

Response to Public Comments

This document contains public comments on the ARB's draft report "Environmental Impact Assessment of Selected Halogenated Chemicals" (September 2007), and ARB staff responses. Comments were received from Kurt Werner of 3M (3M, October 17, 2007 and January 28, 2008), David Ferguson of AGC Chemicals Americas, Inc. (AGC, October 31, 2007 and February 25, 2008), Doug Raymond of Raymond Regulatory Resources (3R, November 19, 2007), Sue Max of ITW Chemtronics (ITWC, November 20, 2007), Steve Cook of TechSpray (TS, November 23, 2007), and Douglas Fratz and Joseph Yost of the Consumer Specialty Products Association (CSPA, November 30, 2007). The comments are paraphrased below with ARB and OEHHA staff response in italics.

Physical Properties

Comment 1: Even though there is an energized electronic cleaner exemption, the current exemption does not adequately protect users from other ignition sources that are in the area and are not being directly sprayed. This further proves the need for non-flammable products. Also, these chemicals are beneficial due to their "flammability masking" effect. Because they are inherently poor solvents, HFC-245fa, HFC-365mfc, HFC-43-10mee, and HCFC-225 are commonly used in electronic cleaners as "inerting" agents. By combining precise amounts of one or more of those nonflammable ingredients with proven cleaning fluids that are flammable, the final blend is one that is nonflammable with reliable cleaning performance. Equally important is plastics compatibility as there are many plastic parts on electronic components today. Thus, many of the solvents petitioning for exemption will increase plastics compatibility as well as quench flammability. (3R, TS)

Response: *We agree there is a need for nonflammable ingredients and also agree that the petitioned chemicals provide a "flammability masking" effect. Because of this need, we recommend a VOC exemption for HFE-7200. HFE-7200 provides the same benefits as the other candidates while exhibiting the least environmental impact. We believe HFE-7200 meets all necessary compatibility and flammability concerns to formulate effective electronic cleaners. Together with the exemption from compliance with the VOC limit for products labeled exclusively for use on energized equipment, a full range of products should be available.*

Impacts on Stratospheric Ozone Depletion

Comment 2: The report should explain that HFCs and HFEs don't deplete stratospheric ozone because the reaction rate of fluorine with the atmospheric constituents of concern is inconsequential. (3M)

Response: Our Environmental Impact Assessment report (chapter 2.2.3) discusses the stratospheric ozone depleting potential of these compounds. Table 2.2 provides the ozone depleting potential of these compounds, showing that only the HCFC-225 isomers have an ozone depleting potential. We further respond as follows. Chlorofluorocarbons (CFCs) are the main chemicals that deplete stratospheric ozone. This is because solar irradiation in the stratosphere contains sufficient ultraviolet (UV) light to break down CFCs to yield chlorine atoms that convert ozone to molecular oxygen. This UV light is not strong enough to break down HFCs and HFEs to yield fluorine atoms. In addition, the molecular structure of HFCs and HFEs includes hydrogen atoms, which renders them susceptible to attack by hydroxyl radicals in the troposphere. Therefore, these chemicals have a relatively short atmospheric lifetime which does not allow any appreciable amounts to penetrate into the stratosphere. Most HFCs and HFEs have atmospheric lifetime of less than a year, compared to more than 50 years for most CFCs.

Impacts on Climate Change

Comment 3: We disagree with the statement that excluding the HCFCs and HFCs from the VOC definition would likely result in an increase to global warming. When the regulation for electronic cleaner was being developed, an industry survey was completed. ARB's Stationary Sources Division¹⁾ thoroughly evaluated the information of this survey and concluded any increase in global warming compound emissions would be negligible since the category of electronic cleaner is extremely small, and any use of the proposed exempt compounds would also be small. (3R, ITWC, TS)

Response: This comment refers to the Initial Statement of Reasons (ISOR) for the proposed amendments to the Consumer Products Regulations, dated May 7, 2004. In that report, we evaluated increased use based on the chemicals being VOCs. With the enactment of Assembly Bill 32 in 2006, which mandates greenhouse gas reductions, any increase in global warming emissions must now be closely evaluated. We also note that a VOC exemption could lead to increased use in these and other categories. This requires a different analysis (which is the subject of this report) than was done for the May 7, 2004 ISOR.

