

# Not All Hybrids Created Equal

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July 5, 2009, Toyota Motor Sales, U.S.A., Inc. – When gas prices hit an all-time high during the spring/summer of 2008, the popularity of ? and chatter about ? hybrid vehicles soared. ?Hybrid? became the buzz word as Americans looked for ways to cut costs while also being environmentally friendly.

But, not all hybrids are created equal. The basic concept of a hybrid vehicle is constant ? a combination of two technologies, in this case a gasoline engine and electric motor?that work in tandem to power the vehicle. However, that?s about where the similarities end.

## **Full hybrids-the most advanced**

Hybrid powertrains differ in motor and engine combinations. The “full hybrid” is generally the most advanced type and is the only system that can operate on electric or gasoline power, or a combination of the two. Full hybrids run on electric drive at low speeds, on gasoline and electric drive in traffic, and on gasoline alone at highway speeds. Computers automatically coordinate the electric motor and gasoline engine for an optimal balance of responsive performance, fuel economy and lower emissions.

What?s more, with a full hybrid, the vehicle automatically shuts off the engine when coming to a stop and restarts the engine as needed when the vehicle begins to move forward again. This prevents wasted energy from idling and starting from a dead stop ? two times when a vehicle?s engine is the most inefficient.

A full hybrid recharges the hybrid battery during operation, so it doesn?t need to be plugged in for recharging. The batteries also recover energy back from the drive train in a process called regenerative braking. Regenerative braking is a mechanism that reduces vehicle speed by converting some of its kinetic energy into a storable form of energy instead of dissipating it as heat as with a conventional brake. The captured energy is stored for future use.

The hybrid system found in the Toyota Prius, Camry Hybrid and Highlander Hybrid, also known as Hybrid Synergy Drive, is a full hybrid system.

## **Power-assist hybrids**

The power-assist hybrid, sometimes called the “mild hybrid,” relies on the gas engine to power the vehicle at all times. In this type of hybrid, the electric motor only assists the engine as needed for more power greater efficiency and lower emissions. Motors and batteries are less powerful than in full hybrids. The transmission can be automatic or manual, and is largely the same as in a conventional car. As with full hybrids, power-assist hybrids also have regenerative braking.

Toyota holds more than 1,000 patents pertaining to hybrid drive trains and shares hybrid technology, licensing cleaner vehicle technology to companies that request it. This approach will support the acceptance of all hybrid vehicles, and has the potential to make Hybrid Synergy Drive the most widely used hybrid standard in the industry.

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