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Investigation of Slug Flow Characteristics for Energy Harvesting Applications

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Abstract

The purpose of this research work is to study the characteristics of air-water slug flow for energy harvesting applications. It involves an investigation and analysis of the liquid hold-up, slug frequency and the translational velocity from conductivity rings. The experimental test was carried out with a different flow rate of the air-water slug flow in 2-inch rig horizontal pipe using a ring type conductance probe. The conductivity rings were used to obtain the slug flow characteristics. Forces were generated as a result of the fluctuating pressure of the slug flow on the entire cross-sectional area of the pipe. The acquired signal of the pressure fluctuation was used to simulate the expected outcome. The result shows that a maximum forward slug force of 30N per cross-sectional area of the pipe was obtained and 26N force of the fluctuating pressure through the cross-section was generated at the flange-end. The obtained forces can be applied to using electromagnetic or piezoelectric harvester to generate the electrical output in order to energize electro-mechanical devices.

Keywords: pressure fluctuation, liquid hold-up, slug flow, slug frequency superficial liquid and gas velocity

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