Changing Trends in Consumer Margarines[1]

F.J. MASSIELLO, J.H. Filbert Co. Baltimore, Maryland 21229

ABSTRACT

Margarine has changed dramatically from 100 years ago when it was first made as a butter substitute. It is now a high technology product with many mutations and variations. There are ten different types of margarine produced today. There are regular, whipped, and polyunsaturated margarines in both stick and soft forms. There are diet margarines, liquid margarines, and new 60% vegetable oil spreads. These margarines are made from a variety of oils including soybean, cottonseed, palm, corn, safflower, and sunflower oils. These tailor-made products cater to the needs of many different segments of the population. This marketing strategy has helped to create increasing consumer demand over the years.

During the past 100 years, we have seen great changes in the margarine industry. Margarine was first produced as a butter substitute, but it is now a high quality, high technology product with attributes that no longer categorize it as a substitute. To many consumers it is now a much more desirable product than butter. In this paper, I will trace and highlight the many important changes in our industry that have created increasing consumer demand for margarine over the years.

Margarine was invented in 1869 to fill a growing consumer need for table fat due to expanding populations during the Industrial Revolution. The production of butter, because of the limited supply of milk fats, was lagging far behind the requirements of the population, especially in Western Europe. Margarine, as first produced by Mege Mouries, a Frenchman, was made with beef tallow. The beef stock was rendered at low temperature, then the separating yellow liquid fat, called oleo stock, was drawn off and left to crystallize in trays. This purified beef fat was then wrapped in filter cloths and cold pressed. The softer part from this pressing, called oleo oil, was the main fatty raw material for margarine.

The oil was mixed with milk and salt. The mixture was churned and then chilled with ice water to solidify the emulsion. The excess water was drained off, and the margarine was then kneaded into a plastic mass and pounded into barrels for sale as bulk margarine.

In spite of the growing herds of cattle on the Great American Plains, (the main source of beef tallow) as the world population continued to grow in the early 1900s, the animal fat supply was not enough to meet the ever increasing worldwide consumer demand for table fat. At about this time, the process of hydrogenation was perfected that could change liquid vegetable oils into hard fats, and vegetable oils were increasing in their availability. This development enabled margarine manufacturers to use a wide range of raw materials; and by combining fats of varying melting points, they were able to improve the texture and plasticity of margarines that would be more acceptable to the consumer.

These raw materials, for margarine, were much less expensive than butterfat and offered an unusual opportunity for fraudulant practices. Unknowingly, the consumer was sometimes sold butter adulterated with margarine. In addition, the sale of margarine was adverse to the interests of the dairy industry. These two factors gave rise to much legislation governing the production and distribution of margarine; and due to the powerful dairy interests, the laws proved to be punitive and restrictive, rather than protective, of the consumer.

In 1886, a Federal law was enacted that imposed a tax of two cents per pound on margarine in addition to restrictive license requirements. In 1902, this was replaced by a tax of .25 cent per pound on uncolored margarines and one of ten cents a pound on colored margarines. In addition, many individual states imposed extra taxes and passed laws prohibiting or otherwise restricting the sale of margarine.

The results of these inhibiting regulations can be seen in Figure 1 which shows the per capita consumption of margarine and butter from 1900 through 1976. You will note that except for the two world wars when there were shortages of butter the per capita consumption of margarine was relatively low from 1900 to 1940. Then in 1941, a Federal Standard of Identity was promulgated for margarine which established it as a food in its own right, and fortification with Vitamins A and D gave it new nutritional respectability.

