

Abstract

Enass Z Massoud

THE RISE OF TAYLOR BUBBLES IN VERTICAL and INCLINED PIPES

Slug flow is one of the key flow regimes encountered in multiphase flow systems, especially in oil and gas production systems. The rise of Taylor bubbles in pipes has always been a practical problem. Through reviewing the literature, the researcher identified a research gap in performing a theoretical treatment to the problem, specifically using the dimensionless treatment and the order of magnitude analysis of equations of motions. To the best of the researcher's knowledge, an analysis of the literature identifies that there is a lack in the numerical studies on the drift of Taylor bubbles in inclined pipes with stagnant liquid. This thesis focuses on studying the flow of the Taylor bubble in the stagnant liquid, which is considered an essential characteristic part of the slug flow regime in pipes by performing theoretical treatment of the problem. To achieve this, the following two steps are carried out (i) Performing a complete dimensionless analysis to the rise of Taylor bubble through stagnant liquid in a vertical and inclined pipe, covering inclination range of 0° to 90° with respect to the vertical position, (ii) Using the guideline of the order of magnitude analysis and the dimensionless group analysis, performing CFD study using the volume-of-fluid (VOF) methodology implemented in the commercial software ANSYS Fluent (Release 16.0) investigating the dynamics of single Taylor bubble drifting through stagnant Newtonian liquid in vertical and inclined pipe.