

Appendix B

Utilization of the Two Percent Fragrance Exemption

Proposed Amendments to the California Consumer Products Regulations

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Appendix B: Utilization of the Two Percent Fragrance Exemption

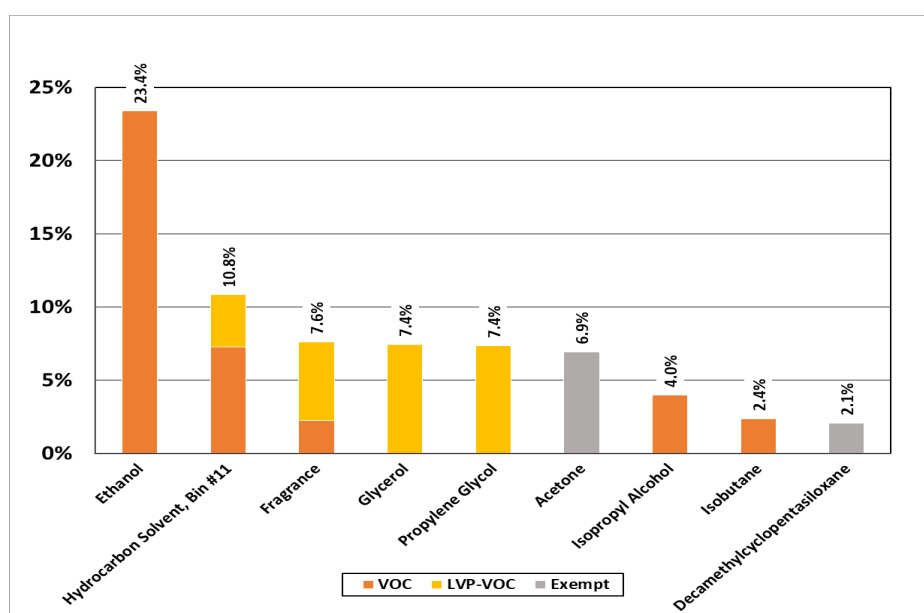
1. Consumer Products Fragrance Survey

In 2014, CARB's Consumer Products Program began a comprehensive survey of consumer products sold in California in 2013, 2014, and 2015 (Consumer Product Survey) to update CARB's consumer product emissions inventory and provide the technical foundation for future rulemaking. The Consumer Product Survey required consumer product manufacturers and formulators to provide product sales and detailed ingredient information for over 400 consumer product categories, covering the entire consumer product sector.

Some survey information is proprietary, and has been aggregated by CARB staff for this public document, as allowed by law. Further, some ingredient information was not reported by product manufacturers and formulators in response to the Consumer Product Survey. For instance, consumer products manufacturers often utilize proprietary fragrance mixtures supplied by specialized fragrance manufacturers. The compositions of these fragrance mixtures are often considered trade secret and could not be provided by the product manufacturers as part of their survey responses. Therefore, manufacturers were instructed to report fragrance as a single ingredient in a product's formulation, while also providing the name of the fragrance formulation and the name of the fragrance supplier.

Preliminary evaluations of incoming data showed that over seven percent of all products' total organic gas (TOG) mass was being reported as fragrance, as shown in Figure B-1, so staff conducted a secondary, more targeted survey of fragrance formulations (Fragrance Survey) in order to better characterize the composition and potential air quality impact of fragrance ingredients in products across the sector.

