Poor-quality fuel may cost fleet owners dearly

The quality of South African diesel has become quite an issue, says fuel-analysis firm WearCheck Africa.

The company notes that poor-quality diesel should not be confused with dirty, wet or adulterated diesel.

There is no doubt that all diesel leaving South Africa's refineries conforms to South African Bureau of Standards (SABS) specifications, however wide or omissive the specifications may be.

The problems start once the fuel leaves the refinery and include poor transport methods, poor handling, sloppy storage and corruption.

In fact, several problems can exist.

Sulphur is a natural component of diesel and not all of it is removed during the refining process.

During the combustion process, the sulphur is turned into acid, which is detrimental to the engine and oil.

Secondly, the sulphur finds its way into the exhaust and is a pollutant.

The reduction of sulphur in diesel is desirable.

However, there is a downside to this, as the sulphur acts as a natural lubricant and low-sulphur diesel must be treated with a lubricity additive.

Particulate contamination is a big problem and can come from many sources.

Dust, wear debris, corrosion by-products, resins and gums, fibreglass, filter media, biological organisms, sediment and degraded fuel are all examples of what is commonly found in fuel samples.

Much of this can be removed by the fuel filter, but badly-contaminated diesel will lead to filter-blocking and poor engine performance.

Some of these particles are small enough to pass through the filter and can result in wear of today's high-performance injectors.

Injector pressures can be as high as 50 000 psi, with clearances as low as 2,5 micrometres.

Abrasive wear from particulate matter results in abnormal wear, which leads to increased fuel-droplet size, dribbling injectors and poor spray patterns.

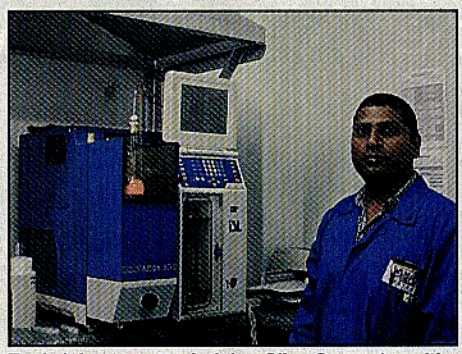
This, in turn, can cause piston torching, loss of power and slugging and poor fuel consumption.

Fuel dilution can also occur, and this reduces the viscosity of the lubricant, resulting in abnormal engine wear.

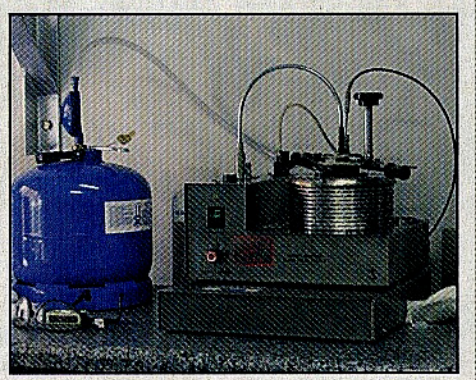
Poor transport practices can result in contamination with petrol.

This reduces viscosity, cetane number and lubricity, manifesting itself in leaking injectors and seals, premature ignition, engine knock and increased fuel-system wear and possible failure.

There are financial incentives arising from differential taxes for the adulteration diesel with illuminating paraffin, which is chemically similar to diesel.



Fuels laboratory technician Clive Govender with distillation apparatus



Flashpoint-determination apparatus

However, the problems are the same as for petrol contamination.

Adulteration with used lubricants and insulating oils that may be expensive to dispose of in an environmentally-acceptable manner has also been noted.

Heavier fuel oils can be blended with diesel, too, all of which results in the degradation of performance and mechanical integrity of the engine.

Water is another contaminant found in diesel.

This comes about through breathing of bulk storage tanks, condensation, dissolved water separation, pipe and breather leakage and careless handling and storage.

Water causes pump and injector corrosion as well as corrosion of bulk-storage tanks.

Water can promote microbial growth too.

Fungi, algae and bacteria are present all around us and would not normally cause a problem but, given the right conditions – including the presence of water – these bugs can thrive in fuel.

They form a black smelly slime that can be acidic.

This results in increased exhaust smoke and fuel consumption, failure of filters, pumps and injectors, increased engine wear and corrosion.

There is great demand from equipment operators in all types of industry – from construction to mining and road transport – to monitor the cleanliness and quality of diesel.

Knowing that the fuel is free of contamination and within specification like those laid down by the SABS offers the fleet owner peace of mind.

In response to this demand, Wear-Check Africa has opened a fuel-analysis laboratory to complement its existing oil- and coolant-analysis services.

Several tests are carried out on diesel samples, including flashpoint measures to establish the lowest temperature at which diesel will ignite in the presence of an ignition source.

This aids in the identification of petrol contamination.

The SABS specifies a minimum flashpoint of 55 °C.

Viscosity measures the diesel's ability to flow, while low viscosity will result in poor lubricity, abnormal wear and fuel leakage.

High viscosity causes poor combustion, and the SABS requires that diesel be between 2,2 and 5,3 cSt.

Sulphur should be below 0,05% for low-sulphur diesel and below 0,3% for normal diesel.

High sulphur levels result in the formation of acids in the engine and hazardous exhaust emissions.

Distillation curves measure the points at which the various fractions of the fuel boil.

Each fuel has a distinctive curve, and deviations would suggest contamination with other volatile substances.

The SABS specifies that, for diesel, 90% of the sample should have boiled off at 362 °C.

Density measures the specific gravity of the diesel and can be used to determine the energy content of the fuel.

Denser fuel can generate more energy.

The specification is a minimum of 0,800 kg/l at 20 °C; deviations can indicate contamination.

All illuminating paraffin in South Africa contains an invisible dye.

If diesel contains illuminating paraffin, then the addition of a reagent will cause the sample to turn purple.

Illuminating paraffin is added to diesel as a tax dodge, but is highly detrimental to the engine.

There is no minimum requirement for particulate contamination in South Africa, but 100 ml of sample is filtered through a 0,45-micrometre filter pad.

The European specification is less than 27 mg/kg.

This form of contamination is highly abrasive to fuel systems.

Water causes corrosion and the highest limit is 0,05%.

Water separates easily from diesel, so it is often difficult to get a representative sample.

Water is measured using a method known as Karl Fischer determination.

Microbial testing is a supplementary test, as it is time-consuming.

A strip is dipped into the diesel which contains a medium that is ideal for the growth of bugs.

The strip is then placed in an oven and incubated for 72 hours.

Microbial growth is then graded as slight, moderate or heavy.

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