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Margarine: 100 Years of Technological and Legal Progress¹

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Abstract

All through its 100 year history, margarine has been a prime example of the technological progress that has been made in the food industry through the efforts of oil chemists, food technologists and nutritionists. Having been developed originally to fulfill a political need for an economically new source of food fat in France during the regime of Napoleon III, the product has been continually changed to provide improvements in flavor, storage stability and physical properties, as well as to satisfy new nutritional and dietary requirements. The Margarine Industry's attainment of today's high standards of quality, nutrition and convenience has also required a comparable legal effort to establish the product's nutritional equivalence to butter, to remove restrictive legislation and to modify the Federal Standards of Identity in order to take advantage of technological advances. This paper attempts to assess some of the problems and changes currently facing the industry as a guide to what we might expect in the future.

Introduction

This year marks the 100th anniversary of the invention of margarine. Today, margarine is an everyday word in the American household; it is the leading table spread by a margin of almost 2 to 1, and it is a truly significant source of food energy, vitamin A and polyunsaturated fatty acids. However, it was not always this way. Much like the history of the airplane, television and space flight, the most significant strides made by the American margarine industry have taken place during the last 20 years, since the end of restrictive legislation, when it finally became possible to apply full technical capability and marketing knowhow to this product. As I glance around the room, I see many people who have made outstanding contributions to this important recent history.

I'm sure most of you know the story of the invention of margarine in France 100 years ago, so I won't discuss it in any detail. I do want to emphasize, however, that Megé-Mouriés' invention was an extraordinary development, when you consider the state of the art at that time.

Technological Progress

Numerous product improvements soon followed. A more pronounced butter-like flavor was achieved by permitting the milk to sour before incorporating it with the fat, later, by controlled fermentation with butter cultures.

Much research was done on emulsifying agents to improve the storage stability and frying properties of the product. The first such material used was egg yolk. Today soybean lecithin is utilized almost universally, generally in conjunction with the use of mono- and diglycerides, which was patented by Harris in the U.S. in 1933.

Around the turn of the century, tests were conducted comparing food value of margarine and butter in France, Germany and Sweden where dairy interests viewed the new product with suspicion. These early tests found that both products were nutritionally utilized to the extent of about 98%. Since these early experiments were made, many similar ones have been conducted using improved experimental techniques with comparable results. The most widely recognized work in this area was initiated by Deuel at U.S.C. and is continuing at U.C.L.A. under Alfin-Slater.

The discovery of vitamins as essential food factors ushered in the modern era of nutrition. By 1917, it was shown that butter contained growth factors which were absent in margarine, and were later identified as vitamins A and D.

Fish liver oils were found to be good sources of A and D and methods were developed for obtaining concentrates

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TABLE I
Production and Per Capita Consumption of Margarine in 1967

Area and country	Production, millions of lb	Consumption, lb per person
Western Europe and U.K.		
Austria	88.7	.....
Belgium	285.2	29.2
Denmark	192.2	39.5
Finland	48.8	10.5
France	328.4	6.5
West Germany	1,248.6	21.0
Irish Republic	26.0	.....
Italy	81.0	.....
Netherlands	566.0	43.2
Norway	197.8	47.4
Portugal	40.7	.....
Spain	49.0	.....
Sweden	266.1	35.3
Switzerland	35.0	.....
United Kingdom	681.2	11.7
Eastern Europe and U.S.S.R.		
Czechoslovakia	110.0	.....
East Germany	420.2	.....
Hungary	16.0	.....
Poland	304.6	.....
Romania	11.0	.....
U.S.S.R. (including compounds)	1,365.0	.....
Yugoslavia	55.0	.....
North America		
Canada	189.7	9.3
United States	2,114.1	10.5
Central and South America		
	110.0	.....
Other		
Australia	122.0	10.7
India (Vanaspati)	862.0	.....
Israel	44.0	.....
Japan	174.7	.....
Pakistan (Vanaspati)	206.1	.....
World total	10,239.1	.....

which could be used in margarine without adversely affecting the flavor of the product. Some years later, processes were developed for the synthesis of these vitamins, thereby assuring plentiful, uniform and high quality sources of supply at greatly reduced cost.

Margarine manufacturers learned very early that yellow margarine is much more acceptable to the consumer. In this country, the practice of including a wafer of oil soluble color with each uncolored print of margarine was introduced as soon as federal taxes on colored margarine and state laws completely prohibiting its manufacture came into effect. From 1944, when it was developed, until the repeal of the above laws, much of the uncolored margarine in the U.S. was packaged in the Peters bag, which considerably expedited the job of coloring the product.

