CASE STUDY

HALLIBURTON

Argentina

Cement system cures severe losses in one of world's largest unconventional reservoirs

SentinelCem™ Pro cement system helps cure total losses

CHALLENGE

- Cure total losses encountered while RIH 7.625-in. casing
- Place KOP to continue drilling lateral

SOLUTION

- Pump SentinelCem™ Pro cement plug through BHA
- Pump Tuned® Defense™ cement spacer
- Cement designed to be mixed on-the-fly

RESULT

- Confirmed TOC at planned depth
- Circulated without losses before and after plug was drilled
- Placed KOP without losses and deviated well

Overview

One of the world's largest unconventional reservoirs is in Argentina. Losses, influx, and wellbore instability are common problems encountered during drilling operations in these fields. Conventional treatment of losses involves the addition of a lost circulation material (LCM) to the drilling fluid. However, LCM concentration is restricted with this method because of the narrow flow path of the measurement while drilling (MWD)/logging while drilling (LWD) tools, and high concentrations modify the drilling fluid's rheological properties, which can cause problems with the well hydraulics. Conventional LCM treatments at feasible concentrations are often ineffective. Operators and service companies face significant lost circulation challenges in this unconventional area, which prompts them to seek new technologies to reduce operational time and associated costs.

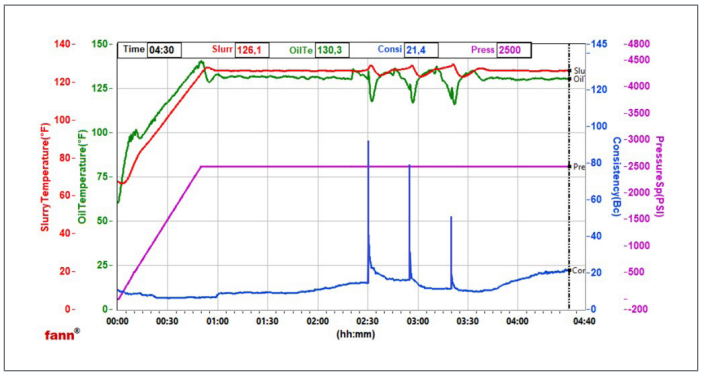
Challenge

An operator in Argentina planned to place a kickoff plug (KOP) below the 7 5/8-in. casing shoe to deviate and continue drilling the lateral section. However, while run in hole (RIH) with the 7 5/8-in. intermediate casing in the 8.5-in. openhole (OH) section, the operator encountered partial losses that escalated to total losses. It was crucial to cure the losses before the KOP was pumped to balance the cement plug and successfully deviate the OH. The mud supply company pumped several pills with LCM at different concentrations but they could not cure the losses.

Solution

Halliburton proposed deployment of the SentinelCem™ Pro cement system, a highly thixotropic single-sack lightweight system that develops rapid gel strength when static and returns to a liquid when shear rate is applied. This property allows the system to be hesitated into the loss formation to address the cause of the lost circulation event deep into the formation rather than only on the formation face.

Approximately 60 bbl of Tuned® Defense™ cement spacer, a specialized lost-circulation cement spacer, were pumped ahead of the SentinelCem™ Pro cement. A total of 100 bbl of 12-lbm/gal SentinelCem Pro cement system was mixed on the cement unit on-the-fly and pumped through the bottomhole assembly (BHA). This eliminated a trip to pull out of hole (POOH) with the BHA and trip back in with a different work string to place the treatment, which saved time. The system was pumped down with the annulus open until spacer reached the BHA, and then the annulus was closed to inject both cement and spacer into the loss zone. Approximately 40 bbl of SentinelCem Pro cement remained in the OH, which left approximately 100 m of cement for later drillout.



SentinelCem™ Pro cement thickening time graph shows the highly thixtropic behavior of the system when exposed to three hesitation cycles, 10 minutes each.

Result

The operation was executed as planned and, after eight hours of wait on cement (WOC) time, the top of cement (TOC) was confirmed at the planned depth. The operator circulated without losses at 120 gal/min, drilled out the SentinelCem Pro cement plug, and circulated with 200 gal/min with full returns.

The operation continued and the operator placed a high-density cement KOP without any losses and then deviated the well to continue drilling operations in the lateral section.

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