

Case study: Middle East

Baker Hughes drills, completes 18,000-ft producer well 16 days ahead of schedule, boosts production rates additional 30%

A customer planned to drill a multilateral production well and perform openhole wireline evaluations of adjacent reservoirs. Based on the subsurface challenges and the complex well plan, the customer chose Baker Hughes to design and execute a solution.

Aligning the well plan

The customer's engineers worked with the Baker Hughes Integrated Well Services (IWS) team to align on the project objectives, review the reservoir characteristics, and determine the optimal combination of technologies to increase overall production.

The 22-in. section of the offset well frequently experienced lost circulation which could lead to a hole collapse. The high risk of mud losses in the reservoir could escalate costs or result in losing the well. The particularly challenging 12 ¼-in. section had often caused bottomhole assemblies (BHA) to become stuck in previous wells. The pilot hole section routinely challenged wireline operations while the complexities in the buildup sections and reservoir typically lowered drilling performances. And the water-bearing zones restricted the already stringent trajectory window for placing laterals.

Complicating the project was the 91-day operational window, a tight schedule considering the complexity and number of deliverables: the drilling, evaluation, and plug-and-abandonment of a 4,000-ft (1219 m) pilot hole; and the sidetracking, drilling, and matrix acid stimulation of two laterals in the reservoir.

Designing the solution

Drawing on a comprehensive technology portfolio and superior service delivery, the IWS team spearheaded the initiative, leading the well engineering and rig operation aspects of the project. The Baker Hughes drilling and completions fluids experts optimized mud properties for hole lubricity and filter cake management.

Baker Hughes earmarked its motorized **AutoTrak™ Curve rotary steerable system** to drill the well with **Dynamus™ extended-life drill bits** to reduce trips and prevent damage of sensitive BHA components by smoothing out lateral vibrations.

For the casing exits, Baker Hughes delivered the hydraulic-set **WindowMaster™ G2 whipstock system**, a solution that requires less rathole to be drilled, saving rig time. By design, the WindowMaster G2 system is retrievable by the **TorqueMaster™ bottom-trip retrievable anchor and packer** no matter the hole conditions.

To ensure a quality cement job and a robust, permanent seal between the casing and wellbore, Baker Hughes selected the **MPas™ mechanical packer**—which uses a noninflatable packing element run as an integral part of the casing string—with a **C2™ liner setting sleeve** to set the liner.

Executing with predictable performance

Baker Hughes began implementing the well plan and, alongside the customer, provided 24/7 remote

Challenges

- Drill a producer multilateral well
- Maintain 91-day schedule and budget
- Achieve zero HSE incidents
- Minimize NPT
- Deliver the well with zero well control incidents

Results

- Drilled the motherbore to 18,000 ft (5486 m) with record-breaking ROPs
- Completed well plan 16 days ahead of schedule, saving an estimated \$750,000 USD
- Delivered an additional 4,300 ft (1310 m) for extra production, an estimated \$110,000 USD per day
- Ran and installed the project's deepest openhole isolation kit to save the entire well from early water cut, an estimated future savings of \$450,000 per day
- Experienced no HSE issues, well control events, NPT, or LTI

monitoring and advisory throughout the entire drilling stage.

Field personnel successfully drilled and wireline logged the pilot hole with the hole in great condition. The optimized mud facilitated exceptional hole lubricity, delivering the highest rate of penetration (ROP) recorded of any 12 ¼-in. section in the field, clocking in at 123.6 ft/hr (37.6 m/hr). The 8 ½-in. section experienced an equally record-breaking ROP for the field: 109.9 ft/hr (33.4 m/hr).

The team drilled the motherbore over 18,000 ft (5486 m) including an additional 4,300 ft (1310 m) beyond the initial well plan—representing a potential 30% production increase to the customer. Field personnel also plugged and abandoned a section of the lateral, sealing off the water-bearing zone. Based on the data available from the motherbore, the team drilled a second lateral to a total depth (TD) of 16,252 ft (4953 m) and avoided entering the water zone.

With the help of the improved drilling fluids properties and the addition of the **OMNI-LUBE™ V2 lubricant**—an ester-based lubricant which enhances invert emulsion fluid lubricity and reduces instantaneous variations in torque due to stick slip—the Baker Hughes solution eliminated short wiper trips for the laterals, saving approximately five days.

In total, the IWS team finished drilling and completing the well in 75.3 days, a time savings of 15.7 days, or 17.2%, as compared to the 91-day window. There were no lost time incidents (LTI) or health, safety and environmental (HSE) events experienced during well construction, and zero nonproductive time (NPT). The flawless execution by Baker Hughes saved the customer approximately \$750,000 USD.

Future well production benefitted from two additional contributions. The Baker Hughes team sealed off the water-bearing leg of the wellbore, preventing future water cut. The extra 4,300 ft (1310 m) in the main bore represented an additional 30% production potential to the customer, an estimated \$110,000 USD per day, annualized at \$40 million USD.

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