Perfumer's Notebook

By Calamondin

PERFUMING OF LAUNDRY DETERGENTS

It is good practice in perfuming any product to learn as much as one can of the properties of that product. This is particularly true of granular or powdered detergents. Chemically a detergent contains a blend of one or more surfactants employed to provide wetting action. These may be expected to have little or no chemical action on perfume materials, but may have some interfering odor. Detersive action is provided by alkaline salts, such as phosphates and/or carbonates. These make up a large part of the composition. Water is also present as product moisture.

How does the possession of this knowledge benefit the perfumer? First, a detergent powder is alkaline and in the presence of its moisture can promote hydrolysis of esters. For example, use of large amounts of amyl salicylate will produce a fusel oil odor. Lactones, such as undecalactone, will hydrolyze and lose odor. The moist alkaline condition may polymerize aldehydes and reduce the odor yield of phenols, such as eugenol.

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The physical characteristics are also important to the perfumer. The spray dried granules possess a large surface area promoting polymerization or resinification of such terpenes as limonene and oxidation of such aldehydes as cyclamen aldehyde. Materials with high volatility will evaporate readily from this large surface.

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This discussion points up product/perfume reactivity and thus the need for single material behavior tests prior to formulation.

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Before discussing compatibility of odorants, testing procedures and laboratory practices it is well to ask the objectives of perfuming detergents. First there is the wish to impart a pleasing fragrance to the product, to its solution in water, as in laundering, and to the washed fabric. Secondly, there is usually support of an advertising concept, such as "powerful cleaning" or "mildness with strength." This writer believes that the fragrance of a detergent can influence a consumer's belief in its efficacy. This is not to imply that strength is best supported by the steam distilled pine oil odor or the medicinal character of carvacrol or xylenols. A fresh, herbal perfume based on lavandin, rosemary and spice, or a clean citrus combination of stable chemicals, such as geranonitril, can suggest and support a "good cleaning" story. Much can be done by perfumers and consumer research people to probe associations between odor and belief in product performance as a basis for effective product perfumery.

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Given a theme how should the perfumer approach a detergent project? First, learn as much as is available of the composition of the product with a view to predicting behavior of aroma chemicals and oils. Here the chemist, as perfumer, has some advantage. Next, consider that a detergent perfume can be simple in formulation. The relatively low percentage use in detergents, 0.05-0.25%, demands high impact and diffusiveness rather than subtlety. The formulation can employ fewer components and their identity need not be as completely disguised as is normal for perfuming of toiletries and essences. The perfumer must seek maximum impact.

The first time when the user is aware of the product fragrance is when the detergent is added to the washer or measured into a cup. Normally, despite the low level the odor is easily perceived at this point. The perfume oil has been dispersed more or less uniformly over the granules thus offering a large surface from which evaporation occurs. What of odor from solution? It must be admitted that modern home laundering allows little opportunity for the user to smell any perfume from the washing machine. However some odor does escape and the scent in the laundry area should be pleasant.

Then the clothes fresh from the washer should have retained fragrance although the greater part of the perfume has left with the wash and rinse waters. Further the dried laundry should have a slight but sweet, clean odor. The action of the wash water and the air in drying partitions the perfume so that the residual on the cloth has a different composition from that of the perfume once added to the powder. There is little evidence that any aroma chemical is substantive to fabric. Instead the residual observed on laundered cloth is there because of its low volatility, low solubility in water, its odor strength and diffusiveness. Some of the most highly retained odorants are the synthetic musks, both nitro and polycyclic, the ionones, hexyl and amyl cinnamic aldehyde, floral chemicals as Lyral, woody odorants as Sandela and chemicals from cedarwood oil.

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Returning to the support of a theme and the composition of odor notes belonging to fresh, herbal and floral areas suitable for detergents, we have many useful materials. I list several

odorants and it is the art of perfumery that such listing suggests others which are similar in effect or support those named. Fresh notes may be built upon geranonitril, on nitrils with straight chains from C_8 to C_{12}, nerol, citronellol. Floral character may be imparted by hexyl cinnamic aldehyde, ionones, especially iso methyl, Lyral, citronellol. Herbal, leafy notes may include lavandin, amyl cinnamic aldehyde, rosemary, terpinyl acetate, galbanum, methyl cinnamate, methyl nonyl ketone, clove leaf oil. In addition to the odor notes listed above good residual sweetness can be achieved through the use of synthetic musks, especially Galaxolid, musk ambrette and xylol. The list is offered in the expectation that the perfumer will build upon it and test numerous other odorants which are likely to be stable and compatible with the theme.

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Returning to the influence of detergent components on perfume it is emphasized that successful perfuming requires knowledge of how single odorants behave in this medium. Testing of single aroma materials and simple blends is strongly advised. This is especially true when the use of substances of uncertain stability is contemplated. Then the possible influence of base odors should be determined although this is seldom a problem with detergent powders.

Testing involves the factors of mixing, aging and evaluation. Mixing in the laboratory is best performed with a tumbling device such as the twin shell blender. The manufacturer's directions should be followed. The amount of powder needed for the test is placed in the blender, the liquid odorant or solution in diethyl phthalate of a solid odorant is weighed into an aliquot of the powder sample, stirred and returned to the blender. The length of the mixing period is only as long as is needed to achieve a coarse but uniform distribution. Overly long tumbling will break down the granules and increase the powder density with a change in aging properties. The appropriate mixing time can be visually assessed by substituting a dye solution in DEP for the perfume and observing when the color distribution is uniform.

Aging tests are best conducted in cartons containing at least 100 grams that are similar in permeability to production cartons. Smaller cartons do not allow sufficient powder for laundry testing and, moreover, permit rapid loss of moisture. Aging in glass containers yields abnormal odor development partly because of trapped moisture. While accelerated aging cannot exactly duplicate case storage at ambient temperature, the results are the best rapid guide to performance that we have. Two weeks at 35°-37°C while holding the humidity at 50% is perhaps the most useful accelerated aging condition. Good ventilation of the storage area is needed and it must be kept scrupulously clean and free from molds and mildew.

Evaluation of the odor of a sample should be performed in comparison with a freshly prepared sample. The most informative test is that of the odor of the powder itself. Any sample showing insignificant change in the carton is unlikely to exhibit change in solution or in on-the-fabric tests. No conclusive evaluation of the odor of any perfumed detergent can be made less than 48 hours from the time of blending. This is the minimum period for equilibration.

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Another factor which is important in perfuming detergents is the cost limitation even through the proportion of perfume used is small. This writer believes that formulation should be based on the level of fragrance desired in the product and cost control should be obtained through selection of concentration. The quality of the perfume components in the blend should not be sacrificed to achieve lower cost. An adequate odor level can usually be obtained through appropriate formulation using chemicals of good odor and chemical quality. Attempts to develop fragrances with materials of poor and variable quality are prone to failure and create problems of control.