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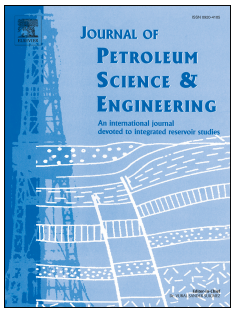

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PII: S0920-4105(17)30959-2

DOI: 10.1016/j.petrol.2017.12.003

Reference: PETROL 4493

To appear in: *Journal of Petroleum Science and Engineering*

Received Date: 15 August 2017

Revised Date: 17 November 2017

Accepted Date: 1 December 2017

Please cite this article as: Ren, X., Li, A., Fu, S., Wang, S., Experimental study on the oil-water relative permeability relationship for tight sandstone considering the nonlinear seepage characteristics, *Journal of Petroleum Science and Engineering* (2018), doi: 10.1016/j.petrol.2017.12.003.

Experimental study on the Oil-water relative permeability relationship for tight sandstone considering the nonlinear seepage characteristics

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Abstract

Oil-water relative permeability is an important parameter to describe the oil-water two-phase flow in oil reservoirs. The permeability rules for oil-water flow in tight sandstone reservoirs do not exactly follow the Darcy law due to its tight lithology and small pore-throat. In addition, the relative permeability curve obtained from traditional processing methods cannot accurately describe the seepage characteristics for this type of oil reservoirs, and therefore, may lead to unreasonable evaluation and prediction of productivity. In this work, the reservoir conditions are simulated and the test for oil (S_{wc}) flow of tight sandstone has been carried out. Addtitionally, the relative permeability curve of water-oil displacement in unsteady state has also been obtained. When the oil (S_{wc}) gets through the tight sandstone sample, the relationship between the flow velocity and the pressure gradient is not a straight line. In addition, the flow velocity and pressure gradient satisfy the equation of $v=\frac{k}{\mu_o}\nabla P\left(1-\frac{1}{a+b\nabla P}\right)$. The traditional JBN method is improved considering the nonlinear seepage characteristics, and the data processing method of oil-water relative permeability for tight sandstone reservoirs is established. Compared with the traditional JBN method, the oil-phase relative permeability, as calculated using the JBN method with the consideration of nonlinearity, is found to be higher. The results also show that the equal permeability point of has moved towards the right.