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RESEARCH PAPERS

段塞流的流量瞬变特性试验研究

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摘要　An investigation of the characteristics of flowrate transients within slug flow was conducted in a largescale outdoor testing facility. The test section consisted of a 378 m long, 7.62 cm diameter stainless steel pipe.Air and water were used as the test fluids. The response to a change of flowrate of either phase or two phases was measured using a series of pressure transducers and differential pressure transducers. An increase or decrease in gas flowrate caused a pressure overshoot above the value at new steady state or led to a pressure undershoot to form a temporary stratified flow. Pressure waves existed in the pipeline, spreading from the entrance to the exit. The magnitude of pressure overshoot in "up-gas" transient or of pressure undershoot and period of the temporary stratified flow in "Down-gas" transient are related to the change of gas flowrate and the distance away from the entrance. In contrast, the change in liquid flowrate was accommodated by smooth transitions between the corresponding steady states, and only one obvious change was found in the slug frequency. According to experimental results, the pressure overshoot, pressure undershoot and the pressure wave propagation were analyzed,and the phenomena were explained reasonably. Some correlations for the calculation of the pressure overshoot and undershoot were proposed.

关键词　slug flow　flowrate transient　pressure overshoot　pressure undershoot
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An Experimental Study of the Flowrate Transients in Slug Flow

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Key words slug flow; flowrate transient; pressure overshoot; pressure undershoot

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