Opinion: Formulating Fragrances for NPA and DfE

Fragrance creators' and manufacturers' challenges and opportunities in meeting criteria

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Why create a fragrance that meets both Natural Product Association (NPA; *www.npainfo.org*) natural and Design for the Environment (DfE; *www.epa.gov/dfe*) safety criteria? Answer: Consumers are demanding it. Though they may not ask for NPA and DfE certification specifically, a large and growing number of consumers who purchase cleaning and body care products want assurances that the products they are purchasing are safe, green, and environmentally friendly. Right, wrong or indifferent, many consumers do not want to see the term "fragrance" on labels.[a]

Unfortunately, the word "fragrance" connotes synthetic chemicals to many consumers, which are in turn viewed by many as toxic, unsafe, and environmentally challenging—despite ample evidence to the contrary. For those of us charged with creating, manufacturing and selling fragrances for a living, the landscape is changing, and changing quickly. At times it is also frustrating.

Today's Complex Environment

Pick up any newspaper or magazine today and one will be hard pressed not to find an article that discusses some aspect of the green-sustainability phenomenon. Meanwhile, the plethora of certifications, standards and nongovernmental organizations (NGOs) that abound in this space is staggering (EcoCert, USDA Organic, NSF, Green Seal, etc.). The large numbers of certification bodies jockeying for position in the body care category, to name just one, are actually doing more harm than good. The consumer is thoroughly confused with respect to what is and what is not natural, green and/or sustainable. This is a problem as the naturals and organics market is being driven by consumers—as well as nonprofits, government agencies, manufacturers and the media—all of whom, at least theoretically, have a stake in the success of environmentally sustainable products. It is *not* being driven by the large conventional consumer marketers.

Product credibility continues to evolve as an important element in the ongoing effort to demystify pseudo-product and greenwashing claims. For this reason, validation by organizations such as the DfE and the NPA has become critical to organizations committed to stamping out pseudo-brands. To illustrate the issue, a 2009 study by marketing firm TerraChoice (*http://sinsofgreenwashing.org/findings/greenwashing-report-2009/*) found that of 2,219 products making green claims in North America, only 25 products were found to be "sin-free," or legitimately green.

Simultaneously, green marketing is no longer black and white. According to an April 2010 *Mediaweek* article by Maryam Banikarim, "Seeing Shades in Green Consumers," marketers now need to speak directly to each individual shade of green. Understanding these segments is the key to successfully formulating and marketing green products to the right target audience.

The first group is the Alpha-Ecos, comprising some 43 million US adults, characterized by a serious commitment to green causes and environmentalism. Next are the Eco-Centrics, comprising about 34 million US adults, of which Banikarim says, "They are more concerned about how environmentally responsible products benefit them personally and immediately than they are about abstract, global level environmental issues." And so, if a product is perceived as better for health or well-being, these consumers are more willing to pay a premium for a green claim. Next are the Eco-Chics, comprising approximately 57 million US adults. This largest segment of green consumers focuses on green from a status-conscious point of view. Economic-Ecos represent 53 million US adults and prioritize saving money above ecological concerns. Any green activities such as water conservation, recycling, etc. are motivated by practicality. Finally, Banikarim discusses Eco-Moms. Representing 33% of mothers with children under 18, these consumers' kids are the main motivation for their responsible practices and desire for cost-effective green products. They place these practices and purchases as a high priority.

The Road Ahead: By the Numbers

It is important to review where the entire naturals and organics category is at this moment. Personal care product sales in the United States continued to grow in 2008, despite poor economic conditions, a rising unemployment rate and slower consumer spending. While conventional sales decreased at a moderate rate in 2009 (down 1.2%), sales of natural and organic personal care products continued to grow at a solid pace (up 8.1%). Statistically, the growth opportunities that exist for green home care, body care and even fragrances are far greater than anyone would have guessed just a few years ago, specifically because of the Eco-Moms, Alpha-Ecos, Eco-Centrics and Eco-Chics. According to an April 2009 article in *Progressive Grocer* magazine, "Consumers seeking ways to 'go green' and protect the environment and their families

[a]To cite just one example of the "consumer movement's" power in media, visit *www.youtube.com/watch?v=QaqgxoZdwCY&feature=related*.

by avoiding chemicals are grabbing natural all-purpose household cleaners off store shelves at a record pace. Mintel … has projected growth in the category to reach $623 million by 2013. Considering the category has already grown from $17.7 million in 2003 to a whopping $64.5 million in 2008, this increase seems attainable."

