COURSE OVERVIEW DE0116
Completions and Workovers
(E-Learning Module)

Course Title
Completions and Workovers
(E-Learning Module)

Course Reference
DE0116

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

Once a well has been drilled to total depth, it must be decided whether it can be made to produce oil and gas in profitable amounts. Perhaps only one out of six wells drilled can ever produce enough petroleum to recover costs and offer profit. Even then, that one well must be completed properly. Recompletion costs are high, and a bad completion may ruin a well. Completion must be done right the first time.

This E-Learning is designed to provide participants with up-to-date overview of completions and workovers. The course covers the main factors influencing completion design, the overall approach to a well's flow capacity, the major types of completion configurations, the main phases in completion, the drilling and casing the pay zone, evaluating and restoring the cement job, perforating, treating the pay zone, the special case of horizontal wells, the general configuration of flowing well equipment, the production wellhead, the production string or tubing, packers, downhole equipment, subsurface safety valves, servicing & workover operations on killed wells, servicing & workover special cases and well stimulation.

Course Objectives

After completing the course, the employee will:-

- Apply and gain the latest techniques on completions and workover
- Demonstrate operational knowledge and understanding on the types and objective of completion operations according to reservoir and production data
- Demonstrate operational knowledge and understanding of natural flow and artificial lift including Single, dual, gas lift, ESP well completion
- Demonstrate operational knowledge and understanding of completion equipment and completion fluid, pressure test function
- Demonstrate operational knowledge and understanding of tubing specification as thread, grade, weight and material
- Ability to use API in designing and material selection for sweet and sour gas
- Ability to order the equipment and evaluate tender document
- Ability to design, plan, execute open hole and cased hole completion and prepare well program
- Coordinate with logistic and service companies.9. Ability to run completion string on site according to sequence of well procedure and HSE.10. Optimize operational steps in the completion program
- Recognize the main factors influencing completions design, overall approach to a well's flow capacity
- Identify the major types of completion configurations, main phases in completion as well as drilling and casing the pay zone
- Evaluate and restore cement job as well as discuss perforating, production wellhead, production string or tubing, packers, downhole equipment and subsurface safety valves
- Run procedures that includes preliminary operations and running subsurface equipment in a well equipped with a permanent packer
- Explain artificial lift that includes pumping as well as choosing an artificial lift process
- Discuss the main types of well servicing and workover, servicing and workover special cases, well stimulation and squeeze cementing

Who Should Attend

This course covers systematic techniques and methodologies on completions and workover for well engineers, drilling supervisors, reservoir engineers, geologists, production, completion engineers and well operations staff needing a practical understanding and an appreciation of well completion design and operation, well stimulation and intervention.

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.

Course Fee

As per proposal

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 Contents

- Completion Overview
- The Instructor
- Participants
- Introduction
- Completed Oil Well
- Types of Completion
- Openhole Completions
- Advantages of Open-hole Completions
- Limitations of Openhole Completions
- Un-cemented Liner Completions
- Perforated Completions
- Completions for Pumping Wells
- Application Range
- Single String Flowing Well Completion
- Multizone Completions
- Subsea Completion
- Completion Selection and Design Criteria
- Completion Design Considerations
- Functional Requirements
- Drilling Considerations
- Completion Productivity

- Risks of Formation Damage
- Drilling Damage
- Perforation Damage
- Fluids Damage
- Sand Fill
- Maximizing Well Productivity
- Drilling Fluid Selection
- Perforating
- Through-tubing Perforating
- Tubing Conveyed Perforations
- Selection of Completion Fluids
- Stimulation
- Key Considerations in Selecting Stimulation Method
- Stimulation
- Summary
- End of this Section
- Completion Equipment
- Completion Equipment and Design Practices
- Tubing
- Packers
- Packer Types
- Retrievable Packers
- Permanent Packers
- Permanent - Retrievable Packers
- Inflatable Packers
- Tubing / Packer Forces and Movement
- Factors Causing Packer Forces or Tubing Movement
- Anchors
- Seating Nipples
- Landing Nipples
- Purposes of Seating Nipples
- Landing Nipple and Flow Coupling
- Selective Landing Nipples
- No-go Landing Nipples

- Sliding Sleeves
- Uses of Sliding Sleeves
- Side Pocket Mandrels
- Side Pocket Mandrels
- Blast Joints
- Flow Couplings
- Subsurface Safety Valves
- Flow-Controlled Safety Valves
- Surface - Controlled Subsurface Safety Valves (SCSSSVs)
- Bottom-hole Chokes and Regulators
- End of this Section
- Completion and Workover Fluids
- Types of Completion Fluids
- Prepared Salt Water
- Emulsion - Wettability Problems
- Viscosity Builders
- Fluid Loss Control
- Perforating Fluids
- Packer Fluids
- Perforation Design
- Shaped Charge Components
- Perforating Techniques
- Reusable Hollow Carrier Gun
- Expendable Shaped Charge Gun
- Parameters Affecting Performance
- Pivot Gun
- Hollow Carrier
- Wire-line Expendable Guns
- Expendable Guns
- Initiation Systems
- Factors Affecting Perforating Efficiency
- Drilling and Perforating Damage
- Wellhead Pressure Control Equipment
- Weight vs. Well Pressure and Friction at Balance Point

