# A Brief History of Production Methods Used in the Margarine Industry

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IN the year 1868 Napoleon III of France was fighting the Franco-Prussian War. Napoleon's armies were hungry as well as his people. As a result of general starvation, Napoleon, being a good manager for his time, called all of his men of science for a conference. He offered a prize to the individual who could produce a new type of food which was nutritious, economical, palatable, and had good keeping qualities. The following year Mége-Mouriés, a French chemist, presented to Napoleon a new food product which he called "margarin." In 1870 Mége-Mouriés was awarded a prize for his contribution.

Mége-Mouriés had taken the lighter portion of beef stearine, mixed it with milk, which had been soured by the addition of the lining of a cow's udder, and salted to taste. After stirring, this mixture was hardened in one of the natural caves of France, after which it was formed into the desired shape.

The product thus formed was put into production immediately all over the French Territory and within a year was very popular, even in the Netherlands, which was a great butter-producing territory. The fame of this new product spread very quickly, and by 1872 it was produced along the eastern coast of the United States. Naturally, since beef fats formed a major ingredient of the new product, the meat processors in the United States proceeded with its manufacture immediately. During the first few years margarine was produced chiefly by hand and in very small quantities. There was very little uniformity in the process used or in the product produced.

By 1890 production of margarine was carried out by spraying a warm emulsion of fat and sour or cultured milk on the surface of a large wooden vat of ice water. As the fat struck the ice water, it was crystallized into small globules, thereby occluding a portion of the milk in the fat crystals. These crystals were raked off the surface of the ice water into troughs which were fastened to the sides of the vat. The crystals were then moved to a working table, where they were worked together and salt was worked into the product. The next step of the old process was to place the salted, plastic mass into chilled rooms so that the product would be in condition to be printed and wrapped. After tempering in the chill-room over night, the product was then placed in a "Friday Box." The "Friday Box" was a rectangular molder, usually holding 30 pounds of product and was built so that after it was tamped full of the product the product could be forced through a grill of wire forming 30 one-pound prints. The one-pound prints were then wrapped and cartoned by hand and packed into shipping cases. You will note that to date no mention has been made of any type of emulsifying agent, therefore margarine made by the process then in existence would lose moisture through the interstices of the fat, causing the wrapper to become wet and then later, after the moisture would evaporate, there would be a coating of salt on the packaging material.

Immediately a great amount of work was carried out with various known emulsifiers, for instance egg yolk was used in Germany during the late 80's. During the next two or three decades egg yolk preparations, glycerine, gelatine, starch, and albumin were recommended.

After approximately 1910 new and better methods of manufacturing were introduced. Instead of spraying the warm emulsion on the surface of a vat of ice water, a high pressure stream of emulsion was allowed to impinge on a high pressure stream of ice water in a trough. The trough would carry the ice water and the resultant fine crystals of hardened emulsion into an ordinary butter churn. Naturally the fatty crystals tended to float to the surface of the ice water in the churn. After all the batch of emulsion was crystallized into the churn, the ice water was drained off the churn and allowed to run off into the sewer. The butter churn was then closed and rolled in the normal manner until the fat crystals were gathered. The process of gathering was carried out so the fat would be worked in the churn, thereby helping to plasticize the fat. From time to time the margarine maker opened the churn and felt the plastic mass and when he decided it was properly worked and the excess moisture had been worked out of the margarine, he added additional cultured milk along with the estimated amount of salt necessary to make the product palatable. During this period in the development of margarine manufacture restrictive federal taxes were instituted along with restrictions on the fat content of the product, and the margarine manufacturers began to find use for a chemist since the product must contain 80% fat before it could be shipped interstate. It had also been found that coconut and babbasu oils could be blended with animal fats, and those chemists specializing in the refining of oils and fats began to show an interest in the product. Also during this period some margarine manufacturers borrowed an idea from the lard and rendering plants. The emulsion of fat and milk containing salt and various new types of emulsifying agents were sprayed onto a chilled roll. After the emulsion congealed, it was scraped from the roll and either tempered in chilled rooms, after which it was worked in various types of plasticizing equipment and printed or in some cases was carried to plasticizers. Then the product was immediately printed and packaged. In the meantime semi-automatic printers had been developed. The tempered margarine was placed in the hopper of the printer and extruded through a die into the form of a ribbon, after which the ribbon could be cut with wires, usually into one-pound prints.

