Engineered Water-Based Fluids Help Operator Save 22 Days on Challenging Geothermal Well

Location: Imperial Valley / Salton Sea Field

**OPERATOR’S CHALLENGE** – The operator planned to drill a geothermal well utilizing a closed loop system, a departure from installing the usual sump pit at the rigsite. The surface challenge was preventing the loss of whole mud across the shaker while drilling a highly reactive clay in the 26-inch hole section. Past fluid designs included commercial bentonite for viscosity to clean large diameter holes, which can impair solids control efficiency.

The main downhole challenge was the 12.25-inch section where the operator planned to run 10.75-inch casing. This had never been done in this field. Past wells had severe losses, swabbing, stuck pipe, fishing operations and downtime due to hole conditions. Some took up to 17 days to complete the 12.25-inch interval. The customer asked Baroid to design a fluid that would tolerate 425°F, minimize fluid invasion, inhibit reactive formations and deliver an ingauge wellbore.

**HALLIBURTON’S SOLUTION** – To prevent losses across the shaker, Baroid formulated a low-solids fluid by substituting BARAZAN® D PLUS xanthan biopolymer for bentonite. This helped maintain a low rehological profile while drilling this section and limit its overall effect on viscosity and progressive gels that can increase surge pressures while running tubulars. The 26-inch section was drilled successfully to 512 ft with minimal washouts compared to past wells (<5%).

The same fluid was used for the 17.5 inch section, with the addition of a shale stabilizer and lubricant. Salt water influx, reactive clay, CO2 and elevated temperatures were encountered in this interval with no adverse effect to the fluids properties. This interval was also drilled with minimal washouts and there was no tight hole encountered as on previous wells. A successful foam cement job was completed with 100% returns.

**ECONOMIC VALUE CREATED** – The fluid performed well, allowing the operator to drill and complete the interval in 12 days – five days less than offset wells. Caliper logs showed less than 3% washout, which compared favorably to the 10-15% average washout on previous wells. The in-gauge wellbore resulted in a cost savings on the premium cement required in ultra high...
temperatures. The 10.75-inch corrosion resistant casing was successfully set and cemented at 3218 ft with 100% cement returns.

The extensive testing and careful fluid selections were based on in-depth discussions with the operator about the anticipated wellsite and wellbore conditions, including the fluid management priorities for running 10.75-inch casing in the 12.25-inch hole.

As a result, the well was drilled without the need for a sump for waste fluids and cuttings – a first in the field. The well was completed 22 days under plan, and the operator was able to obtain the maximum value from the casing and cementing operations.