The Competition of Soaps and Syndets

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THE competition of soap and syndets has both technological and economic aspects, which are properly discussed in that order. Those who, like myself, sit on the sidelines and watch the battle find it most interesting and instructive. What the pattern may be within the big soapers where one department is competing with another I shall not try to predict—I don't know.

Soap had an unrestrained monopoly up to the early 1930's. Then, very quietly, Dreft appeared, a lauryl sulfate built with sodium sulfate. In very hard water areas it had substantial acceptance, but the splash it made was not great. That was the first synthetic detergent so far as the public was concerned.

As to terminology, it is unfortunate that synthetic detergent is often shortened to detergent. When I use the term detergent, I mean both soap and synthetic detergents. For convenience the latter are abbreviated as syndets.

The subject has almost as many facets as a diamond. A few that we will consider are the detergent industry itself, equipment manufacturers, the chemical industry, the fat industry, the petroleum industry, the wholesaler, the retailer, and the consumer. Then there is the competition within the syndet industry between fat-derived and petroleum-derived products.

As to the economic competition, the sale of syndets has gone up progressively from relatively negligible amounts in 1940 to a half-billion pounds in 1948, a billion in 1950, and a billion-and-a-half in 1951. They cannot continue to increase at that rate, but extrapolations indicate about 2 billion in 1955 and two-and-a-half billion about 1960. Since per capita consumption of detergents has not changed greatly from 27 pounds per year or about 4.2 billion pounds, which includes an estimated 800 million pounds for industrial use, it follows that the syndets will have over half the household market this year and over half the total market within the next 10 years. There is every reason to believe that prediction is a plausible one.

Perhaps I should pin-point what that means. In effect, the soap industry had a practical monopoly of the detergent field until 10 years ago. In a decade it has lost half its household market to an interloper, the syndets. I am unable to recall as revolutionary a change with any other product used daily by almost every person.

ANOTHER form of revolution in the detergent industry has been created by the syndets, a revolution in raw materials. It has three aspects. Soaps are produced from fats and caustic soda, yielding glycerine as a by-product. But there are two distinct types of syndets. Those which are fat-derived are made largely from coconut oil, sulfuric acid, and caustic soda. The petroleum-derived type is made from benzene, kerosene or propylene, sulfuric acid, and caustic soda. The mere recital of the raw materials can be more confusing than helpful without some figures.

It takes roughly one-eighth pound of caustic soda to produce a pound of soap. In the syndet industry, whether derived from fat or petroleum, it takes a major fraction of that amount to produce the active agent when we allow for the neutralization of excess sulfuric acid to sodium sulfate. Formulations differ so that I necessarily use averages. But in other industries feeding materials to the syndet builders, it requires about a third of a pound of caustic soda, of which part but not all can be replaced by soda ash, to produce a pound of finished syndet. That means as a sort of subsummary that the chemical industry has to increase its capacity for producing caustic soda by a third of a billion pounds annually in order to produce a billion pounds of syndet in place of a billion pounds of soap.

It takes roughly a third of a pound of sulfuric acid per pound of syndet from either source. It takes no more than a negligible indirect amount to produce soap. So initiation of sale of a billion pounds of syndets annually requires increase of sulfuric acid producing capacity by roughly a third of a billion pounds.

That sends us off on a tangent. There is a world sulfur shortage. Current U. S. and Canada supply is at the rate of about 9 billion pounds with a shortage of about 2 billion pounds. The increased sulfur requirements for syndets are in that picture, creating 100 million pounds of the shortage. The world picture is so bad that one substantial plant for syndet production in England is built but not operating because they cannot get an allocation of sulfuric acid.

Now let's go off on another tangent. The leading syndets are all built with some of the molecularly dehydrated phosphates, called for convenience polyphosphates and not meaning specifically tripolyphosphate. American manufacture of syndets was delayed by polyphosphate shortages, and plants have been going up apace. The expensive multimillion dollar part of the installation is the plant for elementary phosphorus, it being then burned to phosphoric acid and further processed. Again an operation of the soap industry has been transferred to the inorganic chemical industry. Production of tetrasodium pyrophosphate in 1951 was about 180 million pounds and of sodium tripolyphosphate about 600 million pounds. Of those nearly 700 million pounds went into detergents, either soap or syndets, over 20% of that into soap. Shortage of production capacity for polyphosphates is still the limiting factor on quantity and quality of syndets abroad.

