FORD'S FUEL FIGHTER

The new Fusion Hybrid sets a record for distance on one tank of gasoline, achieving 81.5 mpg

Ford kicked off Earth Week this year with an introduction to its latest hybrid vehicles, particularly the launch of the 2010 Ford Fusion Hybrid, at Camelback Ford Lincoln Mercury in Phoenix.

Having just come off a comprehensive launch presentation and fuel challenge drive in the 2010 Toyota Prius (see MayJune issue), and having coincidentally rented a gasoline-engine 2009 Fusion on a recent trip, we were interested to see how Ford would be combining the best of both.

In the face of many developments in the hybrid vehicle market, with gas prices suggesting a right-sized 4-door sedan with great fuel mileage, and while watching Ford skate past the restructuring minefield of its competitors, the new Fusion Hybrid has been a highly anticipated vehicle. We had its goals and details presented to us by the top tier of its development team.

ROOTS

Dr. William Harris, from the Science Foundation of Arizona, points out that sustainability in Arizona is usually thought of as sunshine and water, but it's a lot more. Arizona needs to be working hard to build an economy for tomorrow, with such enterprises as Ford, Boeing and research, not just more houses.

Harris worked with Volvo in the '90s during his involvement with Columbia University and Arizona's Biosphere II project (now run by ASU). Harris traveled to Sweden with Volvo back then, and whereas he was expecting to go straight to the offices and factories, he instead was taken first to a dead lake, then to a Volvo employee resort, where everything is recycled. "You have one planet," they told him. "You had better take care of it."

He did get introduced to the Volvo biofuels program and much else, but overall was stunned not so much by the company's technologies as by their culture. This was pre-Ford ownership of Volvo, but Harris cites it as an example that a Ford-Volvo-green mindset goes way back. It was in this same timeframe that Ford bought Volvo. At first, he was concerned that this would redirect Volvo, but as Bill Ford picked up the environmental banner, Harris realized Ford was "majorly committed" to going green. Ford had carefully chosen a green tail to wag their own dog.

Praveen Cherian, Project Manager for the Ford Fusion Hybrid, and Dr. William Harris, Science Foundation of Arizona. Randall Bohl Photography.

TRENDS

Praveen Cherian, Project Manager for the Ford Fusion Hybrid, has been project development leader since 2005. He was with Mustang prior, thus moving from a team concerned with how the exhaust will sound, to one that wants to know how it smells.

Four years ago, Bill Ford beat the government *and* the competition by declaring Ford would reduce CO_2 emissions in its products 30% by 2030. Some were concerned about the enormous cost of such a transformation, but this is when Alan Mulally took the reins at Ford, who was instrumental in implementing Bill Ford's goals, as he had the foresight to take all of Ford's assets, from bricks and steel down to brands and logos, and secure lines of credit against them. This seemed shocking and risky to some, but turns out to be exactly what kept Ford out of the government bailouts and oversight that GM and Chrysler have endured for the bulk of this year and able to forge ahead with its own best ideas.

The Ford Fusion has been a solid offering since 2005, along with its Mercury Milan and Lincoln MKZ (né Zephyr) brethren. Updated for the 2010 model year (and released this year), the Fusion was already a solid option.

There have been demographic and market shifts that work in concert with their goals. Pushed to smaller cars by fuel costs, people realize they *like* a Ford Focus, when done up with Sync™, leather and other high-end fixings. Ford is quite proud of what they've achieved so far, with the focus getting 35 mpg to the Toyota Corolla's 30. They recognize that many buyers want to accommodate more people or larger loads, and this has traditionally meant "a big V-8." But Ford aims to make the twain meet using new technology that delivers both fuel efficiency and performance. Apply those to the midsize range, and the market seems right for the Fusion Hybrid.

Ford aims to introduce the EcoBoost engine as an option on every model. They will simultaneously keep developing hybrids, plug-in hybrids and full battery-electrics. They also will always seek weight reduction on all vehicles, reminding us that a trimming of 500 pounds can equal a gain of 10 mpg (a broad claim that warrants further study).

FORD FUSION HYBRID

How did Ford achieve 41 mpg on the new Fusion Hybrid? The recipe goes beyond the

KEEP RIGHT >>

VITAL SPECIFICATIONS

PRODUCTION LOCATION: Hermosillo, Mexico

POWERTRAIN: Gasoline engine: Duratec 2.5-liter DOHC 16-valve Atkinson cycle; 156 hp @ 6,000 rpm, 135 ft.-lb. of torque at 2,250 rpm; Electric motor: Permanent magnet AC synchronous motor, 106 hp @ 6,500 rpm, 275 volts maximum, Electronically Controlled Continuously Variable Transmission, 191 net horsepower

FUEL ECONOMY: 41 mpg city/36 hwy

MSRP: Starting at $27,270

HYBRID PROPULSION

NEXT-GENERATION HYBRID SYSTEM:

- New 2.5-liter four-cylinder engine (155 hp/136 ft.-lb. of torque) running the proven Atkinson cycle, mated to an electronically controlled continuously variable transmission (e-CVT).
- Intake Variable Cam Timing (iVCT) allows the vehicle to more seamlessly transition from gas to electric mode and vice-versa. The spark and cam timing are varied according to the engine load to optimize efficiency and emissions.
- Enhanced electronic throttle control reduces airflow on shutdowns, reducing fueling needs on restarts.
- Wide-band lambda sensor analyzes the air-fuel ratio and adjusts the lean/rich mixture accordingly to keep the system in balance and to minimize emissions.
- An added variable voltage converter boosts the voltage to the traction battery to operate the motor and generator more efficiently.
- A new smaller, lighter nickel-metal hydride battery has been optimized to produce 20 percent more power. Improved chemistry allows the battery to be run at a higher temperature and it is cooled using cabin air.
- A new high-efficiency converter provides 14 percent increased output to accommodate a wider array of vehicle features.
- Smarter climate control system monitors cabin temperature and only runs the gas engine as needed to heat the cabin; it also includes an electric air conditioning compressor to further minimize engine use.
- The regenerative brake system captures the energy normally lost through friction in braking and stores it. Nearly 94 percent energy recovery is achieved by first delivering full regenerative braking followed by friction brakes during city driving.
- A simulator brake actuation system dictates brake actuation and delivers improved brake pedal feel compared to the previous generation braking system.

