COURSE OVERVIEW DE0844

Cementing
(E-Learning Module)

Course Title
Cementing (E-Learning Module)

Course Reference
DE0844

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 is designed to provide participants with a detailed and up-to-date overview of cementing. It covers the firm foundation in planning, designing, execution and evaluation for a successful cementation; the planning and design consideration covering the essential requirement for a successful primary and secondary cementation; the slurry design and rheology and well parameters to be considered for cementation; the preparation and execution of well successfully; the design and factors to be considered for cementing under loss situation and cementing of well with gas migration; the potential complication and remedies during cementation; and the critical cementation during planning and designing of linear, stage and horizontal well cementing.

Further, this course will also discuss the techniques of cement job and cement bond tool; the high performance light weight slurries, advancement and H.P.H.T cementing technology and equipment; the thermal cementing; the types and objective of completion operations according to reservoir and production data; the natural flow and artificial lift including single, dual gas lift and ESP well completion; the completion equipment, completion fluid and pressure test function; the main factors influencing completion design as well as well head valves types and applications; the overall approach to a well's flow capacity; and the major types of completion configurations.

During this course, participants will learn the main phases in completion and considerations, completion equipment, completion fluid, pressure test function, drilling and casing the pay zone; the perforating, treating the pay zone, the special case of horizontal wells, production wellhead and production string or tubing; the tubing specification as well as thread, grade, weight and material; the packers, downhole equipment, subsurface safety valves, running procedure, artificial lift and gas lift; the artificial lift process, completion management and artificial lift operations in open and cased holes; the designing and material selection for sweet and sour gas; the equipment and tender document evaluation; the main types of well servicing and workover, light well servicing, heavy servicing and workover operations on live wells; the servicing and workover operations on killed wells; the deviated, multiple zone, subsea, horizontal, multilateral and HPHT completion; and the well stimulation, hydraulic fracturing and acid stimulation.

Course Objectives

After completing the course, the employee will:-

- Apply and gain an in-depth knowledge on cementing
- Specialized on how to use cementing additives properly to improve and reduce job costs
- Able to differentiate between the types of cement that is available
- Interpret laboratory test results
- Perform primary cementing operations to include: casing cementing, liner cementing, multi-stage cementing
- Conduct squeeze jobs and selection of squeeze tools
- Perform cement plug operations to improve overall job success, and on how to Interpret cement sheath evaluation logs
- Specialized on how to use cement software standard program
- Specialized on how to use cement software standard program effectively
- Perform the overall cementing operation independently i.e. perform primary cementing operations to include: casing cementing, liner cementing, multi-stage cementing, plug cementing, the use of cementing additives properly to improve and reduce job costs, interpret laboratory test results, conduct squeeze jobs and selection of squeeze tools
- Perform cement plug operations to improve overall job success and interpret cement sheath evaluation logs using software
- Specialized on how to calculate cement slurry volumes the following types of casing jobs primary casing, intermediate casing, production casing and liners
- Know how to calculate differential pressure to bump the cement plug and to calculate displacement volumes
- Specialized on how to identify cementing float equipment
- Build a firm foundation in planning, designing, execution and evaluation for a successful cementation
- Determine planning and design consideration covering the essential requirement for a successful primary and secondary cementation

