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Flow pattern transitions in horizontal oil-water flows

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In the petroleum industry, the characterisation of multiphase flows in pipes is of fundamental interest in both upstream and downstream processes, such as drilling, transportation and separation. When oil-water mixtures are transported, different flow patterns occur depending on fluid flowrates and properties together with pipe diameter and material. Understanding such flow dynamics is crucial as different patterns largely influence heat transfer, pressure drop as well as corrosion of pipes and the pump power requirements. The current study focuses on liquid-liquid flows in horizontal pipes and more specifically on the transitions from stratified to dispersed flows and the development and separation characteristics of unstable dispersed flows along the pipe. The experiments were carried out in an acrylic test section with 37 mm ID. Tap water and a kerosene oil (Exxsol D140; ρ=830 kgm-3 and μ=5.5 cP) are used as test fluids. Different flow patterns have been observed and the flow conditions where the transition between the flow patterns occurs were identified. Pressure drop and conductivity of the mixture at the pipe periphery were measured at different axial positions along the pipe revealing the development of the flow patterns. In dispersed flows, drop size changes along the pipe were also recorded that were linked to the tendency of the two phases to separate.

Biography

Kyeong H Park obtained his MEng in Chemical Engineering at University College London (UCL) in 2013. He started his PhD in September 2013 at the same institution. His study focuses on flow pattern transitions in oil-water flows.

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