
Integrated Approach of a Successful Geosteering Project Targeting a Low Permeability Reservoir in the Partitioned Neutral Zone between Kuwait and Saudi Arabia

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South Fuwaris (SF) Oil Field was discovered in 1957 and is located in the southwest corner of the Partitioned Neutral Zone (PNZ) between Kuwait and Saudi Arabia. 3D seismic survey shot in 1996 revealed SF is a NW-SE doubly plunging anticlinal feature on the Lower Cretaceous Ratawi level of the Thamama Group in the Gulf Region. The field produces mainly from thin carbonate stringers within the Ratawi Limestone reservoir.

The thick, porous Ratawi Oolite reservoir underlies the Ratawi Limestone reservoir and possesses good hydrocarbon saturation with a clear OWC. The very low productivity of the oolite reservoir in vertical and slant holes is attributed to its abnormal low permeability. As a result, the Oolite was historically ranked as low priority compared to the limestone reservoir on top despite its immense reserves.

Oriented core data, full suite of open hole logs, formation imaging, magnetic resonance and sonic imaging tools were integrated with a walk-away VSP of a pilot hole and 3D seismic data to annotate the reservoir sweet spot and to predict a preferred azimuth for horizontal well trajectory. Based on this integrated study, project uncertainties were fully captured, addressed, analyzed and resolved.

A pre-job geosteering model was built to address different scenarios pending reservoir architecture and log response from pilot and adjacent older wells. Real time LWD and Imaging Logs were utilized for the first time and applied to predict, resolve and geosteer the horizontal well for optimum well placement to maximize reservoir exposure within the sweet spot.

Outstanding results and a ten-fold increase in production rate are the outcomes of this integrated approach and teamwork. Several horizontal wells are planned to mimic this success for optimum productivity of the oolite reservoir that was underdeveloped for decades.
