

Soy Materials Make a Green Mark

Soy-based materials offer renewable green technologies to a variety of industries.

Companies looking to get “greener” and use renewable materials to replace petrochemical products are turning to soybeans. The soybean is a highly adaptable oilseed. The meal and oil can not only be used to feed humans or animals; it can also be used to develop products for everyday use.

“Soy represents a renewable, environmentally-friendly product that has a large part in the ‘green’ movement,” says Bob Haselwood, New Uses committee vice chair of the **United Soybean Board** (USB), St. Louis, and a soybean farmer from Berryton, Kan. “With the price of crude oil high, soy remains a cost-competitive alternative for many industries.”

Developing soy-based products

USB, a farmer-led organization, invests farmer checkoff funds into research, market development, and expansion, including research, development, and commercialization of new industrial uses for soybeans. The USB mission seeks to increase soybean demand through advancements in soy-based research and technology. For industrial uses of soy, USB focuses efforts on six target areas, including adhesives, coatings and printing inks, lubricants, plastics, fibers, and specialty products.

“The number of soy products has risen in the last several years, and this year the amount of soybean oil used for industrial products

has increased to between 1.15 to 1.35 billion pounds,” says Haselwood. “That represents about 120 million bushels of soybeans.”

Soy success

Ford Motor Company, Dearborn, Mich., won a 2009 R&D 100 Award for soy-based foam for use in car seats. Ford has partnered with USB to develop renewable soy-based technologies.

“Ford’s use of soy-based products has been one of the most newsworthy success stories involving soy’s new uses,” says Haselwood.

Ford pioneered the use of soy oil in foam for seat cushions, seatbacks, and vehicle headliners. There are more than 2 million Ford, Lincoln, and Mercury vehicles on the road today with bio-based foam content. Using this biofoam, Ford has annually reduced its petroleum oil usage by more than 3 million pounds, and its carbon dioxide emissions by 11 million pounds.

In addition, Ford has expanded its use of soy-based products to rubber. By using renewable soybean oil to replace 25% of the petrochemicals in rubber, Ford researchers more than doubled rubber’s stretchability and reduced its environmental impact. Soy-based rubber parts, such as radiator deflector shields, air baffles or deflectors, cup-holder inserts, and floor mats, may be installed in future Ford vehicles.

Ford’s recent rubber research, funded in part by USB, included the use of soy fillers, such as soy flour and soybean meal, as well as soybean oil. Ford researchers found that soy fillers could provide an inexpensive and environmentally-friendly partial replacement of carbon black, a petrochemical-based material traditionally used to reinforce rubber. Used together, soybean oil and soy fillers could replace up to 26% of the petrochemical-based content in automotive rubber applications.

Inks and coatings

Soy ink, which is used to print more than 90% of the America’s 1,500 daily newspapers and recently celebrated 20 years in use, can be found in soy-based toners as well. The **Battelle Memorial Institute** in Columbus, Ohio, has worked with the **Ohio Soybean Council** (OSC) to



The United Soybean Board funds the research, development, and commercialization of new industrial uses for soybeans. Its mission is to increase soybean demand through advancements in soy-based research and technology.

develop a soy-based toner for copy machines and computer printers. Battelle and OSC have perfected the science and are currently working with potential marketers to bring the product to consumers. Work continues with other research agencies regarding the possibility of soy ink in pens and other writing applications.

Soy-based coatings, such as wood and concrete stains, caulking, and other building products are making a mark on consumers and have shown versatility in new applications, including ultraviolet and electron beam-curing roof coatings and faux finishing in building artwork.

For many years, soybean oil has been a major ingredient in making alkyd resins, which are dissolved in carrier solvents to make oil-based paints. The popularity of latex or waterborne paints has presented a challenge for soy-based paints. USB works with companies like Sherwin-Williams to develop soy-based paints for consumers.

Other areas of development include: stable, waterborne architectural coatings; high-performance, volatile organic compound (VOC)-free coatings for industrial applications; and 100% solid powder coatings.

Adhesives

Increased prices for petrochemical products, environmental concerns, and human health issues have prompted demand for a renewable feedstock, causing a resurgence of interest in the



Soy ink recently celebrated 20 years of use in newspapers throughout the United States. Currently, over 90% of America’s 1,500 daily newspapers use soy ink in their presses. Images: United Soybean Board

development of new soy-based products for the wood adhesive industry.