A January 2009 Associated Press report noted that the natural cleaning product category accounted for about 1% of the segment's $12 billion whole when Clorox engaged the category in 2007. The company's Green Works brand quickly became a market leader, with 45% of sales in the category. Moving on to beauty products, according to a recent study by Mintel Beauty Innovation, more than one in seven (16%) global beauty product launches in 2008 was either organic, ethical or "all natural." In 2007, just one in nine (11%) new products fit these criteria. In the United States, manufacturers are moving even faster. Nearly 30% of US beauty products launched in 2008 were organic, ethical or all natural—up from 23% in 2007. Natural and organic personal care products accounted for 16.2% of total personal care product sales in 2009, up from 10.5% in 2005. According to Sundial Research in a March 2010 report, 2009 sales of natural and organic personal care products in the United States increased by 8.1% to $8.94 billion, following a 12.9% jump in sales in the previous year. Overall, from 2009 to 2014, sales of natural and organic personal care products are expected to advance by an average of 10.3% per year, reaching $14.6 billion in 2014. Further examination by category reflects:

- Skin care, $3.49 billion, up 8% over 2008 (representing 39% of the natural, organic personal care (NOPC) products category)
- Hair care/coloring, $1.94 billion, up 16% over 2008 (representing 21.4% of the NOPC category);
- Bath/toilet soap, $1.1 billion, up 6.8% over 2008 (representing 12.3% of the NOPC category)
- Other major product segments in the US NOPC include: oral care, color cosmetics, and fragrances and aromatherapy.

In 2009, the skin care, hair care/coloring and bath/toilet soap segments accounted for 7.6%, 5.1% and 4.2% of total NOPC product sales, respectively. From 2009 to 2014, sales of natural and organic oral care products are expected to grow by an average of 9.9% per year, while sales of natural and organic color cosmetics rises by an average of 9.6% per year. Meanwhile, sales of natural and organic fragrances and aromatherapy products should increase by an average of 7.4% per year during this time. The fastest growing NOPC product segments include baby care products, feminine hygiene products and nail care products, which are expected to grow at 15.4%, 13.9% and 16.7%, respectively, over the next five years.

It is important, at this point, to point out that the sales figures reviewed by this author include many brands that would qualify as pseudo-brands as they are far from being green, natural or anything near sustainable, and instead rely on greenwashing methods as a way to communicate a green message to consumers. Greenwashing is defined per the 2003 edition of the *Collins English Dictionary* as:

"The dissemination of misleading information by an organization to conceal its abuse of the environment in order to present a positive public image."

The US Food and Drug Administration has for the most part turned a blind eye to fraudulent green label claims. As a result, companies, so inclined, will continue to mislead consumers until they are taken to task. Out of frustration, retailers such as Whole Foods, Target and Wal-Mart have resorted to creating their own in-house natural and sustainable product standards in an attempt to help their customers make better green product choices. Meanwhile, the green movement has empowered NGOs like the NPA to try and educate the consumer about what is and what is not safe and natural in the personal care and home care categories through well thought out natural product standards. Creating personal care and home care products that meet one or more of the plethora of standards that exist can no doubt be challenging—and expensive—for companies committed to the sustainability initiative.

NPA and DfE Standards

On February 11 of this year, the NPA unveiled its newest standard, the Natural Standard for Home Care (*www.npainfo.org/index.php?src=gendocs&ref=NaturalStandard_homecare*) to alleviate the trend of largely synthetic products being positioned as natural in the roughly $5.6 billion home care category. The NPA Home Care Standard was created by applying the same guiding principles it used when creating the Personal Care Standard in 2008. For natural, the Standard states, "A product labeled 'natural' should be made up of natural ingredients and be manufactured with appropriate processes to maintain ingredient purity. From a safety perspective, the Standard says, "A product labeled 'natural' should avoid any ingredient that research shows may have a suspected human health risk." Of responsibility, the Standard says, "A product labeled 'natural' should use no animal testing in its development." Finally, regarding sustainability, the Standard reads: "A product labeled 'natural' should use (bio) degradable ingredients and the most environmentally sensitive packaging available." The Standard specifies: "Product must be made up of at least 95% truly natural ingredients or ingredients that are derived from natural sources, excluding water; no ingredients with any suspected human health risks" may be used; "no processes that significantly or adversely alter the natural ingredients" may be used; formulations should comprise "ingredients that come from a purposeful, natural source (flora, fauna, mineral)" and employ "processes that are minimal and don't use synthetic/harsh chemicals"; finally, "non-natural ingredients [may be used] only when no viable natural alternative ingredients are available and only when there are absolutely no suspected potential human health risks."