**Figure B-1: 2015 CARB Consumer and Commercial Product Survey:
Top 10 TOG Ingredients**



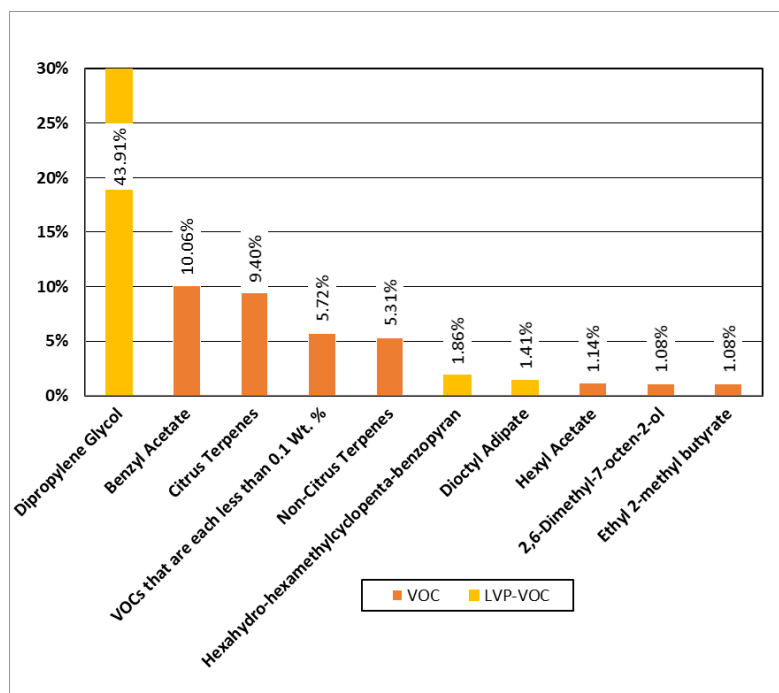
The resulting reported TOG ingredients were split nearly evenly between VOC and LVP-VOC chemical species, with most of the (low vapor pressure VOC) LVP-VOC represented by dipropylene glycol. The VOC species consisted largely of benzyl acetate, citrus and non-citrus terpenes, and hexyl acetate, and included over 130 different VOC compounds that each made up less than 0.1 percent of the total fragrance mass reported. However, the fragrance survey provided limited and inconclusive insight into the profile of fragrance across different survey categories. Submitted fragrance formulations represented only 8.1 percent of the mass reported as "fragrance" in the Fragrance Survey. Furthermore, only 39 percent of the Fragrance Survey mass was speciated to the chemical compound level.

Consistent with past and best practice, and in the absence of reliable representative profiles from the fragrance survey, when processing survey data, CARB staff initially assumed that all reported fragrance was a VOC. Due to the lack of a reliable fragrance profile, CARB staff followed the Aerosol Coatings Regulation's fragrance convention and assigned a maximum incremental reactivity (MIR) to fragrance using the MIR value for terpinolene of 6.36. This MIR value was used to calculate the PWMIR for products containing fragrance. The use of the terpinolene MIR as a surrogate for fragrance is an "upper limit" estimate of the ozone impact of fragrance compounds, based on worst-case considerations.

2. Characterization of the Composition of Fragrance in Consumer Products

In 2017, CARB staff and fragrance industry stakeholders also began discussions to further improve CARB's understanding of fragrance speciation and reactivity. In consultation with stakeholders, CARB staff identified compounds commonly used to formulate fragrance mixtures, along with their physical properties, reactivity, and relative weight fractions. From these efforts, CARB staff were able to estimate an average VOC content and reactivity for the fragrance ingredients for most consumer product categories. This average VOC content was consistent with averages derived from individual fragrance formulations received as part of the Fragrance Survey. The top ten fragrance ingredients identified as part of the Fragrance Survey are shown in Figure B-2.

**Figure B-2:
2016 Fragrance Survey: Top 10 Reported TOG Ingredients**



CARB staff's evaluation of this data indicated that fragrance ingredients in consumer products could be divided into two sub-classifications, depending on the consumer product category and sector. Many products in cleaning and degreasing categories were reported to contain fragrances with high monoterpene concentrations, including limonene. For most other categories, including most air fresheners and personal care products, fragrance could indeed be characterized as a complex mixture consisting of a wide variety of VOC and LVP-VOC organic compounds and natural extracts.

These data allowed CARB staff to generate two separate VOC speciation and reactivity profiles for fragrance across categories and sectors, which was crucial to building an accurate emissions inventory, evaluating potential categories for new regulatory standards, and calculating the emission benefits of doing so. Fragrance in most personal care product categories was classified as 25 percent VOC and 75 percent LVP-VOC, with a MIR of 2.80, while fragrance in 35 mostly household cleaning categories was classified as 100 percent VOC, with a MIR of 4.04.