- Charge Normalization
- Optimum Completion Design
- Productivity Ratio as Function of Penetration and Shot Density
- Productivity Ratio
- Formation Definitions
- Completion Design Procedure
- Classify Formation
- Determining Perforating Under-balance to Overcome Total Skin Damage
- Underbalance Used on Tubing Conveyed Perforation in Oil Zones in Sandstone
- ΔP used on TCP in Gas Zones in Sandstone
- Acoustic Data to Determine ΔP
- Applications of Wire Line Conveyed Perforating
- Tubing Conveyed Perforating
- Firing Systems
- Gun Release
- Venting Devices
- Shot Detection
- Gun Positioning
- Dual Completions
- Standard Rod Pump Completions
- Perforation Cleaning
- Under-balance Perforating
- Perforation Washing
- Back-surging
- End of this Section
- Hydraulic Fracturing Stimulation
- Four Steps of Treatment and Their Respective Functions
- Surface Equipment Layout
- Fracture Geometry
- Fracture Width Equations
- Fracturing Treatment Selection
- Laboratory Tests of Formation Samples
- Formation Properties Affecting the Orientation and Growth Pattern of Hydraulic Fractures

- Hydraulic Fracturing Fluids
- Storage and Mixing Requirements
- Horizontal versus Vertical Fracture
- Sandstone Acidizing
- Mineral Acids
- Oil Well Stimulation
- Gas Wells
- Water Injection Wells
- Acid-Mutual Solvent Volume Requirements
- Mistakes Found in the Application of the Acid-Mutual Solvent Method
- Carbonate Acidizing
- Matrix Stimulation
- Design of a Matrix Treatment
- Acid Fracturing
- Response of Carbonates to Acid Fracturing:
- Matrix Stimulation
- Stoichiometry
- Kinetics of HCl Reaction
- Key Factors in Carbonate Acidizing
- Wormhole Penetration vs. Skin
- Acid Reactivity
- Mineral Versus Organic Acids
- Injection Rates: Dissolution Patterns
- Impact of Pump Rate and Temperature
- Wormhole Pattern from Radial Flow
- Wormhole Growth for Various Rates
- Pore Level Model
- Placement
- Conclusions
- End of this Section
- Workover Planning & Problem Recognition
- What is a Workover?
- Workover Methods
- Reasons for Working Over a Well

- Service Unit Functions
- What are the Tools used for Well Analysis?
- Well Analysis Tools
- Characteristic of Problem Wells
- Water Control Problem Identification & Solutions - Problem Types
- Water Production Mechanisms
- Well Analysis
- The Well Maintenance Requirements for a Completion
- Workover Types
- Stimulation
- Workover Involving Drilling
- Workover Operations
- Summary of Common Problems & Workover Operations
- End of this Section
- Squeeze Cementing
- Introduction
- Purposes of Squeeze Cementing
- Squeeze Terminology
- Squeeze Techniques
- Braden Head Squeeze Method
- Squeeze-packer Method
- Squeeze Pressure Requirements
- Squeezing Fractured Zones
- Slurry Design
- Squeeze Packers
- Drillable Packers
- Retrievable Squeeze Packer
- Testing Squeeze Jobs
- Summary
- Paraffin's & Asphaltenes
- Introduction
- Paraffines and Asphaltenes Characteristics
- Paraffin and Asphaltene Prevention
- Deposition Mitigation

- Paraffin and Asphaltene Removal
- Scale Deposition
- Scales
- Introduction & Discussion
- Causes and Tendency of Scale
- Prediction and identification of Scale
- Scale Removal
- Removal Methods
- Conclusions
- Action to Solve Scale Problems
- Introduction to Sand Control
- Outline
- Cause of Sand Production
- Rock Classification
- What is the Range of Strengths for Sanding Formations?
- Factors Affecting Sand Production
- Pore Pressure and Stress
- Sand Production Prediction
- Reasons for Sand Control
- Sand Control Methods
- Restrictive Production Rate
- In Situ Consolidation
- Sand Consolidation
- Advantages of Resin Consolidation
- Disadvantages of Resin Consolidation
- How Much Resin is Enough?
- Resin Coated Gravel
- Drill Out
- Advantages of Resin Coated Gravel
- Disadvantages of Resin Coated Gravel
- Gravel Packing
- Gravel Pack
- Common Equipment
- Fluid Flow Path

