

N576: Reservoir Modelling and the Application of Outcrop Analogues (*Utah, USA*)

Instructor(s): John Howell

Format and Duration

Field - 5 Days
Moderate Physical
Demand

Summary

In clastic reservoirs, the facies architecture is typically the most important control on the distribution of reservoir properties. Robust reservoir modelling depends upon the ability to visualise and capture the distribution of the architectural elements. This is based upon a conceptual model which is commonly derived from studies of outcrops and modern analogues. During this mixed classroom/field course we will explore a range of clastic depositional environments, understand the depositional processes and how it impacts the resultant architectural elements. We will consider the importance of stratigraphic reservoir zonation and explores different facies modelling strategies for different depositional environments. A key aspect will be understanding the sedimentological heterogeneities that impact flow and the different scales at which they occur. The course will use outcrop analogues from eastern Utah to describe workflows for better, facies-based reservoir modelling and illustrate why this matters with subsurface case studies. The course will visit classic outcrop sections, many of which have well logs and cores behind the cliffs allowing us to close the gap between outcrop and subsurface data. The concepts will be illustrated with reservoir models built from the outcrops. Virtual outcrops will also be available to enhance the understanding and integrate modern analogues.

Learning Outcomes

At the end of this course, participants will learn to:

1. Apply the principals of reservoir model design including the importance of the “conceptual geological models” and the role of analogues.
2. Given a set of petrophysical and facies data, determine which elements need to be captured in the static and dynamic models.
3. Design a modelling grid based upon interpretation of the depositional environment and associated key heterogeneities.
4. Create a stratigraphic based reservoir zonation scheme.
5. Determine the appropriate facies modelling strategy (object modelling, pixel-based modelling, MPS).
6. Given a fluvial reservoir, select the key model inputs and modelling methodology
7. Given a shallow marine reservoir, recognize the role of depositional process in controlling reservoir architecture in shallow marine systems and how to model them.
8. Given an aeolian system, determine how to zone and model the reservoir, with special reference to wet vs dry interdunes, dune trough geometries and other heterogeneities.

Training Method

A five-day course with a mixture of field-based work and classroom teaching (60/40). Teaching will involve a series of short exercises to illustrate and emphasises key points.

Physical Demand

The physical demands for this class are [MODERATE](#) according to the Nautilus Training Alliance field coursegrading system. The fieldwork will involve walking up and down slopes over rough ground. There

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will be walks of up to 3 km (2 miles) on most days, the longest being an ascent (and descent) of 60 m (200 ft) over rocky ground as part of a walk of 3 km (2 miles). The altitude of the field area ranges from 1200-1750 m (4000-5800 ft), which may lead to unexpected shortness of breath for some. The weather should be pleasant, but early-morning temperatures will be below 5 degrees Celsius on some days. Driving will be in SUVs on black-top and unpaved roads.

Who Should Attend

This course is multi-disciplinary. It is designed for geoscientists, petroleum engineers and petrophysicists involved in designing, building and assessing reservoir models.

Course Content

Day 0

- Arrive Salt Lake City, then drive to Price, UT

Day 1

- Introduction to shallow marine systems. Shorefaces vs Deltas. (Panther Tongue, Spring Canyon)
- Night in Price, UT

Day 2.

- Fluvial systems – Non-marine Blackhawk and Price River Formation
- Night in Price, UT

Day 3

- Tidal Estuarine systems. (Woodside Canyon)
- Night in Green River, UT

Day 4

- Correlation and clinoforms in shoreface systems (Green River Embayment)
- Night in Green River, UT

Day 5

- Arid depositional systems – aeolian and fluvial deposits. Bartlett Wash and Hwy 7
- Night in Moab, UT

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Day 6

- Drive to Salt Lake City for return flights