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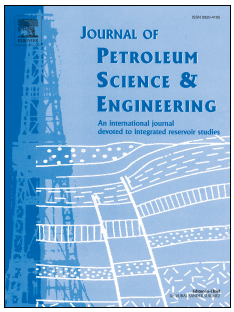

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Numerical study of water displacement from the elbow of an inclined oil pipeline

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Abstract

When oil and water are simultaneously transported along a hilly-terrain pipeline, water may accumulate at low level sections during production shut-down. Since the contact of water with the internal wall of a steel pipe yields significant corrosion, it is desirable for the water accumulated to be flushed out by the flowing oil. As such, the underlying two-phase flow dynamics and its influential parameters, as well as the minimal flow rate of the continuous phase required for the displacement of the accumulated water, are of primary industrial interest. This work presents a numerical investigation of the conditions governing and promoting water displacement at the elbow between a horizontal and an upward inclined pipeline, considering diesel oil as the carrier phase, and an inside pipe diameter of 27 mm. The numerical framework adopted is the opensource CFD package OpenFOAM release 2.3.1, and two-phase flow transient simulations are run by employing the built-in Volume Of Fluid (VOF) algorithm. Due to the complex three-dimensional nature

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