Past and Future of Danish Fat and Oil Industry

DENMARK'S TOTAL POPULATION of approximately four million people cannot provide the basis of much activity in animal and vegetable oil and fat production compared to that of the United States. However the fat-consuming industries are all highly developed, and all fat-consuming production units are mainly based on the domestic markets.

The vegetable oil industries, processing margarine and consumption fats, are confined to three mills; and since Danish farm land has in recent years been used to a greater extent for growing crops more profitable than oil-seeds, most of the raw materials for the mills must be imported. However with the decreasing production of vegetable oil it is encouraging to see the production of animal fats increase and the export of these items rise correspondingly.

Vagn Jespersen

Import restrictions and high duties abroad have however prevented expansion of export to a degree that would fully utilize the high capacities of present installations. This can be traced back to lost markets in Eastern Europe, and much remains to be done commercially as well as financially, depending on the economic climate in Denmark in the time ahead. In choosing trade partners, Denmark is often handicapped by the lack of credit facilities which enable other, more financially well-founded countries to work with more flexible currency systems.

Margarine production increased in 1956 from 85,000 tons to approximately 92,000 tons, and market prices for margarine fats and oils remained stable in spite of the Suez crisis because high prices were absorbed by a special "price buffer-system" enforced on vegetable fats and regulated by the mills and the margarine industries.

The import liberation percentage for vegetable fats was fixed at 15% for the first half of the year and reached 20% at the year's end.

The various animal fats, oils, and tallow industries have been operating under fairly good working conditions. Some plants have not been financially successful in their operations, and rationalization and concentration of production into larger units seems to be the key solution for smaller industries as in other countries.

The fish-oil industry has shown constantly increasing production, especially in 1956, and oil and meal production has been used domestically as well for export in large quantities. The future of this ever-expanding branch of the trade is anticipated with great confidence.

The production of soap and detergents has followed the pattern of most other countries with synthetic detergents covering an increasing percentage of the soap market. The production of synthetic detergents rose by 55% from 1955 to 1956 and covered approximately 35% of the total soap powder production.

TWO IMPORTANT INSTITUTIONS are doing research on fats, oils, and lard in Denmark, apart from work at private industrial laboratories, the Danish Meat Research Institute, established in 1954 and headed by Mogens Jul, and the Danish Fat Research Institute, established during 1956 at the Technical University of Denmark.

The former is in charge of analytical export control of lard; furthermore its lard department is engaged in development of vacuum lard-rendering systems; laboratory tests until now indicate promising results and superiority over existing wet-rendering methods. Besides this, improvement in consistency is being investigated, partly through the use of Votator equipment and partly by means of interesterification.

The use of animal fats in feeds is being tested, and a special "artificial milk" emulsion, consisting of 60% stabilized hog grease in skimmed milk and using esters of condensed glycerol with stearic and palmitic acid as emulsifier, is under study. The tests are accompanied by weeding with antibiotics. To accomplish non-freezing emulsions studies are under way, using the Tween type of emulsifier for the fat. The influence of the size of the fat droplets on fat resorption is being tested.

The latter institute is headed by Prof. H. Dam and Prof. P. Søltoft, who are engaged in nutritive and chemical studies of fats for human consumption. Funds were raised throug the "price buffer-system." It is expected that the activities of the institute will elucidate many of the interesting details connected with the nutritional value and biochemical function of fats. One of the subjects is the nutritional importance of the essential fatty acids, especially when the diet cont ins hydrogenated fats. In this connection it has been planned to investigate the nutritional value of hardened vegetable oils as well as of hardened marine oils.

