**Delaye-d-Reaction Filter Cake Breaker Helps to Achieve Target Production Rates at Half The Reservoir Length**

**Location:** Saudi Arabia, Off-Shore

**OPERATOR’S CHALLENGE** – A major operator in Saudi Arabia was drilling in long, horizontal and dual-lateral wells with bottom hole temperatures reaching 150°F (65 °C). These sandstone reservoir sections were intended to be 3000 feet in the 8 ½-in main bore and 3000 feet in the 6 ½-in lateral.

After encountering tar formations, however, only 1849 ft in the 8 ½-in hole and 833 ft of 6 ½ -in section were able to be drilled, which is less than half the expected reservoir section length. The operator asked Halliburton Baroid fluid experts to help in finding a solution.

**HALLIBURTON’S SOLUTION** – Baroid knew that a properly-designed, oil-based drilling fluid would be needed first. This fluid had to be easy to control, offer minimal formation damage and allow for easy filter cake removal.

Because both the main bore and lateral were much shorter than expected, it was essential to have a breaker that offered thorough coverage and complete filter cake removal to allow for high production rates.

Baroid performed extensive lab testing to develop an invert emulsion drill-in fluid appropriate for the field’s conditions that could be completely removed by Baroid’s N-FLOW™ filter cake breaker.

N-FLOW filter cake breakers allow for a delayed reaction in order to thoroughly place the breaker treatment in the reservoir section. After a prescribed time (depending on temperature), sufficient organic acid is formed in situ, which can, under optimal conditions, completely remove the filter cake and allow for maximum reservoir production.

An acid-responsive surfactant was engineered to change reservoir wettability from oil to water wet after the activation of the N-FLOW breaker treatment.

Production screens were placed smoothly, and the invert, reservoir drill-in fluid was efficiently displaced from the hole using a specially designed displacement pill train. Proper procedures and care during displacement minimized any drill-in fluid residues and premature losses were avoided by not disrupting the filter cake.

The lightly-viscosified N-FLOW treatment was successfully placed into the production screen-by-open hole annulus. Four hours after spotting the N-FLOW breaker, (and just prior to closing the isolation valve) a loss rate of 10/bbl/hr was recorded; further indicating uniform breaker treatment.

The main bore filter cake treatment was placed for ten days, and three days for the lateral. Upon initial production, the well had 100% oil to surface after 3.5 hours with a production rate of 9000 bbl/day.
**ECONOMIC VALUE CREATED** – The productivity index, after being treated with the N-FLOW breaker, nearly doubled from 1.67 b/d/ft to 3.356 b/d/ft; when compared to standard wells (10000 bbl/day for 6000 ft).

The ability to achieve target production rates from only half the length (length limitations caused by tar formations) of the initial target was made possible with the combination of Baroid’s custom-engineered reservoir drill-in fluid and the N-FLOW™ delayed action filter cake breaker.

The result – $2.4 million savings for the operator. The economic benefits were realized due to:

- Less rig time to drill the producing interval
- Reduced reservoir drill-in fluid and fluid chemical costs
- Reduced breaker volume required
- Half the number of production screens required
- Reduced risks when drilling/completing long wells