

Statue of Liberty Goes Green With Soy-Based Elevator Fluid

Visitors to the Statue of Liberty may not know it, but the monument's elevator now runs on a new, biodegradable hydraulic fluid made from soy oil.

Until recently, Lady Liberty's elevator used mineral oil formulations derived from petroleum-based stocks. But the National Park Service (NPS), which manages both Liberty and Ellis Island, has decided to "go green," using products made from renewable sources that are less polluting. In February 2002, NPS building and utilities foreman Jeff Marrazzo contacted ARS chemist Sevim Erhan about the feasibility of developing a biobased fluid for use in the statue's elevator.

Erhan, at ARS's National Center for Agricultural Utilization Research (NCAUR), Peoria, Illinois, recalls Marrazzo's specifications for such a product: It had to readily break down in the environment in case of a leak; it had to come from a renewable resource; the process for making the biofluid had to be economical and nonpolluting; and it had to meet all industry standards for safety and performance, such as for viscosity, stability, and flame resistance.

It so happened that Erhan's group at NCAUR's Food and Industrial Oil Research Unit already had the expertise and equipment in place for attempting such a technological feat.

Erhan's first order of business was to examine the chemical structure that gives mineral-oil-based hydraulic fluids their functional properties, such as transferring energy in moving parts. Along with Atanu Adhvaryu, a Pennsylvania State University postdoctorate scientist working at NCAUR, Erhan then formulated a new elevator hydraulic fluid using soy oil and tested it extensively to see that it had the necessary properties.

Though other vegetable oils will work, soy oil was chosen because of its low cost, chemical

versatility, and availability as a renewable, home-grown resource, says Erhan. Second only to corn as America's most widely grown crop, soy is the nation's leading source of food-grade oil. Yet only 517 million pounds—3 percent of the total supply—are used for industrial purposes, according to the latest figures from Soy Stats.

Agri-Lube, Inc., a Defiance, Ohio, firm collaborating with Erhan's lab, scaled up production of the final biobased formula for testing—first by Otis Elevator using a 50-gallon sample, and then by Mazzarro at Liberty Island using 1,000 gallons.

In both tests, the biofluid worked as well as or better than the mineral-oil-based formulations, especially in terms of lubricity and biodegradability. "We noticed the bioformula also had a higher flashpoint than the mineral-oil-based fluids," says Agri-Lube owner Jack Stover, who is negotiating licensing rights to commercialize ARS patents on the hydraulic fluid and two vegetable-oil-based printing inks.

Erhan hopes innovations like these will spawn new market outlets for soy and other oilseed crops while easing the reliance on petroleum and its burden on the environment.

Perhaps it's fitting that the Statue of Liberty, her torch beaming, is the welcoming point for ushering in such new technologies.—By **Jan Suszkiw**, ARS.

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