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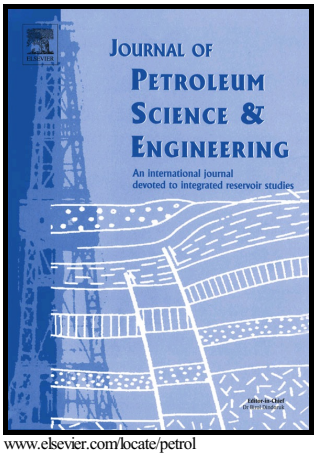

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PII: S0920-4105(16)30510-1
DOI: http://dx.doi.org/10.1016/j.petrol.2016.09.048
Reference: PETROL3655

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

Received date: 18 June 2016
Accepted date: 27 September 2016

Cite this article as: Azizollah Khormali, Dmitry G. Petrakov and Mohammad Javad Afshari Moein, Experimental analysis of calcium carbonate scale formation and inhibition in waterflooding of carbonate reservoirs, *Journal of Petroleum Science and Engineering,* http://dx.doi.org/10.1016/j.petrol.2016.09.048

Experimental analysis of calcium carbonate scale formation and inhibition in waterflooding of carbonate reservoirs

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Abstract

Deposition of inorganic salts such as calcium carbonate ($CaCO_3$) can cause formation damage and production equipment failure during the development of a reservoir. In case of waterflooding, complex geochemical processes between the injection water, formation water and rock occur and the concentration of ions increases. Major contribution of scale control concentrates on understating the conditions scale formation and its inhibition.

In this paper, we analyze experimentally the effect of oil composition and flow conditions on $CaCO_3$ scale formation. We measured the induction period of $CaCO_3$ crystallization in a stirred vessel with different Reynold numbers and the interfacial tension at the boundary between the aqueous scale inhibitor and oil at different percentages of organic components. In addition, we determined the performance of $CaCO_3$ scale inhibition under different static and dynamic conditions in some Iranian carbonate core samples.

The experimental results showed that if the interfacial tension was reduced by increasing the concentration of organic components to 1.5 percent, the $CaCO_3$ precipitation decreases more than 30 percent. In addition, increasing the flow velocity (Reynolds number) had a great influence on the increase in the induction period of $CaCO_3$ crystallization. However, the induction period was insignificantly changed at higher values.

Using a recently developed scale inhibitor, we kept the $CaCO_3$ formation at a constant concentration of 30 mg/L. The efficiency of the inhibitor was insignificantly reduced if the