MATURE FIELDS

CASE STUDY

Operator Successfully Runs 5 ¾-inch Slim-Hole Drilling Operation with Geo-Pilot® RSS System

INNOVATIVE SOLUTION DRILLS ONE OF THE LONGEST SLIM SECTIONS (5,500 FEET) ON NORWEGIAN CONTINENTAL SHELF

NORWEGIAN CONTINENTAL SHELF, NORTH SEA, NORWAY

CHALLENGES

- Expandable liner with an internal diameter of 5.795 inches, forcing the BHA to be very slim
- On very short notice, design the RSS and M/LWD tools that had to be compatible with 5¾-inch hole
- Ensuring that 5-inch liner in long slim hole section was successfully run in the final section

SOLUTIONS

- Newly designed 5200 Geo-Pilot® RSS with modified M/LWD equipment to drill and log 5¾-inch hole
- DES and ADT® specialists to provide drilling optimization
- StrataSteer® 3D geosteering service and MaxBHA™ Software to model and monitor the stabilization of the 5-inch liner run to TD
- Global capabilities of Halliburton services provided wide range of specialized equipment that could be globally sourced and mobilized on very short notice

RESULTS

- First global 5¾-inch hole size run with Geo-Pilot® RSS
- Drilled 5,510 feet (1,679 meters) from 14,900 feet (4,542 meters) to 20,500 feet (6,248 meters) TD in one run in 236 circulating hours
- One of the longest slim-hole runs on the Norwegian Continental Shelf
- In just three days, Halliburton designed and mobilized a 5¾-inch drilling system to achieve operator's goals for this well
- Liner ran without issues and followed the correct wellpath

OVERVIEW

In a mature field on the Norwegian Continental Shelf of the North Sea, an operator had attempted twice to drill a new extended-reach drilling (ERD) wellbore with a 2.05 measured depth (MD) to true vertical depth (TVD) ratio that resulted in the bottomhole assembly (BHA) becoming lost in hole above the reservoir. The operator engaged Sperry Drilling to meet the goal of drilling and geosteering a 5¾-inch section with a complex BHA through the reservoir to the hydrocarbon reserves, with the need of a quick turnaround solution. In only three days, Sperry Drilling designed and mobilized a drilling system engineered to address the reservoir challenges and meet the operator's goal. By partnering with Sperry Drilling, the operator drilled more than 5,500 feet (1,676 meters) in one run, and achieved its goal of reaching the hydrocarbon reservoir without incurring nonproductive time (NPT).

WELLBORE'S NARROW OPENING REQUIRES SLIM DRILL BIT AND AN INNOVATIVE RSS SOLUTION

In the previous operation of this ERD well, an expandable liner had been set to address formation instability. This expandable liner created a challenge, since the liner's internal diameter was only 5.795 inches, which is extremely narrow. The wellbore's narrow opening required a slim-version drill bit and the rotary steerable system (RSS) BHA also had to be engineered to successfully pass through this narrow opening in order to reach total depth (TD). An opening this narrow presented quite a challenge because the smallest wellbore size that Sperry Drilling had ever drilled with an RSS BHA was 5⅞ inches in diameter. This would be the first time globally that Sperry Drilling had ever drilled with an RSS BHA in such a small 5¾-inch wellbore size. Another challenge for this operation included designing an RSS BHA with the right size of logging-while-drilling (LWD) stabilizers that would still be reliable and capable of logging the section. Additionally, the Sperry Drilling team had to mobilize with this newly engineered solution within a very short time frame. Not only did the operator needed to drill and log this small-hole section, but the operator also needed to run a 5-inch liner to complete the well.

SPERRY DRILLING DELIVERS SPECIALIZED DRILL BIT AND SLIM BHA TO DRILL PAST NARROW OPENING

Sperry Drilling applied the strength of its worldwide network of products and expertise to provide a solution for this narrow opening. In only three days, the Sperry Drilling team designed and mobilized a drilling system, including a 5¾-inch Halliburton polycrystalline diamond compact (PDC) drill bit that was flown in from another location. The Geo-Pilot® RSS parts required specifically for the 5¾-inch hole size were brought in from the U.S., and LWD stabilizers were modified locally.

The operator achieved one of the longest runs on the Norwegian Continental Shelf with a slim RSS, and was the first to drill a 5¾-inch wellbore with a 5200 Geo-Pilot® RSS.

