



Innovative New Uses for Soy

[Subscribe](#)
[Contact Us](#)

Soy-Based Metalworking Fluid Pays Dividends for Alcoa



The recent push toward biobased products replacing petroleum has reached all the way to the metalworking industry. Alcoa, Inc is currently replacing some of its petroleum based lubricants with a new metalworking fluid derived from soybean oil. The new lubricant was developed under cooperative research and development agreements with the U.S. Department of Agriculture's Agriculture

Research Service (USDA-ARS) National Center for Agricultural Utilization Research in Peoria, Ill.

Alcoa uses the new soy-based lubricants for hot flat-rolling operations, which produces aluminum sheets for everything from beer cans to aircraft-wing panels. The United Soybean Board (USB) and the soybean checkoff support new uses for soybeans and support research similar to Alcoa's project.

The partnership between Alcoa and USDA began in 2001 when the company's scientist, Dr. Ronald Reich, expressed an interest in switching from petroleum-based to biobased metalworking fluids for their hot rolling operations.

USDA-ARS chemist Girma Biresaw, along with a team of scientists led by Dr. Sevim Erhan, examined the chemical structures that give synthetic metalworking fluids their functional properties. The team then proposed two soy-based oils which were modified by a chemical or heat treatment methods to achieve the desired viscosity, pour point, and other properties.

"When you talk about metalworking, you're talking about everything from drilling holes and grinding to forging and stamping—a multitude of processes with different temperatures, speeds, forces and lubrication requirements," says Biresaw.

In aluminum rolling mills, the fluid's chief function is to keep the metal – and the heavy steel rolls used to flatten it – together. The fluids further ensure product quality by dispersing heat and filtering out surface debris.

Vegetable oils as lubricants are not new to the metalworking industry, but previous efforts struggled with the lubricants oxidizing too easily. The soy oil resisted oxidation because the scientists reduced the double bonds in the structure along with adding suitable antioxidants for stability.

"Soy oil has great benefits to the metalworking industry as well as many other industries," says Todd Allen, USB New Uses chair and a soybean farmer from West Memphis, Ark. "Soy provides great performance with environmental and air quality attributes companies find attractive."

Using the data the ARS scientists provided, scientists at Alcoa formulated different soy-based hot rolling lubricants, chose the most promising and ordered a 150-gallon sample to be made for testing, starting in October 2004. The test included environmental sampling by additional collaborators. The test sample outperformed the previous best technology. In fact, the plant operators threw out their existing lubricants and replaced them with biobased ones.

Since 2004, Alcoa has conducted numerous tests of the soy-based hot rolling lubricants at its rolling mills in the US. Because of successes in these tests, the company has implemented the biobased formulations on some of its domestic hot rolling mills and plans to do more at other domestic and international locations.

In a single day, an Alcoa mill may replace 500 gallons of petroleum-based fluid – most of which escapes into the air as fumes containing volatile organic compounds (VOCs). Cutting down on VOC emissions is a driving force behind the company's decision to use biobased products. The company has a goal of reducing their VOCs by 50 percent by 2012. Air monitoring at the plant that performed the tests indicate using soy-based fluids may help make this possible.

To learn more about new uses for soy, visit www.soynewuses.org. To learn more about Alcoa, visit <http://www.alcoa.com/global/en/home.asp> and to learn more about USDA-ARS, visit <http://www.ars.usda.gov/main/main.htm>.

USB is made up of 64 farmer-directors who oversee the investments of the soybean checkoff on behalf of all U.S. soybean farmers. Checkoff funds are invested in the areas of animal utilization, human utilization, industrial utilization, industry relations, market access and supply. As stipulated in the Soybean Promotion, Research and Consumer Information Act, USDA's Agricultural Marketing Service has oversight responsibilities for USB and the soybean checkoff.