



Organoclay-Free Fluids Enable Operator to Drill and Complete Slim-Profile Well in Record Time

BAROID FLUID SYSTEMS AND AFO SERVICE HELP NARROW ECD WINDOW IN MATURE WELL

OFFSHORE NORWAY

CHALLENGES

- » Drill a slim-profile, extended-reach well within AFE on short notice
- » Clean hole in the 17.5-inch x 20-inch, 16-inch, and 12.25-inch sections
- » Manage narrow drilling window in the lower overburden
- » Minimize fluid losses while cementing and drilling
- » Mitigate unpredictable reservoir pressures due to nearby water injectors and depleted reservoir zones

SOLUTIONS

- » INNOVERT® NS non-aqueous fluid for shelf drilling and environmental compliance with Norway
- » BaraECD® high-performance non-aqueous drilling fluid for narrow pressure margin drilling and completions
- » BaraLogix® Applied Fluids Optimization (AFO) for optimizing ROP and tripping, while reducing downhole losses

RESULTS

- » Reduced downhole pressures and eliminated losses when cementing and running the casing/liner
- » Finished well 10.6 days ahead of AFE for drilling and 15 days ahead of AFE for drilling and completion
- » Contributed to savings of 6 percent below estimated mud cost, despite an unplanned 3-ppg weight increase of the reservoir fluid

OVERVIEW

The operator of a mature oil and gas field on the Norwegian Continental Shelf wanted to drill a slim-profile, extended-reach well through a challenging reservoir formation of Tertiary shale overburden and Cretaceous chalk, with a maximum depth of 119,965 feet (6,085 meters). The operator’s goal was to accomplish this within its budgeted authorization for expenditure (AFE). However, this field was notorious for its hole instability, stringer drilling, packoffs, hole-cleaning issues, losses, and kicks. There were also wells that had been sidetracked in the lower overburden. Unpredictable reservoir pressures further complicated the drilling environment, thus requiring specialized, high-performance fluids and expertise to not only optimize the rate of penetration (ROP), but to also keep downhole fluid loss to a minimum during the drilling and completion stages.

**SAVED
USD 2.8M**

The operator learned of a successful field trial conducted by Baroid, using its high-performance proprietary fluid systems, the INNOVERT® NS and BaraECD® systems, on an adjacent field offshore Norway. This led to instructing the incumbent fluids provider to emulate the Baroid organoclay-free fluids with a flat-rheology system. After the flat-rheology fluid approach failed to produce desired results in the critical lower overburden section, Baroid was requested to provide the services on the next well in place of a long-standing competitor. This also represented a critical first well for Halliburton fluids and BaraLogix® Applied Fluids Optimization (AFO) services to work with the well-known operating company.

FLUID SYSTEMS OPTIMIZE DOWNHOLE OPERATIONS

The combination of INNOVERT NS and BaraECD organoclay-free fluids were ideally suited to the challenging drilling conditions in this field, which included a well temperature of 275°F (135°C). The BaraECD system, in particular, uses the very latest emulsion and polymer technologies to maintain superb rheology and robust, yet fragile, gels. It can be customized to deliver equivalent circulating density (ECD) control based on temperature requirements, environmental restrictions and logistical limitations. The ECD is an important parameter in avoiding kicks and losses, especially in wells that have a narrow window between the fracture gradient and pore-pressure

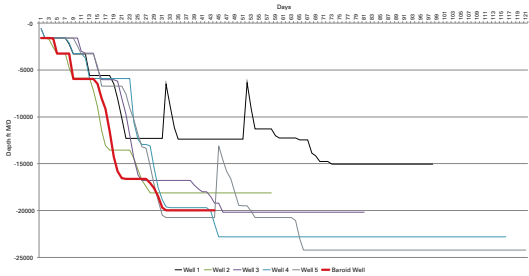


Figure 1 Drilling Time Comparison

Using the INNOVERT® NS and BaraECD® systems, the operator experienced no fluid-related NPT on the well.

gradient. The fragile gel structure and high-temperature rheology improve hole cleaning and cuttings suspension compared to that of a clay-based fluid. In this project scenario, the cold rheology reduced the pressures seen when running the casing/liner and cementing, and no downhole fluid losses were experienced. Furthermore, hole cleaning was not an issue when drilling parameters were reduced as stringers were encountered.

The BaraLogix AFO ROP and tripping optimizations were important factors in streamlining the operations, keeping ROPs to the maximum rate without causing hole cleaning issues. Tripping was optimized to ensure high efficiency without wellbore instability issues. And to ensure successful drilling through the critical lower overburden section, Baroid deployed a local global technical field advisor (GTFA) to the wellsite for three weeks, providing additional support and expertise.

SOLUTION MINIMIZES FLUID LOSS AND PRODUCT CONSUMPTION

The Baroid INNOVERT NS and BaraECD systems incurred less fluid losses and product consumption for the entire well than the competitor's fluid, giving the operator a greater overall cost of ownership. Fluid performance and hydraulic simulations, along with the collaboration between the operator's team and the Halliburton teams (including Sperry Drilling, Cementing, and Drill Bits and Services) helped to deliver the completed well 15 days ahead of the original AFE.

Main Benefits

The operator received the following main benefits from Halliburton drilling fluid technology and expertise:

- » No fluid-related nonproductive time (NPT) on the well
- » No stuck pipe or subsequent sidetracks
- » Seamless delivery on short notice
- » Fastest delivery of an extended-reach well on this field to date
- » Savings of USD 2.8 million, compared to AFE

DFG RT™ Cutting Load Monitoring

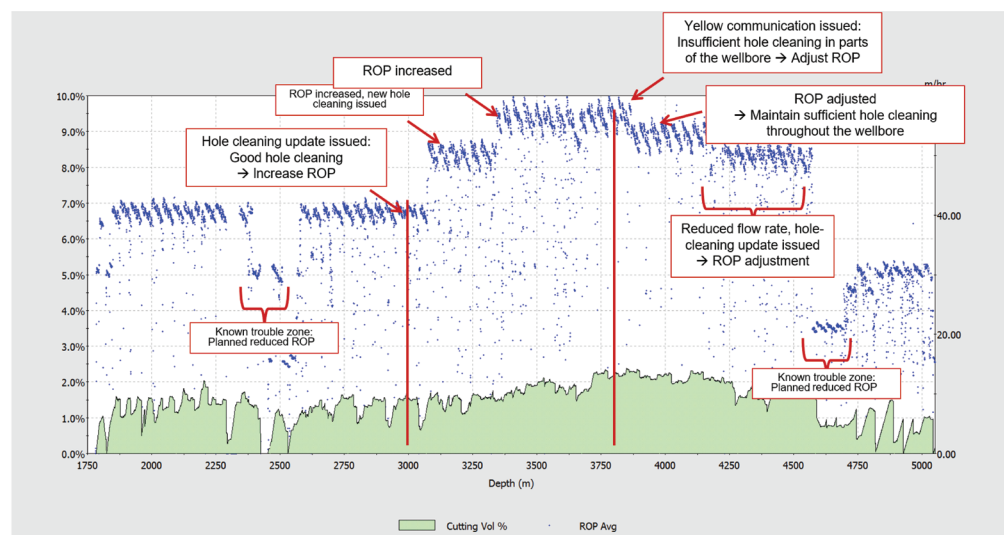


Figure 2 ROP adjustments recommended by BaraLogix AFO services through the use of DFG RT hole cleaning simulations

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