![rps MAKING COMPLEX EASY]

N593: Reservoir Characterisation and Simulation for CCS

Instructor(s): Andy Woods and Pete Smith

Format and Duration

Classroom - 2 Days
Virtual - 3 Sessions

Summary

In this course we will review the geological features of possible storage sites, focussing on the heterogeneity and presence of faults. This will enable an assessment of the impact of complex heterogeneous geology on the storage efficiency and security of the system in terms of the possible migration along faults that transect a reservoir, or through leaky seal layers. In modelling CO2, we will firstly consider the simulation objectives, the impact of aquifer properties, top and bottom seal diffusion, areal coverage of the pressure front, and secondary reservoirs for expansion. Various model approaches will be considered, namely, material balance, sector, full field, two-phase vs compositional, areal and stratigraphic coverage. The simulation of various development strategies will be tackled along with the long-term modelling of CO2 interactions and plume behaviour. The alternative approaches to the estimation of storage capacity will also be investigated.

Learning Outcomes

Participants will learn to:

1. Assess the potential for CO2 to leak or migrate across faults or through seal layers.
2. Analyse the leakage rate in comparison with the injection and plume dispersal rate.
3. Develop a simple model to test the impact of heterogeneity on CO2 storage efficiency.
4. Frame simulation objectives according to whether storage capacity, integrity assessment, development planning, or operational monitoring are the strategic requirement.
5. Select the appropriate model approach, development strategy, and long-term modelling of CO2 interactions and plume behaviour.
6. Compare the various alternative approaches for estimating storage capacity.

Training Method

A classroom or virtual classroom course comprising presentations, discussions, and case studies.

Who Should Attend

This course is aimed at subsurface oil and gas professionals who are familiar with the basics of CCS.

Course Content

Assessment of rock heterogeneity, faults, and seal rock

- Geological features of possible storage sites, heterogeneity, and presence of faults
- Complex flow patterns whereby the buoyancy of the CO2 may cause rapid ascent through the formation,
- The potential for CO2 to leak or migrate across faults or through seal layers
- Assess the impact of complex heterogeneous geology on storage efficiency
- Security of storage in the system in terms of the possible migration along faults or through leaky seal

layers.

- Consider the case study of the Sleipner reservoir, where the 9-layer system, with partially sealing horizons
- Introduce simple model to test the impact of heterogeneity on CO_2 storage efficiency

Reservoir modelling and forecasting CO_2 storage performance

- Modelling objectives – storage capacity, integrity assessment, development planning, operational monitoring
- Considerations for CO_2 modelling – aquifer properties, top and bottom seal diffusion (pressure and CO_2), areal coverage for pressure front, secondary reservoirs for expansion and/or containment monitoring,
- CO_2 dissolution, interaction with hydrocarbons, reservoir minerals, compressibility
- Model approaches – material balance, sector, full area, two-phase vs compositional,
- Areal and stratigraphic coverage
- Flow simulation model – coverage vs reduced gridding, coupled models, sector models
- Development strategies
- Long-term modelling for CO_2 interactions and plume behaviour
- Scenario(s) for estimation of storage capacity