

Case study: Malaysia

OMNIFLOW DIF drills long horizontal wells while MICRO-WASH delivers high production rates

The operator faced frequent clay stability challenges while drilling new wells in a mature Malaysian field. In a recent drilling campaign using a water-based mud (WBM), clay instability resulted in stuck pipe events, drilling only less than 1,640 ft (500 m) in the production zone.

The operator approached Baker Hughes to develop a drilling and completion fluid (DCF) solution to successfully drill long horizontal wells to TD. The solution must also mitigate clay stability issues and allow the well to produce at the desired rates of 1,500 barrels of oil per day (BOPD).

The operator described the wells proposed for this solution to be the most challenging in the field and with the lowest chance of success.

Developing a robust DCF solution

After evaluating the proposed well plan, Baker Hughes DCF specialists proposed the OMNIFLOW™ invert emulsion drill-in fluid (DIF) to drill the long open hole lateral. Designed for drill-in applications containing reactive clays, OMNIFLOW mitigates clay instability and maintains wellbore integrity for subsequent completion operations.

To remove the filter cake prior to bringing the well into production, DCF specialists recommended the MICRO-WASH™ filter cake breaker system—a customized, single-step microemulsion system that is effective in removing DIF filter cakes and remediating in-situ emulsions.

Using permeability data obtained from the operator on previous offset wells, the BRIDGEWISE™ engineering software determined the best bridging package to improve wellbore stability.

Baker Hughes DCF specialists then conducted intensive lab testing on various OMNIFLOW and MICRO-WASH formulation combinations to achieve the expected high return permeability and initial production rate. Test results showed that 9.5 ppg (1.14 sg) OMNIFLOW DIF and 8.5 ppg (1.02 sg) MICRO-WASH breaker in a 3% potassium chloride (KCl) formulations would meet the operator's requirements for the subsequent drilling campaign.

Executing the plan

The drilling campaign comprised four wells, each with a 90-deg inclination, a horizontal production section from 3,281 ft to 4,921 ft (1000 m to 1500 m), and an open hole completion strategy.

Each well was successfully drilled to TD with a 9.5-ppg OMNIFLOW DIF. After running an AICD screen to bottom for the lower completion, the Baker Hughes DCF team circulated the well at least one complete cycle to clear any restrictions at the bottom.

The team then spotted the open hole section with a 10-15% excess of the MICRO-WASH system. After monitoring the well for up to 15 minutes in static conditions, the rig crew picked up the running tool to setting depth and set the hanger. The wellbore cleanup operation then resumed for the upper casing prior to bringing the wells into production.

Challenges

- Safely drill a high-inclination, long-lateral well with a synthetic-based mud (SBM)
- Produce the well at the desired production rate while avoiding clay instability
- Meet expectations for high return permeability and initial production rate

Results

- Successfully drilled long horizontal well with no stuck pipe issues
- Broke filter cake in open hole completion to achieve planned production rate of 1,500-2,000 BOPD
- Maintained hole stability and mitigated clay issues

Meeting production goals

The comprehensive DCF strategy developed by Baker Hughes delivered in terms of both drilling and completion efficiency. OMNIFLOW helped drill the wells with a high rate of penetration and with no stuck pipe events. After spotting the MICRO-WASH breaker, the open hole sections were free of DIF filter cake, with no fluid losses or any indication of formation damage observed.

All wells produced as required, reaching rates of 1,500 – 2,000 BOPD. The operator commended the Baker Hughes team for completing all steps of the campaign per the plan and delivering stable wells that met operational metrics for performance and safety.

