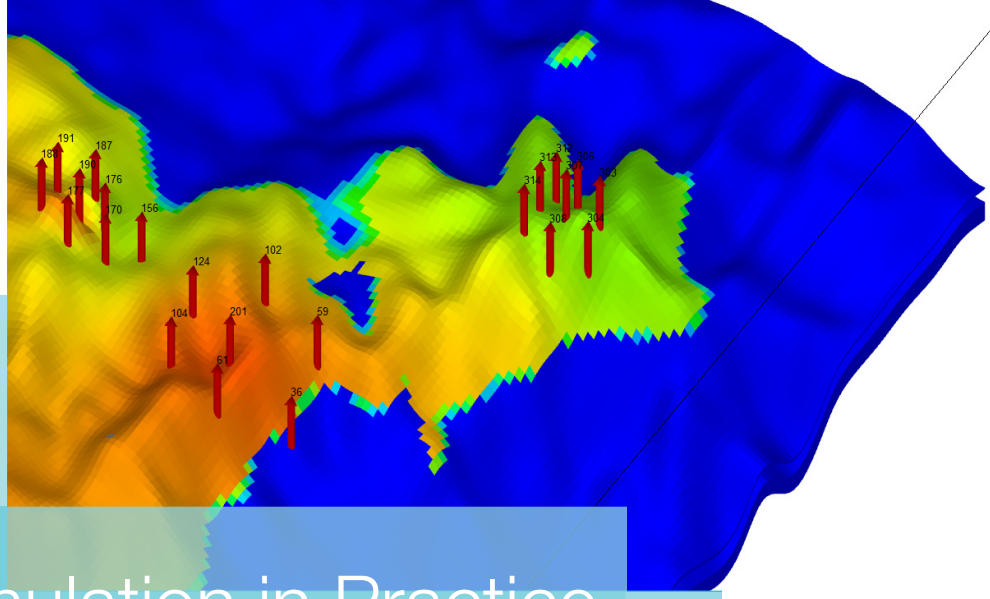
esanda
Oil and gas training specialists

2019 COURSES

Perth 29 APR – 3 MAY
Kuala Lumpur 24 – 28 JUN
London 1 – 5 JUL
Mexico City 2 – 6 SEP
Istanbul 21 – 25 OCT
Atyrau 28 OCT – 1 NOV
Perth 25 – 29 NOV



Reservoir Simulation in Practice Advanced 5 Day Course

Course Overview

Subject to participant requirements

The course provides an in-depth understanding of the role that reservoir simulation plays in exploration and production companies. The course is hands on, looking at real case studies and focusses on practical problems and how to solve them. Simulation for pre-development and mature fields is discussed, providing an integrated view of modelling sub-surface, facilities and commercial operations. A refresher session on multi-phase flow in the reservoir and production facilities is followed by the numerical treatment of the equations of flow, and how these equations are solved using modern computer hardware.

The reservoir simulation workflow is presented, from geological modelling, fluid property characterisation and handling of well completion and production data. The modelling of geological structures including pinch-outs and complex faulting is discussed, together with techniques for interpolating poro-perm distributions and upscaling from geocellular-geostatistical models. Data preparation of fluid and rock properties and initialisation of the model is illustrated by field examples, together with preparation of well production data. These concepts – geology, rock and fluid properties, well data – are illustrated using hands-on models including a gas-condensate reservoir, oil reservoir under water-flood, and a three-phase reservoir with aquifer influx. Uncertainty analysis is introduced by identifying the major uncertainties that impact production forecasts, together with how this analysis is extended to history-matching and planning robust field developments.

The course participants will be able to run the case studies using RFD's tNavigator suite and investigate the impact of model assumptions on field development and economic planning.

Course objectives

Learn the role reservoir simulation plays in the modern oil and gas company.
Discuss the different types of model from pre-development and mature field to integrated asset management.

Understand reservoir simulation workflows including building simulation models from mapped data to upscaling geocellular models.
Learn the data requirements of reservoir simulation and how to prepare and QC data from different sources.

See these concepts integrated in field-scale case studies including a gas condensate, oil water-flood, and three-phase reservoir with aquifer influx.
Understand the concept of uncertainty analysis and how to identify the important parameters for sensitivity analysis.

Use modern methods including experimental design and stochastic optimisation to carry out history-matching.