3. Two Percent Fragrance Exemption Utilization in Regulated Consumer Products

Analysis of the utilization rate of the fragrance exemption in regulated consumer products reported in response to the Consumer Product Survey provides the basis for staff's determination that it is both technologically and commercially feasible to sunset the Two Percent Fragrance Exemption for most consumer products categories. 123 of surveyed consumer products categories are currently subject to VOC standards in the regulation, making it possible to evaluate product formulations and sales mass with respect to how products in these categories

utilize the Two Percent Fragrance Exemption. The analysis did not include non-compliant products; categories that were subject to VOC standard changes during the Consumer Product Survey reporting period (like aerosol adhesives); products subject to standards pursuant to Article 1 or Article 3 of the Consumer Product Regulations; and products in categories with other applicable fragrance exemptions, like 100 percent fragrance air fresheners and personal fragrance products.

Regulated products were then grouped by their regulated category and binned according to VOC and fragrance content. Products with VOC content greater than two percent over the limit for their category were excluded for non-compliance with their applicable VOC standard. Products that were above the VOC limit for their category and contained fragrance up to two percent were considered to be utilizing the two percent fragrance exemption. Products were then binned according to whether they were using the exemption or not, then averages were calculated for each.

As discussed previously, CARB staff undertook an evaluation of the VOC speciation of chemical ingredients reported as fragrance by category in response to the Consumer Product Survey. Based on that evaluation, staff revised its speciation assumption of 100 percent VOC for the fragrance ingredient down to 25 percent VOC for non-cleaning-related categories. However, it was possible that manufacturers formulated their products using the assumption that the fragrance they were using was 100 percent VOC. Therefore, in order to capture both the intent of the product formulator and the actual effect of the two percent exemption on VOC emissions from consumer products, staff analyzed utilization of the exemption using both the 25 percent VOC classification for certain categories and the 100 percent VOC assumption for all categories.

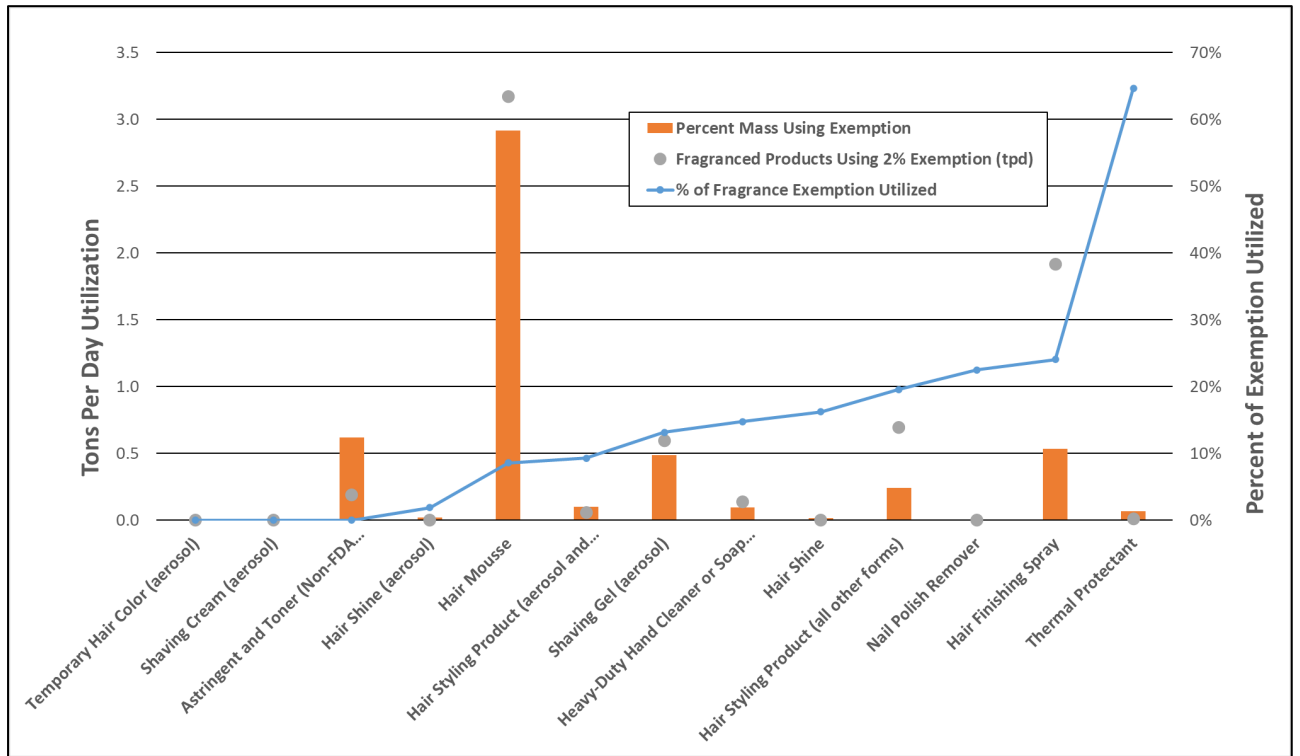
This analysis showed that 88.6 percent of regulated product formulations, making up 86.2 percent of product sales mass, are not utilizing the two percent exemption, because the product was still below the applicable VOC standard even if the fragrance was assumed to be 100 percent VOC (See Table B-1, below). Using the updated speciation profile, the analysis showed that 95.2 percent of products and 87.5 percent of sales mass are not using the exemption for the same reason. Additional information regarding this evaluation can be found in the March 10, 2020, and July 9, 2020, Public Work Group meeting presentations (CARB Work Group Meeting, 2020; CARB July Work Group Meeting, 2020). Table B-2 also provides the Two Percent Fragrance Exemption utilization rates by number of products and product mass for all applicable Article 2 product categories.

