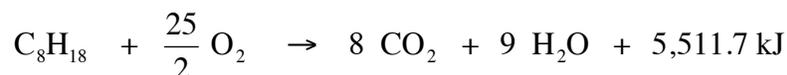


Petroleum Versus Ethanol  
First Year Chemistry Major Problem  
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These are ideal reactions describing the combustion of petroleum (octane is used as a model compound) and ethanol in pure oxygen. The combustion products are CO<sub>2</sub> and H<sub>2</sub>O. In reality, the combustion in air would not be complete, producing various amounts of CO as well as CO<sub>2</sub>.

Combustion of Octane:



Combustion of 114.3 g of octane produces 352.1 g of CO<sub>2</sub> and 5,511.7 kJ of heat energy.

Combustion of Ethanol:



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<sub>2</sub>.

But, that is not the entire picture. Producing the ethanol from corn by fermentation also produces CO<sub>2</sub>, as any "moonshine" maker knows. Using a simple sugar to represent the corn,



Producing 185.8 g of ethanol from corn would also produce another 177.4 g of CO<sub>2</sub>.

Consequently, producing 5,511.7 kJ of heat energy will produce 352.1 g of CO<sub>2</sub> from octane and 532.3 g of CO<sub>2</sub> from corn.

But . . . that is not the entire picture. As any good "moonshine" maker 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<sub>2</sub>. 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<sub>2</sub> emissions.