

What's a Hybrid?

What makes a hybrid a hybrid? Is it alternative fuels, alternative powertrains, or any alternative besides an internal combustion engine? The definition of a hybrid vehicle today seems to mean different things to many different people.

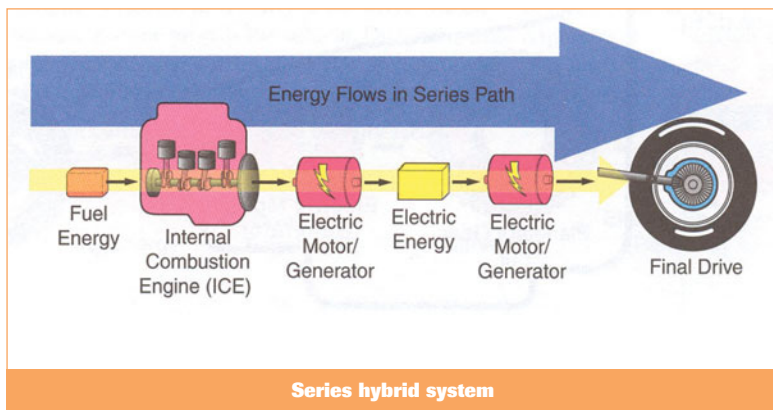
The most common hybrid vehicle on the road is the hybrid electric vehicle (HEV), which combines an energy storage unit, such as a high-voltage battery, and a power unit, usually a gasoline or diesel engine, with a propulsion system that receives input from both systems to propel the vehicle.

But there is much more to it than that, and new systems are being introduced by many manufacturers. To help sort things out, following is a mini hybrid glossary of common hybrid systems, components and other alternative fuel terms.

Hybrid Electric Vehicle (HEV) – Combines an energy storage system (commonly batteries), a power unit (such as an internal combustion engine or fuel cell), and a vehicle propulsion system.

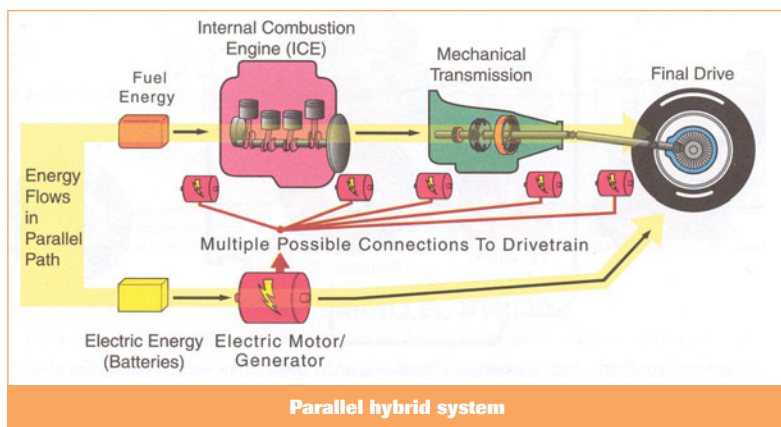
Hybrid propulsion system – Joins two types of propulsion mechanisms so that the advantages of each can be exploited. It generally consists of two energy storage elements (such as a fuel tank and an electric battery) and two energy conversion elements (such as an engine and an electric motor).

Series Hybrid – Propulsion power flows through a single path from the engine to the generator, to the battery, to the electric motor, and to the drive wheels. The engine never directly powers the vehicle; only the electric motor can apply torque to the wheels. Used in large vehicles such as diesel-electric locomotives and non-nuclear submarines.



Parallel Hybrid One-Mode – Propulsion power includes a mechanical connection between the power unit — such as a gasoline or diesel engine — and the vehicle's wheels as well as an electric motor/generator that drives the wheels. The electric motor and the engine can apply torque to the wheels either simultaneously or individually through the one-mode continuously-variable transmission. The power created from the engine is used for highway driving and the power from the electric motor provides acceleration. Used in the Toyota Prius and Ford Escape.

Parallel Hybrid Two-Mode – Features a two-mode, multiple planetary gear set, electronically variable transmission. The two-mode design delivers a low speed range and a high speed/high load range. With two modes, the performance expectations of the vehicle can be met while allowing the



hybrid electrical components to be smaller than that of the one-mode design. Used in the Chevrolet Tahoe and GMC Yukon.

Parallel Hybrid Belted Alternator/Starter (BAS) – Has an engine-mounted electric motor/generator that is driven by an accessory belt used to auto-start the engine after an auto-stop (during which the engine stops) and to charge the battery pack. Only the engine drives the wheels. Used in the Saturn VUE and Chevrolet Malibu.

Auto-Start – The hybrid's electric motor/generator, which is more powerful than a traditional engine-mounted starter, is capable of cranking the engine to its typical idle speed in less than 300 milliseconds. This is used to start the engine without extra fuel after an auto-stop.

Regenerative braking – The process of recovering some of a vehicle's kinetic energy by allowing the wheels to drive a traction motor as a generator, thereby producing electric power that is stored for later use. When the driver brakes, the motor becomes a generator and uses the kinetic energy of the vehicle to generate electricity that can be stored in the battery pack.

Direct Injection (DI) – Fuel is injected directly into the cylinder, as is typical in a diesel engine. Most modern internal combustion engines use port fuel injection (in which the fuel is injected just in front of the cylinder intake valve).

E85 – A mixture of 85% denatured ethanol and 15% gasoline, by volume; an alternative engine fuel.

Fuel flexible (or Flex Fuel) – Ability of a vehicle to operate on a wide range of fuel blends (e.g., blends of gasoline and E85).

Biodiesel – A renewable diesel fuel substitute that can be made by chemically combining a natural oil or fat with an alcohol.

Fuel cell – An electromechanical power unit (no moving parts) that converts the chemical energy of hydrogen and oxygen into electricity without combustion; the only by-product is water. The electricity is then used to power the vehicle.

For more information, visit the U.S. Department of Energy's Energy Efficiency and Renewable Energy website at www1.eere.energy.gov/vehiclesandfuels.

Several training courses on hybrid technology are available through the ACDelco Learning Management System (LMS). Click on the Training tab at acdelcotechconnect.com to log in to the ACDelco LMS.

– Thanks to Steve Falko