



MATURE FIELDS



UNCONVENTIONALS

SentinelCem™ Cement Cures Losses in Iraq Wells

CEMENT TREATMENT SAVES OPERATORS MILLIONS OF DOLLARS ANNUALLY

LOCATION: SOUTHERN IRAQ

CHALLENGES

- » Severe to total circulation losses
- » Pervasive voids in karstified dolomite
- » Voids too large for conventional LCMs

SOLUTION

- » SentinelCem™ cement placed through the BHA

RESULTS

- » Cured losses in six wells
- » Saved 250 hours of rig time
- » Saved operators USD 1.5 million

OVERVIEW

With its introduction of SentinelCem™ cement, Halliburton has achieved major success in curing lost circulation issues in Iraq. Using this innovative system cured severe losses in the challenging karstified dolomite of the Dammam Formation, saving operators millions of dollars annually.

OPERATORS IN SOUTHERN IRAQ EXPERIENCE SEVERE CIRCULATION LOSSES

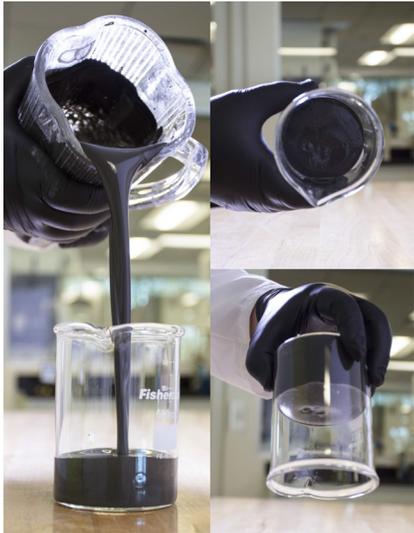
For years, operators drilling in the Rumaila, Zubair, and West Qurna fields in southern Iraq have routinely experienced severe and even total circulation losses at depths of 450–750 meters (1,476–2,461 feet). Underlying these fields is the karstified dolomite of the Dammam Formation, which has geological characteristics that include caverns, vugs, and large fractures.

Encountering these voids compromises the wellbore and results in lost circulation, complicating operations and driving up rig time and costs. To address the problem, operators have historically used conventional lost circulation materials (LCMs) and treatment pills, and, in many cases, have simultaneously pumped multiple conventional cement plugs – all with little or no success.

UNIQUE LOW-DENSITY CEMENT SOLVES CIRCULATION ISSUES

In early 2017, Halliburton found a solution – the application of SentinelCem™ cement.

Designed specifically to treat severe circulation loss, SentinelCem cement is a low-density cement that rapidly develops gel strength to prevent the fluid from being consumed by the loss zone. When first mixed, SentinelCem is a relatively thin fluid, which allows it to be easily pumped through the bottomhole assembly (BHA) and to achieve deep penetration into the targeted zones. As it enters lost circulation zones, the pumping rate (shear rate or velocity of its flow) is slowed, causing it to thicken into a gel that plugs the problematic voids. For a few cycles, shear can be reapplied to return the slurry to its



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After application of SentinelCem™ cement, no further circulation losses were observed in any of the six wells.

Two key attributes that operators have cited are SentinelCem cement's ability to be pumped through the BHA, along with its minimal waiting-on-cement time.

liquid state, a robust property that enables optimal placement. Upon being static, the cement in the slurry hydrates and develops compressive strength that prevents future losses from occurring in the problematic zone.

Unlike conventional LCMs, SentinelCem cement's effectiveness comes from its unique chemical properties rather than mechanical bridging from particle additives. This makes it ideal in places like the Dammam Formation, where the voids are simply too big for the particles in conventional LCMs. It is also operationally easier to apply than standard cement plugs because it can be pumped through the BHA, meaning its application does not require pulling the drillstring out of the hole and running open-ended drillpipe – a major benefit that saves considerable time and money.

Technology teams with the Cementing and Sperry Drilling product service lines (PSLs) collaborated to conduct a risk assessment in order to overcome a widely held belief that the innovative cement posed a risk when pumped through the BHA. The two PSLs then worked together to apply SentinelCem cement to three wells in the Zubair Field, two wells in the South Rumaila field, and one well in the North Rumaila field.

INNOVATIVE CEMENT SAVES OPERATORS SIGNIFICANT RIG TIME

The treatment proved effective. After application, no further losses were observed in any of the six wells. In each well, the operators were then able to move ahead with drilling and cementing the next casing strings, and observed cement returns to surface according to design.

Following its success, SentinelCem cement has quickly become the first choice to cure losses among operators in the area. In addition to its effectiveness in stopping circulation losses, operators have cited SentinelCem cement's ability to be pumped through the BHA, along with its minimal waiting-on-cement time, as factors that make it the go-to solution.

The first six treatments in Iraq saved an estimated 250 hours of rig time valued at USD 1.5 million.

SAVED USD 1.5
250 HOURS
RIG TIME MILLION

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