Gas Condensate Reservoir Engineering

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Introduction:

This is a 5-day classroom based course with micro model reservoir condition flow visualization videos, lab visit, practical field and worked examples, hands-on exercises and discussion.

It will enable participants to develop skills to analyse and manage gas condensate reservoirs. It draws on Heriot-Watt's world leading expertise and addresses: phase behaviour; relative permeability varying with velocity and interfacial tension; material balance equations; well productivity and pseudo-pressure calculation for different completion strategies, condensate banking and gravity drainage; practical fluid and flow simulation models; and demonstrating NeW-COIN software.

Content:

Phase behavior

Equations of state; fluid sampling and laboratory PVT tests; prediction of phase behaviors and reservoir fluid properties; Tuning of EOS using experimental data and field application of fluid data in commercial simulators; a comparison of black oil and compositional models.

Condensate issues

Condensate formation and growth; critical condensate saturation, gravity drainage, residual trapped gas and condensate; condensate banking; and well remedial.

Reservoir Flow

Relative permeability measurement methods; single and two phase inertial factor estimation methods; water flood; relative permeability variations with velocity & interfacial tension due to coupling (capillary number) and inertial effects; mechanistic models of coupling; relative permeability correlations and calculations for use in simulators and using the next generation (universal) method.

Estimating volumes and production mechanisms

Material balance equations (gas in-place calculations and drive mechanism identification); high pressure and high temperature reservoirs, depletion for dry, wet and gas condensate systems; active aquifers and pressure maintenance (including gas injection).

Well issues

Steady state and pseudo-steady state flow equations; well productivity calculations; perforation and fracture characteristics and effective parameters; perforation and fracture design; estimation of skin for perforated, fractured, deviated and horizontal wells.

NeW-COIN

A demonstration of this in-house software which calculates near wellbore relative permeability accounting for coupling and inertia; and estimates gas condensate well productivity for various completion strategies.

Course Schedule

Day 1

- Summary of Basic Reservoir Engineering
- Relative permeability measurement methods
- Phase behavior of reservoir fluids

Day 2

- Equations of state
- Fluid sampling and laboratory PVT tests
- Prediction of phase behaviors and reservoir fluid properties
- Condensate formation and growth
- Critical condensate saturation, condensate banking, gravity drainage;
- Water flood

Day 3

- Single and two phase inertial factor estimation methods.
- Relative permeability variations with velocity & interfacial tension due to coupling (capillary number) and inertial effects.
- Mechanistic models of coupling.
- Relative permeability correlations and calculations for use in simulators and using the next generation (universal) method.
- Steady state and pseudo-steady state flow equations.
- Material balance equations.
- Depletion for dry, wet and gas condensate systems.
- Active aquifers and pressure maintenance.
- High pressure and high temperature reservoirs.

Day 4

- Perforation and fracture characteristics and effective parameters.
- Perforation and fracture design.
- Estimation of skin for perforated, fractured, deviated and horizontal wells.

Day 5

- Well productivity calculations.
- NeW-COIN demonstration.
- Field application of fluid data in commercial simulators.