Many countries now prohibit the use of synthetic dyes and require the use of natural coloring materials, which consist primarily of carotene extracts, red palm oil and annatto. The use of synthetic B-carotene is also generally permitted.

Continuous improvement has also taken place in the method for processing margarine. Originally the emulsion was solidified by pouring large quantities of ice water into the churn. A great stride forward was made when chill rolls cooled by brine recirculation were introduced; further progress was made when a direct ammonia expansion system was developed. Today, most of the larger factories throughout the world use tubular coolers. The first practical and most widely used machine is the Votator, which was introduced in 1936.

Margarine packaging has also been revolutionized over the years. In its early days, margarine usually reached the retail shop packed in wooden tubs and the grocer weighed out the amount required. This practice was not only unsanitary and hard on product quality, but it also encouraged the less honest proprietors to sell the colored product as butter, which later helped provide an excuse for the punitive laws that followed. Today, most margarines for household use are packaged on high speed equipment which wraps a conveniently sized print in a protective wrapper of parchment paper or aluminum foil and places it in an attractive, printed or foil-coated carton. In the last few years, eye-catching table service cups of aluminum or plastic have been introduced in this country.

Developments over the years in the fats and oils industry have also been responsible for dramatic changes in the margarine business. The development of a process for re-

fining coconut and palm kernel oils rapidly led to the use of these oils to relieve the shortage of the more expensive animal fats in Europe. By 1920, the use of coconut oil accounted for about 45% of the fats and oils used in U.S. margarine.

The development of the first edible hydrogenated fats ushered in an era when it became possible for the margarine manufacturer to obtain tailor-made properties from the relatively cheap vegetable and marine oils, thereby eliminating the dependence of the industry on the tallow and lard markets. In the mid-1930's, whale oil became the single most important ingredient of European margarines.

The development of new vegetable oil sources, such as palm, sunflower and, particularly, soybean oil, have done much to increase availability and stabilize prices. It is only during the last 30 years that palm oil has become an important raw material for margarine on the world market. Shortly after World War II, soybean oil became the leading margarine ingredient in this country, currently maintaining a share of about 72%. The work of the Northern Regional Laboratory, of course, was very important in the development of this commodity.

Legal Progress

The history of margarine legislation is every bit as interesting and important to the development of the margarine industry as the technical progress we have been discussing. In some countries, the margarine industry was permitted to develop without too much interference. Other countries, such as Canada and the Union of South Africa, completely prohibited the manufacture and sale of margarine to avoid competition with local dairy interests. Restrictions in these countries were not repealed until after World War II.

There was considerable resistance to the introduction of margarine by the dairy farmers in the United States. In 1884, New York passed the first state antimargarine laws and within two years seven states had laws completely prohibiting the sale of margarine. As was to be the case many times thereafter, the margarine industry had to go to the courts to fight for its very survival. The Supreme Court decided that a state could not prohibit the sale of this food.

This, of course, did not stop the protectionists. Six states soon passed laws ordering that the product must be colored pink, and by 1902, 32 states, or 80% of the population, lived under laws that banned the sale of yellow margarine. The Supreme Court upheld the state laws prohibiting artificially colored yellow margarine, but did strike down the laws forcing the atypical coloration of the product. (However, as recently as 1967, a North Dakota legislator demanded that margarine be colored pink or green.)

Another type of control, the taxing of the product and the licensing of manufacturers and dealers, appeared first on a state level in Mississippi, then on a national basis, with the passage of the Oleomargarine Act of 1886. This act was immediately reviewed by the Supreme Court, which upheld it as a revenue measure, although acknowledging it to be an oppressive use of the tax power.

These restrictive measures, however, did not stop the growth rate of margarine, which continued to set new volume records at the turn of the century. The dairy interests concluded that further restrictions were necessary and finally centered on a stiff increase in the federal tax on yellow-colored margarine. In 1902, Congress enacted a new law which removed the protection of interstate commerce when margarine was transported into a state, and also amended the earlier Act to increase the color tax to 10 cents, which was about half the retail price at that time. The Supreme Court upheld the constitutionality of this amendment, finding that the Fifth Amendment's guarantee of property rights did not prevent Congress from instituting a revenue measure that could possibly destroy a business.

