

Baroid Helps Operator in Norway Save US\$679,000 on Offshore Well

SOLUTIONS INCLUDE HIGH-PERFORMANCE NON-AQUEOUS FLUID SYSTEMS AND APPLIED FLUIDS OPTIMIZATION SERVICE

ELDFISK FIELD, NORWAY

CHALLENGES

- » Operator in Norway was planning to drill through highly stressed (deviatoric or stretched) lower-overburden formations above the Ekofisk chalk reservoir
- » Competitor fluid and hydraulic simulation solutions encountered significant fluid losses and often required sidetracks
- » The operator was looking for new ways to reduce NPT and cost

SOLUTIONS

- » Deploy Halliburton Baroid INNOVERT® NS and BaraECD® fluid systems to drill through technically challenging sections of the well
- » Implement Applied Fluids Optimization (AFO) services to model and monitor real-time cuttings transport and optimize running speeds without sacrificing wellbore stability

RESULTS

- » Operator was able to successfully drill to TD with no sidetracks and zero NPT related to hole cleaning
- » Fluid losses were reduced to 619 bbl and operator reached TD 10.6 days ahead of schedule
- » Operator saved approximately US\$679,000 in fluid costs

OVERVIEW

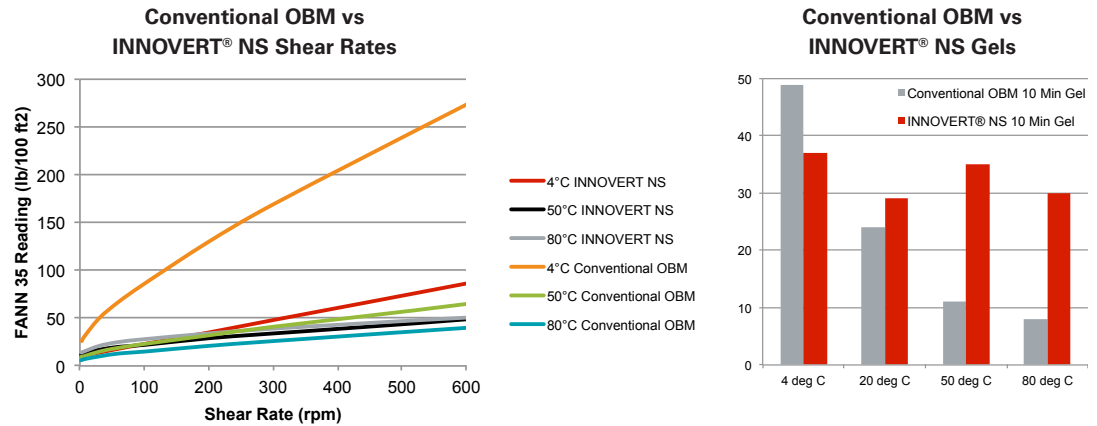
A major operator in Norway was planning to drill through stratigraphically stretched lower-overburden formations above the Ekofisk chalk reservoir. These formations had high risks of wellbore instability, pack-offs, insufficient hole cleaning, whole fluid losses during drilling and cementing, and kicks. Previous wells in the field required sidetracks in the lower overburden sections. The primary operational challenges identified for the new well were hole cleaning in the 13.5-in., 16-in., and 20-in. sections, and equivalent circulating density (ECD) and equivalent static density (ESD) management in the Balder, Sele, Lista, and Våle shale formations.

The operator had a long history of using a competitor's micronized barite and fine-grained barite oil-based mud (OBM) systems, coupled with hydraulic simulations focused on real-time hole cleaning, along with surge and swab calculations, to maintain wellbore integrity throughout the drilling process. However, these solutions encountered significant fluid losses and often required sidetracks to reach total depth (TD). The operator was looking for new ways to reduce both nonproductive time (NPT) and cost due to the increasingly challenging market conditions. The operator was willing to consider alternatives to its existing fluids and hydraulic simulation programs, as long as the proposed solutions included integrated fluids and fluid optimization services.

SOLUTIONS

The Halliburton Baroid team recommended a combination of the BaraECD® high-performance non-aqueous fluid (HP NAF) system, the INNOVERT® NS HP NAF system, and the Applied Fluids Optimization (AFO) service. The BaraECD and INNOVERT NS fluid systems had been used successfully by other operators in nearby offset wells containing similar formations and operational challenges.

The organoclay-free formulations of BaraECD and INNOVERT systems provide unique gel structures that aid in the suspension of solids. This helps reduce pressure fluctuations during transitions from static to dynamic wellbore conditions. Additionally, novel chemistry helps provide consistent and predictable rheology profiles through a range of temperatures, including the swift change from hot downhole conditions to cold seabed temperatures. The INNOVERT NS system was applied to the 17 x 20-in., 16-in., and 8.5 x 9.5-in. sections of the well, while the BaraECD fluid was used in the particularly challenging 12.25 x 13.5-in. and 9.5 x 11.25-in. sections. The BaraECD system was required for the 12.25 x 13.5-in. and 9.5 x 11.25-in. sections due to the extremely tight window between the pore pressure and fracture gradient of the formation.



Simulations for the fluid behavior were conducted by Baroid personnel, with real-time modeling and monitoring provided by the AFO specialists. Accurate modeling of downhole rheology and compressibility of the drilling fluid was used for front-end planning and real-time simulation of tripping schedules, hole-cleaning performance, and ECD management. These simulations can be performed for dynamic, static, and even transient thermal conditions (cooling) in order to accurately model ECD and ESD.

Real-time simulations performed in Drilling Fluids Graphics Real-Time (DFG RT™) software allowed finger-printing of the well operations to help identify trend deviation and enhance early drilling event detection and avoidance. This action helped the Baroid team accurately assign ECD contributions to specific factors in the wellbore. The AFO service offered functionality that exceeded the previous competitor solution by providing beginning-to-end cuttings transport modeling, with tracking of solids throughout the wellbore. Baroid personnel leveraged both Drilling Fluids Graphics (DFG™) and DFG-RT software to maintain hole cleaning; control ECDs; and model pipe running speeds to optimize drilling performance, hydraulics, fluid performance, and tripping schedules.

RESULTS

The combined solution of INNOVERT NS and BaraECD fluid systems with the AFO service allowed the operator to drill to TD with significantly reduced fluid losses and no required sidetracks. Wellbore stability was maintained while drilling and running liner and casings. There were zero reports of nonproductive time (NPT) associated with hole cleaning. Additionally, the real-time monitoring of hydraulics helped the Baroid team reduce product consumption and additive use by providing a clear picture of fluid behavior during treatments.

Baroid’s integrated solution helped the operator reduce fluid losses to 619 bbl and reach TD 10.6 days ahead of the planned schedule. Previous wells in the same field that were drilled with competitor solutions experienced fluid losses of 785 bbl, 3,632 bbl, and 2,206 bbl, and each well required a sidetrack to reach TD. Baroid’s comprehensive package of INNOVERT NS fluid, BaraECD fluid, and the AFO service significantly outperformed competitor solutions, helping the operator avoid a potential sidetrack and saving approximately US\$679,000 in fluid costs on a challenging offshore project.

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