Separately, efforts by the DfE (*www.epa.gov/dfe*) have been underway in recent years (**see Page 36**). While the NPA is focused on natural product standards development, the DfE has been focused on working in partnership with industry, environmental groups, and academia to reduce risk to people and the environment by finding ways to prevent pollution. As detailed in the "About Us" section of its website:

> DfE has been helping consumers and industrial purchasers make wise choices by identifying safe and effective products. It has evaluated and allowed more than 1,500 products to carry the DfE logo. Every year, DfE programs reduce the use of chemicals of concern by hundreds of millions of pounds.

The DfE labels a variety of chemical-based products, including all-purpose cleaners, laundry detergents, and carpet and floor care products. Product manufacturers who become DfE partners and earn the right to display the DfE logo on recognized products have invested in research, development and reformulation to ensure that their ingredients and finished products line up on the green end of the health and environmental spectrum, while simultaneously working to maintain or even improve product performance.

Green watery natural cleaner fragrance (hypothetical) that passes NPA, but fails DfE **F-1**

Use level 0.75% Ingredient	parts/100	% end use	comments DEe
Aldehyde c12 natural	2.84	0.0213	
Aldehyde c10 natural decanal	0.63	0.0047	
Aldehyde c11 natural	0.23	0.0017	
Amyl cinnamic aldehyde natural*	2.51	0.0188	R43 (0.01% in cleaning products)
Camphor powder natural**	0.55	0.0041	R20 inhalation r68 risk irreversible effects
Cinnamon leaf oil****	0.31	0.0023	Cinnamic aldehyde
Cis 3 hexenol natural	0.35	0.0026	
Cis 3 hexenyl acetate natural	1.17	0.0088	
Citral natural*	2.19	0.0164	R43 (0.01% in cleaning products)
Citronellol natural*	3.86	0.0290	R43 (0.01% in cleaning products)
Citronellyl acetate natural	1.03	0.0077	
Geraniol natural*	1.24	0.0093	R43 (0.01% in cleaning products)
Geranyl acetate natural	0.2	0.0015	
Ho wood oil****	23.93	0.1795	R22 harmful if swallowed
Lemon terpenes	12.66	0.0950	
Nutmeg oil****	0.3	0.0023	Safrole
Neryl acetate natural	0.11	0.0008	
Orange oil	25.52	0.1914	
Orange terpenes	18.93	0.1420	
Penny royal oil**	0.6	0.0045	R22
Phenyl ethyl alcohol natural	0.24	0.0018	
Terpineol natural	0.6	0.0045	
Total	100	0.7500	

* Problem ingredients-reduced level for DfE
** Penny royal used as green subitute florozone /cyclmal-replaced; removed camphor
***Changed to linalool
**** Replaced

The DfE Safer Product Labeling Program evaluates each ingredient in a formulation based on the critical health and environmental endpoints defined in "Criteria" documents. Included in the Safer Product Labeling Program are the DfE Criteria for Safer Chemical Ingredients, which now includes DfE Criteria for Fragrances (*www.epa.gov/dfe/pubs/projects/gfcp/index.htm#Fragrances*). These Criteria are designed to identify what the DfE considers safer aroma chemicals and fragrance formulations for use in cleaning products. To identify these safer chemicals for this diverse set of raw materials, a range of human health endpoints serve as the basis for screening out fragrance raw materials of high concern. A fragrance must meet all the criteria for each human health endpoint in order to pass the screen. The screening criteria for the human health endpoints in the screen apply to all chemicals present in the fragrance at or above 0.01% by weight. The DfE's 0.01% threshold reflects a stakeholder-agreed and conservative approach to screening fragrances.

The DfE concerns itself with identifying and promoting safer chemicals while the NPA is focused strictly with promoting the development of natural personal care and home care products. The DfE screens all fragrances and dyes for chemicals that may pose serious adverse health or environmental effects. The NPA prohibits the use of all synthetic ingredients unless a natural equivalent is unavailable. During the development of the NPA Home Care standard that began in early 2009, it became evident that natural home care product manufacturers and marketers who achieved DfE approval wanted to retain their DfE program integrity (and the logo on their products), while striving to have a product that could also meet the NPA definition of natural.

