High Resolution Data Integration Aid on Achieving Successful Level-4 Multi-lateral Wells in Clastic Reservoirs of Minagish Field, West Kuwait

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ABSTRACT

The Middle Cretaceous Burgan reservoir in Minagish Field exhibits variable depositional clastic settings ranging from “Fluvial”, “Fluvio-tidal” to “tidal wave sands”. The sand bodies of Upper Burgan reservoir 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 trajectory with maximum reservoir contact requires high resolution geological and seismic data integration in order to minimize uncertainties related to correlations of timeline surfaces, channels geometries and sub-seismic fault network. Since traditional logs could not capture the textural differences characterizing the reservoir zones, Real-time formation evaluation and geosteering challenges were addressed to ensure the successful drilling and completion of level-4 “Multi-lateral” producers. A combination of the latest advanced geo-steering technology was used in this well including Rotary Steerable, Distance to Boundary and Sourceless petrophysical evaluation while drilling. The uncertainties in the geostatistical models were further reduced while drilling the first lateral section (LAT-0) by deploying extra deep azimuthal resistivity measurements having a higher precision and accuracy to consistently map the rise in OWC due to production operations with depth of detection up to 100 feet TVD above and below the well path and maintaining a standoff from the top of onset transgression undulating surface with poor sand facies. The resultant mapping window provided an accurate guides to update the geo-models. The formation evaluation along with bore hole imaging and geo-correlation assisted in identifying a fault having a great impact on well positioning of the upper lateral due to a high amount of throw fault with significant formation dip changes. This in turn eliminating risks of geosteering in such a complex heterogeneous reservoir. The integrated approach utilizing geological, seismic, petrophysical and geosteering data provided better understanding for well positioning while drilling and achieving the MRC without exiting the sweet zones of targeted upper and lower Burgan sandstone in Minagish field and enhanced water free oil production.