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## **Can flex-fuel vehicles win with public, automakers?**

**Challenges include boosting ethanol's mileage and expanding access to E85**

### **FUELING IOWA'S FUTURE**

By PAULA **LAVIGNE**

REGISTER STAFF WRITER

In the new-car showroom on the Merle Hay auto mile sits a 1915 Ford Model T with its hand-crank starter and an engine that, in its prime, reached 45 miles per hour.

The relic shrinks in the shadow of a fire red 2007 Supercrew pickup sporting a V8 engine that easily can top 75 mph with a 30-foot boat in tow.

Different automobiles from different eras, but Ford designed them for the same purpose. They were to run on ethanol.

Henry Ford abandoned ethanol because gasoline cost less, and almost a century later the cost-per-mile of ethanol remains one of the alternative fuel's biggest challenges.

"Cost is everything. ... You can have the best thing since sliced bread, but if only a small percentage of people buy it, it doesn't have an impact," said Daniel Cohn, senior research scientist at the Massachusetts Institute of Technology.

Ethanol contains less energy per gallon than gasoline and lowers fuel economy. Mileage drops by about 30 percent with E85, which is a mix of 85 percent ethanol with gasoline.

To make ethanol more marketable, researchers, in collaboration with the world's largest auto manufacturers, are working to bridge that gas mileage gap. Some of the technology is already here, but other possibilities are at least five years off.

Cohn and others are developing engines that take advantage of ethanol's unique high-octane properties, instead of merely adapting to the fuel. They're planning to use ethanol to improve mileage and performance, as well as reduce emissions.

"Our technology enhances the value of E85 and makes it into a fuel that people would be willing to pay more for, and that's valuable," Cohn said. Currently there's little economic reason for people to fill up with E85, he said.

"Flex fuels as they exist today are more 'ethanol tolerant' than 'ethanol optimized,' " said Kevin Stork, team leader for fuel technology and technology deployment in the U.S. Department of Energy's Oak Ridge National Laboratory.

"Using modern electronic controls and possibly some advanced combustion systems that people have long talked about but not necessarily put into the market, it will be possible to better optimize engines with fuels like ethanol."

### **Competing with hybrids**

The problem is that these engines are still in development, and not in the showroom where flex-fuel vehicles have to compete against other "green" technologies, such as hybrids.

For 2008, automakers are offering 31 models of flex-fuel vehicles, including the Ford F-150, which can run on regular gasoline or gasoline with up to 85 percent ethanol. That's down two models from 2007, but up from 12 flex-fuel models in 2002.

More people are buying flex-fuel vehicles, but dealers and automotive analysts say the ethanol option just isn't a big draw for consumers.

"It's not a deciding factor," said Jim Bintner, general manager of Charles Gabus Ford dealership in Des Moines, which has the Model T on display. "It's a considering factor, but by no means is it the primary one."

Bintner said many of today's car shoppers look for fuel economy, whether it's the Ford Focus or the Escape Hybrid - both of which can top 30 miles per gallon. Today's flex-fuel vehicles get worse gas mileage running on ethanol, and even though ethanol fuels can be cheaper, drivers won't see a cost savings unless E85 is priced about 25 to 30 percent less than gasoline.

"I hate to give up mileage. It really costs you more in the end," said Fred Stensland, a corn and soybean farmer from Humboldt County in north central Iowa.

Stensland filled up his 2005 Ford Explorer with E85 at Dahl's Fuel - the only E85 station in Des Moines at the time - on a trip to the city in June.

Stensland sells corn to a local ethanol plant and believes in the fuel's economic and environmental benefits, but even he has limits. If E85 isn't at least 25 cents cheaper, he uses E10 instead, he said.

Locally, the spread sometimes can be enough to make up for the lost mileage. Drivers outside of the Midwest rarely see such lower prices because ethanol isn't as widely available and is more expensive to transport.

Using higher blends of ethanol is vital to the alternative fuel industry and to national mandates, said Michelle Kautz, deputy director of the National Ethanol Vehicle Coalition in Jefferson City, Mo. The coalition is working to persuade automakers to offer more flex-fuel vehicles and more gas stations to carry E85.

Regular vehicles already can use low-level blends of ethanol and biodiesel, such as E10, a blend of 10 percent ethanol with gasoline. If all drivers used E10, that would equal about 14 billion gallons, far short of President Bush's mandate for 35 billion gallons by 2017.

Kautz said consumers need to see an advantage to ethanol to demand more of it, and a lot of that demand relates back to their vehicle.

"To push E85 forward ... it needs to start with the model," she said.

### **Ethanol's untapped potential**

Ethanol gets worse mileage than gasoline because, gallon for gallon, it has about 30 percent less energy. But ethanol does have a higher octane rating, and that can mean more horsepower.

