

Biofuels UPDATE

Report on U.S. Department of Energy Biofuels Technology

Ford Evaluates E-85 Minivans for Fleet Use

Ford Motor Company, in a test program with the U.S. Postal Service (USPS), the Illinois Corn Growers Association (ICGA), and the states of Illinois and Wisconsin, modified 15 Ford Windstar minivans to run on either gasoline or E-85 (85% ethanol and 15% gasoline blends), or a combination of both, beginning in early March.

"The actual conversions are being performed by Livernois Engineering in Dearborn, Michigan, under Ford supervision," said Norm Marek, program manager for the Alternative Fuels Program for the State of Illinois, "and all the vehicles are under full factory warranty by Ford for E-85 fuel." ICGA worked closely with Ford to initiate this program, and will help collect data on the Windstars' performance.

"We will operate only one Windstar, to be used in promotional activities," said Jim Tarmann, ICGA field services director. "Our use will center around promoting this vehicle and ethanol as an alternative fuel."

According to Tarmann, ICGA worked closely with the USPS for more than 5 years to find a vehicle it can use in day-to-day operations. The USPS will operate three E-85 Windstars in DeKalb, Illinois, two in Des Moines, Iowa, and one in Washington, D.C. Also, it already has five E-85 Tauruses in operation, with four



Photo Courtesy of Illinois Corn Grower's Assn./PIX 04605

E-85 Ford Windstar Minivan

in Chicago and one at the USPS Research and Development Center in Merrifield, Virginia.

"The E-85 Tauruses in our fleet are used to test fuel economy and emissions," said Han Dinh, a USPS engineer. "We plan to use the Windstars for express mail deliveries." According to Dinh, USPS is pleased with the performance of

its E-85 vehicles, but will delay purchasing large numbers of the flexible fuel vehicles because too few refueling sites are available.

The State of Wisconsin received four E-85 Windstar minivans and placed two each in Milwaukee and Madison. Research

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Chrysler Corporation will step forward in the alternative fuels race when it unveils its ethanol-powered minivan in model year 1998. The Dodge Grand Caravan and the Chrysler Grand Voyager are flexible-fuel vehicles, powered by either gasoline or E-85, a blend of 85% ethanol and 15% gasoline. They are available in all- or front-wheel drive.

Both vehicles, priced at \$17,235, will be void of any incremental costs, and will be sold only to General Services Administration fleet customers.



DOE Ethanol Project Updates

Gridley's Rice Straw to Ethanol Project

Because of environmental regulations and community pressure to reduce air pollution in California, DOE's National Renewable Energy Laboratory (NREL) is working with SWAN Biomass to evaluate the potential for turning rice straw, a major source of air pollutants when burned in the fields, into ethanol.

"Our goal is to work with our industrial partners to build a biomass waste-to-ethanol facility before the turn of the century," said John Ferrell, director of the Office of Fuels Development at DOE.

"So far, the Gridley project is a two-step plan," said Mark Yancey, a senior project coordinator at NREL. "Phase I was completed in February and we have decided to continue into Phase II."

Phase I consisted of what Yancey called a "pre-feasibility study," in which laboratory experiments are run to determine conversion yields and rates of the rice straw and combustion properties of residuals from fermentation. SWAN Biomass, a business partnership formed by Amoco Corporation and Stone & Webster Engineering, formulated a model to estimate project economics, which will help determine whether the Gridley project is likely to turn a profit.

The objective of the study is to identify and evaluate two sites in California, one near Biggs and the second in Orreville, and to determine their potential for long-term operation of a financially sound

rice straw-to-ethanol production facility. Project goals include:

- Demonstrate biomass conversion technology on rice straw
- Integrate the ethanol process with other technologies to allow the biomass to be converted into ethanol and to operate with no detriment (and with possible benefits) to the environment
- Acquire additional cost-share funding to complete Phase II, if Phase I demonstrates sound economics
- Acquire financial commitments to design, construct, and operate a full-scale commercial facility.

Phase II is geared toward obtaining data to develop a business plan, including pilot-scale testing and refining costs for any private corporation that would continue the project.

"If there were a planned Phase III, companies identified in Phase II would have to continue the project and conduct day-to-day operations," said Yancey.

Quincy Library Group Proposal

The Quincy Library Group (QLG), together with DOE, NREL, and other project partners, has initiated a study to determine the economic, environmental, and regulatory feasibility of four facilities designed to process forestry wastes into ethanol. This concept has become increasingly important during recent years, as excess dry and decaying wood has contributed significantly to several major forest fires. The four proposed sites, located in the Sierras of California are Westwood, Chester, Greenville, and Loyalton.

The Quincy Project's seven major tasks are listed below, along

with the group responsible for collecting data:

- Feedstock supply and delivery systems (QLG)
- Site selection (QLG and Plumas Corporation)
- Design and cost estimates (NREL)
- Financial evaluation and sensitivity analysis (NREL)
- Environmental issues (California Energy Commission [CEC])
- Market issues (California Department of Food and Agriculture and CEC)
- Socioeconomic impacts (QLG)

"An important part of both studies is the feedstock supply issue," said Yancey. "We are trying to determine the costs associated with transporting the biomass materials from the original locations to the processing facilities."

