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Effect of flow patterns on two-phase flow rate in vertical pipes   (Article)

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Abstract

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During two-phase gas-liquid flow in pipelines, the fluids may take up different flow patterns. The exact nature of the flow pattern varies according to conduit size and geometry, fluids' properties, and each phase's velocity. When the conduit size and fluid properties are constant, then any changes in individual flow rates will result in changes to the flow regime. Predicting the flow patterns within a pipe is essential as it is a critical parameter that determines the pressure gradient and liquid holdup in the conduit. This paper presents the results in predicting the multiphase flow patterns and their effects on flow measurements in vertical pipes. The study was conducted on vertical upward multiphase flow using well and reservoir properties. OLGA dynamic simulator was used to predict flow pattern in a vertical pipeline for 35 oil wells using electrical submersible pumps (ESP) with external pipe diameters of 3.5 inch. The predicted oil flow rates of 35 ESP oil wells were compared with measured flow rates and a good agreement was observed. Indeed, the results indicated that the variation of the flow pattern had insignificant impact and it was insensitive to the accuracy of the flow rate values of the ESP oil wells where the average overall flow rates accuracy was lower than +/-10%. Additionally, simulation results demonstrated a promising model performance and showed the magnitude of possible variation between the oil rates measured with different methods. © 2019 Penerbit Akademia Baru.

Author keywords

(Annular flow) (Bubble flow) (Electrical Submersible pumps) (Flow pattern) (Multiphase flow) (Slug flow)

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