TETRA TECH RPS ENERGY | TRAINING

EC007: Petrophysics for CCS

Format and Duration
Self-Paced - 7 Hours

Summary

This course considers the properties of carbon dioxide, contrasts its behaviour with that of methane and the interactions between CO2 and water in an aquifer. There is a review of some of the properties of CO2 that affect how different wireline logs respond to it, in particular the significant effects that the gas has on sonic and neutron log responses. The responses on resistivity logs are, however, not very different to the effects of gas or oil. The natural gamma ray tool plays a role in monitoring plumes of CO2 as it is used to assess salt precipitation near the well bore. Pulsed neutron logs provide essential information on the saturation of CO2 in observation wells as part of the process of monitoring the distribution of CO2 plumes in the reservoir. The nature and quality of the data that can be obtained from wireline logs are considered and used to design schedules for running logs in the monitoring processes.

Learning Outcomes

Participants will learn to:

1. The structure of the CO2 molecule and a comparison with the behaviour of methane when injected into an aquifer.
2. Use a knowledge of CO2 physical properties to predict log responses.
3. Explain how and why the CO2 plume is monitored using wells.
4. Appreciate the general features of wireline logs and how these limit what can be learned from wells.
5. Understand the principles and application of pulsed neutron logging tools.
6. Design principles for an observation well.
7. Design a schedule for running monitoring logs.

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 7 hours learning time

Who Should Attend

This course is designed for geoscientists, petrophysicists and engineers working in the energy industry on carbon capture and storage projects. This course assumes a basic knowledge of petrophysics and petrophysical tools and the principles of carbon capture and storage.

Course Content

Physical Chemistry of CO2

This module outlines the most important basic physio-chemical principles of CO2, and where they are needed in CCUS. The module will cover the basic units and concept used in the CCUS industry and how they differ from the petroleum industry, before looking at the physical properties of CO2 and how environmental conditions affect its phase and its reactions to water.

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Petrophysics for CCUS

In this module, you will learn the properties of CO2 that affect log responses and the issue of how an immiscible fluid which is less dense than water distributes itself in a suitable trap. Understand the bonds between molecules and the relationship between the fluids and solid grains in the reservoir.

Capillary Pressure for CCUS

This module explains the fundamentals of capillary pressure and how to interpret capillary pressure curves. Explore the differences between CO2 and methane in terms of their interfacial tension and density, before looking at the effect of CO2 on the permeability of the reservoir.

Monitoring CO2 plumes in the subsurface

This module explores wireline logs and how they are used to monitor the movement of CO2 once it is injected into the subsurface. We will look at the design of observation wells and injection wells to understand how they facilitate the monitoring of CO2 and how their construction can affect measurements.

Neutron Logs

This module explore the underlying principles of how pulsed neutron logs use neutrons to measure Sigma and Ratio. We look at the different ways neutrons interact with atoms and the importance of these interactions in slowing the neutrons in order for them to be useful.

Pulsed Neutron Logs: Principles of Measurement

Here we look at how pulsed neutron logs are measured, specifically we look at the physics of the measurement and how Sigma is defined. We look at the volume of investigation and the effect that porosity, mineralogy and chlorine concentration have on the measurement.

Pulsed Neutron Logs: Outputs and Interpretation

In this module we look at the most common method for monitoring the CO2 saturation at the observation well - Pulsed Neutron Logs. We explore the primary outputs and the units and magnitudes they are measured in. Then we conclude by comparing the pros and cons of each output provided by them.