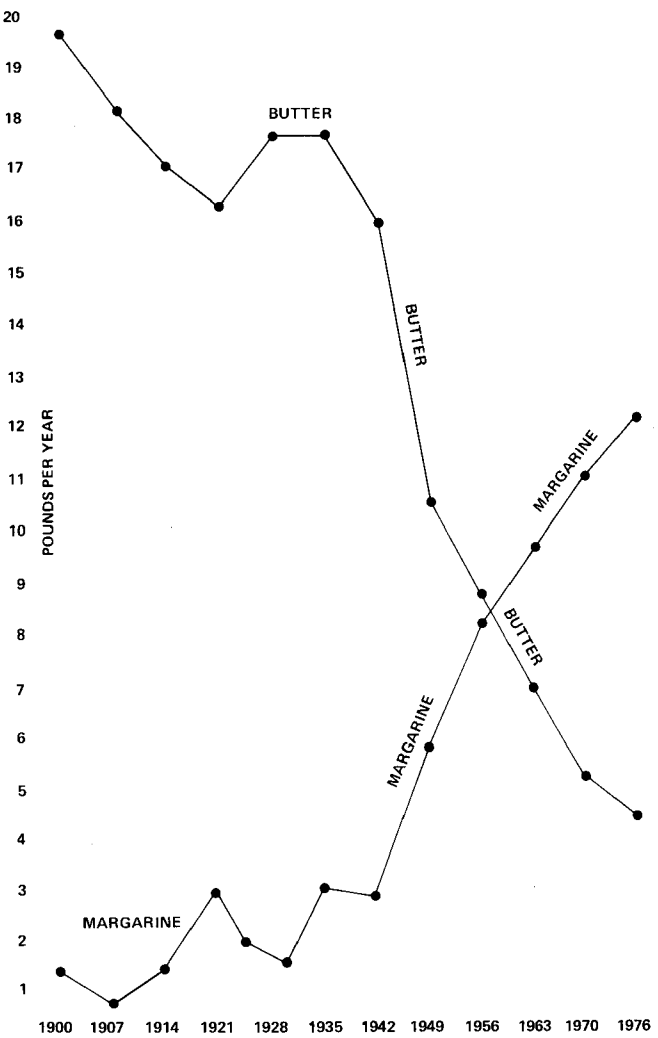

FIG. 1. Per capita consumption of margarine and butter (pounds/year).

[1]Presented at the AOCS Meeting, New York, May 1977.

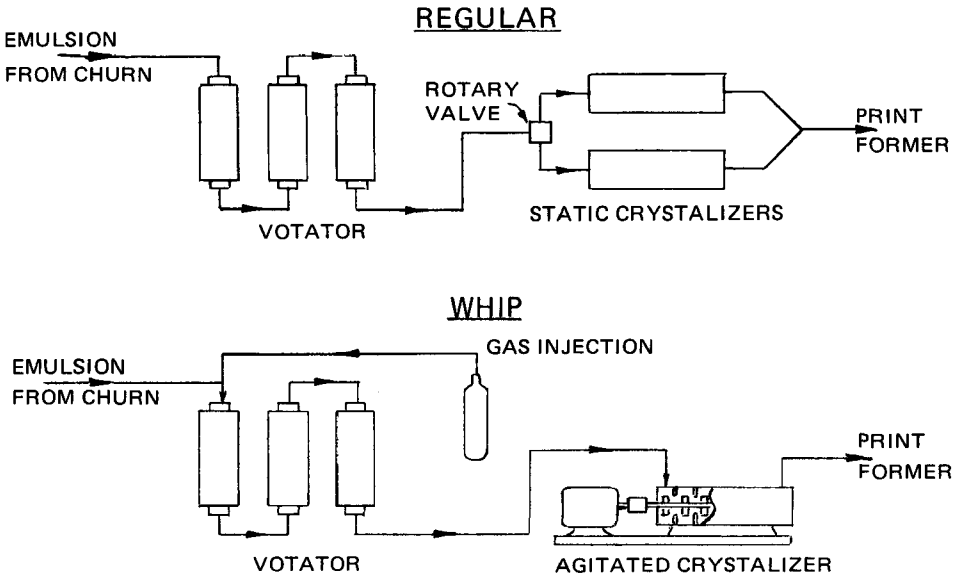

FIG. 2. Stick margarine production.

