The Development of the Evaporated Milk Industry in the United States

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Although the evaporated milk industry is relatively young, it had its beginning in the 19th century. For this reason it is desirable, before going into a discussion of the last 50 years of growth and development, to point out certain of the milestones which occurred during the 1800’s. The search for a method of keeping milk in a condition as nearly as possible like that in which it came from the cow is a fascinating story.

History records that it was Nicholas Appert, an obscure confectioner in the outskirts of Paris, who was the first to evaporate and preserve milk by heat in a sealed container. His experiments on food preparation were begun in 1795 when France, under Napoleon, was fighting most of the other nations of Europe. Need for transportable food for the far-flung French armies had prompted the French government to offer a prize of 12,000 francs to anyone who could find a satisfactory method of preserving food.

Toiling in a tiny kitchen back of his shop, patiently cooking first one food and then another, Appert discovered that he could keep foods for long periods of time by cooking them, sealing them air-tight, and then cooking them again. After 15 years of experimenting, he announced his results, and on January 30, 1810, he was awarded the prize. It is remarkable that Appert, knowing nothing of bacteria, had come to the correct conclusion that food cooked and sealed would remain in good condition. It was another Frenchman, Louis Pasteur, who many years later, by demonstrating the nature and behavior of microscopic organisms, solved the riddle.

Appert’s milk process consisted of reducing a given quantity of milk to one-third its original bulk by boiling in an open kettle. This milk he then put into bottles, which he corked tightly and heated again in a hot water bath. The strong cooked flavor that resulted in Appert’s process can easily be imagined—and he was not aware, of course, of the destructive effect on certain vitamins of the combination of free access to air and heat. Though Appert’s evaporated milk in no way resembles that of today, he demonstrated that concentrating milk was practical.

While Appert was at work, others in both France and England were experimenting in milk preservation by evaporation and the addition of sugar. The early French and English patents obtained for such purposes were the forerunners of the sweetened condensed milk we know today. In 1813, a patent was obtained in England for a “vacuum pan,” now a most important piece of equipment in the evaporated milk process. It is in such pans that the milk boils vigorously at the low temperature of around 130° F., and half of the water is removed without important effect on the vitamin content. In England in 1835, a vacuum pan was used for the first time in connection with milk evaporation.

In 1853 Gail Borden applied for a U. S. patent on his idea of preserving milk in a semi-fluid state after evaporation in vacuo. This followed some 10 years of experimentation. In August, 1856, he received patents from the United States and England. Although the claim of the patent granted Gail Borden was that of “producing concentrated sweet milk by evaporation in vacuo without the admixture of sugar or other foreign matter,” Mr. Borden’s commercial development was in the manufacture of sweetened condensed milk. Equipment design has greatly changed, but the principle of the vacuum evaporator developed by Gail Borden is still a foundation of the industry. Gail Borden’s original vacuum pan can be seen today at the Smithsonian Institution, Washington.

On January 1, 1857, an English patent was granted to Joseph House, for preserving unsweetened evaporated milk. He produced some milk on a commercial scale, but the product was injured to such an extent by the heating that it did not find favor.

It took another war, this time in our country, to demonstrate the usefulness of a storable, transportable milk. At the close of our Civil War, the story of the success of sweetened condensed milk was carried to Switzerland by Americans, and the first European plant was shortly established there. The man placed in charge of the processing and packaging in this plant in Cham, Switzerland, was John B. Meyenberg. It was his conclusion that milk from which only water had been removed and to which nothing had been added would be the most convenient form for the largest number of purposes—milk evaporated and sterilized.

Since he could not interest his organization in his idea, he crossed the Atlantic and eventually landed in St. Louis. There a Swiss countryman and dairy farmer, school teacher Louis
Latzer, had faith in his idea. Together with a group of Swiss dairy farmers in Highland, which was about 30 miles across the Mississippi in Illinois, they formed a company to operate the first unsweetened evaporated milk plant in the United States and in the world.

In 1884 Mr. Meyenberg received a United States patent which covered the process of sterilizing by steam under pressure while the cans are agitated. This is the basis of the sterilization process still used throughout most of the industry. In the following year evaporated milk was first manufactured commercially in the United States.