The effect of these regulations on margarine production was immediately apparent. While volume did take an up-

turn after five years, these increases were due to an expanding population rather than a higher usage level. Consumption rates did not significantly exceed 1902 levels until the first great American wartime fat shortage of World War I. Shortly after the war, margarine production was cut in half and did not attain earlier levels until we were well into World War II, and again ran into heavy fat shortages.

During the Depression, farm prices collapsed and farmers demanded and got sharp increases in the tariffs on margarine and butter, a 3¢/lb tariff was placed on coconut oil, which made its use in margarine prohibitive. By the year 1936, 27 states prohibited colored margarine, 24 imposed some kind of consumer tax, and 26 required licenses or had other restrictions. Legislatively, the U.S. margarine industry had reached its darkest hour.

The turning point in legal history is marked by the promulgation of the Definition and Standard of Identity for Oleomargarine by the Food and Drug Administration in 1941. This Standard gave margarine an official identity of its own, and removed the "imitation butter" stigma from the product. The dairy industry recognized the importance of this step and contested this action in the courts. Fortunately for our industry, the Federal Court of Appeals preserved the Standard.

At about the same time, the comparative nutritive merits of margarine and butter were again being debated at Federal Trade Commission hearings which lasted for almost four years. Some of the leading scientists of the day were called to testify. When the hearings ended, all evidence had conclusively indicated that the two spreads were at least nutritionally equivalent. Further confirmation of this conclusion soon came in special reports by the National Research Council and the American Medical Association's Council on Food and Nutrition.

In spite of all this evidence, the legislative situation may have remained undisturbed for many more years, if a crisis in dairy production had not occurred in late 1947 when butter prices went up to \$1/lb. Four major hearings were held and the controversy raged for more than two years. Finally, the Margarine Act of 1950 was signed into law by President Truman and on July 1st of that year the federal margarine tax system came to an end.

Restrictive state laws also began to be repealed. However, severe struggles were still required in several important states. The removal of all bans on colored margarine was not completed until the old laws were finally repealed in Minnesota in 1963 and in Wisconsin in 1967. Currently, excise taxes ranging from 5 to 20¢/lb still exist in ten states.

The Recent Past and the Present

Finally, after 77 years, the U.S. margarine industry was free to effectively compete in the market place for the consumers' dollar. In a very short time, it was demonstrated that this was not a fair contest either, but now it was the butter interests that suffered. In the relatively short span of eight years, margarine volumes outpaced butter production. Today U.S. margarine production is 2.5 times as great as 1949. The record of the margarine industry is particularly impressive when you consider that total spread consumption has dropped from a prewar level of about 20 lb per person per year to about 16 lb.

Comparative average retail prices of margarine and butter for the last 20 years demonstrate one very important reason for margarine's rapid growth. In spite of a steady pattern of inflation, the average cost of margarine has actually decreased during this time and is now only 1/3 the cost of butter, in contrast to 42% of the cost of the high-priced spread in 1949.

Price, of course, was far from the only factor responsible for margarine's rapid rise. Almost immediately after the restrictions were removed, the margarine industry began to demonstrate what free enterprise and technical capability can accomplish.

The very year that the Margarine Act was passed, Standard Brands Inc. introduced colored quarter pound sticks in aluminum foil wrappers. Almost immediately this be-

came the standard of quality for butter, as well as for margarine.

In 1952, Kraft Foods brought about another major change in the industry by developing and effectively promoting a margarine that "spreads smoothly even when ice cold."

In 1956, Lever Bros. Co. formulated a lower melting oil blend and added a small percentage of butter which enabled them to convince the grocer, for the first time on a national basis, that a margarine should be handled under refrigerated distribution conditions. This development also proved that a new, higher price level could be established for a premium product.

The next year Kraft developed a unique new process for a soft whipped margarine in stick form, packaging six of these sticks to a pound.

In 1958, Standard Brands became the first to capitalize on the nutritional studies that were being conducted with polyunsaturated vegetable oils. The initial Fleischmann's Corn Oil Margarine, however, did not contain any unhardened, liquid corn oil and had a PUFA content no higher than the conventional margarines of the day. In spite of this, the consuming public was convinced of the magic of corn oil, and the Standard Brands' product attained a very significant share of the market. Competitive pressure from other corn oil products, which actually did have increased P/S ratios, soon forced Standard Brands to reformulate their product, which is still the leading corn oil margarine today.

