Trends in Industrial Markets for Fats and Oils and Derivatives[1]

F.J. POATS[2] and M.W. SILLS,[3] Market Development Research Division, Agricultural Marketing Service, U.S. Department of Agriculture

During the past decade, research by industry and government has developed numerous new chemical markets for fats and oils derivatives. Lower prices for competitive raw materials have forced some of these new products into specialty markets. Economic factors, such as the continual growth of the chemical industry, population increases, and high consumer demand, have allowed for steady growth in the fat-derivative market. New fat-type plasticizers are currently consuming about 60 million pounds of fats annually. Synthetic lubricants will probably be consuming 20 million pounds of fatty diesters annually by 1965. Animal feeds consume approximately 600 million pounds of fats and fat derivatives annually and may eventually become the leading domestic nonfood market for fats. The protective coating market as an outlet for fats continues to decline, and the continuing shift to nonfat materials and changes in paint formulas indicate that, while the demand for protective coatings may increase, the use of fats in their manufacture may not share in the increase. Nonfat chemical raw materials provide intense price competition for fatty raw materials. Fat prices are influenced by the demand for use in food, soap, paints, and possibly animal feeds rather than by the demand for use as chemical raw materials.

FATS AND OILS production in the United States has shown a phenomenal increase from 8.3 billion pounds in 1940 to nearly 18 billion pounds in 1960. Soybean oil accounted for about four billion pounds of this increase. Inedible tallow and grease accounted for another two billion pounds. Soybean oil plus inedible tallow and grease has accounted for about two-thirds of the increase in the production of fats and oils during the past 20 years. Most other oils show minor production increases. Domestic use of fats and oils is now larger than before World War II, but the rise in consumption has not compared with the increases in production. The net effect of these trends has been to make large quantities of fats, oils, and oilseeds available for export and as raw materials for new products.

Since the beginning of World War II major shifts have taken place in the consumption of fats and oils both for food use and nonfood use. In the nonfood field, fats that had as a major market such products as soap and protective coatings are now being used to produce chemicals and chemical intermediates. However this shift has not been on a pound-for-pound basis. More fat has been displaced in soaps and protective coatings than the chemical and chemical intermediate markets have been able to absorb. On the other hand, large quantities of fats are now being added to animal feeds, and the trend in total industrial and feed uses has been slightly upward.

Major shifts in the use of food fats and oils have also taken place during the past 20 years even though consumption has remained relatively stable at around 45 lbs. per person. Total consumption of food fats increased from six billion pounds in 1940 to eight billion pounds in 1960, largely reflecting the increase in population.

SUBSTITUTION has been continually taking place among the three major food-fat product groups: table spreads, cooking fats, and cooking and salad oils as well as among products in each group. Cottonseed oil was the major domestically-produced vegetable oil in the United States until the middle 1940's. Since 1945 it has gradually been replaced by soybean oil as the major food oil. Cottonseed oil is a by-product of cotton production, and the supply is determined not by the demand for oil but by the demand for cotton fiber. Soybean oil is a joint product with meal, and the supply of soybeans is influenced by the demand for beans to be used in crushing. The tremendous increase in the supply of soybeans since 1940 can be attributed to a continuing strong demand for high-protein oilseed meal, variety adaptation, mechanization of cultivating and harvesting, improvement of processing technology, and loss of markets for other cash crops. The stimulus in demand for soybean oil can be attributed to the advent of World War II with its heavy requirement of fats and oils of all types for food and industrial applications.

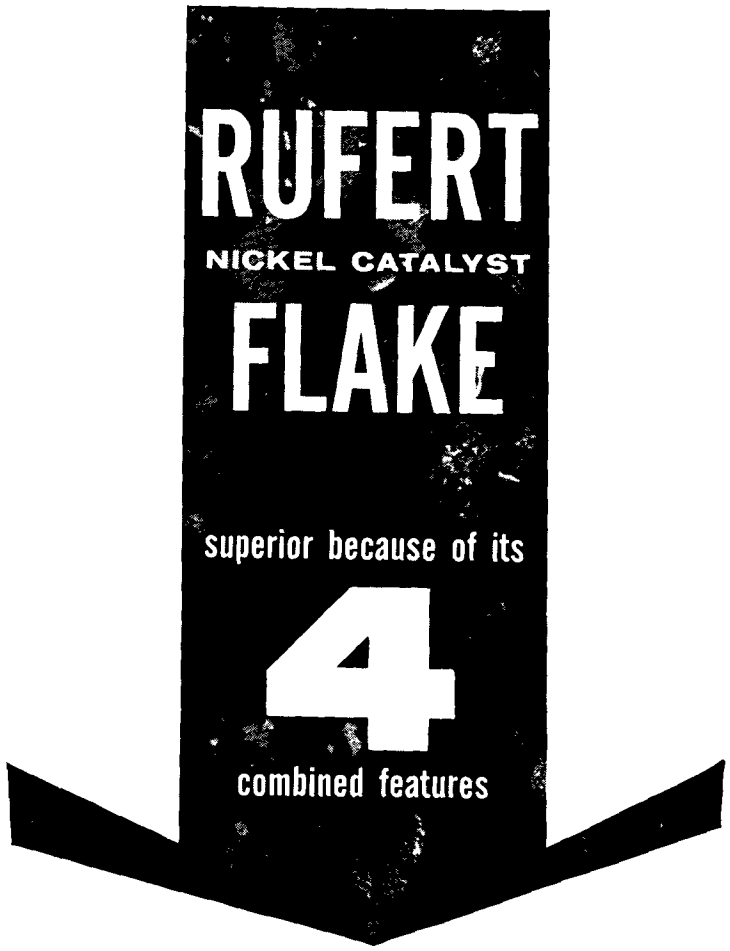
In 1960 four billion pounds of shortening, cooking and salad oils were produced by the United States. Of the total fats used in the manufacture of shortening, soybean oil comprises approximately half, lard a fifth, cottonseed oil a seventh, and edible beef fats a tenth. In 1940 soybean oil comprised 18%, lard 1%, cottonseed oil 69%, and edible beef fat was negligible. *Per capita* consumption of lard, as a cooking fat, has continued to decline in recent years, but this has been partly offset by the increased use of lard as an ingredient in shortening. Direct consumption of lard is associated with low income. Shortening tends to replace lard as the income level rises. A major factor in the declining consumption of lard has been the population shift from rural to urban areas. Other competitive factors in the cooking fats industry include changes in consumer preferences, improved methods of manufacture, and improvement in product quality.

