FACTORS AFFECTING DIESEL EMISSIONS

FACTORS AFFECTING THE FORMATION OF EXHAUST EMISSIONS

Engine design has an enormous influence on the level of exhaust emissions while fuel composition has only a minor influence. This is the reason that there has been little pressure to change fuel specifications in Australia. It is a matter of making the most cost effective changes first and fine tuning the fuel later.

The greatest influence on diesel exhaust emissions is design of the combustion area. This includes motion of the incoming air (swirl), fuel injection efficiency (droplet size and distribution), and turbulence during combustion plus the design of the piston and combustion chamber area. A major change in modern low emission diesel engines is the extremely high fuel injection pressures that are used to produce much finer atomisation of the fuel injected into the combustion chamber. Also, electronic control of injector timing and quantity ensures that no unnecessary fuel is injected and that the timing is optimal for the operating conditions.

Fuel Composition and Sulphur Content

Sulphur content of the fuel, although only having a small contribution to particulate emissions, is becoming more significant as the engine related emissions are reduced by design changes. In simple terms, with a dirty engine the sulphur content has a negligible effect on particulate emissions, but with a clean engine the sulphur level does have a measurable effect. This is why countries with stringent emissions regulations have now taken steps to reduce sulphur levels of diesel fuel.

Fuel composition also has a small influence on exhaust emissions. The main parameters are the final boiling point (FBP) and the aromatic content. The FBP is normally controlled by the 90% recovered point of the distillation test. Hydrocarbons with a high boiling point are difficult to vaporise and so may not burn fully. This partially burnt fuel will contribute to particulate emissions as soot.

Aromatic compounds in diesel fuel have a high boiling point but also are stable compounds which are difficult to burn, so for this reason aromatics have been singled out as being undesirable in a low emission fuel.

For further information, please call the
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