Simulation of Bubbly Flow in a Vertical Pipe Using Discrete Phase Model

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Bubbly flow is widely encountered in many engineering applications, such as those in chemical and nuclear systems, bubble column reactors and oil transportation pipes. Therefore, understanding of bubbly flow in a bubble-liquid flow system is extremely important. In this paper, bubbly flow involved with thousands of bubbles in a vertical pipe is numerically simulated. The motions of the bubbles are tracked using a Discrete Phase Model (DPM) and bubble-bubble interactions are simulated through the model of discrete element method (DEM). The effects of bubble diameter and bubble inlet velocity on the bubble flow trajectories are studied. Comparisons are made between the flow field with and without considering bubble-bubble collision. In addition to these, the breakup of bubbles on the flow field is also investigated.

Keywords: Bubbly flow, Discrete phase model, Bubble trajectory, Bubble breakup