# Fragrance application in consumer products

Irwin Palefsky, Givaudan Corporation, Clifton, NJ

The creation of a fragrance is one of the classic examples of the blending of science and art. The development of a fragrance is controlled by both the chemistry of the materials involved and the discriminating nose of the perfumer. To create the correct fragrance for a cosmetic or household product, a number of disciplines must come together. In many cases, fragrance application laboratories can help to combine these disciplines in a creative fragrance company.

### Perfume development

While a perfumer is working on creating a fragrance for use in a particular finished product, he or she must be concerned with several technical considerations. For example:

- Are there any chemicals in the cosmetic or household product that pose particular problems for the perfumer while he or she is creating the fragrance?
- Are there traditional problems associated with this product or product type? (Some common considerations are yellowing of shampoos with fragrances, suppression of fragrances in talc, and color and odor problems with soaps.)

While a perfume is creating a fragrance and trying to meet a client's profile, he or she wants to make sure that the fragrance notes that are put into the product come through, from a perceptual point of view, as intended by the perfumer. Many cosmetic and household products have a base odor of their own which either blends with or works against the perfume in a fragrance system. Identifying these base odors, bringing them to the attention of the perfumer, and working with the perfumer in dealing with these odors is part of the function of the application labs.

Another important function involving the creative process concerns screening new aromatic chemicals and their performance in cosmetic and household product bases. Givaudan, as a developer and manufacturer of aroma chemicals, is concerned with the employment of these chemicals in finished products to ascertain their acceptability for use by perfumers and their effect on the stability of and compatability with finished products.

### Stability testing

Stability testing is one of the most active areas in a fragrance application laboratory. Stability testing is a fancy way of asking "How can we tell in one day, two days, one week, one month, or three months how a product will look, smell and feel after being on the store shelf or in the consumer's hands for one or two years?" Generally, oven testing of some sort is the most popular form of accelerated age testing.

Just about every cosmetic and household product manufacturer has its own concept of what type of testing is best indicative of shelf-life stability; for example from 6 months at 105°F, to 1 week at 125°F, to 110°F/40°F cycling, and so forth. At our laboratories we use 110°F for 3 months as a stability criteria, observations usually being carried out after 1 and 3 months. *Chemical Kinetics* says that, in most chemical reactions, there is a twofold increase in chemical reactivity for every 10 degrees' rise in absolute temperature, but the use of this in predicting long-range stability is dubious.

The fragrance, frequently the one ingredient in a product's formulation for which there is little or no technical information available to the research and development chemist, is often accused of causing all kinds of mischief in a formulation. Therefore, when doing stability observations, the use of an unperfumed control at all test conditions is vital.

The concerns of a fragrance application laboratory are generally the effect or lack of effect of a fragrance on product stability. The criteria generally involve visual observations as to emulsion stability (when a cream, lotion or other o/w or w/o system is involved), color change, effect or clarity, effect on pH, and, most important from our viewpoint, any odor change. The stability observations can be carried out by:

- physical testing (such as viscometer measurements and pH readings)
- sensory testing (such as observing color and odor changes)
- chemical testing when the effect on a reactive chemical is a consideration

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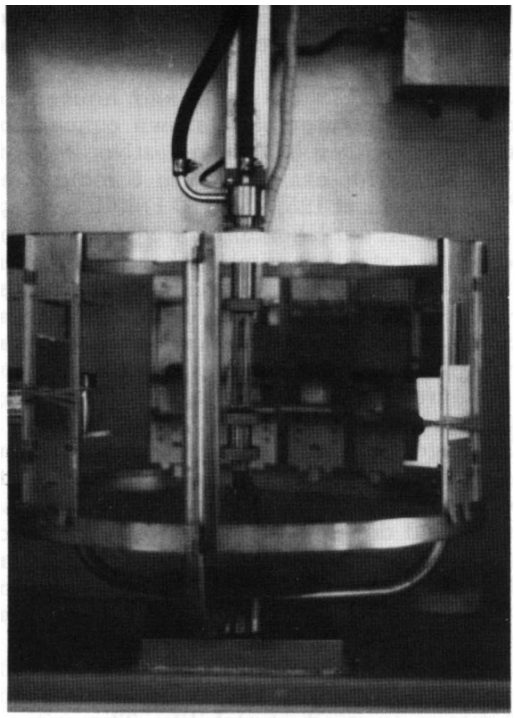
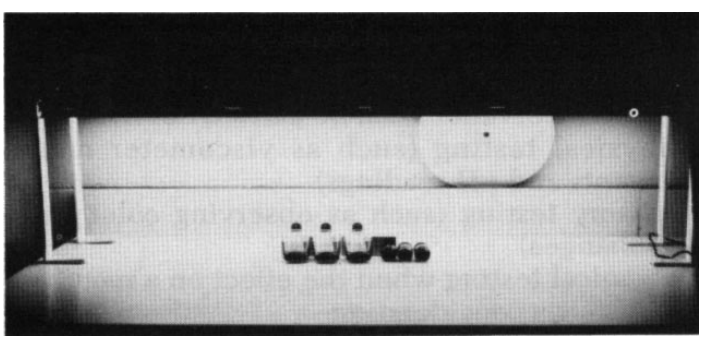
Package compatibility is another area of concern to a fragrance application laboratory. There are many occasions where fragrance and packaging do not mix. Some fragrances contain materials which can act as solvents, such as terpines, methyl salicylate, or diethyl phthalate. These ingredients may create problems with some plastics. Again, it is always necessary to set up unperfumed controls while doing package compatibility testing.

