Influence of bubble size on hydrodynamic in a gas-liquid-solid three phase fluidize bed reactor

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Three phase fluidized bed reactor has been wildly used to operate many chemical and wastewater treatment processes. The successful design and scale-up needs the understanding of flow behavior. The objective of this research work is to study the effect of bubble size on the hydrodynamic behavior in a gas-liquid-solid three phase fluidized bed reactor by means of CFD simulation. Multi-fluid model integrating with the kinetic theory of granular flow was adopted. Bubble size significantly affects to the hydrodynamic behavior. Bed expansion decreases with increasing of bubble size. Large bubble size leads to higher liquid and solids fraction but lower gas fraction. In addition, the uniformity of liquid and solids fraction in the lateral direction increases with decreasing of bubble size. However, bubble size insignificantly affects on the uniformity of the radial distribution of gas fraction. The radial distribution of axial velocity of each phase is more uniform when operate with larger bubble size.

Keywords: Computational fluid dynamics; Gas-Liquid-Solid fluidize bed reactor; Hydrodynamic behavior; Multi-fluid model