

## **Stricter EPA Emission Standards for Diesel Engines in 2007 - Changes to Engine, Oil and Fuel**

The final phase of EPA mandated emission reductions for truck engines will start in 2007. These new emission standards will reduce levels by 90% compared to 2001 EPA requirements. In order to meet these extremely low levels of emissions, the following changes to engine, fuel and oil will be necessary:

1. Addition of exhaust after treatment to engine designs currently on the market.
2. Reduction of fuel sulfur levels to 15 parts per million (0.0015%) from the current level of 350 – 500 parts per million (0.035 – 0.050 %).
3. Use of ash-less or low-ash engine oils to prevent premature failure of the exhaust after-treatment catalyst.

Engine manufacturers used cooled EGR to meet the 2002 EPA emission requirements with the exception of Caterpillar. Caterpillar developed their ACERT (Advanced Combustion Emission Reduction Technology) to meet the 2002 requirements. CAT was late in meeting the October, 2002 requirements and will introduce their first EPA certified ACERT engine in April, 2003. CAT plans introduction of ACERT versions of all their engines by October, 2003. Caterpillar claims that their ACERT engines will meet the more stringent 2007 requirements without exhaust after-treatment, although they have yet to demonstrate that capability.

The engine manufacturers (Cummins, Detroit, Mack, etc.) who used cooled EGR to meet the 2002 requirements will keep the emission control device in their 2007 engines while adding exhaust after-treatment systems. Variable geometry (VG) turbochargers will be used to regulate the amount of exhaust recirculation depending on the engine's speed.

The reduction in fuel sulfur is required to insure durability of the exhaust after-treatment catalyst. However, fuel lubricity issues are sure to arise from this extremely low level of sulfur in the fuel.

The most significant change to meet the 2007 EPA emission regulations is the formulation of heavy-duty diesel engine oils. The zinc anti-wear component and the calcium and magnesium detergents that have been used effectively for decades to protect turbocharged diesel engines contain sulfur and/or phosphorus that will "poison" the exhaust after treatment catalyst.

New, anti-wear and detergent additive chemistry without sulfur and phosphorus is currently under development for the new proposed category (PC-10) defining engine oil performance requirements. This radical new engine oil chemistry may not provide sufficient protection to engines manufactured prior to 2007 and for the first time in history the new oil category may not be backwards compatible for all previous oil requirements. This will cause many fleets to use two engine oils during the transition to the 2007 engine technology.