

Integrated Drilling System Saves Trip for Noble Energy in Deepwater Gulf of Mexico

BHA with dual reamers avoids dedicated rathole cleanout

CHALLENGE

Minimize the time required to enlarge rathole in a 12¼-in by 14½-in hole section of a deepwater well.

SOLUTION

Design an integrated drilling system incorporating a 12¼-in MDi716 PDC drill bit, PowerDrive X6* rotary steerable system (RSS), Rhino XC* on-demand hydraulically actuated reamer, and Rhino XS* hydraulically expandable reamer.

RESULTS

- Drilled the 1,221-ft section at average ROP of 84.5 ft/h.
- Enlarged rathole without making a dedicated run.
- Saved an estimated 16-hour round trip to surface.



Avoid extra run in deep water

Hole enlargement while drilling is a common practice in deepwater wells in the Gulf of Mexico that typically results in a rathole of more than 100 ft at TD. In deepwater drilling, the reamer is positioned above the long, complex LWD string so that the enlarged borehole will not degrade the accuracy of formation evaluation measurements.

To open the long rathole to the larger borehole size, the usual practice is to trip the drilling BHA back to surface and perform a dedicated cleanout run, which adds a day or more to the well construction timeline. Noble Energy wanted to avoid an extra cleanout run in the 12¼-in by 14½-in hole section of a well it was drilling in deepwater Gulf of Mexico.

Design a dual-reamer BHA

Schlumberger designed an integrated dual reamer drilling system for this operation. A Rhino XS hydraulically actuated reamer was positioned above the Schlumberger MLWD tools, and a Rhino XC on-demand reamer was positioned below the tools and above a PowerDrive X6 RSS and MDi716 PDC drill bit from Smith Bits, a Schlumberger company. Optimal reamer placement and surface operating parameters were determined by modeling the drilling system in i-DRILL* engineered drilling system design. The directional response of the PowerDrive X6 RSS was also modeled to ensure that placement of the Rhino XC reamer did not interfere with the directional capabilities of the RSS.

During drilling of the section, the blocks of the Rhino XC reamer were locked at ⅛-in undergauge from the 12¼-in bit size to avoid interfering with the drilling operation. The Rhino XC reamer cutter blocks were special cement cleanout blocks with a minimum number of cutters on the gauge surface that would be passive when retracted during normal drilling mode.



- 12¼-in to 14½-in Rhino XS reamer
- 12⅝-in stabilizer
- 8¼-in pony collar
- sonicVISION825* tool
- TeleScope* 825 telemetry-while-drilling service
- StethoScope* 825 formation pressure-while-drilling service
- arcVISION825* array resistivity compensated service
- Rhino XC 11625 reamer
- PowerDrive X6 RSS
- 12¼-in MDi716 PDC drill bit

Using this integrated drilling system incorporating two reamers, Noble Energy avoided a time-consuming rathole cleanout run.

CASE STUDY: BHA with dual reamers enables Noble Energy to avoid dedicated rathole cleanout run



The Predator cutter block (left) features an active gauge cutting structure, while the Rhino* cement cleanout block (right) features a passive gauge cutting structure.*

In this configuration, the reamer acted as the control stabilizer in the drilling system, providing a pivot point for the PowerDrive X6 push-the-bit RSS. Upon reaching TD, the BHA was tripped back to the depth where the Rhino XC reamer would be above the 12¼-in pilot hole, and the pumps were cycled to activate the reamer blocks so the reamer would enlarge 178 ft of the rathole to 14½ in.

Save estimated 16 hours of rig time

The integrated system drilled the 1,221-ft section in 14.5 hours at an average ROP of 84.5 ft/h while opening the 12¼-in pilot hole to 14½ in with the Rhino XS reamer. After reaching TD, the Rhino XC reamer enlarged the rathole from 12¼ in to 14½ in only 3.5 hours, eliminating the need to perform a dedicated rathole cleanout run after tripping the drilling BHA back to surface. This procedure saved Noble Energy an estimated 16 hours of rig time.

Contact your local Schlumberger representative to learn more.

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