: CHAPTER - IV :

GROWTH AND DEVELOPMENT OF SOAPS AND DETERGENT INDUSTRIES.

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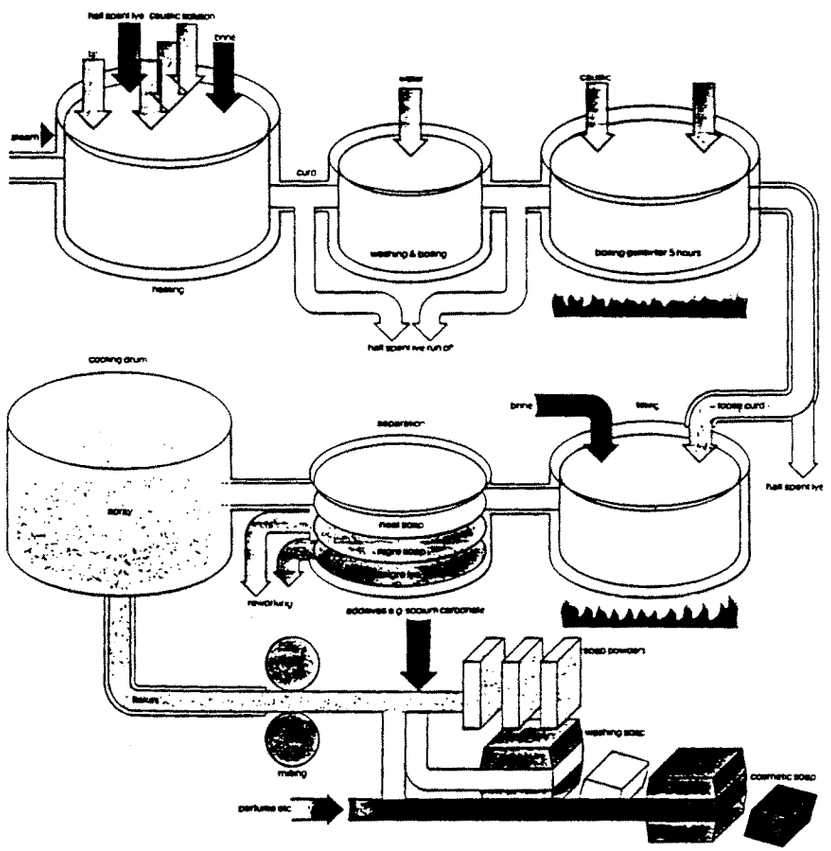
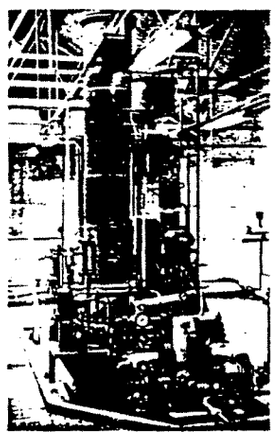
: SOAP INDUSTRY :

HISTORY :

The treatment of fat with alkali has been practised in the Middle East for at least 5000 years. The art was brought to Europe by the phoenicians about 600 B.C. Its perpose, right through to the second century AD was soely medicinal, for example, for the treatment of scrotulous sores. Soap-making disappeared from Europe with the decline of the Roman Empire. It reappeared in the eighth century, but only reached Britain in the eleventh century probably as a result of the Norman invasion. It remained a relatively primitive art till the sixteenth century, when techniques that provided a purer soap - the conversion of pot ash (literally made from wood ash in an iron pot) to caustic alkali by means of quicklime, and the salting out of soap - were developed. In the seventeenth century Leblane produced caustic alkali from common salt, and thereby eliminated a major stumbling block to expansion.

(Today it is made by an electrolytic process) In the nineteenth century Chevreul described the constitution of fats and put soapmaking on a sound basis. At the turn of the century sabatier and senderen discovered how to hydrogenate unsafurated compounds and norman applied their ideas to the hardening of fats. In the first halt of the twenteenth century the crystalline states of hydrated soaps - which affect product performance - were elucidated, the bleaching of fats was perfected, and deodorization of fats was introduced for the highest class products.

