ENVIRO-FUEL LIMITED

innovation and pioneering

((Reg. No. 120170007526)

Overview:

Enviro-diesel
PREMIUM PERFORMANCE

ASTM International is the globally recognised leader in standards development by contributions of its members (Bureau of Standards) worldwide. ASTM D975 standard is the minimum accepted diesel fuel properties to provide adequate customer usage satisfaction and protection of (OEM) engine warranty requirements.

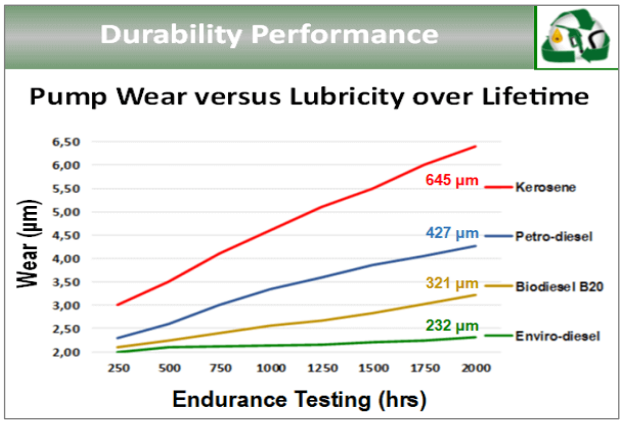
Diesel engine technology changed dramatically from recent years, primarily due to mandated reduced exhaust emissions and the demand for more fuel-efficient engines. As a result, fuel injection-shift to direct injection or common rail systems and operate in significantly harsher conditions of extreme pressures and temperatures.

Lubricity, cetane number, detergency, sulphur content and fuel volatility properties quantify premium diesel's performance and environmental qualities as diesel fuel properties intercorrelate.

Enviro-diesel premium fuel characteristics:

1. Lubricity - (enviro-diesel test result ASTM D6079: 232-µm)

Diesel fuel lubricity is a critical property since the diesel fuel injection system relies on the fuel to lubricate moving parts of diesel pumps and injectors. In the absence of sufficient lubricity in the fuel, vehicles can suffer excessive pump wear and in some cases engine failure. It is essential that the lubricity of the fuel as measured by the HFRR test specified in ASTM D6079 meet the requirement of wear scar diameter.

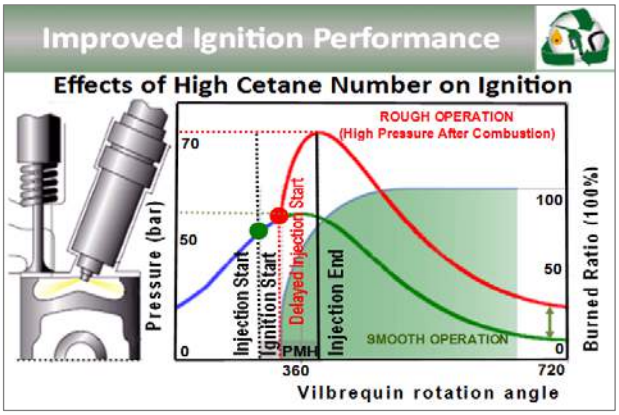


Enhanced lubricity properties in a fuel lead to longer engine life, lower maintenance costs, less equipment downtime and protection against fuel injector failures. Fuel with excellent lubricity is critical, to the satisfactory operation of the engine.

SABS SANS 342: Specification for lubricity test: 460-µm maximum.

2. Cetane Number - (enviro-diesel test result ASTM D613: 54)

The cetane number of diesel measure the ignition quality of the fuel by comparing its combustion characteristics in a test engine with those of reference fuels of known cetane number under standard operating conditions. The ease of diesel fuel ignition and the manner in which it burns determine the ignition quality of the fuel.



The higher the Cetane number, the more efficiently the fuel will combust. Diesel "knock" occurs when fuel injected into the cylinder ignites after a delay that causes a slow shock wave. High cetane fuel causes an engine to run smoothly.

Low cetane fuels result in:

- poor ignition quality
- long ignition delay
- increased engine maintenance
- abnormal engine pressure
- louder engine knock
- poor fuel consumption

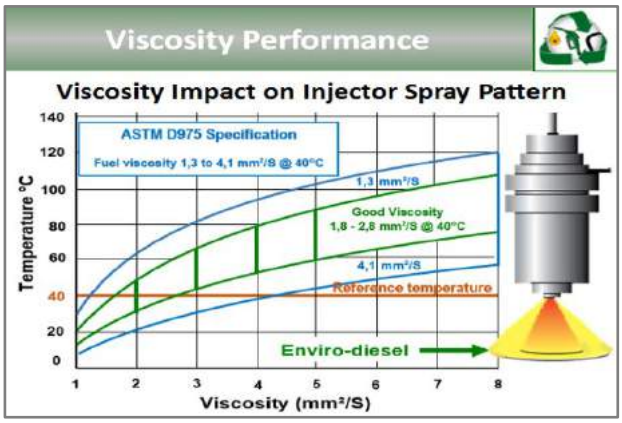
SABS SANS 342: Specification for cetane number is 45 minimum.

