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Heat Transfer Analysis of Splash Zone of Short Fluidized bed Combustor using coal and biomass under variable oxygen conditions

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ABSTRACT: Fluidized-bed combustion (FBC) are quite popular these days due to its excellent features high heat transfer rate, low environmental pollution, ability to burn multiple and low grade fuels simultaneously. Co-firing biomass with coal allows an energetic utilization at a high level of efficiency which is not obtainable in small-scale dedicated biomass combustors. Co-firing at low percentages of the thermal power (typically below 5-10 %) avoids the characteristic operating problems of biomass combustion. Splash zone is important zone of fluidized bed. Due to erupting bubbles along with sand it has very high heat transfer rate.

In this work heat transfer analysis for splash zone of fluidized bed combustor using coal and biomass under oxygen fired conditions is explained. In this work splash zone of short fluidized bed combustor is modeled and experimental measurements were obtained for biomass (rice husk) and coal. Model is formed using commercial CFD software Ansys Fluent. The differential pressure with respect to bed and splash zone is ranging from 1200 to 1400 mbar. It was found that carbon monoxide is higher in splash zone which later decreased in freeboard zone. The percentage of NOx and other gases measured are in permissible limits. Temperature plots are drawn using CFD model. Temperature was measured using K type thermocouples and recorded using data logger.

Key Words:
CFD model, Lagrangian Approach, splash, fluidized bed combustion, freeboard.