CFD Study on Effect of Air Grid Nozzles in Circulating Fluidized Bed Combustion

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A reliable air grid nozzle design for a circulating fluidized bed combustion (CFBC) requires a very detailed model based on the fundamentals of transport phenomena. The optimum design of air grid nozzles significantly enhances the excellent gas-solid contacting and, in turn, reliability of the overall process for the CFBC.
Computational Fluid Dynamics (CFD) approach to address the design of complex gas-solid flow behavior in CFBC including air grid nozzle effects was used in this study. The two-fluid model (TFM) based on Eulerian-Eulerian approach were applied in this simulation by using the FLUENT code. The mathematical model is composed of the continuity and momentum for gas and solid phase to describe flow pattern and mixing for CFBC. In order to describe energy dissipation of solid phase, the kinetic theory model was solved in this simulation. To better understand the effect and impact of air grid nozzles in CFBC on gas-solid flow patterns, 3-dimensional simulations were performed by using exact nozzle configuration. The simulation results compared well with literature data on solid mixing and gas-solid flow patterns near air grid nozzle.