3. Viscosity - (enviro-diesel test result ASTM D445: 2,1 mm²/s)

Viscosity determines the flow of the fuel to the injectors or atomiser. High viscosity diesel is heavier than low viscosity diesel and may cause extreme pressures in the injection systems that will reduce atomization of the fuel spray.

If the viscosity is too low, injection pumps may experience power loss due to pump leakage. Viscosity determines the size of the fuel spray droplets that govern the atomization and penetration qualities of the fuel injector spray.

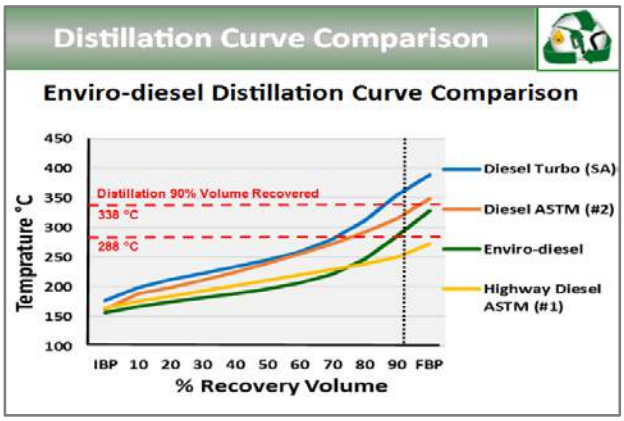
Viscosity for high- speed diesel engines are generally in the region of 1,8 to 2,8 or mm²/S @ 40 °C and will provide good penetration into the combustion chamber, atomization of the fuel and a suitable film of lubrication.



SABS SANS 342: Specification range for viscosity: 2, 2 – 5, 3 mm²/s @ 40 °C.

4. Volatility - (enviro-diesel test result ASTM D86: T90 = 317 °C.)

Diesel fuel volatility requirements depend on the same factors as cetane number. Fuels that are more volatile are best suited for engines were rapidly changing loads and speeds. Power and economy of diesel engines are comparatively insensitive to fuel volatility. Fuels with higher front- end volatility tend to improve starting and warm-up performance and reduce smoke.
Research studies show emissions from engines reduced by **decreasing the final boiling point (FBP).** Heavier components in diesel *(+ 340 °C)* have more potential for incomplete vaporisation and combustion, resulting in increased smoke, soot and engine deposits.

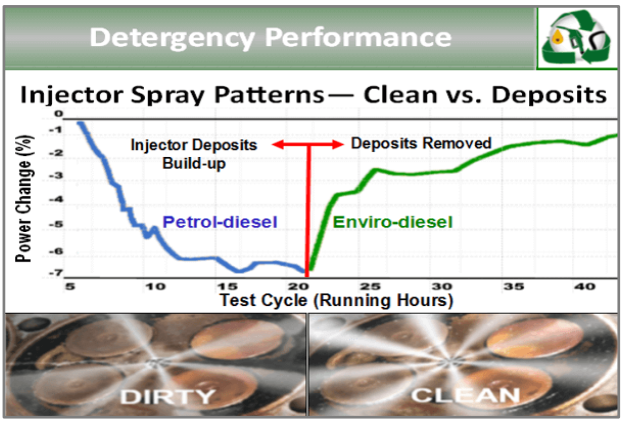


SABS SANS 342: Specification for Distillation T90, ºC: 362 maximum.

5. Sulphur Content - (enviro-diesel test result ASTM D5453, mg/kg: 1.8 or 2ppm)

Sulphur in fuel increase the wear of internal components of the engine, such as piston ring, pistons, valves, and cylinder liners. High sulphur fuel also requires engine oil and filter to be changed more often. The corrosive effects of hydrogen sulphide and sulphur dioxide that formed during the combustion process combine with water vapour form acids.

