OptaSense®
A LUNA company

OptaSense Carbon Capture, Usage and Storage

Cost-effective Distributed Fiber-Optic Solution for CO_2 Monitoring

The growing threat of global climate change and adoption of "Net Zero" initiatives has forced countries to find alternatives to emitting CO_2 in the atmosphere. Carbon Capture and Storage (CCS) is the only industrial large-scale solution currently available across multiple industries.

The process for capturing and storing CO_2 involves separating it from other gases produced by power plants, refineries, and other industrial producers. It is then injected back into the ground and stored in porous rock formations which trap the CO_2 for permanent storage.

In addition to being stored underground, the captured CO_2 can be also be used for enhanced oil recovery (EOR), which uses the injected gas is to reduce the viscosity of crude oil in the rock formation to encourage better flow for extraction. The OptaSense Carbon Capture, Usage and Storage (CCUS) solution uses distributed fiber-optic sensing to deliver cost-effective advanced monitoring at all stages of a carbon storage project, including site evaluation and feasibility, borehole cementing, injection and usage.

The OptaSense Solution

Since 2011, OptaSense has acquired and analyzed carbon capture and storage site data for a variety of clients. In many of those cases, the tracking of the subsurface CO_2 plume size is of utmost importance in order to ensure optimal carbon storage over time.

CO_2 injection is measured along the deployed fiber optic cable in the borehole providing injected gas volumes by depth. Over time, the subsurface CO_2 plume volume and gas flood movement can be reliably tracked with OptaSense's industry-leading time-lapse 2D/3D/VSP seismic acquisition and processing technologies.

OptaSense Advantages

- Assessment of geology and storage reservoir during site characterization
- Map CO_2 plume migration throughout lifetime of facility
- Determine distribution of CO_2 injection rates for wells with multi-zones completions
- Monitor induced seismic activity through all project stages
- Ensure well and storage integrity

The use of distributed fiber optic sensing technology also enables reliable mitigation of potential site risks through early detection of unwanted upward migration through a cap-rock, unknown fault systems, casing leaks, or unintentional fracturing of the reservoir. OptaSense's vast experience in collecting and analyzing distributed strain and distributed acoustic data for diverse range of end users, provides proven and

adaptable solutions for both carbon capture usage and carbon capture storage applications.

How It Works

Accurate, and cost effective monitoring of CO_2 flow, leakage, and distribution is necessary in order to ensure that the injected CO_2 is safely stored in deep underground formations.

The OptaSense fiber-optic interrogator unit at surface is connected to a permanently installed fiber cable deployed in either an injection well or a monitoring well. The solution digitizes the storage site making it more intelligent, safe and reliable.

To better understand the movement and events unfolding around the storage site, OptaSense provides cost effective solutions for CO_2 plume mapping and tracking through seismic imaging, earthquake risk assessment through induced seismicity monitoring. and leak free wells through well integrity monitoring.

Delivered Value

OptaSense, the industry pioneer in distributed fiber-optic sensing, is known for providing innovative solutions where performance and reliability are key to delivering real-time intelligence to reduce risk and optimize asset performance.

Working with end users either during research and development, site selection, injection or reservoir monitoring phases, OptaSense provides adaptable data acquisition paired with unparalleled expertise in data analysis.

Benefits to End User

Increased Flexibility:
- Utilize installed legacy fibers (standard or enhanced)
- Temporarily install in observation wells
- Deploy high-sensitivity specialty fibers and cables
- DAS interrogator and acquisition software allows real-time analysis

Reduced Cost:
- Feasibility studies, data acquisition and analysis as a bundle

Uncompromising Quality:
- Distributed Fiber Optic Sensing technology
- Expert application and analysis teams

For more information, please contact your OptaSense representative or visit www.optasense.com/oilfield-services

Case Study

OptaSense Provides Cost-effective Monitoring of Canadian Carbon Storage Facility

An operator in Western Canada needed a cost-effective technology that would require the least amount of disruption to its CO_2 storage facility and its wells in order to ensure that the materials were safely injected and stored underground.

OptaSense's distributed fiber-optic sensing technology was deployed in wells that were drilled to inject and store CO_2 within a target formation. Using permanent instrumented wells provided a low-cost and minimal-intervention solution for long term monitoring.

The operator turned to OptaSense for its ability to avoid additional well interventions as part of the monitoring. The use of distributed sensing technology was initially validated at a nearby facility to ensure that the fiber-optic sensing would provide sufficient resolution to detect and map the CO_2 plume at different points in time after injection into the reservoir. At specific time intervals, active source seismic data was acquired using OptaSense's Distributed Acoustic Sensing (DAS) technology. The various vintages of the data were compared against baseline measurements to provide a time lapse assessment of the migration of the plume.

OptaSense's technology delivers high sensitivity and repeatability that ensures the subtle CO_2 signatures can reliably be identified and mapped. Extensive project management and detailed field acquisition practices enabled the operator to obtain data in the least amount of time, while maximizing the value of conventional low-cost fiber-optic infrastructure.

The operator has been able to monitor the propagation of the CO_2 plume within the storage facility. Information from the various DAS vintages showcase a repeatable technology that can successfully track small changes in the reservoir. They were able to validate their storage models with distributed sensing data, showing that these facilities can be effectively and safely monitored for years to come. By using fibers in the well or on the surface, the operator was able to avoid the high maintenance costs of other sensing instruments within a harsh well environment.

In July of 2020, the operator reached a milestone with the injection of five million tonnes of CO_2 over a period of five years with a cost savings of 35% based on the original plan.

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