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A Model for Predicting Elemental Sulphur Induced Permeability Damage in a Fractured Sour Gas Reservoir

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Abstract

The complexity and damages that result from the precipitation and deposition of hydrogen sulfide (H_2S) in the sour gas reservoirs constitute challenges during modeling of gas production and transportation from such reservoirs. During production from a fractured gas reservoir with high H_2S saturation, a continuous drop in the pressure is experienced within the formation. The change in pressure generally leads to a decline in the sulphur solubility and precipitation when it reaches its critical saturation state. Sulphur deposition in the pore spaces and throats of the formation rock eventually leads to porosity and permeability damage. It becomes paramount to have a model that depicts what happens in the formation throughout the life of the reservoir and to show the damage trend of the formation as the production time increases. In this current study, Robert's Sulphur deposition model was modified to account for non-darcy flow and fracture properties in the near-wellbore region. The results show that a decrease in fracture aperture lead to a decrease in the formation permeability. It also shows that higher production rate leads to increase in rate of sulphur deposition, and conclusively fracture aperture has a severe influence on the permeability of the formation as damage done in such reservoirs due to sulphur precipitation are more severe. It is advisable to maintain pressure above the critical pressure at which sulphur precipitation is activated, in order to maximize production and not to induce additional pressure drop caused by sulphur plugging on flow conduits.

Keywords:
reservoir surveillance, production monitoring, complex reservoir, reservoir characterization, engineering, reservoir simulation, fracture aperture, fractured sour gas reservoir, formation permeability, saturation

Subjects:
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