**Table B-1: Utilization of the Two-Percent Fragrance Exemption
by Regulated Consumer Product Sector and VOC Speciation Assumption**

Regulated Sector	Fragrance Classification			
	25 percent VOC Classification For Most Personal Care Categories		100 percent VOC Classification For All Categories (Formulator Intent)	
	% Product-Formulations Not Using Exemption	% Mass Not Using Exemption	% Product-Formulations Not Using Exemption	% Mass Not Using Exemption
Household	95.6	84.6	87.1	83.9
Personal Care	92.3	89.0	90.2	80.4
Insecticide, Solvents, and Automotive	97.0	99.0	94.6	97.1
Total	95.2	87.5	88.6	86.2

Fragrance exemption utilization rates vary depending on the specific regulated category, as shown in Figures B-3 and B-4. The orange bars represent the percent of mass in the category that is utilizing some portion of the exemption, and the blue line represents the average fraction of the exemption the exemption-using products are using. For example, for Hair Finishing Spray, a little over 10 percent of product mass in that category, or around two tons per day, is using the fragrance exemption, and that 10 percent is using roughly 25 percent of the exemption.

**Figure B-3:
Personal Care Products Two Percent Fragrance Exemption Utilization**



**Figure B-4:
Household Products Two Percent Fragrance Exemption Utilization**

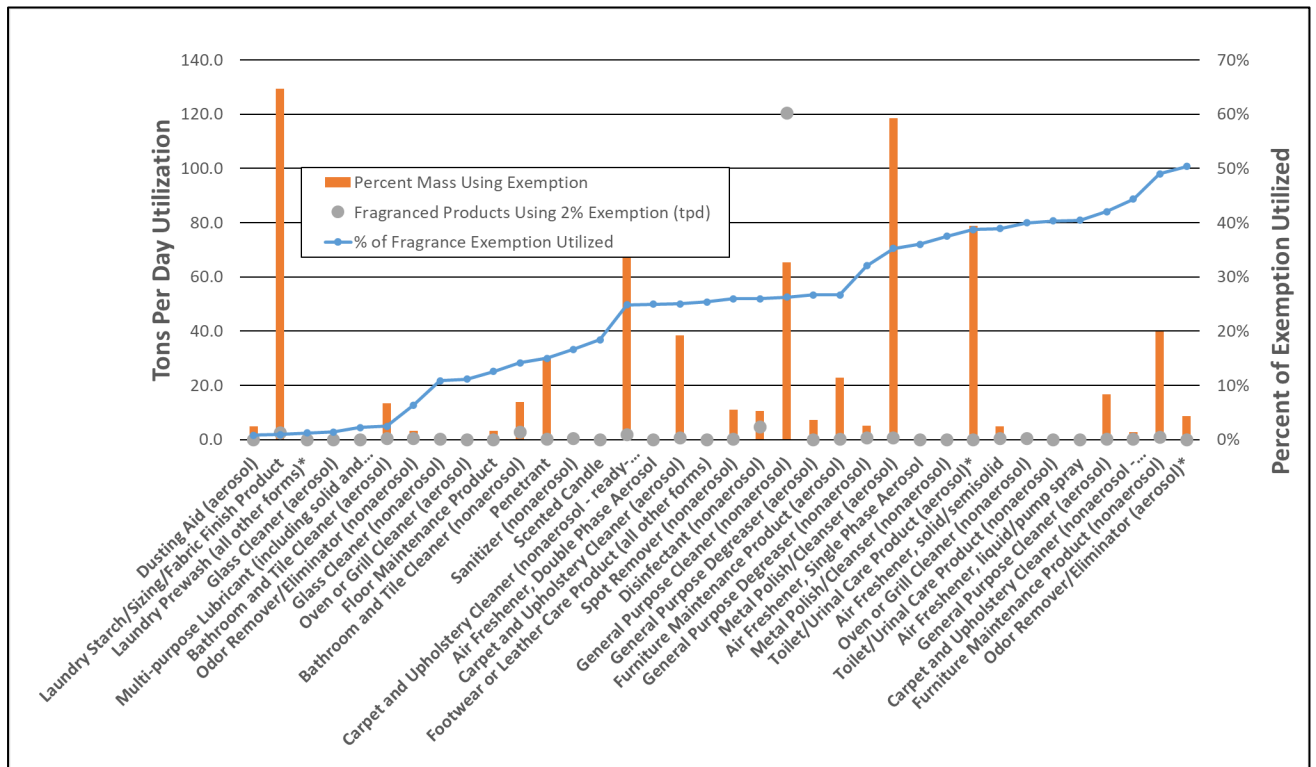


Table B-2
Utilization of Fragrance in Consumer Products for All Regulated Article 2
Consumer Products Categories

