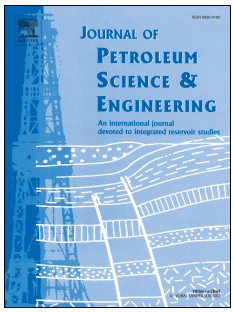
Accepted Manuscript



The role of temperature on optimal conditions in dolomite acidizing: An experimental study and its applications

K. Dong, D. Zhu, A.D. Hill

PII: S0920-4105(18)30203-1

DOI: 10.1016/j.petrol.2018.03.018

Reference: PETROL 4759

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

Received Date: 29 November 2017

Revised Date: 23 February 2018

Accepted Date: 3 March 2018

Please cite this article as: Dong, K., Zhu, D., Hill, A.D., The role of temperature on optimal conditions in dolomite acidizing: An experimental study and its applications, *Journal of Petroleum Science and Engineering* (2018), doi: 10.1016/j.petrol.2018.03.018.

Abstract

Rock mineralogy is one of the factors that affect optimal acid injection conditions for carbonate reservoirs. Extensive research has been done to study the optimal acidizing conditions for limestone. However, very few studies have been reported on acidizing dolomite rocks. This paper presents an experimental study on acidizing dolomite rock samples.

In this research, we cut a dolomite block from a Silurian formation in Thornton Quarry, Illinois. This block was drilled into core samples with dimensions of 1.5-in. diameter by 8-in. long. We first measured the mineralogy of the rock samples to ensure the lithology to be studied. The test shows that more than 99% of the rock mineral is dolomite. To study the effectiveness of acidizing, we then did acidizing coreflood experiments with 15 wt% HCl at different temperatures. These temperatures are 122 °F, 185 °F and 260 °F. Wormhole efficiency relationships were generated, and the optimal acid injection conditions were determined respectively from these experiments. The dissolution patterns created during each experiment was found by CT-scanning each core after acid injection.

Experimental results show that the optimal acid interstitial velocity increases with increasing temperature. However, the rate of increase between 122 °F and 185 °F is significantly larger than the rate of increase between 185 °F and 260 °F. It is due to the difference of increase for acid diffusion rate and surface reaction rate, which is discussed in this paper. Interestingly, unlike limestone, the corresponding optimal breakthrough pore volume decreases with increasing temperature from 122 °F to 185 °F, and increases slightly from 185 °F to 260 °F. This indicates that more volume of acid is needed for reservoirs of lower temperature. Based on the experimental results and an upscaling method, an application scheme is presented for dolomite reservoirs with varying temperatures, which can be used for engineering references.