

(11) Advanced Well Test Analysis

WHO SHOULD ATTEND

The aim of the course is to provide with necessary knowledge in well problem diagnosis and remedial, work-over operations, well stimulation, sand and water control that helps formulate engineering solution of petroleum field production operation related problems.

COURSE OBJECTIVES

- Understand why and how formations can be damaged and how to reduce the risk of damage, and increase the well productivity
- Know the principles underlying well testing and the procedures for analysing well tests in both vertical and horizontal wells
- Learn the reasons for well testing and the information that can be derived from it
- Understand the state-of-the-art of well testing, including testing of horizontal wells, layered reservoirs, and reservoirs producing under multiphase flow conditions
- Design well tests and specify equipment requirements and procedures
- Check the quality of well test data and correct or discard "bad" data
- Analyse well tests for production and injection wells using classical and computer aided methods
- Identify well bore and reservoir effects and choose the correct model for evaluation and design
- Set actual test objectives and design a test to achieve these objectives
- Understand the basic types of well tests (drawdown, buildup, injection, falloff, interference, pulse and DST)
- Understand basic concepts (Horner plots, Log-Log plots, skin effect, well bore storage, and effect of boundaries)
- Perform actual well test interpretations for homogeneous, fractured, double porosity systems)

CONTENT

- Introduction to Well Testing
- Overview of Well Behaviour and Testing,
- Objectives of Well Testing
- Flow Equations Including the Diffusivity and Darcy Equation
- Types of tests, fluid types, reservoir types, well test interpretation approaches
- Reservoir Boundaries and Channel Analysis
- Well bore Skin Factor and Partial Penetration and Deviation, Skin – damage and stimulation
- Well bore Storage and the Use of Type Curves Pressure Derivative
- Hydraulically and Naturally Fractured Wells
- Data Quality (Pressure, Production and Fluids)
- Well Test Interpretations

- Gas Well Testing, Analysis of Gas Well Flow Tests, Analysis of Gas Well Build-up Tests
Water Injectivity Tests
- Well Test Design and Planning
- Horizontal Well Test
- Interpretation of oil and gas well tests
- Drill stem and production tests
- Build up and interference tests
- Pressure Transient Analysis
- Wire line formation and production test
- Estimation of stabilized flow rates from short test
- Basic Concepts: simplifying assumptions, skin effect
- Gas Flow Considerations: turbulence, pseudo-pressure, pseudo-time
- Flow Regimes – Vertical Wells: segmented approach, early time (well bore storage), transient flow
- Flow Regimes – Horizontal Wells
- Useful Concepts: radius of investigation, time to stabilization, superposition
- Drawdown Analysis (or Injection): procedure, specialized analyses, horizontal wells
- Build up Analysis: Horner plot, equivalent time, average reservoir pressure, detection of boundaries
- Non-Reservoir Effects: data validation well bore dynamics, primary pressure derivative (PPD)
- Production Forecasting and Analysis: transient/stabilized IPR, AOF (sand face/wellhead)
- Test design, complex models, pitfalls, etc.
- Fundamentals of Fluid Flow in Porous Media
- Superposition
- Analysis of Flow Tests
- Radius of Investigation,
- Well bore Storage Effects,
- Drainage Area Pressure, Distance to Boundaries
- Flow and Build-Up Test Analysis for Natural Gas Wells
- Non-Darcy Flow
- Multi rate Tests

INTENDED FOR

This course is suitable for:

- Engineers (well completion engineer, production engineers, reservoir engineer and field engineer), and well-site geologist, and other staffs from an operating and/or service and/or consultant and/or engineering company involved in Petroleum Production Operation process;
- Engineers and technical personnel involving with appraisal or field development project, and/or reservoir management team intending to enhance their technical skills and level of confidence in decision making by identifying well problems issues, causes of production anomalies; various operational constraints etc.
- Engineers and earth scientists involved in well and formation characterization and reservoir surveillance

- Reservoir and production engineers, geoscientists and managers involved in well testing for formation evaluation and production optimization