Tallow, as No. 2, is trying harder

Animal fats (tallow and grease), the second largest source of fats and oils in the United States, may touch your life more directly than you suspect.

The fabric in the clothes you're wearing, for example, may have been sized on textile mill equipment using tallow-based fatty acid Lubricants. That's because the tallow-based material, unlike petro-based lubricants, can be washed out of fabrics once they come off the sizing machinery.

The tires on your car may have been produced with the aid of tallow derivatives. In the early 1970s, when tallow was in relatively short supply, a Wall Street Journal article quoted a major tire manufacturing company executive as saying one plant might have to shut down for lack of certain tallow-based materials used to help release new tires from molding equipment.

And tires produced with help of tallow may someday roll across a concrete highway bridge protected from weathering with the help of tallow. Researchers say they can replace part of the concrete aggregate mix with beads of hydrogenated tallow, paraffin and stearic acid. After the concrete is poured, an application of heat melts the tallow beads which become a sealant, flowing into the interstices of the concrete to keep out water and salt. Tallow works well in this use because of its handling qualities and narrow melting range, according to Werner Boehme, director of the Fats and Proteins Research Foundation (FPRF), an industry-backed group that supports animal fat research. A paper on tallow-based weathering sealants, "Concrete Sealants Based upon Animal Fats and Fatty Acids," was presented during the 1978 AOCS annual meeting.

What's the total production of animal fats in the United States? Jack Crouse, director of market development for The National Renderers Association (NRA), says 1977 production totaled about 8.1 billion pounds a year. U.S. government figures say about 6 billion pounds a year, but Crouse says accurate figures on domestic use and exports add up to far more. The difference can not be reconciled by use of imports or reserve stocks, Crouse says. Many persons have told him they traditionally use government figures as an index to animal fat production rather than as accurate figures. In 1976, federal figures show production of 5.6 billion pounds of inedible animal fat and 0.5 billion pounds of edible tallow; Crouse says 1976 total production was slightly above 8 billion pounds.

Production in the first half of 1978 was comparable to a year ago, but declining cattle population indicates reduced production may lie ahead. Beef cow and heifer numbers are declining. The effect of cattle herd liquidation may not be felt until the end of 1978 or during 1979, according to some agricultural economists. Cattle on feed statistics as of July 1 indicate relatively good supplies of cattle going to market in the United States through the third quarter of 1978.

The preponderance of domestic usage for animal feed sometimes worries Crouse. Not too long ago, soap production provided the predominant market for tallow. The relatively swift change to petro-based detergents hurt renderers financially. Crouse would like to see more diversified domestic markets and is encouraged by the recent emergence of the fatty acid market.

Animal feed will continue as the major domestic use for many years. Dr. Conwell Johnson, NRA's director of product development, foresees more usage in the swine industry. Swine production used to be largely a matter of small herds on individual farms. Now the pork industry is developing large scale commercial feedlots, just as the beef industry did. The swine feedlot operations are potential customers for animal fat, which Dr. Johnson says reduces costs by helping hogs reach market weight quicker. Swine also have a preference for animal fat supplemented feeds, Dr. Johnson says.

Research also has indicated that increasing dietary fat of sows will help improve infant pig mortality. Baby pigs, particularly underweight ones, quite often starve to death when their bigger siblings keep the smaller pigs from getting enough milk. Recent research in Czechoslovakia has shown that infant pigs can't use the lactose in sow's milk as an efficient source of energy during the first few weeks of life, but they can metabolize the fat. A farrowing lactation ration with 15% added fat raised the fat content of sow's milk by 3% (which translates to about a 25% higher energy content). Baby pig mortality dropped about one pig per litter; mortality among infant pigs weighing less than 2.4 pounds at birth dropped 18%. Coincidentally, research has shown the milk of wild pigs has a higher colostrum content than that of domestic sows. In the swine industry the highest return per dollar invested in feeding fat can be obtained by feeding fat to the sow from about 5 days before farrowing until the infant pigs are 14 days old, Dr. Johnson says. The high fat farrowing lactation feed has recently been introduced to the industry. The next step in the research is to try lower levels of fat supplement to see if a more economical, effective feed can be developed.

Other studies show that animal fat can be an economical source of energy for young pigs and growing-finishing pigs, Dr. Johnson says. University of Nebraska research showed a 3% to 5% added fat level reduced daily feed requirements by 10% and increased daily gain by 5%.

In cattle feeding, researchers are studying ways animal fat might permit livestock to make better use of protein in feed rations, and conversely, of using protein to permit better use of dietary fat.

