
Testing Static Concepts Used for Discrete Fracture Network Modeling of Najma-Sargelu Reservoir of West Kuwait

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A 3D Discrete Fracture Network (DFN) Model of Najmah-Sargelu unconventional fractured reservoir covering four oil-fields of West Kuwait was built, using petrophysical data from 54 wells including core & image logs, supplemented with seismic facies analysis and production data calibration. Subsequent of model construction, new appraisal data is available from one horizontal well and two vertical wells drilled recently in three different oil-fields. Fractures described in a new core from one well was used for fracture characterization and the same was calibrated using higher resolution image logs available for the first time in these reservoirs. 'Fracture swarms' related to sub-seismic faults were segregated from 'diffuse joint sets' based on fracture morphology, orientations & distribution in well-by-well analysis. Systematic analysis of geological drivers such as mechanical bed thickness and brittleness was carried out to derive fracture spacing, intensity and dispersion to compare with earlier data-set. Qualitative reservoir dynamic calibration was attempted using production log from the horizontal well acquired recently for the first time in this reservoir. Static modeling concepts used for building the DFN model were tested rigorously with the help of additional well data. Besides providing assurance on predictive capabilities of the model including limitations thereof, present effort succeeds in identifying opportunities and directions for further refinement.

In short term, well locations and paths are being optimized with the help of DFN model, to intercept minor fracture swarms using deviated wells for the first time. The appraisal & development wells targeting fracture 'sweet spots' will address multi-reservoir development besides generating necessary data for cost optimization. Parallel efforts to built full-field reservoir models, in longer term will lead to cost-effective development of these unconventional fractured reservoirs.
