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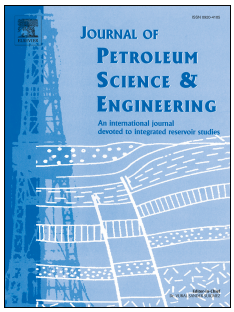

Miri light crude water-in-oil emulsions characterization – Rheological behaviour, stability and amount of emulsions formed

Siew Fan Wong, Sharul Sham Dol, Siaw Khur Wee, Han Bing Chua

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Miri Light Crude Water-in-oil Emulsions Characterization – Rheological Behaviour, Stability and Amount of Emulsions Formed

Abstract

Abstract – Emulsification, specifically formation of water-in-oil (W/O) emulsions, is a very common occurrence in the oil and gas industries which tend to occur naturally given the conditions of the industries. However, it is an unwanted phenomenon as it brings numerous harmful effects to the industries. So, this study aims to carry out a study on the characteristics of the W/O emulsions in order to develop a better understanding on the W/O emulsions. Three parameters, namely, water cuts (WC), Reynolds number and pipeline constrictions were studied. For each of the parameters, the region of study is: 0 to 40% WC; laminar (1100 < Re < 1800) and turbulent (2400 < Re < 2800) flow regime; and gradual contraction with a contraction ratio of 0.50 and 0.75 (GC 0.50 and GC 0.75) and sudden contraction with a contraction ratio of 0.50 and 0.75 (SC 0.50 and SC 0.75). In this study, rheometer and flow rig were used for the experiments. The W/O emulsions characteristics study is carried out based on analyzing the rheological behaviour of W/O emulsions, stability of the W/O emulsions and the amount of emulsions formed. From the rheological behaviour analysis, it is determined that emulsions have a very interesting rheological behaviour, where the emulsions exhibit a shear-thinning behaviour, at shear rates below 200 s^{-1} (for 5 – 30% WC) and 350 s^{-1} (for 35 – 90% WC) and behaves as a Newtonian fluid beyond the respective shear rates. Also, it is determined that phase inversion from W/O emulsions to O/W emulsions happens at 40% WC. Next, the study on the stability of W/O emulsions of different controlling parameters shows that, with the increase in the water cuts, the stability of the emulsions is increased; with the increase in the Reynolds number, the stability of emulsions is increased; the emulsions formed from the pipeline constriction type GC 0.50 and SC 0.50 is more stable than the emulsions formed from GC 0.75 and SC 0.75. In addition, the amount of emulsions formed at different governing parameters is also presented. The presented results show that – amount of emulsions formed increase with the increase in the Reynolds number; amount of emulsions formed increase with the increase in the water cuts; amount of emulsions formed are the same for different types of pipeline constriction. In conclusion, the findings of this study provide a significant contribution to the Malaysia's oil and gas industry as local offshore crude blend, which was Miri Light Crude (MLC) was used in the