COURSE OVERVIEW DE0820
Well Testing and Analysis
(E-Learning Module)

Course Title
Well Testing and Analysis
(E-Learning Module)

Course Reference
DE0697

Course Format & Compatibility
SCORM 1.2. Compatible with IE11, MS-Edge, Google Chrome, Windows, Linux, Unix, Android, IOS, iPadOS, macOS, iPhone, iPad & HarmonyOS (Huawei)

Course Duration
30 online contact hours
(3.0 CEUs/30 PDHs)

Course Description

This E-Learning course provides the comprehensive understanding of the fundamentals and applications of well pressure and flow tests. Emphasis is placed not only on understanding and optimizing well performance, but also on the reservoir performance as a whole. The role of well testing in diagnosing well problems and in reservoir characterization is covered.

This course will discuss the several mathematical basis for pressure test analysis; the analytical solutions of the diffusivity equation for radial flow, constant production rate, closed cylindrical reservoir; the methods of pressure down testing according to pressure drawdown analysis and transient conditions.

Further, the course will also discuss the process of pressure build-up testing; the procedure of detection of linear discontinuities of faults and barriers associated with drawdown testing and build up testing; the aspects of test analysis by type-curve matching such as Ramey's type curves, Earlougher-Kersh type curves, and McKinley type curves; the process of diagnosing the reservoir model through analysis of pressure derivation type curves; and the elements of convolution and deconvolution interpretation methods such as convolution type curve and wellbore storage deconvolution.

During this interactive course, participants will learn the scope of detection of formation damage in line with well testing factor, slanted wellbore, partial penetration and partial completion; the process of gas well testing through conventional and isochronal test; the different wireline formation testers in accordance to the RFT tools and analysis of pressure profiles; the various methods of drillstem testing using typical DST assembly, typical DST sequence, and DST interpretation; and the other well tests and reservoir conditions according to layered reservoir, injection well testing and artificially fractured wells.

Course Objectives

Upon the successful completion of this course, participants will be able to:

- Apply and gain an in-depth knowledge on well testing and analysis
- Drill a well cost effectively and maximize penetration rate
- Evaluate stuck pipe problems and avoid potential problems by optimizing hole cleaning and ROP
- Design, drill string and BOP/wellheads
- Design and implement bit and hydraulics programs
- Recognize and evaluate well control problems by effectively using Mud Logging principles and techniques
- Identify several mathematical basis for pressure test analysis and be able to know the analytical solutions of the diffusivity equation for radial flow, constant production rate, closed cylindrical reservoir
- Employ the methods of pressure down testing according to pressure drawdown analysis and transient conditions
- Explain the process of pressure build-up testing by recognizing the various factors affecting pressure build up testing
- Determine the procedure of detection of linear discontinuities of faults and barriers associated with drawdown testing and build up testing
- Recognize the aspects of test analysis by type-curve matching such as Ramey's type curves, Earlougher-Kersh type curves, and McKinley type curves
- Identify the process of diagnosing the reservoir model through analysis of pressure derivation type curves
- Discuss the elements of convolution and deconvolution interpretation methods such as convolution type curve and wellbore storage deconvolution
- Identify the scope of detection of formation damage in line with well testing factor, slanted wellbore, partial penetration and partial completion
- Apply the process of gas well testing through conventional and isochronal test
- Characterize the different wireline formation testers in accordance to the RFT tools and analysis of pressure profiles
- Apply the various methods of drillstem testing using typical DST assembly, typical DST sequence, and DST interpretation
- Recognize other well tests and reservoir conditions according to layered reservoir, injection well testing and artificially fractured wells

Who Should Attend

This course is intended for engineers and geoscientists practicing in the areas of reservoir, production and development geology and relevant expertise in industrial applied WTA.

Course Certificate(s)

Internationally recognized certificates will be issued to all participants of the course.

Certificate Accreditations

Certificates are accredited by the following international accreditation organizations: -

- USA International Association for Continuing Education and Training (IACET)

  Haward Technology is an Authorized Training Provider by the International Association for Continuing Education and Training (IACET), 2201 Cooperative Way, Suite 600, Herndon, VA 20171, USA. In obtaining this authority, Haward Technology has demonstrated that it complies with the **ANSI/IACET 1-2013 Standard** which is widely recognized as the standard of good practice internationally. As a result of our Authorized Provider membership status, Haward Technology is authorized to offer IACET CEUs for its programs that qualify under the **ANSI/IACET 1-2013 Standard**.

  Haward Technology's courses meet the professional certification and continuing education requirements for participants seeking **Continuing Education Units** (CEUs) in accordance with the rules & regulations of the International Association for Continuing Education & Training (IACET). IACET is an international authority that evaluates programs according to strict, research-based criteria and guidelines. The CEU is an internationally accepted uniform unit of measurement in qualified courses of continuing education.

  Haward Technology Middle East will award **3.0 CEUs** (Continuing Education Units) or **30 PDHs** (Professional Development Hours) for participants who completed the total tuition hours of this program. One CEU is equivalent to ten Professional Development Hours (PDHs) or ten contact hours of the participation in and completion of Haward Technology programs. A permanent record of a participant's involvement and awarding of CEU will be maintained by Haward Technology. Haward Technology will provide a copy of the participant's CEU and PDH Transcript of Records upon request.

- British Accreditation Council (BAC)

  Haward Technology is accredited by the **British Accreditation Council** for **Independent Further and Higher Education** as an **International Centre**. BAC is the British accrediting body responsible for setting standards within independent further and higher education sector in the UK and overseas. As a BAC-accredited international centre, Haward Technology meets all of the international higher education criteria and standards set by BAC.

