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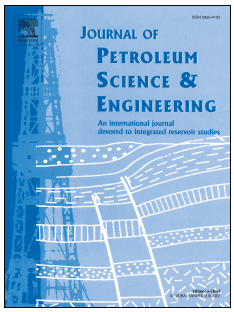

The etching and hydraulic conductivity of acidized rough fractures

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The Etching and hydraulic conductivity of acidized rough fractures

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Abstract

Acid fracturing is one of the eligible techniques for increasing productivity of hydrocarbon reservoirs. Laboratory tests are performed on reservoir rock samples to improve understanding of acid fracture performance. Fractures formed by hydraulic fracturing or acid fracturing before acid etching are rough, therefore in this study, an acid injection cell was developed to study surface etching in rough fracture acidizing on Asmari limestone samples (one of Iran's reservoir rocks). In this research, the effects of acidizing at different times on roughness evolution and also conductivity of fractures with rough surfaces were investigated experimentally and numerically. Conductivity of fractures in low stresses was determined using permeability test. In the case of high stresses, conductivity was determined using a penetration model and local aperture (derived from surface scan) and a numerical finite element code developed in MATLAB. Results showed that increase in the initial roughness coefficient and the linear roughness of fracture surface resulted in higher surface etching and higher dissolved rock equivalent conductivity (DREC). With increase in fracture surfaces mismatch, fracture aperture and eventually initial fracture conductivity also increase. In this study, for the first time, mismatch in acidized fracture has been defined as linear roughness difference and roughness coefficient difference of lower and upper fracture surfaces. Increase in acidizing time resulted in higher difference in roughness coefficient, linear roughness of the two surfaces of fractures, and higher initial conductivity. Also, increase in rock embedment strength clearly increased final conductivity for samples with 20 *min* acidizing time. However, for samples with 10 *min* of acidizing time, final conductivity of fractures