How Idle-stop Systems Work

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It's that dreaded image no one wants to see when they're getting onto the highway -- a flat, hazy sea of cars that are stuck bumper to bumper, barely moving an inch when some space frees up. The experience of being trapped in a traffic jam is hard enough psychologically for most people. Usually we're late for a meeting or some other appointment, so the stress of being unable to get to your destination as easily as possible can be upsetting. Plus, you're fully enclosed in your car, strapped in by your seatbelt and things tend to get a little claustrophobic. Unless you choose to abandon your car, you don't have anywhere to go until traffic clears up.

Tim Graham/Getty Images

Can idle-stop systems reduce fuel consumption?

Coupled with all of these traumas is the fact that when you sit in traffic, your car is still running, and it continues to burn gas. On hot summer days, even if you're inside an air-conditioned car, you can almost feel the heat coming from all of the exhaust pipes surrounding you on the road. So as it turns out, as you sit there in traffic, you're not just stressing about being stuck in one place, but technically you're throwing money out the window, too. A car with its engine simply running, either sitting still or creeping along ever so slowly, is one of the least efficient ways to burn gas.

And, of course, it's not just bad for your wallet; it negatively affects the regional air quality by creating air pollution and contributing to global warming. Carbon emissions released by your engine as a result of the process of internal combustion -- the burning of fossil fuels to create power -- float up into the atmosphere, creating smog and increasing local temperatures. This is known as the **heat island effect** in large metropolitan areas.

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With many drivers' minds on the environment and the increasing costs of oil production and consumption these days, people are looking for alternatives to the conventional gasoline engine. One way to combat the issue of frequently stopping, starting and standing still is a technology that can seamlessly switch your engine on and off depending on how your vehicle is operating. An idle-stop system, also commonly know as a start-stop system, is essentially what makes up today's increasingly popular so-called mild hybrids.

Idle-stop and Mild Hybrid Systems

Although "full" hybrid technology is understandably receiving lots of buzz in recent years, especially now that the auto industry is undergoing such upheaval, mild hybrids are also getting some attention lately. Despite the name, mild hybrids aren't technically hybrid cars. They're actually conventional vehicles that use internal combustion to turn gasoline into energy and rotational motion, propelling a vehicle forward. There is no electric motor in a mild hybrid to move the car, and although there's a battery, it serves a different purpose than a battery does in a full hybrid.

Philip Kramer/Getty Images

Idle-stop systems help so-called mild hybrids save gas by shutting down the engine when a vehicle comes to a halt.

The battery in a mild hybrid is still very important, but its main purpose is as a part of the idle-stop system that shuts off the gasoline engine when a mild hybrid is at rest, coasting or slowing down. For instance, a stop at a red light at an intersection will cause the engine to cut off. When the car is idle, no gas will burn inside the engine. Once the light turns green and the driver applies pressure to the gas pedal, the engine should switch back on seamlessly, as though it hadn't been turned off at all.

There are essentially three main parts involved in an idle-stop system: the gasoline engine, an electric starter/generator and a battery. The transfer of energy works in that order, both forwards and backwards -- it just depends on what state the car is in. When the car's engine is on and you're just about to brake, stop-start systems use

regenerative braking, where rotational energy from the wheels turns the electric generator and creates electricity. The generator sends electricity to the battery where it can be stored for later use. When the driver applies the brakes, however, the generator shuts off the gasoline engine. Pressing the accelerator pedal starts the engine once again by taking the stored energy from the battery and running it through an electric starter.

Cars with Idle-stop Systems

Although the savings you'll get on fuel in a mild hybrid won't really compare to those of a full hybrid car, stop-start technology is still a promising step forward in making conventional cars much more fuel-efficient. This is an especially important step, since most fuel economy problems stem from idling and the constant stop and go nature of city driving. The technology has actually been around for a while, but we'll a look at some notable newer cars using idle-stop systems and the improvements that are underway for the existing technology.

AP Photo/Shuji Kajiyama
Some predict that a third of all new cars will use some kind of idle-stop system by 2012.

Several recent car models will use (or have used) some kind of stop-start technology, with most examples coming from Europe or Japan. Some people might not know that the MINI Cooper, built under the BMW Group, has actually used idle-stop technology since 2007. And German automaker Audi started using an idle-stop system in the second quarter of 2009 in its A3, A4 and A5 models, with more to follow.

The most recent, and perhaps the most significant, example of a vehicle receiving an idle-stop system is the Madza3, which will begin using a new and improved type of stop-start technology by the end of 2009. While some systems tend to suffer due to the use of a conventional electric starter, which can cause slow and sluggish restarts, the new Mazda system will use combustion for the restart. Direct injection plays an integral part in the function of the system that Mazda calls the Smart Idle Stop System, or SISS. When a vehicle slows down and stops, sensors position the engine's pistons in specific locations within each of the cylinders. This allows the system to determine which of the cylinders is fully pressurized and ready to fire. At restart, fuel is injected into the appropriate cylinder, the fuel and air mix is ignited and the engine continues to operate as it normally would.

With these slight improvements, Mazda claims that their engines can restart in 350 milliseconds, about half the time it takes for other conventional systems to restart, and it results in a 10 percent reduction in fuel use, too.

For lots more information about hybrid cars and fuel-efficient technology, follow the links on the next page.

Lots More Information

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Sources

- Abuelsamid, Sam. "Paris Preview: Mazda introducing new, smarter Smart Idle Stop System." AutoBlogGreen.com. Sept. 10, 2008. (June 22, 2009) http://www.autobloggreen.com/2008/09/10/paris-preview-mazda-introducing-new-smarter-smart-idle-stop-sy/
- HybridCars.com. "Stop-Start Engine Hybrids." (June 22, 2009) http://www.hybridcars.com/stop-start-engine
- Korzeniewski, Jeremy. "Audi announces introduction of stop/start technology." AutoBlogGreen.com. May 8, 2009. (June 22, 2009) http://www.autobloggreen.com/2009/05/08/audi-announces-introduction-of-stop-start-technology/
- Pollard, Tim. "MINI stop-start." CarMagazine.com. Sept. 3, 2007. (June 22, 2009) http://www.carmagazine.co.uk/Green-Cars/Search-Results/Drives/Mini-stop-start/
- Richard, Michael Graham. "Tired of getting zero miles per gallon? Stop/start technology is for you." Treehugger.com. Feb. 8, 2008. (June 22, 2009) http://www.treehugger.com/files/2008/02/stop-start_technology_zero_miles_per_gallon.php
- U.S. Department of Energy. "Stop/Start: Overview." (June 22, 2009) http://www.fueleconomy.gov/feg/hybridAnimation/stopstart/stopstartoverview.html