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An improved model for predicting elemental sulphur saturation in sour gas reservoir with incidence of reservoir compaction

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Abstract

Elemental sulphur which is originally soluble in gas phase in the reservoir should precipitate from the gas phase after exceeding saturation state and deposit at pore spaces and throat sequentially resulting in porosity and permeability loss. Over several decades, modelling elemental sulphur deposition around the wellbore are mainly focused on the gas reservoir and were based on Darcy flow. Few recent studies have shown models that capable for predicting elemental sulphur deposition considered non-Darcy flow, variations in gas properties with pressure change as well as permeability reduction caused by compaction. It therefore follows that if compaction causes a reduction in the permeability of the reservoir as well as reduction in its porosity, then porosity damage function induced by compaction becomes a crucial factor needed to be incorporated into the existing models to adequately predict sulphur

saturation. This study is concerned with developing an accurate model for predicting elemental sulphur saturation in the fractured reservoir by exploring the functional relationship between compaction and elemental sulphur deposition over time. The result obtained from newly improved model is at variance with that obtained from Guo et al. model. This variance may not be unconnected with the fact that the rate of sulphur deposition seemed to have been underestimated by Guo et al. model. The refined model is more accurate and practical in predicting sulphur deposition in fractured sour gas reservoir as it leads to a faster rate of sulphur deposition.

Keywords: Elemental sulphur, compaction, sour gas reservoir, permeability loss function, porosity loss function