That is all very confusing, I realize, but we can draw it together in two statements which will take account of the present relative proportions of fat-derived and petroleum-derived syndets. The first is that the requirement of nearly a pound of fat per pound of soap is replaced in syndets by an additional one-third pound each of caustic soda or other equivalent alkali, a third of a pound of sulfuric acid, about an eighth of a pound of alkylate, and nearly an eighth of a pound of fat, usually coconut oil. Part of the caustic soda referred to goes into making the polyphosphates.

The second statement is that a major part of the raw material supply of the detergent industry as it shifts from soap to syndets is transferred from the fat industry to the heavy chemical and petroleum indus-

tries. The latter produces the alkylate. Those are the things which are fundamental to the changes in this billion-dollar industry with which you are connected.

WHAT about the consumer? She is frankly confused. She really does not know the difference between soap and syndet except that this brand of washing product precipitates in hard water and that one does not, one brand gives her a better wash in hard water than another. She thinks in terms of brands, not in terms of chemical formulas, naturally.

What about the wholesaler and retailer? They do not care. A case of soap or a case of syndet at roughly the same cost and selling price is the same thing to them. They simply deliver or unpack the case, and the retailer puts the packages on the shelf for sale. They literally are not affected to an appreciable extent. What the advertiser offers to the public because he, the advertiser, knows it will perform, she, the consumer, buys from the retailer through the wholesaler. Of course if it did not perform, she would not continue to buy it.

Equipment manufacturers are another story. I have heard the statement that the last soap kettle has been installed in this country. That is absurd on its face if we look a century ahead. One factor is population growth, currently at 1.3% a year, which means doubling in a little under 80 years if the factor doesn't change. But considering how long soap kettles last—guess how old some of them are that you have seen—there will be few installed for some decades, particularly as other soap processes are rendering some of the old type of soap-making capacity obsolete. In any event in place of soap kettles, equipment manufacturers are producing sulfonators, slurry tanks, spray towers, etc. Without calculating it, I am sure the equipment cost prior to packaging is for syndets not less than for soap in spite of the simpler drying methods for syndets. The syndet plant takes much less manufacturing space for the same capacity than did the old style soap kettle and appurtenances.

Let's look at the picture in terms of fat-derived vs. petroleum-derived, and only in terms of active surfactant. In 1944 about 75 million pounds of each were produced. That would, if available, have permitted the production of about a half-billion pounds of packaged syndets. It largely went to the armed forces. After the war capacity for fat-derived surfactants was installable more rapidly than for petroleum-derived so the amount from that source increased. The percentage from petroleum then increased to 54% in 1949, 57% in 1950, and is now even larger and growing all the time.

That the fat industry has suffered from syndets is common knowledge. Frankly, the tallow producers are scared, justifiably so. Prices drop as supplies build up. Use of over two billion pounds of fats in soap in 1947 dropped below 1.5 billion pounds in 1951. They are one of the very few groups of major materials not allocated sometime during the past two years. Use of a quarter of a billion pounds of fatty acids in soaps in 1945 dropped to about 50,000 lbs. in 1949 and increased only a little up to 1951. So in 1951 the price of fats dropped by about one-third as stocks built up. The post-war fat shortage is over. Other uses for fats must be found in the chemical industry. Research is going on, catalyzed by the current relatively low price and prospective future maintenance of that price level.

I mentioned glycerine as a by-product of soap. It has had a bad supply-price reputation for years. The syndet industry caused a synthetic glycerine industry to be created which currently produces at a rate of over 50 million pounds a year. Thus that industry synthesizes from petroleum gases the glycerol equivalent to more than half a billion pounds of anhydrous soap.

That is the U. S. picture in capsulated form. In well under 10 years an industry, soap, has lost half its market. Instead of there being a strong demand from the soap industry for fats, they are necessarily looking for other markets. They will find them, of course. Where remains to be seen.

In syndets as in so many other things, the United States has led in commercial development. The rest of the world is following. There are syndet plants in England and Japan, in Uruguay and Israel, to mention only a few. In fact, they are springing up in all civilized countries. The petroleum industry has an international market for a new product, alkylate, and the chemical industry has new markets for many of its old products plus much demand for polyphosphates, a material for which the production capacity has multiplied several times in 10 years.

And at the end of the chain the consumer buys a package with a different label, perhaps having a different color, relying on you to put in it a product which will serve her better.