All products and services were hand-selected for their suitability for this specific application. With the Halliburton 5¾-inch drill bit, Sperry Drilling used a reamer to open the hole to a 6½-inch diameter.

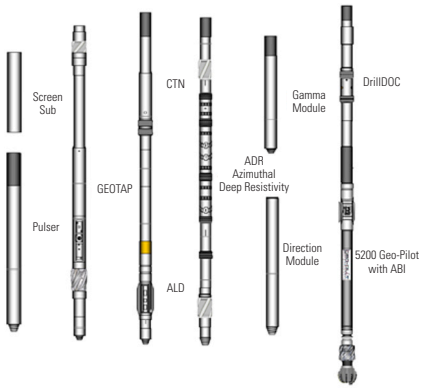
In addition to the 5200 Geo-Pilot RSS, Sperry Drilling used quad-combo LWD tools to provide all the measurements needed while drilling – including azimuthal density, neutron porosity, gamma, azimuthal deep resistivity, pressure while drilling (PWD), downhole weight and torque on bit, and formation pressure points from ALD™, CTN™, DGR™, ADR™, PWD, DrillDOC®, and GeoTap® sensors respectively.

Sperry Drilling also included the Drilling Engineering Solutions (DES) with Applied Drilling Technology (ADT® service) specialists from an onshore operational center to monitor and advise on drilling operations and parameters in real time for improved drilling efficiency. The optimization team also used the StrataSteer® 3D geosteering service and MaxBHA™ software in order to model and advise on the stabilization of the 5-inch liner run to TD.

FOR THE FIRST TIME EVER, OPERATOR REACHES TO TD IN A 5¾-INCH HOLE WITH A GEO-PILOT® RSS AND RUNS THE 5-INCH LINER WITHOUT NPT

Through its partnership with Halliburton Sperry Drilling, the operator reached the targeted reservoir – meeting the goal by successfully drilling a new ERD well that reached 20,500 feet (6,248 meters) TD. The Sperry Drilling team met the challenge of the narrow liner opening and then drilled 5,510 feet (1,679 meters) from 14,900 feet (4,542 meters) to 20,500 feet (6,248 meters) TD in one run in 236 circulating hours. The operator achieved one of the longest runs on the Norwegian Continental Shelf with a slim RSS, and was the first to drill a 5¾-inch wellbore with a 5200 Geo-Pilot® RSS.

By successfully drilling and running the 5-inch liner to TD in this challengingly small hole size, the operator will now be able to produce from this well that may have not been possible without collaboration and teamwork from Sperry Drilling to engineer and design the BHA. Sperry Drilling found an innovative way to move beyond the limitations of a narrow wellbore and to deliver a productive well for the operator. Whenever there is a need to drill a 5¾-inch slim section, Sperry Drilling has an optimal solution – proving that, with collaboration and expertise, Sperry Drilling can provide suitable drilling solutions for complex challenges.



The 5¾-inch 5200 Geo-Pilot® RSS BHA has drilled one of the longest slim sections on the Norwegian Continental Shelf – a global "first" for this newly engineered system.

Item	Description	Length (ft)	Total Length (ft)	Sensor Distance (ft)
1	PDC FXD64	0,8	0,8	
2	DBS Sleeve	0,9	1,7	
3	5200 Geo-Pilot - ABI	16,4	18,0	10,6
4	4 3/4" DrillDOC	10,1	28,2	20,2
5	4 3/4" Direction Module	9,2	37,3	32,2
6	4 3/4" Gamma Module	9,3	46,6	41,9
7	5 5/8" In line Stabilizer	3,6	50,2	
8	4 3/4" ADR	27,2	77,4	63,6
9	4 3/4" ALD	14,3	91,7	81,5
10	4 3/4" CTN	11,1	102,8	97,4
11	4 3/4" GeoTap	24,0	126,8	109,9
12	5 5/8" In line Stabilizer	3,6	130,4	
13	4 3/4" Pulser	11,3	141,7	
14	4 3/4" Downhole Screen	7,2	148,9	
15	4 3/4" x 6 1/2" Reamer	21,2	170,1	153,7
16	Pony Collar	10,1	180,2	
17	4 3/4" AST	16,9	197,0	

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