

CHALLENGES

- » Tackle the British Mile Challenge of drilling one mile in 24 hours
- » Drill through hard formations with several hard stringers
- » Sidetrack the well and navigate a complex 3D 12¼-inch section with drops, builds, and turns
- » Minimize vibration at high ROPs
- » Operate the world's first hybrid rig

SOLUTIONS

Combined expertise and technology from Halliburton, Wintershall Dea, and Seadrill to deliver:

- » Extensive modeling/testing of various options and properties for the BHA, drill bit, and drilling fluid
- » Integrated drilling solutions, featuring:
 - GeoPilot® Dirigo™ and GeoPilot Duro™ RSSs – for optimal geosteering control at the highest possible ROP, without inducing damaging vibrations
 - GeoTech® GTD76MHO drill bit – a next-generation fixed cutter bit with leading-edge PDC technology to drill farther and faster
 - INNOVERT® mud – a best-in-class drilling fluid selected for maximized hole cleaning
 - AFO monitoring service, along with the BaraLogix® DRU for real-time fluid properties analysis
 - Baroid® Separation Solutions™ (BSS) service – to provide a world-class cuttings handling system on board the rig

RESULTS

- » Achieved client's goal of drilling one mile (1609 meters) within 24 hours
- » Controlled vibration, even with maximum ROP registered at 1,358 feet/hour (414 meters/hour)
- » Drilled difficult section in just one run due to rugged drill bit
- » Completed fastest 12¼-inch section in a development well in the field
- » Reduced cost of power and minimized environmental impact by using hybrid, battery-operated rig

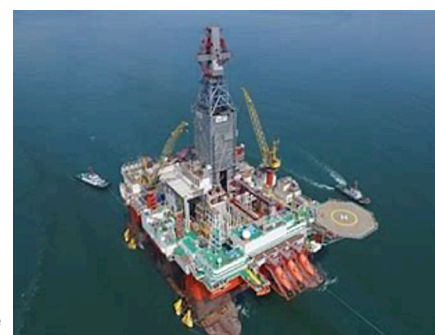
Wintershall Dea Sets Company Record for the British Mile Challenge at Maria Field

ENGINEERED DRILLING SOLUTION HELPS OPERATOR ACHIEVE GOAL OF DRILLING ONE MILE IN 24 HOURS

NORWEGIAN CONTINENTAL SHELF

OVERVIEW

Wintershall Dea, Europe's leading independent natural gas and crude oil company, was drilling production wells in the Maria field offshore Norway, where its team had a desire to meet the British Mile Challenge (BMC) of drilling one mile (1609 meters) in 24 hours. Drilling in the harsh environment of the Norwegian Sea, the operator was also up against a complex well trajectory that would require precise directional control to navigate through drops, builds, and turns in the 12¼-inch section through a mix of soft to tough formations. The newly installed West Mira hybrid rig presented unique challenges, further complicated by several hard stringers and hard formations, which, in the past, had caused tool failures and vibration, affected bit performance, and led to multiple trips in this location. Since the BMC had not been met in the previous drilling campaign, the team was highly motivated to achieve this goal.



The West Mira ultra-deepwater, semi-submersible rig is positioned offshore Norway in the Maria field of the Norwegian Continental Shelf.

USING A ONE-TEAM APPROACH TO IMPLEMENT A METHOD SELECTION STRATEGY

To achieve their BMC goal, the main players needed to be aligned as "one team" comprising Halliburton, Wintershall Dea, and Seadrill.

A method selection strategy was implemented to optimize the well plan. This involved extensive modeling to determine the most durable, high-performance bit (with a redesigned base from a prior campaign), along with a custom bottomhole assembly (BHA) designed expressly for this application. Efficient hole cleaning via the right oil-based drilling fluid was another big concern that had to be modeled in advance to handle the high rates of penetration (ROPs) expected at the start of the run – more than 985 feet/hour (300 meters/hour).