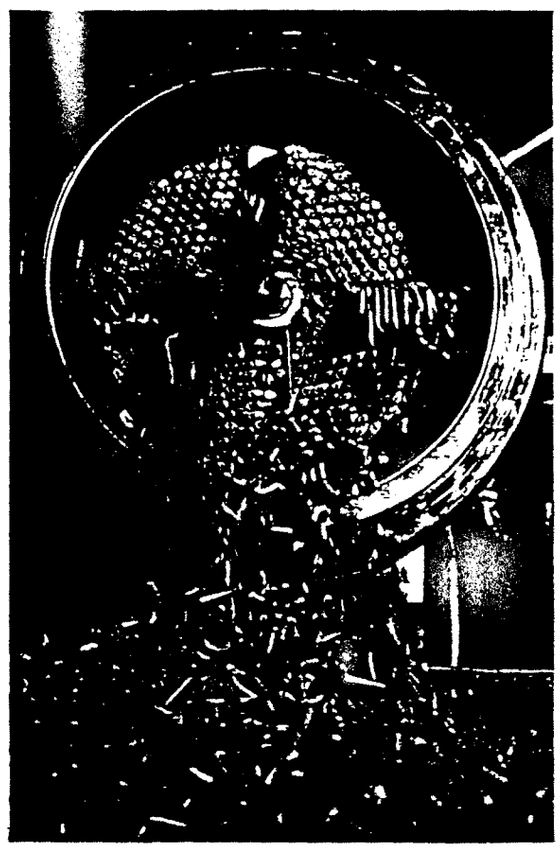




Above: the 'fitting' or 'finishing' common in a large modern soap factory. Any free fatty acids left are neutralized here using an adjusted concentration of caustic and salt.

Right: a giant mincer 'noodling' soap

Left: the soap-making process. First the solution of fat and caustic soda, together with recirculated lye, is steam heated in brine. The curd is washed and boiled while some of the lye is run off. Then it boils gently for some time, with fresh caustic added. Next the curd gets some more brine treatment; then it is separated into various soap products, some of which need further treatment. Final treatment involves more additives, depending on the final product, and mechanical treatment such as flaking, milling, pressing into cakes, and so on.



Types of Soap :

Laundry Soaps are made from neat soap, which contains some 28% water. Warm molten soap-dosed if required with perfume and other additives is spàayed over internally cooled drums and scruped off as flaken. There are fed to milling rollers which, by 'Working' the material, modify its crystal structure beneficially. The milled flakes pass to a plodding machine which not only works the soap further, but also compacts it to bar form. The bars are cut and stamped to their final shape.

Toilet soaps use higher quality fats and the water content is reduced to loy or lers. The neat soap is cooled and flaked as before, but the flakes are passed through a hot air drying over to reduce the water content prior to milling. Trace constituents are matered in at the milling stage. Since the soap is drier, higher pressures are required here and in subsequent plodding. The emergent plodded bar is cut, stamped and wrapped.

Soap flaks are prepared by process that is substantially the same on that for toilet soaps up to the milling stage, but the drying stage reduces the water content to about 7 % and the final milling rollers produce a very thin andhence instantly soluable-flake and cuts it, if required to a defined shape.

Soft soaps are made from fats with a high proportion of unsaturated acids (organic acids which contain double bonds in their HYDROCARBON portions), and are saponified with caustic potash. They are made by a cold process in which the only beat involved is that of the reaction, and the glycerine is not removed. The finished product is a translucent solid solution containing either about 45 % soap, it for toilet use, or 35 % soap, if for domestic cleaning.

Shaving Soaps are made from fats with a minimum of un saturated acids - stearine, fallow and coconut-oil-saponified with caustic potash or a potash-soda mixture to promote easy lathering. A cold process may be used, but

more likely a 'semiboiled' process, that is one on which the initial reaction is promoted by external beating and continued by the beat of reaction, Again, the glycerine is not removed.

Soap powders are formulated products designed to facilitate the removal of fatty and particulate dirt from fabrics with minimum of psychical effort. Ancillary constituents deal with chemical stains and general yellowing. Soap provides 50 % of the product. The washing aids are sodium carbonate, sodium silicate and sodium tripolyphosphate, but the silicate also helps to produce a readily pourable powder. All are mixed to paste with molten soap, and the paste is heated and blown under, pressure through nozzles to fall as tine particles, in to a cooling chamber, Minor costituents are metered in as the powder is moved along to the packing machinery.

: DETERGENT INDUSTRY :

DETRGENT MANUFACTURE :

The word detergent has become a loose description for both the traditional soap and the newes non-soapy synthetic materials. These are different kinds of detergent products ranging from simple tablets and flakes to complex powders and liquids formulated to cope with various washing system.

When washing skin, for example, a dense lather is needed to trap and remove any dirt, So the product must produce a good lather with out becoming mushy in use. In adition it should not interact adversely with the skin. A more complex product, however, is that needed for wash fabrics. It must eliminate calcium and others substances, present in natural water, which would otherwise hinder the removal of dirt. Further more the dirt must be removed efficently with minimum of mechanical force and be kept in suspension, So that it cannot

become redeposited on the fabric. Stains must be removed and off colour. Caused by aging counteracted. But in carring out all those functions the products must not harm the fabric.

