
- (1) that, because of reasons beyond the reasonable control of the applicant, requiring compliance with Section 94509 would result in extraordinary economic hardship.
 - (2) that the public interest in mitigating the extraordinary hardship to the applicant by issuing the variance outweighs the public interest in avoiding any increased emissions of air contaminants which would result from issuing the variance.
 - (3) that the compliance report proposed by the applicant can reasonably be implemented, and will achieve compliance as expeditiously as possible.
- (d) Any variance order shall specify a final compliance date by which the requirements of Section 94509 will be achieved. Any variance order shall contain a condition that specifies increments of progress necessary to assure timely compliance, and such other conditions that the Executive Officer, in consideration of the testimony received at the hearing, finds necessary to carry out the purposes of Division 26 of the Health and Safety Code.
- (e) A variance shall cease to be effective upon failure of the party to whom the variance was granted to comply with any term or condition of the variance.
- (f) Upon the application of any person, the Executive Officer may review, and for good cause, modify or revoke a variance from requirements of Section 94509 after holding a public hearing in accordance with the provisions of subsection (b).

NOTE: Authority cited: Sections 39600, 39601, and 41712, Health and Safety Code. Reference: Sections 39002, 39600, 40000, and 41712, Health and Safety Code.

94515. Test Methods

- (a) Testing to determine compliance with the requirements of this article, shall be performed using one or more of the following analytical methods: (1) Method 24-24A, Part 60, Title 40, Code of Federal Regulations, Appendix A, July 1, 1988; (2) Method 18, Federal Register 48, no. 202, October 18, 1983; (3) Method 1400, NIOSH Manual of Analytical Methods, Volume 1, February 1984; or (4) Environmental Protection Agency Method 8240 "GC/MS Method for Volatile Organics," September 1986. Alternative methods which are shown to the satisfaction of the Executive Officer to accurately determine the concentration of VOCs in a subject product or its emissions may be used upon approval of the Executive Officer.
- (b) Compliance may also be demonstrated through calculation of the volatile organic compound content from records of the amounts of constituents making up the product. If this option is used, daily records of the amounts and chemical composition of the constituents must be kept for at least three years.
- (c) In determining compliance with the requirements of this article, the results of tests conducted by the Executive Officer or by the Environmental Protection Agency to determine the volatile organic compound content of consumer products shall take precedence over the results of tests conducted by others to determine that volatile organic compound content. The results of tests conducted by manufacturers or others to determine the volatile organic compound content of consumer products shall be subject to verification by the Executive Officer.

NOTE: Authority cited: Sections 39600, 39601, and 41712, Health and Safety Code. Reference: Sections 39002, 39600, 40000, and 41712, Health and Safety Code.

94516. Severability

Each part of this article shall be deemed severable, and in the event that any part of this article is held to be invalid, the remainder of this article shall continue in full force and effect.

NOTE: Authority cited: Sections 39600, 39601, and 41712, Health and Safety Code. Reference: Sections 39002, 39600, 40000, and 41712, Health and Safety Code.

Appendix C

VOC Survey Summary

VOC SURVEY RESPONDENTS

Company

3M
Aerosol Services Co. Inc.
Air-Shields Vickers
Alberto-Culver Company
Almay Inc.
American Gas & Chemical Co.
ARC Chemical Div. of Balchem Co.
Armor All Products Corporation
Atlanta Sundries
Babson Bros. Co.
Barre-National Inc.
Berryman Products Inc.
Block Drug Company
Bohringer Ingelheim Animal Health
Boyle-Midway Household Product
Caltech Industries Inc.
Car-Freshner Corporation
Carmel Chemical Corp.
Carter-Wallace Inc.
Celex Corporation
Cetylite Industries Inc.
Chemical Corporation
Chesebrough-Pond's USA Co.
Church & Dwight
Colgate-Palmolive Co.
Compounders Inc.
Conaga Pet Products
Connolly - R & D Associates
Cosmair Inc.
CPC International Inc.
Creative Sales Inc.
Crown Industrial Products Co., Inc.
D' Spense Inc.
Degesh America Inc.
Delcor Laboratories Inc.
Demert & Dougherty, Inc.
Desoto, Inc.
Dial Chemical Corporation
Dow Corning Corporation
Eagle One Industries
EVSCO Pharmaceuticals
Faultless Starch/Bon Ami Co.
First Brands Corporation
Focus 21 International
Ford's Chemical & Service Inc.

Company

Accra Pac Inc.
Airkem Professional Products
Airwick Industries
Allied Block Industries Inc.
American Cyanamid Co.
Amway Corp. Apollo Industries Inc.
Arjo Hospital Equipment, Inc.
Athena Products Corp.
Avon Products, Inc.
Bardahl
Bengal Chemical Inc.
Black Leaf Products Co.
Blue Diamond
Bonat Group Inc.
Cadie Products Corporation
Canberra Corporation
Cardinal Industries Finishes
Carroll Company
Caswell Massey Co. Ltd.
Central Solutions, Inc.
Champion Choice
Chemsico
Chevron Chemical Corporation
Clairol Incorporated
Combe Inc.
Contact Ind. Div. of Safeguard
Conklin Co., Inc.
Consumer Power Co.
Cosmosol Ltd.
Cramer Products Inc.
Crescent Resources Inc.
D-Con Company
Dana Perfumes Corporation
Delagar Division, Belcan Inc.
Del Laboratories Inc.
Descale - lt. Products Co.
Dep Corporation
Dow Brands
E. Davis, Inc.
Econetics Inc.
Farnann Companies Inc.
Fearing Mfg. Company, Inc.
Fitzpatrick Bros. Inc.
Follmer Development, Inc.
Fosrco, Inc.

Frank Fuhner International Inc.
 Georgette Klinger, Inc.
 Grow Group, Inc.
 H & S Chemicals Division
 Helene Curtis Inc.
 Hercules Chemical Co.
 Huntington Laboratories, Inc.
 I Putnam Inc.
 Jasco Chemical Corporation
 Johnson Wax, S.C.
 Kingcaid Enterprises, Inc.
 Kiwi Brands Inc.
 Knight Oil Corporation
 Lamplight Farms, Inc.
 Lanman & Kemp-Bardy's Co., Inc.
 Lever Bros. Co.
 Magnum Research Corp.
 Malco Products, Inc.
 Maril Products, Inc.
 Micro-Gen Equipment Corporation
 Microgen Inc.
 Mil-Du-Gas & Company
 Mine Safety Appliances Co.
 Mofay Corporation Animal Health Div.
 National Laboratories
 Omnitech International Inc.
 Orchite Chemical Coatings Corp.
 Parfumes Dinard Inc.
 Penn Champ Inc.
 Penzoil Products Inc.
 Pet Chemicals
 Pioneer/Eclipse Corporation
 Playtex Beauty Care, Inc.
 Plough Inc.
 Portion Pac Chemical Corp.
 Primex Plastics Corporation
 Professional Pet Products Inc.
 Purina Mills Inc.
 Qualis Inc.
 Reedy International Corp.
 Revlon
 Roc Corp. Inc.
 Rockland Chemical Inc.
 Rug Doctor, L.P.
 Schering - Plough
 Scott's Liquid Gold- Inc.
 Service Master
 Sherex Chemical Company Inc.
 Shield Packaging of California
 Shiseido Cosmetics (america) Ltd.
 Speer Products Inc.
 Sportan Chemical Company
 Fuller Industries, Inc.
 Griffin Bros. Inc
 H. Clay Glover Company Inc.
 Hartz Mountain Corporation
 Henkel Corporation
 Houfigant Inc.
 Hydrosol, Inc.
 Inserta Inc.
 Johnson & Johnson Medical, Inc.
 Kal-Grad Coating & Mfg., Corporation
 King Research Inc.
 Kirker Chemical Inc.
 Lambert Key (Carter-Wallace)
 Lanosheen Inc. Marine Group
 Lehn & Fink Products
 Linette Cosmetics Inc.
 Makiki Electronics
 Major Paint Company
 Melhor Industries Inc.
 Microban Germicide Co.
 Midco Products Co. Inc.
 Miles Inc.
 Minwax Company
 Mothers
 Norton Performance Plastics
 Orange-Sol, Inc.
 Pace National Corporation
 Pel Associates, Inc.
 Penroy Company
 Permabond International
 Pine O Pine Company
 Pitman - Moore Inc.
 Playtex Family Products Corporation
 Poolmaster Inc.
 Prentiso Drug & Chemical Co. Inc.
 Proctor & Gamble
 Purex Industrial
 Purdy Products Co.
 Redken Laboratories, Inc.
 Republic Drug Company, Inc.
 Riverdale Chemical Co.
 Rochester Midland
 Ross Daniels, Inc.
 Sanico Inc.
 Schoer Manufacturing Company
 Scotts Sani-Fresh International
 Shamrock Specialities, Inc.
 Sherwin Williams/Sprayon Products
 Shirlo, Inc.
 Shulton Group/American Cyanamid Co.
 Sporiciden International
 Spray Products Corporation

