Three Primary Issues Affecting Diesel Fuel Operability

Moisture

The causes of higher moisture in recent years:

1. Hydro-treatment to make ULSD generates water in the process.
2. ULSD drops moisture faster than former higher sulfur fuels, generating more free water upon cooling.
3. Biodiesel is now a 5% presence in most diesel terminals, and biodiesel emulsifies water.
4. Free water and emulsified water create problems with icing and microbial activity. Dissolved water does not.
5. Diesel volumes are higher, using the same storage infrastructure. This allows less time in settle tanks originally designed to allow free water to drop out of the fuel stream.
6. Refiners normally would shut down processing during sodium dryer and coalescer maintenance. Now processing continues in some cases during dryer maintenance in order to maintain volume. "Wet" fuel enters the pipeline.
7. There are still some terminals that insist there is no water, and they do no separation treatment.

On the improvement side, some terminals are corrosion proofing the bottom 6 feet of tanks, and drawing from plumbing modified to exclude the water bottom. This has offset part of the problem, but we are still left with more entrained moisture than in previous years.

In 2016, Schaeffer increased by double, our moisture control which dissolves entrained water into the fuel where it becomes harmless, and not usable to microbes, and will not freeze.

Moisture enters tanks via natural entrainment in the incoming fuel in that all diesel has some degree of moisture present. In addition, venting air enters the tank when fuel is dispensed from storage, or consumed in a truck. Ten gallons of fuel pumped equals ten gallons of air in. This air can be part of a hot humid day. 90 degree air at 70% humidity has a dew point of 79 degrees. In winter this process occurs as warm fuel returns to the saddle tanks and then cools, allowing moisture to separate if a good de-icer is not present.

Waxing/Gelling

All diesel fuel has a cloud point, cold filter plugging point, and pour point.

These are caused in order, by formation of wax crystals in stages as the fuel becomes colder.

Anti-gel components must be present before the initial cloud point is reached. The reason is that the additive contains nucleators that cause the wax to form a much larger number of much smaller crystals, so that they pass harmlessly through the fuel filter, and do not become large enough to block filter pores until much colder. If the additive is not present ahead of the cloud point, the crystals will rapidly grow fewer, but larger crystals, plugging the filter right at the cloud point. This is only reversible if the fuel temperature is raised well back above the cloud point, so the additive's nucleators may function.

After nucleation, the additive's crystal modifiers change the shape of the wax as it crystalizes, forming sticks instead of plates. This further enhances the fuel's ability to pass through filters when colder.

Free moisture forms ice crystals which accelerate filter plugging with ice/wax combination.

For reliability, especially in winter, it is imperative to treat by the calendar, not by a weather report. If treatment is sporadic, fuel will not be fully protected throughout the system from storage to truck tanks, and you may be trying to treat fuel already beyond the cloud point, and with ice present on filters.

Full treatment for winter should start no later than November 15, continuing until March 15 in the Midwest because weather cannot be predicted far enough ahead to cover the fueling chain to the end.

Additive should always be placed ahead of a fuel drop in order to properly blend.

Biological Activity

Bio activity or "Bugs" consist of yeasts, molds, fungi, and bacteria which are often called "algae". Algae is a misnomer in that it can only grow in sunlight. There are around 300 species that will grow in water with fuel. Bugs are in all fuels that have contacted the air, but remain dormant until exposed to free moisture. The condensation droplets and pooled water in tank bottoms is free moisture.

Bugs live in the water, and eat the fuel. As they proliferate and create waste (the scientific term is 'bug poop'), the water becomes acidic and corrosive. A bio mat of live and dead bugs develops at the fuel/water interface – even on the little drops of water on the sides and top of the tank interior. Eventually, some of the mat may break loose and deposit on fuel filters. Bio material will be slimy, and sometimes smelly. Corroded material will be gritty with no off-odor. Any fuel tank containing free moisture will naturally develop bio activity over time. Schaeffer's TankDry and Fuel Shock may be used to prevent or cure.

I hope this brief overview is of interest and is helpful. I am glad to offer further detail.

Please contact Jim Clark at 616-261-2750 or jim@schaeffersales.com