It is also important that detergents are biodegradable capable of being broken down naturally by bacteria after use. Sope is naturally so, but non-soapy detergents must be, designed to be so as well to prevent pollution.

Detergent Constituents and action :-

The key to all detergent action is the surfactant, so called because it modifies the surface quality of the water by weakening the forces between water molecules. In simple terms, this helps the water to more readily wet the object being washed. This is because of the characters of the surfactant molecules which, though far tool small to be observed, are known to contain a water-loving, which anchors in the surface attached to a "Water-heating" tail that is forced to protrude from

the surface, So breaking the strong electro-static forces, between the water molecules in the surface. There are two kinds of surfactant soap made from fats, and non soapy detergents (NSD) made mostly nowdays from petroleum by products, such as alkylaryl sulphonate NSD it self is not. So good a detergent as soap. For one thing it does not lather so well. Finding out why has led not only to a better understanding of the mechanisms of dirt removed but also to all round improvement in detergent products. For example to meet the need to minimal lather in front-loading washing machines a non-lathering NSD had to be developed-allkyl phenol polyethylene oxide is the one most widely used. Conversely, to improve the lathering power to a general purpose WSD product a lather booster must be incorporated. This has a molecular structure similar to that of a surfactant and is in competition with it for a place in the surface.

Most product contain anything up to a dozen or so constituents, each with a specific

purpose, though not every one is involved in detergent action. Washing powders, for example, will contain an anti-corrosion agent to protect the bowls of washing machines. Tablets and flacks are the only products that depend substantially on surfactant alone. Both are based on soap and both rely for their product properties on the selection and treatment of the fats used for conversion to soap, and on the subsequent processing of the soap. In all other products detergent action is shared for the most part by the surfactant and a builder, so named because it builds up the surfactant into a more complete detergent.

The usual builder is sodium tripoly-phosphate. Broadly speaking the surfactant, which may be either soap or NSD, takes care of fatty dirt, and the builder of solid particulate dirt, but there is more mutual support.

For fabric washing the two are required in roughly equal proportions. For dish washing,

where there is little mineral dirt, the surfactant predominates for hard surface cleaning the proportions are reversed.

Fatty dirt is removed and dispersed in the wash liquor as minute negatively charged globules, and solid dirt as, entrapped particles in negatively charged molecular cages, which are formed by Compounds in the cleaning product. To prevent their redeposition on fabric it is given a repulsive charge by including in the product multi-charged anti-redeposition agents, each perferentially attracted to a particular type of fabric. Stain removal is commonly dealt with by a chemical bleach sodium perborate. Which performs well at the elevated temperatures and in the alkaline environment of the wash liquor. Off colour is corrected by an optical brightener, a fluorescent material designed to adhere well to fabric and emit a bluish white light. Enzymes, which act as calalysts in breaking down protein stains such as blood, may also be included in detergent.

Washing powders need to contain conditioners, that is, substances that help to produce a readily pourable and easily dissolved product, with out detracting from the detergent action. The most suitable for soap powders is a mixture of sodium silicate and sodium sulphate. Liquid products contain highly concentrated constituents that are mostly immiscible (unwilling of mix) with each other A hydrotrope that is a solubilizingagent such as sodium xylene sulphonate is added to induce them to do so.

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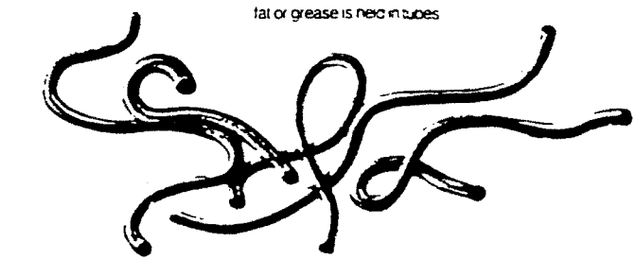
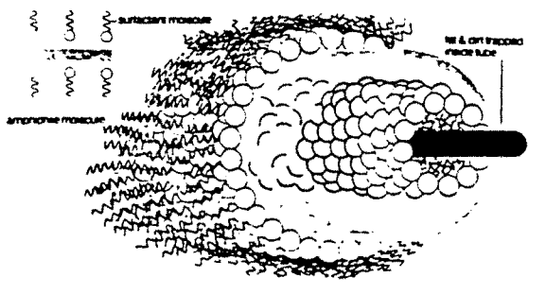
Below: two forms of detergent attack. In both the dislodged grease or dirt is subsequently held in solution and prevented from redepositing on the fabric. Fats are often removed by a tube mechanism—the tubes resulting from liquid crystal formation at the surface of the fat.





DIAGRAM