

Petrogenium. Academy

Upstream (Field Development Planning)

Geological and Reservoir Engineering aspects of deepwater Field Development Planning

Consultant / Trainer

Evert van de Graaff/Wim Swinkels



The **Petrogenium** (in collaboration with EPTS) **Geological and Reservoir Engineering aspects of deepwater Field Development Planning** participants will gain a solid understanding of the geological, technical, and economic characteristics that define deepwater hydrocarbon accumulations. They will learn about the key challenges and risks involved in deepwater exploration and production projects, along with best practices for mitigating these risks and improving project evaluation. The course will help participants appreciate the importance of multidisciplinary integration across geoscience, engineering, and economics in achieving project success. By the end, they will be better equipped to contribute effectively to decision-making and planning in high-cost, high-risk deepwater E&P operations.



Participants

This **Petrogenium**. course aims at practicing subsurface professionals who need to acquire a sound understanding of deepwater reservoir systems. Geoscientists and other subsurface engineers who have recently joined (or are about to join) an FDP team tasked with planning the appraisal and development of a deepwater turbidite hydrocarbon accumulation. Prerequisites: Awareness of the basics of soft rock geology and/or reservoir engineering including knowledge of subsurface technical workflows.



Learning Objectives

This course provides an overview of the geological and reservoir engineering aspects of the field development of deepwater hydrocarbon-accumulations. Though the full range of deepwater oil & gas reservoirs is covered, focus is on providing participants with a sound understanding of clastic turbidite systems. Emphasis in the geology part of this course is on the various controls on reservoir architecture and reservoir properties within a turbidite system. The reservoir engineering part of the course covers the 'why and how' effects on FDP decision-making due to these spatial variations in reservoir architecture and reservoir properties.

Programme

Day1

Course participants will gain a sound understanding of the geological characteristics and depositional origin of deepwater hydrocarbon resources. A clear distinction is made between hydrocarbon reservoirs that originally formed in shallow water environments but which currently occur in deepwater settings and deepwater reservoirs that were deposited in deepwater by mass-flow mechanisms. In deepwater settings a variety of mass-flow sediment transport mechanisms occurs, with debris flows and turbidites most important for the deposition of reservoir quality rocks. Participants will understand the controls on the occurrence and distribution of the different deepwater transport mechanisms. This is important for the prediction and modelling of the spatial variations in reservoir quality.

Reservoir characterisation of a turbidite deposit

- Participants' learning points from the previous day
- Deepwater carbonate sedimentary systems
- Sea-level & sequence stratigraphic controls on deepwater deposition
- Plate-tectonic controls on deepwater sedimentary systems
- Reservoir characterisation of a turbidite reservoir
- Seismic + Cores + Logs + Sedimentology

Day2

Deepwater carbonate and clastic reservoirs are both similar and very different in their reservoir architecture and reservoir properties. For example clastic turbidites most commonly form during low sea-level stands, whereas carbonate mass-flow deposits typically form during high sea-level stands. Identifying suitable reservoir analogues for a clastic turbidite reservoir requires a sound understanding of the plate-tectonic setting of the basin in question. Input data for reservoir characterisation requires combining seismic, log, core and sedimentological inputs.

- Case studies
- Participants' learning points from the previous day
- Outcrop analogues
- Submarine canyon-fills and other channel deposits
- Angola
- Nigeria

Day3

Focusing on channelized turbidite deposits a number of case studies will provide course participants with an understanding of how e.g. plate tectonic and sea-level setting, shelf slope or presence or absence of salt substrate, control the deposition and distribution of clastic reservoir rocks. This will include a group exercise in translating input data (seismic / logs / cores / geological concepts) into qualitative statements about reservoir architecture and reservoir property characteristics.

Reservoir dynamics: Field Development Plan

- FDP Summary
- Impact of turbidite environment on production behaviour
- Impact of turbidite environment on FDP formulation
- Thin bedded turbidites and production behaviour -
- Reservoir modelling
- Modelling thief zones, averaging
- Use of the Hall plot

Case study: Deepwater production improvement and reservoir management

- K field experience - Early production experience - waterflood optimisation - smart well design - monitoring
- Turbidite reservoirs: data integration and model construction
- Participants' learning points from the previous day
- Data collection and interpretation
- Data types: Permeability, saturation, rock -fluid interaction, PVT
- Modelling workflow

Case study: Deepwater production improvement and reservoir management (Continued)

- Aspects of turbidite dynamic simulation modelling
- Data integration and model construction - upscaling
- Relative permeability handling and pseudo rel perms, Stiles and VE
- Fault modelling
- Well modelling
- Aquifer modelling
- Quality and consistency of the model
- Surface-subsurface integration.

Day4

Case study: Integrating data across disciplines

- North Sea experience - Integration of disciplines - depositional model scenarios - compartmentalisation - workflow for building sector models - impact of parameter uncertainty - use of Thomas Stieber analysis

Well productivity

- Slanted and horizontal wells - well options
- Productivity and PIF
- Impact of layered reservoirs / pressure drops in horizontal wells
- What are the options, for a well trajectory in turbidite environment to get optimum productivity & recovery

Turbidite well testing and uncertainty handling

- Participants' learning points from the previous day

Well test options and well test design.

- **Options** for well testing during appraisal phase to reduce the uncertainties
- Well test objectives - table of objectives against test types
- MDT and DST tests - Mini DST (SLB terminology) = Wireline Formation testing - view and data.
- Permeability from wireline formation tests
- Wireline cased hole dual packer (Mini DST) and DST in turbidite environment.
- Pressure transient analysis - classical well tests
- Duration of well tests. Best options to reduce uncertainty by extending well tests.

Programme

Day5

Case study: Complex reservoir architecture validated by well testing: turbidite well test example

- Well testing in deepwater turbidites
- DST operations - well test sequence
- well test interpretation - tidal effects
- Identification of channel model
- (optional case)Extended Well Tests - Regulations NS

Handling uncertainty

- The scenario method - How to use the Realisations method
- Value of Information concept.

Case study: Deep water reservoir uncertainty handling

- Uncertainty management
- Application of multi scenario approach - experimental design
- Key subsurface uncertainties in turbidite environment

Summary and close-out

- Post course questionnaire

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

Website: <https://www.petrogenium.com/training/>

Because Experience Matters