RENNSLI

TECHNICAL BULLETIN
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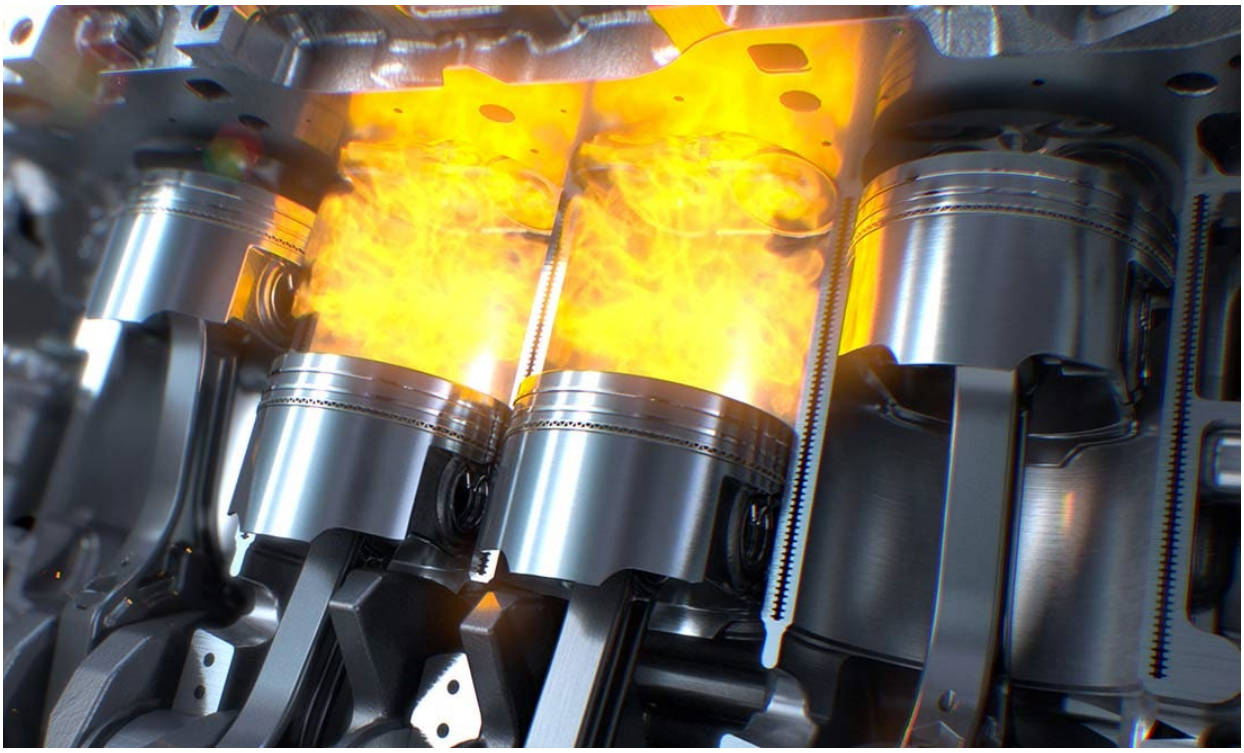
The Ferox Fuel Borne Catalyst Combustion by RENNSLI

Ferox works on the chemical level of the combustion process and therefore works in exactly the same way regardless of the type of liquid, gaseous or solid fuel in which it is used.



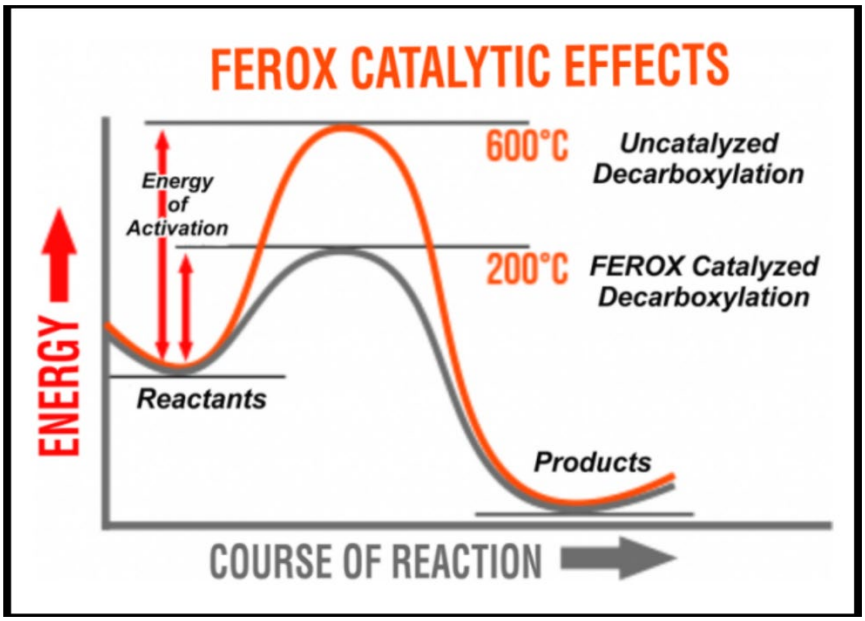
Ferox interacts with the carbon-carbon and carbon-hydrogen bonds of fuel particles. It makes no difference whether the particle is a short carbon chain (gasoline), a medium length carbon chain (kerosene), or a long carbon chain (diesel). The Ferox combustion catalysts interact with one carbon bond at a time.