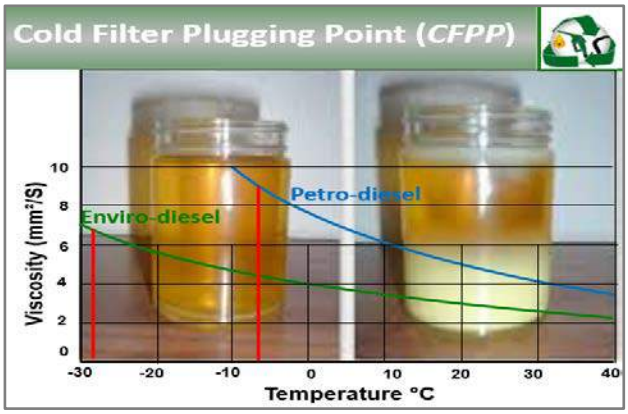
Sulphur is the most important fuel parameter affecting exhaust emissions. It contributes significantly to fine particulate matter (PM) emissions, through the formation of sulphates both in the exhaust stream and later in the atmosphere. Engine Manufacturers will not honour **engine warranties** if their latest model vehicles run on high sulphur fuels.



SABS SANS 342: Specification for Sulphur max: 500 / Low =50 ppm.

6. Low Temperature Operability - (enviro-diesel result ASTM D2500: -37 °C)

Cold filter plugging point (CFPP) is the lowest temperature, expressed in degrees Celsius (°C), at which a given volume of diesel type of fuel still passes through a standardised filtration device in a specified time when cooled under certain conditions. Wax crystals form because normal paraffin occurs naturally in diesel fuel. As the temperature of the fuel reduces, the paraffin has become less soluble in the fuel and precipitate out as wax crystals. In some fuel systems, cloud point can indicate the onset of fuel- filter plugging.



The pour point is the lowest temperature at which the fuel will flow, and cloud point of a diesel fuel is the temperature at which some precipitated wax crystals become large enough to make the fuel appear cloudy or hazy.

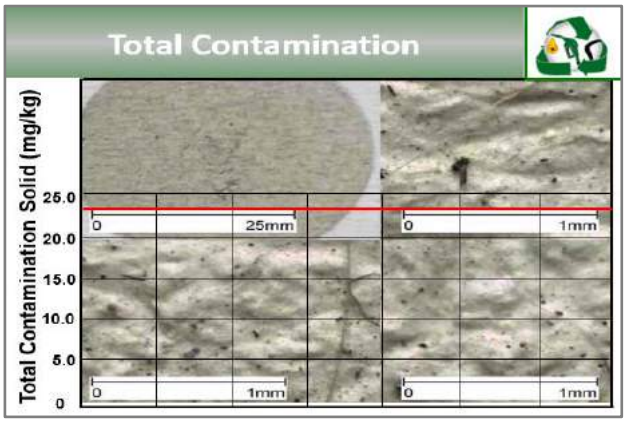
SABS SANS IP 309: Specification for CFPP, °C max.: Summer +3, Winter -4.

7. Total Contamination - (enviro-diesel result ASTM D6217: 18 mg/kg)

Inadequate lubricity is not the only cause of wear in diesel engine fuel systems. Diesel fuel, if contaminated with abrasive inorganic particles cause abrasive wear.

Common rail fuel injection systems utilised on modern low emission engines have critical filtration requirements due to their ever-increasing operating pressures and tighter clearances for both injectors and pumps.

Today, particles smaller than **four (4) microns** are now potential wear contributors. Most fuel filters recommended by engine manufacturers have a nominal pore size of **10 microns.**



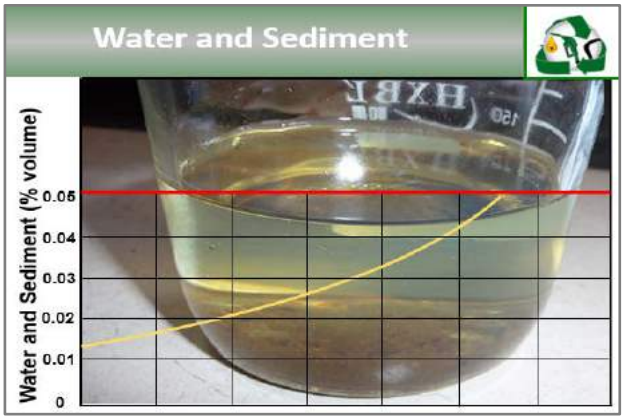
SABS SANS 342: Specification for Total Contamination: 24 mg/kg, maximum.

8. Water and Sediment - (enviro-diesel result for ASTM D2709: < 0,010% or 100 ppm)

Water found in diesel fuels causes engine part corrosion and erosion, fuel lubricity deterioration, fuel pump cavitation, fuel injector deposit build-up's and fuel filter plugging. It also promotes fuel instability and at the fuel/water interface provide an environment where bacteria can grow.

Free and emulsified water in diesel need to be removed, as water can be a potential threat to the engine.

