Fractured Reservoir Characterisation

Designed for:
The course is designed for practicing mid to senior level geologists and reservoir engineers. Geophysicists and petrophysicists aware of reservoir modeling techniques would also benefit.

Duration
(days)

1 2 3 4 5
flexible

Learning Level:

Skills

Knowledge

Awareness

This course provides a practical, integrated approach to characterising and modelling natural fractures where they are important for hydrocarbon delivery.

Fractured reservoirs often display highly heterogeneous dynamic behaviour that is difficult to capture using standard reservoir modelling workflows. This course addresses all the relevant aspects of characterising and modelling fractured reservoirs to allow robust definitions of likely behaviour during production.

Early analysis and integration of all available data, including dynamic data, is vital for the geologist and reservoir engineer to define the relationships between fracture and matrix parameters. Likely fracture distribution concepts (fold related, layer bound joints or fault related) can be defined and simple dynamic models built to test against well test or production data. In addition, first pass estimates of fracture porosity, fracture permeability and fracture sigma (fracture-matrix exchange factor) can be calibrated against available data. Fluid type is also important as gas reservoirs often only need simple modelling approaches compared with multiphase reservoirs.

If the concepts and initial parameter estimates prove robust, more sophisticated techniques can be employed to produce more accurate models with greater control on parameter sensitivities. Parameters in these models can be defined from heterogeneous properties in geomodelling software or upscaled from Discrete Fracture Network packages. Sector models can then be taken and run in reservoir simulators in dual porosity or dual permeability modes. Further upscaling may be required to define useable full field dual porosity or dual permeability models. Throughout this process, iteration of the modelling workflow is key to provide tight integration of all the available data and constrain parameter estimates.

The course steps through the entire process of project definition, data gathering and analysis, concept definition
 and static and dynamic modelling iterations. This will help participants understand fractured reservoirs and define the most efficient way to model them for a given set of objectives.

Early Development
E&P Overview
Reservoir
Wells

Business & Risk
Open Air
Coaching
Master Class
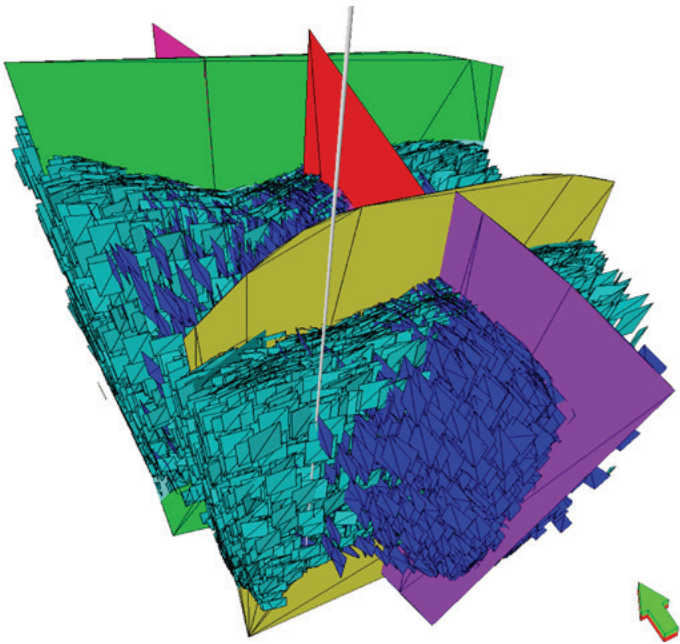
Fractured Reservoir Characterisation continued

Course Content:

Basics
  • What is a fractured reservoir, typical attributes & behaviours, economic impact

Origin and characteristics of fractures
  • Classification and fill types, modes of formation, stresses and rock failure, systems - regional, fold or fault related

Sampling and analysis of natural fractures
  • Detection, density, aperture, distribution, orientation, permeability, sets, type and fill

Geomechanics
  • Rock properties, failure criteria, influence of in-situ stresses

Modelling
  • Geocellular reservoir models, calculating fracture permeability in a property grid, analytical effective fracture permeability tensor, fracture matrix interaction, percolation theory, fracture system connectivity, representative elementary volumes, discrete fracture networks, upscaling

Dynamic data and simulation
  • Rock properties, well testing & productivity, recovery mechanisms, introduction to dual porosity and dual permeability simulator modes, introduction to streamline simulators and discrete fracture network modelling, management of fractured reservoirs
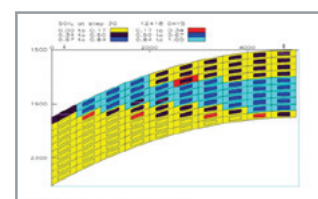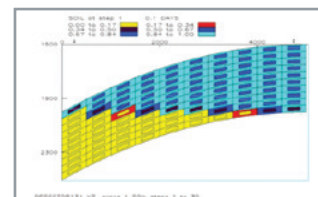
Course Duration:
Duration is 3, 4 or 5 days depending on whether it involes one or two trainers and whether a field day is included

Courses available from this series:
Basic Geoscience
Introduction to Geophysics
Geological Application of Well Logs
Openhole Petrophysical Interpretation
Core Description
Production Geology
Applied Production Geology
Reservoir Model Design
Fractured Reservoir Characterisation
Geology for Drilling Engineers
Reservoir Engineering
Applied Reservoir Engineering
Well Test Design & Analysis
Logging While Drilling
Basin Analysis
Geomechanics

Course Tutors

Tim Wynn PhD
Main Series tutoring: Reservoir, Master Class (fractured reservoirs)
Industry experience: over 25 years, geoscience
Career background: British Gas, GeoScience, ICE, AGR and TRACS
Personal: SPE technical editor, technical paper author, geoscience publications

Richard Oxlade MEng
Main Series tutoring: Reservoir, Early Development, Master Class (business)
Industry experience: over 30 years, commercial, reservoir engineering
Career background: BP, AGR and TRACS
Personal: Global advisor, business planning & economic analysis

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