The dependability of evaporated milk as a safe, sterile, transportable concentrated whole milk supply for maintaining the health of the men in the armed forces was ably demonstrated during the Spanish-American War.

The year 1901 brought machine-made evaporated milk cans to replace those that were fabricated by laborious hand-work. The early machines produced about 60 cans per minute in contrast to present-day machinery, which turns out cans at about six times that rate.

**Introduction of Homogenization**

Homogenization was introduced in the manufacture of evaporated milk in 1909 to stabilize the emulsion and retard fat separation. This process resulted in a substantial increase in the period of time that the product could be held in storage without physical change. This was the first application of homogenization in the dairy industry and was universally adopted by all manufacturers. Homogenization did much to increase consumer acceptance of evaporated milk during this early period.

**Continuous Sterilization**

In 1922 the continuous system for sterilizing evaporated milk was introduced. By 1936 this method had almost completely taken the place of batch sterilization.

In 1923 manufacturers organized the Evaporated Milk Association, the purpose of which was to institute and conduct fundamental research in the public interest and to develop an educational program to apply the fundamental information obtained by research.

Also in that year the U. S. Department of Agriculture promulgated an advisory standard for “Condensed Milk, Evaporated Milk, Concentrated Milk.” This standard called for 7.8% milk fat and 25.5% total milk solids, which had been the standard used by the principal evaporated milk manufacturers for some 10 years previously. In 1926 the definition was clarified by removal from the standard of any reference to concentrated and sweetened condensed milk.

By 1924 the increased consumer interest in evaporated milk prompted the Evaporated Milk Association to institute studies on methods of using evaporated milk in the preparation of superior foods, and recipes were developed for

**FIG. 2.** Filling machine in an early evaporated milk plant.

Millions of cases of evaporated milk were used to supply the need for whole milk for the armed forces of the United States and its allies during World War I. At this time evaporated milk was the only commercially important form of storable whole milk suitable for every milk use. Evaporated milk was hailed as a boon to the fighting man. Between 1914 and 1918 annual production more than doubled. Service men who had been introduced to evaporated milk during the war went right on using this "armor-plated" milk when they returned to civilian life.

1918 to 1920 saw large-scale use of evaporated milk to feed the starving people of war-devastated countries. Millions of cases were shipped from the United States to feed the hungry of Europe.
popular use. This was followed by an intensive program of consumer education, supported by women's magazines and by newspapers. Home economics teachers, home economists with utility organizations, food editors, home demonstration agents, and others also helped disseminate information about better ways of using evaporated milk.

**Clinical Studies of Milk for Infant Feeding**

The year 1928 was the beginning of universal recognition of evaporated milk as the most advantageous form of milk for infant feeding, based on such properties as uniformity, sterility, and digestibility. It was discovered that the heat treatment during processing changed the physical character of the proteins so that they formed smaller and softer curds during digestion, which was of particular advantage to the small baby. The small fat globules resulting from homogenization present a larger surface and are more accessible to the fat-splitting enzymes, thus promoting faster digestion.

1928 also saw the beginning of lecture-demonstration work in college home economics classes. Similar work was begun with home demonstration agents, home economists, utility organizations, and consumer groups.

**Establishment of the Experimental Kitchen**

A fully equipped experimental kitchen was established in 1930 as a part of the Evaporated Milk Association. This was the first maintained by the industry. A home economics staff developed recipes for consumer use, for inclusion in a series of booklets, and for regular editorial services for food writers of magazines and newspapers. These services were expanded to provide food photographs with accompanying recipes in order to meet the demands of print media.

**Beginning of Nutrition Service**

By 1931 it had been established that evaporated milk was an excellent and economical whole milk supply for the entire family. To expand further the outlets for the product, educational work was begun with health and welfare agencies, medical schools, child care institutions, home economics departments in schools, colleges and business organizations, and agricultural extension groups.

By the early 1930's educators were beginning to recognize the importance of visual aids in the teaching field. An educational motion picture was developed in 1932 tracing the history of evaporated milk and showing its uses in modern-day living. This film was enthusiastically received by schools and consumer groups.