Category Name	Percent Mass Not Using Exemption	Percent Products Not Using Exemption
Aerosol Cooking Spray	100.0%	100.0%
Air Freshener, Double Phase Aerosol	99.3%	54.2%
Air Freshener, liquid/pump spray	99.3%	97.4%
Air Freshener, Single Phase Aerosol	99.9%	86.0%
Air Freshener, solid/semisolid	96.6%	78.6%
Anti-Seize Lubricant (aerosol)	100.0%	100.0%
Anti-Seize Lubricant (nonaerosol)	100.0%	100.0%
Astringent and Toner (Non-FDA regulated)	87.1%	98.0%
Automotive Hard Paste Wax	87.0%	96.2%
Automotive Instant Detailer (pump sprays)	100.0%	98.9%
Automotive Rubbing or Polishing Compound	100.0%	99.4%
Automotive Wax/Polish/Sealant/Glaze (all other forms)	96.7%	92.3%
Automotive Windshield Washer Fluid (Nontype "A" Areas)	100.0%	100.0%
Automotive Windshield Washer Fluid (Type "A" Areas)	100.0%	100.0%
Bathroom and Tile Cleaner (aerosol)	93.3%	94.4%
Bathroom and Tile Cleaner (nonaerosol)	91.8%	86.3%
Brake Cleaner	95.1%	93.7%
Bug and Tar Remover	97.5%	91.1%
Carburetor or Fuel-Injection Air Intake Cleaner	99.8%	98.5%
Carpet and Upholstery Cleaner (aerosol)	80.8%	82.5%
Carpet and Upholstery Cleaner (nonaerosol - dilutable)	94.1%	87.5%
Carpet and Upholstery Cleaner (nonaerosol - ready-to-use)	57.7%	66.0%
Crawling Bug Insecticide (aerosol)	98.6%	98.0%
Crawling Bug Insecticide (nonaerosol)	100.0%	100.0%
Cutting or Tapping Oil (aerosol)	100.0%	100.0%
Cutting or Tapping Oil (nonaerosol)	100.0%	100.0%
Disinfectant (aerosol)	98.4%	89.2%
Disinfectant (nonaerosol)	92.3%	82.2%
Dual Purpose Air Freshener/Disinfectant (aerosol)	18.0%	76.5%
Dusting Aid (aerosol)	96.7%	78.9%
Dusting Aid (nonaerosol)	99.9%	83.1%
Electrical Cleaner	100.0%	100.0%
Electronic Cleaner	100.0%	100.0%
Engine Degreaser (aerosol)	97.8%	92.6%
Engine Degreaser (nonaerosol)	63.6%	59.0%
Fabric Protectant (aerosol)	100.0%	100.0%
Fabric Refresher (aerosol)	100.0%	100.0%
Fabric Refresher (nonaerosol)	98.6%	97.3%
Flea and Tick Insecticide	100.0%	100.0%
Floor Maintenance Product	95.1%	87.9%

Category Name	Percent Mass Not Using Exemption	Percent Products Not Using Exemption
Floor or Wall Covering Adhesive Remover	100.0%	100.0%