In 1962, Anderson, Clayton and Co. introduced another product innovation, a soft margarine with a high P/S ratio in a table service plastic container. Further improvements in this concept were made when Kraft introduced an attractive aluminum cup in 1965, and Lever Bros. changed to a decorated plastic container in 1968. This product category currently holds a market share of approximately 15%.

In 1963, Frick's Foods went into test market distribution of a liquid margarine in a squeezable plastic bottle. To date, this product type has not achieved national importance, but a number of major manufacturers are continuing to market test their own particular formula and packaging modifications.

The next year, Carter Wallace Co. developed a diet margarine containing half the calories of the regular product. Shortly after introduction, the product was seized by the Food and Drug Administration, which ruled that the product was illegal. Carter Wallace won the ensuing court case, and all the major margarine manufacturers are producing this type of product today.

It is obvious from the above that the margarine industry has done a tremendous job of providing the changing needs and desires of the consumer, while continuing to improve upon the nutritional properties which the original product was developed to supply.

Where Do We Go From Here?

A new development already visible on the horizon is the impending issuance of the Codex Alimentarius Standards for margarine. I won't discuss this in any detail or speculate on the impact of this development; however, I would like to emphasize that there are some major differences in the Codex Standards which will shortly be considered for international approval. The most important of these are the 16% maximum limit on moisture which is lower than most, if not all, current U.S. consumer margarines; the permitted use of marine oils in the Codex, as well as some differences in the additives allowed.

Table I lists margarine production volumes and per capita consumption figures in the principal producing countries of the world. Analysis of these figures shows the U.S. has 22% of total world production, being over 50% greater than the next largest producer, the U.S.S.R. However, further study shows that the U.S. is one of the lowest in per capita margarine consumption, and far below all other countries in total spread usage. Do these figures indicate that we still have unlimited potential for growth? I think not. The most recent figures show that margarine

volume has very abruptly plateaued at slightly over 2.1 billion pounds. At the same time, it appears that butter production may be bottoming out and that further inroads into its remaining hard core market share will be much more difficult to attain. In fact, there are some factors at play today which could have a negative effect on product volume. Some of these are the following: the growing affluence of the population which tends to increase the usage of meats, convenience foods and butter and reduce the consumption of bread, potatoes and margarines; a growing consciousness of weight control by the consumer and recommendations by segments of the medical profession to reduce the level of fats in the diet; movements in the dairy states to legalize butterine, which is half butter-fat-half vegetable fat product, in order to compete more effectively pricewise; a growing awareness by the dairy interests that the whole industry is vulnerable to the filled and imitation dairy products because of current milk pricing policies, and attempts on their part to change this price structure.

What can the margarine industry do to overcome these negatives? Obviously, it must continue to do everything it has been doing so well in the last 20 years—maintain low margarine prices in relation to butter, continually tighten quality standards in all segments of the industry, and to further proliferate product and package innovations tailored to meet the ever changing requirements of the consumer. However, a conscientious effort must be made to provide really meaningful improvements while avoiding the temptation to resort to sales gimmicks—and we have also had a few of these over the years. Furthermore, products must be developed which provide the P/S ratios to meet dietary therapies desired by the medical profession, while avoiding the dangers of a numbers race. Industry cooperation will be needed to broaden the Standards of

Identity, in order to provide the latitude necessary for continuing product improvement. Last but not least, our counterparts in sales will have to work even harder to open up new markets for our products.

If we were to look at shortening production figures over the last 20 years, we would find that the total volume of usage in households has remained constant, which really means that per capita consumption in this usage area is dropping. On the other hand, the institutional sizes are growing steadily and bulk shipments have increased at a tremendous rate in the last 10 years. These shifts in usage to a large extent reflect the phenomenal growth of the fast food service franchises and the change to bulk handling in the cake mix industry.

A comparison of similar statistics for the margarine industry for 1967 shows that 76% of the product consumed is used in the home, and is more than 2½ times the volume of shortening put up in the smaller sizes. Margarine eaten away from home in public eating places of all kinds is estimated to amount to about 340 million pounds, or about 16% of production; this figure is only about ¼ as large as institutional shortening and much smaller than butter sales to this market. Some 175 million pounds of margarine was sold to bakeries and various industrial outlets to be used as ingredients in other foods. Again this volume is less than 20% of that of shortening. There certainly appears to be plenty of unsolved opportunities for continued growth in these areas.

I would like to make one final comment. I do not know what the historians will have to say about the margarine industry's second 100 years. From personal experience, I do know, however, that the last 20 have been fast-paced and exciting. I am sure that the next 10 or 20 will be also.

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