



Fuel for Thought

Burning gasoline generates energy, and like the digestion of the foods we consume, we can compare the amount of energy in similar units. One litre (\$0.92) of gasoline contains the rough equivalent of 7000 dietary calories. That's the equivalent of 30 Tim Horton's chocolate dip doughnuts (\$22.50). What we ingest affects our health and performance, likewise, what we fuel the vehicle with, affects its health and performance.

We all know that gasoline is an oil product, but what's the difference between the black stuff that comes out of the ground and the liquid at the gas pumps? Oil is a soup of chemical molecules, based on carbon atoms, mostly surrounded by much smaller hydrogen atoms (thus the term hydrocarbon fuels) unrefined it is virtually unusable. Refining consists of distilling the crude oil to separate the various components, chemically treating and remixing them to obtain familiar finished products such as gasoline, diesel, heating oils, jet fuel, asphalt, propane, butane etc.

Blending a few hydrocarbons from crude oil is not enough to make a useful motor fuel. To operate a typical Canadian vehicle, the fuel needs controlled properties such as vapour pressure (fuel volatility rate), anti-knock capability (reduces pinging), detergency (cleansing ability), and oxidation stability (shelf life).

Vapour pressure is a direct measure of how fast fuel vaporizes at a low temperature, which in our Canadian climate is especially important for reliable hot and cold starts. Please note that there is a difference between winter fuel having a higher volatility and summer fuel having a lower volatility.

Tetraethyl lead was the first anti-knock additive, but was phased out because of its toxicity and tendency to poison catalytic converters. Refiners found alternatives, mainly alcohols (methanol and ethanol) and oxygenates (methyl tertiary butyl ether (MTBE) and methylcyclopentadienyl manganese tricarbonyl (MMT) but they also have drawbacks. Methanol is corrosive to many fuel system components. Ethanol isn't corrosive or toxic but it does lower the overall energy content of the fuel. Most modern vehicles are designed to run well with ethanol concentrations and when used in the winter, ethanol-blended fuels also act as a built in gas-line antifreeze. MMT is one of the most extensively tested fuel additives in history. Like other oxygenates, it replaces much of the carbon monoxide (CO) and hydrocarbons (HC) but drives up the oxides of nitrogen (NOX) on engines without computer-controlled systems. (These are the 3 gases the emission's program test.) On modern engines, the oxygen sensors detect a lean condition and the computer, to keep the correct air/fuel ratio, adds more fuel. But since the oxygenate doesn't have energy value, more fuel must be burned; lowering fuel economy and contributing to spark plug misfire and catalyst plugging.

So until the refineries change the prescription of Canadian fuels, we will have to put up with some side affects such as emission failures, drivability issues, hot/cold start problems, and oxygen sensor failures to name a few.