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includes vehicle user convenience, cost analysis on vehicle operations, tailpipe emissions, and a cold-start analysis. The Illinois fleet will run similar tests, but will also use conventional motor oil in two of its four Windstars. In the past, all ethanol-powered vehicles used motor oil designed specifically for use with the alternative fuel. "Using conventional motor oil is much more economical," said Marek. "The oil normally used in ethanol-powered vehicles costs three times as much. We have periodically sent oil samples to Ford for chemical analysis."

Ford has no plan to produce the E-85 Windstar for government fleets, but Illinois State officials are pleased with the vehicle performance and hope to see it mass produced by the year 2000.

Biodiesel

Biodiesel Plants Sprout Up across the United States

Biodiesel, a renewable diesel replacement, is growing in application and demand, and gains attention as it moves through American Society of Testing and Materials (ASTM) procedures. According to Jeff Horvath, chief executive officer of the National Biodiesel Board, the fuel recently received a provisional ASTM standard, a leap toward industry acceptance.

More work must be done before the fuel can be fully integrated nationwide, but some entrepreneurs have already opened biodiesel plants to meet expected demands. Recent plant openings and market developments are highlighted below.

Pacific Biodiesel, Inc.

Pacific Biodiesel, Inc., opened its doors in December 1996 and is the newest of the five U.S.-based biodiesel plants in operation. It is the first biodiesel plant in the

Pacific Rim, and can store 20,000 gallons of raw oil and 15,000 gallons of biodiesel. It can also process 150,000 gallons of biodiesel annually. The biodiesel is derived from waste cooking oil and collected throughout Maui County. The County is also a customer of the plant, and uses the fuel in dump trucks and refuse collection trucks.

Twin Rivers Technologies L.P.

In November 1996, the U.S. Environmental Protection Agency (EPA) certified Twin Rivers Technologies' (TRT) Envirodiesel, a trademark brand of biodiesel, as the nation's first alternative fuel for use in meeting Clean Air Act (CAA) compliance under the agency's Urban Bus Retrofit/Rebuild Program. The EPA certification allows the use of Envirodiesel, blended with its petroleum-based counterpart, in conjunction with a catalytic converter, to reduce urban bus air pollution and achieve CAA compliance. TRT's Envirodiesel is the industry's only CAA-approved fuel. TRT has actively produced biodiesel since 1994, and has an

annual production capacity of more than 30 million gallons per year.

NOPEC Corporation

NOPEC Corporation, in Lakeland, Florida, has an annual production capacity of 22 million gallons, with

a daily production capacity of 70,000 gallons. NOPEC focuses on the marine market, and has an agreement with Boats U.S., a top marine marketing company. NOPEC also services 11 distribution centers around the country for its biodiesel products. The company markets its biodiesel in 20% blends for use in U.S. Postal Service vehicles and school buses statewide, and in low-level blends as diesel additive enhancers (Lubricyl or BioBooster).

Ag Environmental Products

Ag Environmental Products (AEP), a division of Ag Processing Inc., began producing biodiesel last November for transportation uses. AEP's new facility in Sergeant Bluff, Iowa, can produce 6.85 million gallons of the soy-based fuel a year. Currently, AEP-produced 20% biodiesel blends are used in snow removal vehicles in Ohio State fleets. AEP will evaluate biodiesel's potential as a lubricity component for conventional diesel. AEP hopes the program will cover refueling sites in 19 soybean-producing states.

Columbus Foods

Columbus Foods, a Chicago-based food-grade oil distributor for more than 60 years, opened a biodiesel plant last fall that can produce 200,000 gallons of biodiesel annually from a variety of feedstocks, including waste oil, animal fats, virgin soybean oil, and sludge from the city's sanitation district. The Chicago Transit Authority and the American Sightseeing Bus Company each run one bus on Columbus Foods biodiesel in 20% blends. Both have agreed to log at least 100,000 miles on each bus during the test period.



Larry Zolezzi and Carl Nagata at Pacific Biodiesel plant in Maui

Jill Hamilton/PIX 04619

DOE-Funded Hybrid Hits the Road

In an effort to teach university students about cutting-edge automotive technologies, DOE and the Society of Automotive Engineers (SAE) jointly sponsored the development of an ethanol-fueled hybrid electric vehicle (HEV) as part of the Future Car Challenge. SAE president David Holloway joined in the effort to drive the vehicle from Washington, D.C., to Detroit, Michigan.

Holloway arrived in Detroit on February 21, in time to attend the SAE International Congress and Exposition and be officially acknowledged as president of the 71,000-member organization. Accompanying him were four

University of Maryland engineering students Fred Householder, George Martin, Ian Evans, and Mayette San Jaun.

The students used a 1991 Saturn SL2 HEV sedan to win the 1994 DOE/SAE Future Car Challenge. DOE provides limited funding for individual teams and helps test vehicles.

"We've put hundreds of thousands of dollars into the Challenge, but the students raise most of the money themselves by finding their own sponsors," said Phil Patterson, an industry economist at DOE. "The only things DOE gave the Maryland students were the car and about \$10,000."

Not only is the car's engine a hybrid mixture of electric and internal combustion technologies, but the entire automobile is a conglomerate of vehicle technologies. The internal combustion engine is a Geo Metro (Suzuki) three-cylinder 1.0-liter engine dedicated to E-85 fuel and equipped with an alcohol-specific, three-way catalyst engineered to reduce particulate emission levels. A Cadillac electric vacuum pump is used with the hybrid power brake system.

"This hybrid is one the kinds of vehicles we'll be driving in the 21st century," said Holloway.

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