During the early '20's some more developments were instituted, resulting in greater control of the quality of the finished product. For instance, after the margarine was gathered in the butter churn, a moisture determination was made, and while this determination was being made, a definite weight of the collected fat crystals was placed in a large dough blender. After the margarine maker found out how much moisture was in the definite weight of the margarine, he could add back a given amount of milk, salt, and emulsifier and thereby control the fat content of the product better than he ever had previously. Of course, after the margarine left the dough blender, it was still taken to a chilled room to be tempered over-night to prepare it for the wrapping process. In the meantime various wrapping machines were under development and, although many plants continued to place the parchment wrap and cartons on the one-pound prints by hand, a few successful companies were using wrapping machines.

During the early '30's more and more cottonseed oil was utilized in the manufacture of margarine. For years, prior to 1880, cottonseed were burned; however oil chemists found that a very good edible oil could be produced from cottonseed, and large quantities of this oil were blended with animal fats in the shortening industry. Finally, after World War I, hardened cottonseed oil became suitable for use in margarine (1). For several years during the '20's and early '30's various blends of nut oils, cottonseed oil, peanut oil, and, of course, animal fats were made into margarine. The successful production of soybean oil for use in margarine came in the early '30's.

Margarine had now grown into a recognized industry. Newer and better methods for the production of margarine were continually introduced. At this time the margarine industry again borrowed an idea from the lard and shortening industry, which had for several years used Votator apparatus for chilling and plasticizing edible fats. Votator equipment began to be foremost in the minds of all margarine production men for, if this equipment could be adopted, it would provide a compact continuous closed system from the emulsion preparation to the wrapping operation. In the year 1937 margarine was successfully produced in Votator margarine manufacturing apparatus on a commercial scale. Today practically all of the margarine made in the United States is processed in Votator apparatus, and the equipment is finding ready acceptance in other parts of the world.

In taking a quick trip through a modern margarine plant, one will find a modern structure in which the walls, floors, and ceilings are all of sanitary type construction. Production rooms are air-conditioned, and means are available for removing dust from the air introduced into the production rooms. With the exception of oil storage tanks, which are usually manufactured from black iron, all equipment is manufactured from stainless steel or other non-corrosive materials. Oil and cultured, pasteurized skim milk are pumped through stainless steel sanitary pipes to hopper-type scales or metering devices where both ingredients are weighed or measured accurately before they are directed into stainless steel emulsion churns. There they are mixed with the other ingredients of margarine; namely, salt, emulsifiers, vitamin concentrate, and color, provided the product is to be colored. After the emulsion is formed, pumps force the emulsion through the Votator margarine manufacturing apparatus where the product is further emulsified and simultaneously super-cooled. It is then directed to a chamber commonly called a Votator "B" unit, where the fats are allowed to crystallize. From the emulsion churns through the "B" unit the product is in a closed system and handled automatically. After crystallization in the "B" unit the product is further worked and led into the hopper of a standard printing and wrapping machine. The printer and wrapper not only make the print, whether it be quarter-pound (¼-pound.) or one-pound (1-lb.) prints, but it wraps the print in parchment. In the case of four quarter-pound prints the cartoner places them in a one-pound carton, and the date of manufacture may be placed on the carton or inner wrapper. The present process for the manufacture of margarine is conducive to better control of the finished product, and great labor savings are possible. For instance, when Votator equipment replaced two butter churns in a small margarine plant in 1937, labor was reduced from 23 to 13 people with a production increase from 17,000 lb. in 12 hours to 24,000 lb. in a nine-hour day. Since 1937 many improvements in efficiency have been made. In the average margarine plant the one-pound print will be packed into shipping cases by hand. Under certain conditions the one-pound packages will be placed into the shipping containers by automatic packers. In most plants in existence today shipping cases are either stapled or glued automatically after which the product is carried by conveyors into refrigerated storage.