In 1947 when butter hit an all time high of $1.00/pound, the demand for the more economical spread surged forward. Also, at this time, there appeared added consumer pressure to repeal the taxes on margarine. This was finally achieved in 1950. Most state restrictions were removed by 1954. As a result of the economic difference and the improved convenience of colored margarine, consumer demand continued to rise to a per capita consumption of 8.6 pounds in 1957. For the first time since its inception, with most of the restrictive chains broken, margarine captured its hard won position as the leading table spread having met the important consumer needs for good nutrition, utility, and price/value relationship.

During the past two decades, margarine has assumed new forms and new identifies which have furthered its growth to a per capita yearly consumption of 12.1 pounds in 1976.

Let's look at the new technologies and innovative changes that have produced a series of tailor-made products that meet the many individual needs and wants of all the consumers.

First of all, the state of the art of making margarines in 1950 can be seen in Figure 2. A well-agitated emulsion of margarine slurry is pumped from a churn to a Votator chiller that cools the margarine from ca. 44 C down to ca. 9 C. The super-cooled liquid then flows through an alternating rotary valve and alternately comes to rest in quiescent crystallizing units often referred to as "B" Units. The fat crystal structure begins to grow, while at rest, and the mass then becomes firm enough to move forward and to be worked and molded into prints in standard Morpac print forming machines.

In 1957, an innovative process was developed for whipping or incorporating nitrogen into margarine. The nitrogen is introduced during the chilling process or at the suction side of the feed pump from the churn. The chilled aerated mass from the Votator is then mixed in a small agitated crystallizing unit called a blender. The vigorous mixing action, although allowing crystal growth, prevents firm crystal lattice formation. The margarine is then immediately packaged gently as a soft semi-solid mass in specially designed print forming machines. The fat crystals then begin to grow together and firm the margarine after it is in the package. If the product were firm before molding, the pressure used to form the print would squeeze the nitrogen gas from the margarine resulting in a nonuniform product.

This process makes a product with 50% more volume to the pound. The margarine is softer and easier to spread at refrigerator temperatures. With the density being less than regular margarine, equivalent volume servings results in consumption of one-third fewer calories. This feature is attractive to those consumers endeavoriang to limit their daily calorie intake as well as seeking economy.

Today, there are 40,000,000 pounds of whipped stick margarine sold in the U.S. representing 2% of the total retail market.

In recent years, medical research findings have suggested the advisability of increasing the proportion of polyunsaturated fatty acids in the diet and reducing the intake of cholesterol. This has resulted in an increase in demand for all-vegetable oil margarines high in linoleic acid made with corn, safflower, and sunflower oils. In 1958, these special premium type margarines began to appear. By selection of the proper processing conditions during hardening and/or

TABLE I

Fatty Acid Profile

	Regular stick margarine	Special stick margarine (high polyunsaturates)	Soft margarine	Liquid margarine
cis,cis-Polyunsaturates	3-10%	20-40%	30-60%	40-60%
Monounsaturates	50-70%	20-50%	15-42%	20-33%
Saturates	16-25%	13-23%	10-20%	10-16%
Solid Content index				
10 C	25-30%	16-24%	8-14%	1.5-4.0%
21 C	14-18%	10-15%	5-8%	1.5-4.0%
33 C	2-4%	1.5-4%	.5-2.5%	1.0-3.0%

TABLE II

Comparison
Diet Imitation Margarine Versus Margarine

	Diet imitation margarine	Margarine
Fat phase	40%	80%
Water phase	59-59.5% (Water, salt, preservatives)	19.5-19.8% (Milk, salt, preservatives)
Emulsifiers	.5-1.0%	.2-.5%
Types	Soft	Soft and stick

by combining liquid oils with properly hardened fractions, the linoleic acid content of these oils was maintained at a relatively high percentage.

