

United States

Completion fluids provide operator with engineered solution and services for CCUS

Completions modeling facilitates the development of custom pit management system

CHALLENGE

- Displace the wellbore from oil-based mud to brine and clean the casing of debris in preparation for completion operations
- Provide solids-free completion brine required for injectivity testing

SOLUTION

- Used Completion Fluids Graphs (CFG™) software to optimize the displacement and wellbore cleanout
- Customized pit management plan that allowed all completion brine to be built, filtered, treated, and stored on location
- Formulated suspension fluid to inhibit bacterial growth and corrosion

RESULT

- Displaced the well to clean brine and filtered to less than 0.05% total solids content
- Injected 2% by wt. potassium chloride that was built, filtered, treated, and stored on location

Overview

An operator wanted to complete a carbon capture, utilization, and storage (CCUS) appraisal well to conduct formation evaluation to determine the suitability for CO₂ sequestration of future wells.

To accomplish the data acquisition, the operator created a protocol that required large volumes of completion brine to conduct a series of injection fall-off tests (IFT), step-rate test (SRT), and mini-frac test (MFT). These tests would be used to evaluate the reservoir and determine permeability, thickness (kh), breakdown pressures, reservoir quality, fracture gradient, and injection capacity of the target intervals. In addition, upon completion of the operations, the well was to be displaced to a suspension fluid to protect and preserve the well until next stage of development.

Challenge

CCUS wells are relatively new to North America land. The execution of completions for these wells presents multiple challenges, including: (1) ensure the well and fluids are free of debris; (2) secure the availability of large quantities of injection brine; and (3) provide for the logistics and ability to store large volumes of solids-free fluids. In addition to completion of a successful displacement and wellbore cleanout (WBCO), Halliburton Baroid was tasked with the delivery of a design of service that would solve the challenges associated with the build, filtration, treatment, and storage of approximately 20,000 bbl of completion brine on location. In addition, the solution required the interface with other third-party vendors to provide the operator with an integrated service that covered the entirety of the planned scope.

Solution

To help execute the customer objectives, Halliburton Baroid developed an integrated comprehensive fluids plan that addressed all the operational and logistical challenges. The plan for the wellbore cleanout was developed with the use of Completion Fluids Graphs (CFG™) software to optimize parameters of the displacement and wellbore cleanout, such as hydraulics, volumes, spacer



formulations, contact time, physical separation, and flow rates requirements.

The fluids program provided a strategic approach to the logistical and volume management challenges of each stage of development. Baroid collaborated with third parties to provide the customer with on-site mixing capabilities, a Hi-Flow DE filtration unit, and a series of storage tanks that could be scaled. Once assembled, the customized pit system provided a working capacity of ~13,500 bbl of solids-free injection brine available to pumping units via a central manifold.

Results

Halliburton Baroid executed the fluids plan developed for the completion of the customer's CCUS well. This plan resulted in a clean wellbore and the injection > 21,600 bbl of solids-free brine all built and filtered on location. Halliburton Baroid was able to provide the customer with a customized completion fluids solution that integrated services of multiple vendors into a streamlined service that improved efficiency, reduced waste and potential haul off, decreased transportation costs, and helped facilitate the formation evaluation of the target zones. This integrated approach to completion fluids has been adopted and deployed by other operators for the successful completion of their CCUS projects in North America.

Halliburton Baroid displaced the well to a 9.3 ppg sodium chloride/potassium chloride suspension fluid treated with **ALDACIDE® G** microbiocide, **BaraCor® 100** amine inhibitor, and **OXYGON™** corrosion/oxygen scavenger to protect against the effects of bacteria.



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