

Turbodrill BHA Saves Operator Nearly 2 Days and USD 4 Million, Offshore Oman

Neyfor steerable turbodrill and impregnated hybrid bit increases ROP by 88% in long tangent section of appraisal well

CHALLENGE

Improve drilling performance in long 12¼-in tangent section of well, offshore Oman.

SOLUTION

Use 9½-in T112HF steerable Neyfor Traditional* standard turbodrill with 12¼-in impregnated hybrid bit.

RESULTS

- Drilled 250 m at average ROP of 4.7 m/h.
- Maintained planned well trajectory throughout long section.
- Increased ROP 88%, saving approximately USD 4 million.



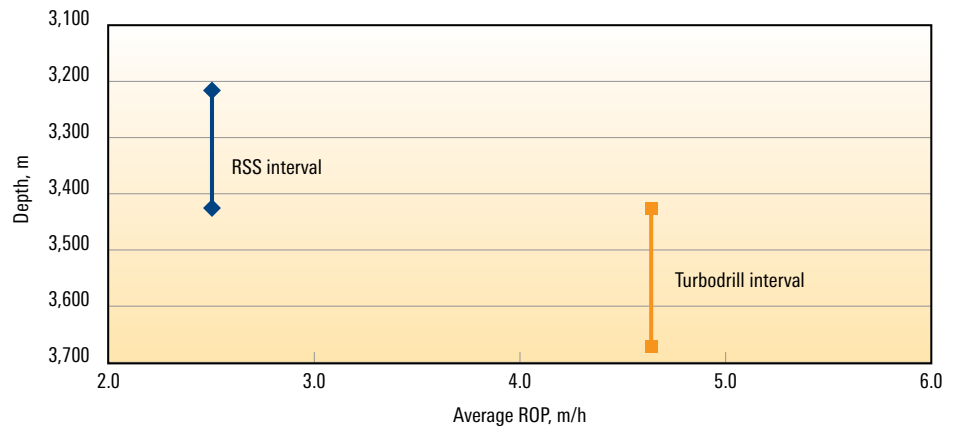
Improve drilling performance in long 12¼-in well section

An operator planned to drill a 12¼-in section of an appraisal well in offshore Oman, which had a 2,300 m long tangent to be held at 42.6° inclination while crossing two formations—a struggle to drill in previous wells. The upper formation was mainly claystone, interbedded with thin limestone stringers; the lower formation was shale interbedded with limestone. The unconfined compressive strength of both formations was between 15,000 and 20,000 psi.

A variety of BHAs were used to drill the 12¼-in sections of previous wells—PDC and TCI bits with positive displacement motors and rotary steerable systems (RSS)—but none proved satisfactory. Because the average ROP was frequently below 2 m/h, the operator wanted to improve drilling performance.

Increase ROP in hard formation with turbodrill and hybrid bit

Schlumberger recommended using a 9½-in T112HF steerable Neyfor Traditional standard turbodrill to drive an impregnated hybrid bit with 16-mm PDC cutters. This combination, which was selected based on hydraulic calculations, significantly increased ROP and reduced drilling time. The bent housing on the turbodrill’s bearing section was set at 0.75° to perform any directional work required to maintain the planned trajectory, and the turbodrill was configured with a 12⅛-in lower bearing stabilizer (LBS) and a 12-in midbody stabilizer (MBS) to hold inclination and azimuth. In addition, there was an 11¼-in stabilizer on the MWD tool above the turbodrill.



The 4.7-m/h average ROP achieved with the Neyfor turbodrill in the hardest interval of the 12¼-in section was 88% higher than the 2.5-m/h average ROP with the RSS in the previous interval.

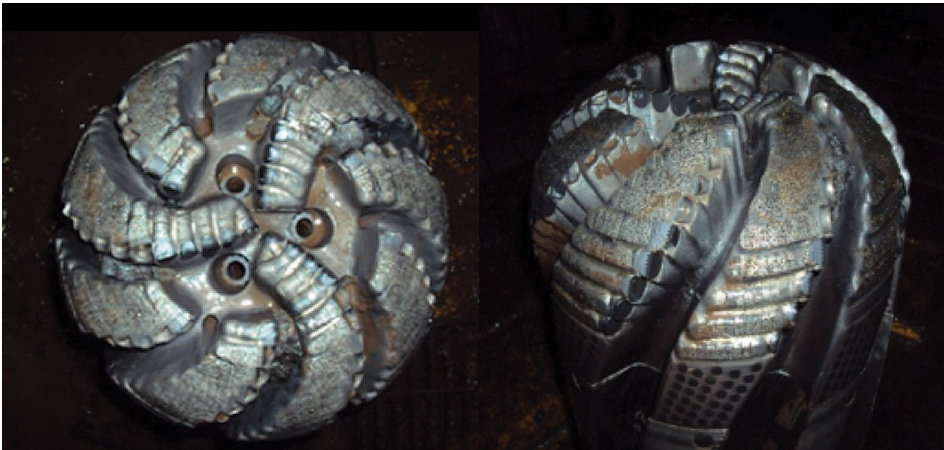
CASE STUDY: Neyfor steerable turbodrill and impregnated hybrid bit increase ROP by 88%

Increased ROP and reduced drilling time, saving USD 4 million

The steerable Neyfor Traditional turbodrill and impregnated hybrid bit achieved an average ROP of 4.7 m/h in the hardest interval of the 12¼-in section, which is 88% higher than the 2.5 m/h average ROP from the RSS and PDC bit in the previous interval. The performance improvement in the 250-m interval saved the operator nearly two days of drilling time and approximately USD 4 million.

The first 212 m of the 12¼-in section, from 3,211 m to 3,423 m MD, were drilled at an average ROP of 2.5 m/h using a BHA with a PDC bit and RSS. At that point, inclination was 45.83° and azimuth was 221.1°. A trip was then made to change to a BHA with the steerable turbodrill and hybrid bit to drill the claystone and limestone formation—considered the section's hardest interval.

The turbodrill BHA then drilled 250 m through the hard upper formation at an average ROP of 4.7 m/h. Throughout the run, inclination and azimuth were held at 45.79° and 222.36°, respectively, per the well plan, with just 33 m spent sliding. After reaching the lower formation at 3,673 m MD, a trip was made to change back to the BHA with the RSS and PDC bit because the formation was softer than the upper one.



The impregnated hybrid bit is designed to drill through mixed lithologies at maximum ROP, reducing trips to change bit types.



Stabilizers helped the Neyfor turbodrill hold the planned inclination and azimuth throughout its 250-m run.

slb.com/Neyfor