Holding One's Own

A new fluid additive used to retain drilling mud could have significant cumulative benefits

THE OPPORTUNITY

In most cases, once drilling fluid seeps into the ground on the vertical section of a well, there's no getting it back. And when drillers encounter an above-average decline in drilling mud levels, there's very little that can be done to stop that seepage. For many years, drilling mud was a simple concoction made from clay and water. When fluid levels dropped, operators would combine walnut shells, wool, graphite or other products to build up a filter cake and clog the pores and fractures downhole.

The technology is quickly becoming more sophisticated. Researchers at the University of Calgary have formed a company aiming to employ drilling fluids that use nanoparticle additives to plug micro-sized pores and fractures. The technology is in its early stages, but the need for the technology is clear to executives at nFluids Inc. "The Western Canadian Sedimentary Basin is so well understood that operators will quote you an expectation of fluid loss every time they drill a well," says Jeremy Krol, the corporate developer of nFluids and member of Innovate Calgary, a startup incubator.

The average well in Western Canada's tight formations loses between three and five cubic meters of drilling fluid for every 100 meters drilled. That gradual seepage can cost between $30,000 to $80,000 per well based on average drill depths in the basin. "What we found [in lab tests] was the technology used in nFluids could be used to assist in that fluid loss reduction."

THE STRATEGY

Maen Husein, who is now chief technology officer for nFluids, teamed up with then-PhD student Mohammad Zakaria in 2011 and the two worked alongside Geir Hareland in the Chemical and Petroleum Engineering Department of the University of Calgary. Around the end of that year Innovate Calgary partnered with the researchers to help build the idea into a company.

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nFluids' approach is unique in that the nanoparticles added to the drill mud are made in-house, rather than ordered to the lab. This allows the company to build nanoparticles to any specification they need. In most cases, nanoparticles bought elsewhere need to be mechanically crushed to size, making the product more costly than making them from scratch. "We use a chemical reaction with specific chemical precursors to develop exactly what we want."

THE PAYOFF

After running countless lab tests, the team found the product can reduce drilling fluid losses by up to 90 per cent. Krol says the company hopes it can add value at operations in tight formations, where pores are smaller than in looser formations and therefore require a finer additive to cover holes and retain drilling mud.

As of now, nFluids remains in the very early test stages. The company did one field test in November and a few more in January. It is first testing the additive for fluid retention, and plans to test for wellbore strengthening and increased lubricity later on. Early test results haven't proved much, Krol says, as a much larger sample size will be required before potential benefits can be determined. "There are so many variables on a drill rig," Krol says. If field tests eventually match what the controlled lab results suggest, however, the additive could be beneficial both economically and environmentally. "Some of the fluids they are drilling with are extremely toxic, diesel-based muds. Any time we can save fluid form being left behind in the ground, I think that's a benefit." AO