Olrarat Wongsirikajorn 2009: Gas Holdup via Electrical Resistance Tomography and Residence Time Distribution via Stimulus-Response Tracer Technique in an External-loop Gas Lift Reactor. Master of Engineering (Chemical Engineering), Major Field: Chemical Engineering, Department of Chemical Engineering. Thesis Advisor: Associate Professor Sunun Limtrakul, D.Sc. 193 pages.

Hydrodynamics in an external-loop gas lift reactor was studied. The gas holdup by ERT system and the residence time distribution (RTD) by a stimulus-response tracer technique were investigated with the effects of superficial gas velocities in the riser and downcomer in the range of 0.51-10.23 cm/s and 0-3.07 cm/s, respectively. Water and air were used as system fluids. A dual-plane ERT system was used for measuring cross-sectional gas holdup distributions of both columns. The ranges of gas holdup values in the riser and downcomer are 0.079-0.238 and 0.037-0.157, respectively. The gas holdup was approximately axis-symmetric and was decreased from the center to the wall both of columns. The gas holdup in both columns was increased with an increasing of superficial gas velocity. Gas holdup in the riser is always higher than that in the downcomer. The mean value and the fluctuation of mixing index were increased with an increasing of the superficial gas velocities of both columns. A stimulus-responses technique with a pulse input signal was used to obtain RTD. The dispersion model was used to obtain the vessel dispersion number (*D/uL*) in both columns. (*D/uL*) values of the riser and downcomer are in the range of 0.23-1.51 and 0.08-0.9, respectively and increase with an increasing of superficial gas velocity. It can be concluded that the fluid flow behavior is large deviation from plug flow and is more close to a mixed flow. The results from both methods lead to the conclusions that the fluid flow in the riser approaches a mixed flow and the mixing is higher than that in the downcomer. Increasing superficial gas velocities increases the mixing in both columns.

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