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The Importance of Moderate or Intense Low-Oxygen Dilution (MILD) Combustion and The Impact on The Global Warming

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The energy demand is dramatically increasing due to the growth of the world's population and substantial economic development mainly in Brazil, Russia, China, and India. Combustion of fossil fuel is projected to fulfil about 75 percent of this energy needs. Some of the significant challenges are to provide efficient energy and limit greenhouse gas (GHG) emissions. Combustion pollution will create unstable weather, increase ocean levels, and ice melting in the North and South Poles that will resulted potential increase for the earth's temperature. To tackle the issue, an improvement of the combustion efficiency is gaining greater interest among researchers in combustion technology and modelling. Preheating of reactants by the hot flue gas is one of the methods to improve the combustion efficiency. The concept constitutes for a new combustion technology called the Moderate or Intense Low-oxygen Dilution (MILD) combustion. Presently, MILD combustion has been applied in closed furnaces where oxygen is diluted, and air-fuel mixture is preheated by the internal flue gas circulation.

MILD combustion yields into higher combustion efficiency with very low emissions recorded. Through recycling of the waste heat from the flue gases increases the thermal efficiency of MILD combustion by 30 percent, while simultaneously reducing the NOx levels by 50 percent. However, this work is focusing on open furnace MILD combustion as are common within the industry. Generally, the setup process for an open furnace is simple and cheaper than a closed system because the latter needs thicker and solid wall. However, open furnace incorporates additional complexity because of the requirement for mixture preheating. It is believed that currently there is no comprehensive data about MILD combustion in open furnaces. In order for the open furnace to attain the MILD combustion, the supplied air must be diluted to reduce its oxygen concentration and preheat the air-fuel mixture to reach the auto-ignition temperature. The exhaust gas recirculation (EGR) concept is utilised to achieve the dilution of oxygen and the preheating of the mixture by collecting exhaust gas for a mixing with the reactants. The furnace needs to be enclosed to capture the required fraction of exhaust gas.