

appreciated this need, but it was not until the early 30's when the first synthetics were produced that this goal seemed attainable. Even then it required many years of work to produce synthetic products that could successfully compete with soap products, but it was finally accomplished (Figure 8).

In terms of economic impact on the soap industry, of stimulating effects on scientific investigation, and in the increased satisfaction consumers have found in using the products, the development of satisfactory synthetic detergents is the outstanding accomplishment of the soap industry during the past half cen-

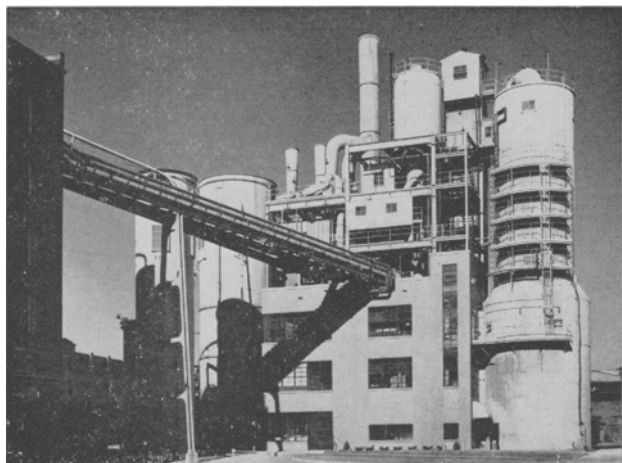


FIG. 8. A single unit, synthetic granules tower.

tury. The reaction of the customers is shown by the fact that three-quarters of the sales of soap plus detergents are now synthetic. Furthermore the proportion is still growing, and there is strenuous competition to find better and/or cheaper new synthetic materials from which to make better products.

While the above changes in processing and facilities for producing soap and synthetics were in prog-

ress, the form and character of the finished products marketed were radically changed, not just once but several times. The soap bars in use in the beginning were largely replaced by soap flakes, which were replaced by spray-dried soap granules and these in turn were replaced by synthetic granules. In each case the old equipment became obsolete, and new processes were developed and new equipment was built.

And now synthetic liquids are having their fling. Just how far they can go and what the next candidate for the housewife's favor will be is the sixty-four—or perhaps I should say the million-dollar question.

As can be seen from this very condensed version, the past half century has been a turbulent period for soap-makers. Most of the procedures and equipment used have been discarded and rebuilt at least once and in some cases several times as better ideas were developed. Within the last 40 years there have been three drastic changes in the type of soap products produced and each change has cost many millions of dollars in obsolescence and new development costs. Very little about the products sold or the methods used in their production is the same now as it was 50 years ago. Soap-makers have had to run hard to keep even, but for the customers it has been a wonderful era. The products are not only better now, but they are much more convenient to use; on a properly adjusted basis, they cost much less to buy than they did 50 years ago.

Many interesting developments of the past half century have been omitted in the above account of the progress made, but we believe that the examples given show that in the processing and production of soap and soap products great strides have been taken to catch up and to hold even with the best technology of our times. The rate at which new processes and products are being developed seems to be increasing, particularly in the soap products field, and it seems very probable that the gratifying progress made during the past half century will be exceeded in the not-too-distant future.

Fifty Years of Progress in Castor Oil

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FIFTY YEARS AGO about 15 million pounds of castor oil were used annually in this country. Twenty-five years later the use had risen to 45 million pounds. The demand has continued to increase, with some fluctuation, to the present current consumption of about 130 million pounds annually. This is about one-fourth of the world's total annual consumption.

