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HYBRID ENGINE

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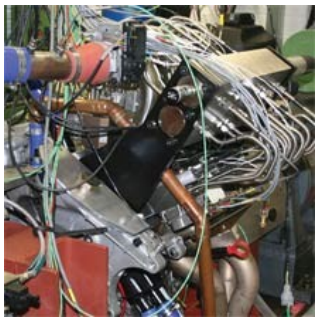
Drive by any car lot in the United States and ask to see the latest hybrid car models. Don't be stupefied if eight out of ten tell you that they can't seem to keep them on the lot-that they're just selling too fast! There is reasoning behind the hype: consumers believe in one (or all) of three things, that they're going to be getting a better deal once gas prices hit $2.50 a gallon, that they're not sacrificing performance and that they're helping the environment.

Let's first take a look at how these cars are put together. First, we have to understand the concept of "hybrid". A hybrid car might be defined as any vehicle that uses two or more sources of energy to propel itself. Seems simple enough. Hybrid machinery is all around us in the form of diesel-electric, such as city buses, and nuclear-electric, such as those used on many US submarines. So, the idea and the technology have been around awhile-it's just now that another energy scare like that of the 1970s, that we start becoming resourceful and a little ingenious.

Hybrid power is on the up-rise (and in-demand) only because the two different types of propulsion possibilities (gasoline/diesel and electric) standing alone have proven an ineffective means to get both power and efficiency in one package. But, working together, there is promise.



A new hybrid: This prototype hybrid engine, dubbed /4SIGHT, can switch between four- and two-stroke modes, thereby reducing fuel consumption by more than 25 percent.

The difference between two- and four-stroke engines is that the latter carry out the four stages of air intake, compression, combustion, and exhaust in four strokes of a piston. A two-stroke engine, in contrast, does this in just two piston strokes.

Two-stroke engines are intrinsically simpler by design and have higher power-to-weight ratios at high loads and low speeds because they get twice as many power strokes per revolution. But traditional two-stroke engines require oil to be mixed in with the fuel, and therefore produce higher emissions. Because of this, they aren't typically used in cars. Instead, they're used for lightweight applications such as chainsaws, lawnmowers, and some motorbikes.

But now, researchers at Ricardo have developed a piston head that operates in both two- and four-stroke mode, and it can switch automatically between the two modes, depending on the needs of the engine. This allows a smaller engine to handle the low-speed, high-load conditions without stalling.

"This is an interesting concept," says Martti Larmi, head of the Internal Combustion Engine Laboratory at Helsinki University of Technology, in Finland.

The main challenge in building such an engine is perfecting the scavenging process, he says, when the residual gases from the previous combustion cycle are replaced with fresh air and fuel.

"You need some kind of pressure on the intake side to push out the gases that have already burned," says Larmi.

In a traditional two-stroke engine, the force of the fuel and air intake drives out the exhaust. Unfortunately, this process causes some unburned fuel to be lost as exhaust, resulting in higher emissions. Four-stroke engines force the spent fumes out of the cylinder through a cam-controlled valve using an upward stroke of the piston. During the following downstroke, fresh air and fuel are injected into the cylinder while the exhaust valve is closed.

A new kind of hybrid vehicle could offer reduced fuel consumption to consumers concerned about gas prices. Mechanical engineers in the United Kingdom have developed a novel kind of combustion engine that is able to switch between being a two-stroke and a four-stroke engine. The system, they say, can reduce fuel consumption by 27 percent.

But small car engines, which are usually based on a four-stroke design, don't offer a lot of power. They can be particularly problematic when operated at low speeds with a high load, such as when accelerating uphill. Such conditions can even make a small engine stall if the driver doesn't downshift.

A hybrid car, in modern terminology, is usually referring to any car that has a combination of an electric and a gasoline (or diesel) motors. These cars use kinetic energy (referred to as regenerative breaking), absorbed by your breaks when you slow down to a stop, to recharge batteries that in turn push the electric motor. All of this is combined into one finely tuned schematic-the result being power to the transmission and propulsion power (i.e. wheel movement).

All hybrids contain a gasoline engine, an electric engine, a generator (mostly on series hybrids), fuel storage container, batteries and a transmission.