Economic Impacts

Comment 4: Flexibility in reformulation is of great benefit to manufacturers to produce more efficient and effective products. Also, the end-users of the

¹ Air Resources Board, "Initial Statement of Reasons for the Proposed Amendments to the California Aerosol Coating Products, Antiperspirants and Deodorants, and Consumer Products Regulations, Test Methods 310, and Airborne Toxic Control Measure for *para*-Dichlorobenzene Solid Air Fresheners and Toilet/Urinal Care Products," May 7, 2004.

products benefit in safer, more productive products. Failure to exempt these compounds could lead to less safe and effective products, which could negatively affect the economic impact on California business.

Response: *We agree that flexibility for reformulation is important, but the potential for adverse impacts must also be considered. We believe that an exemption for HFE-7200 would provide manufacturers with some flexibility to make efficient and effective products, because HFE-7200 is used similarly to the other candidate compounds. Therefore, we do not expect an adverse economic impact to California business.*

Substitution and Scenario Analysis

Comment 5: Methylene chloride, perchloroethylene, and trichloroethylene are not good candidates for inclusion in a substitution analysis. These compounds have been prohibited from production for electronic cleaners since December 31, 2005, and prohibited from production for electrical cleaners since December 31, 2006. Thus any reformulation for these products would have already been completed. This substitution scenario needs to be replaced with realistic examples. (3R)

Response: *When petitioning for VOC exemption, methylene chloride, perchloroethylene, and trichloroethylene were suggested as candidates for substitution analysis. Thus, while we agree that use of these compounds has been prohibited, they do provide a good surrogate for an evaluation of the potential impacts that may result from an exemption.*

Health Effects

Comment 6: We are confused by ARB's decision to approve HFE-7200 since the OEHHA's 2001 assessment states that both HFE-7100 and HFE-7200 are possible carcinogens. Further studies are needed prior to taking an action that could lead to increased use. No data was provided to respond to these findings. Further, HFE-7200 may be intended for electrical or energized circuitry. Thermal decomposition of this product produces PFIB, a chemical that is fatal in the ppb range. We don't understand the rationale in not addressing this hazard. (AGC)

Response: *We determined that HFE-7200 has zero ozone depletion potential, the lowest global warming potential of the seven "Selected Halogenated Chemicals" examined, and a low hazard index. HFE-7200 is not genotoxic. No carcinogenicity data are available for either HFE-7100 or HFE-7200. Since HFE-7100 is a peroxisome proliferator and induces liver enlargement in rats, HFE-7200 probably has similar effects. It is unclear whether rodent peroxisome proliferators have similar effects in humans that might result in cancer. HFE-7200 is a good candidate for a lifetime*

chronic toxicity/carcinogenicity study. However, current information indicates that HFE-7200 is the least hazardous of the seven chemicals considered for VOC exemption.

We are aware of the respiratory toxicity of perfluoro-isobutylene (PFIB). However, although 3M's Material Safety Data Sheet² confirms that decomposition of HFE-7200 at temperatures above 300°C can form PFIB, it adds that "PFIB will only accumulate with continuous exposure to excessive heat in a sealed vessel. The formation rate for PFIB is about 1000 times less than the rate for primary thermal decomposition products such as HF. During normal use conditions, no health hazard is associated with the use of this material due to PFIB exposure."

An article in the *Journal of Fluorine Chemistry*³ shows that the major products of HFE thermal decomposition are, initially, a fluoroalkane and an acyl fluoride. Therefore, HFE-7200 would yield mainly fluoroethane and perfluoro-isobutyl acyl fluoride, rather than PFIB. This article further shows that controlled thermal degradation of HFE-7200 ultimately yields ethylene, HF, CO and perfluoropropane. In this study, the temperatures ranged from 160 - 400°C. Certainly, higher temperatures could cause loss of fluoride to yield carbonium ion, giving rise to a wider range of products, including PFIB. However, we believe that use of HFE-7200 is unlikely to create dangerous levels of PFIB.

