Schlumberger

EverCRETE CO_2-resistant cement system

Extend cement barrier lifetime in reservoirs containing CO_2

Aligned with United Nations Sustainable Development Goals: 12—Responsible consumption and production, 13—Climate action.

CO_2 Reduction:
Serves as barrier for CO_2 storage wells or high CO_2-producing formations. Lowers CO_2 footprint during well construction due to significantly reduced usage of Portland cement.

Temperature:
up to 284 degF [140 degC]

Applications

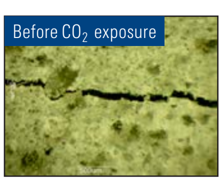
- Carbon capture and storage wells
- Wells in fields that use CO_2 injection for enhanced oil recovery (EOR)
- Primary cementing in CO_2 environments
- Long-term decommissioning objectives for plug and abandonment (P&A) in CO_2 environments

How it improves wells

Because of its intrinsic low permeability, EverCRETE* CO_2-resistant cement system resists cement matrix attack from wet supercritical CO_2 and water saturated with CO_2 conditions. Accelerated reaction kinetics lead to a stabilized matrix within days of exposure to the CO_2 environment, leading to stabilized mechanical properties.

How it works

EverCRETE system blends can be prepared locally using the standard bulk plant. The density can be tailored to well requirements, providing operational flexibility. Unlike other offerings, EverCRETE system is compatible with portland cement. The EverCRETE system can be used as a cement across potential CO_2-producing formations or as the primary barrier in the wellbore for any in situ fluids, with a portland cement-based slurry used as a filler slurry for coverage of remaining casing. It can be prepared and pumped using standard equipment. Additionally, the cement can be engineered with self-healing properties that are reactive to CO_2 exposure.



What it replaces

Portland cement systems are used conventionally for zonal isolation in 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.

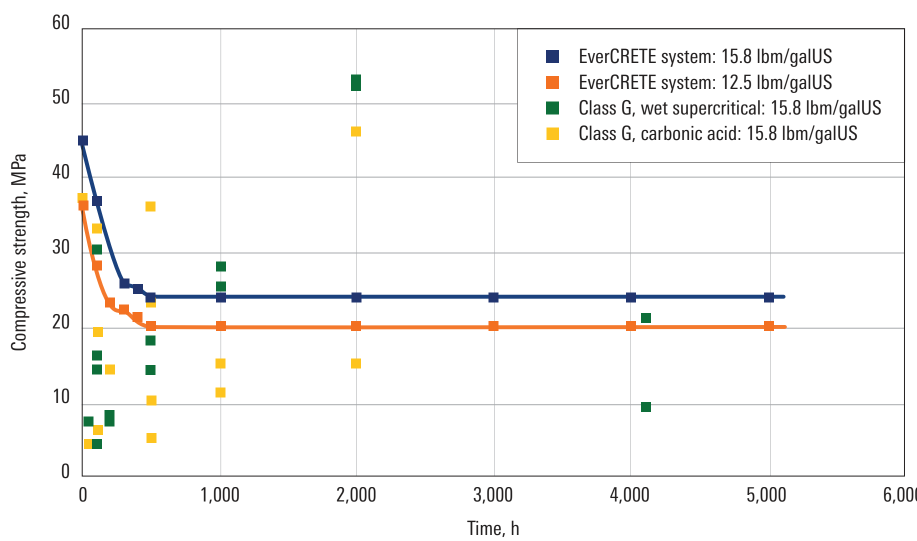
Why it's ideal in any CO_2 environment

Well integrity has been identified as the biggest risk contributing to leakage of CO_2 from underground carbon capture and storage sites. EverCRETE system enables efficient underground storage and keeps greenhouse gases out of the atmosphere.

For wells in fields that use CO_2 injection for EOR or may use it in the future, EverCRETE system reduces the risk of cement sheath degradation and leakage. It can be used to cement new CO_2 injection wells or to plug and abandon injection or production wells at the end of the field life.

In case there is damage to the cement matrix and CO_2 starts to migrate, the self-healing capabilities that can be incorporated in EverCRETE system will repair the crack, reestablishing the integrity of the well and recovering zonal isolation.

EverCRETE system can also be used as a cement across potential CO_2-producing formations or as the primary barrier in the wellbore for in situ fluids after abandonment and permanent decommissioning.



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 194 degF [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. The stability of the EverCRETE system minimizes the degradation potential of the long-term barrier.