Badr Petroleum Co. (BAPETCO) was planning a campaign of horizontal wells in a tight gas reservoir with a 6,562-ft (2,000-m) lateral 6-in. section to be drilled with water-based mud. To avoid expensive, multi-frac completions, they opted for a barefoot completion as the simpler and more economical option.

The increased damage potential in a low permeability (0.5-5.0 mD) formation required a customized drilling fluid and filter cake breaker system to ensure maximum well productivity.

**CHALLENGE**

BAPETCO was concerned about formation damage and the risk of low production from the tight reservoir permeability and planned barefoot completion method. All the other wells in the field had previously been fracked to maximize production.

The drilling fluid design would need to be suitable for horizontal well conditions with 2,000 psi overbalance and have demonstrated proven stability at the anticipated 300°F reservoir temperature downhole.

**SOLUTION**

Baroid’s Technical Team collaborated with BAPETCO to engineer a customized BaraDrilN™ reservoir drilling fluid (RDF) system with low solids content and a BaraCarb® ground marble bridging package. The fluid rheology was tuned to enhance the rate of penetration (ROP), while providing required hole cleaning and fluid stability.

Several return permeability tests were run on natural cores from offset wells to optimize RDF, select the proper lubricant, and examine the effect of the filter cake breaker on enhancing the final permeability. The N-FLOW™ 408 filter cake breaker system was engineered to ensure uniform removal of filter cake from the lateral section, to help the well produce to its maximum potential.

**RESULTS**

The engineered BaraDrilN RDF provided superior drilling performance, achieving an ROP of 39-59 ft/hr (12-18 m/hr), compared to 6-13 ft/hr (2-4 m/hr) achieved on offset wells drilled with oil-based mud. Two pilot wells were drilled to test this BaraDrilN fluid, and good hole conditions were attested by freely tripping in and out of hole.

The N-FLOW 408 filter cake breaker was spotted in the open hole before testing the first well. The production rate exceeded expected production, indicating no damage to the producing formation, and skin damage <5.
The second well was drilled with the same BaraDrilN RDF in close proximity to the first well. BAPETCO elected to test this well without spotting N-FLOW 408 system in an open hole, and the production rate was only 25 percent of the expected production rate. After spotting N-FLOW 408 in the open hole, the production rate increased by more than four-fold and exceeded the expected production rates.

BAPETCO successfully reached the desired production rates without the need for an expensive, multi-frac operation, and with a potential cost savings of USD 6M. Based on the positive drilling and completion results of these initial wells, BAPETCO has decided to continue the campaign and drill an additional five wells.