

# Advanced Well Test Analysis and Design

## Program Objectives

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This 5-day course covers practical methodologies in well test analysis and design along with the underlying principles, dealing with various situations encountered in actual well test analysis and interpretation. The primary focus is on model recognition and validation using transient pressure analysis software. Straight-line analysis of pressure responses, interpretation of both pressure and its derivative response and validation of the analysis results.

The course emphasizes well performance analysis and reservoir description within the context of reservoir geology and operational history. Operational issues in well test design and preparation are also addressed. Manual problem solving is used to understand the basic engineering principles applied. Complex examples and class problems are analyzed with Transients, PetroTel's pressure transient analysis software.

This course is designed to provide attendees a working knowledge of well test analysis and design for engineers working in the areas of reservoir engineering, production operations, drilling and completion.

## Course Outline

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### Day 1

- Introduction
  - Purpose & Use of Well Tests
- Types of Well Tests
  - Single Well Tests - Drawdown, Buildup others
  - Multi-Well Tests - Interference, Pulse Tests
- Basic Well Testing Concepts
  - Basic Fluid Flow Equation
  - Use of Dimensionless Variables
  - Wellbore Effects - Storage and Skin Effect
  - Transient & Pseudo Steady-State Flow
  - Radius of Investigation & Drainage
  - Discussion of Flow Regimes & Models

### Day 2

- Drawdown Testing & Reservoir Limit Testing
  - Equations for kh, Skin, Reservoir Size etc.
  - Effect of single & Multiple Boundaries
- Principles of Superposition
  - Both in Time and Space
- Pressure Buildup Testing
  - Horner & Equivalent Time
  - Equations for kh, skin etc.
- Multiple-Rate Testing
- Analytical & Type Curve Analysis Methods
- Well Test Design

### Day 3

- Gas Well Testing
  - Pressure Drawdown & Buildup Testing
- Effect of Variations in Gas Properties
  - Plot Pressure, p-square, or Pseudo Pressures
  - Use of Pseudo Pressure and Pseudo Time
- AOF & Deliverability Testing
  - Flow after Flow, Isochronal, Modified Isochronal
- Introduction to Decline Curve Analysis
  - Use of Permanent Gauge Data

### Day 4

- Horizontal Wells
  - Discussion of Flow Regimes
  - Analysis Methods for Each Flow Regime
  - Effect of various boundaries on Response
  - Impact of Key Parameters on Test Response
  - Impact of storage & Damage on Testing
  - Design
- Injection Well Testing
  - Injection and Fall-Off Testing
- Step-Rate Testing & Two Rate Testing

### Day 5

- Multiple-Well Testing
  - Interference Testing & Test Design
  - Introduction to Pulse Testing
- Effects of Multiple Phases on Testing
- Effects of Reservoir Heterogeneity on Testing
- Exam