

Additional Markets Needed for Domestic Tung Oil

Fundamental investigations in tung oil chemistry necessary in the search for promising derivatives

BILOXI, MISS.—In 1952 domestic production of fats and oils was 50% above consumption; before World War II, production was 15% under domestic consumption. This was the shifting market described by F. G. Dollear of the Southern Regional Research Laboratory to members of the American Tung Oil Association during their 20th annual meeting here Sept. 24 and 25.

Dr. Dollear said that this shift in the market points to the need for more attractive tung oil products. He feels that research can lead the way. He called for more fundamental investigations of tung oil chemistry. We need to know, he declared, more about tung oil reactions during heat bodying, how tung oil may be chemically modified by reaction with various organic compounds, and determinations of product properties. He said that fundamental data would be quickly applied to the development of new products.

Tung Utilization Research. The decreasing market for tung oil in the manufacture of protective coatings has caused the tung oil research program to change from emphasis on processing and analytical methods to a more fundamental program looking toward new uses. According to A. Freeman of SRRL, who described the present program, chemical modifications of tung oil have been prepared and will be tested as plasticizers for polyvinyl chloride resins. Mercury-containing derivatives of eleostearic acid are being prepared for testing as fungicides, herbicides, seed disinfectants, and plant growth regulators. Liquid and solid tung oils, and both α - and β -eleostearic acid have been submitted to cooperating research groups for determination of various chemical and biological properties, he said.

Tung Press Cake. Commercial press cake is toxic and has been sold only as a fertilizer. At current prices for protein in other oilseeds used for feed stocks, about \$19 per ton is available

for tung press cake to cover cost of detoxification and profits, if it can be utilized for feed, according to R. S. McKinney, U. S. Tung Oil Laboratory. In a study of tung meal detoxification, all meal preparations made from hexane-extracted tung kernels were found toxic and unpalatable to young female albino rats. Ground commercial press cake was less toxic. Alcohol-extracted press cake and the same product after autoclaving were of still lower toxicity. Rats fed on a diet containing tung oil did not grow as well or consume as much food as did animals on the control diet, but no evidence of toxicity was noted. Additional experiments on nonextracted press cake and solvent-extracted press cake which has been autoclaved will be conducted. Efforts will be made to isolate and characterize toxic components in tung kernels, he said.

Fertilizer Effects. Since 1945, an experiment has been in progress near Monticello, Fla., to determine fertilizer requirements of mature tung trees on a "worn out" but basically good soil—Red Bay fine sandy loam. Most tung in the eastern part of the tung belt is planted on similar soil, declared M. S. Neff and M. Drosdoff of USDA. Although tung in the western part was planted on newly cleared, virgin land, proper fertilization may be necessary to prevent deficiencies from developing. Highly variable and usually adequate amounts of native phosphorous in the soil apparently masked any effect of the phosphorous treatment. Calcium and magnesium applications tended to be detrimental because of an absorption and accumulation of potassium. Effects of the treatments on the uptake and accumulation of zinc, boron, manganese, and copper were of no consequence. Only the response to nitrogen and potassium were of importance. Yields of air-dried fruit were increased by nitrogen, and both yield of fruit and percentage of oil in the fruit were increased by potassium.



R. S. McKinney, in charge of U. S. Tung Oil Laboratory, examines product from a tung oil fruit separator

Applications of potassium hastened and those of nitrogen tended to delay maturity of the fruit.

Chemical Control. Blackberry briars and volunteer tung seedlings are troublesome in the tung orchard, said B. G. Sifton and W. A. Lewis of the Bureau of Plant Industry, USDA. Tests with 2,4-D at concentrations twice that recommended killed only the above ground parts of volunteer tung trees and blackberry briars. Better results were obtained with 2,4,5-T, which gave perfect control of volunteer tung trees and almost complete control of blackberry briars. Definite recommendations will not be made before the spring of 1954, when results of the tests can be evaluated, because of uncertainty as to the risk of injury to orchard trees.

Marketing Cooperative. Marshall Ballard, Jr., president of the American Tung Oil Association, happily reported during his annual address that a more harmonious working relationship has been established with the Tung Growers Council of America. This is a very important step forward, he added. A joint committee of both associations has de-

voted much time and study to the formation of an industry wide marketing and research organization, the National Tung Oil Marketing Cooperative. Mr. Ballard recommended that serious considera-

tion be given to the proposed organization. "Because I believe in the plan, I have caused my company to sign as a charter member of the new organization," he asserted.