Castor oil was first produced from seed grown in the Midwest. However about the time our Society was founded, it was found more economical to import the beans from Brazil and India and domestic production ceased. During World War II some castor was grown in this country, and again during the Korean conflict high price and government support permitted an ap-

preciable quantity of castor to be profitably grown here. However when "normal" conditions were re-established, the domestic crop was not quite ready to compete with foreign imports and declined. In 1956 the agronomic research that had been going on for the past decade began to pay off and gave improved castor-plant varieties and more efficient harvesters. The greatly improved yield changed the picture and has resulted in increased domestic production. Thus 1,800,000 lbs. of castor oil were obtained from domestic seed grown in 1956 and 10,000,000 in 1957; 22,000,000 will be produced from seed grown this past year. While this is still only 15% of our current con-

sumption, it is expected the quantity will continue to increase.

The first use of castor oil as a purgative and in cosmetics has been lost in antiquity. While the use that has made castor oil famous has decreased in recent years, it is still valued highly by many doctors. It is an excellent wetting material for the early rouge and the more modern pigments that go into lipstick. In fact, the majority of the lipsticks today use a sizeable quantity of castor oil. However the industrial uses of castor oil have increased to such an extent that the pharmaceutical and cosmetic uses account for only about 2% of the present total consumption. Another use for castor oil that pre-dates our Society is as a lubricant. Its early use was principally for heavy bearings. When the first gasoline engines were made, castor oil was rated as a "par excellent" lubricating oil, combining high viscosity with a flat viscosity-temperature curve and low cold test. It was particularly valuable for the airplane engines used in World War I. All of us "old-timers" remember the peculiar odor from the early racing automobiles as a result of the castor oil used. As higher compression engines were built, using closer tolerance and running at a higher temperature, castor oil was found to be unsuitable. However a simple ester of castor oil which has lower viscosity is still used in engine lubrication. Sulfated castor oil (Turkey-Red oil) was one of the first surfactants and was in use more than 50 years ago. These sulfated oils, along with castor soaps, amount to about 7% of the castor consumption. Thus the principal use of castor oil at the start of our period was as a lubricant, surface-active agent, and medicine and cosmetic ingredient.

DURING World War I castor oil was found to be useful as a plasticizer for celluloid and in leather lacquers. Several years later it was found that blowing castor oil gave an improved plasticizer for this use in many of the formulations. In 1928 Scheiber found castor oil fatty acids could be dehydrated, and later Ufer developed a process for the oil. Dehydrated castor oil became a commercial product in this coun-

try in 1936. Protective coatings are the largest consumer of castor oil and account for about 45% of its consumption.

Various derivatives of castor oil, such as acetylated castor oil and the simple esters, have been known for some time and in about 1938 found use as plasticizers in rubber and also in vinyls. This use has continued and at present accounts for about 4% of the use of castor.

About 100 years ago it was observed that when castor oil was heated with an alkali, sebacic acid and capryl alcohol were formed. Large-scale production of sebacic acid started in this country in the late '20's and now takes about one-fourth of all the castor oil used. Sebacic acid is used for the preparation of ester plasticizers, a special type of nylon, and a jet engine lubricant. Another old pyrolysis reaction consists of cracking oil to give undecylenic acid and heptaldehyde. The undecylenic acid is used in an athlete's foot remedy, and the heptaldehyde goes to the perfume industry.

When hydraulic brakes were first developed, about 30 years ago, it was found that castor oil plus a solvent gave a good hydraulic brake fluid. This application has continued and accounts for about 5% of the castor oil. A little more than 10 years ago it was found that the soaps, particularly lithium soap, from hydrogenated castor oil gave an excellent grease. It, along with its use in various lubricants, accounts for about 7%.

There always has been a large amount of miscellaneous uses that include fly paper, inks, electrical insulation, leather preservatives, carbon paper, candles, crayons, wetting agents, etc., which probably accounts for about 8% of the castor consumption. The recent developments include castor oil derivatives as paint additives, polyurethanes, epoxides, and surfactols.

Castor oil goes into some of the newer rocket developments, and it would not be surprising that the first rocket to the moon will take along some castor. Thus castor oil is shown to be a truly versatile industrial oil that can be adapted to changes in technology.