Heat Transfer Analysis of Laboratory Scale Reactor of Fast Pyrolysis Fluidised Bed

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ABSTRACT

This report presents the results of heat transfer analysis of a fluidised bed by using different type of fluidised bed sands. Academic version of FLUENT 15.0 was used in performing the simulations. Eulerian-Eulerian two-fluid granular model is used as the multiphase flow model to solve this simulation. 2-D axisymmetric fluidised bed (2.5cm × 50cm), glass beads and stainless steel beads of 1mm and 0.5mm in diameter are used in the simulations. Thermal conductivity of the material is calculated using the standard approach used by Kuipers et. al. (1992). Gidaspow model is used for the drag equation and Gunn's model (1978) is used in the calculation for interphase heat transfer coefficient.

In order to analyse the heat transfer of different material and different sizes, heat transfer is evaluated by comparing the HTC measured in the simulation. It is found out that stainless steel beads is better in heat transfer compared to glass beads as it has higher heat transfer coefficient, interphase HTC and wall to bed HTC. Nevertheless, the temperature rise of the glass beads is higher than stainless steel beads after 30 seconds. It is also found out that temperature rise for small diameter granular solids is much higher than that of the larger diameter granular solids.

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