- Discuss slurry design and rheology and well parameters to be considered for cementation
- Prepare and execute well successfully
- Recognize the design and factors to be considered for cementing under loss situation and cementing of well with gas migration
- Identify the potential complication and remedies during cementation
- Explain critical cementation during planning and designing of linear, stage and horizontal well cementing
- Evaluate and interpret the techniques of cement job and cement bond tool
- Describe the high-performance light weight slurries, advancement and H.P.H.T cementing technology and equipment
- Employ thermal cementing in a professional manner
- Discuss the types and objective of completion operations according to reservoir and production data
- Interpret natural flow and artificial lift including single, dual gas lift and ESP well completion
- Identify completion equipment and completion fluid, pressure test function
- Identify main factors influencing completion design as well as well head valves types and applications
- Apply overall approach to a well's flow capacity and recognize the major types of completion configurations
- Determine main phases in completion and considerations, completion equipment, completion fluid, pressure test function, drilling and casing the pay zone
- Discuss perforating, treating the pay zone, the special case of horizontal wells, production wellhead and production string or tubing
- Explain tubing specification as well as thread, grade, weight and material
- Discuss packers, downhole equipment, subsurface safety valves, running procedure, artificial lift and gas lift
- Choose an artificial lift process and apply completion management and artificial lift operations in open and cased holes
- Use API designing and material selection for sweet and sour gas
- Order the equipment and evaluate tender document as well as design, plan, execute open hole and cased hole completion and prepare well program
- Coordinate with logistic and service companies, run completion string on site according to sequence of well procedure and HSE and optimize operational steps in the completion program
- Identify the main types of well servicing and workover, light well servicing, heavy servicing and workover operations on live wells and servicing and workover operations on killed wells
- Discuss deviated, multiple zone, subsea, horizontal, multilateral and HPHT completion
- Illustrate well stimulation, hydraulic fracturing and acid stimulation

Who Should Attend

This course provides an overview of all significant aspects and considerations of cementing for supervisors, senior engineers, mud engineers, cementing engineers, drilling engineers, drilling representatives, workover and completions personnel, drilling contractors, cement company personnel and for those who are responsible for the design, planning, implementation and evaluation of a well cementing program

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, Virginia 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

- Advanced Cementing and Completion Design & Operations
- Well Planning
- Cement Program
- Slurry Design
- Slurry Characteristics and Design
- Cement Setting Process
- Causes of Primary Cementing Failure
- Causes of the Cement Setting to Quickly or Slowly
- Causes of Channeling of the Slurry in the Annulus
- Surface Casing
- Surface Casing has several functions
- Remember when cementing surface casings
- Calculation of a Simple Surface Casing
- Density
- Slurry Density
- Yield
- Thickening Time
- Mix Water

- Slurry Water Content
- Compressive Strength
- Fluid Loss
- Rheology
- Intermediate and Production Casings
- Purposes of Intermediate Casing
- Purposes of Production Casing
- Important procedures when cementing intermediate and production casings
- Plug Flow
- Laminar Flow
- Turbulent Flow
- Calculate
- Equipment Selection
- Casing Shoe
- Float Collars
- Multistage Collars
- Centralizers
- Bow Type Centralizer
- Positive Type Centralizer
- Scratchers
- Cement Baskets
- Scratchers
- Plugs
- Wiper Plugs
- Wiper Plugs in Position
- Placement Techniques
- Methods
- Flow Rates
- Spacers
- Course Recap
- Primary Cementing Overview
- Primary Cementing
- Types of Casings
- Conductor
- Thru-Drill Pipe Cementing

- Outside Cementing
- Surface
- Surface Cementing
- BOP
- Intermediate (Also Called Protection)
- Intermediate Casings
- Two Stage Cementing
- Production
- Liners
- Course Recap
- Best Practices Review
- Mud Displacement Best Practices
- 5 Key Displacement Factors
- Mechanical Aids Best Practices
- Centralization Best Practices
- Fluid Velocity Best Practices
- Spacers & Flushes Best Practices
- Running Casing – Best Practices
- Course Recap
- Cement and Cement Additives
- API Classification of Cements
- HES Classification of Cements
- Premium Cement
- Premium Plus Cement
- World Wide Cement Usage
- Cement Additives
- Accelerators
- Retarders
- Fluid Loss
- Dispersants
- Light Weight
- Heavy Weight
- Defoamers
- Loss Circulation
- Expansion

