Role of Geomechanics on Natural Fractures in Different Reservoirs: A Middle Eastern Perspective

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ABSTRACT

The mechanical behavior of natural fractures during production makes fractured reservoirs unique in terms of fluid flow behavior and reservoir's response to in-situ stresses. While the mechanical behavior of non-naturally fractured reservoirs is controlled by textural properties of rock matrix, the behavior of fractured reservoirs is driven by degree of inherent anisotropy depending upon the spatial distribution of fracture sets and their reaction to present day in-situ stress conditions.

While those natural fractures which are intersected by the well are detectable on image logs, fractures in the vicinity of wellbore also need to be incorporated while studying the hydraulic conductivity at field scale. Detection of such fractures is possible with application of certain deep shear sonic technology.

Well-scale geomechanical models offer reasonable accuracy to determine the sensitivity of detected fractures in respect to in-situ stresses to become critically stressed and therefore possibly hydraulically conductive. However, the translation of such well-scale analyses to field-scale requires improvement in methodology. Appropriate up-scaling of well-based fracture interpretation to field-scale is already in practice in the form of Discrete Fracture Network (DFN) modeling based on the integration of field-scale seismic & structural data and well-based data. However, the effective integration of field-scale geomechanical models in combination with DFN models can offer practical solutions to identify possible stress sensitive fracture dominated sweetspot locations. This can be helpful for decision support on well positioning and field development.

This presentation covers a careful application of the critically stressed fracture concept for practice and some new techniques at well-scale and field-scale to improve practices for Middle Eastern fractured reservoirs demonstrated with case studies.