Petroleum Versus Ethanol
First Year Chemistry Major Problem
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These are ideal reactions describing the combustion of petroleum (octane is used as a model compound) and ethanol in pure oxygen. The combustion products are CO_2 and H_2O. In reality, the combustion in air would not be complete, producing various amounts of CO as well as CO_2.

Combustion of Octane:

$$C_8H_{18} + \frac{25}{2} O_2 \rightarrow 8\ CO_2 + 9\ H_2O + 5{,}511.7\ kJ$$

Combustion of 114.3 g of octane produces 352.1 g of CO_2 and 5,511.7 kJ of heat energy.

Combustion of Ethanol:

$$C_2H_5OH + 3\ O_2 \rightarrow 2\ CO_2 + 3\ H_2O + 1{,}366.8\ kJ$$

Combustion of 46.1 g of ethanol produces 1,366.8 kJ of heat energy.

To produce the same amount of heat energy as octane, one would have to burn 185.8 g of ethanol. Burning 185.8 g of ethanol, however, will produce 354.9 g of CO_2.

But, that is not the entire picture. Producing the ethanol from corn by fermentation also produces CO_2, as any "moonshine" maker knows. Using a simple sugar to represent the corn,

$$C_6H_{12}O_6 \rightarrow 2\ C_2H_5OH + 2\ CO_2$$

Producing 185.8 g of ethanol from corn would also produce another 177.4 g of CO_2.

Consequently, producing 5,511.7 kJ of heat energy will produce 352.1 g of CO_2 from octane and 532.3 g of CO_2 from corn.

But . . . that is not the entire picture. As any good “moonshine” make knows, when you ferment corn, the maximum percentage of alcohol one gets is about 12%. The other 88% is water. The water has to be removed by distillation and it takes heat energy, a lot of heat energy, to do that. Producing the heat energy used to remove the water also produces a large amount of additional CO_2. So, in reality using ethanol in place of petroleum may be appealing to biofuel advocates, but it certainly will not be appealing to those who feel the need to lower CO_2 emissions.