POOR COMBUSTION CAN RESULT IN ENGINE WEAR

One of the major purposes of a diesel engine oil is to keep lubricated parts free of deposits, but this function is often hampered by poor combustion.

For engine cleanliness, an oil's detergency/dispercancy package is called upon to remove and suspend deposits that exist. It must also prevent further deposits from forming on surfaces. These contaminants are suspended until they can be removed by the filter or at the next oil change.

Engine deposits can be caused by many factors, eg. fouled injectors, over-fuelling, incorrect timing, clogged air filters, over-extended oil change intervals, altitude and temperature factors, engine condition and application. Whatever the reason, the result is the same: the oil is called on to work harder!

Assuming good maintenance and operating practices exist, the fuel itself may not burn properly. With today's diesel fuels, which typically contain some fractions that are more difficult to burn, it's a greater problem. The slower burning fractions of diesel are associated with black smoke and deposit formation.

Deposits tend to form on combustion surfaces, eg. cylinder heads, valves, piston crowns, top lands, ring grooves, injectors, etc. This promotes a condition which, in itself because of reduced cylinder compression, poor oil control, poor fuel spray patterns, causes very poor combustion.

While the oil is trying to remove deposits as they form in ring grooves, etc., it is also being rapidly taxed by soot reaching it through exhaust blow-by. Soot, which also appears as black smoke, is damaging! It's an abrasive — just like valve grinding paste, only a bit slower! This reduces the oil cleaning ability, which allows deposits to build up faster, increasing blow-by and soot. Higher levels of maintenance are required, and operating efficiency and engine life are reduced quite measurably.

A major Central Queensland coal mine has provided some recent insight into this. In conjunction with Fuel Technology Pty Ltd, FTC Combustion Catalyst was introduced into the fuel for the mobile fleet. Data from the mine's R & D laboratory in Mackay was used to construct wear profiles. Substantial wear reductions were noted (in the range 18-46%). With less soot being produced and reaching the lube oil, abrasive wear can be reduced dramatically. The oil can then cope better with keeping ring grooves cleaner and reducing blow-by.

This was confirmed in the fleet of twelve Cummins powered coal haulers which showed an average 58% reduction in oil consumption.

Inspection of a Caterpillar 3412 engine from a Caterpillar 992C loader bore testimony to the benefits of an efficient burn. The engine displayed a complete absence of sludge, with valve covers and sump pan in very clean condition. Cylinder heads, piston crowns, exhaust manifolds and turbo-chargers were coated with a light fluffy layer of soot, which easily wiped off to expose bare metal. Valve part numbers could be clearly read.

Injectors were clean and free of deposits. Inlet and exhaust ports were totally free of any hard deposits. Slight inlet valve stem deposits were noted, and these showed signs of erosion. Piston top land deposits were moderate, while rings were free in their grooves and skirts exhibited no varnish.

Overall, the description is one of a very clean engine. But considering that the engine was overhauled at a programmed change-out, with a total of almost 17,000 hours (original and untouched), it's condition can only be described as exceptional! It had burnt FTC catalysed treated fuel for approximately 2,400 hours.

The mine has noticed a reduced incidence of carbon related failures during the period of FTC catalyst use. Figures of **$4,000 per truck, per hour** are common, so any improvements in engine cleanliness will have real benefits to production.

As an added bonus, fuel consumption measurements on four trucks showed an average 7.1% fuel saving due to FTC catalyst use. Similar experience with mobile mining fleets in Tasmania and Western Australia using FTC treated fuel are providing further proof of reduced carbon related problems.

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