TETRA TECH RPS ENERGY | TRAINING

EC005: Behaviour of CO2 in Reservoirs

Format and Duration
Self-Paced - 6 Hours

Summary

The course addresses CO2 as a fluid phase and the key question of CO2 storage efficiency, the equivalent of oil recovery factor. The course will address the rate of CO2 injection and the role reservoir permeability. The all-important issue of the geomechanical effects of CO2 injection and feedbacks between induced mineral dissolution and rock strength and other rock properties will be addressed. The range of possible interaction between CO2 and both aquifer and top-seal will be covered.

Learning Outcomes

Participants will

1. Gain an appreciation of the question of the injectivity of CO2 and the roles of permeability and aquifer architecture on CO2
2. Appreciate the types of CO2 injections projects have occurred so far, and the ones that are planned.
3. Be aware of issues related to reactions between CO2 and saline formation waters
4. Consider the geomechanical effects of CO2 injection and the implications for top-seal integrity.

Training Method

This is a self-paced e-learning course. Learning materials are structured into short sections, each including interactive text and image content, animations, video, and audio. An end of course quiz is scored to provide the learner with their learning progress. Approximately 6 hours learning time.

Who Should Attend

This course is designed for scientists and engineers working in the energy industry and provides a foundation in key aspects of carbon capture and storage. It forms part of a foundation programme of 4 courses: Fundamentals of CCS (EC003), Geological Storage of CO2 (EC004), Behaviour of CO2 in Reservoirs (EC005) and Monitoring CO2 Storage (EC006).

Course Content

Injectivity at CCS sites and controls on permeability in potential CCS reservoirs

Over the duration of this module, we will explore the factors that influence injectivity at a CCS project, most importantly permeability. As permeability is the master control on the injectivity of a CCS project we will discuss the various factors that control reservoir permeability. Finally, we will focus on the influences of rock texture, specifically pore throat radius and sorting, have on reservoir permeability.

Relative permeability, formation damage, history matching CO2 flow patterns

The aim of this module will be to learn about how CO2 interacts with other elements of the subsurface, such as other fluids and stratigraphy. Understand the role of two-phase flow and relative permeability in influencing CO2 movement in mixed brine-CO2 systems and develop an appreciation of the various processes that can lead to formation damage and thus a reduction of CO2 injectivity via examples.

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Geomechanical responses to elevated CO2 pressure

This module will develop an appreciation of the geomechanical issues around the CCS lifecycle, including how the magnitudes and orientations of the three principle stresses have a major influence on the consequences of injecting CO2 into the subsurface. We will also explore how to understand how the failure mechanisms and the link between elevated CO2 pressure and movement risks on exisiting fault zones.

Risk and rate of mineral precipitation: halite and water salinity plus CCS in basalt

Over the duration of this module, we will explore the risks and rates of mineral precipitation due to carbon capture and storage. We will discuss the mineral growth in conventional, sandstone and limestone, and unconventional, basalt, reservoirs. and limestone. Additionally, we will talk about the risk of hyalite growth and the effects of water salinity on carbon capture and storage projects.

Top-seal properties and stability at CCS sites

In this module, you will learn about various top-seals or caprocks which can be used in a CCS project. Understand how different top seals will need different approaches to understand their lithologies. As well as develop and awareness of how the overall lithology plays a part in the top seal effectiveness.