

**Case study:** Development well, offshore Brazil

# First SOLU-SQUEEZ job in ultradeepwater field delivers stable wellbore, curbs 1,000-bbl/hr losses

The operator planned to drill an ultradeepwater development well offshore Brazil, 185 km (115 mi) from the coast of São Paulo state and in water depths of approximately 2050 m (6,726 ft).

The reservoir shares many characteristics with Brazil's pre-salt Santos basin, including a composition of heterogeneous carbonate lacustrine rocks buried to a total depth of 6000 m (19,685 ft) from sea level.

The operator planned to drill the well with five sections using water-based fluids. Specifically, the operator required a drilling fluid designed to help drill an 8½-in. wellbore through the reservoir to target while maintaining borehole stability and avoiding formation damage. Based on previous experience in offset wells, this pre-salt reservoir's geological complexity, high pressure, and elevated temperature (greater than 100°C [212°F]) brought a high risk of fluid losses.

Drilling commenced and the operator experienced many lost circulation events of approximately 100 bbl/hr in a short interval within the reservoir. Baker Hughes Drilling and Completion Fluids (DCF) team supplied heavy lost circulation material (LCM) pills to control these losses. But while drilling the last stand, a lost circulation event of greater than 1,000 bbl/hr occurred, which was too large for the conventional LCM pills to handle.

Baker Hughes DCF specialists proposed an alternative: the SOLU-SQUEEZ™ lost circulation squeeze pill. A high fluid loss, high solids lost circulation squeeze

product, SOLU-SQUEEZ provides effective lost circulation control and excellent bridging and wellbore strengthening performance in reservoir temperatures exceeding 100°C.

## Collaborating on the optimal formulation

While SOLU-SQUEEZ had been widely used to control lost circulation issues in other drilling operations in Brazil, this project marked the first application in this particular ultradeepwater field. As a result, the project required close collaboration and teamwork between the operator and the DCF team.

Beginning with the reservoir information provided by the operator, the DCF laboratory team started designing the optimal SOLU-SQUEEZ formulation. Due to the reservoir's high pressure and heterogeneous carbonate formation profile, the formulation needed a bridging material package that provided the fluid weight and acid solubility required to deliver a superior LCM pill that was compatible with the reservoir.

The DCF team conducted a series of lab filtration tests using slots with different-sized openings and simulating a reservoir overbalance of 500 psi and 100°C. Pill weight and acid solubility were also evaluated to customize the SOLU-SQUEEZ for the reservoir.

## Efficiently stopping losses per the plan

Once the optimal SOLU-SQUEEZ formulation was developed, and with the operator's approval, the

## Challenges

- Drill 8½-in. hole to TD in remote, ultradeepwater well
- Effectively control losses while drilling high-pressure/high-temperature, heterogeneous carbonate reservoirs
- Avoid formation damage risks, maintain borehole stability, and achieve good wellbore quality for subsequent completion operations

## Results

- Cured losses higher than 1,000 bbl/hr
- Eliminated formation damage due to an acid solubility of greater than 91%
- Demonstrated high potential to minimize lost circulation in high-risk reservoirs
- Ensured a high-performance field operation with excellent material logistics and time management

Baker Hughes team began deploying the SOLU-SQUEEZ solution. The well's blowout preventer was closed, and bottomhole pressure was maintained by pumping through the kill line. After the PBL multiple activation bypass system (a Baker Hughes valve) was opened via ball drop, SOLU-SQUEEZ heavy LCM pills were deployed in three separate stages.

- The first 50-bbl pill was pumped and displaced, reducing fluid losses to 110 bbl/hr.
- A second 50-bbl pill was then pumped and displaced, further reducing fluid loss to 45 bbl/hr.

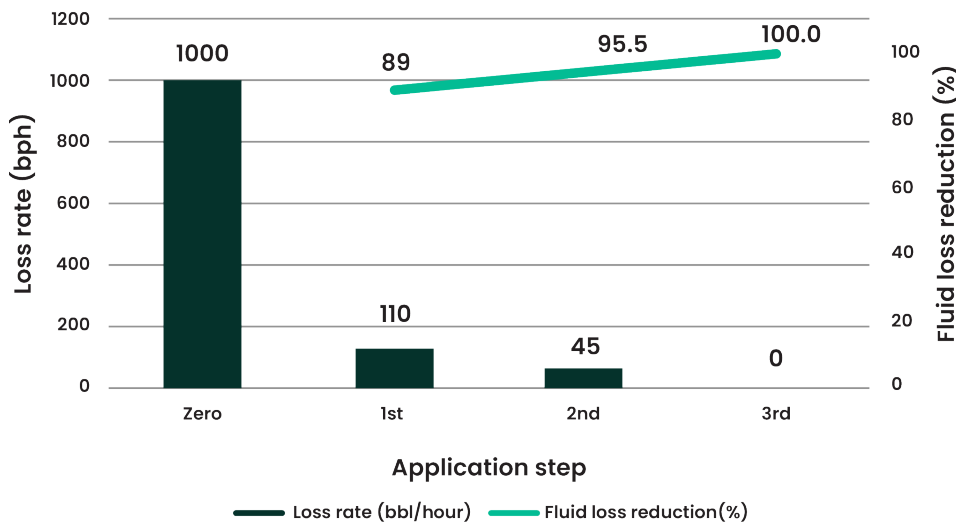
- A third and final 50-bbl pill resulted in the complete curing of fluid losses

The operator considered this first-of-its-kind application of SOLU-SQUEEZ in their ultradeepwater field a success. The bridging material helped deliver a stable wellbore in a challenging deepwater formation while successfully controlling lost circulation events with a loss rate exceeding 1,000 bbl/hr. With all losses stopped, the operator saved time and avoided the extra logistics costs of refurbishing fluid from the shore base.

The operator attributed the serious team commitment—from engineering

design to lab testing to deployment on the rig—as critical to the job's success. Best-in-class operation execution in the field also contributed to a high-quality client experience.

Baker Hughes is taking the lessons learned from this well to further refine the SOLU-SQUEEZ formulation for other operators eager to apply it in their wells.



The three-stage SOLU-SQUEEZ displacement dramatically reduced fluid losses after just the first pill and resulted in the complete curing of losses after the third pill.

