



De-Bugging

In issue 31 we featured an article Fuels for Thought in which we discussed how fuel quality affects engines. One of the points raised concerned microbial contamination, a condition it would appear from readers' responses, that is quite widespread.



Images and information supplied courtesy of De-Bug Australia and Driveline Media Services

When diesel leaves the refinery it is clean, with an acceptable water content. Every stop the fuel makes on its way from the refinery to your vehicle is an opportunity to pick up bugs and water. By the time it reaches your tank, the fuel has already become contaminated to some degree.

Bugs are prolific in earth's atmosphere and are carried as spores in air and water. They can enter diesel at any point in the supply chain through vents and filling ports and once acquired, can be very difficult to get rid of.

The main problem encountered with diesel fuel is contamination from bugs; micro-organisms of bacteria, fungus and yeast which individually are extremely small – 100 times smaller in diameter than a human hair.

There are 27 individual species of bugs that can occur in diesel fuel and each species has its own characteristics:

Bacteria utilise hydrocarbons and reproduce asexually by binary fission; swelling in size as they feed, they then separate into two cells. In this way microbes double their numbers every 20 minutes, one spore becomes 262,144 in six hours.

Sulphate Reducing Bacteria (SRB) are a specific group of bacteria utilising simple carbon, not hydrocarbons, and require the activity of other microbes in a consortium. SRB produce hydrogen sulphide. SRB are also directly involved with many microbial corrosion reactions and can cause sulphide souring of stored distillate products.

Yeast bud onto the parent cell, then eventually separate. Reproduction takes several hours and yeast prefer acidic environments.

Fungus grow in the form of branched hyphae, a few microns in diameter, forming thick, tough, intertwined mycelial mats at fuel/water interfaces.

Bugs feed on the energy of the fuel, produce wastes and cover themselves in a protective bio-film known generally as slime. The bugs form colonies of microbial mats or long strings of seaweed like structures that clog fuel lines and filters.

The problem can become worse in your tank if water is present or condensation is allowed to accumulate. The darkness of a fuel tank, especially in warm climates, is the ideal environment for bug growth.

Operational problems can occur with only trace amounts of contamination. The most common problem is prematurely plugged fuel filters and plugged water separators.

In severe cases the fuel line can become partially or totally blocked. Micro-organisms form deposits on injectors that can lead to inefficient fuel injection and reduced operational economy; cylinders develop cool spots causing uneven wear to the rings and cylinder bores. Acids and gums can eventually leach into the lubricating oil, causing corrosion of the crank components.



Fuel Systems



Corrosion of metal parts is a potentially costly problem that is caused by the acid by-product of bugs, hydrogen sulphide. This acid can corrode fuel tanks, injector pumps, injectors and fuel lines and can also attack hoses and tank linings.

Common indicators of contamination are sludgy fuel filters, frequent filter changes, low rpm at full throttle, dark exhaust smoke, water in the water separator, and motor stoppage due to lack of fuel.

The first sign is often dark, smoky exhaust that persists even after the engine has warmed up. The accumulation of bugs on filters and in fuel lines will eventually cause your engine to starve for fuel. Loss of power at higher rpm is a sign of this.

Engine stoppage, especially if it is first encountered in rough conditions, is a sign of significant bottom sludge which becomes suspended in the fuel and is sucked into the fuel pick up tube if the tank is vibrated over say, corrugations.

A dark brown or black slime on fuel filters is another sign of severe bug infestation. Any discovery of corrosion in the fuel tank, or other metal parts that contact the fuel should be investigated. A more subtle indicator is hard deposits on engine injectors. Normal deposits should wipe clean with a cloth.

The by-products of bugs are acid and sludge which contribute to contamination and corrosion in the tank and engine. Biocides can be very effective in killing off bugs but the dead organisms tend to accumulate in the bottom of the tank and after a time can become suspended in the fuel causing plugged filters and engine operation problems.

Biocides and fuel treatments are often used to treat microbial contaminations but by the time they are used damage has already occurred and as the treatments only work once, there is opportunity for re-infestation.

Some transport groups treat their fuel as a matter of maintenance and while this process is effective to some degree, their storage tanks still require cleaning to remove the microbial sludge that occurs. The sludge itself is toxic and must be cleaned by companies qualified in the handling and removal of toxic waste.

You'll be happy to know however that there is a much easier and more cost effective solution available – the De-Bug Clean Fuel Unit.

De-Bug founder and developer Lindsay Forrest was a diesel engineer and as such was very familiar with the problems caused by bugs in fuel. After reading about a technique used to clean water, Lindsay realised a similar application could be used to clean diesel fuel and developed his De-Bug fuel treatment unit.

The device uses a magnetic flux; as the microbes are simple, single-cell structures that have a positive and negative charge, when subjected to the magnetic flux of a magnet, the microbes twist to align themselves with the magnetic field.



By stacking magnets on top of each other the field becomes extremely complicated and the bugs quite literally blow themselves apart in their frantic twisting to align.

Melbourne based Morison & Morison Pty Ltd are Australian distributors of De-Bug clean fuel units, and Garth Morison, manager of De-Bug Australia says that the units have been proven time and again to reduce microbial contamination in a wide range of applications and provide owners and operators with significant financial savings.

"It is far more cost effective to use De-Bug Units than biocides or fuel treatments," Garth explained. "De-Bug Units require no additives, no moving parts, no wires, no part replacement and will last at least 15 years with the minimum of maintenance."

The various De-Bug Units can be used in many different applications from marine vessels, power generators, service station pumps, trucks and any other machinery dependent on diesel powered engines.

"Shell Deepwater Production Inc U.S. uses four gas turbines for power generation on an oil rig. The fuel filters were continually clogging with microbial slime, at an annual replacement cost of US\$8,000," Garth commented. "After a De-Bug Unit was fitted, the filter replacement cost dropped by 87.5 percent to less than US\$1,000 per year. The engineers were also satisfied with the appearance of the fuel and have had no unscheduled engine shutdowns due to clogged filters since."

Laboratory tests performed by ICI New Zealand, the Dutch Institute for Fishery Investigations (RIVO) and Shell Oil (New Zealand) Ltd have all concluded that regardless of the contamination level in the fuel, the De-Bug Unit successfully cleaned up the fuel system and confirmed their operational and economic benefits.

Transport operators using the L500 De-Bug unit quote fuel savings averaging at five percent, although some with previously serious infestations quote savings of up to 20 percent. They also state that filter change intervals were extended from 15,000 km to 100,000 km, lower exhaust temperatures enabling the engine to cope with higher loads and exhaust emission reductions as a result of more efficient fuel burning.

So, better economy, better performance, cleaner filters and less downtime. In a business environment where every dollar counts, living with the threat of microbial infection affecting your engine's performance and longevity is no longer necessary. As is so often the case, there is a simple solution to what can be a complex and expensive problem. 