Spurrier Chemical Companies Inc.
Stanhome Inc.
Sunnen Products Co.
Sunshine Makers Inc.
Surcotech Products
Tek-Trol Chemicals Inc.
Thompson & Formby Petrolite
Tomlyn Products
The Bramton Company
The Clorox Co.
The Drackette Products Co.
The Larskspur Group Inc.
The mennen Company
The Reese Chemical Company
The Tangle Foot Co.
Turtle Wax
USA Group
Vineland Laboratories
W.F. Young Inc.
Walton-March, Inc.
Waterbury Companies, Inc.
Wexford Labs, Inc.
Whitmine Research Laboratories Inc.
Wesco Manufacturing
Wynn Oil Company
Zema Corporation
Zimmerman Products
Zoecon Corporation

Sta-Lube Inc.
Sun Laboratories
Sunshine Chemical Spec. Inc.
Surco Products, Inc.
Technical Products Corp.
Theochem Laboratories Inc.
Thompson Medical Co.Inc.
Topiderm Inc.
The Chas H. Lilly Co.
The Dial Corporation
The George Basch Co. Inc.
The Ias-Stik Manufacturing
The Murphy-Phoenix Company
The Savogram Co.
The Wardy Corporation
Unsmoke International
Vapor Products
Virbac, Inc.
W.M. Barr & Company Inc.
Warner-Lambert Company
Wesco Manufacturing
Whink Products Co.
Willert Home Products
Wexford Labs, Inc.
York Chemical Corp.
Zep Manufacturing Company
Zoe Chemical Co. Inc.

RESULTS OF CARB CONSUMER PRODUCTS VOC SURVEY
 (INCLUDING HEIDEN ASSOCIATES AND BAKER AND HOSTETLER DATA)

<u>PRODUCT CATEGORY</u>	<u>VOC EMISSIONS lbs/Day</u>	<u>PRODUCT FORM</u>	<u>NUMBER OF PRODUCTS</u>	<u>SALES-WEIGHTED AVERAGE VOC WT%</u>	<u>PERCENTAGE SHARE MARKET</u>	<u>SHARE EMISSIONS</u>
Air Fresheners	17,300*	Aerosol (2-phase)	65	40	45	63
		Aerosol (1-phase)	5	96	4	18
		Liquid	109	19	20	14
		Other	13	19	2	2
		Pump	27	9	<1	<1
		Solid	72	3	29	3
		Dual Purpose Air Freshener/ Aerosol Disinfectant	5	80	N/A ⁽¹⁾	N/A ⁽¹⁾
Automotive Windshield Washer Fluid	48,000	Liquid	N/A ⁽¹⁾	35	100	100
Bathroom and Tile Cleaner	900	Aerosol	14	6	37	65
		Liquid	53	2	48	28
		Pump	6	<1	13	2
		Solid	2	6	2	5
Engine Degreasers	9,000	Aerosol	11	94	100	100
Floor Polishes (Wax)	5,200	Products For Flexible Flooring Material	148	5	89	74
		Products For Nonresilient Flooring Material	UTQ	UTQ	10	8
		Wood Floor Wax	6	90	1	18
Furniture Maintenance	5,600	Aerosol	43	27	72	87
		Solid (Paste)	2	86	2	5
		Others	22	7	26	8

<u>PRODUCT CATEGORY</u>	<u>VOC EMISSIONS lbs/Day</u>	<u>PRODUCT FORM</u>	<u>NUMBER OF PRODUCTS</u>	<u>SALES-WEIGHTED AVERAGE VOC WT%</u>	<u>PERCENTAGE SHARE MARKET</u>	<u>EMISSIONS</u>
General Purpose Cleaner	9,800	Aerosol	26	18	<1	3
		Liquid/Pump	159	6	59	93
		Solid	9	<1	41	4
Glass Cleaner	4,600	Aerosol	29	13	6	12
		Liquid/Pump	59	6	94	88
Hair Spray	92,000	Aerosol	186	94	74	80
		Pump	96	70	26	20
Hair Mousse	1,160	Aerosol	88	12	100	100
Hair Styling Gel	820	Liquid	86	11	96	95
		Pump	6	16	4	5
Personal Insect Repellent	880	Aerosol	11	72	91	99
Laundry Prewash	4,000	Aerosol	6	35	14	52
		Liquid/Pump	14	5	85	44
		Solid	4	24	1	4
Nail Polish Remover	2,200	Liquid	25	91	100	100
Oven Cleaner	2,000	Aerosol	23	10	55	63
		Liquid	11	5	22	12
		Pump	9	10	23	25
Shaving Cream	520	Aerosol	17	7	100	100

- * This includes approximately 8,600 lbs/Day emissions from dual-use aerosol spray disinfectants
- (1) N/A = Not Applicable; Dual Purpose Air Freshener/Air Disinfectant data not included in Air Freshener data.
 - (2) UTQ = Unable to Quantify.
 - (3) It was announced that 10% of the market share and emissions from nonwood floor products are due to products for nonresilient floors, the remaining 90% being due to products for flexible flooring.

AIR RESOURCES BOARD

1102 Q STREET
P.O. BOX 2815
SACRAMENTO, CA 95812



February 9, 1990

Dear Sir or Madam:

Consumer Products Volatile Organic Compound Survey

With the passage of the California Clean Air Act in 1988, the Air Resources Board has been charged with reducing volatile organic compound (VOC) emissions from consumer products. To assist in this effort, the Air Resources Board staff is conducting a survey of companies that manufacture consumer products for sale in California. The survey information will assist ARB staff in developing standards which are both technically and economically feasible and in improving our current inventory of VOC emissions from consumer products.

For the purposes of this survey, we will assume that the VOC emissions from a product are directly related to the VOC content of that product. However, we understand that this assumption may not apply to all formulations. Possible cases for which this assumption may not apply include products with compounds that are highly polar or have a very low vapor pressure, very high boiling point and/or carbon number. Please feel free to make note of these compounds in the survey form's comment sections. Assuredly, we will address the issues associated with emissions from these compounds as we proceed in the regulatory development process.

The attached survey form was developed from a draft version which was presented to attendees of the first consumer products workshop, held on September 6-7, 1989. Based on comments received during and after that meeting, the draft survey form was revised and the revised draft was sent to workshop attendees for comments and the Chemical Specialties Manufacturers Association (CSMA) for a pilot study. The attached survey form incorporates all comments received to date.

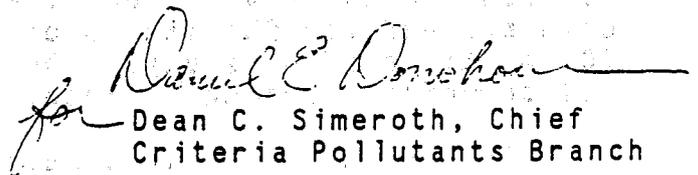
This request for information is made pursuant to Sections 39607, 39701, and 41511 of the California Health and Safety Code. These sections authorize the Air Resources Board to require the submission of information needed by the Board to estimate atmospheric emissions and to carry out its other statutory responsibilities.

In accordance with the California Code of Regulations, Sections 91000 to 91022, and the California Public Records Act (Government Code Sections 6250 et seq.), the information which you provide may be released (1) to the public upon request, except those trade secrets which are not emission data, and (2) to the federal Environmental Protection Agency which protects trade secrets in accordance with Section 114(c) of the Clean Air Act, as amended in 1970 (42 USC 7401 et seq.). Information which you deem to be a trade secret should be submitted with a detailed written justification in accordance with California Code of Regulations, Section 912010(b) (See Attachment A). In the case of sales figures for various products marketed in California, an affirmation that this data is considered proprietary and a "trade secret" will suffice.