Thus an industry was started with a few pounds of "margarin" in France in the year 1869 and has grown into an industry which produced 1,219,000,000 pounds of margarine in the United States alone last year. Many of you, although not directly connected with the margarine industry, have contributed indirectly to the development of a product which the industry is today proud to present to the ultimate consumer.

REFERENCE

1. Black, H. C., "Cottonseed & Cottonseed Products."

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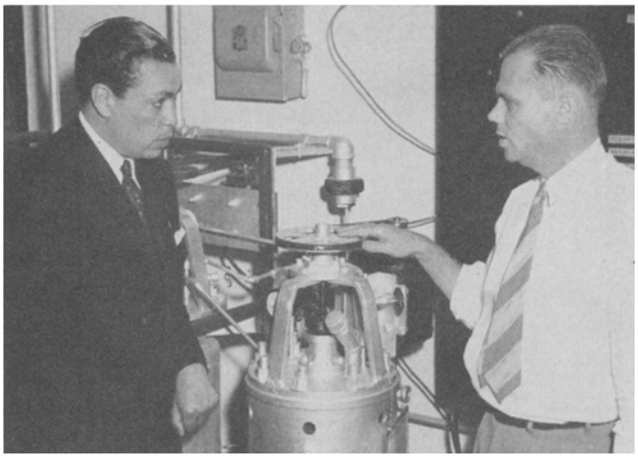
George A. Perley, associate director of research, recently celebrated the 25th anniversary of his employment by Leeds and Northrup Company, Germantown, Pa., manufacturers of instruments, automatic controls, and heat-treating furnaces.



**Sarwat Montassir (left), authority on the Egyptian vegetable oil industry, was a recent visitor at the Southern Regional Research Laboratory, New Orleans, La. Montassir, who is head of the Vegetable Oils and Soap Industries Division, National Production Council and Department of Industry, was interested in obtaining the latest information on vegetable oil extraction and processing. He is discussing the hydrogenation of rice oil with R. O. Feuge.**

## A.O.C.S. CALENDAR

**1954**

**Short Course on "Inedible Fats and Fatty Acids," Lehigh University, Aug. 15-20**

**Fall Meeting: Radisson hotel, Minneapolis, Oct. 11-13**

**1955**

**Spring Meeting: New Orleans**

**Fall Meeting: Philadelphia**

## People and Products

EMERY INDUSTRIES INC., Cincinnati, O., announces that J. E. Quinty has assumed sales responsibility for all of Emery's fatty acids and derivatives, plasticizers, and textile oils in northeastern Pennsylvania and parts of northern New Jersey. W. J. Major has been appointed to the chemical sales staff.

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A new incubator which places temperatures from 5° to 50°C., held to within 1°, is available from FISHER SCIENTIFIC COMPANY, Pittsburgh, Pa. It holds up to 160 standard size 300-ml. B.O.D. bottles and maintains the 20°C. temperature specified by the American Public Health Association for measurement of biochemical oxygen demand in water and sewage.

F. Leonard McCauley has been named production manager of Fisher Scientific and will head all Fisher design, instrument shop, inspection, and dispatching units.

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V. D. ANDERSON COMPANY, Cleveland, O., has developed a new small line type of LC Hi-eF purifier, that takes the place of filters commonly used to keep dirt and moisture out of air tools and other pneumatic equipment. This unit removes dirt and moisture by means of a combination centrifugal and baffle-type separating element inside a forged steel body. This eliminates the need for any filters, and, as a result, the manufacturer claims that once the unit is installed on the air line near the pneumatic equipment, there is no necessity for periodically cleaning the unit or even inspecting it.

