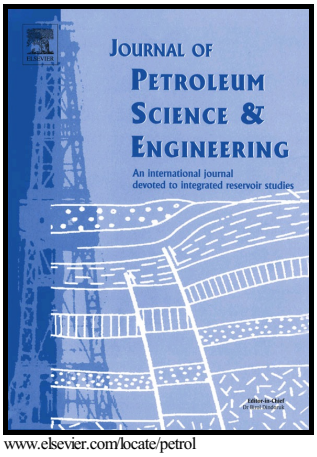

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A New Correlation to Evaluate the Fracture Permeability Changes as Reservoir is Depleted

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Abstract

The increasing development of unconventional resources plays an important role in filling the gap between demand and conventional oil and gas supply. Due to the nature of low permeability, tight gas and shale reservoirs need fractures, natural and artificial, to produce hydrocarbon at commercial rates. Fracture permeability is a key factor affecting the development of these unconventional reservoirs. It is observed that fracture permeabilities decline as reservoirs are depleted because pore pressure declines lead to the closures of fractures and the permeability reductions. Therefore a correlation to quantify the variations of the fracture permeability with pore pressure is highly needed. In this study we investigate the effects of pore pressures on fracture permeabilities assuming constant in-situ stresses exert on the formations. Starting from the force balance, we derived equations to calculate fracture permeability based on fracture geometry. Our new correlations can also be used to evaluate the changing fracture permeability during the recovery of hydrocarbon. The proposed correlations provide a way to estimate the fracture permeability at initial pressure and the depleted pressure at any production stage. Although some experiments had been conducted to build relationships between fracture permeability and pressure for some types of rocks. It is noted that experiments are time consuming and cost expensive. Sometimes, the unavailability of shale sample and difficulty in