THE DISTRIBUTION OF FLUID FLOWS IN A MODIFIED SPOUT-FLUID BED

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Abstract

The Draft Tube Spout-Fluid Bed (DTSFB) is obtained by inserting a draft tube into a bed and introducing an auxiliary gas flow for aeration in the annular region. A specific modification of this system is a hydraulic barrier, which is an extension of the column from the bottom and whose diameter is smaller than the diameter of the column. The barrier prevents the mixing of the spouting and aeration gas streams as well as the bypass of the gas from the annulus to the draft tube. Because of the great potential of the DTSFB with the hydraulic barrier for other applications (chemical reactions, CO2 capture by adsorption), it is very important to understand the gas distribution between the draft tube and the annulus. In this work, the influence of the aeration gas flowrate, the draft tube diameter and entrainment zone height on the gas distribution between the annulus and the draft tube was investigated. The experimental system consisted of a cylindrical column with a diameter of 100 mm and a hydraulic barrier with a diameter of 60 mm and a draft tube with a diameter of 20 mm and 25 mm at variable distance from the bottom. Spherical glass particles were used in the experiments and air was used as a spouting agent. The bypass of spouting gas into the annulus increases with increasing height of the entrainment zone and decreases with increasing flow rate of the aeration fluid and the draft tube diameter. It was found that due to the presence of a hydraulic barrier, a very small portion of the aeration fluid from the annulus enters the draft tube only at maximum flow rate of the aeration fluid and that the bypass of the aeration fluid into the draft tube increases with increasing draft tube diameter and decreasing height of the entrainment zone. Based on experimental results, optimum operating conditions were determined in which there is no gas bypass from the annulus to the draft tube.

Keywords: *spout-fluid bed,hydraulic barrier, spouting gas bypass, aeration gas bypass*