Configuring an engine to run solely on 85 or even 100 percent ethanol would not only add horsepower, but it would be more efficient in burning ethanol, thus using less fuel and delivering more miles per gallon.

That's the concept embodied in Saab's BioPower 100 Concept car. Saab, the Swedish automaker, is a division of General Motors. The BioPower 100 can use any blend of gasoline and/or ethanol, but it delivers double the horsepower - 300 hp - with the most ethanol. And it allows for a 2-liter engine compared with a 4-liter engine, reducing the vehicle's overall weight.

These efficiencies result in an even further improvement in fuel economy - only half of what you would lose with a regular flex-fuel vehicle running on E85.

"Why shouldn't we design an alcohol engine?" asked Kjell ac Bergstrom, Saab vice president of powertrain. "If we decided that now our priority is alcohol, then we should sustain running on it."

The BioPower 100 takes advantage of a spark-ignited direct injection system, which Bergstrom said is the next step in making ethanol-powered vehicles more attractive. The direct-injection concept also is fueling other research into better uses of ethanol, including that of MIT's Cohn.

Cohn, along with other MIT scientists and engineers, has taken the direct-injection idea further in an ethanol-boosted turbo engine. It starts with a small separate compartment for E85 in the fuel tank.

The direct injection system pulls E85 into the mix with gasoline when the engine calls for more power - such as accelerating or climbing a hill - and the ethanol turbo boost kicks in.

Cohn said this combination creates several advantages, including the possibility of a smaller engine that can provide as much power and more efficiency than an engine twice its size.

One gallon of E85 can make 20 gallons of gasoline 25 percent more efficient, or, to say it another way, a gallon of E85 can replace more than three gallons of gasoline, he said.

"Not only does it replace (gasoline) directly, but it makes a lot of gasoline last longer," he said. "It's just the opposite of what you have in the present."

Only 5 percent of the fuel has to be E85, but drivers could use 100 percent E85 if they wished, and they wouldn't suffer the drop in fuel economy they get with today's flex-fuel vehicles, Cohn said.

The innovative engine gives consumers an incentive to buy E85, regardless of price, Cohn said.

The E85 compartment only needs to be refilled about once every three to six months, so drivers might be willing to pay as much as \$5 a gallon to use E85 as a sort of additive, Cohn said.

Adding this technology will add an extra \$1,000 to \$1,500 to the price of the average vehicle, Cohn said, which is significantly less than the \$3,000 to \$5,000 premium for hybrids, and it costs less than the new clean-diesel vehicles as well.

The MIT inventors, who formed their own company called Ethanol Boosting Systems, have been working with Ford on the new engine technology. Cohn said new vehicles with the specially designed engine could be in production by 2011, just in time to celebrate the 100th anniversary of the Model T.

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**Graphic Table Source: U.S. Department of Transportation and Electric Drive Transportation Association/THE REGISTER - Hybrids on the move** (see linked .pdf for information)

## **MORE MILES AND MORE SMILES**

**PHOTOS BY: DOUG WELLS/REGISTER PHOTOS**

### **- HYBRID OWNER**

**Owner:** Ken Shibata of Carroll

**Vehicle:** 2005 Toyota Prius hybrid

**What it runs on:** Gasoline and electricity.

**In his words:** Since I bought it, it averages about 45 miles per gallon. You get more miles per gallon and you cut down on emissions. Because it's a hybrid automobile, you don't run on gasoline all the time and you put a lot less emissions into the atmosphere.

**Money saver:** "Although I'm one person out of many million, I think more people ought to think about what they're putting into the atmosphere when they drive these automobiles. I guess they call it global warming. The bottom line is when I fill up with gas now I only spend about \$10 to \$15 every two or three weeks. My wife has a (Toyota) RAV4. She spends about \$35 to \$40. I'm saving money."

### **- E85 OWNER**

**Owner:** Don Mostrom of Des Moines

**Vehicle:** 2003 flex-fuel Ford Ranger pickup

**What it runs on:** Gasoline, E10 or E85.

**In his words:** What I was looking for was a light-duty pickup. I make musical instruments and I needed an enclosed area, which is why I got the extended cab. The main thing was the price. I really was not aware of the flex fuel when I bought the pickup, so the fact that it was a flex fuel was a matter of sheer luck.

**Fueling:** Once (E85) became available, I haven't used anything else since. Now the price difference is about 30 cents. That's not really sufficient to make up for the mileage (per gallon) drop. I am still using it simply because I've been talking for quite some time that this country needs to do some serious work on its trade deficit and such. ... Every little bit less we use of imported oil helps.

- Everything old is new again at the Charles Gabus Ford dealership in Des Moines. Both this antique Ford Model T and a new Ford F-150 truck run on ethanol. As E85 becomes more available in Iowa, will drivers be willing to buy it knowing the 85 percent ethanol blend gets fewer miles per gallon than traditional gasoline?