Fast-tracking Technology Development Improves Sonic Cement Evaluation Logs

■ A technology developed for the US military enables faster evaluation of cementing.

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By leveraging unique partnerships, a group of Shell experts from various disciplines successfully deployed in 2015 and 2016 a technology in both Appalachia and the Gulf of Mexico (GoM) that improves acoustic coupling between a cement sheath and wellbore casing.

Steel Cement Interface Nanobond (SCIN) uses a patented technology from science and engineering company Oceanit.

"This innovative treatment process creates a surface morphology on the outside of pipe that is both superhydrophilic (water-loving) and chemically reactive to oil well cements, thus allowing an improved cement evaluation and greater confidence in the verification of cement quality in the annulus of a wellbore," said Shell cement expert James Heathman.

Shell has utilized technology developed by the U.S. military to improve its sonic cement evaluation logs. (Image courtesy of Shell)

An 'aha moment'

But SCIN wasn't originally invented for use in wells. Oceanit has a track record from 35 years developing technologies for the military in areas ranging from satellite to material science to ballistics to biotech. Heathman had an "aha moment" in 2013 during a review of technologies developed by Oceanit. His colleague, Hani Elshahawi, then working in deepwater business and now a member of Shell's GameChanger program, had just met company representatives at an industry conference and invited them to present their cement technology developments to Shell.

During the presentation, Heathman's interest was piqued by Oceanit's specialty coatings and metal treatments. Heathman asked whether they could modify one of their treatments to facilitate better acoustic signal clarity if used on the outside of pipe under the conditions of wellbore cementing. An idea was born and quickly took shape. The project leveraged the cement laboratory in the Shell Technology Center Houston, which was used for the collaborative development phase through rapid, tight testing cycles with frequent feedback loops between Shell and Oceanit laboratories.

Only 15 months later—twice as fast as most 100% in-house developments and at much lower cost—three successful field trials in the Marcellus play in Appalachia were carried out. The outcomes encouraged Shell's deepwater GoM engineering teams to deploy treated casings in 2016. Results were promising.

Avoiding cost through greater certainty

SCIN is an attractive proposition if one considers that cement quality in the annulus of a wellbore often has to be verified using acoustic bond logging, but the results are sometimes ambiguous. Projects may suffer delay while logs are analyzed or conversations take place between Shell teams or between Shell and regulatory agencies to resolve any ambiguities. In some cases additional cementing has to be performed. These efforts are sometimes duplicative because the cement was in place all along. This lack of full certainty of bond log acoustic signatures may lead to delays and nonproductive time of three to 10 days. Avoiding such delays means avoided costs.

Climate for open innovation

"It pays to keep your finger on the pulse of potentially applicable technologies from other industries," said Jonathan Crane, vice president, Wells Technology Deployment. "We shouldn't sit back and wait for such opportunities to arise by coincidence but create conditions for them to flourish."

In Crane's view these include convening established experts from different organizations to form the collaborative expertise needed to address a problem from a fresh perspective.

"We need to keep our eyes open everywhere, and with our GameChanger program we have a platform that actively supports innovative ideas as we are searching for novel wells technologies that could be implemented in six to 12 months," he said. ■