Fractured and Unconventional Reservoir Modelling: DFN, Dual Porosity and Shale Well Forecasting

10 – 14 October 2027
Jeddah - Corniche four-star



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Introduction:

Fractured and unconventional reservoir modelling fails when fracture data from image logs, cores and seismic never reach the flow model, and when shale or tight gas wells are forecast with tools built for high-permeability rock. The result is overstated fracture connectivity, steep unexpected well decline and reserves that are revised downwards. This Core Concept course takes subsurface teams from fracture characterisation through DFN construction, dual-porosity parameters and stress-sensitive fracture behaviour to rate transient analysis of multi-fractured horizontal wells. Participants build a Fractured and Unconventional Asset Forecast Pack for a sample play.

Course Objectives:

- Classify fractured carbonate, shale gas, light tight oil and tight gas plays by storage mechanism and screening criteria such as organic richness, brittleness and maturity
- Interpret natural fracture sets from image logs, core and seismic attributes and convert them into Warren-Root dual-porosity or dual-permeability parameters
- Construct and condition a DFN model and upscale it to fracture permeability tensors and shape factor grids
- Evaluate in-situ stress, critically stressed fractures and stress-dependent aperture to judge fracture conductivity under depletion
- Diagnose linear flow in multi-fractured horizontal wells and forecast them with Duong, stretched exponential and modified hyperbolic methods
- Compile probabilistic type wells, spacing and completion scenarios and PRMS reserves support into an asset forecast pack

Target Audience:

- Reservoir engineers who forecast fractured and resource-play wells and prepare reserves submissions
- Geomodellers who build fracture networks and property grids for flow simulation
- Structural and production geologists who describe fracture sets from cores, image logs and seismic
- Completion engineers who set stage spacing, cluster design and proppant loading for horizontal wells
- Asset team engineers who compare well spacing and development concepts for unconventional plays

Course Outline:

Day 1: Fractured and Unconventional Play Types and Storage Mechanisms

- Unconventional Resource Classes: Shale Gas, Light Tight Oil, Tight Gas and Basin-Centred Gas
- Fractured Reservoir Classification by Matrix and Fracture Storage Contribution
- Adsorbed, Free and Fracture-Held Gas in Organic-Rich Shale
- Organic Richness, Brittleness and Thermal Maturity as Play Screening Criteria
- Fractured Carbonate Versus Shale Play Uncertainty Map

Day 2: Fracture Characterisation and Dual-Porosity Frameworks

- Fracture Picking and Aperture Classes on Resistivity and Acoustic Image Logs
- Core Fracture Description: Natural Versus Drilling-Induced Fractures
- Seismic Curvature, Coherence and Azimuthal Anisotropy as Fracture Density Proxies
- Warren-Root Parameters: Shape Factor, Storativity Ratio and Interporosity Flow Coefficient
- Dual-Permeability Versus Dual-Porosity Formulation Selection

Day 3: DFN Construction, Upscaling and Fractured-Rock Geomechanics

- Fracture Set Definition by Orientation, P32 Intensity and Size Distribution
- Stochastic DFN Realisations Conditioned to Wells and Seismic Drivers
- Oda Upscaling of DFN to Fracture Permeability Tensors and Sigma Grids
- In-Situ Stress Orientation, Critically Stressed Fractures and Reactivation Risk
- Stress-Dependent Fracture Aperture and Closure Under Depletion

Day 4: Multi-Fractured Horizontal Wells: Stimulated Volume, RTA and Spacing

- Stimulated Reservoir Volume and Complex Versus Planar Fracture Geometry from Microseismic Mapping
- Square-Root-of-Time Linear Flow Plot and Fracture Half-Length Root-k Estimate
- Duong, Stretched Exponential and Modified Hyperbolic Forecasts with Terminal Decline Switch
- Parent-Child Well Interference, Frac Hits and Well Spacing Concepts
- Completion Intensity: Stage Spacing, Cluster Count and Proppant Loading Trade-Offs

Day 5: Modelling Build: Fractured and Unconventional Asset Forecast Pack

- Type Well Construction and P10-P50-P90 Probabilistic Forecast Envelope
- Resource Play Reserves Under PRMS: Undeveloped Locations and Analogue Support
- Fractured Carbonate Sector Model Sensitivity to Sigma, Fracture Permeability and Block Size
- Development Concept Comparison: Well Spacing, Lateral Length and Completion Design
- Asset Forecast Pack Presentation and Peer Challenge

Skills You Will Gain:

- Image Log Fracture Interpretation
- Seismic Fracture Attribute Screening
- Discrete Fracture Network Modelling
- Fracture Permeability Upscaling
- Fractured Rock Stress Analysis
- Linear Flow Diagnostics
- Unconventional Well Forecasting
- Type Well Uncertainty Analysis

Why Attend This Course:

- Return with a Fractured and Unconventional Asset Forecast Pack built on a sample play and challenged by peers
- Stop carrying unconnected fracture data into flow models by linking image log, core and seismic evidence to one DFN
- Defend shale and tight gas forecasts with flow regime evidence instead of curve fits alone
- Compare spacing and completion choices with engineers and geoscientists working different fractured and resource plays

Conclusion:

Fractured carbonates, shale and tight gas reward teams that treat fractures and stimulated volume as measured, modelled and uncertain properties. The week moves from play types and storage mechanisms to fracture characterisation, dual-porosity parameters, DFN construction, upscaling and fractured-rock stress, then to rate transient analysis, forecasting methods, well interference and completion intensity. The final day brings these together in a Fractured and Unconventional Asset Forecast Pack with type wells, sensitivities and reserves support ready for the next asset review.