Instrumentation of the Food Processing Industry Continues

Automatic evaporator control improves product quality and lowers cost

CHICAGO.—The food industries are coming in for their share of attention in the trend towards greater instrumentation in the process industries. Food processing applications were indicated by many of the more than 300 booths of exhibits at the conference and exhibit of the Instrument Society of America here on Sept. 21 to 25.

Evaporation. Whether an evaporator is used to concentrate milk, sugar, or grape juice, comparable instrumentation is employed, said J. E. Barber, Taylor Instrument Co. As the food industry's demands grow for product quality improvement and lower costs for evaporator operation, the application of more complete and satisfactory instrumentation become increasingly important.

Heat input, liquid feed level, concentration of final product, rate of evaporation, and final effect pressure or temperature may be controlled automatically and thus decrease evaporation costs and improve the quality of the product, according to Mr. Barber.

Heat input to an evaporator may be controlled by regulating either the pressure of the steam chest or of the vapor space above the evaporating liquid. In

Recording spectrophotometer, shown by Beckman Instruments, automatically runs more samples in an hour than an operator could handle in a day with conventional equipment, according to company



either case temperature-activated controllers are made to operate the valve governing the incoming steam.

Steam chest control is the more desirable method for heat sensitive materials. If the vapor space pressure is the controlled variable, any build-up of solids on the evaporator tubes will result in ever increasing steam chest pressure to maintain the vapor space pressure, and will, therefore, overheat the liquid being concentrated.

Concentration. Concentration of the product is the most vital, and also the most difficult, variable to control in an evaporator. Concentration cannot be measured directly, but must be related to some characteristic such as density, viscosity, or the boiling point rise. Boiling point rise is the most desirable var-

iable to control, but it is only useful when it changes sufficiently with concentration. The difference between the temperature of the product withdrawn and the vapors (after removing the superheat) is a function of the boiling point rise.

Density may be measured by circulating a small stream of the product through a sample column. A tube immersed to constant depth in the liquid in the column is connected to an air source and a manometer. A small quantity of air is allowed to bubble through the tube. Any change in density of the liquid is reflected in a change in back pressure which is recorded by the manometer. There are several other continuous density measuring devices, including a submerged float whose varying buoyancy may be recorded.

Feed Level. Control of the feed level is a necessary part of the concentration control. The concentration control mechanism will open the withdrawal valve, but a level controller is needed to govern the addition of more dilute material to the evaporator effect.

Liquid level control on all effects enables each one to operate at maximum efficiency. Low levels decrease the available heat transfer surface, while high levels cause excessive hydrostatic pressure in the lower portion of the liquid, resulting in boiling starting too far up the body tube, said Mr. Barber.

Industry

Carnation Centralizes Research In New California Laboratory

Unit under study flakes and cooks cereals in one short operation

CARNATION Co., which moved its headquarters to Los Angeles in 1949, formally opened its new research facilities in nearby Van Nuys, Oct. 8. The new lab, costing about \$750,000 and containing 31,000 square feet of floor space, consolidates in one place the research operations Carnation previously carried on in Milwaukee and Oconomowoc, Wis., and Oakland, Calif.

The new laboratory consists of six laboratory rooms (for engineering, cereals, bacteriological, biological, processing, and analytical work) plus pilot plant space for "wet" (milk) and "dry" (cereal) product processing. Carnation, like most of the food industry, is not neglecting short time, high temperature processing. An experimental Martin aseptic canning unit has a prominent place in the "wet" pilot plant. In the "dry" pilot plant room, a unit Carnation has dubbed a flame flaker is being

used to investigate the high-short possibilities for processing the so-called instant cereal preparations. This unit, which is a typical cereal industry flaker, has its rolls heated by direct application of gas flames. It thus flakes and cooks a cereal within a matter of seconds and is expected to eliminate the present two-step operation of coldroll flaking followed by cooking.

Carnation, like most companies, is mum about the specific products or processes it will work on in the new lab. However, Phillip K. Bates, Carnation general manager of research and president-elect of the Institute of Food Technologists, points out the following as being among the challenges facing his company and others in the field:

Special Diets for the Aged. Canned baby foods, unknown in the not too distant past, are now an established consumer item, and they serve a large and