Geological Data Integration for Challenging Horizontal Well Placement in the Wara Sandstones of Minagish Field, Kuwait.

Jeevankumar Silambuchelvan[1], Taher M. El Gezeery[1], Adel M. Ebaid[1], Abdul Aziz Ismael[1], Girija S. Padhy[1], Tahani Al Rashidi[1], and Khalaf Al-Anezi[1]

[1]Kuwait Oil Company, Kuwait, Kuwait.

ABSTRACT

The Middle Cretaceous Wara reservoir in the Minagish field - Kuwait, exhibits variable depositional settings ranging from fluvial to offshore. The sand bodies are highly heterogeneous in terms of the stratigraphic architecture implying extensive lateral facies variations, stacked sand bodies and varying petrophysical properties. Modeling the target sand channels and optimizing subsurface well placement requires detailed integration of geological, geophysical and petrophysical data. Detailed core study on stratigraphic architecture and sedimentology in particular is very much essential to minimize uncertainties related to correlations of key stratigraphic surfaces, channels geometry and sub-seismic fault network. The varying degree of minerals like glauconite, pyrite and hematite with other cementing materials such as calcite and dolomite affects the reservoir quality. The presence of glauconite has a strong impact on petrophysical evaluation, whereas the presence of shale poses several challenges during drilling and geosteering. The sequence stratigraphic model was attempted for this complex Burgan and Wara formations. The seismic data including pre-stack depth migration and pre-stack simultaneous inversion have been utilized with well log curve shales and elastic impedance to trace the good quality sand. The geostatistical models for sand distribution were prepared integrating core, sedimentological models, electrofacies, seismic data, and petrophysical interpretations. The geosteering and formation evaluation challenges were addressed in real-time to ensure the successful drilling and completion of horizontal producers to achieve the maximum reservoir contact in the desired sand bodies. The wells drilled in this complex settings are geosteered with high definition inversion based distance to boundary technology having a higher precision and accuracy of resistivity contrasts. Formation capture cross section (sigma) saturation was of great value in “mixed lithologies” of Wara & Upper Burgan reservoirs.