By Mike Antich

UNANTICIPATED TRADE-OFFS TO ULSD?

The EPA mandated the introduction of ultra low sulfur diesel (ULSD), effective June 1, 2006. Since then, there has been an uptick in reports of fuel-related problems. Recurring complaints are corrosion in storage tanks and dispensing systems containing ULSD, onboard vehicle fuel tank corrosion, clogged filters, and seal and gasket deterioration. "I've been around diesel equipment most of my life and clearly we have seen a significant spike in fuel-related issues within the past three to four years, including the identification of particles that appear to be pieces of rust in fuel samples, in addition to increased bacteria, microbes, and water," said one fleet manager.

Similarly, some OEMs report field issues with corrosion of steel fuel tanks on vehicles. "We don't know if it is related to ultra low sulfur diesel or not, but it has correlated with its introduction," said one OEM engineer, who wished to remain anonymous. "Since ULSD came out, we have seen more of an issue with fuel tank corrosion and fuel filter clogging, but we don't know definitively if it is being caused by ULSD or by poor quality biodiesel. The fuel tank corrosion seems to occur more in the Southeast. We're not sure what's causing these issues, but we've definitely seen more in the last couple of years than before."

POSSIBLE SOURCES

EPA standards require ultra low sulfur diesel to contain no more than 15 parts per million of sulfur. One consequence to the reduction of sulfur, according to some in the industry, is that it creates a more favorable environment for microbes and bacteria to develop and thrive. Some fleet managers are concerned ULSD may increase the incident of microbial contamination. These fleets report a higher degree of water contamination in storage tanks and vehicle tanks. Microbes depend on this water to live and the "food hydrocarbons" found in diesel fuel to proliferate. Few microbes actually proliferate in the fuel itself, but do depend on the hydrocarbons in diesel fuel for nutrition. Once the contamination process begins, it will quickly accelerate while the fuel is stored. Microbes will immediately start to grow in water, which will ultimately expand into a growing colony. The colony produces acids that corrode metal parts in the fuel tank and fuel systems. Another contributing factor to contaminated diesel has been the introduction of biodiesel. Some organic blends of biodiesel have been found to accelerate bacteria and microbe growth.

As bacteria and fungi reproduce, they form biomass, which accumulates at the fuel-water interface, on tank surfaces, and on filters. The development of biomass is a direct consequence of microbial growth, but its effect on fuel systems is mostly indirect. As the metabolic waste from the biomass and dead cells accumulate, they settle out as sludge at the bottom of a fuel tank. If not treated, the colony will grow very rapidly in a fuel storage tank and produce as much as several pounds of sludge per week. The sludge not only gums up storage and dispensing tanks, it can also be transferred to the vehicle's fuel tank. As a result, vehicle fuel filters may become clogged. The first symptom of this is reduced filter-life. Occasionally, catastrophic failures may occur, such as engine shutdown due to fuel starvation.

In most cases, contaminants are "imported" into a vehicle's fuel system. For instance, before ULSD fuel reaches the dispensing pump, it may be transferred from three to six storage tanks and/or trucks. At every point along the way, the fuel usually absorbs small amounts of water and contamination. Also, some companies do not "top off" their storage tanks and keep a minimum amount of fuel on hand. The reduced fuel volume maximizes the surface area of the tanks to produce condensation. Another factor that contributes to both microbe growth and water accumulation is how fast fuel is run through storage and dispensing tanks. Generally, problems decrease with higher volume.

Once condensation and microbes become an issue, fleet managers must remediate (pump out tanks) and filter the fuel. Once you have microbes, it is almost impossible to completely eliminate them. You must treat your storage tanks.

FUEL TRADE-OFFS

ULSD is designed to decrease emissions and prevent sulfur damage to diesel particulate filters (DPF), which need to be cleaned of ash every 150,000 to 300,000 miles, depending on application. In pre-2007 engines, the ash was primarily created by oil additives needed to protect engine components from sulfuric acid. Since ULSD has only 15 parts per million of sulfur, it allows the use of CJ-4 engine oil, which doesn't contain these additives to protect against sulfuric acid, and, as a result, generates less ash and maximizes DPF cleaning intervals.

However, there are trade-offs. ULSD costs a few cents more per gallon and contains 1-2 percent less energy. The refining process that removes the sulfur also removes high-energy aromatics, which corresponds to a 1-2 percent increase in fuel consumption.

What has the industry scratching its "collective head" is the chronological correlation between the uptick in fuel-related problems in diesel trucks and the introduction of ULSD. Is there a connection between the two? Although highly controversial, some are asking: Are the increased incidents of microbial contamination and fuel tank corrosion unanticipated trade-offs for the use and storage of ULSD?

Let me know what you think.

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