

Plugging Into a New Market

Startups get ready to roll out a new variant of hybrids.

As oil prices keep rising, powertrain alternatives that once seemed, well, too alternative, are starting to look a lot more mainstream. Ethanol- and natural gas-powered vehicles, old hat in places like Brazil, are starting to sell in the United States. Even more amazing, buyers of gasoline-electric hybrids now have to wait in line for a month before they can drive off in their new cars.

Hybrid sales in the U.S. grew 97 percent in 2004, and 140 percent in 2005—to 205,749 units last year. And sales should keep soaring: oil prices hit \$73 a barrel in April, putting gas prices on a march toward \$4 per gallon in the U.S.

Researchers are now retrofitting hybrids with extra batteries that can be recharged as easily as plugging in a toaster. These so-called “plug-in hybrids,” advocates contend, can deliver more than 100 miles per gallon (mpg). “One with even

a 20-mile range could reduce petroleum fuel consumption by about 60 percent,” asserts Bob Graham, manager of the Electric Transmission program at the Electric Power Research Institute (EPRI) in Palo Alto, California.

Three years ago, plug-ins were the playthings of academics in university labs, and off-campus tinkerers. Now automakers, who once rejected plug-ins as being too fussy, are giving them a second look.

Times change. In June 2005, Cindy Knight, environmental communications administrator at Toyota Motor Sales, said Toyota didn’t see a market for plug-ins, declaring them “something most consumers don’t want anything to do with.” Now, she says, Toyota is seriously studying them. “There have been a lot of new developments in alternatives that were more under the radar before,” Ms. Knight says.

DaimlerChrysler is also researching

the technology, and Honda and General Motors say they are investigating plug-ins, though none has plans to make them—which has only emboldened startups to come out with their own retrofit kits. “OEMs are considering developing their own plug-in hybrids, so that tells you there’s a market out there,” says Ricardo Bazzarella, president of Concord, Ontario-based startup Hymotion.

Electric Gasoline

Conversion is pricey and it can void manufacturers’ warranties. But Mr. Bazzarella isn’t fussed by that. “There are a lot of people who don’t care about the warranty [and] don’t care about the price,” he says.

Hymotion is taking orders for lithium-ion polymer-based systems to convert the Toyota Prius, Ford Escape Hybrid, and Mercury Mariner into plug-ins. The company, which only went into business last

year, sells kits to fleets—in the \$10,000 to \$12,000 range. It plans to enter the consumer market by year's end. Hymotion is now raising its first round of venture capital—1.5 million Canadian dollars (\$1.35 million) to cover expansion over the next six months, and C\$5 million to C\$10 million after that, Mr. Bazzarella says.

EnergyCS in Monrovia, California, has also developed plug-in conversion kits for the Prius. President Pete Nortman and Vice President of Engineering Greg Hanssen say EnergyCS has so far delivered five prototype plug-in hybrids, and has contracts for a total of eight. The first, delivered in March, is being tested by the South Coast Air Quality Management District in California.

EnergyCS will supply its kits through EDrive Systems, its joint venture with electric vehicle maker Clean-Tech, which will install and distribute the kits in the U.S.

On average, a plug-in Prius uses half the petrol a standard model uses for the first 50 miles or so—getting about 100 mpg, Mr. Hanssen says. That means one full charge displaces about half a gallon of gas, at an equivalent of less than \$1 per “gallon” in electricity costs, he says. Once the batteries are depleted, after about 50 miles, the plug-in drives like a regular Prius, getting 51 mpg on the highway and 60 mpg in the city. You don't need to charge it up to drive it, Mr. Hanssen explains. “But whenever you plug in, you get extra savings.”

Not to kid anyone, the plug-in technology does substitute gas with electricity, which also comes mostly from thermal plants burning fossil fuels. But the efficiency is higher and the price far lower, says Andrew Frank, a mechanical and aeronautical engineering professor at the University of California, Davis.

At \$0.06 per kilowatt hour, the electricity replacing gasoline costs about \$0.02 per mile versus \$0.12 to \$0.15 per mile using gasoline, he says. “When people realize they can plug in and drive for \$0.02 a mile, they will definitely be interested,” he says. The other feature of the story is that most drivers will be recharging during off-peak hours, at night when electricity is in surplus, not when supplies are being stretched to the limit.

Mr. Hanssen says he hopes to launch conversions for consumers by this summer, although the original goal was to have them ready by spring.

EDrive System's current challenge, not a small one, is getting costs down, Mr. Hanssen says. Gas prices would have to reach into the stratosphere to make EDrive's current proposition a compelling one: Converting a vehicle and adding in a hand-built battery pack adds \$30,000 to the cost of a Prius that lists at only \$21,725.

EDrive hopes to get the price on the extras down by two-thirds, to maybe \$10,000 to \$12,000, by the time it launches consumer conversions, Mr. Hanssen says. Streamlining current processes alone would bring costs under \$20,000, he says, “but suffice to say we would have a much bigger market at \$10,000 to \$12,000.”

Hymotion says it is also working hard to reduce the cost of its system. “The strategy is to spend more money to get everything to the consumer level, so that they can afford [the systems],” he says.

The 'Hyper-Early-Adopter' Niche

A number of environmentalists think plug-ins would have a market at \$12,000, even though most customers would never make a return on their investments. Felix Kramer, founder of CalCars, says a financial payback isn't the only reason people will buy something. “I believe there are millions of Americans who will pay more for the environmental feature,” he says.

And Mr. Bazzarella says if plug-in prices come down, gas prices keep rising, or government incentives for plug-in hybrids are added to the equation, the market will be greater than people expect. “If you can get the price to between \$5,000 and \$6,000, it's very doable, and if you can get another \$3,000 and \$4,000 in incentives,

then you would have a big market,” he says. “If the federal government comes up with some kind of incentive, similar to ethanol or natural gas, then you're going to see the market taking off.”

But even Mr. Hanssen concedes the market is “probably not that big” at \$12,000. “The people we're targeting are the hyper-early adopters.”

He adds, that EnergyCS aims to convert perhaps only one hybrid a day in the first year. “While plug-in hybrids might sound like a magic bullet to our energy problem, right now, they're not economically viable.”

So while EDrive doesn't expect any profit in the first couple of years while it pays off R&D, unit prices should come down as the company scales up. “The market will blossom over the next five years,” Mr. Hanssen says. “What may be several hundred people in the first year could be... several thousands in five years.”

Mr. Bazzarella says he expects the plug-in part of Hymotion's business to be profitable “with the first batch” of 250 conversions in the first year.

Of course, the startups would be up the road without a drop of juice if the majors moved into the plug-in space. Automakers would have significant cost advantages, and can design cars from scratch so that the batteries wouldn't take up the extra weight or space that they do now, Mr. Frank says. “When you design a complete system and add more batteries, you are increasing the motor and you can cut out some of the engine, so the overall weight of the vehicle is the same.”

But there is no evidence—so far—that car companies are coming out with plug-ins. “Plug-in hybrids require more batteries, which is more weight, which is kind of counterproductive,” says Honda spokesperson Sage Marie.

Steve Zimmer, director of government collaborative programs at DaimlerChrysler, sees plug-ins in niche markets, “but only if battery technology can be improved.” His company has no plans to make them.

Mr. Bazzarella counters that, despite the addition of the 72-kilogram battery pack, plug-ins still achieve better mileage.

Currently, plug-ins are too niche to be of much interest to automakers. After all, they need scale to turn a dollar, while startups may be able to eke out profits on lower volumes. If so, clever startups with cutting-edge technology could become suppliers—or acquisitions. **RH**

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