Hydrodynamic Characteristics in a Square Internally Circulating Fluidized Bed

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A square internally circulating fluidized bed has been developed for easy modulation in the reactor scale-up purpose. In the present study, the effects of superficial gas velocities (1.3 – 7.1 Umf) to a draft tube and to an annulus section (0.9 – 1.6 Umf) on gas bypassing fractions from the draft tube to the annulus section and from the annulus section to the draft tube, pressure drop across the orifices and gas holdup have been determined in a square internally circulating fluidized bed (0.28 m-width × 2.6 m-height) with an orifice type square draft tube (0.1 m-width × 0.9 m-height). At a given aeration rate to the annulus section, pressure drop across the orifices and gas bypassing fraction from the draft tube to the annulus section increase with increasing gas velocity to the draft tube through the maximum values thereafter they decrease with increasing gas velocity to the draft tube. At a given aeration rate to the draft tube, the gas bypassing fraction from the draft tube to the annulus section and pressure drop across the orifices exhibit the minimum values with increasing gas velocity to the annulus section at the flow transition conditions.