Hydrodynamic Studies of Inverse fluidized bed and CFD Simulation Analysis

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ABSTRACT

Fluidization usually involves two or three phase systems, in which the solid particles are fluidized by a liquid or gas stream flowing in the direction opposite to that of gravity. Fluidization, where the liquid is a continuous phase is commonly conducted with an upward flow of the liquid in liquid-solid systems or with an upward co-current flow of gas and liquid in three phase systems. Under these conditions, a bed of particles with a density greater than that of the liquid is fluidized with an upward flow of liquid counter to the net gravitational force of the particles. Fluidization can also be achieved by downward flow of liquid when the particles are having lesser density than the continuous liquid medium. This phenomenon is particularly termed as inverse fluidization. The inverse fluidization system has gained significant importance during the last decade in the field of environmental, biochemical engineering, and oil–water separations. The minimum fluidization velocity is lower in inverse fluidization and also it takes lesser energy to pump a fluid to force the particles. Hence, it can save a lot of energy at the industrial level operations. Such energy efficient processes are the need of the day when energy crisis is at its peak. The applications of inverse fluidization technique in biotechnology is one of the most important areas in bioreactor engineering. In this report various hydrodynamic characteristics of the three phase inverse fluidized bed has been studied based on literature and CFD is proposed to be applied on the system for further analysis.

Keywords: Inverse fluidization, Hydrodynamics, Minimum fluidization, CFD