

“A horizontal production well in a Central North Sea oilfield was to be drilled using a water-base drill-in fluid and completed with premium screens and gravel pack. The reservoir contains reactive shale interbeds that require an inhibitive reservoir drilling fluid, and a non-corrosive filter-cake cleanup was requested by the operator. FLOPRO NT reservoir drill-in fluid and WELLZYME* AE enzyme breaker achieved exceptional production.”*

Peter Clark, Senior Account Manager

Well Information

Location UK North Sea
Spud/Completion Date June 2002
Well Horizontal oil producer
Measured/True Vertical Depth 9,829/5,721 ft (2,996/1,744 m)
Bottom Hole Temperature 173°F (78.3°C)
Max. Deviation 89°
Mud System FLOPRO NT
Mud Weight 10.0 lb/gal

The Situation

An operator in the Central North Sea selected a low-solids, water-base reservoir drill-in fluid (RDF) with sized carbonate to drill a reservoir that was to be completed with premium screens and a gravel pack. The reservoir contained interbedded water-sensitive claystone; so the well required an inhibitive fluid. Cleanup of the filter cake trapped between the gravel and the screen is difficult, especially when the filter cake contains clay drill solids as well as sized carbonate. In a situation like this, relying on filter-cake flowback is insufficient. An enzyme breaker was selected as the best option to guarantee effective cleanup.

The Solution

M-I SWACO suggested a combination of 55 lb/bbl KCl brine and 5% GLYDRIL* HC stabilizer to optimize shale inhibition and to ensure optimum compatibility with the reservoir crude. HIBTROL* additive was also added for improved shale stability. The formulation of the FLOPRO NT RDF system was optimized in the laboratory to maximize clean-up efficiency with WELLZYME AE enzyme breaker.

The Results

The 8½-in. hole was drilled to TD with no problems other than minor downhole losses. Average hole size was measured at 8.584 in., with occasional spikes up to 11 in. The drilling team ran the screen to TD with no problems, and the well was successfully gravel packed using a high-rate water pack. The well flowed at the expected production rate.



The Details

During drilling, the active clay content of the FLOPRO NT RDF system was controlled below 7.5 lb/bbl equivalent bentonite to enhance cleanup efficiency. To maintain the D₉₀ required along with good bridging capability, sacrificial carbonate was added to the mud on a continual basis. The carbonate content of the filter cake was determined by an acidization procedure, which allowed the rate for adding sacrificial material to be adjusted accordingly.

The drilling team used a Malvern Particle Size Analyzer to monitor the PSD. The bridging ability of the fluid was regularly tested using the Permeability Plugging Apparatus (PPA) equipped with a 35-micron aloxite disk. Based on previous experience, a liner was run to consolidate the hole drilled. After cleanup and displacement to brine, the sand screens were run and set at the required depth.

When the screens were set, gravel packing operations commenced. Average returns of 60% were obtained during the alpha wave. On commencement of the beta wave, WELLZYME AE breaker was added at 3% v/v to the beta wave. Returns were treated with a further 0.25% breaker to replace that lost on solids. Screenout occurred at 145% of the expected gravel pumped. The well was displaced to brine before completion operations began.

About WELLZYME AE Enzyme Breaker

WELLZYME AE breaker is an enzyme that specifically targets the starch in the filter cake. Starch acts a binder for the calcium carbonate and other solids. When the starch is destroyed, the filter cake loses its integrity, allowing oil or gas to flow through it. WELLZYME AE breaker eliminates the corrosion, wormholing, and health-safety hazards associated with strong acids and oxidizing breakers.

WELLZYME AE breaker benefits:

- Even drainage of entire reservoir for sustained production over the life of the well
- Does not promote corrosion of screens and other downhole components
- Does not react with tubulars, eliminating elevated iron concentrations that promote sludging and iron-precipitation problems
- Reduces system upsets because the completed well can be placed online in less time than conventional cleanup
- Reduces cost and increases return on investment

Questions? We'll be glad to answer them.

If you'd like to know more about the FLOPRO NT system or WELLZYME AE product and how they are performing for our other customers, please call the M-I SWACO office nearest you.

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