Floor Polish or Wax (for nonresilient flooring)	100.0%	100.0%
Floor Polish or Wax (for resilient flooring)	99.9%	99.5%
Floor Polish or Wax (for wood floors)	100.0%	100.0%
Flying Bug Insecticide (aerosol)	64.4%	82.4%
Flying Bug Insecticide (nonaerosol)	100.0%	100.0%
Footwear or Leather Care Product (aerosol)	100.0%	100.0%
Footwear or Leather Care Product (all other forms)	99.9%	97.2%
Footwear or Leather Care Product (solid)	100.0%	100.0%
Furniture Maintenance Product (aerosol)	88.3%	72.0%
Furniture Maintenance Product (nonaerosol)	75.8%	73.4%
Gasket or Thread Locking Adhesive Remover	100.0%	100.0%
Gear, Chain, or Wire Lubricant (aerosol)	100.0%	100.0%
Gear, Chain, or Wire Lubricant (nonaerosol)	100.0%	99.2%
General Purpose Adhesive Remover	98.0%	86.7%
General Purpose Cleaner (aerosol)	91.6%	76.4%
General Purpose Cleaner (nonaerosol)	60.0%	72.6%
General Purpose Degreaser (aerosol)	96.4%	90.5%
General Purpose Degreaser (labeled not for retail sale)	100.0%	100.0%
General Purpose Degreaser (nonaerosol)	89.2%	73.2%
Glass Cleaner (aerosol)	99.9%	92.3%
Glass Cleaner (nonaerosol)	97.1%	87.8%
Graffiti Remover (aerosol)	98.6%	94.7%
Graffiti Remover (nonaerosol)	99.6%	96.6%
Hair Finishing Spray	89.3%	84.2%
Hair Mousse	41.6%	65.2%
Hair Shine	99.6%	97.0%
Hair Styling Product (aerosol and pump spray)	74.8%	93.5%
Hair Styling Product (all other forms)	94.8%	93.3%
Heavy-Duty Hand Cleaner or Soap (nonaerosol)	92.8%	67.5%
Insect Repellent (aerosol)	80.5%	87.7%
Insecticide Fogger	100.0%	100.0%
Lacquer Thinner	100.0%	100.0%
Laundry Prewash (aerosol/solid)	100.0%	100.0%
Laundry Prewash (all other forms)	100.0%	96.7%
Laundry Starch/Sizing/Fabric Finish Product	35.3%	71.2%
Lawn or Garden Insecticide (nonaerosol)	98.7%	92.4%
Metal Polish/Cleanser (aerosol)	40.1%	74.5%
Metal Polish/Cleanser (nonaerosol)	99.3%	92.2%
Motor Vehicle Wash (nonaerosol)	95.9%	80.1%
Multi-purpose Lubricant (including solid and semisolid products)	100.0%	99.8%
Multi-purpose Solvent (aerosol)	100.0%	100.0%
Multi-purpose Solvent (nonaerosol)	100.0%	98.4%
Nail Polish Remover	100.0%	99.6%