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FOSTER D. SNELL INC., New York City, announces that Gabriel Appleman, chemical engineer, will be in charge of process design, handling the design of all types of chemical processing equipment and complete chemical processing plants and packaged detergent plants. Purchasing for the Hull Company will be handled by S. E. Taub, who will also supervise all pilot plant operations for Snell.

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Four changes in personnel in the research department of KOPPERS COMPANY INC., Pittsburgh, Pa., have been announced. T. E. Robbins has been named assistant manager of the laboratory section, to succeed B. F. Daubert, who resigned. R. S. Detrick has been appointed assistant manager of the laboratory branch at the company's research center at Verona. H. E. Tiefenthal will replace Robbins as group leader.

Koppers has selected Port Arthur, Tex., as the site for its new plant to produce polyethylene plastic. It will be located on a portion of a 1,000-acre site purchased several years ago. Early in 1953 the company placed in full production at this site an installation which produced ethylbenzene, an intermediate in the production of styrene, used in making Koppers polystyrene plastics and synthetic rubber.

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E. E. Daggy has been transferred to the product development department of CORN PRODUCTS REFINING COMPANY, New York City. He will be concerned primarily with a program for development of feed products.

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T. O. McDonald was appointed sales manager of AMERICAN CYANAMID COMPANY'S refinery chemicals department, New York City. He will administer and supervise all sales activities of the department, whose products include Aerocat cracking catalyst, Aeroform reforming catalysts, Aerolube lubricating oil additives, and Aeropan drilling mud-conditioning compounds.

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The NOPCO CHEMICAL COMPANY, Harrison, N. J., has available an all-purpose synthetic detergent, Nopco 1479-A, with excellent scouring properties, for the textile industry. It is packaged in 55-gallon steel drums, available at Nopco's warehouses from coast to coast.

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SWIFT AND COMPANY industrial oils department, Hammond, Ind., has announced the production of a new highly distilled fractionated fatty acid to be known as oleic acid No. 905. The product has been made possible by new manufacturing processes which allow for more selective extraction of color bodies and unsaponifiable material.

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T. F. WASHBURN COMPANY, Chicago, Ill., manufacturer of ingredients for oil base paints, is introducing new vehicles for obtaining a thick, jelly-like consistency in household paints, which eliminates settling in flat, semi-gloss, and high-gloss enamel paints and provides a great many other advantages to the paint user.

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R. C. Allen has been appointed director of mechanical engineering and L. J. Linde, director of electrical engineering for the general machinery division of ALLIS-CHALMERS MANUFACTURING COMPANY, Milwaukee, Wis.

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J. P. Milionis has joined the new product development department of AMERICAN CYANAMID COMPANY, New York City. He will introduce new Cyanamid products to the chemical industry and will be concerned with general development projects within Cyanamid.

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Kenneth M. Irey has been elected assistant vice president of HEYDEN CHEMICAL CORPORATION, New York City.

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A new process for the manufacture of hydrogen peroxide has been announced by SOLVAY PROCESS DIVISION, ALLIED CHEMICAL AND DYE CORPORATION, New York City. Work on this new process was initiated by the company's laboratory at Morristown, N. J., and perfected on pilot plant scale by a team of chemists and engineers at Solvay's research center in Syracuse. In contrast with the older electrolytic method of producing hydrogen peroxide, Solvay's new process involves a chemical oxidation reaction, using raw materials mainly available within the Allied organization.

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W. W. Frymoyer has been elected vice president of the FOXBORO COMPANY, Foxboro, Mass., in which capacity he will supervise all instrument-manufacturing activities of the company.

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George M. Walker, who for the past two years have been primarily engaged in planning and advising on the future growth of Koppers Chemical Division, has been named vice president and general manager of that division for KOPPERS COMPANY INC., Pittsburgh, Pa.

A chemical, called DBPC, which is highly effective in deterring rancidity in fatty foods and which will cost processors as little as 1c per 100 lb. of food treated, has also been announced by Kopper's Chemical Division. It comes in pure crystals resembling coarse grains of refined sugar and dissolves easily during the processing cycle.

