

# DCA & DIAGNOSTIC METHODS FOR PERFORMANCE FORECASTING

**RSE028**

## COURSE OVERVIEW

Decline curve analysis has been called the most commonly used and misused technique for forecasting future production and remaining reserves. This course will give the learner a better understanding of how fundamental reservoir properties and drive mechanisms affect the shape of the production decline curve and how to avoid many of the mistakes commonly found in decline curve forecasts. The course also examines the use of modern production decline type-curves to evaluate reservoir properties and predict future performance.

## COURSE OBJECTIVES

By the end of this course, participant will be able to:

- Understand DCA curve equations and their relationship to reservoir properties and drive mechanisms.
- Avoid common mistakes in decline curve forecasts to prevent overestimation of reserves.
- Analyze reservoir performance and account for heterogeneities and changing operating conditions.
- Utilize alternative diagnostic methods for accurate analysis and forecasting.
- Apply advanced decline curve analysis for reservoir characterization.
- Select appropriate decline curve equations based on reservoir properties and drive mechanisms.
- Properly handle transient production and constrain forecasts.
- Forecast production during displacement processes using relevant trends.
- Address challenges in decline curve analysis and forecast for groups of wells.
- Identify and avoid common mistakes in decline curve analysis.
- Utilize production decline type-curves, including modern methods, for accurate forecasting.
- Understand decline analysis and forecast for unconventional reservoirs.

## WHO SHOULD ATTEND

Engineers or technical assistants who are responsible for making forecasts of future production using decline curves analysis. Economists, managers, or geoscientists who are interested in developing a greater working knowledge of decline curve methods and how to make better forecasts will also benefit from this course.

## COURSE DURATION

5 Working Days

## COURSE OUTLINES

### Day 1

- Pre course evaluation.
- Introduction to DCA curve equations:
  - Exponential
  - Hyperbolic
  - Harmonic
- See the relationships between reservoir recovery mechanisms and decline curve types
- Identify and understand how the transient flow period can lead to an overestimation of reserves
- Use multiple methods to avoid overestimating reserves

### Day 2

- Recognize reservoir performance characteristics based on actual field examples
- See the impact of reservoir heterogeneities
  - Faulting
  - Permeability variance
  - Layering
- Account for changing operating conditions
- Perform analysis on a multi-well basis without introducing common errors
- Use alternative methods including diagnostic performance plots
  - Log WOR vs.  $N_p$
  - Stagg's
  - P/Z vs.  $G_p$

### Day 3

- Use advanced decline curve and production data analysis for reservoir characterization:
  - Flow regime
  - Hydrocarbons-in-place
  - Permeability
  - Skin
  - Drainage area
  - Fracture properties
- Conventional decline curve equations
  - Exponential
  - Hyperbolic
  - Harmonic

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#### Day 4

- Rate versus time
- Rate versus cumulative production
- Selecting the proper equation based on reservoir properties and drive mechanisms
- The effects of transient production:
  - How to recognize transient production
  - How transient forecasts can overestimate remaining reserves
  - How to properly constrain transient forecasts
- Forecasting during displacement processes:
  - Using trends like water-oil ratio and versus cumulative oil production to estimate ultimate oil recovery
  - Converting these trends into an oil rate versus time forecast

#### Day 5

- Difficult situations:
  - Layered and compartmented reservoirs
  - Downtime
  - Workovers
  - Changing facility conditions and facility constraints
  - Forecasting groups of wells
  - Common mistakes
- Production decline type-curves:
  - Introduction and historical background
  - How to use modern Fetkovich type-curves for forecasting production
- Brief discussion of unconventional gas/oil reservoir decline analysis and production forecast
- Post course evaluation.

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