

Seventh Generation LLC

About the Company

Seventh Generation is a privately-held household and personal care products company based in Burlington, Vermont. Founded in 1988, Seventh Generation's stated purpose is to make "products that help protect human health and the environment."¹ Seventh Generation distributes products to a variety of retailers across the United States and Canada.

Summary

Seventh Generation switched their primary surfactant from sodium laurel ether sulfate (SLES) to sodium laurel sulfate (SLS) to eliminate carcinogenic 1,4-dioxane contamination in the surfactants commonly used in a variety of cleaning products.

Motivation

SLES is a common surfactant ingredient used in household detergents and cleaning products (e.g., laundry detergent, dish detergent, shampoo, bubble bath, etc.).² SLES is produced using a chemical process known as ethoxylation. A byproduct of the ethoxylation process (and consequently a contaminant in SLES) is a chemical called 1,4-dioxane. 1,4-dioxane is a concern to human and environmental health due to its status as a known or suspected carcinogen by a number of authoritative bodies, such as the State of California, U.S. EPA, and European Union.^{3,4,5} When 1,4-dioxane was publicized as a common contaminant in cleaning and personal care products in 2008,^{6,7} Jeffrey Hollender, company founder and then-CEO of Seventh Generation, challenged his team to effectively eliminate 1,4-dioxane to non-detectable levels. Thus, Seventh Generation began to explore non-ethoxylated alternative surfactants to SLES.

Achievement

According to Seventh Generation, the typical level of 1,4-dioxane contamination in SLES is 50 ppm (or 0.005%). Seventh Generation worked with suppliers to explore alternative, non-ethoxylated surfactants to replace SLES. After a research and development effort, Seventh Generation decided to use the non-ethoxylated surfactant sodium laurel sulfate (SLS) as the substitute. To Seventh Generation's surprise, the ethoxylate-free SLS contained the unexpected

presence of 1,4-dioxane at 1–5 ppm as it arrived from the supplier. The team at Seventh Generation worked with the supplier to determine the source of this residual 1,4-dioxane. They discovered that the contamination came from continuous processing equipment that was also used to make ethoxylated surfactants, as most suppliers of SLES also produce SLS and vice versa. Seventh Generation worked with its suppliers to set up quality control measures that would assure that the 1,4-dioxane concentration in their SLS was undetectable at a limit of detection of 0.5 ppm. With this change, Seventh Generation succeeded in getting 1,4-dioxane to non-detectable levels in their cleaning products.



During their R&D efforts, Seventh Generation found that the replacement of SLES with SLS resulted not only in the elimination of 1,4-dioxane but also in a product with greater efficacy than the previous formulation. Cleaning product companies have a number of tests they perform to determine the efficacy of a new formulation in various applications. Each of these tests run by Seventh Generation showed an increased effectiveness of the new SLS-based formulation over the previous SLES recipe. Specifically, the "plate count" test, used to determine the efficacy of dish detergent,⁸ showed a 37% increase in cleaning power with the new formulation. This comparatively increased cleaning ability of the new recipe means that Seventh Generation customers can use a smaller

amount of the product per application to achieve the same results.⁹

Seventh Generation launched its products reformulated with non-ethoxylated SLS in 2010.

Business Impact

Profitability

Seventh Generation has found that the price of surfactant ingredients for their products has become increasingly volatile, due less to the demand for one surfactant over another and more to price fluctuations of raw materials in the commodity markets.

Sales of its reformulated laundry liquid and dish liquid continue to be very strong, and the reformulated products meet Seventh Generation's margin requirements. That said, it is difficult for the company to connect this strong sales performance solely to the formula change because other factors (e.g., revised marketing strategy, etc.) could have had a positive effect during the same time period.

Supply Chain Impact

Seventh Generation did change its supplier mix, but not based on a supplier's inability to provide SLS. A key driver for the selection of the suppliers for the SLS was their ability to get 1,4-dioxane to non-detectable levels. As noted earlier, Seventh Generation received some SLS samples with detectable levels of 1,4-dioxane present and was willing to work with suppliers to find process solutions. The company selected only those suppliers willing to make the quality control adjustments to provide SLS with non-detectable levels of 1,4-dioxane.