Book here

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tNavigator®

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RFD Rock Flow Dynamics
Integrated static and dynamic modeling from reservoir to surface

The course is designed for

Engineers with a good understanding of reservoir engineering principles and a basic knowledge of reservoir simulation. Also, for practising geoscientists who need to work with and supply data to reservoir simulation engineers.

DAY 1

Morning

The role of reservoir simulation in the corporation

- Pre-development, green-field
- Mature, brown-field
- Integrated production modelling

Review of simulation fundamentals

- Multi-phase flow in porous media
- Flow in pipelines and tubing
- Numerical methods

Computing systems

- Desktop
- Parallel Clusters
- GPUs

Afternoon

The reservoir simulation workflow

- Geological modelling
- Reservoir structure
- Rock properties
- Fluid properties (PVT, Rel Perm, Cap Pressure)
- Fluid contacts
- Model initialisation
- Well completions
- Production data

Model QC

Running the model

Analysing Results

DAY 2

Morning

Reservoir Simulation Approaches

- Top-down versus Bottom-up

Simulation Data Requirements

- Static volumetrics
- Dynamic single-phase flow
- Dynamic multi-phase flow

Modelling Reservoir Structure

- Depth and structure maps
- Vertical and complex faulting
- Stratigraphy
- Erosional and truncation surfaces
- Pinch-outs

Afternoon

Modelling Depositional Environments

- Simple interpolation
- Advanced Kriging
- Facies and rock types
- Geostatistics
- Geocellular models

Upscaling

- Porosity and permeability
- Saturation end-points
- Fault juxtaposition and cross-flow

DAY 3

Morning

Preparation of Rock and Fluid Properties

- SCAL
- Rel permeability
- Cap pressure
- End-point correlations
- Normalisation
- PVT analysis
- Rock and water properties

Preparation of Production Data

- Well completions
- Horizontal wells
- Multi-laterals
- Multiple hydraulic fractures
- Smart wells
- Artificial lift
- Production constraints

Afternoon

Introduction to Field-Scale Models

- Gas condensate reservoir – depletion drive
- Oil reservoir – water-flood
- Oil column with gas cap – aquifer influx

DAY 4

Morning

Parameters for Sensitivity Analysis

- Structural modelling
- Seismic picks
- Seismic Velocities
- Well trajectories
- Rock property distributions
- Facies models
- Geostatistical realisations
- Fault transmissibility modifiers
- Permeability-porosity modifiers
- Rock and fluid property uncertainty
- Fluid contact uncertainty
- Production operations

Afternoon

Production Forecasting under Uncertainty

- Probability distributions
- SPE PRMS reporting requirements

Hands-on Examples

- Gas condensate reservoir
- Water-flood reservoir
- Oil and gas-cap reservoir with aquifer influx

DAY 5

Morning

History Matching

- Objectives

Techniques

- Experimental design
- Latin hypercube sampling
- Direct search methods
- Response surface (proxy methods)
- Ensemble Kalman filter

History-Match Workflow

- Parameter identification
- Parameter ranges
- Global versus local parameters
- Consistency checks Data analysis and review

Afternoon

History Match Hands-on Example

- ADNOC model reservoir

tNavigator Q&A

Course Review

** Practical Reservoir Simulation exercises*
Course schedule:- subject to modification to suit participant requirements

Course instructor: Professor Andrew Wadsley

Dr Andrew Wadsley has more that forty-two years' experience in the petroleum industry—starting as a wellsite petroleum engineer with Shell International in 1975—and has been a consultant petroleum engineer for thirty years. Dr Wadsley is a founder and engineering guru with EPGuru.com; he was Chief Technology Officer and founder of Stochastic Simulation Limited; Director and Principal of his own company, Exploration and Production Consultants (Australia) Pty Ltd which he founded in 1988; adjunct Professor in Petroleum Engineering at the Curtin University of Technology; Chief Scientist for Paradigm Geophysical from 1999 to 2005; and Reservoir Engineering Expert on the Gorgon CO2 Sequestration Review Committee for Department of Industry and Resources, Western Australia. Dr Wadsley has been Umpire for resolution of a Gas Reserves Dispute, and has been called as an expert witness in cases ranging from reservoir engineering, the mercury content of natural gas, to gas production operations. He is a member of the Society of Petroleum Engineers (SPE), the European Association of Geoscientists and Engineers (EAGE), and the Society for Industrial and Applied Mathematics (SIAM). He received a Bsc (Hons), University Medal in Mathematics from the Australian National University in 1970, an MSc from the University of Warwick (UK) in 1972, and a PhD from the University of Warwick (UK) in 1974.

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