

Development of a Well Delivery Process for CO₂ Injection Wells

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The emission of greenhouse gases are the dominant cause for the climate change observed over the last centuries, and the increased carbon dioxide (CO₂) concentrations in the atmosphere play the most prominent role in the observed warming. To mitigate adverse consequences of climate change, reduction of greenhouse gases is goal of political initiatives globally like the Paris Agreement. Generation of CO₂ can be hard to abate and thus capturing CO₂ and its geological storage is seen as important measure to counteract further increase of CO₂ in the atmosphere; carbon capture and storage (CCS) can facilitate the mitigation of climate change on a global scale.

Wintershall Dea has ambitious climate targets and is aiming for Net Zero emissions by 2030 with strong commitment to sustainable development, transparency, and a low-carbon future. As Wintershall Dea builds on its gas portfolio by developing hydrogen capabilities, CCS will be an essential element of the sustainable development plan by providing a mitigation pathway for Scope 3 emissions as defined in the Paris Agreement.

CO₂ injector wells play a central role in CCS as they connect the CO₂ capture facilities topsides with the geological storage sites downhole, mostly depleted hydrocarbon reservoirs or saline aquifers. These wells have to deal with a variety of challenges. Any well penetrating the cap rock in the storage site poses a significant risk for the long-term containment of CO₂. Injector wells will be exposed to harsher conditions than other wells of the projects (e.g. monitoring wells) in terms of pressure, CO₂ concentration and temperature variance.

Technical key challenges for CO₂ injector wells are identified as:

Handling of nearly pure CO₂ as fluid

Variance in CO₂ stream

Phase management

Long-term well integrity

Monitoring requirements

Whereas the well design should allow for CO₂ injection at rate which makes the overall CCS project economically viable.

The presentation illustrates the development of a well delivery process for CO₂ injector wells. Many lessons can be learned from the comprehensive experience of the oil and gas industry in terms of safe and efficient well design, management and operations. Therefore, the newly developed process for CO₂ injector wells follows the principle of the established processes for delivering oil and gases production wells, however, considers the specific requirements of CCS projects.