1445 MILES / TANK 81.5 MPG

FORD FUSION HYBRID 1000-MILE CHALLENGE
Drivers trained in mileage-maximizing techniques achieve 1,445 miles on a single tank of gas in a 2010 Ford Fusion Hybrid on a drive from Mount Vernon VA to Washington DC—averaging 81.5 mpg in DC—setting a world record for a gasoline-powered, midsize sedan and demonstrating that fuel-efficient driving techniques can nearly double a vehicle's EPA-rated fuel economy.

powertrain (see sidebar), to such details as dual climate-control systems. Climate control uses more fuel and more battery power, so the Fusion Hybrid has an occupant sensor, which know when a passenger has left the vehicle, and then mitigates any energy-sapping settings they may have left behind. They saved .25 mpg by reengineering the wheels. Even careful engineering of the fog lamp openings provided a .425 mpg savings. There is no dedicated battery cooler, as on the Escape Hybrid (a 50-pounder). The Fusion Hybrid's newer technologies run cooler, plus the battery draws cabin air back to cool itself.

To see how well you are performing behind the wheel (and they think you can get up to 50-60 mpg with a little care), Ford's SmartGauge with EcoGuide has configurable information screens, which along with specific tech information also has a compelling innovation: the display includes a collection of green leaves, which fall off if you are achieving poorer fuel economy. (It does always have at least one lonely leaf, just "for being smart enough to buy a hybrid.") The goal of this interface, as with the Toyota Prius, is to reward the driver's efficiency and help to change driving habits. Carrots and sticks.

THE MARKETPLACE AND THE FUTURE

So is this what the marketplace wants? Apparently so. Even for the proudly obtuse F-Series market (no worries; we own one), fuel economy has moved from number 11 to number three in customer importance.

Ford engine plants are doubling capacity for inline-4 engines. Ford sees hybrids as not a whole new vehicle (e.g. Honda Insight and Toyota Prius), but rather as a powertrain option (as on the Ford Escape, the Lexus lineup or GM's Malibu, Tahoe and others).

They are already confident about mainstream reliability. The Escape Hybrid is in heavy use as a taxi in both New York City and San Francisco, where an individual vehicle easily racks up 300,000 miles a year. The powertrain and technologies have proven very durable, as they also have for Honda and Toyota after quite a few years on the road.

At the same time, Ford is developing a plug-in hybrid version of the new Transit Connect delivery truck for 2010 (a good implementation, given its typical usage cycle), They are working on an unspecified C-size battery-electric vehicle for 2011 and an all-plug-in-electric for 2012. They also state that they can adapt the vehicles and launch cycles depending on energy and market trends.

Plug-in hybrid and battery-electric plug-in vehicles involve very different types of battery development. Ford is performing strategic collaboration with infrastructure partners, developing broadly applicable interfaces not only for those who may not have a garage with their house, but also for retail locations, apartment renters and many more. They are also working with power utilities to develop smart meters connected to the grid that can be used as conveniently as (and more willingly than) a parking meter. And they are working with SAE and others on a universal plug.

Ford has diesel products in Europe, and some would like those in the US. But these vehicles and their fuels are subsidized in Europe, so the perceived advantage is not as strong here (and sometimes, as last year, diesel fuel is more expensive than gasoline, further eroding the comparison). Ford states that they do have some diesel products, but that the hardware is more expensive, and while there is "some interest," they do not see that the market is there at this time.

Ford's long-range goals are intended to get higher volume sales through flexible, advanced development and high-volume manufacturing. They do not include food-based sources (i.e. ethanol) among their solutions. And they seek to do all they can with domestic sourcing of raw resources. They do not foresee a loss of driving freedom. They simply want to help us go farther but use less.

EASY TO DRIVE, EASY TO BUY

Whereas we'd taken the new Toyota Prius on a 40-mile course around metro Tucson, including freeways, hills and city grid, our Fusion Hybrid test was confined to one multi-block square starting on Camelback. The car was very conventional to operate, no real adjustment to the alternate power—but our ability to learn from the display's feedback and optimize our leaf-count was limited. It was not hard to reduce our display to one leaf, and we had no time to bring it back.

We cleared out of our seat, asked a few questions, said our thanks and bid our goodbyes. Mr Cherian was now off to LA, where next to grace the seat would be Jay Leno.

The Fusion Hybrid is built at Ford's Hermosillo plant in our neighboring Mexican state of Sonora, so they have faced hot-climate issues. You can remote-start the car, set the cabin at 70° and pre-cool with no engine. (Note that while 8% of the vehicle's development funds went to the Hermosillo plant, most research and development and economic impact has been in the US.)

The gasoline-engine 2010 Ford Fusion with its new 2.5-liter I-4 engine has a base price of $19,995 (prices include delivery and destination) and offers best-in-class fuel economy of 34 mpg highway. The Fusion Hybrid starts at $27,995 and offers best-in-class 41 mpg city, 36 highway. The 2010 Mercury Milan starts at $21,905 and the Milan Hybrid at $31,300.

But wait, there's one more thing: Fusion and Milan Hybrid models qualify for the highest available federal tax credit of $3,400. ■