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3D Coupled Reservoir Geomechanics applied to Arab-D carbonate, Khurais area, Saudi Arabia

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ABSTRACT

This paper presents the 3D Geomechanics analysis of the carbonate (Arab-D) interval within the southern part of the Khurais area of Eastern Saudi Arabia. The Khurais structure is a gentle pericline ~ 123 Km in length with an NNW-SSE axial trend, and slightly steeper (~7° dip) western limb. The majority of the injector wells were drilled on the flanks parallel to the main structure to maintain the pore pressure with the producers occupying the more crestal position. The wells, which lie at a depth of around to -4000ft subsea, were completed mainly in open hole. This study was initiated to assess the long--term well-bore stability and permeability due to changes in the reservoir conditions.

A 3D Geomechanical model was built over a representative area of the reservoir, using calibrated 1D mechanical earth models, pore pressures, conventional logs and geostatistical model, to allow propagations of rock mechanics properties into the geological model. The initial stress tensor, for wellbore stability and the volumetric strain tensor, for effects on the reservoir properties, were calculated through history matching individual wells with their while-drilling operational records.

The coupled geomechanical modelling results show in the present day a strike slip regime, changes in the matrix permeability are likely to be moderate, due to the normal compaction of the rock and that the well-bore stability is good.