Industry Effect

The blogosphere picked-up the concern over 1,4-dioxane content in personal care products, especially those marketed for use on children.¹⁰ This public concern and pressure resulted in renewed action by Johnson & Johnson and Procter & Gamble to commit to reducing 1,4-dioxane in their personal care and laundry products. In 2012, Johnson & Johnson announced it would reformulate its products to contain 1,4-dioxane at no more than 10 ppm by 2015.¹¹ In 2013, Procter & Gamble entered a consent decree in California to reduce levels of 1,4-dioxane in its Tide laundry detergent to less than 25 ppm.¹² This recent increased public awareness and action from competitors validate the decision by Seventh Generation to effectively eliminate 1,4-dioxane from its products.

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Certifications/Eco-labels Received

Seventh Generation's cleaning products are certified biobased products through the USDA Bio-preferred Program. Specific products and their corresponding bio-based content can be found on the USDA Bio-preferred Program website.

¹ All URLs in references were accessed as of June 2014. Seventh Generation. About Seventh Generation. <http://www.seventhgeneration.com/about>. ² National Library of Medicine, National Institutes of Health. 2002. TOXNET (Toxicology Data Network): Sodium Dodecylpoly (Oxyethylene) Sulfate—CASRN 9004-82-4. Last updated November 8, 2002. <http://toxnet.nlm.nih.gov/cgi-bin/sis/search/r?dbs+hsdb:@term+@rn+@rel+9004-82-4>. ³ State of California, Office of Environmental Health Hazard Assessment. 2004. California Proposition 65 (Safe Drinking Water and Toxic Enforcement Act of 1986, Health and Safety Code Section 25249.6), CRNR Notices, Current Proposition 65 List. Last updated June 6, 2004. http://oehha.ca.gov/prop65/prop65_list/Newlist.html. ⁴ U.S. Environmental Protection Agency. 2010. Integrated Risk Information System: 1,4-Dioxane (CASRN 123-91-1). Last revised August 11, 2010. <http://www.epa.gov/iris/subst/0326.htm>. ⁵ European Commission Joint Research Centre, European Chemicals Bureau. 2002. 1,4-dioxane: Risk Assessment (CAS 123-91-1; EINECS 205-661-8). European Union Risk Assessment Report 21. Series: 2nd Priority List. <http://echa.europa.eu/documents/10162/a4e83a6a-c421-4243-a8df-3e84893082aa>. ⁶ EWG. (Environmental Working Group). 2007. EWG Research Shows 22 Percent of All Cosmetics May Be Contaminated With Cancer-Causing Impurity. July 8, 2007. <http://www.ewg.org/news/news-releases/2007/02/08/ewg-research-shows-22-percent-all-cosmetics-may-be-contaminated-cancer>. ⁷ Organic Consumer Association. 2008. Cancer-Causing 1,4-dioxane Found in Personal Care Products Misleadingly Branded as Natural and Organic. Press release, March 14, 2008. <http://www.organicconsumers.org/bodycare/DioxaneRelease08.cfm>. ⁸ Lai, Kuo Yann. 2005. Liquid Detergents. 2nd ed. Boca Raton, FL, USA: CRC Press. ⁹ Rinkevich, J. January and February 2013. Teleconference and email exchanges with Reed Doyle and Martin Wolf at Seventh Generation. ¹⁰ MomsRising. 2012. OMG! There's a CANCER-Causing Chemical in This?! Blog, Environmental Health. October 15, 2012. <http://www.momsrising.org/blog/omg-theres-a-cancer-causing-chemical-in-this/>. ¹¹ CBS News (online). 2012. Johnson & Johnson to phase out harmful chemicals by 2015. August 15, 2012. http://www.cbsnews.com/8301-504763_162-57493890-10391704/johnson-johnson-to-phase-out-potentially-harmful-chemicals-by-2015/. ¹² Environmental News Service. 2013. Procter & Gamble Must Scrub Carcinogen Dioxane from Tide. January 25, 2013. <http://ens-newswire.com/2013/01/25/procter-gamble-must-scrub-carcinogen-dioxane-from-tide/>.

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