

Deepwater Cement Technologies Exceed Shell's Expectations

Case study: DeepCRETE cement system overcomes deepwater cementing challenges offshore Pakistan

Challenge

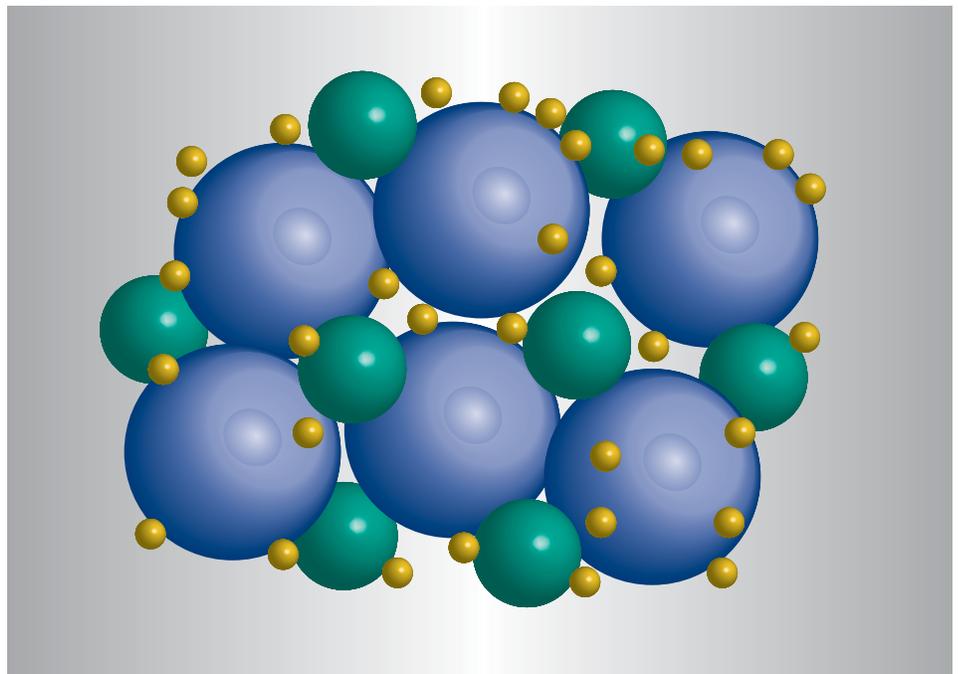
Design a cement slurry that can be used on a drillship with limited deck space, that achieves the required compressive strength—for zonal isolation, and that ensures complete cement coverage in a deepwater environment.

Solution

Use DeepCRETE* cement system to mitigate the technical challenges of a narrow margin between pore and fracture gradients, low temperature at seabed, and unconsolidated formation.

Results

Achieved full returns to seabed, reduced waiting-on-cement (WOC) time, and exceeded Shell's leakoff test (LOT) expectations.



Applying optimum particle-size distribution technology in DeepCRETE cement system.

Cementing in a deepwater environment

Deep water is one of the most technically and logistically challenging environments for cement operations. In cold deepwater temperatures, cement takes longer to set and to achieve the required compressive strength. Losses can occur as a result of the narrow margin between the pore pressure and the fracture gradient.

During well planning, Shell was looking for a cementing solution that would address the technical logistics of drilling the Anne-AX exploration well offshore Pakistan, which included

- narrow margin between the pore and the fracture gradients
- weak, unconsolidated formation for the 17 ½-in hole section
- low temperature at seabed (39 degF [4 degC])
- limited deck space on the drillship.

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Drilling for the deepwater project in Pakistan was done from the drillship Discoverer 534.

A custom design for cement blend management

Understanding the limitation of foamed cementing, Shell selected DeepCRETE cement slurry and DeepCEM deepwater additives as a customized solution for the first deepwater exploration well in Block 2365-1.

Extensive collaboration between Shell and the Schlumberger well services team in Pakistan resulted in a detailed blend management plan that was based on drillship bulk capacity restrictions. The cementing operation, which required fewer trained personnel and less equipment than is needed for foamed cementing, was prepared and transferred to the rig site.

The DeepCRETE slurry was pumped as the lead slurry of the 13 3/8-in casing, taking into account 150% excess volume on open hole. The design showed a gain of 1,500 psi of compressive strength in 24 hours, with the compressive strength continuing to progress. Best practices were maintained throughout execution of the cement job and the operator did not have to wait on cement.

Exceeding customer expectations

The DeepCRETE deepwater cementing solution exceeded Shell's expectations in overcoming the cementing challenges in this deepwater environment. The custom-designed blend enabled Shell to achieve full returns to seabed and reduced WOC time for the 13 3/8-in casing. Hard cement was later drilled from the casing shoe, and the LOT achieved 10.9 lbm/gal [1,306 kgm³] equivalent mud weight, exceeding Shell's expectations.

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