- Strength Stabilizing
- Course Recap
- Cement Job Design
- Problem Analysis
- Depth and Wellbore Configuration
- Calipers
- Caliper Characteristics
- Wellbore Environment
- Temperature
- Slurry Selection
- Placement Mechanics
- Well Security and Control
- Casing Job Design and Simulation
- Course Recap
- Well Completion
- Definitions
- What is Completion?
- Ideal Completion
- What is Workover Operations?
- Well Maintenance
- Major Workovers
- Well Barriers
- Well Barriers Theory
- Barriers Theory
- Types of Barriers
- Mechanical
- Types of Barriers
- Mechanical Barriers Types
- Mechanical Barriers
- Hydrostatic Barriers
- Barrier Classification
- Types of Barriers
- Surface Barrier
- Structural Barrier
- Geological Barrier

- Down Hole Barrier
- Hydrostatic Barriers
- Example Barrier Classifications
- Example Completion Barrier Envelopes
- Completion Barriers
- Well Integrity
- Definition of Well Integrity
- The Foundation of Well Integrity
- Why is Well Integrity Important?
- High Risk Well
- Well Integrity Assurance Task Force
- Task Force Purpose and Scope
- Well Completion Types
- What is Completion?
- Well Design Considerations
- Generic Well Completion Design Process
- Factors Affecting Well Completion & Workover Design
- Completed Oil Well
- Completion Classifications
- Types of Completion
- Openhole Completions
- Well Completion Types
- Openhole Completions
- Open Hole Completion Types
- Advantages of Openhole Completions
- Openhole completions are particularly attractive
- Uncemented Liner Completions
- Screen/Pre-perforated Liner Completion
- Uncemented Liner Completions
- Perforated Liner Completion
- Cemented Liner Completion
- Cased Hole Completion Type
- Perforated Completions
- Mode of Production Flowing Artificial Lift
- Completions for Pumping Wells

- Application Range
- Typical Artificial Lift Application Range
- Number of Zones Completion
- Single String Flowing Well Completion
- Single Completion
- Single String Flowing Well Completion
- Multizone Completions
- Multizone Zones Completion Schematics
- Multi-Zone Completion
- Subsea Completion
- Multi-zone TFL Subsea Completion Schematic
- Gas Producer Completions
- Water Injection Completions
- Horizontal Water Injection Completions
- Course Recap
- Completion Equipment and Design Practices
- Tubing Selection
- Tubing
- Completion Design
- Tubing String Selection and Design Objectives
- Tubing Material
- Which Tubing Grade?
- Tubing Grade Examples
- Tubing Material
- Example of a Tubing-connection
- Tubing Selection Criteria (Forces & Stresses -1)
- Example of API tubing specification
- Definitions
- Tubing Selection Criteria (Forces & Stresses - 2)
- Tubing Selection/Design Factors
- Tubing - Detailed Specification
- Tubing Burst
- Tubing Collapse
- Tubing Tension
- Bending Stresses

- Couplings and Threads
- Well Completion
- Packers
- What is the Packer?
- Why Run a Packer?
- Packers Applications
- Single Packer
- Dual Packer
- Packers-Mechanism
- Packer Types
- Retrievable Packers
- Permanent Packers
- Permanent - Retrievable Packers
- Inflatable Packers
- 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
- Anchors
- Seating Nipples
- Landing Nipples
- Purposes of Seating Nipples
- Landing Nipple and Flow Coupling
- Selective Landing Nipples
- No-go Landing Nipples
- Sliding Sleeves
- Well Completion
- Sliding Sleeve Side Door – SSD
- Uses of Sliding Sleeves
- Side Pocket Mandrels
- Blast Joints

