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Novel Integration of Modeling, Oil Production Behavior and Hydraulic Fracture Geometries in the Tight Athel Formation

Oswald Quintero Sarmiento[1], Gregory Stone[1], John Fraser[1], Martin Healey[1], and Loic Bazalgette[1]

[1]Petroleum Development, Oman

ABSTRACT

This poster summarizes the integrated fracture study workflow which supports the MGI (Miscible Gas Injection) development plan of the Athel silicilyte reservoir formation in Al Noor and Al Shomou fields. The Athel silicilyte is a Precambrian pre-salt formation being developed in the South of the Sultanate of Oman. It is characterized by a relatively high porosity but very low permeability reservoir, with good lateral continuity but a high degree of vertical heterogeneity with tight rock intervals.

An extensive hydraulic fracturing campaign has been set-up to improve the low initial oil production and injection rates recorded from the Al Noor and Al Shomou wells. Diverse hydraulic fracturing strategies, techniques and designs have been implemented in the wells over the years, with the objective to increase the productivity of the producers wells and Miscible Gas injection conformance in the injector wells.

The key decision influencing the success of the further development of this reservoir is the placement and design of the hydraulic fractures to ensure vertical conformance of the miscible gas injection flood. To better understand the fracture propogation of existing hydraulic fractures and hence better design future hydraulic fractures an integrated 3D modeling workflow has been used. This integrates the diverse dataset which includes micro-seismic, PLT's, temperature logs, image logs and seismic data. The workflow then provides an improved understanding of the mechanical stratigraphy, vertical and horizontal rock quality, hydrocarbons storage potential, location and density of natural fracture corridors, and prediction of the azimuth and vertical propagation extent and direction of hydraulic fractures.

This workflow has provided an improved understanding of the current sweep profiles within the reservoir, and provides a tool to support the decision of where best to place hydraulic fractures in new wells to maximize sweep and recovery.