Schlumberger

EverCRETE

CO_2-resistant cement system

APPLICATIONS

- Carbon capture and storage injection wells
- Enhanced oil recovery CO_2 injection wells

BENEFITS

Longer-lasting zonal isolation in CO_2 underground storage and injection because the EverCRETE* CO_2-resistant cement system is resistant to degradation when exposed to a CO_2 environment

FEATURES

- Temperature up to 230 degF [110 degC]
- Wide density range of 12.5 to 16 lbm/USgal [1,497 to 1,917 kg/m^3]
- Mixing and pumping with standard equipment
- Compatibility with portland cement

CO_2 isolation challenges

Portland cement systems are used conventionally for zonal isolation in oil or gas production wells. However, portland cement is thermodynamically unstable in CO_2-rich environments and can degrade rapidly upon exposure to CO_2 in the presence of water.

As CO_2-laden water diffuses into the cement matrix, the dissociated acid (H_2CO_3) reacts with the free calcium hydroxide and the calcium silicate hydrate (C-S-H) gel. The reaction products are soluble and migrate out of the cement matrix. Eventually, the compressive strength of the set cement decreases and the permeability and porosity increase, leading to loss of zonal isolation.

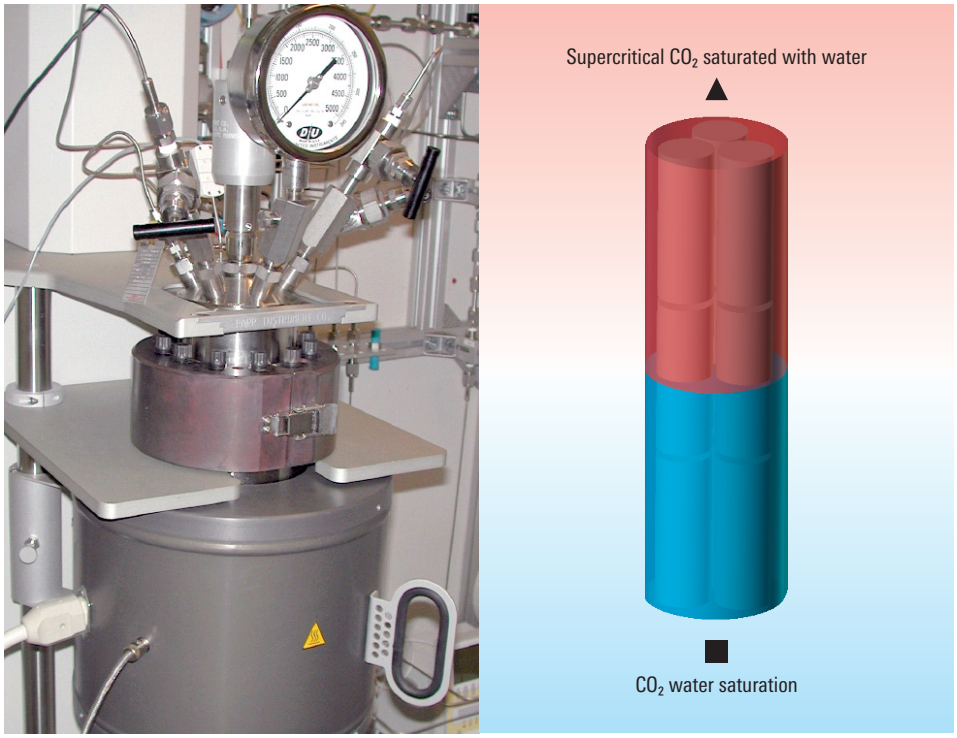
CO_2-resistant isolation solution

With the EverCRETE system, Schlumberger has developed

- CO_2-resistant cement system to extend the duration of zonal isolation
- testing methodology using a computer-controlled titanium reactor to assess the long-term durability of cement cores under well CO_2 conditions.