Further specially prepared fats ("tailor-made fats") and polymerized oils will be included in the research program. It is also intended to study the interconnection between fat metabolism and the

(continued on page 24)

a melting point of 98–100°F. is aimed at, resulting in a yield of oleo-stearine of around 28%. There is a rather fluctuating demand for this by-product from various parts of the world. Before the war, when peanut oil was cheap, a bread compound was made containing one part of oleo stearine and three parts peanut oil, but now all the oleo stearine that is not exported is retained for hydrogenation. The hardened product mixed with hardened coconut oil is sold as a fairly tough confectionery fat. Alone it is used for a variety of purposes. At one stage during the war hydrogenated stearine was used as a substitute for paraffin wax, and it has also been used as a bonding and weather-proofing agent for cattle licks. Its chief use now is as a basis for the manufacture of monoglycerides. In this connection an interesting development originated in 1953 in Australia (8), where it had previously been found that addition of skim milk solids produced a poor, coarse, immature loaf. However it was noted that if small amounts of hardened stearine, glycerol monostearate, and potassium bromate were added with the milk powder, a good loaf could be baked. The procedure is to add to every 100 gal. (Imperial) of skim milk an emulsion of 4 lb. of fully hydrogenated stearine and 1 lb. of glycerol monostearate in a gallon of water, plus 9.5 of potassium bromate. The mixture is then spray- or roller-dried. For spray drying slightly better results are achieved by using 5 lb. of G.M.S. and no hydrogenated fat. The resulting powder is added at the rate of 6% to the flour in the dough mixer, and in this way the nutritive value of the bread is improved and skim milk more profitably used than in the usual feeding to hogs. This product has been very well received in Australia; well over 1,000 tons were used last year in Victoria alone, equivalent to 1 ton for every 100 tons of flour used in bread.

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Danish Fat and Oil Industry

(continued from page 4)

cholesterol contents of the tissues. The feeding experiments will be performed partly with chickens and rats, and the chemical analysis of the tissues of the experimental animals will be supplemented by histological examinations. For the analysis of the fats several methods are being used, *e.g.*, fractional distillation, ozone splitting, paper and gas-phase chromatography, and spectrophotometry in ultraviolet and infrared regions. Pilot-plant equipment for the production of the required special fats will be installed. This pilot-plant can be used not only to supply the materials for feeding experiments but also for a thorough study of certain technological processes used in the fat industry.

A Scandinavian anti-rancidity convention is planned for the fall of 1957 with the participation of members of research institutions in Scandinavia. This will be a continuation of the convention in Sweden in the year of 1952. Approval of various antioxidants and their application will be discussed along with other factors influencing the subject.

Private and official research is greatly stimulated and encouraged by research in the United States, and scientists and industry follow with the greatest interest articles in the Journal of the American Oil Chemists' Society, which in itself is of valuable assistance and support to everyone engaged in the fat and oil industry.

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Problem Corner

October 3, 1956

Question

I have read that sodium bicarbonate, if put in the cooker when loading it with pork fat, will neutralize the free fatty acids in the pork fat and produce an excellent grade of lard.

I understand that sodium bicarbonate is used to neutralize fat in the drip-rendering system. What percentage is used? Could you give me more detailed information on the subject?

From Philadelphia

Answer

If sodium bicarbonate is put in melters or cookers before rendering, it will not neutralize the free fatty acids present in the fat. It possibly reacts with the protein bodies present.

Drip rendering provides for two compartments in the rendering vessel, and soda is added to the lower compartment which contains the rendered lard. It thereby neutralizes the free fatty acids in the lard.

For details regarding drip rendering equipment, we are pleased to refer you to The French Oil Mill Machinery Company, Piqua, O.

J. P. Harris

Question

We should like to know the specifications for choice white grease.

From Massachusetts

Answer

Specifications for choice white grease are as follows:

FAC Color	13 to 11 B
Free Fatty Acids	4% maximum
Titre	37 minimum
MIU	Basis 1%

We find that two types of grease are permissible under the above specifications, and they are known as "all hog" and "blend." In other words, if you desire an all-pork product, you should specify "all hog."

We also find that stabilized choice white grease is available. We know of at least one producer who offers a 20-hr. AOM product, which shows satisfactory resistance to rancidity.

J. P. Harris