SOME CURRENT PROBLEMS IN TOILET SOAP MANUFACTURE

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It was the Roman historian, Pliny, who stated that the Gauls were the original inventors of the art of soapmaking, which they introduced into Italy after their successful invasions of Gaul. Goats' fat and the ashes of the beech tree were the essential ingredients of the epoch, while the subject of odour appeared only to have received attention at a much later period. Prior to the invention of soap, the ancients employed plant fibres and juices of a detergent nature, as well as various types of silica such as fuller's earth, which was rubbed upon the skin and clothes as a means of absorbing grease.

The Mediterranean nations employed fuller's earth even up to the beginning of the eighteenth century as a cleansing medium in the bath.

In the eighth century, soap was made chiefly in Italy and Spain, and it is somewhat remarkable that nearly five hundred years elapsed before soap making was introduced into France by the Phoceans, a mixed but talented race of Grecian and Egyptian origin.

Marseille was the chosen city for the introduction of soap into France, owing to the facilities afforded of obtaining olive oil, and a crude soda ash obtained by calcination of various maritime plants, both of which products were to be found in great abundance along the shores of the Mediterranean.

The exact period at which soap was first produced in England appears obscure, although it is frequently given as the fourteenth century, when it was made upon the French system. The first British Patent referring to soap manufacture was taken out in 1622 under the title of Castile Soap by Messrs. Jones and Palmer, who claimed a process of making hard soap without the aid of heat. From this period up to the present time, however, soap patents must run into hundreds of thousands, this being one of the most prolific subjects treated in the patent literature.

For an unduly long period the art of soapmaking was empirical, and real progress was made only after the invention of Leblanc's process for the manufacture of soda from common salt, which was duly developed by James Muspratt of St. Helens, a then small town in the heart of industrial Lancashire. The truly scientific production of soap

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only came into being through the efforts of Chevreul, another French confrère of Leblanc, who raised the art of soapmaking from the rule of thumb method to something that can be predicted from the specific reaction that actually takes place. Progress from this period onwards seems to have been fairly rapid and many new fats, oils and additives were introduced.

It must be admitted, however, that soapmaking remained a relatively backward industry until about half a century ago, for the so-called "practical business man" remained supreme, scorning the aid of science or even the assistance of a works chemist. A classic example of inefficiency due to such ignorance was the failure for many years to recover all or even part of the available glycerin. Many other wasteful procedures were common practice at this epoch. It is fortunate that managerial and technical staff now work in much greater harmony, although a few factory owners still exist (notably in undeveloped countries) who cannot refrain from attempting false economies in plant and process control, technical investigation and research.

Some Current Problems

A subject of particular interest to manufacturers of toilet soaps at the present time is what may conveniently be termed "the economics of soap perfuming."

The devising of an attractively odorous perfume compound for soaps is much more difficult than is generally supposed and the pitfalls are many. Of course, all perfume compounds call for skill in their invention and production, but more contributory causes produce failures when one is dealing with soaps. Stability and fixation are the two main features to consider. To choose any floral compound and "hope for the best" when incorporating into a soap base is both illogical and most uneconomical, many such compounds giving disappointing results, with a veritable disaster upon ageing. One of the main causes is the erroneous view taken about perfume base costs, it being far cheaper to use less of a relatively expensive base than much more of a cheap base. In many cases the use of cheap perfume bases may be regarded as the direct cause of unsuccessful results, and a final product that has no popular appeal.

Cheap soap base perfumery compounds frequently contain various residual terpenes; these may, however, from an odour point of view, be regarded merely as diluents of no value. This general, although incorrect, method of compounding a soap perfume, should be discarded in favour of the method which requires that a base is first selected, which contains a definite odour value with a known stability in soaps, and that to this base other ingredients are added to build up a suitable odorous compound that is not affected when incorporated in the soap base. Volatility, stability and boiling range are the three main points to consider when choosing your ingredients, whether they are to be natural or synthetic. The use of a cheap perfume compound calls for a much higher ratio to obtain a reasonable odour than when a compound is employed containing, say, a blend of absolutes or concretes, together with judicious blending of natural essential oils or high-grade synthetics, but containing no diluent such as the residual terpenes. In the one case, one pound or more is used to perfume 1 cwt. of soap, while two to six ounces of the more expensive blend would suffice. And if an odour comparison be made with the two compounds of like tonal value, it will be clearly appreciated that it is false economy to employ the cheaper compound. Also, odour value is in many cases a much stronger selling point than actual lathering properties, and must of necessity influence repeat sales of any toilet soap of well-liked odour.

