Squeeze Play

CERAMIC CEMENT OFFERS COST EFFECTIVE SOLUTION FOR ZONAL ISOLATION

WHILE ALBERTA'S HORSESHOE CANYON COALBED methane is generally dry, small quantities of water production from a few rogue seams can put an area at risk, inhibiting production from the neighbouring dry producing seams within the wellbore.

The Alberta Energy and Utilities Board (EUB) has strict rules regarding wells completed above the base of groundwater production, requiring that water production from an individual well is not to exceed five cubic metres per month. An operator that doesn't want to abandon a well is then faced with the challenge of isolating that water production, often an expensive and time-consuming proposition.

A new Calgary-based company, Cemblend Systems Inc., believes it can offer a more efficient and economic solution to isolation of these problematic zones than conventional cement squeeze technology, which requires service rigs, retainers and subsequent drill outs.

"Normally it takes three days and about $100,000 to squeeze off the water zones and there is potential damage to the upper producing zones during the drilling out process," says Don Getzlaf, Cemblend president. "All in all, our technology requires about one-third of the total squeeze time and this saved time can reduce costs significantly."

Rather than traditional Portland cement, Cemblend uses a fast-setting ceramic cement that is a variation on the ceramic material used in the industry for other applications in high temperature and severe wear environments. The unique material originated from an intensive U.S. research effort in the 1990s to produce a substance that could safely encapsulate and bind nuclear waste for thousands of years. The result is a material that can set across a temperature range from zero to 600 C with a substantially low permeability, high bonding characteristics and, most importantly, permanence, according to Cemblend.

Argonne National Laboratory in Argonne, Illinois, developed and patented the ceramic cement, for which Cemblend holds the exclusive Canadian licence. Since it was developed to permanently intern highly radioactive material, it has been run through stringent tests under severe conditions. The oil industry saw the advantages of having a high-end alternative to Portland cement and first looked at ceramic cement for deeper wells where the material's

high temperature tolerance could be used. However, it struggled to inhibit the set time for the long pump times required for these deeper wells.

Cemblend took another tack — using the material to deal with lost circulation, shallow gas migration and wellbore strengthening. Getzlaf and Marty Stromquist, the company's chief executive officer, founded Cemblend in 2006 and obtained the Argonne licence in July of that year. Since then, the pair has supervised numerous squeeze well operations.

The ceramic cement is activated in situ within the formation porosity to permanently isolate the water producing zone. The ceramic blend has an engineered micro particle distribution that can penetrate the matrix of the zone. Types of Portland cement plug the perforation tunnels and thus are susceptible to failure if the perforations aren't all squeezed on the first attempt or have substantial pressure from the formation. "By activating the ceramic cement in situ there is nothing to drill out in the wellbores and there is little to no risk of damage to the upper producing formations," says Getzlaf.

Working with a service company hired by the well operator, Cemblend places a Microceramic activator into the water producing zone, followed by a Microceramic binder. The binder is squeezed into the formation and reacts with the activator, forming an impermeable barrier around the well. "The cement sets very quickly — in about one minute — and shuts the water off at its source, in the formation," says Getzlaf.

CEMENTING NEW DEALS
Ceramic cement was initially developed to encapsulate nuclear waste. Cemblend's executives saw the product's unique features and realized that it could be used in the oil industry.

The cement does not set inside the cased wellbore because the activator and binder do not mix until they are in the zone. Once the

squeeze (barrier) is in place and pressure tested, the excess binder is circulated out of the well. The zone is pressure tested once again and blown down. The well is then ready for production.

"We do this in one day," he says. "We pull onto the lease in the morning, prepare the well, squeeze and clean out the well, and turn it over to production."

In addition to Microceramic, which is used in water and gas control, Cemblend has a second ceramic cement, DuraSeal. This product uses ceramic cement's unique properties in conjunction with larger particle sizes to combat lost circulation. When Cemblend used DuraSeal cement to shut off water production in a shallow well for Pioneer Natural Resources Canada in January, it was a global-first use of ceramics in a wellbore application.

As a result of ceramic cement's substantial tolerance for temperature, carbon dioxide and contaminants, Cemblend sees several other markets for the product, including thermal, gas migration and carbon dioxide storage injection wells. For example, the EUB requires that any operator drilling through a bitumen or heavy oil zone is required to use a thermally-stable cement. Ceramic cement has a temperature tolerance substantially higher than Portland cement and has the added benefit of improved bonding and ability to cope with the severe stress at the extreme conditions of wells under steam injection. ntm — Elsie Ross

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