Table I shows the fatty acid profiles of these special high linoleic acid margarines versus the regular margarines. Note that the amount of polyunsaturates in special margarines, mainly *cis,cis*-linoleic acid, is several times greater than that in regular margarines. The monounsaturates (mainly oleic acid) are lower due to less hardening and less formation of the oleic isomers. The amount of saturates is about the same, to impart the needed body for the margarine for printing into sticks. There are ca. 260,000,000 pounds of this type of margarine sold today which is 13% of the total retail market.

In 1962, soft margarines were developed which were special margarines with even higher percentages of polyunsaturated fatty acids. Substantial amounts of liquid oils, as high as 70%, were used in formulations. These margarines couldn't be formed into firm sticks and, therefore, had to be packaged in tubs made of plastic or coated paperboard.

The process for making soft margarine is similar to making whipped margarine in that after votating the chilled emulsion is mixed in a large agitated crystallizing unit that prevents fat crystal structures from growing into a firm network. The soft fluid product can then be readily filled into plastic cups on liquid filling machines. The margarine will then firm-up after it is in the package.

Table I shows the fatty acid profiles and the solid content index of soft margarines versus the stick margarines. Note that the *cis,cis*-polyunsaturates are as much as 20 times higher than in regular margarines. Monounsaturates are considerably lower due to less hardening and less formation of the oleic isomers. The saturates are just slightly lower because they are still needed to give some body to the margarine. The solid content of soft margarines is ca. 50% less than regular margarines which accounts for their softness and spreadability at refrigerated temperatures.

Today, there are 430,000,000 pounds of various types of soft margarines sold in the U.S. which is ca. 22% of the total retail market.

In 1964, another tailored product, liquid margarine, was developed as a useful product for both home consumers and commercial users. For consumers, it is packaged in a convenient squeeze bottle and is pourable at refrigerator temperatures. It can be readily used for pan frying and spreading on cooked foods or foods to be frozen. For commercial users, it is packaged in drums and can be easily metered and pumped. Some products are stable for long periods of time at room temperature as well as at refrigerator temperatures. This characteristic is developed by chilling and crystallizing a blend of liquid or lightly hydrogenated oil with a small amount of hard fat. The formation of β' fat crystals, several hours before combining with the milk phase and rechilling, makes a very stable fluid margarine emulsion at all working temperatures. Direct preparation of the emulsion and subsequent votation can also be used to manufacture this product type leading to liquid margarines with better flavor characteristics but requiring refrigeration at all times. A unique characteristic of liquid margarine (Table I) is that the solid fat content is very low and almost the same at all temperatures. This, of course, accounts for its pourability at all temperatures.

There are 26,000,000 pounds of liquid margarine sold in the U.S. which is 1.3% of the total retail market.

Innovation in types of margarine continued in 1965 with the development of imitation diet margarine for those consumers on low fat diets. As shown in Table II, this type of spread has only one half the fat of regular margarine. The water phase doesn't contain milk because its protein content adversely affects the necessary water-in-oil emulsion for margarine. Because of the large amount of water, a strong emulsification system is needed to maintain the diet emulsion. Greater percentages of emulsifiers and more intensive mixing action are needed in churning the emulsion than with regular margarines. Maintaining very precise processing conditions are most important to prevent a phase reversal to an oil-in-water emulsion. This would be most unsatisfactory because water will tend to separate when the emulsion is chilled in the Votator; and microbiological problems will also arise if oil is not the continuous phase of the emulsion. Diet margarine is manufactured only in the soft form; the use of harder fat blends would result in water separation when used as a spread.

The disadvantages of diet spread is that the melt down and emulsion breakdown in the mouth is slower than with regular margarine. Also, because of its high water content, it can't be readily used for frying or baking. Nonetheless, 48,000,000 pounds are sold to fat conscious consumers, which amounts to about 2.4% of the margarine sold in the U.S.