World Fuel Charters recommends the maximum content of water to be less than 200 ppm. ASTM limit for water and sediment in diesel fuel is a 0.05 percent by volume.



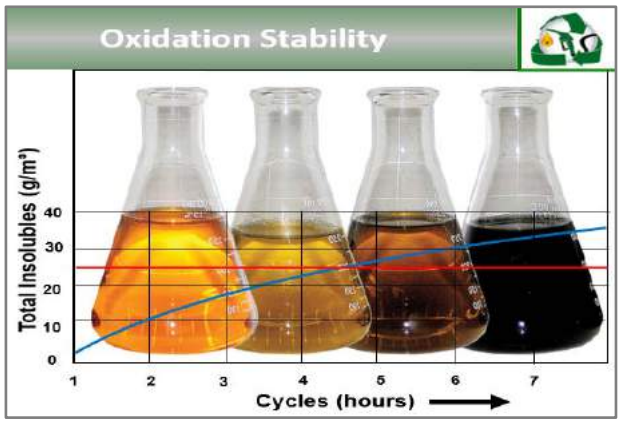
SABS SANS 342: Specification for Water content: 0,05 % or 500 ppm, maximum.

9. Oxidation Stability - (enviro-diesel result ASTM D2274: 18 g/m³)

This test method covers the measurement of the inherent stability of middle distillate fuels under specified oxidising conditions at 95°C.

Long-term (at ambient temperatures) storage stability of diesel is of little concern to the average user. Most diesel fuels consumed occur within a few weeks of manufacture.

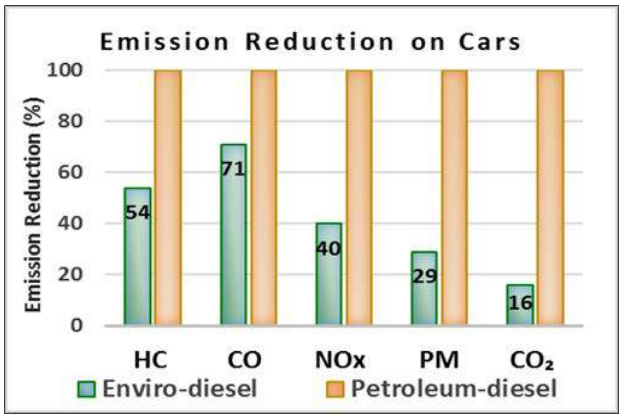
Unstable fuels form soluble gums or insoluble organic particulates. Both gums and particulates may contribute to injector deposits, and particulates can clog fuel filters.



SABS SANS 342: Specification for Oxidation stability, g/m³: 25, 0 **max**.

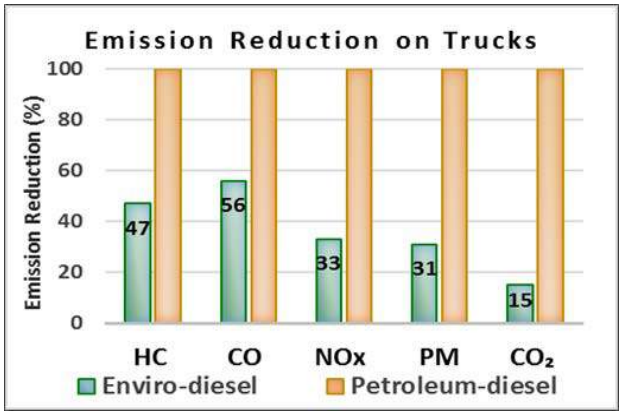
10. Emissions (carbon footprint)

Air pollution is one of the main driving forces for alternative fuels. Nowadays, people are looking for ways to reduce their carbon footprint, that is to say, the amount of fossil carbon that they release into the atmosphere.



Low-sulphur fuels burn cleaner and reduce particulate engine emissions. The reduction in diesel fuel sulphur will provide particulate emission decrease in all machines, regardless of the emission control devices installed. The latest generation of common rail engines emits 60% less particulate matter than their immediate pre-chamber predecessors, and when combined with a DPF system, reduce the number of particulates in the exhaust gases to the level of ambient air.

Fuel composition, especially aromatic content also has a significant impact on PM emissions. The Higher aromatic result in increased PM (mass), PN (particle number) and PAHs emissions, with more toxic gases for human health. Researchers concluded that reducing aromatic content is an important means to reduce primary particulate emissions and improve air quality.



Documented research studies show emissions from diesel engines reduce by decreasing the final boiling point (FBP) or sulphur content in commercial diesel fuel. **Enviro-diesel complies with both requirements.**

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Certificates of analyses available on request.