

SOLTRON[®]

Enzyme Technology for Fuels

The enzymes used in our technology have specific functionality, they cleave and breakdown long chain hydrocarbons. They are rapid surfactants, cleaning surfaces and removing and inhibiting reformation of hydrocarbon deposits throughout the fuel distribution network.

Modifying these chains or stopping agglomeration of asphaltenes is a scientifically and industry proven way of enhancing combustion. This reduces both fuel consumption and pollution.

What are Enzymes?

Enzymes and **catalysts** both affect the rate of a reaction. The **difference between catalysts and enzymes** is that while catalysts are inorganic compounds, enzymes are largely organic in nature and are bio-catalysts. They make life possible. These valuable proteins are known to industry as “esteemed helpers”. They are used in hundreds of processes; bread making, laundry soap powders and even toothpaste, to name a few.

Enzyme catalysts are more effective than chemical catalysts at reducing the energy barrier to enable transition state formation and thereby increase the rate of the reaction. The efficiency of enzymes catalysis varies, but most enzymes can enhance the rate of an un-catalysed reaction by a factor in the range of 10^5 to 10^{14} .

Effect of Soltron[®] on fuels

Some applications for our technology are in:

- Bio remediation of hydrocarbon wastes
- Maintaining fuel at refinery quality to the point of sale and combustion
- Energy efficiency
- Mitigating polluting gas emissions.

- **Bio remediation**

“Bottom Settlings and Water” BS & W commonly referred to as Sludge, is present along with microbes, to one degree or another, at the refinery tank farm through to the consumer. They are an economic waste and of environmental concern. In Crude and Heavy Fuel Oils the hydrocarbon components have a propensity to separate in storage. New Diesel rapidly degrades in combustion quality when added to old fuel in the presence of tank bottom sludge.

Microbial contamination reduces the calorific values of fuels and their acids in tank bottom sludge causes corrosion to steel work.

Bio remediation is energy efficient. In some instances the Soltron® Enzymes can be left to work on the hydrocarbon element of these sludges by themselves, or the process can be speeded up with the help of agitation and filtration.

- **Maintaining fuel quality**

“Fuel Quality” and “Fuel Efficiency” are much talked about. Fuel Quality only refers to the refinery process and manufacture of fuels, where fuels sold at the pump or at the point of combustion to be of the same mandated standards as that of manufacture, fuel efficiency would improve and combustion emissions would drop substantially.

Hard science shows that it is possible to achieve these aims with the use of Soltron® Enzymes. In specific instances it has been shown that some of the degradation in legal fuels is reversed.

- **Energy Efficiency**

As plant ages, the fuel system – like human arteries – furs up. By restoring the designed fuel volume, pressure and flow to the system, combustion and energy efficiency is often restored to that when the plant was installed or engine new. This is the surfactant effect of the Enzymes on the; gums, waxes, resins, carbon and caramelised products that are found on pipe wall, in pumps, injector nozzles, etc.

Treating the fuel also reduces filter blinding, the biggest problem in maintaining consistent fuel pressure and good atomisation in industrial plant and power generation.

- **Mitigating polluting gas emissions**

Residual and Heavy Fuel Oils

Using Soltron® Enzymes homogenises HFO and cutter stock, reduces filter blinding and enables the industrial use of Low Excess Air firing. These elements are all scientifically; BS, MARPOL and industry proven avenues that reduce industrial pollution and increase thermal and MW(e) output.

Their application is easy to implement with minimal or zero capital cost and with rapid payback in plant utilisation and reduced maintenance. Emissions compliance is another key factor, fuel issues are often the cause of noncompliance.

Regulated emissions such as, Black Smoke, PM, CO, VOC's are reduced. The ability to support Low Excess Air firing also means that NO_x and SO₃ emissions are further reduced proportionally.

Motor Spirits and Road fuels

These have a number of different issues; microbial contamination, fuel degradation, adulteration, particulates or the presence of water – biodiesel and Ethanol are particularly susceptible to water. These issues change the properties of fuel, their mandated additives and the combustion and ignition profiles of fuels as they travel through the distribution chain. In effect, engines may not maintain their original certified emission standards though the use of such fuels.

Diesel in particular needs to be considered as a degradable asset, its performance is affected by water, microbes and instability in its chemical structure. Its degenerative nature is enhanced when added to tankage that already holds remnants of old fuel, microbes and water.

Microbial activity exists in four distinct places in stored fuel but only in one where fuel is sampled for sale. Microbial filaments eventually block filtration systems, as will any other fuel contaminant picked up by the filtration system. This causes a change in the stoichiometric, Air to Fuel, ratio for the engine causing incomplete combustion.

The obvious sign of incomplete combustion from diesel is black smoke. However PM, HC, NO_x and CO are also present in the exhaust plume, invisible but toxic.

It has been repeatedly demonstrated that there is a correlation between exhaust emissions and fuel economy.

Soltron® treated diesels show lower HSU and $k\ m^{-1}$ smoke values and of those emissions mentioned above, particularly PM and HC. Gasoline engines show significant reduction in HC emissions and smaller reductions in NO_x and unregulated NMHC's. Vehicles with emission control technologies also benefit from treated fuel by reduced deposit build-up on sensors and alike.

On specification Motor Spirits; HSD, EN590, Bharat Stage IV, EN228, E10, etc. when treated with Soltron® Enzymes retain their mandated properties. Their use however can deliver rapid emissions reductions. Regular use will eliminate most fuel related operational issues that typically effect transport systems; blocked filters, injectors and sticking pumps.

Vehicular emissions continue to be one of the main sources of urban air pollution in India. Incomplete combustion is unburnt fuel; money wasted, smog generating toxic health hazard.