The growth in these two oils can be attributed to expanding demand in institutional food manufacturing and household uses. Restaurants are using more of these oils for deep-fat frying and as salad oils. The growth in food mixes and prepared foods, such as potato chips, has contributed to the increased demand in food manufacturing. There has been a slight shift from hard shortening to liquid oils among household consumers. The annual rate of growth for liquid oils is higher than that of growth for solid shortenings. Again soybean oil is the major oil used, comprising nearly half of the total oil used in 1960. Cottonseed oil used comprised more than a third, corn oil a seventh, and peanut oil 2%.

THE DEMAND for nonfood fats and oils has remained relatively constant during the past 20 years. There has been an increase in total consumption because of population increases, but the *per capita* consumption of 23.6 lbs. in 1959 compares closely with 23.4 lbs. in 1940. There was an increase in *per capita* consumption immediately after World War II, but this resulted from a need for making up shortages of soap, paints, and other fats and oils products which developed during the war. Again in 1950 there was an up-surge in the demand for nonfood fats, but this was on account of so-called "scare purchases" and inventory building to hedge against wartime shortages that never developed.

Although the total demand for nonfood fats has remained relatively constant, the shifts in use patterns have been striking. In 1947 the use of fats for soapmaking was almost three times the 876 million pounds used for this purpose in 1959. The use of fats for soapmaking fell below a billion pounds in 1958 for the first time since 1921. The use of fats and oils in drying oil products has shown a gradual decline during the past 20 years, but the decline has not been as marked as the decline in soap. In 1959 the use of fats and oils in drying oil products was above that used in soap for the first time. It is an accepted fact

[1] Presented before the American Oil Chemists' Society, New York, October 17, 1960.
[2] Washington, D. C.
[3] Philadelphia, Pa.



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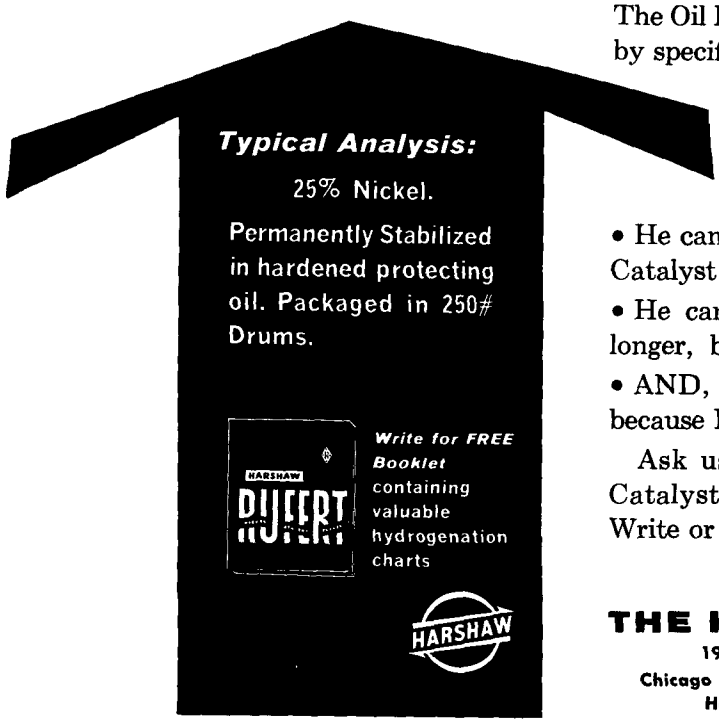

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that the loss of the soap market is caused entirely by the increasing production and sale of synthetic detergents. For the past two or three years there have been indications and even predictions that the synthetic detergent market was saturated and would level off at a constant rate, but this has not been the case. Every year we find a little more displacement of soap. With the advent of synthetic toilet bars the future soap market for fats and oils looks discouraging. However synthetic bars are presently priced in the premium class and do not compete for markets attracted to conventional toilet soaps. It is not unrealistic to assume that, in the future, increased production, accompanied by lower costs, and improved merchandising techniques will lower prices of synthetic bars to make them competitive with the soap bars.