Comment 7: We find the values of the Hazard Index interesting, but question the introduction of such values here. This calculation is not found in globally recognized toxicity protocols, or by federally regulated bodies (U.S. EPA, UNEP, MITI, etc). We do not support the use of new methodologies without peer review. (AGC)

Response: California's Air Toxics Hot Spots Program has used the Hazard Index calculation since 1987. This procedure was most recently peer-reviewed (by ARB's Scientific Review Panel on Toxic Air Contaminants) in the late 1990s, after extensive public comment. The methodology for calculating acute Hazard Indices is available at http://www.oehha.ca.gov/air/acute_rels/acuterel.html and that for calculating chronic Hazard Indices is at http://www.oehha.ca.gov/air/chronic_rels/pdf/relsP32k.pdf. The Hazard Index calculation has been used in more than 800 health risk assessments submitted in compliance with the Hot Spots program. The U.S. EPA also uses the Hazard Index approach; for example, in

² http://multimedia.3m.com/mws/mediawebserver?66666UtN&ZUxL99XL8TtMXTE5Vu9KcuZgVU_LXT1u666666--

³ Marchionni G., S. Petricci, P. A. Guarda, G. Spataro, and G. Pezzin (2004) "The comparison of thermal stability of some hydrofluoroethers and hydrofluoropolyethers", *Journal of Fluorine Chemistry*, Vol. 125, 7, pp 1081-1086.

conducting health risk assessments of chemical mixtures (see: http://www.epa.gov/NCEA/pdfs/chem_mix/chem_mix_08_2001.pdf).

Regulatory Concerns

Comment 8: ARB should consider HFE-7200 exempt for compliance purposes from January 2008, when VOC category limits take effect, until the proposed VOC exemption take effect later in 2008. (3M)

Response: *The current Consumer Products Regulation provides a “sell-through provision” that allows products manufactured before the effective date of a VOC limit, to be sold for up to three years after that effective date. Therefore, such a provision is not needed prior to regulatory action.*

Comment 9: In 2002, CSPA adopted a set of principles aimed at assuring responsible use of HFCs and became a founding member of a partnership that includes the Alliance for Reasonable Atmospheric Policy, the U.S. EPA, the U.N. Environment Programme, and the Japan Ministry of Economy, Trade, and Industry. This is an international agreement, entitled “Responsible Use Principles for HFCs,” that limits the use of these propellants. Therefore, the U.S. consumer products industry is already committed to strictly limiting the use of HFCs. (CSPA)

Response: *Comment noted.*

Comment 10: The ARB should provide MIR and GWP thresholds for finished formulations, in order to allow latitude in formulation. The VOC issue should be evaluated independently of climate change, while a more comprehensive MIR and GWP packet can be created. (AGC)

Response: *We disagree that VOCs should be evaluated for exemption independently of climate change. Under the California Environmental Quality Act (CEQA), potential adverse impacts of a regulatory action must be evaluated, and mitigated if necessary. By providing an exemption from the VOC limit for products used on energized equipment, and proposing an exemption for HFE-7200, we are providing flexibility for formulation. Also, we are not prohibiting the use of these compounds, as the limit for the Electronic Cleaner category is 75 percent by weight. This means that a product could contain any of the alternative halogenated chemicals so long as the amount in the product does not exceed 75 percent by weight. Those products that are clearly labeled for use on “Energized Equipment” could also be formulated using the alternative halogenated chemicals.*

Comment 11: 3M is concerned about potential unintended consequences of the multiple regulatory impacts including ARB consumer products regulations and AB 32 Early Actions on electronic and electric cleaners. The ARB

should assess if the combined effects of various regulations could lead to unintended consequences, such as: A) continued or increased use of *n*-propyl bromide (nPB) in electronic and electrical cleaners; and B) increased use of HFC-134a to get VOC-compliant cleaners prior to implementation of the proposed AB32 early actions. Both chemicals are currently commonly used in electronic and electrical cleaners. nPB is an ozone depleting, hazardous substance. HFC-134a is a potent greenhouse gas. (3M)

