Customized Lost Circulation Treatments Help Resolve Severe Fluid Losses and Reduce Costs in Highly Fractured Geothermal Wells

Location: Geysers, Northern California

OPERATOR’S CHALLENGE – Geothermal wells in Northern California are drilled in highly fractured volcanic reservoirs, where massive fluid losses can bring operations to a halt.

One operator considered discontinuing a drilling program because 44 cement plugs were used to fight losses in a single section of a previous well.

HALLIBURTON’S SOLUTION – While drilling the second well on the same pad in the same zones, 300 bph losses were encountered at 3288 ft. The initial effort to stop losses with a combination of lost circulation materials (LCM) was not successful. The next attempt included 50 ppb HYDRO-PLUG® hydrating lost circulation squeeze, as well as 25 ppb STEELSEAL® 1000 resilient graphitic carbon and 25 ppb BARACARB® 600 ground calcium carbonate. This formulation and the subsequent treatments were engineered through WellSET® analysis that models particle size distribution and determines the optimal mix for specific formations.

The pill was spotted on bottom and the drill string was pulled up to 1400 ft. After 4 hrs the rig pumped 150 bbl of mud and regained circulation. At 3401 ft losses occurred at a rate of 100+ bph. A pill containing 47 ppb DUO-SQUEEZE™ H and 64 ppb HYDRO-PLUG LCM was placed on bottom and drill string was pulled up eight stands. After a one-hour wait, the operator resumed drilling to 3555 ft, where 100-bph losses were encountered, and another pill was set containing multiple types of LCM, including DUO-SQUEEZE H, STEELSEAL 400 and HYDRO-PLUG materials.

After this pill was spotted on bottom, the operator was able to resume drilling. The continued application of a series of combined pills including squeeze type materials and bridging agents allowed the operator to reach total depth at 4395 ft without resorting to cement plugs.

ECONOMIC VALUE CREATED – Eliminating the need to set multiple cement plugs saved the operator time and expense. Comparing the cost of the LCM treatments to the cementing operations required on the previous well, the operator was able to save approximately $1.5 MM in rig time and treatment costs.