In 1975, new second generation economy products also appeared in the marketplace in the form of 60% vegetable oil spreads. These spreads can't be called margarine because they do not meet the 80% fat requirement in the Federal Standards for margarine. These spreads, like the imitation

TABLE III

Varieties of Margarine and Percent Share of Market

Types of margarine	1976 Sales (million lbs)	% Share of		1955 Pounds sold	% Share of market
1. Regular stick margarine	440	22.0%		1,200,000,000	100%
2. Polyunsaturated stick margarine	664	33.2%	70.2%		
3. High polyunsaturated stick margarine	260	13.0%			
4. Whip stick margarine	40	2.0%			
5. Regular soft margarine	240	12.0%			
6. Premium soft margarine	132	6.6%	21.6%		
7. Whipped soft margarine	60	3.0%			
8. Diet imitation margarine	48	2.4%			
9. Liquid margarine	26	1.3%			
10. Vegetable oil spreads	90	4.5%			
Total	2,000	100.0%			

diet margarine, need a stronger emulsifier system than regular margarine, and care must be taken to prevent phase reversal with attendant watering-out of the product and possible microbiological problems.

The advantages of the spreads are that they are more economical and have reduced calories per serving.

Vegetable oil spreads have already reached a volume of 90,000,000 pounds and represent a share of total market equal to 4.5%.

About two decades ago, there was only available a regular stick margarine. Today, as can be seen in Table III, the consumer can purchase ten different major varieties of margarines and spreads. The stick margarines, as a major category, holds approximately a 70% share of the market, but it is segmented into four varieties:

1. Regular Stick Margarine – made with partially hydrogenated soybean and cottonseed oils.
2. Polyunsaturated Stick Margarine – made with liquid and partially hydrogenated soybean and cottonseed oils.
3. High Polyunsaturated Premium Stick Margarines – made with liquid and partially hydrogenated corn, safflower, and other premium oils.
4. Whipped Stick Margarines – made of partially hydrogenated soybean and cottonseed oils.

The soft margarines, as a major category, has 21.6% of the market, but is segmented into three main varieties:

5. Regular Soft Margarines – made with all partially hydrogenated or liquid and partially hydrogenated soybean and cottonseed oils.
6. Premium Soft Margarines – made with liquid and partially hydrogenated corn and safflower and other premium oils.
7. Whipped Soft Margarines – made with all partially hydrogenated or liquid and partially hydrogenated soybean and cottonseed oils.

The remaining categories of diet (8), liquid margarine (9), and vegetable oil spreads (10), made mainly with liquid and partially hydrogenated soybean and cottonseed oils, hold small but still significant shares of the margarine market.

What will be the future consumer trends in margarine? We may see further segmentation of the market as well as further growth of recent innovations.

I think we will see a further dramatic increase in 60% vegetable oil spreads. This category can possibly capture 10% of the market within the next few years, especially if oil prices continue in an upward trend.

We will also see a continued growth in the high polyunsaturated margarines not only because the consumer is becoming increasingly aware of the health factors, but also due to energy considerations. High liquid oil margarines consume less natural gas (needed in the hydrogenation process) which is fast becoming less available and more expensive.

Because of recent publicity of potential carcinogenic properties of food additives that have been generally regarded as safe, we may see a growing demand from consumers for a margarine made with nutrients that are considered mainly of natural origins (unhydrogenated oils, natural flavors and no preservatives). There are a few such products in test market today.

We may also see a demand for margarine with greatly reduced *trans* isomer content because of questions raised about the biological utilization and affects of *trans* fatty acids. Margarine oils for this type of product could be made by interesterification.

In conclusion, we have been the evolution of margarine from very small and difficult beginnings with legal shackles and barriers that inhibited its growth. However, there was a great underlying need for this product; it was something the consumer wanted. Therefore, margarine was destined to reach its present stature as a major commoditiy of commerce.

Its evolution is not yet completed. Its future will continue to be one of growth, change, and innovation all oriented toward consumer needs and acceptance.

[Received May 31, 1977]