

DIGGING FOR ANSWERS

GDI ENGINE COMPLAINTS OFTEN MYSTERIOUS, HARD TO RESOLVE

BY JIM LEMAN

Many modern vehicles powered by Gasoline Direct Injection (GDI) engines are showing up in Service Departments with mysterious complaints: high oil consumption, misfires and performance loss. These problems can put the diagnostic skills of even the best Technicians to the test.

Diagnosing and remedying these engines' issues early is important. Problems can affect engine performance in as little as 3,000 miles. Neglected treatment may require a costly upper end teardown or vigorous mechanical cleaning to restore vitality.

A dealer (and OEM) can only hope that the repairs will restore the vehicle owner's brand trust.

Shawn Crow, Service Manager for Bob Robinson Chevrolet-Buick-Cadillac-GMC near Wheeling, West Virginia, told me his shop sees GDI engine issues every day. "It involves '07 models forward," he said. "It's even more a problem in turbo versus naturally aspirated GDI engines because the intake gases in turbo engines are even hotter."

Pat Goss, Motorweek's resident master Technician and Owner/Operator of Goss's Garage near Washington, D.C., for the last 43 years, has told me that part of the diagnostic challenge is that many Technicians have not been educated about issues associated with GDI engines.

OEMs developed GDI engines to meet 2016 CAFE fuel economy standards and they've been increasing in use since 2000. The technology, however, has been around since WW II. Mercedes-Benz used it in the early '50s for its 300SL Gullwing, which won at LeMans in 1952.

One reason GDI problem diagnosis is often elusive is that some of the diagnostic skills to identify it are long out-of-practice. For instance, the industry's heavy reliance on sensor codes and scan diagnostics have eroded many Techs' ability to diagnose based on observation, knowledge and instinct.

Also disconcerting, Goss said, is that many techs and motorists still check a vehicle's tailpipe for bluish exhaust. That diagnosis for cylinder oil burning was valid in the days before cars had to use catalytic converters. These devices burn away all gases entering them, leaving zero telltale oil smoke at the tailpipe.



"MANY MODERN VEHICLES POWERED BY GASOLINE DIRECT INJECTION (GDI) ENGINES ARE SHOWING UP IN SERVICE DEPARTMENTS WITH MYSTERIOUS COMPLAINTS: HIGH OIL CONSUMPTION, MISFIRES AND PERFORMANCE LOSS."



Problem details

GDI engines burn leaner than port fuel injection engines, a 40-to-1 versus 14.7-to-1 air-to-fuel ratio. This leaner mixture results in more conservative fuel usage but contributes to much hotter engine operating temperatures.

There are several GDI engine concerns:

- Higher cylinder temperatures and pressures released into the crankcase accelerate oil vaporization. Eventually this causes oil droplets to coat intake valves.
- Cylinder injector spray position means fresh fuel is not sprayed onto intake valves to flush away vapor build-up. This build-up can accumulate and bake onto intake valves in as little as 10,000 miles (16,000 km).
- Rings can become stuck into their lands by carbonized oil sludge. This can prevent these engine’s low-tension rings from properly sealing the piston. This also causes sludge, oil and fuel deposits to bake onto piston tops.
- Since inception, GDI engines have had known problems with coking – a buildup of cooked fuel deposits that foul injectors.

Konrad DeLong is a former regional field engineer for General Motors. He now is Development Coordinator for Lubrication Specialists, Inc. of Houston. In both roles, he has learned well how major vehicle engine problems, like those showing up in GDI engines, can shake consumer confidence.

“Customers would bring vehicles into the shop complaining of misfires or performance lags, but when Techs run diagnostics, the PCM [power control module] might show a diagnostic trouble code but no indicator of the cause,” DeLong recalled from his GM experiences.