We ask that you complete the attached survey form in as much detail as possible. Please submit the completed survey to the ARB by March 31, 1990. For your convenience, we have enclosed a return mailing label for your reply to the survey. You may direct any questions concerning the attached survey to any of the ARB staff listed in the attached survey form.

It is essential that industry be involved in developing standards for consumer products which are both technically and economically feasible. Industry response to the survey will assist the Air Resources Board in developing feasible regulations. We appreciate the cooperation we have received to date from members of the consumer products industry and hope to continue that cooperative spirit in this effort.

Sincerely,


Dean C. Simeroth, Chief
Criteria Pollutants Branch

Enclosures

Date: _____

CALIFORNIA AIR RESOURCE BOARD
CONSUMER PRODUCT
VOLATILE ORGANIC COMPOUND SURVEY

Company Name: _____

Contact Person: _____

Address: _____

Telephone: () _____

Confidential Information [] Yes [] No

Please indicate which of the following best describes your company's operations:

- () DISTRIBUTION ONLY
- () PRIVATE LABEL MANUFACTURING
- () BOTH MANUFACTURING AND DISTRIBUTION
- () NO DISTRIBUTION OR MANUFACTURING OF ANY PRODUCT
WHOSE TYPE IS LISTED - please check and return form

Please Read The Attached Instructions Carefully Before Filling Out the Survey Form

OWN REGISTERED TRADEMARK? YES OR NO (A)	PRODUCT INFORMATION			CALIFORNIA ANNUAL SALES (1988) lb/yr (E)	PERCENT BY WEIGHT		
	BRAND NAME (B)	PRIMARY FUNCTION (C)	FORM (D)		TOTAL VOC (F)	> C-14 (G)	VOC PROPELLENT (H)

IF NO [*]	BRAND NAME (B)	PRODUCT MANUFACTURER (BB)

Comments: _____

* IF YOU ANSWERED "NO" IN COLUMN (A), PLEASE FILL OUT COLUMNS (B) THROUGH (E) AND COLUMN (BB)

(PHOTOCOPY AND ATTACH ADDITIONAL COPIES IF NECESSARY)

OWN REGISTERED TRADEMARK? YES OR NO (A)	BRAND NAME (B)	PRODUCT INFORMATION			CALIFORNIA ANNUAL SALES (1988) lb/yr (E)	TOTAL VOC (F)	PERCENT BY WEIGHT	
		PRIMARY FUNCTION (C)	FORM (D)	> C-14 (G)			VOC PROPELLENT (H)	

IF NO ^{*}
→

BRAND NAME (B)	PRODUCT MANUFACTURER (BB)

Comments: _____

* IF YOU ANSWERED "NO" IN COLUMN (A) PLEASE FILL OUT COLUMNS (B) THROUGH (H)

DIRECTIONS FOR COMPLETING THE CALIFORNIA CONSUMER PRODUCT VOC SURVEY

Directions for completing the VOC Survey are provided below, along with an example of a completed survey. Once you have completed the survey, please send to:

CALIFORNIA AIR RESOURCES BOARD
STATIONARY SOURCE DIVISION
P.O. BOX 2815
SACRAMENTO, CA 95812
ATTN: FLOYD VERGARA

If you should have any questions regarding this form, please feel free to contact any of the following Solvents Control Section staff:

PEGGY VANICEK	(916) 327-1517
FLOYD VERGARA	(916) 327-1503
TOM EVASHENK	(916) 327-1504
ED WONG	(916) 327-1507
PAUL MILKEY	(916) 327-1516
LINDA CLARK	(916) 327-1506

DESCRIPTION OF INFORMATION REQUIRED

- (A) **OWN REGISTERED TRADEMARK:** If you own or control the registered trademark for the product, please enter "Yes" in Column (A). For each product that you enter "Yes" in Column (A), please fill in the requested information in Columns (B) through (H). For each product that you enter "No" in Column (A), please enter the information requested in Columns (B) through (E) and Column (BB).
- (B) **BRAND NAME:** List the brand name of each product exactly as it appears on the label. Products with the same brand name or primary function, but with minor differences in formulation (i.e., the only difference is in the fragrance or color used) and with no greater than a 5% variation in VOC content, should be listed as a single product. If you do list products which vary less than 5% in VOC content under the same brand name, please enter the total production (lbs/yr) for all the these products in Section (E). If you do not manufacture the product, please list the name and address of the products' manufacturer. If you are a private label manufacturer, the name listed here will not necessarily be the name that appears on the label.

(BB) PRODUCT MANUFACTURER: If you answered "No" in Column (A) for any product, please indicate the owner of the registered trademark from whom you obtained the product.

(C) PRIMARY FUNCTION: Indicate the primary function or end use of the product using the attached list of consumer product types as a guide. For example, for products whose primary function is to clean windows, you would enter "Window Cleaner" into Column (C).

(D) PRODUCT FORM: Use the following letters to describe the dispensing form. Products with multiple dispensing forms should be listed separately.

A = Pressurized Package (Aerosol, includes foams) S = Solid O = Other (Describe)
P = Pump Spray L = Liquid (includes creams, gels, and lotions)

(E) CALIFORNIA SALES: Indicate the sales (pounds/year) for California in 1988. Sales volume (pounds/year) should be reported as net product weight (i.e., not including weight of container). For example, only the weight of the ink in ballpoint pens should be reported. If the 1988 calendar years sales volume is not available, any consecutive 12 month period commencing no earlier than January 1987 is acceptable (Please specify the year which you use for your calculation). If California sales information is not available, sales may be estimated using national or regional sales figures. Please indicate how sales data for California was determined. If you use population as a basis for determining sales, please use the population estimates provided in the attached table of population estimates. The sales volume reported should include only that portion of a product's sales used for typical consumer, institutional, and commercial purposes. Sales volume should specifically exclude industrial process manufacturing use. However, general industrial maintenance use should be included.

(F) **TOTAL VOC:** Under total VOC content, report the total VOC content, including VOC propellants, of the product as a percentage of the total product weight (do not include container weight). For the purposes of this survey, the following definition apply:

VOC: VOC means any compound containing at least one atom of carbon, except methane, carbon monoxide, carbon dioxide, carbonic acid, metallic carbides, or carbonates, ammonium carbonate, 1,1,1-trichloroethane, methylene chloride, trichlorofluoromethane (CFC-11), dichlorodifluoromethane (CFC-12), chlorodifluoromethane (HCFC-22), trifluoromethane (HCFC-23), trichlorotrifluoroethane (CFC-113), dichlorotetrafluoroethane (CFC-114), chloropentafluoroethane (CFC-115), dichlorotrifluoroethane (HCFC-123), tetrafluoroethane (HFC-134a), dichlorofluoroethane (HCFC-141b), and chlorodifluoroethane (HCFC-142b).

Please note that for the purposes of this survey, any organic compound, regardless of its carbon number, should be included in Section (F) unless it is one of the compounds listed above.

(G) > C-14: Please enter the total weight percentage for the compounds that have more than fourteen (14) carbon atoms. This weight percentage should be included in your response to Section (F), Total VOC Content.

(H) **VOC Propellant:** Propellant means a VOC containing liquified or compressed gas in a container, where the purpose of the liquified or compressed gas is to expel the contents of the container. Non-VOC containing propellants are excluded from this definition.

SAMPLE CALCULATIONS (SEE FILLED SAMPLE FORM)

COMPANY: Entomol, Inc.