**The Vitamin D Program**

In 1933 the American Medical Association Council on Foods and Nutrition organized a vitamin D milk program to encourage the production and use of vitamin D fortified milk. Also in 1933, the *Journal of the American Medical Association* commented editorially, "Whatever the explanation may be, the fact remains that the incidence of rickets is still too great and will continue to be until some cheap, generally available, agreeable source of vitamin D is provided. Vitamin D milk seems to offer promising possibilities of meeting these requirements."

The following year brought the introduction of methods of increasing the vitamin D content of evaporated milk to 135 USP units per pint, either by irradiation or by addition of vitamin D concentrate. This pioneering step proved to be an important nutritional advance by providing a significant source of vitamin D, which promotes utilization of milk minerals for growth and maintenance of good bones and teeth. The use of vitamin D in evaporated milk and later in other fields of the dairy industry has provided an effective means for the elimination of rickets as an infant health problem.

**Establishment of Standards**

In 1939 an industry-wide voluntary sanitary standards program for the production of evaporated milk was inaugurated. It covers all phases of plant, milk, and farm sanitation, and it is accepted and followed by all plants and receiving stations. The standards and quality control methods of the industry have been widely approved at federal, state, and local levels.

In 1940 the evaporated milk definition and standard of identity was promulgated by the U. S. Food and Drug Administration. This standard required 7.9% milk fat, 25.9% total milk solids, and provided for the optional addition of 7.5 USP units of vitamin D per avoirdupois ounce.

**Expansion During World War II**

During this period (1940-45) millions of cases of evaporated milk were used to supply safe whole milk for the armed forces and civilians throughout the world. During one year more than 38 million cases of evaporated milk were so used. During 1945 alone almost 87 million cases of evaporated milk were produced, as compared to the prewar figure of about 48 million cases.

This increase in production of evaporated milk was brought about largely through increasing the capacity of existing plants and through the use of receiving stations for expanding the buying territory of a plant. Since World War II this trend has continued.

**Adoption of Vitamin D Fortification by Industry**

In 1944 vitamin D fortification of evaporated milk by the addition of pure vitamin D concentrate was inaugurated on an industry-wide
Vitamin D addition was increased to 400 USP units per pint, the level considered to be optimum for meeting the needs of infants, children, and adults. This increase was subsequently supported by the American Medical Association Council on Foods and Nutrition and by the National Research Council Food and Nutrition Board.

Shortly thereafter it could be said that all evaporated milk marketed in the United States contained 400 USP units of vitamin D per pint. The level of vitamin D was controlled by a voluntarily accepted and financed check program.

The importance of vitamin D evaporated milk is illustrated by the low incidence of rickets today. In 1955 Dr. James E. Wilson, member of the Nutrition Committee of the American Academy of Pediatrics and former Secretary of the Council on Foods and Nutrition of the American Medical Association, stated: "It is difficult at the present time to find enough active cases of rickets in infants for purposes of teaching medical students.” This is a tribute to the dairy industry.

The Postwar Period

As the supply of stainless steel became available, the large-scale replacement of coil type, single effect vacuum pans gained momentum. Tubular, double and triple effect vacuum pans of stainless steel construction were widely installed. Development of new types of equipment has enabled evaporated milk plants to concentrate fluid milk at a rate of nearly 50,000 lb. per hour. Filling and continuous sterilizing equipment was improved to the point that it could be operated at more than 200 cans per minute.

As subjects of interest to women were given considerably more space and attention in the metropolitan dailies in the postwar period, requests from editors for exclusive food features became more frequent. Editorial services were begun on an "exclusive on your coverage" basis for newspaper food editors and syndicate food writers. Demand for food photo-recipe features necessitated increased production of this type of material. An editorial service for women radio broadcasters was begun and was subsequently expanded to include women television broadcasters.

The Industry Today

From the beginning of commercial production of evaporated milk in 1885, the industry has grown to the point where there are hun-
dreds of brands of the product on the market at the present time. Evaporated milk is the largest single canned food sold in the United States—consumers open an average of more than 5,000 cans every minute.

The public has learned that evaporated milk is a safe, uniform, concentrated whole milk, but the search for ways of furnishing an even better product at reasonable prices continues. The industry's aim of supplying the consumer with this most convenient, versatile product moves forward as the results of research find practical application in the processing, distribution and sale of evaporated milk.