Response: *When we propose regulations, we evaluate the potential for adverse impacts to result. We do not expect an increase in nPB use, because it is a VOC. As to an increase in use of HFC-134a, unlike some of the other candidates, HFE-7200 provides a formulation pathway that would not necessarily rely on the use of HFC-134a in a product.*

Comment 12: 3M acknowledges that HFE-7200 enables formulation of safe, sustainable electronic and electric aerosol cleaning products with the least environmental impact of those candidates being considered for exemption. The ARB should also exempt HFE-7100 because it is superior to chlorinated solvents and those chemicals considered for exemption and provides the industry with additional formulation flexibility. (3M)

Response: *We believe that the proposed exemption of HFE-7200, along with providing an exemption for energized electrical and electronic cleaners, addresses the need to allow for formulation flexibility with the least impacts. Also, HFE-7100 is not prohibited from use in this category.*

Comment 13: The continued use of these compounds is necessary for the production of nonflammable products. Electrical and electronic cleaners are used to remove oil grime or built-up soils from electrical equipment without leaving a conductive residue and need to be formulated with nonflammable compounds to avoid flash fires that can cause burns. Therefore, it is important that these two narrowly-defined categories of products have low flammability and low conductivity characteristics. The ARB as well as the local air districts should consider safety (flammability and performance) in addition to potential health and environmental impacts as they review new candidates for VOC exemption or review previously granted exemptions. A thorough review of the entire balance of properties would need to be made on an application-specific basis. (3M, CSPA)

Response: *We agree with the need for low flammability and low conductivity. The proposed exemption of HFE-7200, along with providing an exemption for energized electrical and electronic cleaners, addresses potential health and environmental impacts as well as safety.*

Comment 14: Limiting VOC exemptions to acetone and HFE-7200 does not provide sufficient compliance options for formulators and businesses. Since all the candidates requested for VOC exemption are nonflammable, they are often used to formulate electrical and electronic cleaners that require low flammability for some of their various uses. Not all HCFC-141b replacement can be accomplished using only HFE-7200, the only substance recommended for exemption. Without such exemption approvals, formulators may have to replace 141b with VOCs, which would raise the level of ground level ozone. Therefore, we request a limited exemption for the use of these compounds in electric cleaners and electronic cleaners. (AGC, CSPA)

A limited use exemption for HCFC-225ca, HCFC-225cb, HFC-245fa, HFC-365mfc and HFC-43-10mee for use in electronic cleaners would not cause any adverse environmental impacts and would have a positive economic impact on businesses by providing additional reformulation or substitution alternatives. The global warming potential resulting from these substances considered for exemption is negligible for both electronic and electronic use, and less for electronic use only. An exemption is needed for the HCFC's and HFC's for use in electronic cleaner only. (3R, ITWC, TS)

Response: *We disagree that a limited exemption for these chemicals is appropriate. HFE-7200 should provide the same qualities and meet the same needs as any of these other candidates. Therefore, we believe the exemption of HFE-7200 would provide sufficient compliance options for formulators and businesses, while having less environmental impact than the alternatives.*

Comment 15: The ARB should consider exempting HCFC-225ca because its global warming potential (122) and atmospheric lifetime (90 days) both fall within the acceptable values that CARB has set out. Its MIR value is ten times lower than HFE-7200, which CARB proposes to exempt. We also feel that the toxicity is much lower than the details outlined in the draft. (AGC)

Response: *The primary reason we did not recommend an exemption for HCFC-225ca was its potential health impact. Our Environmental Impact Assessment report acknowledged that rather large uncertainty factors were used for HCFC-225ca/cb, due to a lack of data. However, the modeled concentration at 1 hour exceeded the estimated acute Reference Exposure Level (Hazard Index = 1.75).*

We are also concerned about the impact of HCFC-225ca on the stratospheric ozone layer. Our report notes that HCFC-225ca is an ozone-depleting compound, although its ozone-depleting potential (ODP) is relatively low (ODP = 0.02). Our report also notes that, in accordance with

the Montreal Protocol, production or import of HCFC-225ca will be prohibited in the U.S. by 2015. Therefore, it could not provide a long-term alternative to potential users of halogenated solvents.