

HYBRID TECHNOLOGY



Normally a “Hybrid” is an offspring of two dissimilar plants or animals, but one must wonder how “Hybrid” is related to Automotive Technology. The US Dept. of Energy defines a hybrid as a type of electric vehicle (HEV) which combines two or more energy conversion technologies (e.g., heat engines, fuel cells, generators, or motors) with one or more energy storage technologies (e.g., fuel, batteries, ultra capacitors, or flywheels).

Hybrid electric vehicles (HEVs) are somewhat as same as today’s day to day automobile; it is different only in one sense that it has two “engines” (sources of power). Today some companies are using gasoline or diesel internal combustion “heat” engines (or ICEs), a few are using electricity-generating micro turbines, and a few are using fuel cells.

In today’s gasoline-only vehicles, the ICE is “sized” to the vehicle for peak load demands like accelerating, hill climbing etc. While “pure” battery electric vehicles (BEVs) are considered pollution free, they unfortunately lack extended range, quick recharge, and a charging infrastructure... plus the batteries are heavy. To overcome these obstacles, the lighter, cleaner, more fuel efficient hybrid-electric vehicle provides an alternative: the HEV uses an electric motor to serve as a supplemental power source for peak-load conditions.

Generally, most production hybrid-electric cars use a relatively small (~1 liter) gasoline or diesel ICE in concert with batteries and electric traction motor(s). Some of the HEV gasoline and diesel engines use direct fuel injection (into the combustion chamber). Diesel-electric hybrid transit busses are now using relatively small engines for lower emissions, and one bus configuration instead uses a pair of propane-powered micro-turbines to generate the needed power.

There are two basic HEV configurations:

The *series-hybrid system* which uses a small fuel-burning engine to drive a generator for electricity, which is in turn sent to one or more electric motors which drive the wheels.

The second is *parallel-hybrid system* in this there are two power paths. Either, the fuel burning (heat) engine, the electric propulsion system, or both, power the wheels.

Thus, with the hybrid electric vehicles (HEV s), the heat engine can be downsized and run at peak efficiency (peak-torque RPM) to propel the vehicle and to run the battery-charging generator. Hybrid electric vehicles (HEVs) help in cutting fuel consumption and emissions, while minimizing the range and weight issues. Hybrid electric vehicles (HEVs) also help in reducing CO₂ [global warming].

One such company which manufactures and designs Hybrid electric vehicles (HEVs) named the Protean Drive(TM), a fully integrated, in-wheel motor, direct-drive solution is Protean Electric. Protean Electric's patented in-wheel motor design with distributed architecture revolutionizes the integration of electric propulsion and propulsion assist for mass production vehicles.

To speak about **Protean Drive™** is the most advanced in-wheel electric drive system for hybrid, plug-in hybrid and battery electric light duty vehicles, developed by Protean Electric. The wheel motors can significantly improve fuel economy, depending on the vehicle and driving mode.

In addition, this unique and patented direct-drive design has the highest torque and power density of any electric propulsion system and incorporates the motor control electronics and regenerative braking inside each motor assembly. Each Protean Drive in-wheel motor can deliver 110 hp (81kW) and 590 lb.-ft. (800Nm), yet weighs only 31kg (68lbs) and is sized to fit within the space of a conventional 18-inch road wheel. The simplicity of the design creates more power density per motor and much simpler vehicle integration.

These motor wheels are powerful enough to be the only source of traction drive for a variety of battery electric vehicles, and can also be added to a FWD or RWD car or truck with an internal combustion engine drive train, creating a hybrid configuration. In hybrid applications, the technology is designed to be "**driver selectable**," which means the driver has choice to decide between three operating modes: all electric (city/stop-and-go traffic or low-emissions zones), hybrid (combined constant and slow speeds) or all gas/diesel (constant speeds). This helps in providing fully independent torque control, making vehicles safer.

Some of the Benefits of Hybrid electric vehicles (HEVs):

- Provides the power and torque required for electrification of full size sedans and SUVs without compromising performance.
- Enables full regenerative braking in normal driving, recapturing large amounts of kinetic energy, which reduces well-to-wheel CO2 emissions for large vehicles to less than those from small city cars and can increase electric range by as much as 50 percent.
- Offers a unique, highly integrated and modular motor/inverter technology with very high power and torque density, which eliminates the need for a separate large power electronics module.
- Packaged in-wheel, which saves large amount of space in the vehicle for passengers, load-space and batteries, and eliminates the need for transmissions, drive shafts and differentials.
- Enables advanced vehicle dynamics through independent "torque vectoring" torque control of each wheel.
- Designed for high volume, low cost automated mass production.
- Supplied with reference control system software for a centralized electronic control unit (ECU), which provides all essential electric vehicle control functionality and braking control

Other companies manufacturing and designing Hybrid electric vehicles (HEVs) are Toyota and Honda. Some of the HEV s from Toyota and Honda are –

Toyota Prius HEV. Toyota’s 4 cyl. “Generation 1” hybrid seats 5 and gets around 50 mpg.

Toyota Prius Underhood

Honda Insight HEV. Honda’s 3 cyl. Seats 2 and gets around 70 mpg.

Honda Insight Underhood.

An American Methanol Institute report predicts that by 2020, seven to 20% of all new cars sold will be powered by fuel cells. There will be a time when various engines and power sources will exist simultaneously.

For now, those who service and repair today’s vehicles will have plenty of work to do. And for those trained and equipped for hybrid vehicle service and repair, hybrids have *two* power sources to work on.

The U.S. Department of Energy’s Office of Advanced Automotive Technology, GM, Ford, Chrysler and the National Renewable Energy Lab are all working together under the President’s PNGV initiative (Partnership for a New Generation of Vehicles) to produce a variety of automobiles featuring all the comfort and performance of today’s passenger cars, yet achieving 80 miles per gallon.

