



# Maximum Shear Stability

## Protection Against Viscosity Loss

Viscosity is the most critical characteristic of oil. The viscosity, or thickness, of oil directly relates to its ability to bear extreme loads and provide adequate protection for internal engine parts. Hard-working diesel engines present a serious challenge to the lubricants that protect them, generating enough force to literally tear apart, or shear, the molecular structure of the oil. Once a motor oil shears, it quickly loses viscosity, leading to accelerated equipment wear, excessive oil consumption and, ultimately, increased time and money spent on maintenance and repairs.

AMSOIL Premium API CJ-4 Synthetic 5W-40 Diesel Oil retains its viscosity in the face of shearing forces. Its advanced shear-stable formulation, also available in 15W-40 viscosity grade, stays in grade longer than other oils.

## At 4 Percent Fuel Dilution AMSOIL Delivered, While the Competition Failed

Because diesel fuel is a natural solvent, it quickly reduces the motor oil's life expectancy and effectiveness. Fuel dilution leads to reduced oil viscosity, reduced oil film strength, increased engine wear (particularly in the cylinder/ring area), increased volatility, weakened lubricant detergency, accelerated lubricant oxidation, varnish formation, acid formation/corrosion and low oil pressure.

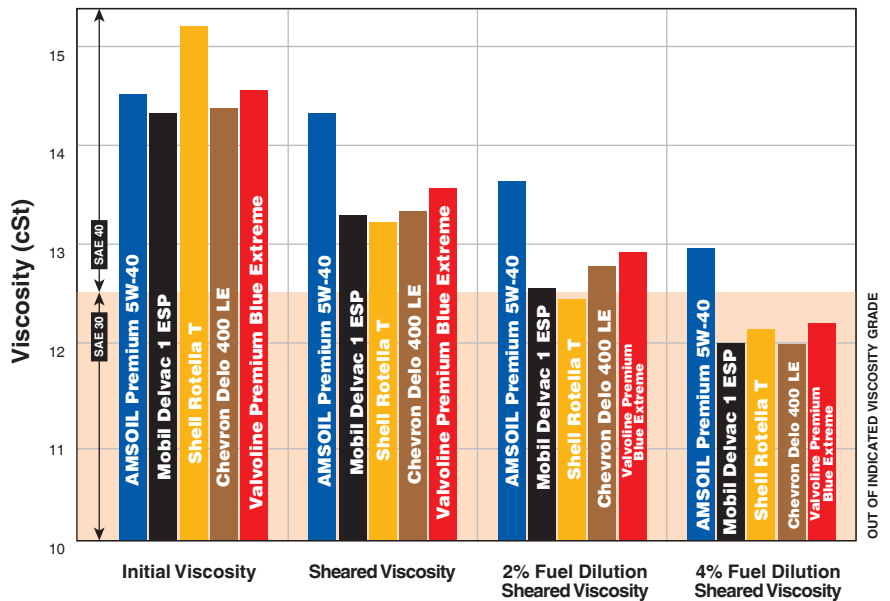
In diesel applications, a fuel dilution rate of 2 percent is abnormal and anything over 5 percent is excessive. Factors such as frequent starts, excessive idling, short trips and cold starts have contributed to moderate levels of fuel dilution in diesel applications for years, while recent issues with some modern applications have brought the fuel dilution problem to a whole new level. For example, AMSOIL has documented increasing fuel dilution levels in 2007–2009 Caterpillar C13 and C15 on-highway engines. In addition, the diesel particulate filter (DPF) regeneration process in 2007–present light-duty GM, Ford and Dodge diesel pickups has also been identified as a major cause of fuel dilution. These models employ a process that includes the in-cylinder injection of raw diesel fuel on the engine's exhaust stroke. Some of the fuel may wash directly past the rings and into the crankcase, diluting the oil. Regular washing of fuel into the oil makes it even more prone to viscosity loss and places the engine at greater risk of abnormal wear.

AMSOIL Premium API CJ-4 Synthetic 5W-40 Diesel Oil stays within viscosity grade, even when diluted with 4 percent fuel. It continues to maintain viscosity at even higher fuel dilution rates long after other oils have failed.



## Kurt Orbahn Shear Stability Test 180 Cycles

As tested in an independent lab November 2009. All oils 5W-40. (ASTM D-6278\*)



\*Oil diluted with fuel is especially prone to the effects of shearing. When combined with shearing conditions, as little as 4 percent fuel dilution is generally enough to reduce an oil's viscosity to less than the specified viscosity grade. Considering the tough environment that diesels present to lubricating oils, AMSOIL doubled the standard Kurt Orbahn 90-cycle test and had the oils tested for 180 cycles. Samples were then contaminated with 2 and 4 percent ultra-low-sulfur diesel fuel (ULSD).

As the graph shows, even after being shear-tested for twice the industry standard and contaminated with 4 percent fuel dilution, AMSOIL maintained viscosity and was the only oil to stay within the SAE 40 viscosity rating.