PRODUCTS: Insect Repellents

BRANDS: 1 = Shoo! (Aerosol), 2 = Go Away! (Stick), 3 = The Terminator (Towlettes)

OWNER OF REGISTERED TRADEMARK: (1) Entomol, Inc. = Brands 1,2 (2) Bug Terminators Co. = Brand 3 (Column BB)

U.S Production Rates: Brand 1 = 87,000 pounds/year, Brand 2 = 21,800 pounds/year, Brand 3 = 10,000 pounds/year

Ratio of CA Population to US Population (Pop. Factor) = 28,314,000 / 245,807,000 = 0.115
(1988 US Census Bureau)

Geographical Usage Factor = Unknown (Assume = 1.0)

General CA Production Rate = US Production Rate * CA Pop. Factor * CA Geographical Factor

∴ CA Production Rates: Brand 1 = 87,000 * 0.115 * 1.0 = 10,000 pounds/year (Column E)
Brand 2 = 21,800 * 0.115 * 1.0 = 2,500 pounds/year (Column E)
Brand 3 = 10,000 * 0.115 * 1.0 = 1,150 pounds/year (Column E)

Brand	Ingredient	Ingredient Wt % of Product	VOC Content, wt %		Propellant Only
			Total Product	> C-14	
Shoo!	N,N-diethyl-m-toluamide	15%	15%	---	---
	Water	5%	---	---	---
	Isopropane	65%	65%	---	65%
	Isopropanol	15%	15%	---	---
	Total	100%	95% (F)	0% (G)	65% (H)
Go Away!	N,N-diethyl-m-toluamide	25%	25%	---	---
	Isopar E	25%	25%	---	---
	Water	5%	---	---	---
	Isopropanol	15%	15%	---	---
	Beeswax	30%	30%	30%	---
Total	100%	95% (F)	30% (G)	0% (H)	
The Terminator	Not Available	N/A	N/A	N/A	N/A

Note - Although N,N-diethyl-m-toluamide is the active ingredient and a large molecule, for the purposes of this survey it would still be counted as a VOC.

- F, G, and H refer to the columns in the survey form under, "Percent by Weight".

- Beeswax is assumed to be composed of organic molecules which have more than fourteen carbon atoms (C-14).

Date: 1/1/90

CALIFORNIA AIR RESOURCE BOARD
 CONSUMER PRODUCT
 VOLATILE ORGANIC COMPOUND SURVEY

Company Name: Entomol, Inc.

Contact Person: Dr. Zachary Smith

Address: 10000 Bugs Circle
 San Diego, CA 93060

Telephone: (619) 222-4444

Confidential Information [] Yes [X] No

Please indicate which of the following best describes your company's operations:

- () DISTRIBUTION ONLY
- (X) PRIVATE LABEL MANUFACTURING
- () BOTH MANUFACTURING AND DISTRIBUTION
- () NO DISTRIBUTION OR MANUFACTURING OF ANY PRODUCT
 WHOSE TYPE IS LISTED - please check and return form

Please Read The Attached Instructions Carefully Before Filling Out the Survey Form

OWN REGISTERED TRADEMARK? YES OR NO (A)	PRODUCT INFORMATION			CALIFORNIA ANNUAL SALES (1988) lb/yr (E)	PERCENT BY WEIGHT		
	BRAND NAME (B)	PRIMARY FUNCTION (C)	FORM (D)		TOTAL VOC (F)	> C-14 (G)	VOC PROPELLENT (H)
YES	Shool	Personal Insect Repellent	A	10,000	95%	0	65%
YES	Go Away!	Personal Insect Repellent	S	2,500	95%	30%	0
NO	The Terminator	Personal Insect Repellent	0	1,150			

IF NO *	BRAND NAME (B)	PRODUCT MANUFACTURER (BB)
	The Terminator	Bug Terminators Company

Comments: _____

 * SAMPLE FORM *

* IF YOU ANSWERED "NO" IN COLUMN (A), PLEASE FILL OUT COLUMNS (B) THROUGH (E) AND COLUMN (BB)

CONSUMER PRODUCT CATEGORIES (Use for answering Column C)

PESTICIDE PRODUCTS

Space Insecticides
Residual Insecticides (Personal and surface repellents, moth proofers)

HOUSEHOLD PRODUCTS

Room Deodorants and disinfectants
Cleaners (glass, oven, rug, fabric, wall and tile)
Laundry Products (starch, fabric finish, pre-wash)
Waxes and polishes
Other Household Products (shoe polishes, dyes, leather dressing, fuels, drain openers, anti-stats, caulking and sealing compounds)

PERSONAL CARE PRODUCTS

Shaving Lather
Hair Care Products (Hair Sprays, Mousse, Gels, Shampoo)
Medicinals and Pharmaceuticals (vaporizers, fungicides, burn treatments, antiseptics, contraceptives)
Colognes, Perfumes and After Shave
Personal Deodorants, Antiperspirants, Powders and Deodorant colognes
Other Personal Products (suntan preparations, lotions, breath fresheners, depilatories)

ANIMAL PRODUCTS

Veterinarian and Pet Products (shampoos, insecticides, repellents)

AUTOMOTIVE AND INDUSTRIAL

Refrigerants
Windshield and Lock Spray De-icer
Cleaners (automotive upholstery, leather, vinyl, dressing, tire cleaners)
Engine Degreaser
Lubricant and Silicones (penetrating oils, demoisurizers, rust proofing, mold releases)
Spray Undercoating
Tire Inflator and Sealant
Carburetor and Choke Cleaner
Brake Cleaner
Engine Starting Fluid
Other Automotive and Industrial Products (adhesives)

FOOD PRODUCTS

Pan Sprays
Aerosol Food Products (whipping cream, cheese)

MISCELLANEOUS

Estimates of the Resident Population of States: July 1, 1988, and Components of Change Since 1980

(In thousands. Includes Armed Forces residing in each State)

Region, division, and State	July 1, 1988
United States	245,807
Northeast:	50,595
New England	12,963
Middle Atlantic	37,631
Midwest:	59,878
East North Central	42,119
West North Central	17,759
South:	84,655
South Atlantic	42,426
East South Central	15,344
West South Central	26,885
West:	50,679
Mountain	13,328
Pacific	37,351
New England:	
Maine	1,205
New Hampshire	1,085
Vermont	557
Massachusetts	5,879
Rhode Island	993
Connecticut	3,223
Middle Atlantic:	
New York	17,909
New Jersey	7,721
Pennsylvania	12,001
East North Central:	
Ohio	10,855
Indiana	5,556
Illinois	11,614
Michigan	9,240
Wisconsin	4,855
West North Central:	
Minnesota	4,307
Iowa	2,834
Missouri	5,141
North Dakota	667
South Dakota	713
Nebraska	1,602
Kansas	2,495
South Atlantic:	
Delaware	660
Maryland	4,622
District of Columbia	617
Virginia	6,015
West Virginia	1,876
North Carolina	6,489
South Carolina	3,470
Georgia	6,342
Florida	12,335
East South Central:	
Kentucky	3,727
Tennessee	4,895
Alabama	4,102
Mississippi	2,620
West South Central:	
Arkansas	2,395
Louisiana	4,408
Oklahoma	3,242
Texas	16,841
Mountain:	
Montana	805
Idaho	1,003
Wyoming	479
Colorado	3,301
New Mexico	1,507
Arizona	3,489
Utah	1,650
Nevada	1,054
Pacific:	
Washington	4,648
Oregon	2,767
California	28,314
Alaska	524
Hawaii	1,098

(Source: U.S. Dept. of Commerce
Bureau of the Census
Series P-25, No. 1044)

- Represents zero or a number that rounds to zero.

AIR RESOURCES BOARD

1102 Q STREET
P.O. BOX 2815
SACRAMENTO, CA 95812



March 6, 1990

Dear Sir or Madam:

Consumer Products Volatile Organic Compound Survey Changes

The purpose of this letter is to inform you of some recent and significant changes to the Consumer Products Volatile Organic Compound (VOC) Survey which was mailed to you on February 9, 1990. Based on discussions at the second consumer products workshop held on February 28, 1990 we are limiting, at this time, the products subject to the survey and changing the reporting requirements for the VOC content in Column (G) of the survey form. The specific changes are as follows:

- 1) At this time, we are asking that information be provided for only those consumer products listed in the Table of Standards in Section 94510 (Standards for Consumer Products) of the draft regulation and for all aerosol spray products. A summary of the products that must be reported are listed in Attachment A. Information on the other non-aerosol consumer products will be required at a later date and a new survey form will be mailed to you.
- 2) The reporting requirements for Column G have been changed. Instead of reporting the weight percentage for the compounds that have more than fourteen carbon atoms, please report the weight percentage for the compounds that have 12 or less carbons for which the vapor pressure is unknown or that have a vapor pressure of 0.1 mm Hg or greater at 20 degrees Centigrade.

If you have completed and mailed the VOC survey to us, we will call you for information regarding the above changes. If you have not yet completed the VOC survey, please do so in accordance with the changes outlined above. We would like to remind you that the due date for the VOC Survey is still March 31, 1990.