RENNSLI solid fuel catalyst technology is based on catalytic effects. The main active ingredients are synergistic, multifunctional combustion catalysts, that include combustion surface modifiers and deposit surface modifiers.

In a Ferox treated environment the surfaces of the fuel particles and deposits are modified such that the catalyst lowers the energy of activation of the modified surfaces. <u>The modified surfaces can then burn up quicker at a much lower temperature.</u>

A typical engine develops a temperature gradient ranging from 200°C at the combustion chamber wall, to 1200°C at the center of the combustion process. Many of the fuel components require a temperature greater than 600°C to combust. The heavy fuel components that are exposed only to the 200 - 600°C range never fully burn and are what contribute to deposit formation, particulates, emissions and other undesirable combustion side effects.

When the temperature of the combustion environment reaches a minimum of about 200°C the Ferox catalysts are activated and the chemical reaction begins to occur at an increased rate speed. **The catalysts can't tell what kind of fuel they are in, or what type of engine they are in, or what type of combustion environment they are in. All they see are carbon-carbon and carbon-hydrogen bonds in an environment of 200°C or more. This process is the same for all hydrocarbon fuels regardless of whether it is being burned in an internal combustion engine including turbines or open flame type applications.** The trends will be the same regardless. The only thing that the type of equipment or type of fuel used will affect is the magnitude of the trends.



Ferox treated fuel and modified deposit surfaces lead to burn over the entire temperature range to which they will be exposed. **The result is more complete combustion and eventually complete removal of all engine deposits as well as the inhibition of new deposit buildup. This ultimately leads to lower emissions of CO, SOx, NOx, HC's and PM-10, lower fuel consumption, and over all better performance and maintenance in all types of applications and equipment.**

The process of deposit removal by Ferox begins immediately but can take up to 5 months, 600 hours or 4,000 miles for the full benefits to be realized. The actual time required for the full benefits of Ferox to be achieved and the degree of change noticed depends on the operation, history and age of the engine in question.

Generally, the lighter the fuel the greater the improvement in fuel economy that will show up. Also, a dirtier engine will show greater improvement after it is cleaned up than a not so dirty engine. Another example is with particulate and smoke production. **Generally, the heavier the fuel the greater the reduction in smoke and particulate emissions.** In yet another example CO reduction in gasoline is high while CO reduction in diesel is lower partly due to the fact that CO emissions in diesel applications are naturally low in the first place. In all cases the trends are the same with only the degree of magnitude differing.

In a new, clean engine the difference made by the immediate catalytic effect of Ferox on the fuel itself is often not noticeable although the combustion process is more complete than would otherwise be attainable. What will be noticed however, is that engine

performance will not degrade as quickly and maintenance will remain at a minimum due to the fact that deposits will not form. Also, a gasoline engine will not experience octane requirement increase. The biggest difference resulting from the use of a Ferox combustion catalyst becomes apparent upon complete removal of the deposits from the fuel injectors, intake and exhaust valves, and other parts exposed to the combustion chamber of a dirty engine. This difference can show up as a 5% - 90% drop in total emissions and a 3% - 20% increase in fuel economy.

Once the chemistry of Ferox is understood it is not hard to predict with good accuracy the trends that one will see due to its use. The difficult part is predicting the magnitude of

those trends. In most cases a ball park estimate can be given, but it is not until all the variables affecting the combustion environment are understood or controlled that a number can be declared. However, the trends will be the same regardless of the fuel type or the application.

A Ferox combustion catalyst will keep a new engine clean and can clean up a dirty engine while allowing the fuel used to burn cleaner.

Ferox offers a cost effective way to conserve energy and protect the environment yet not sacrifice performance.