Conditions necessary for Combustion

Combustion takes place when fuel, most commonly a fossil fuel, reacts with the oxygen in the air to produce heat. The heat created by the burning of fossil fuel is used in the operation of equipment such as boilers, furnaces, kilns, and engines. Along with the heat, CO2 (carbon dioxide) and H2O (water) are created as byproducts of the exothermic reaction.

Complete Combustion

Complete combustion occurs when 100% of the energy in the fuel is extracted. It is important to strive for complete combustion to preserve fuel and improve the cost efficiency of the combustion process. There must be enough air in the combustion chamber for complete combustion to occur. The addition of excess air greatly lowers the formation of CO (carbon monoxide) by allowing CO to react with O2. The less CO remaining in the flue gas, the closer to complete combustion the reaction becomes. This is because the toxic gas carbon monoxide (CO) still contains a very significant amount of energy that should be completely burned.

Incomplete combustion

Incomplete combustion occurs when the supply of air or oxygen is poor. Water is still produced, but carbon monoxide and carbon are produced instead of carbon dioxide.

In general for incomplete combustion:

hydrocarbon + oxygen ? carbon monoxide + carbon + water