An almost Universal Base of exceptional value for every type of soap, from which an individual compound can be made, consists of: Ionone 10 per cent, Linalol 5 per cent, Terpineol, anhydrous, 85 per cent. A proportion of this base serves as a foundation upon which the final perfume is built.

Terpineol is strongly resistant to any alkaline reaction as encountered in a soap base, and is of almost universal usage on the Continent, where soaps must in general possess a good, strong, likeable odour, or the discriminating public will not deign to try them.

For all high-class toilet soaps, those containing a compound blend of absolutes and concretes, together with selected essential oils, are the best compounds to employ. The results obtained are excellent and the fragrance imparted is lasting. Ordinary distilled oils in judicious combination with isolates or synthetics, cannot compare with these compounds based upon absolutes and concretes. The latter have, of course, a much higher initial cost, but there is no justification for the soap manufacturer's reluctance to employ them, when one considers that the use of only 0·25 per cent of a natural Jasmin can give a more fragrant lasting odour than, say, 10 to 15 per cent of a high-class Jasmin synthetic. Often it is superficial economy that is being practised, quite apart from the fact that the substitute can never impart the finesse of the natural product, however good it may be. One must also bear in mind that, with the compound based upon the more expensive ingredients, a ratio of 12·5 per cent to 30 per cent can be used as against 100 per cent of the cheaper base.

Deterioration in Toilet Soaps

Toilet soap deterioration can be classified under the following headings:

(a) that due to the composition of the soap base;
(b) that caused by the process of manufacture; and
(c) that which can be traced to additions to the finished product and to impurities en-

countered in pressing and stamping.

(a) The employment of a base composed of highly unsaturated fatty acids is to be avoided, owing to the likelihood of rancidity development, with consequent discoloration and spotting after exposure to the air. Impurities contained in certain fats and fatty acids are frequently found that have a detrimental effect upon stability, and a prior "cleaning up" process saves much later trouble, such as colour development, odour deterioration, etc. Another interesting point is that tallow obtained from animals that have been fed upon oil cakes and by other artificial means gives a resulting unstable soap unless treated. Of course, a high content of free fatty acids is a sure test that the tallow is neither fresh nor clean, but of inferior quality. To-day, however, the supply of a soap chip base from a reputable firm can give little rise to anxiety, as a stable product of constant quality grading is readily available.

(b) If the "cleaning up" process before saponification has been undertaken, subsequent bleaching in the boiling pan will be unnecessary. Bleaching in the boiler is convenient and is common practice, although the resulting soap stock after storage frequently proves unstable, so that rancidity develops and no perfume compound can possibly cover the bad odour, even if used in great quantities.

Another processing fault is frequently to be found in the drying, as unless the soap is cut into very thin chips and adequate ventilation is employed throughout the lowering of the temperature change until cold, the soap stock again proves unstable. If the soap chips are "sacked" while still warm (and this can occur during heavy production days in the factory) heat develops once more in the centre of the sack and the chips may discolour or even char, and again odour value is greatly influenced. I would, however, reiterate that a reputable firm takes all due precautions to guard against these possible deterioration problems.

