



Heavy Equipment Fuel System Maintenance

Maintaining the fuel systems of your heavy equipment fleet isn't difficult, per se, but performance and engine health can be adversely affected if not done properly. Much of it comes down to preventive measures related to fuel selection and storage. Cleanliness is critical as the high speeds and pressures of today's Tier 4 engines with high pressure common-rail (HPCR) systems can turn a microscopic spec of dust into an abrasive rocket capable of causing wear and corrosion. That wear and corrosion then introduces additional contaminants into the system, and changes the science and geometry of how that fuel system is designed to work, ultimately degrading engine performance. It also can damage injectors and other parts that are difficult to repair or may require total replacement, leading to downtime.



In this article we will examine a number of factors for optimal fuel system health, as well as a few critical maintenance practices to ensure safety and performance. An important note: Each fuel system is different. This article does not replace professional consultation with a qualified heavy equipment service professional or recommendations from the OEM specific to each equipment model. Consult with your dealer or OEM as needed.

Consider the Source: Preventive Maintenance through Smart Fuel Practices

Just as with the human body, you will only get out of your machine what you put into it. Most construction firms, especially those in populated areas, don't have to be too concerned with "fresh" fuel as the supply is regularly cycled through. Fuel quality in North America is generally pretty good. Having said that: source your fuel from a reputable source with a track record for clean and fresh diesel. Diesel fuel begins to degrade as it ages. This degradation leads to the formation of a variety of "organic" materials within the fuel that clogs filters and can impede performance of the engine. As filters clog and that material works its way into the injectors, the chances of abrasion wear increases. Putting old diesel into a high-performance diesel engine starts you off on the wrong foot immediately.

How you store your diesel fuel is also important. It is recommended that portable tanks of diesel be stored inside to prevent exposure to temperature fluctuations that can cause condensation. That condensation then provides a direct source of water into the diesel fuel. Some even suggest filling equipment tanks at the end of each shift to minimize the physical space on the inside of the tank where condensation can occur. It is also recommended to outfit bulk storage tanks with breathers and dryers designed to keep water and contaminants out of the diesel, as well as added filtration at the input and output as another line of defense. Eliminating water is important as it presents numerous challenges: it encourages further microbial growth, and water that bypasses the water separator can cause internal damage to the injectors and corrosion throughout the system. Water in diesel also reduces the heat of combustion, which can rob the engine of power. Water in diesel can also freeze and accelerate the gelling process that occurs when diesel drops below a certain temperature in cold weather climates. Most equipment now has a warning light that lets you know that your water separator is full, but it is also suggested to make it a point to drain the water from the water separator daily to ensure optimal performance.

The effects of biodiesel should also be noted. Biodiesel tends to degrade faster than petroleum-based diesels and have a greater affinity to water, clogging filters at a faster rate and requiring a greater level of maintenance/vigilance in monitoring performance.



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A note on storage tanks: keep an eye out for damage, rust and possible holes on the tank. These can provide opportunities for materials to enter the tank and contaminate the fuel.

Also – quite basic: when filling your machine’s tank, make sure the area surrounding the fueling point is free and clear of any dirt or debris that can enter the tank. Construction sites are not “clean”, by nature, but every attempt should be made to maintain the quality of the diesel fuel that enters the machine. Always remember to replace the fuel cap and tighten it.

A couple of final pleas: first, always make sure it is diesel that is going into the tank. With the introduction of diesel exhaust fluid (DEF) in Tier 4 selective catalytic reduction (SCR) technologies, we have heard anecdotes related to workers accidentally putting DEF into the fuel tank and causing thousands of dollars worth of damage to the engine and fuel system. Secondly, it is equally important not to mistakenly pump diesel fluid into the DEF tank as this can cause serious damage to various system components such as the DEF injector and SCR Catalyst. It is vitally important DEF quality is up to the strict purity requirements as listed in the ISO 22241-1 specification of 32.5 percent water to 67.5 percent urea. Always think twice before fueling and/or filling DEF and diesel. The DEF and diesel fill points are clearly marked.

A Word on Safety

Appropriate safety measures must be taken. Proper safety glasses and other personal protective equipment should always be worn. The pressures at which HPCR systems operate at are extremely high (some over 30,000 psi.). Exposure to pressurized liquids can cause harm to exposed skin—always depressurize the system prior to maintenance as instructed in the machine’s owner’s manual.

Fuel collected during the maintenance process should be properly captured and stored, and disposed of through appropriate channels.

Take a Surgical Approach to Maintenance

There are a few key fuel system maintenance suggestions that are quite obvious:

- Change fuel filters at or before intervals determined by the manufacturer
- Use filter types and sizes approved for use by the manufacturer (it’s also best to have the same micron size filter as the fuel system requires installed on all fuel storage tanks to ensure a clean supply).
- Drain water from the water separator daily, or immediately when the water separator warning light goes on.
- Periodically check the fuel lines and other components for leaks. It is always safe to assume that, if diesel is leaking out, that air, dirt and other contaminants may be entering the system through the same leak. Finding the source of leaks and making that repair immediately is important. Leaks of all sizes pose a problem as it only takes a small contaminant a few microns in size to cause problems with injectors, etc.

While it may be difficult, controlling the environment in which fuel system maintenance occurs will go a long way into ensuring success. Perform repairs indoors when possible. If this is not possible and you’re working on a large, outdoor site, erect windbreaks as needed to protect the work area from airborne contaminants. Use clean and dedicated tools to plug fuel lines and other gateways to the fuel system to minimize the risk of contamination. For instance, that old golf tee in your pocket or that dirty paper towel from your truck cab will not suffice. Also use clean tools throughout the process so as not to introduce other foreign dirt and oils to the components. If using compressed air, ensure your air supply is moisture free.

One common mistake that is made is filling the fuel filter with diesel prior to installation. All this does is introduces unfiltered diesel fuel into the system and provides greater access for contaminants to the injectors



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and other sensitive components. Always install the fuel filter without adding diesel and prime the engine separately before starting.

These are just a few tips to set you on the right path for a healthy diesel fuel system. Monitoring fuel storage and distribution practices can go a long way into ensuring a healthy fuel system, and strict attention to maintenance intervals and cleanliness in servicing the fuel system will help your diesel engine perform the way it was designed to.

(Source: Case Construction)

