



How to Prevent the #1 Diesel Fuel Contaminant from Harming Your Fleet's Engines

Diesel fuel contamination results in higher fuel and maintenance costs, and a reduced bottom line.





Diesel is not a perfect fuel and its hygroscopic nature — the tendency to attract and hold water — causes problems.

Even with today's lower fuel prices, fleets are still paying about 40.3 cents per mile for fuel which equates to about 25 percent of their vehicle's operating expenses¹.

Given the significant impact of fuel on a fleet's bottom line, fleet managers need to make sure they get the most miles out of each gallon of diesel they purchase. Unfortunately, they can be thwarted in their efforts by contaminants that find their way into the fuel supply and decrease the efficiency of the fuel system.

Contaminants cause numerous problems for fleets at every stage of their operation. Trucks that have contaminated fuel:

- **Are less efficient**
- **Use more fuel**
- **Increase expenses**

Since contaminated fuel damages the fuel system and other engine components — creating a more likely need for replacement — maintenance costs are higher. And because downtime is typically higher for major repairs, this affects the fleet's bottom line by reducing the number of trucks and drivers on the road.

Why Water Contaminates Fuel

Diesel fuel is one of the most efficient fuels available today; about 33 percent more efficient than gasoline. It is also a cleaner fuel than gasoline, emitting less carbon dioxide into the air. Diesel fuels serve as a source of combustion for a diesel fuel system and as a lubricant for diesel fuel pumps. High pressure common rail fuel systems on today's trucks have tight tolerances, making the lubricating characteristic of diesel important to the proper operation of the truck.

But diesel is not a perfect fuel and its hygroscopic nature — the tendency to attract and hold water — causes problems. Water in diesel fuel is a serious problem. The No. 1 contaminant of diesel fuel, water can cause a great deal of damage to the fuel system if it gets into the fuel.

¹ *An Analysis of the Operational Costs of Trucking: 2016. September 2016. American Transportation Research Institute. Accessed June 11, 2017.*

How Water Contaminates Fuel

Unfortunately, there are a number of ways for water to get into diesel fuel. As little as 100 parts per million of water in a diesel fuel tank can cause problems to develop. Studies have shown that diesel fuel degradation starts almost as soon as the fuel is produced and the fuel quality continues to degrade while it is being stored.



Free water is that which has separated out of the fuel to form a visible layer between the heavier water and the lighter fuel floating above the water.

1. Fuel degradation starts when the fuel is in transit from the refinery where condensation of air, leaking fill pipes or vents, or careless handling allow water to seep into the fuel. Care must be taken at all points in the supply chain to ensure the purity of the fuel, and to prevent water from getting in.

2. Once the fuel is delivered, condensation can form inside storage tanks and cause contamination. This can cause diesel sludge to form and settle at the bottom of the tank. Failure to maintain proper closures on fuel storage tanks also can allow water to get into the tank and contaminate the fuel.

3. Debris from storage tanks can also get into the vehicle's fuel tank during fueling. The good news is that when fuel tanks are full this may not be a big problem. However, as the fuel is used, contaminants that have settled at the bottom of the tank can get stirred up and enter the engine.

4. High volume fueling pumps used during refueling can agitate existing contamination in the fuel tank thereby contaminating the new fuel too.

Types of Water Contamination

There are two ways that water can contaminate diesel fuel: in an emulsified or in a free state.

- Emulsified water is a mixture of water and fuel where the water is dispersed uniformly throughout the fuel.
- Free water is that which has separated out of the fuel to form a visible layer between the heavier water and the lighter fuel floating above the water. Free water is the water that drops out of a suspended state.

While it is a contaminant, emulsified water is less of a problem for the fuel system. Free water, however, can cause serious problems, because it allows an algae-like substance to form. In addition, both aerobic and anaerobic bacteria can thrive in fuel tanks and fuel storage tanks. If left alone, they will turn into a slime that will clog the filter and/or cause corrosion of the tank.

Diesel sludge is the algae-like substance that settles to the bottom of fuel tanks and can clog filters, causing the engine to not work as efficiently or cause serious damage to the fuel system.



Failure to remove these deposits could cause the engine to shut down.