PureBond, a promising new product from **Columbia Forest Products**, Greensboro, N.C., is a formaldehyde-free plywood technology developed with funding from USB. To date, 40 million PureBond plywood panels have been installed in the United States.

This product represents an expanding market, one that uses soy flour. Columbia Forest Products uses approximately 15 million pounds of flour processed from U.S. soybeans annually.

Plastics

Soy-based plastics can be divided into two main groups: polyurethane using soy polyols and thermosets. As more manufacturers look for alternatives to high petrochemical prices, soy-based plastics provide a viable option.

Polyurethanes using soy polyols include urethane foams, binders, coatings, adhesives, and sealants. Soy polyols perform exactly like their petrochemical counterparts or better in some cases when it comes to total weight, strength, and durability. Plastic composites and polyurethanes, used for plastic body and interior

USB partners with companies like Ford to develop soy-based products. Ford's use of soy foam in seats helped them win an R&D 100 Award in 2009.

parts for automobiles, boats, and agricultural equipment, could potentially replace an estimated 300 million pounds of thermoset resins in a market totaling 2.7 billion pounds in North America.

Lubricants

The need for high-performing and low-toxic lubricants in environmentally-sensitive areas has been recognized, and growing regulatory pressure to reduce or eliminate some emission of petroleum lubricants should encourage increased incorporation of soy-based oils. Growing regulatory impacts on lubricants



should create more use of bio-based lubricants in the U.S. over the next five to 10 years.

When compared to mineral-oil lubricants, soy lubricants have higher viscosity, lower evaporation loss, and a potential to enhance lubricity, which could lead to improved energy efficiency.

Hydraulic fluids from **Environmental Lubricants Manufacturing, Inc.** (Grundy Center, Iowa.), are used in the Statue of Liberty and other structures in the United States. Other soy lubricants include cutting fluids, bar and chain oils, and soy-based transformer fluid.

"Green" products

USB continues to review research proposals and partners with companies with promising new soy technologies. Soy represents a renewable product, grown in the United States, providing quality products and reducing U.S. dependence on foreign petrochemicals.

"Everyone continues to look for sustainable and 'green' alternatives, and soy will play a part of the sustainable movement for a number of industries," says Haselwood.

—United Soybean Board
www.soynewuses.com

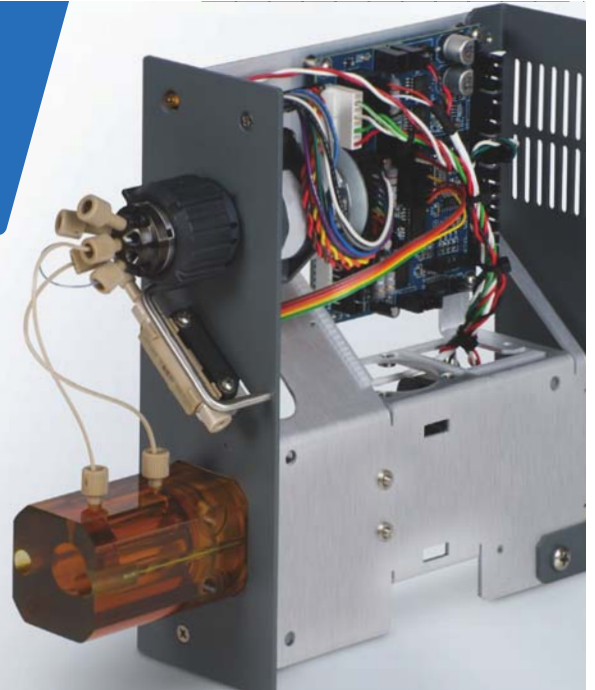
Moving You Forward *in Optimized Fluidics*

Integrated fluidic sub-systems are our specialty.

We work with your team to design custom fluidics that increase performance, eliminate waste, and move your business forward.

Get your **FREE Instrument Design Resource** today!

Visit info.idex-hs.com/RD5



IDEX
HEALTH & SCIENCE

Eastern Plastics | Innovadyne | Ismatec | Isolation Technologies | Rheodyne | Sapphire Engineering | Systec | Upchurch Scientific

Logos are registered trademarks of IDEX Health & Science LLC | ©2010 IDEX Health & Science LLC | IDX1214-AD-IH | www.idex-hs.com