

Diesel fuel additive considerations

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Fuel from filling station pumps already contains additives designed to optimize diesel engine performance, so fleets should be cautious when determining whether aftermarket additives are necessary.

The commercial trucking industry is demanding more from diesel fuel given the complexities of today's heavy-duty vehicle systems. In fact, many are recognizing that high quality diesel fuel is more than just a commodity driven by price; it offers significant potential for optimizing modern diesel engine performance.

This growing interest in "all-in-one" differentiated diesel fuels has brought attention to additives as managers look to utilize the best formulation package for their fleet's needs. However, finding the right mix can be tricky.

Fleets looking to enhance their diesel fuel formulation should seek input from their fuel providers on the additive content already in their supply, as well as best practices for adopting new additives.

Fleets should always be cautious of adding additives to diesel fuel as it can cause more harm than good.



Baseline additives

Standard additives blended during the refining process enhance key properties consistent with a quality diesel fuel. Fleets should be mindful of additives that already exist in their fuel before considering new ones.

- Cetane improvers are added by refineries when the crude selection or processing does not result in an on-spec cetane number on its own. Higher cetane may benefit cold start and reduce noise and smoke upon starting.
- Lubricity improvers are required because the natural lubricity-enhancing compounds in diesel fuel are reduced in ultra-low sulfur diesel fuel. Improving lubricity protects the fuel pump and fuel injectors from wear. Lubricity improvers are not necessary if a minimum of 2 percent Fatty Acid Methyl Esters (FAME) is blended into the diesel fuel.
- Corrosion inhibitors are typically added at refineries to help prevent corrosion of steel and copper or its alloys (e.g., brass, bronze) in fuel systems.
- Conductivity improvers are added at refineries and sometimes again at the terminal stage since their effectiveness can decrease over time and at cold temperatures. These improvers help protect against static discharge during loading.
- Cold flow additives are added at the refinery or the terminal to ensure the diesel fuel flows at the temperatures to which it will be exposed. Blending of cold flow additives depends on geography and season. High quality diesel fuels from reputable providers will contain the required additives described above that support basic needs and

are essential to maintaining adequate fuel performance. Fleets should also ask about providers' quality assurance procedures applied at the refinery, at the terminal, and during transportation. For example, ExxonMobil tests fuel at its refineries and again as it enters the pipeline or barge for delivery to the terminal to ensure the fuel meets or exceeds specifications. ExxonMobil then tests its fuel again at the terminal to ensure it still meets or exceeds the expectations, and then additives are precisely injected into the fuel for vehicle performance, product quality, safety, and regulatory purposes. Finally, fuel dispensers at Exxon- and Mobil-branded service stations have built-in filters to help preserve fuel quality as the fuel enters the vehicle's fuel tank for assurance of vehicle performance on the road for years to come.

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Aftermarket additives

There are many aftermarket additives sold that claim to meet specific customer needs. In contrast to the additives described above that are blended at the refineries and terminals, aftermarket additives are added to fuel by hand. However, fuel should meet the required specifications without customers needing to purchase additional additives. Fleets should always be cautious of adding additives to diesel fuel as it can cause more harm than good. For example, aftermarket cold flow additives can interact poorly with cold flow additives blended into the fuel at the refinery or the terminal, which can result in filter clogging and potentially worsen the fuel's cold flow properties. In addition, in cold temperatures, aftermarket additives become less soluble and may not dissolve correctly in the fuel.

Enhancing diesel fuel may be a science best left to the experts. ExxonMobil recommends against fleets adding aftermarket additives to their fuel supply by hand. While some fleets may prefer the satisfaction of personally pouring an aftermarket additive into their fuel tanks, diesel fuel pre-blended at the terminal with performance-enhancing agents like detergents and cold flow additives is much more likely to meet standards for consistency, homogeneity, and effectiveness.

Detergent-based additives provide substantial benefits for diesel fuel products by removing injector deposits and preventing them from forming in the first place. In some cases, pre-blending diesel with detergent-based additives has proven valuable for addressing demands for improved fuel economy, lower emissions, and reduced downtime.

Looking ahead

According to ExxonMobil's 2019 Outlook for Energy: A Perspective to 2040, energy use by heavy-duty vehicles is expected to grow and become the largest portion by volume of the overall transportation sector. In response, diesel engine technology will become even more sophisticated in the future. The commercial trucking industry will continue to have a major impact on what the full diesel package needs to deliver down the road.

Above all, persistent research and innovation at the molecular level will be critical to engineering a fully formulated diesel fuel that meets the performance needs of commercial fleets, every time.