Case study: Offshore, Gulf of Thailand

BRIDGEFORM system strengthens wellbore to avoid mud losses and reach target depth

An operator drilling multiple wells through a severely depleted, 4,800 ft (1463 m) reservoir section faced wellbore stability challenges that hindered well productivity. The drilling mud weights ranged from 9.2 lb/gal to 14.5 lb/gal, but the depleted section had a 6.0 lb/gal to 9.5 lb/gal equivalent mud weight pore pressure. The resulting 3,000 psi to 4,000 psi overbalance led to frequent lost circulation events and total mud losses.

The operator tried sealing off microfractures using a competitor's lost circulation material (LCM). But the product could not prevent significant fluid losses through the depleted zone, forcing the operator to stop drilling, short of target depth (TD). In addition, they lost the production below the depleted zone.

The operator asked Baker Hughes to develop an alternative LCM and wellbore strengthening solution that would:

- Reliably remediate lost circulation
- Improve drilling efficiency to TD
- Maintain mud weight with minimal additional treatment required during drilling
- Leave the wellbore in excellent condition for subsequent wellbore logging operations

Leveraging a proven wellbore strengthening solution

Baker Hughes drilling and completions fluids (DCF) experts worked with the operator to collect and analyze formation data for the 4,800 ft depleted sand section.

Based on this analysis, the DCF experts proposed the Baker Hughes BRIDGEFORM™ single-sack wellbore strengthening system. While BRIDGEFORM had never been used in a Gulf of Thailand well, the system is a field-proven bridging solution for highly permeable zones with high differential pressures.

Designed to seal off permeable formations, the system improves drilling efficiency by reducing stuck pipe risks, minimizing induced losses, providing filtration control, and enhancing rates of penetration (ROPs).

The formation data served as inputs for BRIDGEFORM qualification testing and modeling to predict the equivalent circulating density (ECD) and drilling parameters for field testing.

Efficiently reaching TD to maximize production

With the parameters set, operations continued through the depleted zone. The drilling crew pumped a 30 bbl pill containing 40 ppb of BRIDGEFORM through the drill string at an initial circulation rate of 140 gpm. The pill effectively stopped fluid losses into the formation.

To improve efficiency and shorten time to TD, the rig crew increased the circulation rate to 160 gpm. The BRIDGEFORM system continued to effectively seal off the formation and prevent fluid losses at this higher rate—without plugging the rig

Challenges

- Depleted sand formation of 4,800 ft (1463 m) TVD
- Total fluid losses forced operator to stop drilling wells, short of TD
- Actual production rates were well below plan

Results

- Avoided LCM plugging on rig equipment and BHA while circulating
- Drilled to planned TD, providing a footage gain of 241 ft (73 m) compared to other LCMs
- Remediated lost circulation to reach entire production zone
- Successfully logged openhole formation with excellent hole condition
- Saved an estimated $53,000 USD in rig and fluid costs by avoiding losses

equipment and bottomhole assembly during circulation.

The performance of the BRIDGEFORM treatment was compared to two other LCMs used in drilling two adjacent wells. This comparison showed that BRIDGEFORM helped more effectively maintain mud costs within the original budget. By consistently improving wellbore integrity and preventing fracture formation, the system minimized the need for on-the-fly adjustments to the mud composition. The operator estimated that by avoiding fluid adjustments and losses, they saved an **estimated $53,000 USD in rig time and additional fluid costs.**

With the losses successfully cured throughout the rest of the depleted zone, drilling continued to TD without incident. The operator confirmed that the first BRIDGEFORM pill prevented further fluid losses.

As a precautionary measure, a second 30 bbl BRIDGEFORM pill was pumped to cure the well at TD and ensure no fluid losses during swab and surge tests of the depleted zone.

Wireline logging of the openhole formation confirmed that the hole was in excellent condition for subsequent completion operations. The tubular was run in hole and set in place per the original completion plan, with no surge effects observed.

The operator was pleased with the performance of the BRIDGEFORM system in this first Gulf of Thailand field trial. The system stabilized the wellbore and maintained a consistent ECD below the formation's fracture threshold.

Compared to previous wells that stopped far short of TD, the BRIDGEFORM-treated well provided an additional 241 ft (73 m) of reservoir access—helping to maximize well production while minimizing fluid costs.

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