

Simon O'Brien, PhD.
Shell Global CCS Deployment Lead

Simon O'Brien joined Shell Canada as a Geophysicist in 1997 and worked in seismic processing, new technology development, depth imaging and quantitative interpretation for more than 18 years. His work has included a wide variety of projects; structural and stratigraphic, conventional and unconventional, onshore and offshore from across Canada and the United States. He was the Quest Storage Manager from 2015-2021, overseeing the subsurface aspects of the Quest CCS project, and he is now the Global CCS Deployment Lead for Shell.

Simon O'Brien graduated with a B.Sc. (Hons) in Geophysics from Memorial University of Newfoundland in 1987. He then attended the University of British Columbia, working on refraction seismic data from the Mackenzie Delta, completing an M.Sc. in 1990, and later returned to Memorial, developing marine seismic processing technologies, graduating with a Ph.D. in 1997.

Six years of operations at the Quest CCS Facility

Abstract

The Quest Facility is a fully integrated CCS operation with a capture target of just over one million tonnes of CO₂ per year. It captures CO₂ from three hydrogen manufacturing units at the Scotford Heavy Oil Upgrader in Fort Saskatchewan, Alberta, Canada and transports it by pipeline to a storage facility located roughly 65 km north of the Upgrader. Construction of the facility was completed on time and on budget, and it started commercial operations in August 2015. This presentation will provide an overview of the Quest facility, how the project was developed and constructed, and how the facility has performed in its first six years of operation.

To ensure the safe containment and conformance of the injected CO₂, the first version of the Measurement Monitoring and Verification (MMV) Plan was written in 2010, and it adopted a very conservative approach. It was designed to be comprehensive, covering domains from atmosphere to geosphere, including a combination of new and traditional technologies, as well as the acquisition of considerable baseline data pre-injection. Since the start of operations, learnings have been integrated to modify and update the MMV plan, with the latest MMV plan approved in 2020.

Using three wells, the CO₂ is injected into a deep saline aquifer, the Basal Cambrian Sandstone (BCS), at a depth of about 2 km below ground. The BCS is a high-quality reservoir with excellent porosity (17%) and permeability (almost 1000 mD), which is capped by more than 150m of shale and salt seals. Although reservoir performance has been excellent, there was a gradual reduction in injectivity due to halite precipitation that was successfully remediated by water treatment in 2020/21. To date, the operations have been extremely successful, with the capture facility demonstrating excellent reliability and the wells and reservoir performing at or above expectations. By the end of 2021, the Quest project had captured and stored more than 6.5 million tonnes of CO₂, more than any other onshore CCS facility in the world.