CASE STUDY

HALLIBURTON

Middle East

Tailored corrosion-resistant cement solution provides zonal integrity in CO_2 storage well

CorrosaCem™ cement system provides corrosion resistance in CCUS well prone to losses

Overview

An operator in the Middle East initiated a carbon capture, utilization, and storage (CCUS) campaign to broaden the country's infrastructure in CO_2 storage. The operator planned to evaluate this well to better understand storage zone structural integrity and target reservoir salinity.

CHALLENGE

Effective CO_2 corrosion-resistant cement placement across both sections at risk of losses

- Deliver CO_2-resistant, batch-mixed cement system in openhole section with potential for losses
- Achieve good CBL in 9 5/8- and 7-in. sections

SOLUTION

Deliver tailored cement system focused on CO_2 resistance, wellbore integrity, and lost-circulation management

- Deploy Tuned® Defense™ cement spacer to mitigate losses and lift cement in openhole section
- Deploy latex cement with Super CBL™ EXP additive to ensure wellbore integrity
- Place CorrosaCem™ system with Microbond™ additive and Super CBL™ EXP additive as tail cement to address corrosion resistance

RESULT

Successful execution of operations supported by positive CBL results

- Full returns observed during displacement in open hole
- Spacer and cement circulated to surface
- CBL indicated good cement bond in 9 5/8- and 7-in. sections

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Challenge

In the presence of water, CO_2 forms carbonic acid. This acid can react with a non-optimized Portland cement barrier and compromise cement barrier integrity. Because of this, well conditions required a corrosion-resistant cement system to provide wellbore integrity in a zone intended for CO_2 storage. With a high potential for lost circulation, a cement placement procedure to minimize the risk of lost circulation and achieve total coverage in the section of interest was imperative.

Solution

Halliburton proposed Tuned® Defense™ cement spacer, a specialized spacer to combat seepage and lost circulation, enhanced with Econolite™ additive and a surfactant package to prepare the first stage annulus for effective mud removal and mitigate risks of lost circulation. CorrosaCem™ cement, a reduced Portland cement slurry designed with latex to reduce permeability, was selected for its CO_2 resistance and execution properties to deliver an effective long-term barrier. Super CBL™ EXP additive was included to optimize a good CBL response and mitigate flow potential. To mitigate cement shrinkage and facilitate better bonding, Halliburton supplemented the cement with Microbond™ additive, a post-set expansion additive. The spacer and cement rheological properties were optimized and evaluated with the iCem® cementing service hydraulic modeling software to achieve effective displacement and optimum equivalent circulating density (ECD) to prevent losses.

Result

The operation was executed with full returns during both cement sections. Post-job pressure match using iCem cementing service indicated the planned top of cement (TOC) objective was met. CBL evaluation confirmed cement bonding in both sections. This met the zone of interest isolation objectives.

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