Case study: Malaysia

MICRO-WASH breaker remediates formation damage to boost production in four long-lateral wells

An operator drilling long-lateral wells faced wellbore stability challenges that threatened to increase drilling costs and prevent production from reaching peak levels.

Offset wells drilled through similar sandstone formations failed to meet target production rates. The operator attributed this to near-wellbore damage caused by the oil-based drill-in fluid (DIF) used in the lateral sections of the wells.

Oil-based DIFs are typically used to drill high-angle wells to minimize hole instability, torque, and drag. However, when the pay zone is exposed to oil-based DIFs for long intervals after drilling, there is an increased risk of emulsion blockages, wettability changes, and screen blockage by the DIF filter cake. These risks can diminish reservoir connectivity and limit the well's full production potential.

The operator asked Baker Hughes to develop a DIF/breaker fluid system for its high-integrity horizontal wells, which would be drilled and completed through a sandstone reservoir with a narrow fracture gradient. The fluid system would have to deliver sustained production rates and a return permeability of greater than 80%, while minimizing workovers or interventions.

Developing an optimal drilling and remediation solution

Baker Hughes drilling and completion fluids expert conducted extensive lab testing, including core plugging tests, reservoir-fluid-sensitivity studies, and filter cake cleanup tests.

The formation analysis confirmed that a significant pressure depletion was likely while drilling the lateral through the sandstone reservoir. The Baker Hughes fluid experts recommended a 9.2 lb/gal (1.10 sg) OMNIFLOW™ invert emulsion DIF, which would create a thin, non-permeable filter cake to control fluid losses and maintain wellbore integrity.

After drilling and running the completion string, the team proposed the MICRO-WASH™ filter cake breaker system to bring the well into production. A system based on microemulsion technology, MICRO-WASH has a proven record of dissolving filter cakes, removing near-wellbore emulsion blockages, and leaving the solid surfaces water-wet—all of which help maximize the well's production.

Executing to exceed expectations

The operator agreed to trial the OMNIFLOW/MICRO-WASH fluid treatment in four horizontal wells in the field.

As an extra precaution against fluid losses and wellbore damage, calcium carbonate was added as a bridging agent to the OMNIFLOW DIF formulation.

The OMNIFLOW DIF helped drill the horizontal sections of the four wells safely and efficiently, avoiding stuck pipe issues and nonproductive time. The bridging agent strengthened the wellbore and minimized fluid losses during run in and setting of the completion string.

Challenges

- Reduce risks of wellbore damage to maximize production rates
- Minimize workovers, interventions, and completion costs
- Drill through the horizontal section (inclination between 90° and 91°) while avoiding stuck pipe risks

Results

- Avoided stuck pipe issues and nonproductive time (NPT) while drilling through the challenging, high-trajectory formation
- Exceeded expected production rates by 60%
- Safely and efficiently drilled through the horizontal section and remediated formation damage to improve completions operations

After the completions were set, each well was displaced to the MICRO-WASH. The breaker pills slowly dissolved the filter cakes while remediating any formation damage. They also changed the wettability of the formation rock from oil-wet to water-wet and achieved the desired 80%+ return permeability target.

The operator was pleased with the performance of the OMNIFLOW/ MICRO-WASH fluid treatment in the four wells. Two of the wells met the operator's expected production rate while the other two exceeded the productivity target by 60%. The operator plans to use this combined fluid treatment solution in future horizontal drilling campaigns.

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