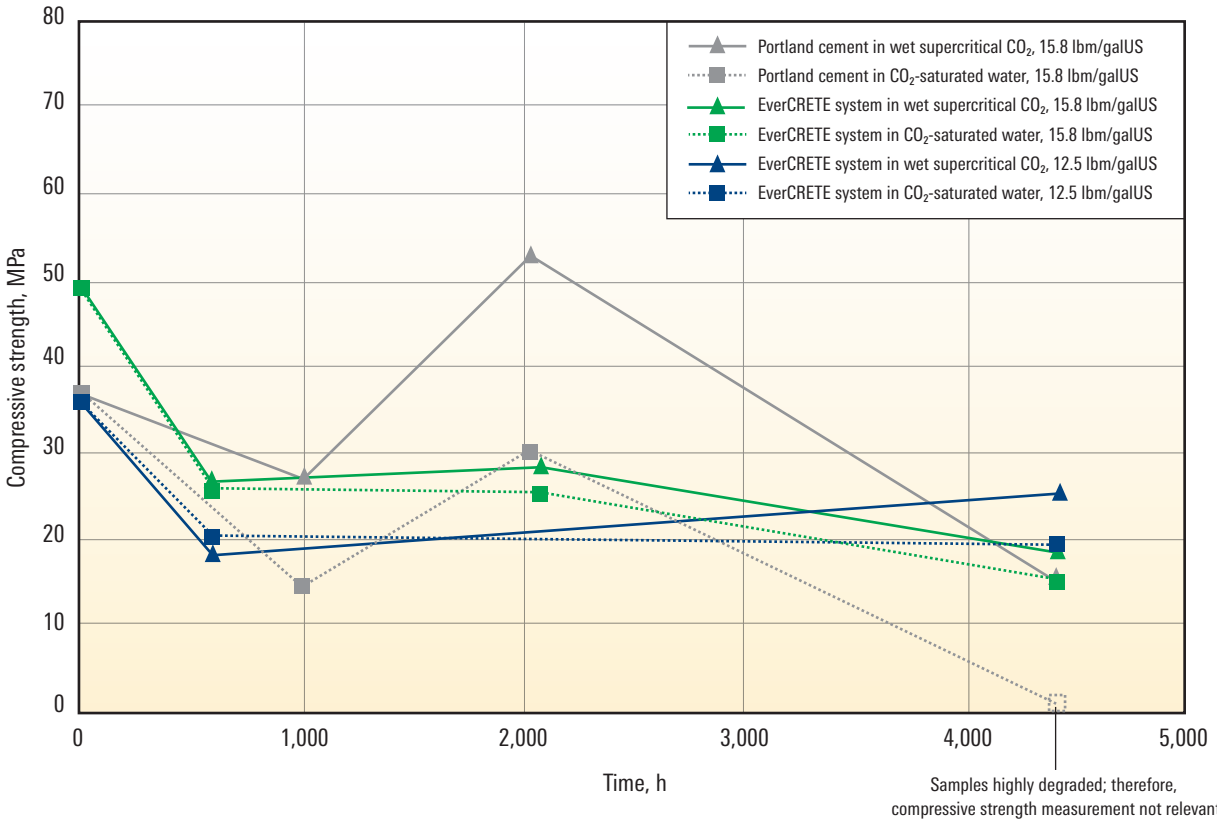
In laboratory tests, the EverCRETE system has proved to be highly resistant to CO_2 attack from wet supercritical CO_2 and CO_2 water saturation.

EverCRETE system can be prepared locally using the standard bulk plant. The density can be tailored to well requirements, providing operational flexibility.



CO_2 durability test reactor: Cement cores are tested simultaneously in supercritical CO_2 that is saturated with water and in CO_2 water saturation under downhole temperature and pressure conditions.

EverCRETE



Compressive strength evolution of portland cement and EverCRETE system samples with time in wet supercritical CO_2 fluid and in CO_2 saturated in water at 90 degC under 28 MPa of pressure. After 6 months in CO_2-saturated water, the compressive strength of portland cement is not measurable because most of the samples are highly deteriorated.

This system is compatible with portland cement. EverCRETE system can be used with conventional portland cement slurries, depending on the requirements for CO_2 resistance. EverCRETE system can be used as a tail slurry across a CO_2 injection zone or as a lead slurry to protect the casing string from CO_2 attack in front of any reservoir with CO_2 contact. It can be prepared and pumped using standard equipment.

Carbon storage

Carbon capture and storage is becoming a critically important part of global warming mitigation efforts, and this trend is expected to continue, with more and more wells being drilled for this purpose. Well integrity has been identified as the biggest risk contributing to leakage of CO_2 from underground storage sites.

Schlumberger offers a total solution with services for the entire process, from selecting the reservoir to isolating CO_2-sequestration zones to monitoring the CO_2 plume in the reservoir after injection.

CO_2-enhanced oil recovery

CO_2 injection wells can be used to increase reservoir pressure to recover oil in existing wells. This oil recovery methodology contributes to CO_2 underground storage, reducing emissions to the atmosphere.

During the CO_2 injection process, cement can be affected, which can compromise the integrity of the project. EverCRETE system reduces the risk of CO_2 degradation and leakage and can be used to cement new CO_2 injection wells or plug and abandon existing injection and production wells at the end of the project.

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