

Advanced Basin Modelling and Thermal Maturity Simulation Training Course

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Overview

Advanced Basin Modelling and Thermal Maturity Simulation Training Course is a one-week course for exploration geoscience and petroleum systems functions who leave with a Basin Model Calibration and Petroleum Systems Risk File. Participants condition stratigraphic, thermal, geochemical, and structural inputs; reconstruct burial and heat-flow histories; calibrate source-rock maturity; and test generation, expulsion, migration, and charge timing. The course turns uncertain inputs into traceable scenarios and assurance evidence. Agile Leaders Training Center presents basin modelling and thermal maturity simulation.

Who Should Attend

- Exploration geoscience functions responsible for basin evolution, play context, and charge risk
- Petroleum systems functions responsible for source, maturity, generation, migration, and timing models
- Geochemistry functions responsible for source-rock properties, kinetics, maturity indicators, and fluid evidence
- Seismic and structural interpretation functions responsible for horizons, faults, erosion, and model geometry
- Reservoir geology functions responsible for charge context, trap timing, preservation, and uncertainty
- Technical assurance functions responsible for model review, scenario challenge, and evidence traceability

The course assumes participants can interpret geological, geochemical, well, and seismic data, and it leaves out introductory petroleum geology, specialist software administration, seismic processing, petrophysical inversion, and reservoir flow simulation.

Departments and Industries

The course supports departments and industries that evaluate sedimentary basin evolution and petroleum charge.

- Oil and gas exploration, appraisal, and subsurface assurance
- Geothermal exploration and sedimentary-basin heat studies
- Carbon storage screening and regional subsurface characterization
- Petroleum systems, geochemistry, geology, and geophysics
- Technical services, research, data management, and exploration risk

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Learning Objectives

By the end of this course, participants will be able to:

- Build conditioned stratigraphic, lithologic, structural, and geochemical input sets
- Analyze burial, erosion, compaction, heat-flow, and temperature histories
- Calibrate thermal maturity with measured temperature and maturity evidence
- Evaluate source-rock kinetics, generation, expulsion, migration, and charge timing
- Compare one-dimensional, two-dimensional, and three-dimensional scenarios
- Build uncertainty, sensitivity, quality-control, and assurance records

Course Agenda

Day 1: Condition Basin Model Inputs

- Stratigraphic Event and Unconformity Table
- Lithology, Porosity, and Compaction Property Matrix
- Well, Seismic, and Geochemical Data Conditioning Register
- Source-Rock Richness, Quality, and Kinetics Input Sheet
- Model Coordinate, Unit, and Version-Control Checklist

Day 2: Reconstruct Burial and Thermal History

- One-Dimensional Burial and Subsidence History Plot
- Erosion, Nondeposition, and Paleowater-Depth Scenario Table
- Basal Heat-Flow and Surface-Temperature History Model
- Present-Day Temperature and Pressure Calibration Dataset
- Thermal Boundary Condition Assumption Register

Day 3: Calibrate Maturity and Generation

- Vitrinite Reflectance and Maturity Indicator Calibration Plot
- Source-Rock Kinetic Model Selection Matrix
- Transformation Ratio and Generation-Timing Chart
- Hydrocarbon Expulsion Threshold and Yield Assessment
- Calibration Residual and Misfit Diagnostic Board

Day 4: Model Migration and Charge Risk

- Two-Dimensional Carrier, Fault, and Seal Pathway Section
- Three-Dimensional Generation Kitchen and Migration Map
- Trap Formation, Charge, Leakage, and Preservation Timeline
- Sensitivity, Uncertainty, and Scenario Comparison Matrix
- Petroleum Systems Charge-Risk Evidence Register

Day 5: Practice Basin Model Assurance

- Suggested Exercise: Audit Stratigraphic and Thermal Inputs
- Suggested Exercise: Calibrate Burial, Temperature, and Maturity Histories
- Suggested Exercise: Challenge Generation, Expulsion, and Migration Results
- Suggested Exercise: Rank Charge Scenarios and Uncertainty Drivers
- Capstone Exercise: Complete the Basin Model Calibration and Petroleum Systems Risk File

Practical Exercises

The course uses suggested activities to turn model inputs, calibration evidence, and simulation results into traceable petroleum systems decisions.

- Suggested activity: condition a well-based stratigraphic column and document erosion, lithology, source-rock, and thermal assumptions.
- Suggested activity: compare measured temperatures and maturity indicators with simulated burial and heat-flow histories.
- Suggested activity: evaluate generation, expulsion, migration, and trap timing across alternative scenarios.
- Suggested activity: challenge uncertainty drivers and prepare an assurance record for an exploration review.

FAQs

Who suits advanced basin modelling and thermal maturity simulation, and what does it assume?

Advanced basin modelling and thermal maturity simulation suits exploration geoscientists, modelers, geochemists, interpreters, reservoir geologists, and assurance reviewers. It assumes working knowledge of subsurface data, stratigraphy, source rocks, and petroleum systems concepts.

How does basin modelling training differ from reservoir simulation training?

Basin modelling training reconstructs geological, burial, thermal, maturity, generation, migration, and charge histories at well-to-basin scale. Reservoir simulation training evaluates fluid flow and production behavior within a developed reservoir using different inputs, equations, and decisions.

How is thermal maturity simulation calibrated?

Thermal maturity simulation is calibrated by comparing simulated histories with measured temperatures, vitrinite reflectance, and other maturity evidence, then challenging heat flow, erosion, burial, lithology, kinetics, and boundary conditions while preserving an audit trail.

What uncertainty should basin and petroleum systems models report?

Basin and petroleum systems models should report uncertainty in geometry, ages, erosion, lithology, thermal boundary conditions, source-rock properties, kinetics, migration parameters, and calibration data. Scenario comparisons show which assumptions control maturity, generation, timing, and charge risk.

Conclusion

Participants take back a Basin Model Calibration and Petroleum Systems Risk File linking conditioned inputs, burial and thermal histories, maturity calibration, generation, expulsion, migration, charge timing, sensitivity, and assurance evidence. It changes isolated simulation outputs into traceable geological scenarios. The file supports technical review, uncertainty communication, and exploration risk decisions.

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