Petrogenium. Academy

Upstream (Geology)

Sedimentology and Depositional Environments of Deep-water Deposits

Consultant / Trainer

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The **Petrogenium (in collaboration with EPTS) Sedimentology and Depositional Environments of Deep-water Deposits** course will provide participants training covering the theory and application of sedimentology and depositional environments of deep-water deposits. A good understanding of how depositional processes control the distribution of deep water reservoir and non-reservoir rocks in the subsurface is of fundamental importance to sound EP decision making. This applies throughout a field's life-cycle, all the way from the exploration phase, through appraisal, field development and finally field abandonment.

Participants

This **Petrogenium** course is aimed at Geoscientists who need to fully understand the origins of deep-water sedimentary systems.

Learning Objectives

Participants will be trained in theory and application of sedimentology and depositional environments of deep-water deposits. The course comprises an extensive series of topic-related modules, with provision to include workshops on Client &/or student datasets. The course can be concluded with a multiple choice test.

Programme

DAY 1

Course Intro & Refresher: Why soft rock geology matters to the Oil industry

- significance of stratigraphy & sedimentology to the E&P sector
- impact of reservoir heterogeneity on fluid flow; sedimentary characteristics as a control on poroperm
- fundamentals of reservoir modeling workflow; overview of sedimentary systems; correlation of well data and building the fluid flow model

Deepwater petroleum systems overview

- deep water discoveries
- fields in deep water vs fields in deep water deposits
- petroleum systems in deep-water settings; trap styles in deep water
- importance of mobile substrates [salt &/or shale]; exploration risk: importance of DHIs / AVO; offshore economics & need for high productivity
- deep water development options.

Deepwater petroleum systems & source rocks

- lacustrine source rocks in syn-rift settings
- marine source rocks & sea level change; Black Sea: present day source rock factory
- 'Ice House' vs 'Green House' oceanic circulation
- Jurassic Kimmeridge Clay: submarine fan sands interfingering with source rock

DAY 2

Deepwater mass-flow depositional mechanisms

- introductory overview and review of gravity-flow / mass-flow sediment transport mechanisms [slumps / debris flows / grain flows / turbidites]
- three main settings: west coast California / sea level low-stands with deltas reaching shelf slope / seismically induced shelf slope collapse & Grand Banks case study
- tectono-sedimentary setting as a control on mass-flow sediment transportation; review of slumps / debris flows / grain flows / turbidites and likely reservoir characteristics; turbidites - vertical [Bouma sequence] and lateral depositional characteristics; dimensions of turbidite systems
- mud-rich / mixed sand-mud / sand-rich as a control of type of submarine fan; overview comparison clastic versus carbonate deepwater deposits

Deepwater contourite depositional systems

- oceanic circulation systems; Hjulström / Sundborg diagram; examples of contourite deposits

Programme

DAY 2 Continued

Deepwater mass-flow clastic sedimentary systems

- dimensions of clastic deepwater mass-flow systems; sediment supply to deepwater; linkage with sea level; glaciations & sea level
- sea level low-stand > key control on turbidite sedimentation; submarine fan models & terminology, comparison deepwater fans - subaerial fans - deltas; autoclycicity; vertical sequence in fan deposits; thin bed effects [shaley sands evaluation] in basin plain & levee deposits; shelf edge collapse & megaturbidites
- analogues from 3D seismic & from outcrops; proximal channel deposits > levee deposits > basin-plain deposits
- 'milking' 3-D seismic to characterise deep water deposits; describing geometry of deep water deposits [translating geological jargon into descriptive terms]

DAY 3

Refresher on carbonates: reefal build-ups as sources of deep water carbonates

- comparison clastic & carbonate depositional systems
- Bahama platform; sea level as key control on carbonate sedimentation; main types of carbonate factory - Tropical factory / Cool water factory / Mud mound factory; T-factory & M-mound factory: common sources of deep water carbonates
- T & M factory during Phanerozoic; T-factory reefal systems - geometry & distribution

DAY 3 continued

Slope & basin floor fan systems - Gulf of Mexico clastics case studies

- Gulf of Mexico depositional system; salt diapirism as a control on sea floor topography
- sea floor topography and turbidite sedimentation & distribution; turbidite classification & depositional architecture; value of inversion modeling for reservoir characterization

Slope systems Angola - clastics case study

- stratigraphic & sedimentological setting; seismic expression; reservoir heterogeneity; core / log characteristics; reservoir characteristics

Proximal slope & basin floor settings North Sea - clastics case studies

- Brae field - coarse grained proximal fan; reservoir heterogeneity & recovery; Schiehallion field - channelized turbidites
- reservoir connectivity; Nelson field - channelized basin floor fan
- delayed development of a 400+ million barrel UR field due to not understanding a 'dry hole'
- impact of sea floor topography on sand distribution; crestal versus flank well control
- impact on volumetrics of T/Z variation between crest and flank; impact of shaley sands on volumetrics

Programme

DAY 3 Continued

Proximal slope & basin floor settings

North Sea - clastics case studies

- Brae field - coarse grained proximal fan; reservoir heterogeneity & recovery; Schiehallion field - channelized turbidites
- reservoir connectivity; Nelson field - channelized basin floor fan
- delayed development of a 400+ million barrel UR field due to not understanding a 'dry hole'
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DAY 4

Slope & basin floor fan systems - Nigeria - clastics case studies

- Niger delta - depositional and structural characteristics
- growth faulting & shale diapirs; slope mini-basins versus outboard plays; the outboard play - Bonga; reservoir heterogeneity, 4D seismic & fluid displacement
- mini-basin play; depositional architecture & shale diapirism; stratigraphic reservoir compartmentalization
- 3D seismic & reservoir characterization - value of AVO & inversion; shaley sands evaluation and production performance; reservoir compartmentalization & drive mechanisms

DAY 4 Continued

Carbonate mass flow deposits - case studies

- Devonian reefs [Canning Basin - NW Australia]; fore reef setting - debris flows & olistostrome deposits
- mixed clastic & carbonate system; Jurassic carbonate platform - slope - basin [Marocco]
- proximal slope channel deposits versus distal basin plain deposits; Cretaceous fore reef deposits [Poza Rica / Golden Lane system - Mexico]
- seismic expression; reservoir characteristics; seismic facies & prediction of reservoir characteristics
- Cretaceous Chalks [North Sea]; pelagic deep water carbonates; Cretaceous 1st order high sea-level stand & carbonate sedimentation; allochthonous versus autochthonous chalks & reservoir quality; impact of Chixculub K/T event on reservoir quality; modern Bahama platform - distribution of deep water mass flow deposits; comparison clastic & carbonate deep water deposits; key characteristics & dimensions of carbonate slope deposits

Programme

DAY 5

Optional modules upon request [depending on students' general level of sedimentological / stratigraphic knowledge]

- Module: Sea level & Eustacy fundamentals
- Module: Sequence stratigraphy concepts

Overview and summary

Optional workshop module

- Presentation by students of own data sets with review & discussion in workshop format

Multiple choice course test (optional on client request)

Why select Petrogenium.?

The above support will be provided by principal consultants with 30+ years world-class experience in the technology and hands-on know-how from operation of refinery units.

Contact Petrogenium.:

Email: training@petrogenium.com
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Because Experience Matters