Collaborative, real-time decision making among stakeholders was critical to the job's success. To ensure excellence all the way through engineering and execution, Halliburton remained fully engaged, monitoring the drilling operations both offshore and remotely from onshore offices. This helped the Wintershall Dea team reach its ambitious goal.

“Well done by everyone to achieve the British Mile Challenge. Now we go for the 2000-meter challenge!”

– Nils Petter Norheim,
Head of Drilling & Wells,
Wintershall Dea

ENGINEERED DRILLING SOLUTION HELPS ACHIEVE BMC GOAL AND SET RECORD

Several different Halliburton domains and technologies, together with Wintershall Dea and Seadrill expertise, were leveraged to accomplish this BMC goal:

Halliburton – Integrated multidisciplinary knowledge and proven tools, as follows:

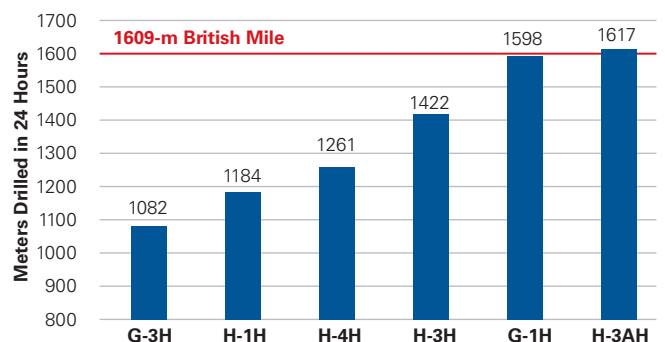
- » Engineered and modeled BHA and bit configurations, using DrillingXpert™ software to design the well plan (including MaxBHA™ software for planning and real-time modeling)
- » Designed most appropriate bit for the job, based on experience in previous campaigns; utilized GeoTech® GTD76MHO drill bit
- » Selected the Geo-Pilot® Dirigo™ and Geo-Pilot Duro™ rotary steerable systems (RSSs) for their ability to receive and monitor real-time, at-bit measurements and tool status information; along with the Applied Drilling Technology (ADT®) service, which was rehearsed prior to execution
- » Optimized oil-based mud, mud (INNOVERT® drilling fluid) by modeling cuttings load, and by considering the expected instantaneous high ROP, mud weight, and rheology strategy (and reviewing/approving everything prior to use)
- » Mixed and pumped a 2.03-SG G-cement KOP tailored with high compressive strength development to optimize the kickoff
- » Installed the BSS world-class, high-capacity cuttings handling system, the biggest installation ever done by Halliburton Worldwide called BaraStream®. Having eight electrical compressors, 3 sets of twin blowers and 12 HCB tanks, connected to a dedicated vessel by three cuttings transfer hoses to be able to transfer with rates up to > 90 MT/h, allowing to drill at ROP >200m/h in a 17½-inch section
- » Provided Applied Fluids Optimization (AFO) monitoring service, together with the BaraLogix® Density and Rheology Unit (DRU) for real-time fluid properties analysis

Wintershall Dea – Set a “one team” tone and employed a method selection strategy for all engineering decisions. Additionally, provided wired drillpipe for faster streaming of DrillDOC® sensor data with better drilling mechanics assessment

Seadrill – Provided offshore drilling services, including a semi-submersible, first hybrid rig, fulfilled in an environmentally safe and cost-effective manner

Halliburton was just as committed as Wintershall Dea to the goal of achieving the British Mile Challenge of drilling one mile in 24 hours. This was the first team in the Maria field to reach that goal, and to even exceed the 1609-meter BMC goal by 8 meters, thanks to the aligned parties and advanced technology tools that were key to engineering a solution of top-notch directional drilling, from start to finish.

The entire operation was monitored in real time to view and control all drilling dynamics that were of utmost importance under such high ROP conditions, especially keeping a close eye on the well trajectory. Another record was set, with this being the second time a Maria field section was drilled in just one run – making this the fastest section to be completed in the field.



This chart shows how the West Mira job (H-3 AH) actually exceeded the 1609-meter British Mile Challenge by drilling 1717 meters in 24 hours.

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