

## **Manufacture of cosmetics and toiletries with low energy and agitation**

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### **1. Introduction**

In view of the dwindling supplies and higher prices of natural products from which energy can be liberated—wood, coal, oil and natural gas—the development of energy-saving manufacturing processes is a matter of current interest, also for the cosmetics industry.

A further requirement that results from the steadily-increasing demands for high-quality cosmetics is the development of rational, time-saving processes.

The process engineering industry can supply continuous-type apparatus. Because of the complicated design of the machinery, the high investment costs and a low level of adaptability to the wide variety of cosmetic preparations, some of these continuous have only limited fields of application. As a result, particularly the medium-sized and small manufacturers of cosmetics are still giving preference to general-purpose, discontinuous types of apparatus.

Fig. 1 shows the most important of the unit operations in the production of cosmetics. One should note that intensive mixing of the liquid or solid components of the cosmetics is generally the most important of the technical parameters.

Raw materials manufacturers are today extending their ranges of highly-concentrated surfactants for the production of skin care products and shampoos; these gel-like raw materials with their low water contents offer particular advantages, in that they save space and costs in transportation and storage. A currently-interesting example is the quick foam- and air-free dilution of (for example) alkyl ether sulphates in simple and low-priced mixers. In the model experiments which are described below, we have therefore concentrated on widely-used, simple agitator systems and specimen formulations which can be produced without applying thermal energy.

### **2. Experimental procedure**

#### **2.1 Preliminary theoretical considerations**

Various kinds of apparatus with static or dynamic agitator elements are used in the