



Tech Tip

DIESEL FUEL 160

DIESEL APPLICATIONS And Fuel Related Challenges

When a fuel filter becomes restricted on a diesel application, the chances are great the system needs more than just a fuel filter replacement. Many erratic or poor performance related symptoms are due to fuel quality related conditions. Often these symptoms result from corrosion or deposit formations in the fuel tank. Surprisingly, the source of these deposits may come from fuel degradation, instead of foreign material being introduced to the fuel tank. Eventually these deposits make their way to the fuel filter and other system components. These conditions may pose a challenge for a technician who is looking for a quick solution to a performance related problem. If not properly diagnosed and the condition corrected, a repeated failure is certain. In addition to numerous performance symptoms, the failure of some expensive components is possible. Keeping the fuel system clean is the key to preventing some major expensive repairs.

For the most part, fuel delivered from the refinery is clean and clear of harmful contaminants. The problems arise during and following the distribution process, as the fuel is moved to the distributors and delivered to the various storage tanks/facilities and distribution points. The problems stem from contaminated storage tanks, condensation, water entry, improper handling procedures, the blending or mixing of some additives, or the age and degradation of the fuel. When a restricted fuel filter is encountered, a thorough inspection of the fuel and fuel tank should be performed to prevent a recurring condition. Let's consider some of the conditions that can promote fuel related problems with the diesel applications:

WATER-IN-FUEL

When we think of contaminated diesel fuel, most technicians associate water as the source of contamination, as it is the most common problem. That is why the systems are fitted with water separators, water-in-fuel indicators and water drains. There are several sources from which water can accumulate in the fuel tank. A common source is through the process of condensation. Moisture

condenses on the walls of the fuel tank during filling or certain atmospheric conditions. This is especially a problem in storage tanks exposed to the elements. In-ground storage tanks are highly susceptible to water entry through leakage around the fill caps. On some injection systems, the surplus fuel is returned to the fuel tank at temperatures ranging between 130–140 degrees F. This promotes condensation, as the hot fuel meets the cool metal tank. While water contaminated diesel fuel creates some major performance symptoms and challenges, it can also cause some major damage to some expensive components such as fuel injectors or injector pumps. The tight tolerances of the injector pumps quickly succumb to the corrosion and the injector tips become restricted, which causes restricted fuel spray. While the diesel fuel serves as a lubricant, the water does not. The presence of water causes accelerated wear and premature failure of the mentioned components.

SEDIMENTS

Often, sediments get introduced into the fuel tank via fueling or degradation of the fuel. It is imperative that these sediments be filtered from the fuel to prevent damage to the fuel injectors and the injector pump. While using a less efficient fuel filter may prevent premature plugging of the filter by allowing sediments to pass through, it can result in some expensive repairs. Extreme cases of contamination may require removal and cleaning of the fuel tank. It is imperative that you keep the filters changed to prevent restrictions that can create performance related symptoms.

IDENTIFYING THE CONTAMINATION

Determining the nature of the contamination can be a challenge, as it could be a biological or chemical related concern.

Micro-Organisms... This is the biological side of the fuel restriction. Often, there is a creepy crud, more commonly referred to as a fungus or micro-organisms that can live and grow in the fuel system. The fungus requires very little water to survive and thrive, as it feeds

off the hydrocarbons in the fuel. When this condition is present, a black or green slimy substance will appear. The substance can deposit itself throughout the system, including the fuel lines. Simply draining the system is not enough to kill the fungus. Often, the fungus is introduced when a fuel storage tank containing the fungus is agitated when a fuel tanker is depositing fuel in those tanks. A short time later the customer fills his tank and introduces the substance into his vehicle's system. There it can live, thrive and multiply with only small traces of water and minerals, changing the fuel into water, sludge, acids and products of metabolism, and creating a myriad of performance and corrosion related symptoms. The slimy substance must be eliminated with the use of a biocide added to the fuel. Further, removal of the fuel tank and properly cleaning it with hot water/steam will be necessary, including the fuel lines. The system should be dried with air, prior to fueling the system.

Asphaltene... This is the chemistry side of the fuel restriction and it is the most common restriction. Asphaltene is a by-product of the fuel oxidation process, and it can also occur from fuel blended from different crude stocks, forming sludge. When diesel fuel oxidizes or breaks down, a by-product of that process is formed and is called Asphaltene. These molecules become solids and accumulate in the bottom of the fuel tank where they can be picked up by the fuel pump and forced throughout the system, clogging the fuel filters and other components. Often this condition is misdiagnosed as a micro-organism and treated as such, making the condition more pronounced. Test kits are available to differentiate between the two contaminants.

Surprisingly, by-products of the fuel are usually what plug the fuel filters, instead of debris being introduced into the fuel tank. The instability of diesel fuel allows the fuel to degrade, forming solids and eventually sludge in the fuel tank, which can eventually clog the system. The condition is further aggravated as the heated fuel being returned to the tank accelerates the formation of the deposits. The process of fuel degradation involves the formation of sediments that fall to the bottom of the fuel tank, where they get dispersed throughout the fuel system.

WAXING

Diesel fuel contains wax or paraffin as a part of the fuel blend. It is an important part of the fuel due to its high cetane value. The cetane number is a measurement of the

combustion quality of diesel fuel during compression ignition. It is a measure of the interval between the start of injection and the igniting of the fuel. Higher cetane fuels will have a shorter ignition delay compared to a lower rated cetane fuel.

While the wax provides a source of energy, cold weather operation requires certain measures to prevent waxing or clouding of the fuel. When the temperature drops to a level where the fuel cannot dissolve the wax or paraffin, this condition is referred to as the cloud point, and it is usually around 32 degrees F. When the temperature approaches 15 degrees F below the cloud point, wax crystals form in the fuel, clogging fuel filters and fuel lines, resulting in a no-start or stalling condition. This condition is referred to as waxing or gelling of the fuel. For a no-start or stalling condition during cold conditions, the first check should involve inspecting the fuel filter for the presence of waxing or clouding of the fuel. If this condition is present, the fuel in the filter reservoir will exhibit a white or yellow deposit. Warming the fuel in the filter reservoir and fuel lines will be necessary. Be aware that some of the waxes may remain as solids in the form of wax crystals or pellets. Special additives are available to prevent these conditions. Many fuel systems are equipped with fuel heaters to help prevent these conditions from occurring.

Varying the cloud point of the fuel in relation to ambient temperature is imperative. For example...summer fuel has a higher cloud point and cannot be used in the winter months, just as cold conditions require a low cloud point fuel. In your diagnostics, be aware of seasonal changes and the effect that the fuel blend can have on the performance of the vehicle.

ADDITIVES

Special additives are available to reduce problems associated with fuel contamination and the lack of lubricity in today's low-sulfur fuels. Sulfur has been the main lubricant for the diesel fuel and the present low-sulfur fuels are creating major problems for the fuel injectors and injector pumps.

Ask your Mighty Rep about his complete line of chemicals available for diesel applications. These include fuel injector cleaners, fuel supplement cleaners and conditioners, total system cleaners and anti-gel products.

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