

N236: Addressing Carbonate Reservoir Description Challenges

Format and Duration
Classroom - 5 Days

Instructor(s): Trevor Burchette

Summary

Participants will gain a thorough understanding of the nature of carbonate rocks, the controls on carbonate reservoir quality, the implications of several scales of heterogeneity in carbonate reservoir architectures, the geological data requirements in preparation for static and dynamic reservoir modelling, and evaluate examples of development strategies for carbonate reservoirs. Lectures on these topics are supported by numerous exercises using subsurface data and case studies and analogues.

Learning Outcomes

Participants will learn to:

1. Appraise the controls on carbonate reservoir quality and be able to relate these to original depositional facies, rock textures and diagenesis.
2. Predict the complexity of a carbonate reservoir and determine the likely impact that heterogeneities deriving from stratigraphy, pore types and structure may have on reservoir behaviour.
3. Construct and correlate reservoir layers and determine the data required, and the most appropriate way, to populate these with reservoir parameters for static modelling.
4. Synthesise the data from a range of carbonate reservoir analogues and become conversant with the principal issues to be resolved and integrated during the development and management of carbonate reservoirs.

Training Method

This is a classroom course, it is an integrated mix of lectures and exercises, involving numerous case studies.

Who Should Attend

Geoscientists and engineers with an interest in the characterisation of carbonate reservoirs. Prior experience with carbonate rocks is not essential, although some familiarity with carbonate depositional facies and sequences is advantageous. Note that this is NOT a reservoir modelling class, rather discussion is centred around the geological characterisation and data required in order to better represent carbonate reservoirs.

Prerequisites and Linking Courses

For people with no experience of carbonates a useful precursor to this course is classroom course N020 (Carbonate Depositional Systems: Reservoir Sedimentology and Diagenesis). Intermediate level field classes that examine carbonates are N059 (Applied Carbonate Geology: Carbonate Facies and Reservoirs, Mallorca Spain), and N091 (Carbonate Reservoir Architecture and Applied Carbonate Sequence Stratigraphy). Topics relating to deformation of carbonates are discussed in N134 (Carbonate Faulting and Fracturing Seminar, Central and West Texas), and N186 (Complex Carbonate Reservoirs: Influence of Facies and Tectonic Processes on Porosity Development, Southern Italy). For experienced carbonate workers, the Nautilus Training Alliance offers an exercise and discussion-based 3 day classroom course N073 (Workshop in Geological Seismic Interpretation: Carbonate Systems) and field

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course NI43 (Advanced Concepts in Carbonate Exploration and Reservoir Characterisation, Northern Spain).

Course Content

1. Carbonate reservoir rocks: components, facies and controls

A brief introduction to: carbonate sediments and components; carbonate facies; carbonate platform styles and facies distributions

2. Understanding carbonate reservoir properties

Carbonate rock textures and fabrics; Pore types and their characterisation; Vuggy porosity; Data sources

3. Controls on carbonate reservoir quality

Diagenesis as a control on reservoir quality; Porosity vs. depth; Porosity vs. permeability; Kv; Impact of karst and unconformities; Dolomites vs. limestones; Faults, fractures and stylolites

4. Carbonate reservoir heterogeneities

Impact of stratigraphic-scale heterogeneities; Core- and pore-scale heterogeneities; Low-resistivity pay; Utility of seismic attributes; Use of analogues

5. Carbonate reservoir architecture

Carbonate reservoir styles; Sequences and cycles; Vertical and lateral reservoir quality variations; Correlation in carbonate reservoirs; Seals, baffles and compartments in carbonate reservoir

6. Data requirements and sources

Collecting essential information; Issues of data scales in carbonate reservoirs; Value of core; Core logging; Core vs. wireline logs; Wireline log facies; SCAL

7. Aspects of carbonate reservoir characterisation

Objectives; Reservoir layering; Reservoir rock typing; Carbonate “geobody” dimensions; Identifying and accounting for thief zones; Upscaling issues; Sw distribution

8. Carbonate reservoir case studies

Carbonate reservoir development examples; Pressure-support mechanisms; Recovery factors and production rates; Fractured/faulted reservoirs

9. Participant case studies/reservoir problems

Optional confidential “no-notes” session in which participants can share examples of current carbonate reservoir characterisation/development problems that are problematic or of interest