Saving 57½ Rig Days and USD 1.4 Million for Four Natural Gas Wells with Turbodrilling Strategy

Neyrfor turbodrills reveal high performance and major opportunity in previously unsuccessful Oklahoma sandstone

CHALLENGE
Reenter the natural gas market in Oklahoma, US, with an efficient, effective extended-reach horizontal well strategy.

SOLUTION
Test Neyrfor* turbodrill BHA against conventional turbodrill BHA using two trial wells.

RESULTS
Drilled 15,050-ft MD for both trial wells, using just three drill bits for the Neyrfor well compared with five for the conventional well. Implemented strategy for four more wells, saving 57½ drilling days and USD 1.4 million.

After the success seen on the first trial well, the operator drilled four more wells using Neyrfor turbodrills, an effort that not only saved 57½ rig days and USD 1.4 million, but also set five new drilling records in Oklahoma, the US, and the world.

Operator seeks solution for drilling extended-reach natural gas wells
A mature field in Oklahoma, produces natural gas from a Pennsylvanian sandstone reservoir. The pay sand is separated by a thin, hard Ordovician bromide carbonate (100 ft and 35,000-psi unconfined compressive strength) and a hydrated shale. With little success, an operator attempted to drill horizontal prospects in this field with a variety of polycrystalline diamond compact (PDC), impregnated, and tungsten carbide insert (TCI) drill bits.

Because of escalating natural gas prices though, the operator reevaluated the economics of drilling extended-reach horizontal wells in the field and sought a solution to maximize production. The operator wanted to efficiently drill within the nonproductive Ordovician layer, land wells horizontally in the carbonate, and extend horizontal wellbore reach to the maximum before employing a directed openhole fracture treatment—all without touching the lower hydrated shell.

Neyrfor turbodrill and conventional turbodrill BHAs drill trial wells for direct comparison
Based on offset well data from a nearby county that revealed the bromide’s lateral continuity and homogeneity, the operator decided to perform a trial of the Neyrfor turbodrill with a Kinetic* diamond-impregnated drill bit. Neyrfor turbodrills combine a turbine power section with a directional bearing section for higher mechanical hp, higher rpm, more uniform torque, and more directional control when compared with conventional positive displacement motors (PDMs). Neyrfor turbodrills also improve wellbore quality while reducing downhole drilling shock and vibration.

The first trial well was run out of a 7-in liner, with the BHA comprising a Neyrfor turbodrill, a Kinetic impregnated drill bit and M/LWD systems. A second trial well was drilled thereafter to test the Neyrfor turbodrill against a BHA comprising a conventional turbodrill, an alternative impregnated drill bit, and a conventional PDM drive system.
**Case Study:** Neyrfor Turbodrills save time and money in Oklahoma

Neyrfor turbodrill performance compared with conventional motor performance—operator saved 57½ rig days and USD 1.4 million over four wells.

High performance from the Neyrfor turbodrill well turns into significant time and cost savings across the field

Using the Neyrfor turbodrill BHA, the operator built the first trial well from 70 to 90° before landing the wellbore horizontally at a TD of 15,050-ft MD—with only three drill bits required.

The second trial well, however, saw immediate complications after only 130 ft when the alternative impregnated bit stopped drilling. The conventional BHA suffered catastrophic failure after making just 16 ft of hole with the PDM drive system. To finish the hole section, the operator had to select another alternate BHA, which was run in hole at 13,216-ft MD. It made a total of 1,834 ft to get to TD at 15,050-ft MD—with five drill bits required.

Because of the performance achieved with the Neyrfor turbodrill in this extended-reach trial, the operator drilled four more wells with the successful strategy, an effort that resulted in 57½ cumulative saved drilling days, cost savings of USD 1.4 million, and several record-setting wells:

- most total footage in an Oklahoman slim hole (2,701 ft)
- most footage in the US (2,772 ft)
- most cumulative footage in the world for 6½-in impregnated bits (11,976 ft)
- most single-run footage in the world for 6½-in impregnated bits (3,304 ft)
- highest ROP in the world for 6½-in impregnated bits (22½ ft/h)

www.slb.com/Neyrfor