Training Methodology

This Trainee-centered course includes the following training methodologies:-

- Talking presentation Slides (ppt with audio)
- Simulation & Animation
- Exercises
- Videos
- Case Studies
- Gamification (learning through games)
- Quizzes, Pre-test & Post-test

Every section/module of the course ends up with a Quiz which must be passed by the trainee in order to move to the next section/module. A Post-test at the end of the course must be passed in order to get the online accredited certificate.

Course Fee

As per proposal

Course Contents

- Well Test Design Part 1 General Information and Basic Assumptions
- Well Test
- Nomenclature and Oilfield Units
- Other Data
- Interrelated Geologic and Engineering Activities
- Significance of Sandstone and Carbonates
- Structural Map due to Faulting
- Oil Accumulation in Anticline Zone
- Oil in Non Conformity Structure
- Oil in Vicinity to Salt Dome
- Reef Oil Accumulation
- Ideal Permeability Profiles
- Reservoir Considerations In Well Completions
- Forces in Hydrocarbon Behavior
- Vapor Pressure vs. Temperature
- Vapor Pressure Curves for Two Components
- Phase Diagram Low Shrinkage Oil
- Relative Permeability (Water-Wet Core)

- Wettability
- Fluid Distribution
- Effects of Height Above Free Water Level on Connate-Water
- Fluid Distribution in a Uniform-Sand Reservoir Containing Connate Water
- Fluid Flow in The Reservoir
- Pressure Conditions Around a Flowing Well
- Radial Flow Around Wellbore
- Pressure Distribution Near the Well in Radial Flow
- Varying Permeabilities
- Linear Flow Via Perforations
- Radial Flow Series Combination of Beds
- Pressure Drop vs Flow Rate Via Perforations
- Causes of Low Flowing Bhp
- Influence of Skin Effect on Pressure Around Wellbore
- Damage Ratio
- Effect of Reservoir Drive Mechanism
- Dissolved Gas Drive Mechanism
- Gas Cap Drive Reservoirs
- Water Drive Reservoirs
- Well Testing
- Periodic Production Tests
- For Oil Wells
- For Gas Wells
- Productivity or Deliverability Tests
- Deliverability Tests
- Oil Wells
- Inflow Performance Test
- Typical Inflow Performance Curves
- Inflow Performance Relationship
- Flow After Flow
- Pressure Rate History for Modified-Isochronal Flow Test
- Modified Isochronal Test Data Plot
- Modified Isochronal
- Gas Wells
- Transient Pressure Test

- Pressure Distribution Around a Well With Positive Skin Factor
- After Flow Deliverability Curve
- Pressure Build Up Test Ideal
- Drill Stem Testing
- Fluid Diagram, Open Hole DST
- DST
- Ideal Horner Build Up Plot
- Surface R/Up Closed Chamber Test
- Buildup pressure
- RFT Tool (Repeated Formation Tester)
- Conclusions
- Well Testing, Transient Test Analysis, Equations, Curves
- Principles of Transient Test Analysis
- Diffusivity Equation
- Solutions to the Flow Equation Dimensionless Quantities
- Wellbore Damage and Improvement Effects
- Pressure Distribution Around Well with A Positive Skin Factor
- Skin Zone of Finite Thickness
- Pressure Drop in Damaged or Improved Well
- Skin Finite Thickness W Permeability ks
- Apparent Wellbore Radius
- Wellbore Storage
- Pseudoskin Factor for Partially Penetrated Wells
- Ratio of Sand-Face to Surface Rate
- Dimensionless Pressure Including Wellbore Storage
- Steady-State Flow
- Linear and Radial Pressure Distribution Steady State Flow
- Many Irregular Steady-State Systems
- The Principle of Superposition
- Multiple Well, Infinite System
- Superposition
- Rate History of Well
- Pressure Calculation
- Example Superposition Calculation
- N Rates for the Equation

- Superposition – Example
- Example for Superposition
- Well 2 for 11 Hours pw
- Pressure Drawdown Testing
- Beginning Time of Semilog Straight Line
- Skin Factor Rearranged Form
- Multiple Rate Testing
- Slope of the Data Plot for the Multiple-Rate Test psi/cycle (STB/D)
- Mathematical Basis for Pressure Analysis Methods
- Mathematical Basis for Pr Analysis
- Laminar Flow, Low Reynolds Numbers
- Hubberts Formula
- Radial Flow No Gravity
- Velocity Correction to Modify Law
- Derivation of Continuity Equation for Radial and 3D.
- Continuity Equation / Principle
- Three Dimensional Case. General Form. Combines Darcy's Law and Continuity
- Radial Flow
- Single Phase Liquid Flow
- For Const. Perm. Porosity and Small Compressibility
- Final Formula for Radial Flow
- Pressure Buildup Analysis
- Pressure Build Up Equations
- Coeficient Same as Absolute Value of Slope
- Pressure Build Up in Nearly Ideal Reservoir
- PR. B. Up Showing Effect Wellbore Damage and after Production
- Example Calculation
- Nomenclature
- Dimensionless Pressure Single Well
- Single Well Infinite System
- Single Vertically Fractured Well
- Semilog Plot for Fractured Single
- Horizontally Fractured Well
- Wellbore Storage and Skin Included
- Infinite Reservoir Skin and Storage Included

- Type Curve for a Single Well
- Well in Center, Circular Reservoir
- Closed Circular Reservoir No Skin
- Closed Square System, Well in Center
- No Storage No Skin, Well in Center
- Various Closed Rectangular System
- Fractured Well No Skin No Storage
- Constant External Pressure
- One or More Constant Pressures Boundaries
- RFT