Paints and varnishes account for more than 80% of the fats and oils used in protective coatings. Floor coverings, oilcloth, and other products account for the remainder. Since 1940 fats and oils used in all paints and varnishes declined from 1.9 lbs. per gallon to 1.2 lbs. per gallon in 1960. If only paints that contain whole drying oils are considered, there has been a decline over the same period from 2.8 lbs. per gallon to 1.6 lbs. per gallon. This downward trend reflects technological changes that resulted in the substitution of synthetic resins for drying oils. This shift is still in progress and is expected to continue. Another factor is the architectural trend toward the replacement of wood with such materials as glass, brick, steel, and stone, which require no preservatives and have therefore reduced the demand for exterior paints.

ONE OF THE MOST important factors in the fats and oils picture has been the development in recent years of the tall oil industry. The production of crude tall oil has increased from about 50 million pounds prior to World War II to an estimated 800 million pounds in 1960. Here is a low cost source of oleic acid, which replaces the oleic acid previously obtained from the triglycerides, most of which would be tallows and greases. In 1959 about 560 million pounds of tall oil was used in making fatty acids, producing approximately 250 million pounds of oleic acid. The balance was used in protective coatings, floor coverings, lubricants, chemicals, and detergents, both soap and synthetic.

The largest single new market which has been developed for fats and oils is in animal feeds. In 1960 503 million pounds of fats were mixed into feeds. In 1950 a fats and oils chemist who happened to mention animal feeds as a potential market for fats was a dreamer. But through the efforts of the Department of Agriculture and the American Meat Institute Foundation this dream became a reality in 1953. Here was a feed ingredient which not only supplied a low-cost source of energy but also provided certain advantages to the feed manufacturer in his plant operations. In addition, it added some semblance of stability to tallow and grease prices.

Recently efforts have been made, with some measure of success, to incorporate ground and conditioned soybeans into animal feeds. If the price of soybean oil remains relatively low, it may be economical to use soybeans as a feed ingredient. In the final analysis it may really depend on the relationship of the soybean oil-tallow price-spread extraction and shipping costs for soybean oil and meal, also on caloric differences.

A REALLY BRIGHT SPOT occurring in the fats and oils economy during the past 10 years has been the export demand. In 1959 5.5 billion pounds of fats and oils were sold abroad. This was almost a third of production. Fortunately during the past few years there has been this market for our abundant supplies of fats and oils. However, aside from political factors, there is one development that may affect the export demand for U.S. fats and oils, and that is the development of a synthetic detergent industry in foreign countries. Synthetic detergents made abroad are unlikely to experience a comparable rate of growth, but nevertheless we may eventually find a displacement of American fats and oils in this market.

During World War II the United States shifted from a net-importing to a net-exporting country, and each year since 1945 has seen a strengthening of this position. Prior to World War II there was a deficit of fats for industrial uses. Large quantities of palm oil, lauric acid oils, and drying oils were imported. Today there is only one imported oil, coconut, for which it would be difficult to find replacement with a domestic oil. In fact, at the present stage of technological knowledge it would be impossible. If it became necessary, Americans could become accustomed to a slow-lathering soap.

In a short span of years, major changes have taken place in the industrial market outlets for fats and oils. There has been a rise in the volume of synthetic detergents and a consequent decline in the use of fats and oils for soapmaking. Water-emulsion paints for interior use have reduced the market share of drying oils in surface coatings; synthetic glycerine has come out to share market uses with glycerine from fat splitting. The list is long, and very familiar. What has market research found out about trends and perhaps about guidelines for the future?

One phase of the government market research program on fats and oils is devoted entirely to industrial uses. One of the first efforts was the measurement of the use of fats and oils in prepared animal feeds (1). Through the Bureau of the Census a special survey was made to find out the volume for this outlet in 1956. This market has continued to expand so that today it stands just behind fats and oils consumption in soapmaking. In addition to the efforts to measure volume consumed by feeds, there is a study of the factors governing use, level of use, types of fats consumed, and an estimate of market potential for use of fats in feeds.

From the original study of fats for making prepared animal feeds were found a number of factors affecting individual feed mill usage that also help explain market behavior. For example, there was curiosity about why use of fats continued high and expanding at times when the energy-cost ratio between fats and feed grains, particularly corn, did not favor fat addition. The study, which included a survey of 100 feed mills and livestock feed-ingredient makers, showed why this could occur and be economically feasible. Fat addition was shown to contribute not one, but several, benefits to the feed and to act as an aid in processing as well. In addition to its energy value and increase in feed efficiency, fat increases palatability; it reduces dustiness; it aids in homogenizing and stabilizing the distribution of such fine-particled feed additives as antibiotics, vitamins, and minerals; it reduces wear on pelleting dies and gives feed a better appearance. These "plus" factors cause feed formulators to use fats even when the energy-cost ratio for fats is above other energy sources. In one year the cost of fats averaged 34% above corn on an equivalent energy basis.

