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Effects of Diluent Gas Velocity on Formation of Moderate or Intense Low-Oxygen Dilution Combustion with Fuel Spray for Gas Turbine

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Abstract : Mild combustion is characterized with its distinguished features, such as suppressed pollutant emission, homogeneous temperature distribution, reduced noise and thermal stress. However, most studies for MILD combustion have been focused on gas phase fuel. Therefore further study on MILD combustion using liquid fuel is needed for the application to liquid fueled gas turbine especially. In this work, we will focus on numerical simulation of the effects of diluent gas velocity on the formation of liquid fuel MILD combustion used in gas turbine area. A series of numerical simulations using Ansys fluent 18.2 have been carried out in order to investigate the detail effect of the flow field in the furnace on the formation of MILD combustion. The operating conditions were fixed at relatively lower heat intensity of 1.28 MW/m³ atm and various global equivalence ratios were changed. The results show that the local high temperature region was decreased and the flame temperature was uniformly distributed due to high velocity of diluted burnt gas. The increasing of diluted burnt gas velocity can be controlled by open ratio of adapter size. It was found that the maximum temperature became lower than 1800K and the average temperature was lower than 1500K that thermal NO formation was suppressed.

Keywords : MILD combustion, spray combustion, liquid fuel, diluent gas velocity, low NOx emission
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