

WELL TEST DESIGN AND ANALYSIS

RSE004

COURSE OVERVIEW

This course will focus on the practical application of modern techniques in well test analysis, with a special emphasis on the pressure derivative. Various pressure analysis techniques will be used to analyse flow tests, buildup tests for one phase or multi-phases, multi-rate tests, interference tests, and pulse tests. Interpretation of pressure tests under multiphase flow conditions, hydraulically fractured wells, naturally fractured reservoirs, composite reservoirs, slanted wells, and horizontal wells will be discussed in great detail. Participants will be introduced to the Kappa Saphir software starting from beginner level reaching to advanced user. Numerical well test will be discussed in detail with many exercises starting from day one.

The material includes step-by-step procedures to interpret pressure transient tests, such that participants will be able to immediately apply the knowledge and skills gained to their job assignments upon course completion. Concepts will be illustrated by several daily exercises and workshops.

Participants attending the programme will be skilled in the following:

- Well test development history, and recent advancements in PTA.
- Origins of heterogeneity and what makes WTA/PTA a complicated problem.
- Types and classes of well tests, and when to use each.
- Pressure-based analysis of flow and buildup tests
- Derivative-based analysis of flow and buildup tests
- Determining Average reservoir pressure
- Drainage area and pore volume of bounded systems, oil in place
- Practical aspects of fracturing and acidizing
- Uniform-flux and infinite-conductivity models of hydraulic fractures
- Finite-conductivity: linear, bilinear, and elliptical flow
- Interpreting using the Kappa Saphir
- Indicators and types of NFR
- Pseudo-steady state and unsteady state matrix flow models
- Storativity and Porosity Partitioning coefficient (λ and Ω)
- Fracture porosity from well logs and well test analysis
- Interpretation of Fall off test

- Numerical vs. Analytical well testing
- How to design a well test for complex configuration
- Qualitative and quantitative analysis for DST
- Applications deconvolution techniques
- How to simulate Partially completed/penetrated/perforated wells
- How to get Vertical permeability from spherical flow, MDT
- How to interpret horizontal wells pressure derivative
- Flow regimes and analytical solutions
- Pressure analysis of hydraulically fractured wells
- Be proficient in using Kappa Saphir

WHO SHOULD ATTEND

This course is designed for anyone who want to understand well testing principles and want to apply advanced modern interpretation techniques using software. The course is key for many disciplines: Reservoir engineers, petroleum engineers, geologists, geophysicists, petrophysicist, drilling engineers, team leaders and everyone involved in reservoir characterization and reservoir development.

COURSE DURATION

5 Working Days

COURSE OUTLINES

1. Pre course evaluation
2. Fundamentals of Well Test and Getting Started with Kappa Saphir
 - Reservoir Engineer deliverables
 - RE tools and roles
 - Reservoir heterogeneity
 - Basic definitions
 - Mobility, capacity, transmissibility
 - Skin, WBS, boundaries
 - Applications of Well Test
 - Governing Equations
 - History of WT development
 - Analysis techniques
 - Types of Well Tests

- Flow regimes
- Radius of Investigation
- Introduction to Pressure build-up
- Introduction to Pressure draw down.
- Workshop: Getting familiar with Kappa Saphir

3. Pressure Build-Up Test, Pressure Derivative, Diagnostic Plots & DST

- Horner Plot
- MDH
- Type Curve Matching
- Diagnostic Plots
- Bourdet derivative
- Definitions: ETR, MTR and LTR
- Flow Behaviors
- Composite Reservoirs
- Volumetric Behavior
- Radial Flow
- Linear Flow
- Bilinear Flow
- Spherical FLOW
- DST (Periods, interpretation and analysis)
- Workshop: to practice basic concepts and definitions

4. Well Test Analysis for Stimulated Wells + Numerical Well Test

- Well Test for Fractured Wells
- Flow Regimes
- Depth of Investigation
- Straight Line Analysis
- Numerical Well Test
- Analytical vs. Numerical WT
- Design using Numerical WT
- Workshop: to practice actual examples + stimulated wells (acidized and fracked) and Numerical well testing.

5. Well Test Analysis for Horizontal Wells

- Well Test for Horizontal Wells

- Steps to Evaluate Horizontal wells
- Flow Regimes
- Radial, Hemi-Radial, Early Linear, Late Pseudo Radial, Late Linear
- Analysis Procedures
- Factors Affecting Interpretation
- Workshop: to practice real cases for many wells + practicing interpretation of Horizontal wells.

6. Well Test Design Exercise, Deconvolution and Course Recap

- Concept of Well Test Design
- Applications of Deconvolution
- Course Recap
- Workshop: to continue practicing real life cases in addition to practicing well test design using the software to get the optimum shut-In time needed.

7. Post course evaluation

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