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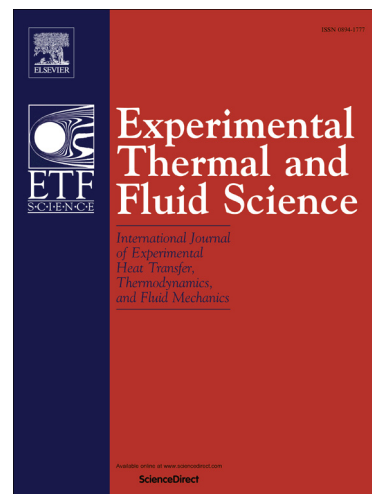
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Experimental Investigation on the Initiation and Flow Development of Gas-Liquid Slug Two-Phase Flow in a Horizontal Pipe

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ABSTRACT

Slug flow is the most prevalent problem of two-phase fluid transportation in the petroleum industries. Here, large amplitude waves lead to the pipe blockage that possible to cause the damage of the mechanical structure. The experimental investigation of gas-liquid slug two-phase flow in a horizontal pipe was carried out to investigate the initiation and flow development mechanisms. Air and water were used as the working fluids. The inner pipe diameter was 26 mm. In the present experimental study, the slug initiation mechanisms were explained by visual observation and pressure fluctuations. Moreover, the initiation frequency of slug flow and the evolution of passing slug frequency along the pipeline were also observed by using two high video cameras.

As a result, several basic mechanisms of slug flow initiation in a horizontal pipe were clarified. Those were the wave coalescences, the wave growth mechanism, and the large disturbance waves. A flow initiation map was proposed to address those mechanisms. Here, the slug initiation frequency and the passing slug frequency were obtained in relation to the pipe length position. The static pressure measurement was also used to verify the image processing results on the characteristics of slug initiation mechanisms. The obtained qualitative and quantitative results from the investigation can be used to evaluate the recent available models.

Keywords: Slug initiation, Slug flow development, Visual observation, Pressure fluctuations, Slug initiation frequency

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