Direct-injection engines improve performance and save fuel, but at a price

Cars with this technology might end up in the repair shop more frequently

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Cadillac ATS 2.5-liter four-cylinder engine with direct injection.
Photo: GM

It has been touted as the automotive holy grail, the ultimate marriage of better performance and greater fuel economy. It's the direct-injection (DI) engine, the latest technology designed to squeeze more mpg out of cars. And it has actually been delivering results.

For example, the Mazda3's combined fuel economy jumped from 28 mpg in 2010 to 32 mpg in 2012 in our testing of the new Skyactiv engine. Other automakers have been using direct injection to add horsepower—the Cadillac CTS, for example, gained 34 hp—without any sacrifice in fuel economy.

Though direct injection is currently seen mostly on luxury vehicles or on mainstream cars as a higher-trim option (priced anywhere from a few hundred dollars to a couple of thousand), it could soon be within the means of more drivers as costs continue to come down.

But those engines are also having reliability problems, something that automakers are trying to keep quiet.

Not surprisingly, a number of readers have asked us about direct injection. Take Anestis Halkidis of North Kingstown, R.I.:

"I have a 2006 VW GLI with the 2.0T FSI engine with direct injection," he wrote. "At around 80,000 miles, I went to the VW dealer to diagnose a check-engine light. It turns out that the intake valves had to be cleaned due to carbon deposits that were causing drivability issues."

When his dealer failed to offer free work or any compensation, Halkidis took his car to a local VW shop that cleaned the valves by blasting them with walnut shells. (Yes, walnut shells; it's a method used by BMW.) The cost to Halkidis was about $400.

So what's up with direct injection?

First, a primer on how it works: By injecting gasoline at high pressure directly into the engine's combustion chamber, direct injection more precisely measures fuel than conventional fuel-injection systems or old-time carburetors.

The result is more complete combustion and cooler cylinder temperatures that enable a higher compression ratio for greater efficiency and power. Engine technology supplier Bosch says that direct injection can return a 15 percent gain in fuel economy while boosting low-end torque as much as 50 percent.

Combining direct injection with other technologies—such as turbocharging—can deliver even greater gains in economy and performance. That in turn enables carmakers to use smaller displacement engines, resulting in an efficiency snowball effect. Many automakers are marketing DI as providing fuel economy that's almost as good as a hybrid's, and with better performance—but without the $4,000 hybrid premium.

Although the breakthrough seems like a dream come true, an unwanted side effect has been emerging. Letter writers have complained to Consumer Reports and the National Highway Traffic Safety Administration (NHTSA) that over time DI can lead to clogged fuel systems and engine carbon buildup. The result can be engine hesitation and a loss of power—and the need for expensive repairs.

Some carmakers, including BMW and Kia, have issued technical service bulletins (TSBs) to their dealers recommending that drivers use only name-brand detergent gasoline—without ethanol additives—and that they periodically add a fuel-system cleaner when they refuel. (A TSB is an alert that the automaker sends to dealers to warn about ongoing problems with individual models and how to fix them. It may allow dealers to make repairs at little or no cost to the customer as a goodwill gesture.)

Other automakers have devised an engineering fix that works while the car is operating. It involves modifying the engine to spray a small amount of fuel directly onto the valves to help keep them clean.

It's important to note that not all cars with direct injection experience long-term problems. But if your engine stumbles more than it used to, or it suddenly lacks power, ask your dealer about it. A fix may be available, and you may not have to pay for it.