

Starc Limited Saves USD 3.5 Million Using BHA with High-Abrasion-Resistance PDC Drill Bit

Integrated drillbit design platform enables BHA to drill additional 220 m and complete section 3.5 days ahead of schedule

CHALLENGE

Avoid NPT while drilling a 12¼-in vertical borehole through interbedded claystone and sandstone formations with large differences in unconfined compressive strengths (UCS), causing impact damage and wear to the PDC cutters.

SOLUTION

Use IDEAS* integrated drillbit design platform to develop a BHA solution comprising SHARC* MDSi716 high-abrasion-resistance PDC drill bit and PowerPak* steerable motor with 0.78° bend, and establish recommendations for optimal operating parameters.

RESULTS

- Drilled 1,140.2 m in one run at high average ROP of 38.4 m/h.
- Drilled 220 m more than planned, completing section 3.5 days ahead of AFE plan.
- Saved operator USD 3.5 million.

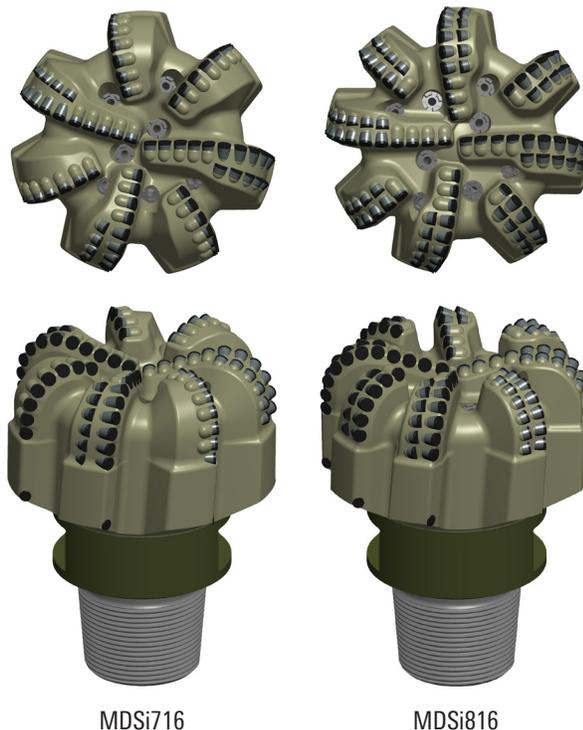


Complex formations in deep water complicate run

Starc Limited was planning to drill a 12¼-in vertical borehole through highly interbedded claystone and sandstone formations in deep water off the coast of Equatorial Guinea in West Africa. The high UCS and the sandstone's quartz content resulted in impact damage and wear on PDC bits in nearby offset wells. Therefore, the operator needed a bit that can complete the section in one run while minimizing shock and vibration to the cutting structure and critical BHA components.

Aggressive PDC drill bit and steerable motor achieves higher ROP

Using the IDEAS drillbit design platform, Smith Bits recommended a BHA comprised of a SHARC MDSi716 bit with seven blades and a PowerPak steerable motor with 0.78° bend. Operating parameters for optimal bit and motor speed were determined by producing a formation description based on log data from offset wells, most of which used SHARC MDSi816 bits with eight blades. However, based on simulations of various surface rotary and WOB combinations and its influence on vibration and torque levels, the MDSi716 bit design proved more dynamically stable in varying lithology. It also had a higher side rake angle and lower back rake angles, which increased bit aggressiveness to achieve higher ROP while reducing shock and vibration. The steerable motor enabled the bit to spin at a higher rpm to increase ROP, and allowed corrections to be made if the well deviated from the vertical direction.