The Consequences of Water Contamination in Fuel

Contaminated fuel affects the engine and fuel system in many ways.

- 1. Poor engine performance.** This includes reduced engine rpm, decreased power for the engine, increased fuel consumption, poor cycle time, hard starting, engine knocking, exhaust smoke, and rough running.
- 2. Inefficient fuel flow.** Contaminated fuel will also have an elevated cloud point. Cloud point is the temperature below which wax in diesel fuel becomes cloudy. If this occurs, waxes in the diesel fuel have thickened and solidified, making it more difficult for the fuel to flow smoothly.
- 3. Higher likelihood of engine failure.** Contamination reduces the effectiveness of the detergents in fuel, which are designed to remove deposits that build up in the engine. Failure to remove these deposits could cause the engine to shut down. Contamination reduces the effectiveness of detergents in the fuel, leading to increased deposit buildup on critical fuel system components and lead to a greater likelihood of engine failure.
- 4. Clogged injectors** are another consequence of contaminated fuel. When an injector is clogged, the fuel intake is sluggish. This increases the amount of time it takes the engine management system to complete the injection event. Water in the fuel also prevents the fuel from lubricating the fuel pump properly, which can lead to wear or corrosion.
- 5. Fuel filters are needed** to filter out harmful material and help the fuel reach the engine. When the filter becomes clogged with an excessive amount of contaminants, fuel is not able to reach the engine as it normally would.
- 6. Corrosion**, which can occur in both fuel tanks and fuel storage tanks, can further contaminate the fuel and can cause premature wear of metal tanks.

Both clogged injectors and clogged filters can cause severe damage to the fuel injection system.

How to Mitigate the Effects of Water Contamination

While it is difficult to prevent all contamination, there are steps that can lessen the amount of contamination and mitigate its impact on the engine and fuel system.



Ask questions about what practices and procedures the supplier has in place to prevent contaminants from entering the fuel supply.

1. Buy from a Reputable Supplier

The first step is to buy fuel from a reputable supplier. Make sure the fuel supplier is thoroughly vetted. Ask questions about what practices and procedures the supplier has in place to prevent contaminants from entering the fuel supply. Tour the storage facility if possible to observe firsthand the supplier's handling procedures. Ask for a customer reference and find out about the customer's experience, including how the supplier handled any contamination issues.

2. Practice Good 'Fuel Storage' Hygiene

Practice good fuel storage hygiene, including testing bulk storage tanks for contamination. Test for water in storage tanks every six months and drain or pump out excess water as needed. Also make sure to keep tank filters clean.

3. Have a Maintenance Schedule

Fuel system maintenance is a critical step in controlling contamination. Like any system on a truck, the fuel system needs regular maintenance to ensure it is operating at peak levels. Make sure to replace fuel filters according to manufac-

turer recommendations and perform other fuel system maintenance at least as often as recommended by the manufacturer. Depending on the specific operating characteristics of the fleet and the purity of the fuel used, it may be necessary to perform fuel system maintenance more frequently.

4. Use Fuel Additives

Fuel additives are another good defense against contaminants. They provide many benefits and prevent the spread of microbial growth in fuel, dispersing moisture, improving lubricity and inhibiting corrosion. There are many types of products on the market designed to help with contamination issues, including detergents, lubricity additives, fuel stabilizers, biocides, and cetane improvers.

While it is nearly impossible to prevent water from getting into the fuel system, it is very important to understand the effects of fuel system contamination and recognize the ways that water can get into fuel. Armed with that knowledge it is possible to put in place a comprehensive plan that can help minimize the damaging effects of contamination.

About E-ZOIL

Founded in 1980 with headquarters near Buffalo, New York, E-ZOIL manufactures a complete line of performance-enhancing fuel additives and cleaning solutions for fleet owners, owner operators and consumers to protect their diesel vehicles and equipment. E-ZOIL specializes in highly concentrated formulas developed by the company's in-house chemists and backed by over three decades of expertise. E-ZOIL products improve vehicle power and mileage, reduce costly breakdowns and downtime, assist with preventive maintenance and enhance and protect vehicle appearance. For more information, visit www.ezoil.com.