The issue of confidentiality was raised at the Sacramento workshop as it had been previously raised during the Los Angeles meetings of September 6-7, 1989. We wish to inform you that the Air Resources Board (ARB) has had many years of experience in handling confidential information obtained from industry. A recent example is the ARB Architectural Coatings Survey which began in 1984. To date, we have not encountered any

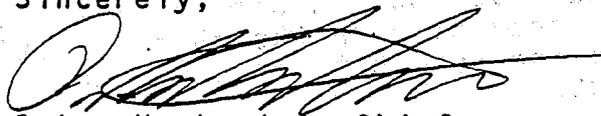
difficulties with the confidential data submitted for the survey. Currently, we are conducting a second survey for architectural coatings data for the year 1988.

Enclosed is a brief summary (Attachment B) of how confidential information is treated by the ARB in accordance with Title 17, California Code of Regulations, Sections 91000 to 91022, and the California Public Records Act (Government Code Sections 6250 et seq.). (We apologize for not enclosing this attachment with the VOC Survey as was originally intended.) These legal provisions provide substantial procedural safeguards against the disclosure of confidential information to third parties. If you have further concerns regarding confidentiality, you may wish to call ARB's legal counsel, Robert Jenne, at (916) 322-2884.

To simplify the process of requesting confidentiality protection for information submitted by your company, we have also enclosed a standard disclosure form. Please have the appropriate company representative complete the form and return it with the VOC survey or to Dean C. Simeroth, Chief, Criteria Pollutants Branch, California Air Resources Board, P.O. Box 2815, Sacramento, CA 95812.

If you should have any questions regarding the VOC Survey or related documents, please feel free to contact any of the Solvents Control Section staff listed in the survey. Again, we appreciate the cooperation we have received from your company and hope that we can continue to receive input in this necessary and important process. If you have any questions regarding the overall development of the consumer products regulation, please do not hesitate to call my Branch Chief, Dean Simeroth, at (916) 322-6020 or Peggy Vanicek, Manager of the Solvents Control Section, at (916) 322-8283.

Sincerely,



Peter Venturini, Chief
Stationary Source Division

Enclosures

ATTACHMENT A

Consumer Products Subject to VOC Survey

Air Fresheners

Any Aerosol Product

Automotive Bug and Tar Remover

Automotive Chrome Polish

Automotive Leather/Vinyl Cleaner

Automotive Wheel Cleaner

Automotive Tire Colorant

Bathroom and Tile Cleaner

Floor Polish (Wax)

Furniture Maintenance Products

General Purpose Household Cleaners

Glass Cleaner

Hairspray

Hair Styling Gel

Hair Mousse

Insect Repellents

Laundry Detergents (Liquids and Powders)

Laundry Prewash

Oven Cleaner

Nailpolish Remover

Rug Deodorizers

Windshield Washer Fluid

ATTACHMENT B

In accordance with Title 17, California Code of Regulations (CCR), Sections 91000 to 91022, and the California Public Records Act (Government Code Sections 6250 et seq.), the information that a company provides to the Air Resources Board (ARB) may be released (1) to the public upon request, except trade secrets which are not emissions data or other information which is exempt from disclosure or the disclosure of which is prohibited by law, and (2) to the Federal Environmental Protection Agency (EPA), which protects trade secrets as provided in Section 114(c) of the Clean Air Act and amendments thereto (42 USC 7401 et seq.) and in federal regulations, and (3) to other public agencies provided that those agencies preserve the protections afforded information which is identified as a trade secret, or otherwise exempt from disclosure by law (Section 91000, Title 17, CCR and Health and Safety Code Section 39660((e))).

Trade secrets as defined in Government Code Section 6254.7 are not public records and therefore will not be released to the public. However, the California Public Records Act provides that air pollution emission data are always public records, even if the data comes within the definition of trade secrets. On the other hand, the information used to calculate air pollution emissions may be withheld from the public if the information is a trade secret.

If any company believes that any of the information it may provide is a trade secret or otherwise exempt from disclosure under any other provision of law, it must identify it as such at the time of submission to the ARB and must provide the name, address, and telephone number of the individual to be consulted if the ARB receives a request for disclosure or seeks to disclose the data claimed to be confidential. The ARB may ask the company to provide documentation of its claim of trade secret or exemption at a later date. Data identified as confidential will not be disclosed unless the ARB determines, in accordance with the above referenced regulations, that the data do not qualify for a legal exemption from disclosure. The regulations establish substantial safeguards before any such disclosure.

California Air Resources Board
PO Box 2815
Sacramento, CA 95812

Attention: Dean C. Simeroth, Chief,
Criteria Pollutants Branch

In accordance with the provisions of Title 17, California Code of Regulations, Sections 91000 to 91022, and the California Public Records Act (Government Code Sections 6250 et seq.),

_____ declares that all the
(company name)
information submitted in response to the California Air Resources Board's information request on _____

_____ is confidential "trade secret" information, and requests that it be protected as such from public disclosure. All inquiries pertaining to the confidentiality of this information should be directed to the following person:

Date _____

(signature)

(printed name)

(title)

(telephone number)

Mailing Address:

Appendix D

Workshop Announcements

WORKSHOP PARTICIPANTS

LOS ANGELES, CA
SEPTEMBER 6-7, 1989.

Company

The Soap and Detergent Association
Procter & Gamble
The Clorox Company
Scott's Liquid Gold
The Dail Company
Johnson & Mattesich
Grow Group, Inc.
Lehn & Fink
US EPA
US EPA/AEERL
Shield Packaging
Helen Curits, Inc.
Amway Corporation
Image Labs
DuPont
Rubon
Jones, Day, Reauis, & Pogue

Company

The Gillette Company
Faultless Starch/BonAmi Company
S.C. Johnson Wax
Airwick Industries
Shulton Group American Cynamid Company
Sprayon Products
CSMA
Lathani & Watkins (Representing 3M)
Industrial Economics, Inc.
Exxel
Clairol-Bristol Myers
General Electric Co./Silicone Products
ICF
Diversified CPC
DeMert & Dougherty, Inc.
CTFA
Chemsico

WORKSHOP PARTICIPANTS

SACRAMENTO, CA
FEBRUARY 28, 1990

Company

Chevron USA
BMP
Scott's Liquid Gold
Follmer Development
Chemsico
PPG, Industries, Inc.
The Soap & Detergent Association
DEP Corporation
FAC
Sprayon Products
Aerosol Service Company
Diversified CPC, Inc.
Allen, Matkins
Dow Corning Corporation
Procter & Gamble
EPA
Randlett Association
Scott's Liquid Gold
Aerospres Corporation
US EPA/AEERL
Duffy & Duffy
Advanced Mono Bloc
WD-40
Sebastian Int.
Sebastian of Sacramento
Bentley Mftg.
DuPont
PMI Distributors
The Drackett Company
Kans Research
Grow Group, Inc.
Sharp, Green, & Lankford
HSIA
Currel Assoc.
Ian Gecker & Associates

Company

The Dail Corporation
Clairol Inc.
CSMA
Peterson/Purtian
Revlon Research
American Cynamid Company
Winzer Corporation
IFF
Armor All Products
Precisions Valve Corporation
Colgate/Palmolive
SC Johnson & Son
Lehn & Fink (Consultant)
Amway Corporation
Claire/Sprayon
The Clorox company
Airwick Industries
Sherwin-Williams
US Can Company
CTFA
Western Aerosol Information Bureau
Chesebough-Ponds
DeMert & Doughert
Uniroyal Chemical
Calmar, Incorporated
The Gillette Company
Major Paint Company
American Home Products Corporation
Helene Curtis
Image Labs
Seaquist Valve
Haloengated Solvents Industry Alliance
Boyle Midway Household Products
Eagle One

WORKSHOP PARTICIPANTS

SAN FRANCISCO, CA
MARCH 28-29, 1990

Company

Advanced Monobloc
Accur Pac Company
Claire Mfg.
CTFA
US Cellulose
ICI Amgricas
Calmar, Inc.
Clairol Inc.
The Clorox Co.
EPA
Peterson/Puritan
Sika Corp.
Alliance Technologies Corp.
Pennzoil
Scott's Liquid Gold
The Soap & Detergent Assoc.
Shulton Group American Cyanamid Co.
CFC Alliance
IKI Mfg.
WD-40 Company
Drackett Co.
Alberto Culver
Dow Brands Inc
Revlon
Piedmont Labs
Airwick Industries
Image Labs
Sprayon Products
Grow Group, Inc.
Randlett & Assoc.
Summit Pkg.
PMI Distributors
Crown Curk & Seal
Claire MFG Co.
American Home Products Co.
Precision Valve
Halogenated Solvent Industry All.
Citizens For A Better Environment

