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Talk

An Introduction to Heavy Duty Diesel Coolant

The powerhouse of all compression or spark engines is the combustion chamber. It is here where the combustion of diesel fuel, petrol, LPG or natural gas produces energy in the form of heat and pressure, which is converted into mechanical power for operating the vehicle/equipment. The temperature in the combustion chamber averages around 600°C, with the temperature at the point of detonation being over 2000°C during the combustion phase. The cylinder walls, engine block, pistons, valves, cylinder head will absorb large amounts of the combustion heat which can cause them to fail if not cooled and maintained at a safe design temperature.

Internal combustion engines are actually quite inefficient with only around 30 percent of the energy produced being converted into mechanical power. The remainder is lost via the:

exhaust system - ~40%

cooling system - ~30%

The cooling system is designed to remove and manage heat loads in and around the engine block, cylinder head and oil coolers and to transport this to the radiator for release. But it's not just about the cooling system, if the engine heat isn't dispelled overheating will affect the oil as well. It reduces its lubricity and accelerates oxidation which can lead to liner wear, piston and valve failure and crankshaft bearing failure.

A coolant does more than just transfer heat!

If transferring heat is all a coolant needed to do then water or a water/glycol mix (ethylene glycol (EG) or propylene glycol (PG)) could be used, but cooling systems are complex. They are expected to operate at high temperature and pressure, low and high flow rates, are comprised many different metals (eg. cast iron, steel, steel, brass, copper, solder, aluminum), rubber seals/hoses, gaskets and plastics. Additives are needed to protect these materials against corrosion, provide compatibility and chemical stability which extend coolant service life but would otherwise lead to a radiator blockage, overheating, leaking or engine failure. Furthermore, heavy duty engine coolants need special additives to protect against wet cylinder liner cavitation and scale.

What's in a coolant?

Most heavy duty OEM's will design engines to use either fully formulated water/EG or water/PG at a mix ratio of 40% - 60% glycol, blended with about 2-4% additives to provide the right balance of heat transfer, antifreeze, anti-boil, corrosion protection and chemical stability. Some manufacturers offer the coolant as a premix (1:1 or ~50% strength) which avoids dilution problems and water quality issues, or it can also be sold as a concentrate for dilution by the user. Never use undiluted coolant concentrate (>90% glycol) in a cooling system as the heat transfer rate will be much lower and the high concentration of additives may cause system fouling and overheating.

What does a coolant do?

The basic function of the coolant is to provide:

- Anti-boil protection – ~50% PG (~105°C, or ~126°C at 101 kPa gauge pressure)
- Freeze protection – ~50% PG (~-32°C)
- Heat transfer and control of nucleate boiling in heat rejecting areas
- Corrosion protection
- Cavitation protection for wet cylinder liners (HD diesel coolant)
- Scale protection (HD diesel coolant)
- Foam protection (i.e. coolant formulated reduce foam in the circuit)
- Lubrication for moving parts such as the water pump and thermostat.
- Acidity protection (control effects of acidic coolant degradation by-products)

What else should be considered?

Coolant provides heat transfer and cooling system protection but other factors are also important to ensure the coolant provides the service life and protection expected. When choosing a coolant for your application choose one that is right for the job and meets recognised specifications. After installation perform periodic testing and maintenance on the coolant and cooling system. For heavy duty engines ensure the coolant meets industry recognised coolant specifications (eg. ASTM D6210 - for heavy duty coolants and includes a requirement for wet cylinder liner protection). Even better if it is approved by the OEM.

Cummins Filtration Heavy Duty Coolant

PGPlus and PG Platinum Heavy Duty Coolant are manufactured in Australia by Cummins Filtration.



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