N155: Introduction to Clastic Depositional Systems: a Petroleum Perspective

Format and Duration
Classroom - 5 Days

Instructor(s): John Howell or Adrian Hartley

Summary

This course examines and differentiates the main clastic depositional systems in a pragmatic way from a petroleum perspective. Exploration, basin-scale aspects of the depositional systems are addressed, and the key development and reservoir scale issues are reviewed in this context. Subsurface expression of the systems is reviewed, using seismic, well log, and core data. The overall aims of the course are to provide a basic overview of clastic depositional systems and an awareness of current trends in subsurface analysis.

Learning Outcomes

Participants will learn to:

1. Apply seismic, well log and core data to characterise sandstone reservoirs in a range of depositional systems that are commonly encountered in hydrocarbon exploration and development.
2. Apply appropriate correlation strategies to the deposits of different depositional systems.
3. Interpret the deposits of alluvial depositional systems in terms of their sandstone body characteristics, dimensions, and architecture, and understand the importance of palaeosols in subsurface analysis.
4. Differentiate the deposits of wave- and tidal-processes in shoreline-shelf depositional systems and be able to predict reservoir presence and understand reservoir heterogeneities in the sandstone bodies.
5. Interpret the deposits of deltaic depositional systems, appreciate the differences between shelf- and shelf-edge deltas and the importance of incised valleys in the stratigraphy of deltaic deposits.
6. Analyse the deposits of deepwater depositional systems with particular emphasis on correlation strategy and the seismic expression of deepwater elements.
7. Use sequence stratigraphy in the interpretation and prediction of different depositional systems.

Training Method

A classroom course (with a core workshop session where facilities allow) comprising lectures and practical exercises using a variety of data types.

Who Should Attend

The course is designed for geoscientists seeking an up-to-date introduction or review of clastic depositional systems from a petroleum perspective. It is particularly appropriate for early career geoscientists wishing to gain a broad appreciation of the potential of clastic depositional systems and their analysis in the subsurface.

Course Content

The principal clastic depositional systems that form commercial prospects, fluvial, aeolian, shoreline, deltaic, and deepwater, will be reviewed. Each system will be studied independently from basic principles through to specific hydrocarbon issues, and linkages between systems will be emphasized. Evidence from

modern depositional settings, surface exposures and subsurface data will be used to develop an in-depth introduction to the petroleum potential of the major clastic depositional systems. Strategies for the use of these data sets in characterising and correlating the deposits of different depositional systems emerge from the discussions.

In the SE Asia-based version of this course, exercises and discussions will draw on exploration and production aspects relevant to this region. Concepts and applications will include examples of sedimentary basins, petroleum systems and hydrocarbon accumulations from SE Asia.

1. Introduction

- Why sedimentology is important
- Introduction to sedimentary basins

2. Fluvial/Alluvial Depositional Systems

- What are fluvial systems?
- Process and bedforms
- Alluvial fans
- Distributary fluvial systems and their deposits
- Subsurface characterisation of fluvial deposits
- Correlation strategies in fluvial deposits
- Stratigraphic architecture of fluvial
- Reservoir aspects
- Exercises on architecture, sand body connectivity and correlation of alluvial deposits

3. Aeolian Systems

- What are aeolian systems?
- Types of aeolian system
- Processes and bedforms in aeolian systems
- Subsurface characterisation
- Correlation strategies
- Stratigraphic architecture
- Reservoir aspects

4. Shallow Marine/Paralic Depositional Systems

- What are shallow marine/paralic systems?
- Progradational versus transgressive systems
- Wave dominated shorelines
- Tide dominated shorelines
- Fluvial dominated shorelines
- Sequence stratigraphy

- Reservoir aspects
- Well log exercises in the correlation of parasequences
- Seismic based exercise on shelf edge stratigraphy - understanding clinoforms

5. Deep Marine Systems

- Deepwater settings
- Deepwater processes
- Basic deepwater deposits
- Debrites, linked debrites and hybrid beds
- Sequence stratigraphy of deepwater systems
- Deepwater architectural elements
- Mass transport complexes
- Slope channel and canyon complexes
- Unconfined elements
- Facies models for unconfined systems
- Confined systems
- Seismic based exercise on sequence stratigraphy, seismic facies and deepwater elements.

A core workshop session examining a range of depositional systems will be included where facilities are available.