Dr. Johnson described new testing on impregnating protein feed rations with saturated fat to reduce the breakdown of protein in the rumen. Unprotected protein is attacked by bacteria in the rumen, and a high percentage of the dietary protein never reaches the bovine's main stomach; thus, its nutritive value is wasted. If more protein reaches the digestive tract, it could improve feed conversion rations, reducing the amount of feed needed to bring a steer to market weight.

Conversely, researchers are trying to move more usable fat into a lactating cow's stomach, Dr. Boehme notes. Dr. Johnson stated that if faulty energy metabolism occurs in the cow, she develops ketosis. Protecting small particles of fat in rations with protein would avoid high concentrations of free fat in the rumen yet permit the fat to reach the small intestine and thus reduce the incidence of ketosis. Animal fat is the preferred fat because of its fatty acid composition, relative degree of saturation and cost, Dr. Johnson says.

In a quest for diversity, the rendering industry is buoyed by an increasing use of animal fats to produce fatty acids. Dibasic acids have been prepared from animal fats by nitric acid oxidation. In the past, nitro-compound impurities have prevented commercialization. Now a way has been found to modify the oxidation procedure and avoid this contamination, Dr. Boehme says. If further work is successful, tallow fatty acids could be processed for use in long chain ester synthetic lubricants or as plasticizers and coatings in a variety of industrial uses.

The third largest domestic use for tallow is in soaps. The FPRF has supported work at the Eastern Regional Research Center on developing tallow-based detergents that are practical in hard water through addition of lime soap dis-

persing agents. The process has been commercialized in Japan for consumer detergents. FPRF is sponsoring work by SRI International on manufacturing processes for tallow-based detergents.

The biodegradable properties of tallow-based cleansers may prompt more acceptance as industrial cleansers and in commercial laundries than in consumer products, Dr. Boehme says. If petroleum prices continue to rise, tallow-based cleansers will become more competitive in price with all petro-based detergents, he adds.

Exports totaled 2,910 million pounds of the 8,100 million pounds produced in 1977, according to Crouse's figures. The USDA estimates 1977 inedible tallow exports at 2,694 million pounds. Egypt was the single largest importer of animal fats for 1977, accounting for 250 million pounds worth $54 million by USDA figures.

Egypt's animal fat imports have increased in recent years as rising living standards have spurred more demand for soap and other cleaning products, Crouse says. The renderers thus have benefitted commercially by warmer political relations between the United States and Egypt.

Crouse views Latin America as a potential major growth market for U.S. animal fats, partly because of its proximity. While Argentina is a major beef producing nation, most of that beef is range fed and produces less tallow per animal than American feedlot herds.

Europe was the largest regional market for U.S. inedible tallow in Fiscal Year 1977, importing about 971,818,000 pounds. Some was subsequently shipped elsewhere, and some refined for use as an edible fat, Crouse says. Africa, including Egypt, imported 509,333,000 pounds; the Far East (primarily Korea and Japan) 474,620,000 pounds; Latin America, 432,272,000; India, Pakistan and Bangladesh, 190,740,000; and the Mideast region, 73,132,000.

J. Stewart Cox, the NRA's European Director, noted in the NRA's 1978 Spectrum that shipment of tallow within the EEC increased 77% from October 1976 to July 1977. "Most markets indicate that usage in the fatty acid industries and other technical applications are the biggest factor in increased movement," Cox said.

Tallow is one of the least expensive sources of fats and oils. Dean Specht, NRA's executive director, points out that while tallow's price cycle tends to follow the worldwide fluctuations in fats and oils markets, the variations are not as great as they are for vegetable oils derived from annual crops. Tallow also is attractive to developing nations, Specht says, because less sophisticated processing equipment is required than for competitive vegetable oils.

The rendering industry organized both the National Renderers Association and the Fats and Proteins Research Foundation Inc.; NRA and the Foundation maintain separate offices in Des Plaines, IL. NRA serves as a trade association, and, in cooperation with the Foreign Agricultural Service, runs an overseas market development program. It also supports research on animal fats (as well as protein byproducts from the rendering industry) and promotes domestic use of such products. The research foundation helps finance research in universities, in research institutes, by independent consultants, and at the USDA's Eastern Regional Research Center. About half the FPRF projects concern animal nutrition; others cover fats modification, environment and ecological problems, and protein studies. NRA's annual meeting is later this month, Oct. 30-Nov. 3, 1978, in Houston, TX.

Both groups' officials expect increased growth in use of animal fats, particularly as research helps find profitable new uses for the United States' second largest supply of fats and oils. ●