Company

Pillsbury, Madison & Sutro
Ian Gecker & Assoc.
Proctor & Gamble
CSMA
Holchem Inc.
Phillips Petroleum
Dow Corning Corp.
BASF
Chesebrough-Pond's USA
Aeropres Corp.
The Dail Corp.
Eagle One
Bentley Mfg.
Chemical Spec Mfg. Assoc.
Monsanto Company
Diversified CPC
Colgate-Palmolive Co.
Bacch & Labs
FMG/Tsomura
Aerosol Services Co.
Faultless Starch Co.
SC Johnson Wax
Lehn and Fink
DeMert
Boyle-Midway Household Products
BAAQMD
GAF Chemical Corp.
Chevron Chemical Co.
Church & Dwight
Ecolab Inc.
3M
Sprayon Products Div. S.W.
Chemisco
Gillette Co.
SEAQUIST
Helene Curtis
McKenna, Conner & Cuneo

WORKSHOP PARTICIPANTS

LOS ANGELES, CA
JUNE 5, 1990

Company

Fairfield American
Clairol Manufacturing
Turtle Wax
Mary Kay Cosmetics, Inc.
Dow Corning Corp.
State Chemical/Neutron Ind.
US Can Co.
Image Labs
Paul, Hastings, Janofsky & Walter
Chemsico
Redken Laboratories
Proctor & Gamble
SEAQUIST
Creative Products
Advanced Mono Bloc
OCS Manufacturing
CSMA
Faultless Starch/Bon Ami
Cosmair
Clairol
Allen, Matkins, Leuk, Gamble &
Molloy
Aerosol Age Magazine
Revlon
MGK Company
Advanced Packaging & Products Inc.
Aerosol Services Co. Inc.
BAAQMD
United Industries
The Clorox Co.
WD-40
Boyle - Midway
Gillette Co.
Haight, Brown & Bowestec
K & W Products
P & CSD

Company

Chevron Chemical Co.
Sprayon Products
Jafra Cosmetics
Shulton Group
CSA Limited
Aeropres Corp.
W.A.I.B. Pres./US Can Co.
Ian Gecker & Associates
Alberto Culver
SCAQMD
National Aerosol Products
Alberto-Culver Canada
Precision Valve
SEAQUIST Valve
The Dail Corp.
HSIA
MOTHERS
Drackett
McKenna, Connera & Caneo
Crown Cork & Seal Co.
Boat Kare Products Inc.
Nationwide Industries
Chesebrough-Ponds USA Co.
Airwick
Grow Group
Eagle One
Self
Baker & Hosteller
McLaughlin, Gormley King Co.
Diversifield CPC International
I.K.I. Mfg.
Helene Curtis Inc.
Colgate Palmolive Co.
National Starch & Chemical
3M
Duffy & Duffy

INNOVATIVE PRODUCT CONSULTATION MEETING

JULY 30, 1990
SACRAMENTO, CA

Company

SC Johnson
Cosmair
Shulton Group
The Gillete Company
CTFA
Soap & Detergent Association
Dow Corning Corporation
Drackett Company
Ecolab
Chesebrough-Ponds USA Company
DeMert & Dougherty
US Environmental Protection Agency
Advanced Mono Bloc
Seaquist

Company

CSMA
Clairol
Creative Products Inc. of Rossville
Airwick Industries
Sprayon Products
The Clorox Company
Dow Brands
Alberto Culver
Procter & Gamble
Crown Cork & Seal Company
Revlon
Precision Valve
Helene Curtis
Bay Area Air Quality
Management District

WORKSHOP PARTICIPANTS

SACRAMENTO, CA
JULY 31, 1990

Company

Chevron Chemical Company
DR Thomper
DeMert & Dougherty
Peterson/Puritan
KMS Research Inc.
Procter & Gamble
Steiner Company Inc.
Lehn & Fink Products
Creative Products Inc. of Rossville
Seaquist
Airwick
Shulton Group
Clairol, Inc.
Calmar, Inc.
Dow Brands
Diversified CPC International
POW! Chemical Company
First Brands Corporation
Quantum Chemical Corporation
Gillette Company
Hydrosol Inc.
Baker & Hostetler, McCutcher, Black
FDB, CDHS
CSMA
Firmenich Inc.
Sprayon Products
WD-40
The Clorox Company
Ecolab Inc.
Redken Laboratories

Company

Bay Area Air Quality
Management District
Precision Valve
Dow Corning Corp.
ARB/MLD/EEB
Monsanto/Chlorobenzene Producer Assoc.
Scott's Liquid Gold
Paul, Hastings, Janofsky & Walker
Miles Inc.
Alberto Culver
Revlon
Cosmair
Chesebrough-Ponds USA Company
Helene Curtis, Inc.
US Can Company WAIB
Aeropres Corporation
3M
Dial Corporation
Environmental Protection Agency
Crown Cork & Seal Company
Citizens For A Better Environment
IFF
Dep Corporation
Advanced MonoBloc
KMS Research
Radiatur Specialty
I-K-I Manufacturers
Livingston & Mattesich for SDA
PMI Distributors

AIR RESOURCES BOARD

1102 Q STREET
P.O. BOX 2815
SACRAMENTO, CA 95812



August 14, 1989

Dear Sir or Madam:

Personal Care/Household Products - Consultation Meetings

I am writing to request your company's participation in a consultation meeting to explore regulatory approaches to reducing volatile organic compound emissions from personal care and household products.

With passage of the California Clean Air Act of 1988, the Air Resources Board (ARB) was given direct authority to adopt statewide regulations on or before January 1, 1992 to achieve the maximum feasible reduction in volatile organic compound emissions from consumer products. On July 13, 1989, the ARB approved a consumer product control plan for addressing the requirements of the California Clean Air Act. This plan describes the need for regulatory action, the regulatory authority and several milestones for meeting the legislative mandate. According to the control plan, personal care and household products are the first categories to be addressed. Personal care products include, but are not limited to, such items as hairsprays and hair products, cosmetics, body lotions and creams, breath fresheners and mouthwashes, shaving products, colognes, medicinal and pharmaceutical products. Deodorants and anti-perspirants are also part of the personal care category but are being addressed separately. Household products include general purpose cleaners, floor and furniture waxes and polishes, air fresheners and deodorants, and laundry products.

As a first step in the development of regulations for these categories we will conduct two informal consultation meetings in Los Angeles on September 6 and 7, 1989. The meeting on September 6, 1989 will pertain to the personal care products category and the September 7th meeting will focus on the household product category. The location and time for each meeting are as follows:

Date: September 6, 1989 (Personal Care)
September 7, 1989 (Household)

Time: 10:00 AM

Place: Los Angeles State Office Building
107 South Broadway, Room 1122
Los Angeles, CA 90012

Each consultation meeting will begin at 10:00 a.m. and conclude at or before 5:00 p.m.

Attached are several items that we will be discussing at the consultation meetings. We would appreciate your review of these items and look forward to your comments at the meetings. The first item, "Consumer Product Emissions Survey Form," is a form that we are considering using to survey consumer products marketed in California. The information from this survey would be used to update and improve our consumer product emissions inventory. The second item, "Consumer Product Emissions and Selected Personal Care and Household Products," is a listing of products that are included in the personal care and household products categories. The third item, "A Discussion on Regulatory Approaches for Consumer Products," is a brief summary on different types of regulatory options that could be pursued in the development of consumer product regulations. The fourth item, "Questions," is a list of some of the other topics we would like to discuss with you at the meeting. A tentative agenda is also attached. A final workshop agenda will be available at the consultation meeting.

