CASE STUDY

HALLIBURTON

Papua New Guinea

Thixotropic cement system mitigates losses, improves CBL during liner cement operation

SentinelCem Pro™ cement and ChannelFix™ additive help operator reach planned TD in depleted formation

CHALLENGE

- Total lost circulation prevented operator from reaching planned TD
- Spot plug through BHA in single run without pull out of hole (POOH)
- Reduce rig time
- Cement casing and achieve zonal isolation

SOLUTION

- Place SentinelCem Pro™ cement system down BHA
- Add ChannelFix™ additive to cement to address OBM contamination
- Include Tuned® Defense™ cement spacer to help cure seepage losses

RESULT

- Cured total losses and reached TD
- Ran and cemented liner and achieved zonal isolation
- Confirmed zonal isolation with CBL
- Saved operator approximately USD $900,000 in reduced rig costs

Overview

In Papua New Guinea, operators often encounter lost circulation during drilling and cement operations, as these geological formations can lead to severe to total losses. Overbalanced drilling through high-permeability, naturally fractured, or easily fractured formations results in lost drilling fluids. In many cases, operators experience total lost circulation where they lose all drilling fluids to the formation with zero returns to surface. This presents problems during attempts to cement casing strings and liners in place. While industry approaches to address lost circulation involve the application of various materials and techniques, pumping a thixotropic slurry through the bit without the requirement to trip out of the hole (TOOH) to change the downhole bottomhole assembly (BHA) has helped operators save significant rig time and mitigate losses.

Challenge

A major operator in Papua New Guinea encountered significant challenges with severe losses while it drilled a reservoir section with oil-based mud (OBM). These losses caused substantial delays and operational constraints, which made it difficult to reach the planned total depth (TD). The inability to stabilize the wellbore and mitigate losses with lost-circulation material (LCM) not only hindered progress but also increased the complexity and cost of the drilling process. The losses further jeopardized the integrity of the well, as the lack of sufficient pressure and cement volume around the casing compromised zonal isolation, a critical factor to support reservoir containment. This prevented inter-zonal communication and would require costly future remedial operations.

To address these challenges, the operator required a more effective tailored solution than conventional lost-circulation solutions. The solution must mitigate losses, improve wellbore stability, and facilitate effective cement placement around the casing to restore operational viability and the long-term productivity of the reservoir.

Solution

Halliburton recommended that the operator pump SentinelCem Pro™ cement with ChannelFix™ additive to address the severe lost-circulation challenges encountered while drilling. The thixotropic properties of SentinelCem Pro cement allowed the cement system to remain fluid during pumping and rapidly form a gel once static, which helps it penetrate deeply into fractures to seal the loss zones. The addition of ChannelFix additive to the slurry increased the cement system's contamination tolerance in a nonaqueous drilling fluid. ChannelFix additive swells on contact with OBM, which alleviates the negative impact of OBM contamination to the cement slurry and improves the resilience of the cement system.

The crew mixed the tailored cement system on the on-the-fly. They pumped Tuned® Defense™ cement spacer, a specialized spacer to combat seepage and lost circulation, ahead of the SentinelCem Pro cement. To save significant rig time compared to conventional plug setting techniques that pull the BHA and run back in hole with open-ended pipe, the crew pumped the treatment through the bit. The team bull-headed the cement with the bit positioned above the loss zone. After the slurry exited the bit, they closed the annulus to ensure accurate placement. They repeated the procedure multiple times to isolate sections across the entire loss zone. This approach effectively mitigated losses, stabilized the wellbore, and supported overall well objectives.

Result

SentinelCem Pro cement cured the losses, as indicated by the fluid level that rose to the surface post-job. After it cured lost circulation, the operator drilled to TD and ran and cemented the production liner in a single stage with no losses. The cement bond log (CBL) showed good bonding to the pipe and formation, which indicated full coverage throughout the payzone and met regulatory requirements for zonal isolation. This solution saved the operator approximately USD $900,000 in rig costs.

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