E. H. SARGENT AND COMPANY, Chicago, Ill., has developed the Sargent Thermometric Bridge, which is a thermistor actuated sensing bridge with output controls permitting the direct use of galvanometers or potentiometric recorders. When used with galvanometers of moderate sensitivity or recorders having full scale equivalents of a few millivolts, a measuring precision of plus or minus several thousandths of a degree centigrade is practicable over the range of 0° to 100°C.

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FOSTER D. SNELL, New York City, has promoted Dan Schoenholtz to director of the product development department. He will be in charge of product development, applied research and testing in the fields of paints, waxes, varnishes, polishes, inks, adhesives, and chemical specialties. Other activities of the product development department include examination and evaluation of raw materials, development of new test methods, plant investigations, and performance testing.

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W. Wendell Drummond, who has been engaged in basic and applied research for the past 14 years with the Owens-Corning Fiberglass Corporation, has accepted a position with the BJORKSTEN RESEARCH LABORATORIES INC., Madison, Wis.

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A number of precision weighings under unusual conditions are now practical as a result of the development of a special purpose model of the Fisher Gram-atic Balance, developed by FISHER SCIENTIFIC COMPANY, Pittsburgh, Pa. This balance has a single-pan, constant-load, *constant-sensitivity*, direct-reading balance in which there is no personal handling of weights.

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Vernon L. Frampton, formerly research scientist in charge of the Basic Cotton Research Laboratory at the University of Texas, recently joined the staff of the SOUTHERN REGIONAL RESEARCH LABORATORY, New Orleans, La., as project leader on chemical investigations to extend the utilization of peanuts.

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GLYCO PRODUCTS COMPANY INC., Brooklyn, N. Y., has developed a monoglyceride "Monocet," which is soluble in certain proportions in methanol, ethanol, tuluol, and naphtha. When heated, it is soluble in vegetable or mineral oils, acetone, and ethyl acetate. It is tasteless and bland in odor and has a melting point of 36-46°C. Suggested uses for "Monocet" are for coatings for cheese, dried fruits, nutmeats, fruits, vegetables, meats, and fish, as a plasticizer for chewing gum and brittle waxes, and for special industrial and textile fiber coatings.

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The appointment of Russell L. Jenkins as associate director of inorganic chemical research in the chemical research department of MONSANTO CHEMICAL COMPANY'S Research and Engineering Division, St. Louis, Mo., has been announced. John M. Butler and Milton Kosmin were named assistant directors of the chemical research department.

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Robert A. Hardt, vice president and director of HOFFMANN-LAROCHE INC., Nutley, N. J., has been elected president of the American Pharmaceutical Manufacturers' Association. He succeeds Michael F. Charley, president of Standard Pharmacal Company, Chicago, Ill.

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William G. Dahlquist has been named manager of the Chemical Division for A. E. STALEY MANUFACTURING COMPANY, Decatur, Ill. James W. Hurley has been appointed manager of marketing plans for the Chemical Division.

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WILL CORPORATION, Rochester, N. Y., has announced a name change for its Atlanta laboratory supply house from Southern Scientific Company Inc., to Will Corporation of Ga. and in Buffalo from Buffalo Apparatus Corporation to Will-Buffalo Inc. Ownership, services, and personnel remain the same in both places.

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ARMOUR RESEARCH FOUNDATION of Illinois Institute of Technology, Chicago, Ill., performed more than $10,000,000 worth of research for industry and government during 1953. The record volume of research, 25% over the 1952 figure, was announced in the annual report of the Foundation, February 15, 1954. Developments in 1953 ranged from improved automatic rocket launchers to an effective rodent repellent for baler twine. The Foundation extended its research and development services to sponsors in Mexico, India, Pakistan, Burma, Austria, Costa Rica, and the British West Indies. In Burma, for example, a three-year program was undertaken to create a state industrial research institute. A total of 467 different research projects, 70 more than 1952, was conducted for industrial firms, trade associations, government agencies, and the Foundation itself.