SHADOW plugs enabled interventionless plug-and-perf completion at record depth, saved USD 50,000
Location: Williston Basin

An operator in the Williston Basin drilled a well with a total measured depth of over 25,400 ft (7742 m) and a kick off point at 10,589 ft (3228 m). The well contained cemented 4.5-in., 11.60 lb/ft casing and was designed for a plug-and-perf completion.

When using traditional composite plugs in a standard plug-and-perf completion, the plugs must be milled out before hydrocarbons can flow through the wellbore. Mills are typically run in using coiled tubing and the debris is flushed up and out of hole. The extreme depths of this challenging wellbore prevented the use of coiled tubing to remove composite plugs. To effectively produce the well, the operator needed an interventionless treatment solution for the farthest depths of the 15,000-ft (4572-m) lateral. After looking at available technology, the operator chose to use proven Baker Hughes SHADOW™ series frac plugs because they are deployed on wireline and are designed with a large, flow-through inside diameter (ID), eliminating the need for post-fracture milling. The plan called for running IN-Tallic™ disintegrating frac balls with the SHADOW series frac plugs to deliver an interventionless plug-and-perf completion solution.

A total of 30 SHADOW plugs were successfully deployed, with the deepest being set at a record 25,113 ft (7654 m) and the shallowest at 18,477 ft (5632 m), creating 31 interventionless treatment stages in the deepest part of the lateral. The operator then used conventional composite plugs to isolate treatment stages in the shallower portion of the lateral.

The first and second SHADOW plugs were deployed as planned. When running the third, the bottomhole assembly (BHA) stopped advancing due to wellbore blockage.

Results
- Eliminated milling, saving two days of drillout time and an estimated USD 50,000
- Enabled plug-and-perf completion in lateral depths unreachable by coiled tubing
- Reduced risk of pre-setting with impact-resistant SHADOW plug design

Challenges
- 25,400-ft measured depth well
- 15,000-ft lateral section
- Needed interventionless equipment for deepest treatment stages

Baker Hughes solution
- Deployed 30 size 368 SHADOW plugs to isolate 31 production stages in the deepest part of the well lateral, where coiled tubing is not an option
- Used IN-Tallic frac balls to seal the plugs during treatment delivering an interventionless plug-and-perf completion solution
By design, the SHADOW plug resisted the debris impact and did not pre-set, enabling the operator to trip the BHA out of hole, flush the wellbore, and continue the operation. Outside of this one wellbore related incident, SHADOW plug installation went smoothly and treatment of each zone occurred flawlessly.

Using SHADOW series frac plugs and IN-Tallic frac balls saved the operator an estimated two days rig time. Assuming an average daily rig rate of USD 25,000, this solution saved roughly USD 50,000 and enabled the operator to successfully install an interventionless plug-and-perf completion at extreme depths in a challenging well.