

ForeSite[®] Sense Optical System Enabled Advanced, Real-Time Insight in CCS Reservoir Surveillance for CO₂ Injection Well

Objectives

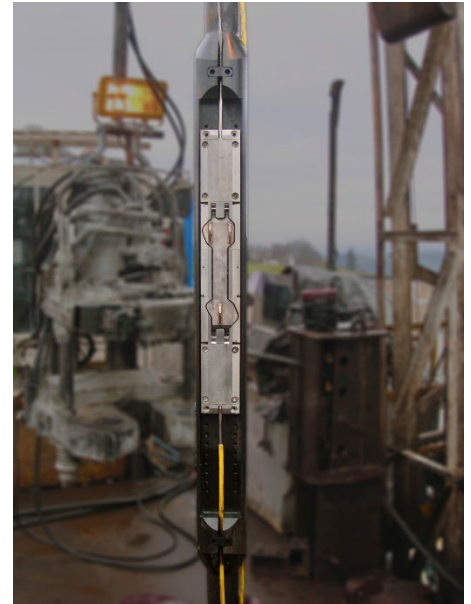
- Provide an integrated downhole surveillance system as part of a carbon dioxide (CO₂) injection well completion design. An energy customer in France executed a carbon capture-transport-storage pilot project as part of its commitment to reduce greenhouse gas emissions. The project required technologies for monitoring of downhole CO₂ conditions and reservoir caprock integrity during injection, and continued monitoring post injection.

Our Approach

- After extensive collaboration and assessment of the project requirements with the customer, Weatherford proposed a customized solution with the ForeSite Sense optical system.
- The ForeSite Sense optical system provides permanent reservoir monitoring in moderate to ultra-extreme well conditions. The gauge can be combined with multiple ForeSite Sense optical gauges or other optical sensors on a single fiber or cable, which provides comprehensive multiparameter downhole sensing for well production, injection, storage, and monitoring.
- The gauge has minimal parts and no in-well electronics. It is immune to electromagnetic interference, which enables functionality while using other electrical completion components.
- Weatherford installed optical pressure/temperature (P/T) gauges and seismic sensors at various depths and connected via a downhole optical cable to the surface. The seismic sensor was conveyed on completion tubing to depth which was then activated with a rupture disc during commissioning to enable direct contact with casing (formation). Sensor orientation was confirmed with a wireline tag to correlate offset vibrator source.

Value to Customer

- Weatherford's ForeSite Sense optical system delivered continuous, real-time P/T insight of the CO₂ conditions in the well during the critical injection phase.
- In addition, the system successfully monitored, measured, and verified CO₂ storage reservoir and caprock integrity by delivering continuous data from the optical P/T and micro-seismic monitoring and periodic vertical seismic profile (VSP) survey.



Using optical-glass Bragg-grating sensor and glass-to-metal penetrator technologies for ultra-extreme well conditions, the ForeSite Sense Optical system are well suited for high-value wells, delivering stable, reliable, high-resolution measurements with no measurable drift.

LOCATION

France

WELL TYPE

Onshore, carbon dioxide injection

FORMATION

Depleted gas field

CASING SIZE

7 x 3-1/2 in., completion

DEPTH

14,435 ft (4,400 m)

PRODUCTS/SERVICES

ForeSite Sense optical system