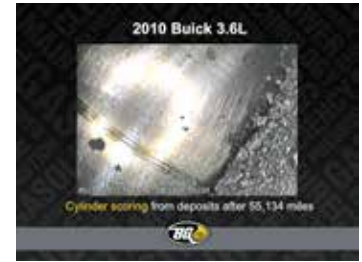
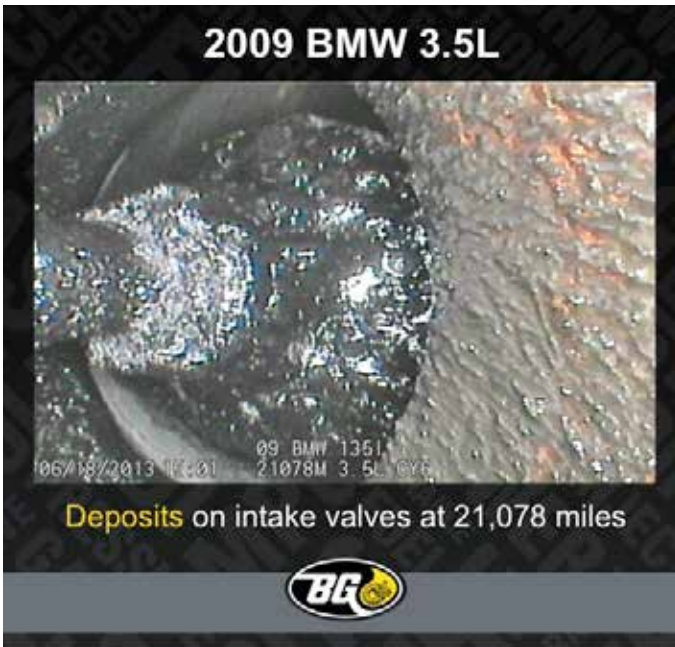
“The Technician would perform an intake cleaner service perhaps, but the vehicle would return with the same problem,” he added. “The cleaners and the cleaning process used couldn’t reach these deposits and did little to address the stuck rings and crankcase vapor deposits that were the core issues.

“Having to tear down an engine to address a problem can be a real confidence shaker for the customer, causing loss of trust in the brand, so remedying the situation correctly is critical,” he said.

The National Highway Traffic Safety Administration believes that 60 percent of the fleet by 2016 will use GDI technology. Service Departments can expect to see an increasing volume of GDI-powered vehicles in their shops. OEMs reluctance to talk about these engines’ issues, Goss believes, has hampered techs’ ability to understand, diagnose and remedy these problems for their customers.

To be fair, OEMs are studying and hoping to resolve GDI combustion chamber and valve design to prevent these issues. For instance, General Motors Service bulletin document ID 3650687 addresses “engine misfires due to major carbon deposits on the intake and / or exhaust valves.” It covers 17 GM models from 2009 to 2014. In other cases, motorists have sued Ford for performance issues related to its EcoBoost GDI engine. According to reports, the National Highway Traffic Safety Administration is investigating.

However, as is often the case, the aftermarket provides a remedy.



Solution details

Experts' observations and my personal research of literature on the topic led to BGFuelTest.com. This site bristles with photography, obtained by borescope, of what the combustion chambers of these engines can look like even after only a few thousand miles. Other borescope studies on these engines show:

- Oil sucked into the air intake and into the turbocharger at 6,454 miles on a 2012 Porsche 4.8L
- Intake port deposits at 21,000 miles on a 2009 BMW 3.5L
- Cylinder scoring from deposits at 25,600 miles on a Ford F-150 3.5L Eco-Boost
- Sticky deposits on pistons in a 2013 Porsche 4.8L after 6,454 miles

Goss and Crow described a supplements-based treatment they have found to be effective in remedying GDI issues. One or both described the service they do on these cars as:

- A detergent- and additives-rich fuel tank and fuel system cleaner to clean deposits in the fuel line, intake manifold, fuel injectors, valves and combustion chambers

- A crankcase cleaner (added to the engine and the engine operated for 15 minutes prior to an oil and filter change and then introduced as supplement treatment with the fresh oil change) to loosen and dissolve heat-baked oil sludge in the crankcase, piston rings and oil screens and passages, rocker arms and other critical areas of engines.

- An engine-performance restoration treatment to control future oil deposits.

How advisors present this remedy is important, Crow said.

"Presenting customers a supplement treatment solution can be a fine line," said Crow, a former master-certified GM Technician. "No customer who just purchased a new vehicle powered by a GDI engine wants to hear that more than routine oil and filter maintenance may be necessary.

"This is especially true now that new GM models come with a two-year free maintenance program. Why then should a customer want to pay for an out-of-pocket preventive service? However," Crow stressed, "treating GDI engines with a motor oil additive that reduces acidity and sludge buildup between oil changes and fuel tank and valve cleaners is the only way we've found to de-

liver a solid, proven maintenance investment for these vehicles."

Goss of Goss's Garage agreed. "We have had tremendous luck with this treatment for these engines, which uses a chemical engine cleaner that dissolves and removes deposits from piston rings to help restore compression," he said.

Summary

GDI engines deliver superior fuel economy, performance and reduced emissions. However, these advantages come with some potentially costly problems.

Finally, where a solution is available and presented knowledgeably for GDI engine performance problems – and its use in their engine is agreed to by vehicle owners -- this noninvasive remedy may save them frustration, money and lost confidence and get their vehicles running like new again.



Round Lake, Illinois-based Jim Le-man, who has faced carbon and sludge buildup in the '30s and '40s engines he has rebuilt, writes often about automotive technologies and automotive retail.