Ultralight FlexSTONE Flexible Cement Conserves Hydraulic Isolation
Advanced system enhances downhole conditions in Wintershall Noordzee’s North Sea field

**CHALLENGE**
Redevelop reservoir zones that had watered out by ensuring optimal hydraulic isolation.

**SOLUTION**
Used an 11.5-lbm/galUS ultralight formulation of FlexSTONE® advanced flexible cement in a custom solution that can withstand changing downhole conditions for the life of the well.

**RESULTS**
Minimized losses and achieved zonal isolation across the zones of interest.

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**Well positioning and design**
Wintershall Noordzee BV planned to drill a near-horizontal development sidetrack offshore the Netherlands. The objective was to redevelop a number of variably depleted reservoir zones that were no longer producing due to water influx. The consideration for positioning, designing the well, and selecting the target entry point was the optimal penetration of all zones at highest possible position to reduce the risk of early water breakthrough. Effective hydraulic isolation was more critical than ever, considering the planned sequential production from the variably depleted horizontal reservoir zones.

**Advanced, customized cement solution**
Schlumberger cement sheath stress analysis software was used to model the mechanical performance of the set cement under changing well conditions. The software predicted the required set-cement properties. Furthermore, because of the very small margin between drilling fluid and slurry densities, equivalent circulating density simulation strongly indicated that lightweight slurry was required to prevent losses. This analysis led to the selection of FlexSTONE advanced flexible cement technology. The 11.5-lbm/galUS customized cement system designed was the lightest ever pumped in the North Sea.

FlexSTONE advanced flexible cement technology represents a fundamental change to oil- and gas-well cementing. This sealant system has mechanical properties that are matched to the downhole stress environment. By enabling the set cement to conform to the changes that occur during the drilling, production, and abandonment cycles of the well, the FlexSTONE system can offer lifelong zonal isolation.

Each FlexSTONE slurry is individually designed for a specific well application. First, the stresses that the cement sheath will experience over the well’s life are predicted by numerical analysis modeling. Then the system’s mechanical properties are customized using the FlexSTONE trimodal particle-size distribution technology to accommodate the predicted stresses.

**Robust, production-quality zonal isolation**
The team used the ultralightweight expandable FlexSTONE flexible cement system, shown to be robust through a 5,000-psi pressure test and subsequent 1,400-psi in-flow test. Sonic bond logs have shown that the cement job achieved its primary objectives by minimizing losses and achieving production-quality zonal isolation across the zones of interest.
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CBL/VDL log showing good cement bond