

IntegraGuard™ Star II System Optimizes Isolation Through Proper Product Identification and Application

EXECUTIVE SUMMARY

- Operator experienced partial lost circulation while cementing.
- Losses also caused decreased annular fluid velocity, further impacting effective mud removal and job outcome.
- IntegraGuard Star II system allowed for a flexible spacer design that optimized drilling fluid displacement while providing enhanced lost circulation protection.

OVERVIEW & CHALLENGE

An operator in Wyoming's Powder River Basin was cementing a pair of wells less than a mile apart in the Parkman Sandstone and Fox Hills Formations, where they encountered many challenges during drilling — most notably was maintaining circulation due to the low fracture gradient of both regions, which could be as low as 0.47 psi/feet.

The operator needed to cement two wells (Well A and Well B) and used similar fluid systems to mitigate the anticipated lost circulation issues experienced during pumping. The only significant differences between the fluids were a reactive spacer system used on Well A and a small amount of lost circulation material added to the cement on Well B. The two subject wells had a surface casing set to ~2,200 feet and the production string was set at a true vertical depth (TVD) of ~7,400 feet with a total measured depth (TMD) of ~11,800 feet. The measured bottomhole temperature (BHT) of these wells was ~190°F. Both wells were cemented with the same 11.5 ppg lead cement and 13.5 ppg tail cement.

The bond log showed sufficient isolation above the Fox Hills, but there was room for further optimization (Figure 1). A comprehensive post-job analysis was done on Well A, which showed there was subtle lost circulation during the job that was difficult to identify while cementing. The calculated return rate revealed that this also caused a decrease in fluid velocity in the annulus that then impacted the displacement of drilling fluid prior to cement placement.

SOLUTION

An on-site American Cementing engineer recommended replacing the 9.2 ppg reactive spacer system with 40 bbls of 11.0 ppg IntegraGuard Star II, designed to generate the necessary shear stress to mobilize the gelled and dehydrated drilling fluid at the wall. In addition, 20 lb/bbl of IntegraGuard Star Plus lost circulation material was added to the spacer system to help combat the anticipated losses. As a contingency plan, an engineered particulate lost circulation material was added to both the lead and tail cement at a loading rate of 1 lb/sk. To aid in equivalent circulating density (ECD) reduction, 100 bbls of water were pumped ahead of the IntegraGuard Star II system.

RESULTS

Full circulation was achieved throughout the job and the bond log showed a significantly higher level of comprehensive isolation (Figure 2). The IntegraGuard Star II system and Star Plus lost circulation material provided a flexible spacer design that optimized drilling fluid displacement while providing enhanced lost circulation protection. The fluid’s ability to optimize drilling fluid displacement and lost circulation mitigation enabled the operator to maximize fluid-flow rate through the annular space and effectively remove the drilling fluid for optimized isolation.

Figure 1: Well A Return Analysis

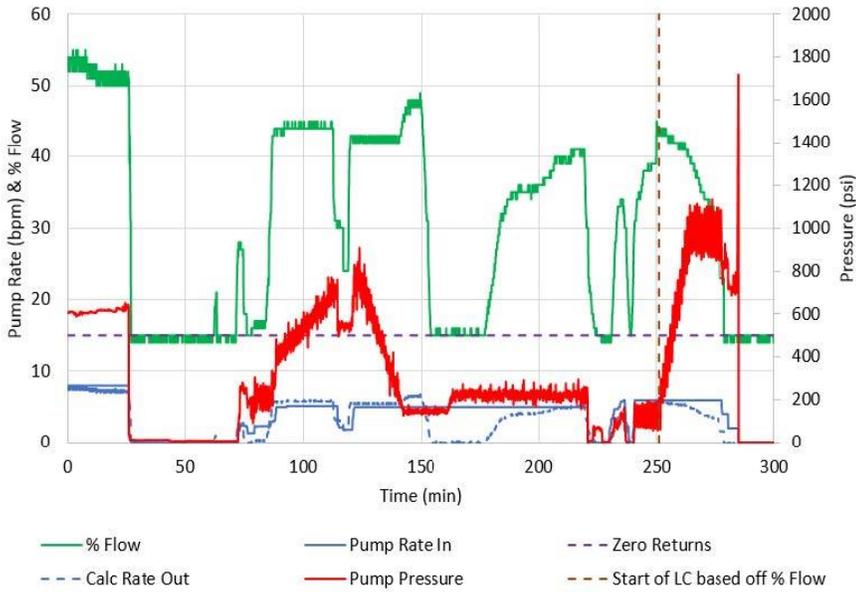


Figure 2: Bond Log Comparison of Well A & Well B