AMONG THE VARIOUS opportunities for the expanding use of fats the feed market apparently has the largest potential for growth. The over-all statistics for the feed market show that formula feed is produced at an annual volume of more than 50 million tons. Poultry feed, a major user of added fat, contributes about half of this volume. If all poultry feed contained the 8% of added fat, for an over-all fat content of 11%, that some feed formulators now use in broiler feeds, this usage in all poultry feeds alone could consume more than 2 million tons of fats and oils. This may be comparable with the current consumption in all feeds of about 300 thousand tons annually. Therefore a very large potential for expansion of fats usage in livestock feeds is seen. This outlet will continue to expand in the consumption of fats and oils and to provide a price floor for them, which will be about equal to the energy-value equivalent cost from feed grains.

How about uses for fats and oils derivatives outlets in which the chemical rather than caloric properties of fats and oils may assure use? Those in the American Oil Chemists' Society know about the efforts and achievements in this field. As the chemists who develop fatty derivatives for various uses, they have a major stake in market information in this field. If they have looked at sources of statistical data and other market information on fats and oils, they have very often found little help beyond figures on the supply of raw materials and data on the consumption of whole fat.

In a program of market-potentials research a search has been made to provide market information on new uses and new materials from fatty acids. It was with this intent that the market potentials were studied for fats and oils in plasticizers for plastics (2) and the market potentials for fats and oils in synthetic lubricants and lubricant additives (3). Reports of findings in both these markets have been published.

IN THE SYNTHETIC lubricants field market research had its greatest value in taking the rosy glow from some overly-optimistic hopes for substantial material sales. Research and development of fat derivatives was redirected to longer duration and more lucrative markets. Not that the making and selling of synthetic lubricants is an undesirable market but over-optimism, over-expansion, and loss of profitability in an industry should be avoided. At least three firms gave this report a thorough study in their consideration of whether or not to enter the synthetic lubricant market as a supplier. In each case the market information supplied was a valuable aid in making the decision to shift their commercial development to other materials and markets.

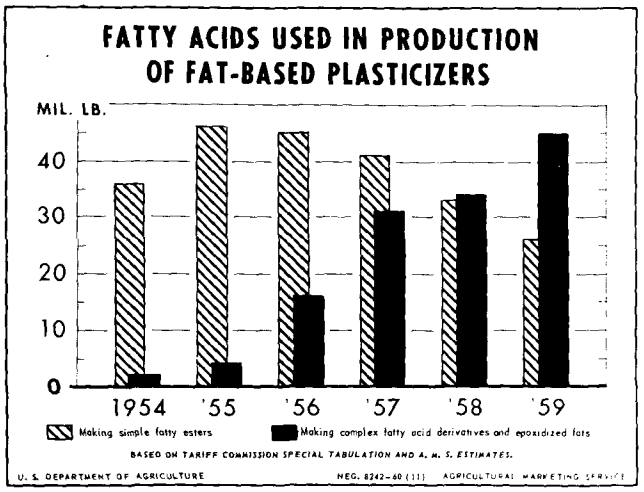

FIG. 1.

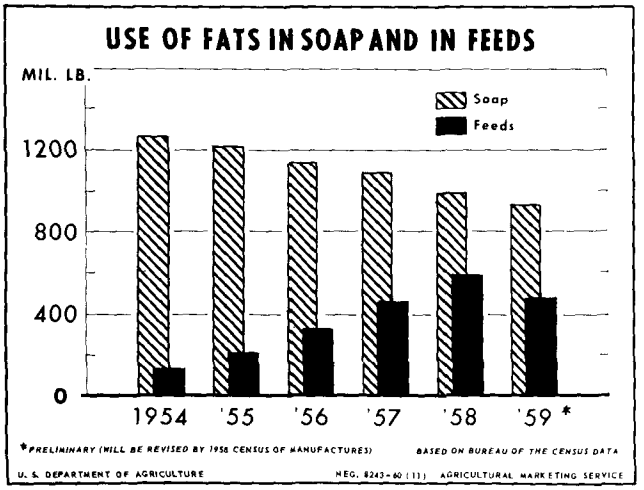

FIG. 2.

