



## Soot in Diesel Engines

### **Soot Production in Diesel Engines:**

Internal combustion engines produce soot as a result of incomplete fuel combustion. Ideally, complete combustion in a cylinder would only produce carbon dioxide and water, but no engine is completely efficient.

### **Why does soot occur more in diesel engines?**

Because of the way that fuel is injected and ignited, soot formation occurs more commonly in diesel than in gasoline engines. Unlike gasoline engines where the fuel/air mixture is ignited with a spark, fuel and air entering the diesel cylinder ignite spontaneously from the high pressure in the combustion chamber. The fuel and air mixture in diesel engines typically do not mix as thoroughly as they do in gasoline engines. This creates fuel-dense pockets that produce soot when ignited. While the majority of soot easily escapes through the exhaust, some gets past the piston rings and ends up in the oil.

### **Factors that Cause Excessive Soot Levels in Crankcase Oil:**

- ✓ Periods of excessive idling
- ✓ Worn piston rings
- ✓ Injectors with poor fuel spray patterns
- ✓ Rich air-fuel ratios
- ✓ Clogged air filters decreasing the air supply, which increases the fuel-air ratio and ultimately leads to increased soot formation

### **How Soot Particles Lead to Imposing Threats in your Diesel Engines:**

Soot particles are 98 percent carbon by weight and typically spherical in shape. While most are only around .03 microns in size, they often clump together to form larger particles. Individual soot particles pose little risk to engine parts, but clumps of soot can cause damage. Dispersant additives in today's engine oils keep the individual soot particles from forming damaging clumps.

### **So what goes on in the engine once excessive soot levels occur?**

Excessive soot levels in the oil can quickly overwhelm the dispersant additives in lower quality engine oils and ultimately form what is commonly known as sludge. As the dispersants become depleted, the soot particles clump together, attach themselves to engine surfaces and lead to reduced lubrication due to impeded oil flow through the engine as well as through the oil filter. High oil soot levels can also lead to a higher lubricant viscosity which impedes oil flow and increases engine wear. The performance of anti-wear lubricant additives can also be negatively impacted and lead to increased wear and premature engine failure.

## **To make matters even worse...**

High soot conditions can lead to the formation of carbon deposits in the piston ring groove. This causes degradation of the oil seal between the piston rings and cylinder liner and eventually causes abrasion. As abrasion widens the gap between the rings and liner, increasing amounts of combustion byproducts such as gases and unburned fuels blow into the crankcase. Eventually, the cylinder loses more and more compression and the expanding gases from combustion increasingly lose their ability to push the piston down. This is realized by the operator as a loss in horsepower and fuel efficiency.

## **Luckily, FS can help you protect your engines from excessive soot levels.**

FS Suprex Gold ESP is blended with the latest additive technology for handling the soot produced in modern engines. While soot particles cannot be avoided, the robust chemistry in FS Suprex Gold ESP prevents problems by keeping soot particles from clumping together long after the dispersants in other oils give out. Our technology ultimately minimizes abrasive wear, maintains viscosity levels and prevents filter clogging for longer engine life and extended drain intervals. When you depend on your equipment, depend on FS Suprex Gold ESP to protect your diesel engines.

