

OVERVIEW of FUEL BASICS

Stored Energy

Fuel is a conduit for energy. We use a motor to convert that energy into torque, and that torque into work. We think of it as miles per gallon. What we need to realize is that a car that travels 25mpg actually travels 25 miles per 114,000BTU. This makes it more obvious that we use an engine to convert energy (BTU) into miles travelled. A reduction in BTUs means a reduction in mileage. An increase in BTUs conversely equates to an increase in mileage.

Lubricity

While this is typically measured within dedicated lubricants, the idea of lubricity is clearly more relevant in the days of unleaded and low sulphur fuels. Every part of the engine in which air is pumped through has minimal lubrication, and much of it is subject to extremely high loads and temperature. Valve seats and stems, cylinder walls and piston rings all NEED the protection afforded by lubricity that survives the combustion process. A fuel additive that introduces lubricity protects the function and longevity of the moving parts on the top of the engine, within intake and exhaust.

Octane

High (research) octane fuel has no more BTU than low octane fuel. What it has is the ability to provide a uniform burn at high cylinder pressure, basically no knocking and pinging, while it is burning. This indirectly makes an engine more efficient. Octane does not provide more mileage, but reduces the inefficiencies due to an incomplete burn. Higher mileage and better performance are a byproduct of reducing pre-ignition in the combustion process.

Increases Performance / Fuel Economy

An engine with an increased BTU fuel can do more work. This work means that the engine makes the same power at lower RPM (the engine has to spin less to make the same power). It consumes less fuel to make the same power, this can translate to increased mileage, since it takes less RPM and fuel to get the same power, and it takes a certain amount of power to travel at speed. Most drivers will see the savings with casual driving styles. A subset of drivers typically enjoys the other side of increased fuel energy – POWER. They drive the engine at the same RPM, the same fuel flow – FOOT TO THE FLOOR – and enjoy a slightly more robust engine, with no savings. course, fuel economy means to do the most with the least. Foot to the floor driving is fun, but not

economical. Driving style needs to be adjusted to take advantage of the increase in power in order to experience the best savings.

Reduced Exhaust Emissions

Gasoline is a liquid formed purely of carbon and hydrogen chains of different lengths ranging from C_7H_{16} through $C_{11}H_{24}$. If you could burn gasoline as a vapor with a hot flame and plenty of oxygen, you would get nearly pure carbon dioxide and water as the combustion products. That is why you can burn natural gas, LP gas and kerosene indoors in the winter. Automobile exhaust, unfortunately, contains a lot more than carbon dioxide & water. The key pollutants in vehicle exhaust include:

Carbon Monoxide (a poison) - Carbon monoxide is formed because "combustion is incomplete". Not enough oxygen is available fast enough to react completely with the entire carbon chain.

Nitrogen Oxide – The higher the cylinder temperature the more nitrogen oxide produced.

Unburned Hydrocarbons - Because of long carbon chains and a very quick combustion phase, not all hydrocarbons participate in the reaction, resulting in unburned fuel or incomplete combustion.

Diesel Particulate Matter (DPM) – DPM is produced during the combustion of diesel fuel. DPM's have a large surface area, where relatively large amounts of organic material from unburned fuel are adsorbed, including a variety of mutagens and carcinogens.

ECO-Fuel Saver helps reduce the two major factors that result in harmful emissions in engine exhaust. 1) incomplete combustion (unburned fuel) 2) higher temperatures.

ECO-Fuel Saver enables shorter carbon chains, so oxygen can react more completely at the point of combustion to produce a more complete burn of the fuel. ECO-Fuel Saver also lowers cylinder and exhaust temperatures, which lowers a number of factors, including Nitrogen Oxide emissions.