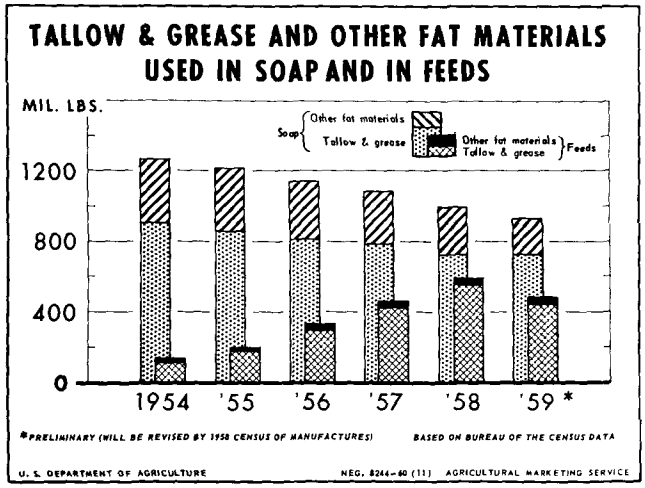

FIG. 3.

The study of market potentials for fats and oils derivatives as plasticizers, published last year, came when the role of epoxidized fatty esters and oils was just being established. Through the mechanism of surveys in four industry groups, suppliers of fat derivatives, suppliers of polymer resins, fabricators of plastic products, and consultant and research institutions, basic information was obtained on physical, chemical, and economic factors affecting use of various fat materials. Market analysis showed the role of simple fatty esters, such as methyl or butyl esters of medium- and long-chain fatty acids, to be on the decline. Price competition from phthalate esters and lack of aesthetic and physical properties of plastics fabricated with them were major contributory factors.

At the same time however a different market situation was found for more complex fatty acid derivatives. For example, dibasic acid esters, polymeric fatty acid derivatives, epoxidized esters and oils, and internal plasticizer systems that were based on fat derivatives were on the increase. For these, with inherently higher cost to the user than work-horse DOP, the market volume increase resulted from improved properties over other materials offered. After investigation some little known ones were found to be quite important.

For instance, a dangling hydroxyl group caused a fat-deriviative plasticizer to be used in an important line of plastic household items where warm feeling to the skin is important. Fat-based plasticizers that add density without increasing viscosity to vinyl plastisols and organosols led to significant volumes of use. Fat-based plasticizers reduced material use and costs of metallic stabilizers slightly and led to widespread use. Despite a higher price level than other plasticizers, fats seem to have a continuing and growing market in the plastics field.

IN DETERMINING the quantity of fatty acids used in plasticizers, Tariff Commission data were used. The Commission reported these as esters and lumped many of the plasticizers materials of interest together into categories such as "all other oleates or stearates" and even into "all other acylic." To recap their industry data reports, by use of a conversion factor, the chemical formula for each ester was worked out. Also it was assumed that a 95% yield on raw material for each fatty acid would tell the approximate amount of fatty acid raw material used in each case. There was a little error this way.

Next it was found that reports to the Commission about epoxy esters and oils were incomplete. Some 15 million pounds were missing or misplaced. Statistics were shored up by putting those extra 15 million in because the survey covered supplier firms and gave the basic data.

Fatty esters and complex polymeric plasticizers from fats were then related to over-all plasticizer production. There was a nice round figure of 480 million pounds for the total plasticizers made in 1957, a special tabulation of fatty acids that were used, and an estimate of epoxy esters and oils. But how about the polymerics? The specific volume of each of the fatty esters could not be obtained because of reporting limitations.

By some weighting and estimating it was determined that fatty esters and fatty polymerics combined were an average of 77% by weight of fatty acid. This meant 72 million pounds of fatty plasticizers in the plasticizer market in 1957, or 16% of the total. This same procedure was carried back through each of the years to 1953 and obtained a nice picture of the growth in volume and share of the market for fats for the four-year period.

These data have been brought up to date by a similar tabulation for 1959 with Tariff Commission data (4).

Now a word on future market research in fats and oils materials. A market research study is on the way which