One of the most significant areas of testing is the determination of light stability. This type of testing can take on many facets: sunlight stability, UV stability, and fluorescent light stability. The ideal test for sunlight stability, obviously, is to take a sample of the product in the proposed finished package and expose it to a constant source of natural sunlight for an extended period of time. But, as with other stability tests, the pressures of marketing and other deadlines require instant answers and immediate predictions on normal light exposure processes. To enable us to shed some light on these problems, a number of valuable tests are used.



Weatherometer



The test that we at Givaudan find very valuable, and one we find many of our clients using, is the weatherometer or fadeometer test. The weatherometer is a chamber which can simulate natural sunlight, heat, and humidity conditions. The heat and light are generated by a xenon lamp. The wave length distribution from this lamp is the closest available of any synthetic source of "natural" sunlight. Unfortunately, the bulk of the stability data on this machine has been generated by the building and construction industry, which uses it to measure durability of exterior siding, finishes, and paints. To the best of my knowledge, there is no conclusive data on the correlation of a cosmetic exposed to natural sunlight and the length of exposure of this product in the weatherometer.

The acceptable level of color change, the amount of time a sample should be exposed, and so forth are subjective considerations and are determined on an individual project basis. We generally use 6-hour exposures to the xenon lamp as a good indication of light stability. UV lamp exposure and the use of fluorescent light to determine light stability in a store are also used. Stability tests run anywhere from a 7-hour exposure to UV to a 12-week constant exposure to fluorescent light.

The problems that are generally observed during light stability testing are color changes, either darkening or lightening, odor changes, especially where a perfume or finished product has many natural ingredients in it, and occasional clarity problems.

Since cosmetic and household products, along with the fragrances contained in them, are complex formulations, predicting the problems before they happen is, to a large extent, based on past experience and familiarity with product formulations.

### Incorporation of fragrance into existing finished products

The bulk of the day-to-day work in the application laboratory involves the incorporation of fragrances in existing products. These products could either be bases developed by our labs or finished product bases developed by our clients or potential clients. Incorporating a fragrance into these products, which on the surface seems routine, frequently involves many concerns. Some of these are:

- Solubility of the fragrance in the finished product—a situation which may require us to suggest auxiliary fragrance solubilizers or possibly modifying the fragrance to enhance the solubility.
- The effect of a fragrance on color, texture, and appearance of soaps.

- In the case of candles, the effect that a fragrance can have on burn rate, smoking, pool formation and other problems.
- Maceration, chilling, and filtering of solutions (perfumes, colognes and after-shaves) and the effect on fragrance perception.

Sometimes the routine incorporation of fragrance turns into a major problem-solving session and, because the selection of a fragrance is generally done after the product is developed and after marketing timetables have been set, there usually is a tight schedule for selection, evaluating, testing, and submitting the fragrance to the client for its product.

### Product development

The area of new product development is a vital one in the establishment of new business and the expansion of existing business. This requires the application laboratories to keep up to date with existing products that are on the market, developing prototypes similar to these products, and being aware of the intricacies and unique problems that may be associated with them.

In addition to being knowledgeable on the particulars of product formulations, new product concepts are developed which may be of interest to our customers. Being a supplier to the finished goods industry, a fragrance house frequently can stand back and take an overview of product and marketing trends and present to customers our interpretation of these trends. Along these same lines, the laboratories are frequently involved in the development of extension products associated with new fragrance lines.

Many of the new designer fragrances introduced recently in the United States (Karl Lagerfeld, Calvin Klein) have expanded their markets by going into skin care and makeup products. The fragrance application laboratory literally becomes the research and development arm of these marketers in developing new products.

As in other research and development labs, the technical staff of a fragrance application laboratory must keep up to date with the laws and regulations regarding the formulation, manufacture, packaging, and labeling of cosmetic and household products. The fragrance application laboratory frequently is the originator of the finished product formula and therefore knows the ingredients, has an idea of the stability, and in general knows the products.

Even though we often deal with major marketers in the cosmetic and household products market who have their own extensive research and development laboratories, we can and do provide assistance in the product development area. The research and development laboratories of many companies are usually heavily involved in serving the immediate and current needs of the product management team. Frequently, there is little time to work with long-range or low priority projects which can lead to new products in the future. The fragrance application laboratory can work on these long-range projects on a give-and-take basis with a client and then, when their research and development department is ready to take over the project, can brief them, discuss the work already done, and possibly save the development chemist some time when he or she takes on the project.

This give-and-take allows us to open up a dialogue with cosmetic and household product manufacturers and have good communication and understanding of marketing objectives and goals which are essential to the creation of the proper fragrance for a product. The fragrance application laboratory serves as research and development arm, technical consultant, source of information regarding packaging manufacturers, contract manufacturing, legal adviser, and marketing consultant on product trends and formulations in the consumer products area.

The final area of concern in a fragrance application laboratory is that of trouble-shooting. As was mentioned before, the fragrance is the one ingredient for which there is probably the least amount of technical information available to the research and development chemist, and, therefore, is the first to be blamed when formulation problems occur.

I would be less than honest if I didn't admit that in some cases the fragrance does affect a finished product, either from a stability viewpoint, packaging compatibility viewpoint, or other aesthetic aspect. Part of our attempts to resolve these problems involves setting up and evaluating component studies on products where the fragrance is found to be giving a problem. Sometimes this involves breaking down a fragrance into the hundreds of ingredients that comprise the formula and testing each one individually in the finished product. Once the problem ingredient or ingredients are found, then the major job, usually delegated to a perfumer, becomes eliminating the problem without changing the character or the price of the fragrance.

### Conclusion

A fragrance application laboratory is a necessary and integral part of selling fragrance. It is the bridge between the research and development and marketing of the finished product and the creative development and evaluation of the fragrance.

#### Acknowledgment

This paper was first presented at the Annual Symposium of the Chemical Institute of Canada, Toronto Branch, on June 5, 1979.