Combining rotary steerable, LWD technologies, Weatherford achieves RSS milestone in Abu Dhabi

By Ivor Sinclair, Weatherford International

Characterized by harsh, carbonate formations inducing high levels of stick-slip and vibration, drilling and completion work in Abu Dhabi presents a unique set of challenges. Nevertheless, the Revolution rotary steerable system (RSS) and Precision LWD have been used by a major operator in the region to successfully achieve complex drilling objectives both on- and offshore.

In the onshore Abu Dhabi case, the tools were used to drill and complete two water injection wells. In one of the wells, the tools were used to drill a horizontal section while staying within the zone of interest using real-time geosteering services. The well was planned with a vertical kick-off and doglegs up to $8^\circ/100$ ft, requiring performance at the upper end of RSS capability.

The triple combo RSS and LWD service combined with the multi-frequency resistivity (MFR) sensor was deployed to geosteer the 6-in. (152.4-mm) horizontal-hole section. Integrating technologies enabled the well to be safely drilled to 4,193 ft (1,278 m), staying within the 6-ft (1.8-m) thick target zone. Ultimately, the operator was able to drill the ultra-narrow target zone despite the fact that the zone was almost 20 ft (6 m) deeper than anticipated prior to drilling. Advanced system design and integration, combined with real-time images of wellbore faults and dips, allowed the operator to correct the well trajectory and direction to reach a target that would have been missed without this technological capability.

In another water injection well, the operator challenged service companies with drilling out a 9 5/8-in. shoe track, drilling vertically, then building to an approximately 80° inclination to reach a 7-in. liner point in a single assembly run. The operator, had not yet achieved this objective in a particular field, making the accomplishment a significant first and a major milestone.

The RSS and LWD system was used to drill 2,200 ft (671 m) of the well’s horizontal section. The section was drilled in 89 ½ hrs in a single run with zero nonproductive time, successfully meeting the operator's objective and saving more than 40 hrs compared with conventional directional drilling techniques. The operator now recommends use of this technology combination in all its water injector wells landing in this type of target formation.

Offshore Case History

Offshore, the same operator used the RSS and LWD to drill and complete 1,364 ft (350 m) of a 6-in. section in a horizontal well. The section was drilled with a rate of penetration (ROP) of 20 ft/hr (6.1 m/hr). The RSS technology ensured 100% rotation while drilling, enabling a full-quadrant density image. Using this improved imaging and integrated geosteering approach, the operator successfully executed the turn and build within the target formation. Geosteering technologies saved the client significant time and expense, allowing the build and turn to be successfully executed within the formation. Average ROP was greatly improved compared with drilling with motors, leading to significant savings in cost and time. The continued success of this approach has led the operator to adopt combined RSS and LWD technology as a recommended best practice.

Drilling challenges like those that have been met in Abu Dhabi are contributing to continuous RSS engineering upgrades — raising the bar for performance and reliability by pushing the technology to the next level.

Weatherford’s Revolution rotary steerable system and Precision LWD are being used to achieve complex drilling objectives. Advanced system designs and integration, combined with real-time images of wellbore faults and dips, are allowing operators to correct their well trajectories.