I would like to emphasize that we have not chosen a regulatory approach to use for these two categories of consumer products. There are many ways to achieve emission reductions and we want to explore several options before committing to an approach. By examining these approaches together we will increase the chance of having a regulation that will provide for the maximum feasible reduction yet provide flexibility to the industry. I hope you will participate in these consultation meetings and the development of consumer product regulations. Your participation, particularly in this developmental stage, is important and essential to the success of this process. If you have any questions or if you need a copy of the Consumer Product Control Plan, please call either Dan Donohue, Manager, Solvents Control Section at (916) 322-8283 or Peggy Vanicek, Associate Air Pollution Specialist, at (916) 327-1517.

Sincerely,



Peter D. Venturini, Chief
Stationary Source Division

Enclosures

AIR RESOURCES BOARD

1102 Q STREET
P.O. BOX 2815
ACRAMENTO, CA 95812



February 9, 1990

Dear Sir or Madam:

Public Workshop to Discuss Draft Regulation
for Consumer Products

I am writing to request your company's participation in two public workshops to be held by the staff of the Air Resources Board (ARB) concerning the regulation of volatile organic compounds (VOC) in consumer products.

With passage of the California Clean Air Act of 1988, the ARB was given direct authority to adopt statewide regulations on or before January 1, 1992 to achieve the maximum feasible reduction in volatile organic compound emissions from consumer products. In July 1989, the Board approved a Consumer Products Control Plan. To begin implementing the plan, on September 6 and 7, 1989 the ARB held a public consultation meeting to discuss the implementation of the CCAA mandate. The workshops announced in this notice are a continuation of the process begun last fall.

The locations and times for the upcoming workshops are as follows:

WORKSHOP II

Date: February 28, 1989

Time: 9:30 AM

Place: Sacramento Community Center
1100 14th Street El Dorado Room
Sacramento, CA 95814

WORKSHOP III

Date: March 28-29, 1989

Time: 9:30 AM

Place: San Francisco State Office Building
455 Golden Gate Avenue Room 1158
San Francisco, CA 94102

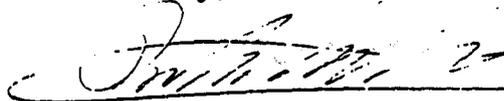
Each workshop will begin at 9:30 AM and conclude at or before 5:00 PM. A final agenda will be available at the workshop meeting.

Enclosed with this notice is a draft regulation entitled "Regulation for Reducing Volatile Organic Compound Emissions From Consumer Products." This draft regulation will provide the basis for the discussions at the workshops. In this regulation we are proposing to establish VOC standards for selected products and to require a reduction in VOC content of aerosol products equal to or greater than the percent of VOC propellant contained in the aerosol product. We are particularly interested in your assessment of the proposed standards and dates for implementation. We have also included two attachments for discussion: Attachment 1 - Voluntary Labeling Program and Attachment 2 - Alternative Compliance Plan (Quota).

I hope you will be able to attend these workshops. These meetings will give you the opportunity to share your comments and concerns about the proposed regulation and your participation in this regulatory development process will help ensure a regulation that will achieve reductions in consumer product VOC emissions and still provide flexibility to industry. Written comments will also be accepted. If you would like to offer written comments, please submit them no later than March 5, 1990. They should be mailed to Daniel E. Donohue, Manager Solvents Control Section, California Air Resources Board at P.O. Box 2815, Sacramento, CA 95812.

Questions concerning this meeting may be directed to either Dan Donohue, Manager, Solvents Control Section at (916) 322-8283 or Peggy Vanicek, Associate Air Pollution Specialist, at (916) 327-1517.

Sincerely,



Peter D. Venturini, Chief
Stationary Source Division

Enclosures

AIR RESOURCES BOARD

1102 Q STREET
P.O. BOX 2815
SACRAMENTO, CA 95812



March 22, 1990

Dear Sir or Madam:

Public Workshop to Discuss Changes to
Draft Regulations for Consumer Products

Enclosed is a copy of the revised draft to the statewide regulation for the control of volatile organic compounds (VOC) in consumer products, a summary of the changes made to the regulation, and a draft regulation for the Bay Area. These draft regulations were discussed at the second public workshop held in Sacramento on February 28, 1990. Many of the revisions are the result of information given by industry representatives at that workshop.

I would like to remind you of the March 28-29, 1990, workshop which will be held at the location given below:

WORKSHOP III

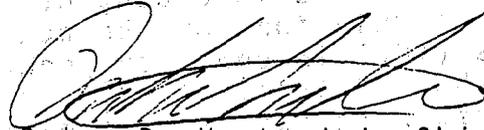
Date: March 28-29, 1990
Time: 9:30 AM (Second day will begin at 8:30 AM)
Place: San Francisco State Office Building
455 Golden Gate Avenue (at Polk Street)
Room 1158
San Francisco, CA 94102

The revisions to the draft statewide regulation will be discussed during the first day and may continue into the second day, if necessary. During the second day, the draft Bay Area consumer product regulation will be discussed. In this regulation, we will consider two options. The first option is to establish VOC standards for selected products and to require a reduction in the VOC content of certain aerosol products. The second option is to establish an alternative compliance plan that will require a 15% reduction in VOC content by February 1, 1993. This second option is attached for discussion purposes only. We believe this option will need further development before it can be considered viable.

As before, the workshop will give you the opportunity to share your comments and concerns about the proposed regulations. I hope you will be able to attend. Written comments will also be accepted if you are unable to attend.

Should you have any questions regarding this workshop, please call Peggy Vanicek, Manager, Solvents Control Section, at (916) 322-8283.

Sincerely,



Peter D. Venturini, Chief
Stationary Source Division

Enclosures

AIR RESOURCES BOARD

1102 Q STREET
P.O. BOX 2815
SACRAMENTO, CA 95812



May 18, 1990

Dear Sir or Madam:

Public Workshop to Discuss Changes to the
Draft Regulations for Consumer Products

Enclosed is a copy of the revised draft of the statewide regulation for the control of volatile organic compound (VOC) emissions from consumer products. Also enclosed is a summary of the revisions made to the March 20, 1990 draft regulation that was discussed at the public workshop held on March 28 and 29, 1990.

The revised draft regulation will be discussed at the fourth consumer product workshop to be held at the date and time given below:

WORKSHOP IV

Date: June 5, 1990

Time: 8:30 AM

Place: Junipero Sierra State Building
107 South Broadway (at First Street)
Auditorium, Room 1138
Los Angeles, CA 90012

The primary focus of this workshop will be to discuss the revisions to the draft statewide consumer products regulation. However, we will also allow time for comments pertaining to the proposed Bay Area Regulation that was distributed on April 27, 1990.

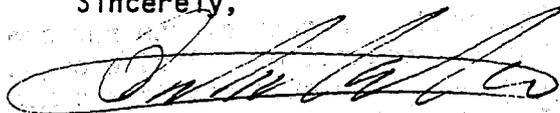
Revisions to the draft statewide regulation include: the addition of new terms and definitions; the addition and revision of some product category limits based on emission data submitted by industry through Heiden Associates; the addition of more exemptions; and the addition of the Innovative Products, Registration, and Severability sections. An agenda will be provided at the workshop.

We have received many requests for documentation supporting the draft statewide consumer product regulation. It is our intention to provide industry with the Technical Support Document and another revision to the draft regulation in early July for consideration and discussion at a workshop to be held in July of this year.

This workshop and the previous workshops are an important component of the regulatory development process. As before, the workshop will afford you the opportunity to participate in the development of the draft consumer product regulation by sharing your comments and concerns about the draft regulation. If you are unable to attend, written comments will be accepted.

If you have any questions regarding the draft regulation or workshop, please call Peggy Vanicek, Manager, Solvents Control Section, at (916) 322-8283.

Sincerely,



Peter D. Venturini, Chief
Stationary Source Division

Enclosure

AIR RESOURCES BOARD

1102 Q STREET
P.O. BOX 2815
SACRAMENTO, CA 95812



July 5, 1990

Dear Sir or Madam:

Public Workshop to Discuss Changes to the
Draft Statewide Consumer Product Regulation

The Air Resources Board staff will conduct a public workshop at the time and place noted below to discuss revisions to the draft statewide consumer product regulation.

Date: July 31, 1990
Time: 9am to 5pm
Place: State Office Building 8
714 P Street Room 103
Sacramento, CA

(Public parking facilities available at 7th and L Streets and 2nd and P Streets)

Proposed revisions to the draft regulation and a draft technical support document will be the primary focus of this workshop. These documents will be sent to you under separate cover prior to July 31, 1990. As stated in our previous consumer product workshop announcements, these workshops are an important component of the regulatory development process and provide you with the opportunity to participate in the development of consumer product regulation for California. If you are unable to attend, written comments will also be accepted. If you decide to provide us with written comments, please submit them to us by August 2, 1990.

