A New Approach for Integration of Well Placement and Directional Drilling Processes in Extended Reach Wells through Thin Carbonate Reservoirs: Case Study, Offshore Abu Dhabi

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ABSTRACT

After decades of targeting easy oil reservoirs, the industry has made a significant step toward unlocking complex, thin reservoirs with significant geological challenges that can negatively affect the drilling process. Recently, a successful dual-lateral horizontal well was drilled in Formation A using an advanced geosteering workflow integrated with advanced engineering solutions, including a new bit design, an optimized bottomhole assembly (BHA) design, and a point-the-bit rotary steerable system. The dual-lateral well was drilled in one bit run, much farther than previous horizontal wells drilled in this reservoir. By integrating an understanding of the target layer's geology and analysis of the previous offset horizontal wells, a new bit design was developed that overcame geological challenges. A well placement methodology and workflow were developed and integrated with the new bit design and with an optimized BHA design. The plan used advanced geosteering, azimuthal density imaging, and the point-the-bit rotary steerable system to land and geosteer the well in the thin target layers, while maintaining the planned trajectory with minimal borehole tortuosity by use of real-time drilling optimization. The well was successfully drilled and the geosteering objectives were reached with 100% reservoir contact, targeting multiple thin and abrasive carbonate layers containing calcite concretions with ±3 ft. true vertical thickness (TVT) in an early Cretaceous carbonate sequence offshore Abu Dhabi. The new bit design and optimized BHA design exhibited outstanding performance, increasing the rate of penetration (ROP) by 30%, producing smoother well trajectory in the thin target layers, and drilling more than 7,000 ft. in both horizontal sections. Additionally, compared to the previous horizontal wells in this type of reservoir, non-productive time (NPT) was reduced by completing the target sections using one bit run; the well was completed 10 days ahead of schedule. Additionally, downhole vibrations never exceeded established limits. The uniqueness of the new bit design and optimized BHA design can help address geological challenges and enhance the drilling process, maximizing the asset value.