KAYDON FILTRATION

The benefits of diesel fuel filtration

Staying ahead of the diesel curve

In every part of the world, you'll find vehicles that rely on diesel fuel. From transportation trucks, mobile construction equipment, agricultural machinery, public safety vehicles, emergency (back-up) power, and combustion turbines, diesel fuel is the dominant power source in key sectors throughout the world. As new machines and engines are required to meet ever-changing air quality standards, diesel engine design and quality is rapidly improving, which means that reliable diesel engine operation demands cleaner and dryer fuel.

Sophisticated High Pressure Common Rail Fuel Injections Create Need For Clean Fuel

In an effort to reduce emissions and particulate matter into the atmosphere, common rail injection systems were introduced.[1] While earlier systems used a separate fuel rail from the low pressure transfer pump to feed each injector, today's high pressure fuel pumps (30,000+ psig) feed a single, common fuel rail system to provide the injectors a consistent high pressure fuel.[2] The introduction of the "Tier" system for lower emissions diesel engines is another force that is pushing the use of high-pressure fuel injections in diesel fuel engine designs. This change in diesel engine design to provide the required emission control has created a significant need for better fuel quality. The reason for cleaner fuel is that common rail fuel systems, which will be supplied on Tier III and Tier IV engines, have much tighter tolerances which make them extremely sensitive to water and particulate contamination.

The Changing of Fuel Chemistry

To help diesel fuel burn cleaner, the fuel's chemistry is being altered. Through an array of processes, with most common being hydrotreating (removes sulfur and aromatic content) – diesel fuel suppliers are tailoring specific properties of their diesel fuel to match various performance demands in different marketing regions.[3] The downside to these processes is that they can have an effect on diesel engines. Sulfur removal reduces fuel lubricity and new refining processes have difficulty controlling abrasive inorganic particle generation, which means high pressure fuel injectors and fuel injection pumps are susceptible to wear from the particle laden fuel. In addition, hydrotreating destroys naturally occurring antioxidants. The traditional methods of fuel filtration are not capable of providing the needed level of fuel cleanliness. Poorly filtered fuel causes wear between moving components, contributes to valve corrosion and erodes high pressure injectors. Over time, the traditional fuel treatments and filtration

Emissions control is making it essential for diesel fuel to be clean and dry

equipment will cause a diesel engine to work harder, which creates even more damage, increasing maintenance costs and fleet downtime. From fuel pumps to injectors and engines, water and particles in diesel fuel are reducing engine component life from thousands of hours to only hundreds of hours. Today's newer engines need fuel to be completely conditioned. That is, the fuel needs to be less than 500 ppm water and meet cleanliness code ISO 16/14/12 or less.

Realities of fuel transfer

As mentioned previously, water and particulate impact engine service life and performance by being abrasive to fuel system and engine components. A major cause of this fuel contamination occurs during the fuel handling process. Unfortunately, prevention of water and particulate from entering through the transport and storage process is extremely difficult. It will happen; it's only a matter of how much. The process allows water and particulate to be picked up as fuel moves through pipelines, barges and delivery trucks. In addition, the fuel transport process is prone to changing temperatures, creating water droplet formation. The fuel tank becomes the endpoint for all the contamination that has been collected and carried through the fuel transport process. As the contaminated fuel is pumped into a fuel storage tank, it combines and agitates with the pre-deposited particulate and water already in the fuel storage tank, and the fuel becomes further contaminated. The low contaminate holding capacity of on-engine filters is not large enough to capture the amount of contaminant needed to provide protection for common rail injection systems. The use of bulk fuel conditioning in the fuel offloading and fuel forwarding lines removes the burden of contamination removal from on-engine filters, thus providing fewer emergencies fuel maintenance incidents and extending vehicle operational time. Also, by adding bulk fuel conditioning equipment, the fuel becomes much cleaner, which offers more protection to critical and sensitive diesel engine components like fuel injectors and control valves. Fuel tanks can also be kept free of water with continuous fuel tank circulation and conditioning systems.

Solution: Early Filtration

More important than the new engines that are being designed to control emissions is ensuring that the fuel going into them is properly filtered. Indeed, using the proper on-engine filter is critical to any vehicle's success. And where there is an opportunity, companies should ensure the installation of bulk fuel filtration to capture particulate and remove water before entering the engine's fuel system. And while on-engine filtration is a must, it is always a smart investment to install bulk fuel conditioning assemblies to guarantee that the maximum amount of debris is kept from entering the engine fuel system which could easily overwhelm the very limited capacity of the on-engine filters. While it may be difficult to monitor and control the fuel received from other sources, companies that control their own fuel storage tanks and delivery systems have no excuse for not keeping water and particulate from being delivered to their vehicles. Whether above ground or underground, storage tanks for every type of fuel are susceptible to contamination – eventually leading to emergency shutdowns, increased operating and maintenance costs, and shortened engine design life cycles.

1. Diesel Fuel Systems Have Come A Long Way Since the 70's; Robert Bosch; Bosch, LLC; p. 1
2. Ibid.
3. Diesel Fuel Technical Review. 2007 Chevron Corporation. John Bacha, John Freel, Andy Gibbs, Lew Gibbs, Greg Hemighaus, Kent Hoekman, Jerry Horn et. al. http://www.chevron.com/products/ourfuels/prodserv/fuels/documents/Diesel_Fuel_Tech_Review.pdf p. 56

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