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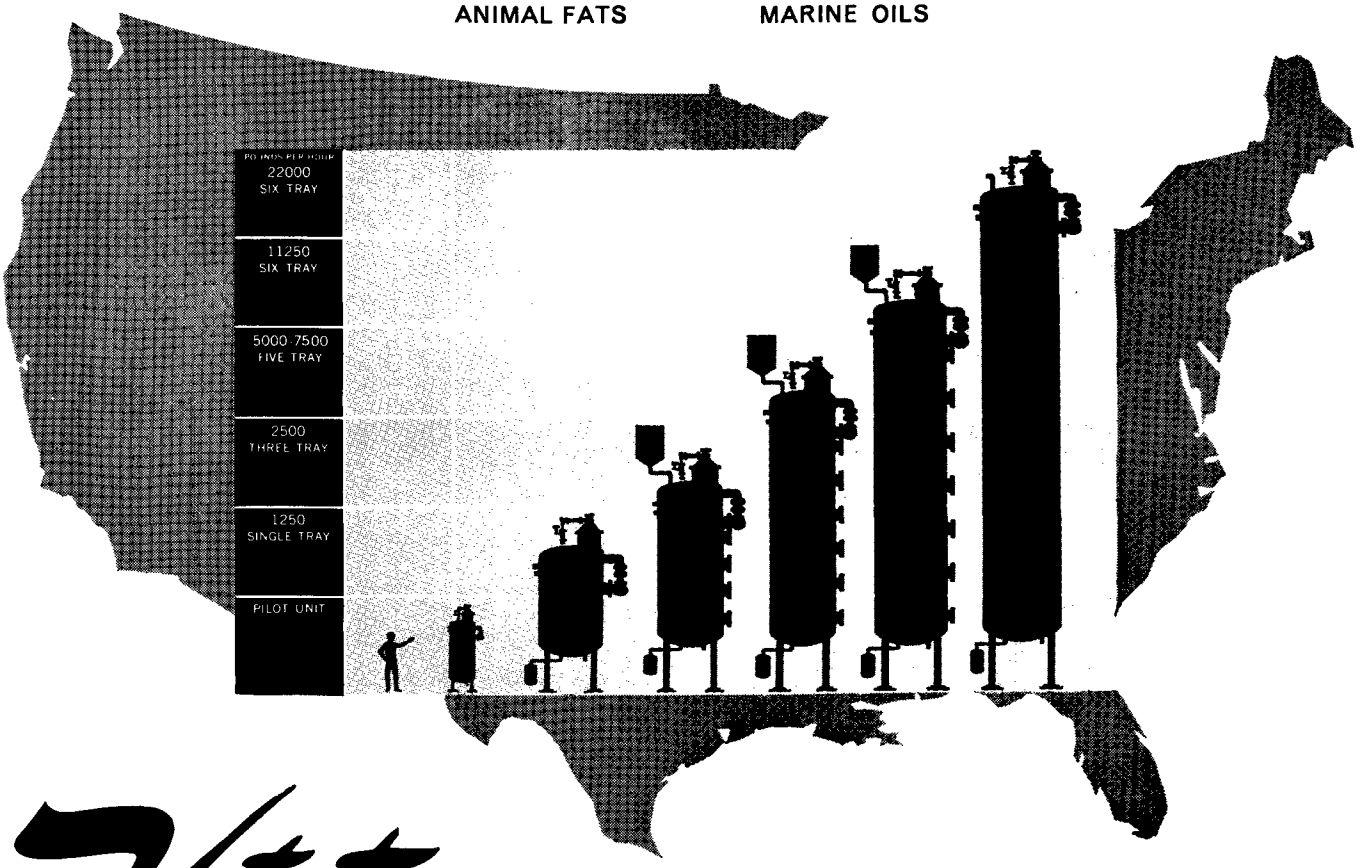

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deals with 10 important areas of fatty-derivatives marketing. It is planned to evaluate a new-use market for fat and materials in urethanes, fatty nitrogen compounds, and synthetic rubber. The impact of potential supplies of fatty alcohols from petroleum on uses of natural fat-based materials in detergents, emulsifiers, and surfactants will be looked into. Surface coatings, where drying oils, reconstituted oils, and a host of synthetics vie for markets, are to be surveyed to bring a previous study on drying oils up to date (5). Markets are also changing with technological changes in foundry, ore refining, and extraction uses of fats and oils.

The steel industry has been invited by the government's critical materials committee to change from palm oil to tallow in tin-plating and cold rolling of steel. Each of these facets of fats and oils usage will be given a market analysis rundown in the next study. Some questions have been added for cosmetics and medicinal people to answer as well as some questions on pesticides and fungicides to round out the program. From these efforts qualitative information will be received on 10 markets for fat materials and a new quantitative market measure that will aid in planning industrial research and development programs.

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[Received March 20, 1961]

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• *Book Review*

INDEX DES HUILES SULFONES ET DETERGENTS MODERNES, Vol. III, by J.P. Sisley, Directeur General de l'Institut des Corps Gras, Professeur Titulaire a l'Ecole Superieure d'Application des Corps Gras (Teintex, 60 Rue de Richelieu, Paris, 2e, 560 pages, 1961, price 80 N.F.). This is a completely new and up-to-date version of a familiar volume by the renowned J.P. Sisley who during his lifetime contributed so much to our knowledge of the chemistry and technology of surface active agents. He died on September 10, 1958. One of the previous editions, justifiably popular, is the "Encyclopedia of Surface Active Agents" translated from the French by P.J. Wood and reviewed by C.Z. Draves in the American Dyestuff Reporter *42*, 52 (1953).

A literal translation of the title of the present volume is "Index of Sulfonated Oils and Modern Detergents." This title suits the present volume for it is an index, and yet it is more than an index and the word "encyclopedia" suits it quite well.

The book begins with an introduction, followed by a list of easily perceived abbreviations for the names of journals, bulletins, and manufacturing companies. A small section on the development and economic growth of surface active agents follows. The more important sections then appear. A chapter on commercial surface active agents includes an excellent discussion and review of detergent bars, soap-detergent combinations, sequestering, dispersing, suspending, and thixotropic agents, corrosion inhibitors and detergent additives.

In a further and more extensive chapter surface active agents are classified as anionic, cationic, and nonionic and reviewed. One of the features of the present volume is a review of mixtures and formulations of differing types of surface active agents and a discussion of the usefulness of such mixtures in several applications.