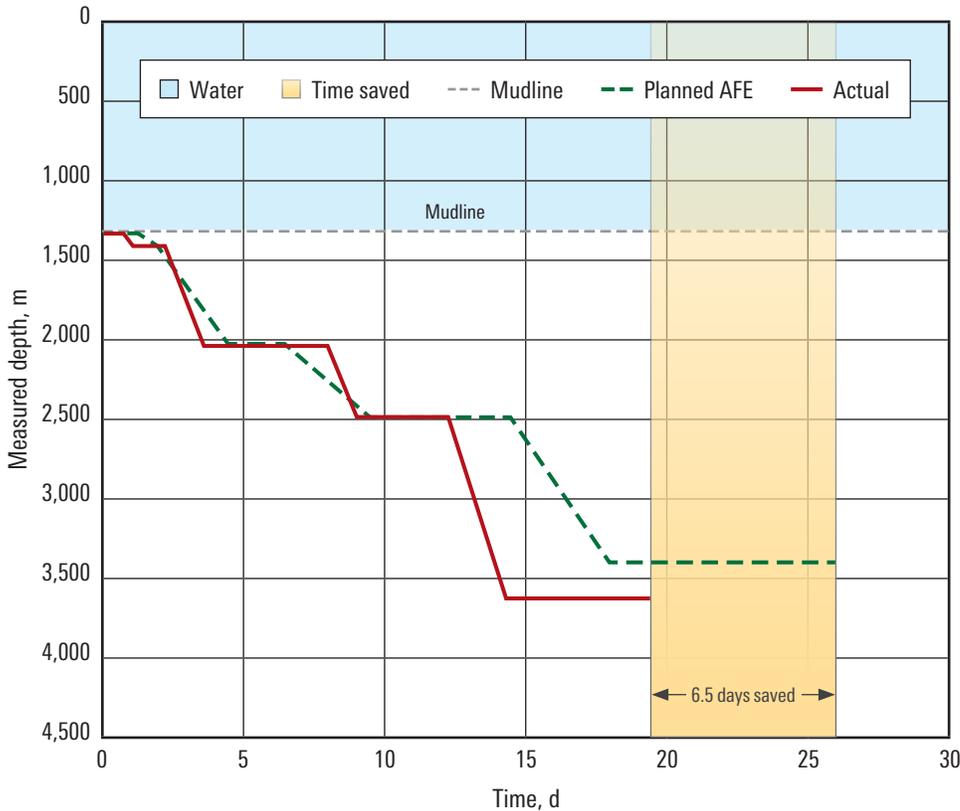


The SHARC MDSi716 bit was predicted by the IDEAS integrated design platform to be more dynamically stable with the ability to achieve higher ROP than the benchmark MDSi816 in this application.

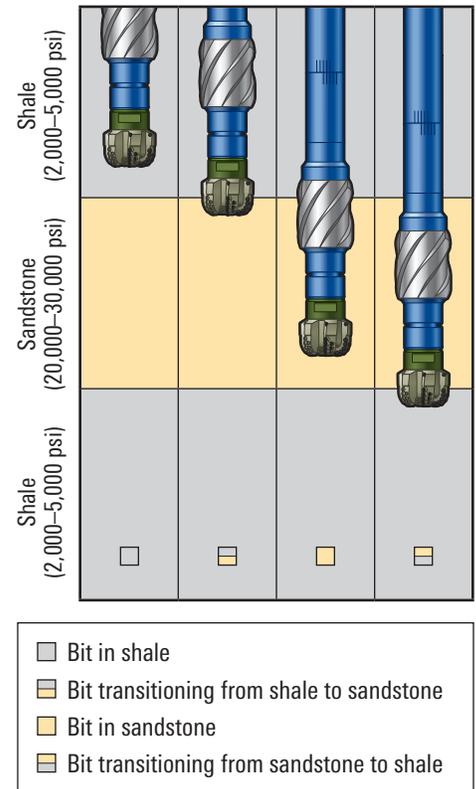
MDSi716

MDSi816

CASE STUDY: BHA in West Africa enables cost savings of USD 3.5 million



The BHA with SHARC MDSi716 bit and PowerPak motor with 0.78° bend completed the section 3.5 days ahead of AFE plan, saving the operator USD 3.5 million.



To optimize operating parameters and mitigate vibration, simulations were run in four application scenarios.

Optimized BHA drills longer distance in fewer days, saves operator USD 3.5 million

The BHA consisting of SHARC MDSi716 bit and PowerPak motor with 0.78° bend drilled 1,140.2 m in one run at an average ROP of 38.4 m/h. The bent motor BHA maintained verticality throughout the section without any corrections, and had a 0.08° difference in inclination from the beginning to the end of the run. The section was drilled without any significant shock or vibration, retaining the bit's good cutter condition.

The optimized BHA and operating parameters enabled Starc Limited to drill an additional 220 m while still completing the 12¼-in hole section 3.5 days ahead of schedule, resulting in cost savings of USD 3.5 million. Starc Limited used Smith Bits to drill the entire well, which was completed 6.5 days ahead of AFE plan, saving the operator more than USD 6 million.

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SMITH BITS

A Schlumberger Company