Impact

SHIELD BOND®

Wellbore Shielding® Technology

Innovative Solution for Zonal Isolation Challenges in a Reservoir with a Narrow Operating Window

CHALLENGE

A major national oil company in the Middle East decided to use managed pressure drilling (MPD) to drill the 8 ½-in. open hole (OH) in a gas reservoir section with a bottom hole temperature (BHT) of around 300°F. MPD was chosen due to the narrow operating window of 0.14 pound per gallon (ppg) between the reservoir pore pressure (PP) of 19.06 ppg and a fracture gradient (FG) of 19.2 ppg. The section was drilled using 17.2 ppg OBM while maintaining a constant bottom hole pressure (BHP) of 19.2 ppg equivalent mud weight (EMW). This minimized the likelihood of formation influxes or kicks while managing controlled partial losses using the MPD methodology.

During the running of the 7-in. liner to total depth (TD) and upon breaking circulation, the OH section was exposed to increasing friction pressures due to the narrow annular gap between the tubular external surface and the OH. Losses were in the range of 50 bph prior to the cementing operation with the liner at the bottom. Furthermore, during the cement job, the wellbore encountered elevated equivalent circulating density (ECD) due to the increase in fluid densities and rheologies (spacers and cement slurries). Under these conditions, it was crucial to control the BHP and include materials that could enhance or increase the frac gradient during the cementing operation.

SOLUTION

A unique cementing approach was implemented including managed pressure cementing (MPC), which allowed the operational parameters—such as pumping rate and pressure—to be adjusted during the cementing job. This mitigated the increase in the ECD, aiming for a near-constant BHP of 19.2 ppg during the placement of cement in the annulus. The cementing design included an engineered heavyweight slurry of 20 ppg and an 18.4 ppg cementing spacer with a Wellbore Shielding® component (SHIELD BOND® NXT) paired with eco-friendly lost circulation materials (SHIELD BOND® LC1k) capable of sealing permeabilities of up to 3,500 D. This expanded the operating window, mitigating losses to the formation. Surfactants and mutual solvents were added to the spacer package to flip the wettability of the surfaces from oil-wet to water-wet.

RESULTS

The primary cementing job was successfully completed, with the cement placed accurately and effectively in the OH. Throughout the job, there were no operational or Health, Safety, and Environmental (HSE) incidents, highlighting the effectiveness and safety of the chosen approach. Implementing SHIELD BOND® NXT paired with SHIELD BOND® LC1k significantly increased the operating window, allowing for greater flexibility and control during the cementing process. The SHIELD BOND® NXT/ SHIELD BOND® LC1k spacer system and 16 bbl of high-quality cement were reverse circulated to the surface, indicating that the liner hanger was cemented properly. Good cement was drilled in the shoe track, and negative pressure testing was successfully performed on the liner with 5000 psi differential pressure against the formation pressure. This ensured optimal zonal isolation and wellbore integrity, marking a substantial improvement in cementing operations under challenging conditions..

LESSONS LEARNED

The operator made this approach a best practice to successfully ensure wellbore coverage and zonal isolation, observing that the SHIELD BOND® NXT/SHIELD BOND® LC1k mixture:

- Can be used in cases where the wellbore operating window must be slightly increased during cement operations
- Successfully works in reservoirs with highly permeable formations

POWERED BY IMPACT SHIELD BOND® NXT SHIELD BOND® LC1k

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