A logical classification system has been devised and the final portion of the book, the "Index Sisley" lists, from "A2Z" to "Zwitterion" about 2500 commercial products, alphabetically by trade name, the products of manufacture from about 200 different companies. This listing includes the manufacturer, the chemical nature, the Sisley classification symbol, the physical state, types of application, solubility, and many other physical properties. The book is international in scope and so includes many well-known American trade names but also many others which will be unfamiliar to the American chemist.

Literature references throughout the book are quite abundant. There is a total of about 700 patent and journal references. There is no index to author or to subject but the material is arranged in such a logical manner that the lack of full indexing is not felt or realized. The reviewer has noticed a misprint, "Nalco," for "Nacco," in the description of "Nacconol SL," but it is probable the book is relatively free from errors.

The French is not difficult for the interested reader who in some degree makes easy recognition and anticipates a portion of the subject matter.

The book is recommended to libraries as a reference work and to all individuals who have an interest in the ever-expanding domain of surface active agents. The reviewer closes in agreement with the publisher's endorsement: "Le 3e volume de l' index des Huiles Sulfonées et Détergents Moderne est susceptible de rendre service non seulement aux Industriels et Techniciens, mais également aux étudiants, aux agents commerciaux et à tous ceux qui désirent approfondir leurs connaissances dans un domaine sans cesse en extension."

A.J. STIRTON, Eastern Regional Research Laboratory, Philadelphia, Pa.

LITERATURE REVIEW ON OILS AND FATS, 1958, by B.Y. Rao (Central Food Technological Research Institute, Mysore, 96 pp., 1960). This paperbound book, listing over one thousand references, represents a concise annual review written in English, containing the following chapters: Statistical Survey—Oilseeds—Extraction and Processing of Oils and Fats—Spoilage—Chemistry, Characteristics, Com-

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position and Analysis of Oils and Fats—Nutrition and Metabolism—Characteristics and Compositions of Newly Recorded Oils and Fats—Books, New Periodicals; Symposia and Miscellaneous.

The author, with the cooperation of D.S. Bhatia, Head of the Division of Food Processing, Central Food Technological Research Institute, Mysore, has prepared an excellent review of the important developments published in the world literature during 1958. The difficult task of selecting the more important publications from the huge annual offering of the general and the patent literature appears well accomplished. The highlights of the abstracted articles are expertly emphasized and reported in an interesting and concise manner. The consideration given to Indian publications is relatively great.

With respect to similar reviews, particularly that of the American Oil Chemists' Society, it should be noted that this collection offers much supplementary material. In view of this the publication appears of value as an additional source to all who wish to make a thorough study of the respective chapters of the fat and oil literature. It is of particular value to those investigators interested in Indian and Far East developments.

H.G. KIRSCHENBAUER, Colgate-Palmolive Company, Jersey City, N.J.

METHODS OF TESTING CHEMICALS ON INSECTS, Vol. II, edited by Harold H. Shepard, (Burgess Publishing Company, Minneapolis, Minn., 250 pp., 1960, $5). Quoting from the preface, "This volume is the second in a series to achieve the intent of the former Chemical-Biological Coordination Center of the National Research Council to publish a manual of test methods dealing with the effects of chemicals on insects." Like Vol. I, published in 1958, it is devoted primarily to descriptions of entomological procedures of interest to those engaged in research and development of pesticide chemicals. Whereas the first volume dealt largely with techniques for determining the effects of chemicals on the physiological and metabolic processes of insects, including methods of exposing insects to chemicals under laboratory conditions, this second volume consists of a series of 13 reports by various authors on factors affecting experimental results, together with discussions of some screening techniques for potentially useful substances intended for soil, textile, packaging and animal uses. There are also chapters on repellants and attractants.

Together, this series will undoubtedly serve as a reference source and guide to professional entomologists entering pesticide research for testing. No materials are included covering insect culture or maintenance of colonies to supply the test subjects. Neither is reference made to data relating chemical structure and insecticidal activity.

Since the majority of the chapters are written on the assumption that the reader possesses at least a rudimentary knowledge of entomology, the book is not too helpful to the chemist except to the extent that it provides some awareness of the problems of those responsible for screening and testing the products of his laboratory. However, all laboratories directly engaged in pesticide research should find this series valuable.

KENNETH MORGAREIDGE, Food Drug Research Laboratories, New York, N.Y.

PROGRESS IN BIOPHYSICS AND BIOPHYSICAL CHEMISTRY, Vol. 10, edited by J.A.V. Butler and B. Katz (Pergamon Press, New York, 440 pp., 1960, $15). Topics included in this volume are: the high energy phosphate bond concept by P. George and R.J. Rutman, the structural and physical chemistry of nucleic acids and nucleoproteins by A.R. Peacocke, mechanisms for enzyme-catalyzed transfer reactions by S.A. Bernhard and H. Gutfreund, oxygen tension and oxidation-reduction potentials in living tissues by D.B. Cater, configuration of proteins in solution by E. M. Shooter, *in vitro* studies on the radiation biology of mammalian cells by T.T. Puck, thermodynamics and the interpretation of biological heat measurements by D.R. Wilkie, recent investigations on tobacco mosaic virus by A. Gierer, and molecular structure and contact relationships of cell membranes by J.D. Robertson.

