**Case study**: Offshore, Gulf of Mexico

# Intelligent fluids solution eliminates instability issues in multiyear drilling campaign, saves $10+ million USD yearly

Wellbore instability challenges raised drilling costs and risks for an operator during a multiyear campaign in the Gulf of Mexico's continental slope Mass Transport Deposits (MTD), which are characterized by highly reactive, unconsolidated formations that are highly susceptible to debris flows, were also found above the pay zone of each planned well. This posed a high risk of wellbore instability and resulting pack-offs, bit balling, downhole losses, and well control events.

Without a reliable means of stabilizing the MTD while drilling, the operator would face these risks along with a high risk of reduced rates of penetration (ROP), multiple unplanned trips, and expensive, time-consuming remedial operations.

Other fluids service companies attempted several drilling fluid systems and specialty products but failed to stabilize the MTD issues consistently. The operator then approached Baker Hughes to provide a wellbore strengthening solution that would consistently stabilize the MTD to increase drilling efficiency and mitigate the wellbore integrity risks.

## Collaborating on the optimal fluid design

Baker Hughes drilling and completions fluids experts analyzed cuttings samples provided by the operator to determine the formation's composition. The team also examined pore pressures, wellbore stability, wireline logs, downhole measurements, and operations summaries from offset wells—all provided by the operator—to generate a comprehensive geomechanical model.

These studies helped predict the safe mud weight windows to control borehole collapse, prevent lost circulation, and permit optimal casing placement.

Additionally, the team evaluated the existing casing and mud weight vs. depth projections to determine if it is sufficient to maintain wellbore stability to TD. A quantitative risk analysis (QRA) was conducted to calculate the effect of uncertainties associated with the model on the predicted mud weights and define how different parameters in the geomechanical model would affect the predicted likelihood of success.

The laboratory analysis confirmed that the formation was highly reactive and dispersible. Without proper inhibition, the unconsolidated sediment in the formation could slide into the wellbore while drilling or tripping out of hole. The cuttings also contained synthetic oil from the competitor's last fluid treatment, which created enough lubricity to further increase the likelihood of the formation sliding into the well.

Based on these results, the operator and Baker Hughes fluids team jointly decided that a proper remedial action would be to minimize drilling fluid invasion into the MTD.

## Delivering wells with predictable performance

Baker Hughes recommended a SYN-TEQ™ synthetic-based drilling fluid system, augmented with

## Challenges

- Reactive, unconsolidated formation
- High risk of bit balling, pack-offs, fluid losses, and formation washouts
- Increased likelihood of unplanned downhole trips, expensive remedial operations

## Results

- Eliminated pack-offs
- Mitigated downhole losses
- Minimized downtime to repair rig equipment
- Reduced drilling time by an average of 9 days per well
- Saved the operator more than $10 million USD in rig costs annually

NANOSHIELD™ wellbore sealing polymer and BRIDGEFORM™ wellbore strengthening system, for the MTD interval. The NANOSHIELD polymer helps seal micro-pores/micro-fractures in a formation to reduce fluid invasion and minimize sediment sliding into the wellbore. The BRIDGEFORM system strengthens the wellbore and reduces fluid losses while increasing lubricity to improve ROPs.

This intelligent fluids solution helped successfully drill 20 wells over the next four years, each of which had at least 4,000 ft (1219 m) of exposure to the MTD.

In these wells, the wellbore instability issues associated with this formation were essentially eliminated. As a result, the operator avoided the costly downtime due to wellbore instability events encountered in previous wells—lowering drilling time by an average of nine days per well and saving >$10 million USD in rig costs annually. Over the course of the drilling campaign, the Baker Hughes team captured lessons learned on the initial wells and optimized the fluids solution for subsequent wells. The overall result: a more efficient and cost-effective drilling campaign in a historically challenging field.