- Cased Hole - Internal Gravel Pack
- Open Hole - External Gravel Pack
- Cased Hole GP Considerations
- Poor Perforation Pack Efficiency
- Open Hole GP Considerations
- Treatment Design
- Gravel Selection
- Obtaining Formation Sample
- Gravel Size Selection
- Screens and Selection
- Wire Wrap
- Wire Spacing
- Evolution of Well Screen Filter Materials
- Wire Wrapped Screens
- Double Wire Wrapped Screens
- Pre-Pack Screens
- Halliburton's (Purolator) PoroPlus
- Pall's Stratapac
- EXCLUDER (Baker)
- Petroline's Expandable Sand Screen
- Perforating
- Natural Sand Packing (Screens)
- Horizontal Completion (Natural Sand Packing
- Natural Sand Packing
- Screenless Completions
- Screenless Completions What Can We Do Now?
- Fracturing
- Effect of Fracturing on Near Well Pressure
- "Classic" Fracturing
- "Ideal" Fracturing for Sand Control
- Screenless Completions Problem
- Fluid Selection
- Sand Control Fluids
- Brines

- High Rate Water Pack
- Viscous Fluids
- Leakoff Control Additives
- Polymers
- Viscoelastic Surfactant
- Particulates
- Leakoff Control – Summary
- Specialty Products
- PERFPAC* Service
- Perforate
- Flowback Well
- Tools Set in Gravel/Frac Pack Position
- AllPAC/AllFRAC (SM)
- AllPAC Shunt System
- SandCADE Simulation
- Tubing and Completion Equipment Stress Analysis
- Completion Design
- Tubing Burst
- Tubing Collapse
- Tubing Tension
- Bending Stresses
- Couplings and Threads
- Tubing/Packer Forces and Movement
- Factors Causing Packer Forces or Tubing Movement
- Mechanical Forces
- Temperature or Thermal Effects
- Piston Force Effects
- Ballooning Effects
- Buckling Effects
- Slip and Seal Assembly
- Completion Tubulars Metallurgy
- Introduction to Metallurgy & Steel
- Introduction to Metallurgy & Glossary
- Metallurgy

- Metals & Non-metals
- Alloys
- Review of Ferrous Metals
- Classification of Steel & Heat Treatment
- Classification of Steels
- Classification of Steels: AISI Series (More Detail)
- Classification of Steels
- Principles of Heat Treatment of Steels
- Heat Treatment of Steels
- Stainless Steels
- Types of Stainless Steels
- Testing of Metals
- Tensile Testing
- Typical Stress/Strain Curve – Steel
- Testing of Metals
- Sample Preparation
- Area of a Circular Cross Section
- Calculation of Tensile Strength
- Percent Elongation
- Percent Reduction of Area
- Stress-Strain Diagram High and Medium Strength Steels
- Brittle vs Ductile Failure
- True Stress Strain Diagram
- Temperature Effects
- Directional Properties
- Fatigue Testing
- Bend testing
- Bend Test Procedure
- Guided Bend Test Jig
- Hardness Testing Steps
- Testing of Metals
- Brinell Test
- Hardness Tester
- End of this Section

- Coiled Tubing Equipment and Application
- What is the Coiled Tubing Unit?
- Ct Surface Equipment & Performance Specifications
- Tubing Injector.
- Injector Specifications
- Chain-gripper Blocks
- Tubing Guide Arch
- Service Reel
- Prime Mover
- Control Console
- 6 - Well Control Stack
- Conventional CT Applications
- Features of Conventional Applications
- Different C. T. Applications
- Wire Line Intervention
- Field Wireline Operations
- Wire Line Surface Equipment
- Typical Field Wire Line Rig Up
- Upper Sheave and Grease Injector Schematic
- Lubricator Length
- Wireline Surface Equipment
- Wireline BOP Ram Detail
- Wireline Operations
- Selecting Wireline
- Testing Grease Injector
- Wireline Used to "Operate" Well
- Wire Line Mandrels
- Sliding Sleeves in Open & Close Position
- Wire Limits (Estimates Only)
- Wire Fatigue
- Common Problem Swith Wireline
- Observe Type of Wire Break
- From Experience
- Wire Line Equipment Checks

- Common Wireline Problems
- End of this Section
- Well Integrity in Multilateral Completions
- TAML Classification
- TAML Level 1 Definition
- TAML Level 2 Definition
- TAML Level 3 Definition
- TAML Level 4 Definition
- TAML Level 5 Definition
- TAML Level 6 Definition
- Development of Multilateral Wells
- Offshore Southeast Sumatra
- Objective
- Completion Characteristics
- Development Cost Summary
- Location of Multilaterals
- Completion Schematic
- Level 6 Completion
- Intelligent Completion in Multilaterals
- How to Optimize Well Production?
- Optimization method:
- Cross Section
- Lower and Upper Legs
- Completion Schematic
- Tapping on Reserves, Upper lateral
- Production Scenario
- Summary
- End of this Section