

On the Line

Gum and Carbon Deposits Create Engine Performance Challenges

It was a busy morning with multiple vehicles arriving on roll-backs with no-start symptoms. The vehicles ran perfectly the previous day, only to encounter a no-start condition the following morning. The symptoms were that of loss of compression. Each vehicle shared two things in common: 1) They were low mileage vehicles with tight tolerances. 2) The vehicle owners had purchased fuel from the same fuel distributor.

GUM RESIDUE

A compression test revealed low or no compression on some cylinders. Removing the valve covers and observing valve movement revealed some lazy moving valves or no valve movement on some cylinders. Pulling the cylinder heads and removing the valves revealed a gum-like residue, which was restricting valve movement. This contamination is especially a problem on low mileage engines with tight tolerances. A high mileage engine with excessive wear may not be affected. The condition is more pronounced once the engine cools down and the gum-like residue solidifies, forming a sticky, gummy like substance. The problem with the fuel was determined to be a lack of anti-oxidants and deposit control additives necessary to prevent the formation of gum. This is common with fuel that has been in storage too long or blended improperly. Some of the engines required major mechanical repairs as they were interference engines.



"THIS GOOEY MESS TELLS ME HIS LAST FILL-UP MUST HAVE BEEN AT THE HOUSE OF PANCAKES!"

CARBON BUILD-UP

Another issue that is becoming a common problem is carbon build-up. Detergents and deposit control additives are added to the fuel to help prevent the formation of carbon deposits on the intake valves. This condition is especially a problem with Gasoline Direct Injection (GDI). With this system, fuel is injected directly into the combustion chamber instead of on the face of the intake valves, which provides a fuel wash for any contaminants. Valve overlap further promotes the accumulation of deposits, as some combustion gases are forced past the intake valves promoting carbon build-up.

Carbon deposits promote misfires, rough idle, long crank times and no-start conditions. In some cases the engine will run rough for a few minutes and then perfectly until the next cold start. The reason is the carbon accumulates in a porous form and initially absorbs the

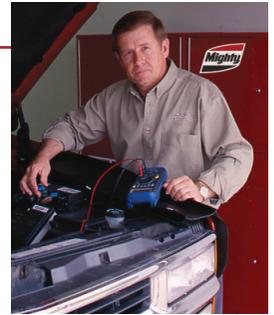
fuel, creating a lean condition. Once the carbon becomes fully saturated with fuel, the engine will run perfectly. These deposits can collect on the fuel injectors, affecting their spray pattern, resulting in hard starts, misfires and excessive levels of hydrocarbons and carbon monoxide.

The carbon deposits can cause an increase in the compression ratio, often requiring a higher octane fuel to prevent spark knock. This can be a problem with turbocharged engines as the boost pressure increases the compression ratio to a level resulting in violent detonation. Higher compression ratios can result in pre-ignition of the air-fuel mixture, resulting in detonation. Carbon knock can also result due to the pistons making contact with the carbon deposits.

TOP TIER FUEL

Eight automotive companies including GM, Fiat Chrysler Automobiles, BMW, Honda, Toyota, VW, Audi and Mercedes-Benz worked together to develop stringent gasoline standards known as Top Tier Detergent Gasoline and they recommend it for use in their vehicles to reduce intake valve deposits. The required detergent level in this fuel contains 2-3 times more detergents than the minimum standard set by the EPA and Canadian General Standards Board (CGSB). This fuel is not to be confused with higher octane fuels commonly sold at fuel outlets. It is all about detergent levels, not octane ratings. Top Tier Fuels cannot contain metallic additives, which can harm the vehicle's emission system and create pollutants. Often these additives are used to raise the fuel octane rating. This is a voluntary program and not all fuel suppliers will offer Top Tier Detergent Gasoline, which is considered the premier standard for gasoline performance. For a list of gasoline brands that meet the Top Tier standard visit www.toptiergas.com and click on Retailers.

Damage to engine components can occur when large chunks of carbon are dislodged. Performing an induction cleaning annually or every 15K miles can help prevent the formation of heavy carbon deposits. Ask your Mighty representative for information and a demonstration of his Total Intake System Cleaner.



By Larry Hammer
Technical Services