If you have any question regarding the workshop, please call Peggy Vanicek, Manager, Solvents Section, at (916) 322-8283.

Sincerely,

A handwritten signature in dark ink, appearing to read "Peter D. Venturini".

Peter D. Venturini, Chief
Stationary Source Division

AIR RESOURCES BOARD

1102 Q STREET
O. BOX 2815
SACRAMENTO, CA 95812



July 10, 1990

Dear Sir or Madam:

Consultation Meeting to Discuss the Statewide
Consumer Product Regulation Innovative Product Provision

The Air Resources Board staff will conduct a public consultation meeting at the time and place noted below to discuss the draft statewide consumer product regulation's innovative product provision and the draft alternative control plan.

Date: July 30, 1990
Time: 1:15 pm to 5:00 pm
Place: State Office Building 8
714 P Street Room 103
Sacramento, CA

(Public parking facilities available at 7th and L Streets and 2nd and P Streets)

This informal consultation meeting has been scheduled to discuss issues pertaining to the draft innovative product provision and the draft alternative control plan provision. The current draft of the statewide consumer product regulation contains a provision that allows for innovative products. An innovative product is presently defined as a product that has a volatile organic compound content higher than the volatile organic compound content limit proposed for that product category, but because of some feature of the product design, use of the innovative product would result in the same emissions of volatile organic compounds as would be emitted from the use of a product meeting the specified limit for that product. Several issues have been raised concerning the innovative product provision including, how to evaluate the innovative product, what criteria will be used to approve or disapprove the application for use of an innovative product, and the need for "pre-market" clearance.

Many of the issues that apply to the draft innovative product provisions also apply to the draft alternative control plan. In addition, since the draft alternative control plan may result in trade-offs in emissions reductions between individual products and possibly product categories, it is inherently more complex. We are especially concerned about the enforceability of any alternative control plans.

If you have any questions regarding the consultation meeting, please call Peggy Vanicek, Manager, Solvents Section, at (916)322-8283.

Sincerely,

A handwritten signature in black ink, appearing to read 'Peter D. Venturini', written over a horizontal line.

Peter D. Venturini, Chief
Stationary Source Division

AIR RESOURCES BOARD

1102 Q STREET
P.O. BOX 2815
SACRAMENTO, CA 95812



July 16, 1990

Dear Sir or Madam:

Draft Technical Support Document and
Draft Statewide Consumer Product Regulation

Enclosed is a copy of the draft technical support document (TSD) and draft consumer product regulation (Appendix B of the TSD). As indicated in our letter dated July 5, 1990, proposed changes to the draft TSD and draft regulation will be discussed at the public workshop to be held on the date and time given below.

Date: July 31, 1990
Time: 9 am to 5 pm
Place: State Office Building 8
714 P Street, Room 102
Sacramento, CA.

(Parking facilities available at 7th and L Streets and 2nd and P Streets)

Please note that the room number for the workshop was incorrectly printed in the July 5th letter. The correct room is shown above. Again, we welcome your participation in this important aspect of the regulatory development process. If you cannot attend, you may wish to provide us with written comments. Please submit your comments by August 2, 1990.

If you have any questions regarding the workshop, draft TSD, or draft regulation, please call Peggy Vanicek, Manager, Solvents Control Section, at (916) 322-8283.

Sincerely,

A handwritten signature in black ink, appearing to read "Peter D. Venturini".

for Peter D. Venturini, Chief
Stationary Source Division

Enclosure

Appendix E

Cost Analysis Calculations

COST ANALYSIS CALCULATIONS

Annual Cost

1. Reformulation cost estimates from industry ranged from \$2,000.00 to \$2,000,000.00 per product. Most estimates were between \$50,000 and \$100,000 per product. Cost-effectiveness ratios were determined for reformulation costs of \$100,000 and \$2,000,000 per product.

Low Cost to Reformulate: \$100,000 per product
High Cost to Reformulate: \$2,000,000 per product

2. The cost to reformulate was amortized over both 5 years and 10 years.
3. Annual cost to reformulate a product for four cases:

Case 1

Cost to reformulate: \$100,000

Amortization: 5 years

Assume interest rate = 10%

$$\text{End of Year payments} = \text{principal} * \frac{i(1+i)^n}{(1+i)^n - 1}$$

where i = interest rate
 n = number of years

$$= \$100,000 * \frac{0.1(1+0.1)^5}{(1+0.1)^5 - 1}$$

End of Year payments = \$26,378 per product

Case 2

Cost to reformulate: \$100,000

Amortization: 10 years

Assume interest rate = 10%

$$\text{End of Year payments} = \text{principal} * \frac{i(1+i)^n}{(1+i)^n - 1}$$

where i = interest rate
 n = number of years

$$= \$100,000 * \frac{0.1(1+0.1)^{10}}{(1+0.1)^{10} - 1}$$

End of Year payments = \$16,274

Case 3

Cost to reformulate: \$2,000,000

Amortization: 5 year

Assume interest rate = 10%

$$\text{End of Year payments} = \text{principal} * \frac{i(1+i)^n}{(1+i)^n - 1}$$

where i = interest rate

n = number of years

$$= \$2,000,000 * \frac{0.1(1+0.1)^5}{(1+0.1)^5 - 1}$$

End of Year payments = \$527,595

Case 4

Cost to reformulate: \$2,000,000

Amortization: 10 year

Assume interest rate = 10%

$$\text{End of Year payments} = \text{principal} * \frac{i(1+i)^n}{(1+i)^n - 1}$$

where i = interest rate

n = number of years

$$= \$2,000,000 * \frac{0.1(1+0.1)^{10}}{(1+0.1)^{10} - 1}$$

End of Year payments = \$325,490

Total Cost to Industry

1. Total Annual Cost = (Annual cost per product reformulation) x (number of noncomplying formulations)
2. Number of noncomplying products from ARB survey estimated at 683.
3. Total Cost using annual cost figures above.

Case 1: (683)(\$26,378) = \$18,148,064 ~ 18 million

Case 2: (683)(\$16,274) = \$11,196,512 ~ 11 million

Case 3: (683)(\$527,595) = \$362,985,360 ~ 360 million

Case 4: (683)(\$325,490) = \$223,937,120 ~ 220 million

Cost Effectiveness

1. Cost Effectiveness = (Total annual cost of regulation)/(Total emission reduction)

2. Total (national) emission reduction (1994) estimated at 290 TPD.

3. Cost Effectiveness Ratios in dollars per pound VOC reduced.

Case 1: (\$18 million)/[(290 TPD)(2000 lbs/ton)(365 d/yr)] ~ \$0.08/lb.

Case 2: (\$11 million)/[""] ~ \$0.05/lb

Case 3: (\$360 million)/[""] ~ \$1.50/lb.

Case 4: (\$220 million)/[""] ~ \$1.00/lb.

Cost Impact to Consumers

The cost increase of an average aerosol product was estimated. It is assumed that all reformulation costs are passed on to the consumer and that products are marketed nationally with the cost of reformulation spread throughout the nation.

1. Cost increase per unit = (Total cost)/(Total number of aerosol units)
2. Total cost (in California) = (Cost/formulation)(no. aerosol formulations)

Cost/formulation = Annual cost per formulation from the four cases in Appendix F scaled down for California by population. California is approximately 11% of the nation's population.

The number of noncomplying aerosol formulations is estimated at 391 based on the ARB survey.

3. Total number of aerosol units from ARB survey = 97,600,000

(An estimate of the total number of aerosol units was calculated using the total sales of noncomplying aerosol products (lbs/year) reported in the ARB VOC Survey and assuming an average unit size of 10 oz. by wt.)

4. Cost per unit:

Case 1: $(\$26,378)(0.11)(391)/97,600,000 = \$0.012/\text{unit}$

Case 2: $(\$16,274)(0.11)(391)/97,600,000 = \$0.007/\text{unit}$

Case 3: $(\$527,595)(0.11)(391)/97,600,000 = \$0.23/\text{unit}$

Case 4: $(\$325,490)(0.11)(391)/97,600,000 = \$0.14/\text{unit}$

