Case Study: Integrated formation evaluation for Geosteering

Fluid characterization and formation evaluation through surface logging enhances carbonate reservoir development

Client
Kuwait Oil Company
Onshore Development, Kuwait

Challenge
The Mauddud “E” & “D” zones are difficult to differentiate as they are adjacent, clean carbonates. Differentiating the clean sandstone of the Mauddud “H” from the clean carbonate in the Mauddud “G” is also difficult using basic LWD tools. These challenges result in geosteering accurately being both difficult and costly. Limited sampling has resulted in little being known about the hydrocarbon content in the Mauddud “H”. Impermeable barriers are known to exist within the Mauddud but are not readily identified. Very little information exists in terms of:
- Connectivity of fluid in the reservoir sublayers
- Fluid maturity
- Fluid charging (single or multiple charge-events)
- Fluid quality changes in the reservoir sublayers

Solution
GEOLOG provided an integrated suite of real-time services that included geochemical analysis of drill cuttings and core chips combined with compositional and isotopic analysis of mud gas.

Results
The integrated services have demonstrated the ability to identify and differentiate the Mauddud D & E sub-layers and identify the Mauddud H sandstone layer. The hydrocarbon fluid content and maturity has been identified through the entire Mauddud formation, confirming the common thermogenic origin throughout. This suggests that variations in hydrocarbon content are not related to different origins. These observations, delivered in real-time allowed geosteering to position the well in the optimal zones.

Value
This integrated approach enabled the asset team to build an accurate geological model in near real time at a far lower cost than using more complex LWD tools. The results were applied to the geosteering model to allow effective well placement and completion.

Services used
- Mineral & elemental analysis
- C9-C27 Hydrocarbon analysis
- Carbon isotope analysis (C1-C3)

Technical Paper References
Innovative Well-Site Surface Logging Solutions to enhance Mauddud Reservoir in Sabriyah- EAGE 44499