(c) Additives to soap stock likely to cause instability are both numerous and varied. Take the range of "fillers," for example, perfumery compounds, and unsuitable superfatting agents, etc. In fact, any addition, even if considered harmless, should not be made until a very thorough test has been carried out. Fillers such as titanium and zinc oxides, etc., serving the dual purpose of both filler and whitening media, are widely used in the very cheap range of toilet soaps and are better omitted. If they are used, however, they should be incorporated by suspension in a 10 per cent solution of either Tylose or Cellofas to produce a paste, which is added to the chips before working them in the mixing machine. Tylose or Cellofas additions can also be made with the object of improving the malleability of soap chips, the use of 2 per cent of a 10 per cent solution protecting against brittleness and improving the plasticity and transparency of the chips, to give ease in plodding and facilitate stamping-out of the final soap tablet.

The presence of any excess, however slight, of alkali in the base, often causes perfumery difficulties, as alkalis saponify any esters used in the perfume compound. In the higher priced range of toilet soaps, the use of cinnamic acid is a most satisfactory addition, for this acid acts as a neutraliser, antioxidant and fixative.

To enumerate the various possibilities of deterioration caused by the use of perfume compounds is beyond the scope of this paper, as among the aromatic constituents used one can have both positive and negative catalysts present, aromatic alcohols and the esters thereof, certain ketonic bodies such as musk ketone ; then synthetics as, for example, benzaldehyde ; and in the formulation of a soap perfume the reactions of all ingredients must be very carefully considered before use, with price considerations put entirely at one side until a satisfactory compound has been obtained. Then a cost adjustment may be made and by careful substitution of analogous replacement materials the desired cost price may be approached. I would once again emphasise, however, that it is not always economical to employ cheaper products.

Metallic contamination is the final cause of deterioration and, in particular, contamination caused by copper base dies that are in poor condition either through neglect or wear and tear. All machines should be regularly maintained and any signs of plate stripping be returned for replating, as only in this way can a perfect product be assured.

The superfatting of toilet soaps is a well-known practice to-day, whether milled or cold-processed soaps are being considered, and many combinations are possible. Lanolin, of course, was once the most favoured superfatting agent, but owing to odour difficulties it has been replaced by various other ingredients. Probably one of the best is the use of an emulsion compound of Polyethylene Glycol 1500, Mineral Oil (in traces), Wool Wax Alcohols, Oleyl Alcohol and Cetyl Alcohol. An even more modern method is the use of Sulphonated Cetyl/Oleyl Alcohols, which impart a remarkable smoothness to the soap base.

Coloration and Discoloration

The final subject in this brief collection of notes must be the coloration of soaps, a matter of great importance, as even the slightest discoloration in a white soap can mar the product. Pastel shades are popular and can suitably cover any mild discolorations due to either the soap base or the perfumery compound. It is the latter, when of a doubtful nature, that causes much deterioration of a soap, as the "faults" only develop upon ageing and are most unsightly either through spotting or just partial fading. No solid aromatic body should ever be employed unless the whole of the crystalline derivatives have either been dissolved along with the normal perfume blend or in a suitable solvent such as benzyl alcohol.

As for colouring matter, only a guaranteed fast-to-alkali colour should be employed. Again, it is false economy to purchase anything but the finest quality, as the cheaper grades may contain many impurities that, in the more expensive variety, have been eliminated by sufficient washing. Aniline dyestuffs are chiefly employed, although only those with a high alkaline milling resistance and adequate manufacturers' proof of stability should be used. A simple test, yet a most reliable one, is to take 50 grammes of the soap base and 5 grammes of soda ash to a litre of distilled water and gently heat and maintain at a temperature of 40° C. until observations are completed. The soap base employed must, of course, have been already coloured, then as "fastness" is usually based upon an "8" scale, any soap can be calculated as to the degree of fastness to alkali. Then if the degree of the dyestuff itself is known (and it should be requested from the makers), one aims at employing an alkaline fastness from 4 to 5 or even higher. The test given will soon reveal whether the soap will remain constant or not, during the normally expected shelf-life of the final product.

The dyestuff used, and of whatever nature, must also, of course, be employed in a solution form that has been filtered so that no extraneous matter or fine particles of dyestuff are left for subsequent incorporation in the soap base, a fault that usually gives rise, within a few weeks or months, to more or less clearly defined spotting.