The challenge is that not all natural ingredients are safe and some fail the DfE criteria of "safe" when scrutinized. This is particularly true when evaluating natural fragrances containing certain essential oils and/or constituents of these essential oils. For example, nutmeg oil contains safrol, cinnamon leaf oil contains cinnamic aldehyde and both are red flags as far as safety is concerned, per the DfE. If a client requires a fragrance to meet the NPA standard, the perfumer would first have to determine if the ingredients he or she planned on using were natural (i.e. free of parabens, phthalates, 1,4-dioxane and petrochemicals). Next, the perfumer would review the allowable use recommendations and thresholds detailed in the International Fragrance Association/Research Institute for Fragrance Materials database. Then, the perfumer would have to determine if his formula is within the allowable limits of the DfE fragrance threshold of 0.01%. Finally, the fragrance would have to be submitted for third-party verification to both the NPA and

Green watery natural cleaner fragrance revision (hypothetical) that passes both NPA and DfE **F-2**

Use level 0.75% Ingredient	parts/100	% end use	comments DfE
Aldehyde c12 natural	2.37	0.0175	
Aldehyde c10 natural decanal	0.53	0.004	
Aldehyde c11 natural	0.2	0.0015	
Benzaldehyde natural	0.1	0.0008	
Amyl cinnamic aldehyde natural*	0.43	0.0032	R43 (0.01% in cleaning products)
Cinnamic alcohol natural	0.1	0.0015	
Cis 3 hexenol natural	0.29	0.0022	
Cis 3 hexenyl acetate natural	0.98	0.0073	
Citral natural*	0.16	0.0012	
Citronellol natural*	1	0.0075	R43 (0.01% in cleaning products)
Eugenol natural	0.2	0.0015	R43 (0.01% in cleaning products)
Citronellyl acetate natural	0.86	0.0065	
Geraniol natural*	0.2	0.0015	
Geranyl acetate natural	0.17	0.0013	R43 (0.01% in cleaning products)
Linalool ex orange oil	1	0.0075	
Lemon terpenes	14.03	0.105	
Melon aldehyde natural	0.14	0.0011	
Neryl acetate natural	0.09	0.0007	
Orange oil	23	0.1725	
Orange terpenes	53.25	0.399	
Phenyl ethyl alchol natural	0.2	0.0015	
Terpineol natural	0.5	0.0038	
Terpine 4 ol natural	0.2	0.0015	
Total	100	0.7500	

* Problem ingredients-levels now ok DfE
Removed camphor; pennyroyal oil - used melon aldehyde natural
Cinnamon leaf & nutmeg removed
Ho wood r22 replaced with linalool ex orange @ reduced level

DfE organizations (DfE Cleangredients program; *www.cleangredients.org*). Both organizations employ authorized third parties responsible for conducting the formula verification review. All of this takes money—and time.

Formulating to Standards

In recent months there have been discussions between the Environmental Protection Agency and NPA regarding the two certification programs to find some common ground and perhaps streamline the certification process for those wishing both DfE and NPA certification for their home care products. **F-1** and **F-2** contain two hypothetical formulas for illustration, one that shows a fragrance that meets NPA, but fails DfE standards, and one that meets both sets of criteria. In F-1, the perfumer created a formula that would qualify under the NPA criteria of natural, but would fail the DfE fragrance screen. A few of the problematic ingredients here include amyl cinammic aldehyde, camphor powder natural and cinnamon leaf oil. In F-2 the perfumer corrected the problem by modifying the formula by either reducing the ingredient percentage in the formula, or removing/replacing the ingredient entirely. For example, ho wood oil, which was flagged in the first formula, was replaced with linalool ex orange at a reduced level. At this point the corrected formula would be submitted to the DfE through one of its third-party certifiers such as NSF International, and independently, to the NPA for further review. There are, of course, fees involved in this process.

The NPA continuously revises its Natural Standard and recently announced that, as of Sept. 1, 2010, synthetic fragrances will no longer be allowed. At the same time, continued consumer, NGO, governmental and media interests regarding health, safety and well-being now transcend all industries. The green/sustainability movement is now firmly entrenched in the fragrance world. These forces will no doubt challenge body care, home care and fragrance companies in the future, but, this author believes, they will also ultimately result in better, safer products.

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