Category Name	Percent Mass Not Using Exemption	Percent Products Not Using Exemption
Non-selective Terrestrial Herbicide	100.0%	100.0%
Odor Remover/Eliminator (aerosol)	93.7%	72.7%
Odor Remover/Eliminator (nonaerosol)	98.3%	94.3%
Other adhesive removers	100.0%	100.0%
Oven or Grill Cleaner (aerosol)	100.0%	91.7%
Oven or Grill Cleaner (nonaerosol)	99.2%	96.9%
Paint Remover or Stripper	100.0%	99.2%
Paint Thinner (aerosol)	100.0%	100.0%
Paint Thinner (nonaerosol)	100.0%	96.6%
Penetrant	84.6%	90.6%
Rubber and Vinyl Protectant (aerosol)	100.0%	100.0%
Rubber and Vinyl Protectant (nonaerosol)	100.0%	100.0%
Rubber/Vinyl Protectant (aerosol)	92.1%	91.9%
Rubber/Vinyl Protectant (nonaerosol)	99.4%	98.6%
Rust Preventative or Rust Control Lubricant (aerosol)	100.0%	100.0%
Rust Preventative or Rust Control Lubricant (nonaerosol)	100.0%	100.0%
Sanitizer (aerosol)	100.0%	100.0%
Sanitizer (nonaerosol)	98.8%	94.5%
Scented Candle	100.0%	100.0%
Shaving Cream (aerosol)	100.0%	100.0%
Shaving Gel (aerosol)	88.4%	84.8%
Silicone-based Multi-purpose Lubricant	100.0%	100.0%
Specialty Adhesive Remover	100.0%	100.0%
Spot Remover (aerosol)	99.9%	96.6%
Spot Remover (nonaerosol)	93.2%	89.1%
Temporary Hair Color (aerosol)	100.0%	100.0%
Thermal Protectant ¹	69.3%	86.8%
Tire or Wheel Cleaner (aerosol)	100.0%	100.0%
Tire or Wheel Cleaner (nonaerosol)	95.2%	95.5%
Tire Sealants and Inflator	100.0%	100.0%
Toilet/Urinal Care Product (aerosol)	60.6%	93.3%
Toilet/Urinal Care Product (nonaerosol)	99.3%	90.6%
Undercoating (aerosol only)	100.0%	100.0%
Wasp or Hornet Insecticide	100.0%	100.0%
Windshield Water Repellent	100.0%	100.0%
Wood Cleaner (aerosol)	99.5%	66.7%
Wood Cleaner (nonaerosol)	99.9%	96.3%

¹Thermal Protectants are regulated as "Hair Styling Products"

Reference

California Air Resources Board "Work Group Meeting for Hair Care Products, Manual Aerosol Air Freshener, Personal Fragrance Products < 20% Fragrance, Sunset of 2% Fragrance Exemption, Topics for March 19, 2020 Work Group Meeting, and Next Steps" Work Group Meeting Presentation. March 10, 2020 (CARB Work Group Meeting, 2020)

California Air Resources Board "Discussion of CARB Proposals for 2% Fragrance Exemption Sunset, Web-Based Product Claims, and 'Energized Electrical Cleaner' Definition" Work Group Meeting Presentation. March 10, 2020 (CARB July Work Group Meeting, 2020)