This volume continues the excellent typography and coverage found in earlier volumes in this series. The long chapter on the molecular structure of cell membranes will be of particular interest to oil chemists because most of the studies described deal with the myelin sheath on nerve fibers and, hence, are related to the probable position of lipids in these membranes.

DOROTHY M. RATHMANN, Corn Products Institute of Nutrition, Argo, Ill.

INDIAN ESSENTIAL OILS: A REVIEW, by A.K. Menon, (Council of Scientific and Industrial Research, New Delhi, India, 89 pp., 1960, 10 shillings). This brief account summarizes the commercial aspects of the essential oil industry in India. The major emphasis is on the growing, harvesting, and processing techniques in current use and what the future prospects are. The research advances are presented against the background of the industry.

The 44 pages of text are divided into four chapters. The essential oils are discussed first with an alphabetical presentation of more than 40 different varieties. Most of the information pertains to the cultivation of plants and trees in India and the kind of processing employed. The second chapter describes the six principle spice oils. Attars and aqueous products are listed in the brief third chapter, and natural isolates and aromatic chemicals in the fourth. The bibliography covers all of the work conducted on Indian essential oils. Of the 575 references less than half are later than 1950.

This book will be of interest to those who are concerned with the production and quality of Indian perfumes and essential oils.

J.H. BENEDICT, The Procter and Gamble Company, Cincinnati, O.

ALGINSAURE ALGINATE, by Phil. Heinrich Maass (Strassenbau, Chemie und Technik Verlagsgesellschaft m.b.H., Heidelberg, 465 pp., 1959 DM. 64). This treatise covers chemistry, technology and uses of alginic acids and derivatives. The contents of this book are divided in chapters entitled: Occurrence, Constitution and Shape of the Alginic Molecule; Physical and Chemical Properties. This latter chapter is subdivided according to electrochemical behavior, viscosity, gel formation, surface tension, wettability and protective colloids, hygroscopicity and ability to bind water, ion exchange and fibers, hydrolysis and decomposition, effect on micro-organisms, and physiological properties. There are chapters discussing Technical Preparation, Alginic Acids, and Combinations of Alginic Acid. This chapter is subdivided according to reactions involving the hydroxyl and the carboxyl groups. Analytical Procedures and Analytical Procedures with Special Reference to Food Products are treated in separate chapters.

A brief discussion on algae as raw material for technically valuable materials is presented. Uses of alginic acid and alginates are discussed according to various fields of applications: in agriculture, insecticide formulations, and various food products such as meat, sausages, milk and milk products, margarine, fats and oils, bakery goods, alcoholic and non-alcoholic drinks, and jellies. Uses in pharmaceuticals and cosmetics, and uses for industry are discussed, particularly in textiles, paints, adhesives, paper, building materials, and photography.

A résumé of papers concerning alginates given at three International Seaweed Symposia is included.

Companies preparing alginates and trade names of alginic derivatives are listed. Literature references, author, and subject indices and patent tabulations are included.

Each chapter contains abstracts of papers and patents pertaining to the subjects discussed.

This volume is of particular interest to chemists, food technologists, and pharmacists whose work will at some time or other require information on alginic derivatives. The author did an excellent job in compiling references. This volume is of more interest to those concerned with application, than to the academic-minded reader.

HANS WOLFF, A.E. Staley Manufacturing Company, Decatur, Ill.

ARMOUR ALIPHATIC ORGANIC CHEMICALS FOR REFINED PRODUCTS AND PROCESSES. An 8-page booklet covering the use of aliphatic organic chemicals as additives for gasoline, fuel oil, lubricants, and asphalt. Armour Industrial Chemical Company, 110 N. Wacker Drive, Chicago 6, Ill.

ROTOVISCO. A 12-page bulletin featuring the Haaks Rotating Viscometer. Brinkmann Instruments, Inc., 115 Cutter Mill Road, Great Neck, N.Y.

VAREA-METERS. A 20-page booklet announcing design improvements in W&T's precision mercurial manometer. Wallace and Tiernan Inc., 25 Main Street, Belleville 9, N.J.

ROTARY AND CONVEYING VALVES. A 4-page brochure covering rotary and conveying valves manufactured by Systems Engineering Company. Systems Engineering and Manufacturing Company, Inc., 6330 Washington Avenue. Box 7634, Houston 7, Tex.

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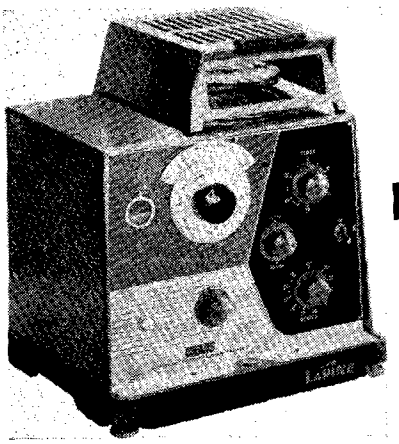

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