TETRA TECH RPS ENERGY | TRAINING

N492: Clastic Depositional Systems in SE Asia: Concepts and Models for Reservoir Characterisation and Prediction

Instructor(s): Joseph Lambiase

Format and Duration
Classroom - 5 Days

Summary

This course addresses the fundamental sedimentological controls on clastic reservoir distribution and character, and provides a practical guide to the use of integrated facies and sequence stratigraphic models in the interpretation and prediction of petroleum reservoirs. The course focuses on reservoir sedimentology through the integration of core, well log and seismic data. The class will learn how to apply these methods and concepts to petroleum exploration and production through a series of lectures and exercises that examine a wide range of clastic depositional systems from lacustrine, fluvio-deltaic, shallow marine to deep-water environments. We will investigate the geological controls on these systems at a range of scales: From the basin-scale down to the reservoir-scale.The concepts, models and applications will be demonstrated through exercises based on actual oil and gas fields, with emphasis on examples in SE Asia.

Learning Outcomes

Participants will learn to:

1. Recognize the subsurface diagnosis of the main clastic reservoir types through the integration of their core, well log and seismic data.
2. Use of modern and ancient analogues in the quantification, modelling and prediction of clastic reservoirs.
3. Consider the distribution of reservoir facies in a sequence stratigraphic framework.
4. Assess the impact of clastic depositional processes and stratigraphic architecture on reservoir zonation, correlation and 3D reservoir models types, including heterogeneity characterisation.
5. Appreciate the exploration and production implications and how these vary for the different clastic depositional systems.
6. Review how to undertake subsurface facies analysis for reservoir characterisation and modelling in fluvio-deltaic to deep-water clastic depositional settings.

Training Method

This is a classroom course which includes lectures with discussion, worked examples, case studies and practical exercises.

Who Should Attend

This course is designed for geoscientists who wish to gain an understanding of clastic depositional systems in SE Asia and develop models for reservoir characterisation and prediction.

Course Content

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The course includes the following main topics:

1. A brief introduction to fluid flow, sediment transport mechanisms, bedforms and sedimentary structures associated with open channel flow, sedimentary gravity flows and waves to establish the basis for facies interpretation.,
2. Continental depositional systems,
3. Integrated facies and sequence stratigraphic models of clastic coastal and deltaic depositional systems, including both regressive and transgressive systems.
4. Modern fluvio-deltaic depositional systems in SE Asia.
5. Deep-water depositional systems

The central theme of each session is reservoir sedimentology, involving the following: integrated facies and sequence stratigraphic analysis (depositional processes, sediment supply versus accommodation space and reservoir architecture), sand body types (size, shape and orientation), reservoir characterisation (thickness, reservoir quality and core/well log/seismic expression), heterogeneity (shale body thickness, shape and distribution) and implications for exploration and production (exercises and case studies).

The course will be customized by introducing actual reservoir examples of direct operational interest tothe course sponsor, including the use of cores. This could include detailed analysis of some or all of:

Continental depositional systems - Fluvial processes, hydrodynamics & modern rivers; fluvial facies models (bedload dominated/braided, mixed-load/meandering and suspended load/anastomosing systems). Nature & recognition of incised valleys. Lacustrine systems.

Facies recognition based on outcrop, core, well log and seismic expression for the diagnosis of different fluvial reservoir types. Geological controls on fluvial architecture: base level concept & fluvial equilibrium profile, fluvial architecture, channel stacking patterns and relative sea-level changes; linkage between coastal & alluvial plain successions. Reservoir implications of different channel styles: predicting reservoir connectivity, examples of fluvial reservoir field development projects.

Coastal depositional systems - regressive and transgressive coasts & deltas. Process-based, texture & physiographic classification schemes; relationship to relative sea-level; behaviour, basinal processes and sediment type. River-, tide- and wave-dominated deltas: morphology, sand body types, reservoir characteristics; supported by examples of modern deltaic systems. Deltaic reservoir bodies & their outcrop & subsurface recognition (cores, logs & seismic); supported by ancient examples from outcrops and subsurface. Estuaries: nature, definition, processes and their subsurface recognition; estuary facies models (wave- & tide-dominated systems). Sequence stratigraphic framework, incised valley fills, key stratal surfaces & stratigraphic architecture. Reservoir implications of different types of delta types: predicting reservoir architecture, examples of deltaic reservoir field development projects.

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Recent to Modern fluvio-deltaic depositional systems in SE Asia – The interaction between climate, tectonics and relative sea-level changes and how these processes influenced the character of fluvial, coastal plain and coastal depositional systems. This will enable us to integrate these concepts and models with the modern depositional systems that we can directly observe in SE Asia and beyond. We will critically assess the applicability of these systems as analogues to comparable Miocene reservoirs in SE Asia.

Deep-water depositional systems - deep-water processes and deposits. Identifying architectural elements in deep-water systems, confined deep-water basins related to salt- and mud deformation, the nature, origin and controls on submarine fans. Sequence stratiraphic framework, larger-scale nature of deepwater systems, including submarine fans, particularly with regards to reservoir distribution. Reservoir implications of deep-water reservoirs will be considered with reference to actual field examples.

Exercise sessions should include a core workshop which will provide the participants with the opportunity to examine a range of clastic depostional facies and consider their reservoir characteristics.