

Case study: Offshore, Timor Sea

Customized fluid solution boosts drilling efficiency, maintains wellbore stability, saves \$220k USD in material costs

An operator required a customized fluid solution for drilling an offshore well through multiple depleted reservoir intervals with up to 2,500psi overbalance. The ideal solution must help meet the operator's overall objective to efficiently drill and case each interval with minimal fluid losses and sustained hole stability.

Baker Hughes proposed a unique solution combining the PERFFLOW™ CM reservoir drill-in fluid (DIF) with the MAX-BRIDGE™ advanced bridging solution.

Using a specialized selection of bridging agents, the combined system helps seal off permeable formations. The system also improves drilling efficiency by reducing stuck pipe risks, minimizing induced losses, providing effective filtration control, and enhancing rates of penetration (ROPs).

Collaborating on the optimal bridging solution

The initial MAX-BRIDGE formulation included several lost circulation and wellbore strengthening materials: NANOSHIELD™ wellbore sealing polymer, LC-LUBE™ synthetic graphite particulate, and various grades of calcium carbonate. In collaboration with the operator, Baker Hughes thoroughly tested this formulation in its own local and regional laboratories as well as in a third-party lab.

To further optimize the bridging package to suit reservoir conditions, the operator proposed adding a third-party bridging additive to the

formulation. Baker Hughes instead proposed adding its CHEK-LOSS™ lost circulation material (LCM), a premium cellulosic material proven to arrest lost circulation challenges ranging from seepage to major fluid losses.

Baker Hughes tested the CHEK-LOSS material and third-party product side-by-side in a permeability plugging apparatus (PPA) designed to evaluate fluid losses and spurt losses under filtration conditions that approximate downhole conditions. Both products performed well in the PPA, but the CHEK-LOSS LCM's lower unit cost translated to a \$220,000 USD savings on bridging additive for the operator's wells.

Drilling stable sections with no losses

Based on the positive lab results, the operator deployed the PERFFLOW CM DIF/MAX-BRIDGE bridging solution with the CHEK-LOSS LCM while drilling two depleted sections of its next offshore well. The novel bridging solution helped drill the first section, a 12¼-in. interval, with an overbalance of between 600 to 2,154 psi (4.14 to 14.85 MPa).

The same solution successfully drilled an 8½-in. interval with an overbalance of 718 to 1,144 psi (4.95 to 7.89 MPa).

Baker Hughes field technicians added bridging agents periodically throughout the drilling and formation pressure-while-drilling (FPWD) sampling program. This practice helped compensate for attrition of particles, both downhole and at the

Challenges

- Keep wellbore within multiple reservoir targets with overbalance up to 2,500 psi
- Drill both 12¼-in. and 8½-in. intervals with minimal fluid losses and nonproductive time
- Deploy bridging solution on rig with small footprint and inadequate surface solids control system

Results

- Drilled through the 12¼-in. and 8½-in. depleted reservoir intervals in a single bit run and with no losses
- Obtained 48 FPWD samples compared to the 9 planned samples, all while maintaining hole stability
- Saved operator approximately \$220,000 USD with a lower cost, fit-for-purpose bridging additive
- Avoided HSE incidents and fluids-related NPT

surface. As a result, neither section recorded any wellbore instability issues or fluid losses during drilling.

While the original plan called for taking nine FPWD samples while drilling, the stable wellbore created with the optimized PERFFLOW CM DIF/MAX-BRIDGE solution allowed the operator to take 48 FPWD samples. The high-quality wellbore also helped ensure efficient running and cementing of both the 9⁵/₈-in. casing and 7-in. liner, with no hole stability issues or losses.