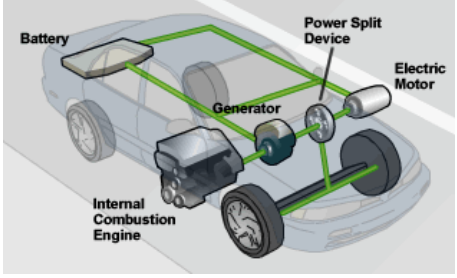
There are basically two different types of hybrid engines. The first is a parallel hybrid. This sort of hybrid actually contains both a gasoline and electric motor that both operate independently to propel the car forward. It's designed to have two power sources working with one goal in mind. In many ways, they are still "connected".

The second hybrid is often referred to as a series hybrid. In a series hybrid, the gas or diesel powered engine doesn't connect to the transmission directly, meaning that it doesn't actually propel the car by itself. It actually works indirectly, powering a generator, which in turn (controlled by computer monitoring systems) either feeds power to the batteries or directly feeds power to an electric motor that connects to the transmission.

The Cost of Hybrid Cars

Hybrid-engineered cars cost a bit more too. Usually the price difference is around 3,000 bucks. And, it may take a few years (depending on gas prices) for you to actually make the savings in fuel worthwhile. However, it's still better for the environment, and that lingers (and makes it worthwhile) in some consumers' minds.

Hybrid-electric vehicles (HEVs) combine the benefits of gasoline engines and electric motors and can be configured to obtain different objectives, such as improved fuel economy, increased power, or additional auxiliary power for electronic devices and power tools.



Some of the advanced technologies typically used by hybrids include.

Regenerative Braking.

The electric motor applies resistance to the drivetrain causing the wheels to slow down. In return, the energy from the wheels turns the motor, which functions as a generator, converting energy normally wasted during coasting and braking into electricity, which is stored in a battery until needed by the electric motor.

Electric Motor Drive/Assist.

The electric motor provides additional power to assist the engine in accelerating, passing, or hill climbing. This allows a smaller, more efficient engine to be used. In some vehicles, the motor alone provides power for low-speed driving conditions where internal combustion engines are least efficient.

Automatic Start/Shutoff. Automatically shuts off the engine when the vehicle comes to a stop and restarts it when the accelerator is pressed. This prevents wasted energy from idling.

Sales and rankings.

The Toyota hybrids combined with Lexus reached 1 million hybrids sold in the US by February 2009, and worldwide sales of hybrids by both carmakers reached over 2,016.9 million vehicles by August 2009. As a top seller in the U.S. and Japanese markets, the Toyota Prius reached cumulative sales of 1.6 million Prius sold worldwide in 2009.

Worldwide there were more than 2.5 million hybrid electric vehicles by 2009, led by the United States with 1.6 million units, followed by Japan (more than 640 thousand) and Europe (more than 237 thousand).By December 2009, the top seller in the U.S. was the Toyota Prius, with cumulative sales of 814,173 units, followed by the Honda Civic Hybrid, with 197,177 vehicles, and the Toyota Camry Hybrid, with 154,977 units. The top seller in the U.S. by an American manufacturer is the Ford Escape Hybrid, with cumulative sales of 95,285 vehicles by December 2009, followed by the Fusion Hybrid, with sales of 15,554 units in just nine months.

Worldwide, Toyota Motor Company is the leader with more than 2 million hybrids sold by August 2009,followed by Honda Motor Co., Ltd.with more than 300 thousand hybrids sold by January 2009, and Ford Motor Corporation with more than 122 thousand hybrids sold by December 2009.

Top national markets for hybrid electric vehicles between 2007 and 2009

ank	Country	Number of registered hybrids 2009	Percent of global hybrid registrations 2009	Number of registered hybrids 2008	Percent of global hybrid registrations 2008	Number of registered hybrids 2007	Percent of global hybrid registrations 2007
	Japan	334,000	48%	94,259	18%	69,015	14%
	United States	290,271	42%	312,209	61%	350,289	70%
	Canada	16,167	2.3%	15,385	3%	14,828	3%
	Netherlands	13,686		11,814	2%		
	United Kingdom	13,661		19,963	4%	15,968	3%
op 5				453,630	89%	457,615	91%
orld		700,000		511,758		500,40	