MERCURY

Dynamic Reservoir Simulation

04 - 15 Aug 2024
Online

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Dynamic Reservoir Simulation

Ref.: 15345_304955 **Date:** 04 - 15 Aug 2024 **Location:** Online **Fees:** 4500 **Euro**

Course Objectives:
At the end of this course the participants will be able to:

- By taking this course, the Participants will know the structure of the reservoir simulator, the way in which numerical calculations of processes in the reservoir are formulated, and the method of reservoir modeling, from data preparation to history matching with production reservoir data and visualization of simulation results.

Targeted Competencies:

- Select the necessary set of data for certain calculations, ie reservoir-development methods;
- Oppose the most popular production calculation methods, ie comparisons of production history;
- Format statistically valid set of data for reservoir engineering calculations;
- Structure and initialize the simulation model;
- To match individual measured or recorded data with the analytical, and simulation model;
- Apply methods of prediction of recovery from hydrocarbon reservoirs using reservoir engineering methods;
- Show examples of numerical calculation of pressure drop in reservoirs.

Course Content:
Unit 1: Production prediction methods:

- Overview of reservoir behavior prediction methods
- Revision of material balancing calculations in a reservoir - an example of Craig's multi-well calculation
- Overview of terms and data related to dynamic reservoir description - petrophysical parameters
- Statistical processing of permeability, porosity, relative permeability, and capillary pressure data for analytical and simulation applications;
- Possible data sources laboratory measurements, correlations, processed laboratory data, data related to production history
- Concepts and data related to dynamic reservoir description - pVT parameters tables or equations of state

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Unit 2: Examples of numerical calculation:

- Example of a numerical calculation for heat transfer in a two-dimensional layer;
- Calculation of the spatial distribution of heat based on the Laplace equation;
- Theory of numerical flow calculation
- An example of the equation of left, right, and central finite differences for the flow account between two elements
- Example of numerical flow calculation in a two-dimensional model
- Example of numerical calculation for pressure in a two-dimensional model
- Numerical solution of pressure drop in 2D model MS Excel

Unit 3: Simulation models:

- Structure of simulation model in modern reservoir simulators - required data sets, types of networks gridding, aquifer models numerical aquifer, Fetkovich aquifer, explicitly defined aquifer, the definition of well equipment transmissibility, flow conditions, boundary pressure condition
- Data preparation for the reservoir simulator - comparison of the input data structure in the Schlumberger Eclipse simulator and CoatsEngineering SENSOR
- Example of an oil model in a numerical simulator ECLIPSE, SENSOR, BOAST4D
- Creation of different types of networks uniform Cartesian = block-centered, structural = corner-point, cylindrical coordinates, combination of networks
- Simulation of a simple example block model model in Eclipse - presentation of results pressure drop in time, production, daily production, saturation in 3D space, pressure changes in 3D space
- Initialization of the simulation model matching of the initial state of saturation and pressures of the simulation model with the predicted, ie measured data
- Matching of production history and simulation model - an example of history-matching the simulation model with pressure drop calculations by material balancing
- Development of a block model in Eclipse and comparison with the material balancing calculation made within the course Hydrocarbon reservoir development
- Matching of reservoir simulation parameters with material balance calculation - segmented model, modeling of porosity changes, heterogeneity
- Seminar project assignment upscaling and stochastic modeling of data, matching of models with Craig's calculation, matching with Buckley-Leverett's calculation, etc.
- Translation upscaling, homogenization of laboratory data to the level of the reservoir - coreflood simulation, ie harmonization of the simulation model with laboratory measurement of relative permeability
- Project assignment: development of a simulation model based on the initialized reservoir model and given production data

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Unit 4: Project task:

- Cost-effectiveness of an individual simulation scenario - selection of the most efficient model ie the one that gives the highest recovery with the least number of wells in the optimal time
- Changing the resolution of a reservoir model - examples of the influence of numerical error on the result
- Solution convergence problems
- Statistical quantification of heterogeneity and application to a reservoir model with a large number of simulation cells
- Scales of model definition, a simple example of data homogenization upscaling
- Stochastic approach to predict data not available for the model and grid refinement with a large number of cells
- Development of a miscible flow model for enhanced, ie tertiary methods
- Example of application of the compositional models, comparison with previous developed black oil simulation models
- Project assignment: Matching production histories in a compositional model
- Scenario analysis of future hydrocarbon production

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Registration form on the :
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