- Flow Couplings
- Subsurface Safety Valves
- Flow-Controlled Safety Valves
- Surface-controlled Subsurface Safety Valves (SCSSSVs)
- SSSV Setting Depth
- Bottom-hole Chokes and Regulators
- Expansion Joint
- Course Recap
- Perforation & Completion Design
- Wellbore Conditions While Perforating
- Overbalanced Perforating
- Shaped Charge Perforator
- The Perforation Process
- Factors Affecting Charge Performance
- 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
- Gravel Pack Screens
- Wellhead Pressure Control Equipment
- Charge Normalization
- Optimum Completion Design
- Productivity Ratio
- Formation Definitions
- Completion Design Procedure
- Classify Formation
- Determining Perforating Under-balance to Overcome Total Skin Damage

- Acoustic Data to Determine Δp
- Tubing Conveyed Perforating
- 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
- Artificial Lift
- Pressure Losses in Oil Production
- Main Types of Artificial Lift
- Gaslift
- Gas Lifted Well
- Kick-off (Continuous)
- Gas Lift is Preferred For
- Pumping
- Artificially Lifted Well – Downhole Pump
- Pumping - Best Applied When:
- Beam Pumping
- Conventional Beam Pump
- Pump Action
- Electrical Submersible Pumps
- ESP with Y-Tool
- Hydraulic Pumping
- Jet Pumping
- Selection of Artificial Lift
- Summary
- Course Recap

- Formation Damage
- Introduction – Definitions
- Formation Damage Impact
- Reservoir Pressure Profile
- Formation Damage Causes
- Drilling Fluid Damage
- Common Formation Damage Problems, Factors, and Mechanisms
- Injection Damage
- Production Damage
- Formation Damage Characterization
- Cause of Formation Damage
- Formation Damage Location
- Scale
- Solids/Particles Effects in Porous
- Drilling Damage
- Perforations
- Completion Fluids Damage
- Water Block Damage
- Damage Due to Production
- Damage Quantified through Skin Factor & Productivity Index
- Skin
- Radial Production and Skin (Darcy's Law)
- Geometric Skin - Flow through Perforation
- Geometric Skin – Partial Penetration
- Geometric Skin – Deviated Wellbore
- Geometric Skin – Well with Hydraulic Fracture
- Completion Skin
- Gravel Pack
- Productivity Index
- Flow Efficiency
- Formation Damage
- Potential Sources of Formation
- Common Formation Damage Mechanisms
- Extraneous Materials
- Organic Deposition

- Mitigation Methods
- Treatment Fluids
- Sandstone Acidizing
- What is Well Stimulation?
- Well Stimulation
- Objectives of Acid Stimulation
- Stimulation Techniques
- Matrix Acidizing
- Chemical Stimulation Without Acid
- 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
- Pore Level Model
- Placement
- Conclusions
- What is Hydraulic Fracturing?
- Hydraulic Fracturing Equipment

- Proppant
- Fracturing Fluids
- Cross Linked Gel with Proppant Sample
- Broken Sample
- Hydraulic Fracture Treatment Process
- Mini Frac or Data Frac Schedule
- Mini Frac or Data Frac Plot
- Main Frac Treatment Schedule
- Fracture Shape & Dimensions
- Functions of PAD & Flush
- PAD and Proppant
- Proppant Distribution
- Net Pressure
- Schematic of Net Pressure
- Measuring of Net Pressure
- Fracture Height
- Fracture Height vs. Pnet/ Δσmin Ratio
- Fracture Half Length (Xf)
- Expressions in Hydraulic Frac
- Harsh Environment for Hydraulic Fracturing
- Why Some Treatments do not Work as Well as Expected?
- Proppant Settling
- Hydraulic Fracturing
- High Permeability Formations
- Low Permeability Formation
- Ideal Reservoir Properties
- Design Parameters That We Can Control
- Measured or Estimated Parameters (Uncontrollable)
- Course Recap
- Scale Deposition
- Scale Deposits
- Causes of Scaling
- Calcium carbonate (CaCo3)
- Causes and Tendency of Scale
- Gypsum CaSO4 . 2H2O & Anhydrite CaSO4

- Barium Sulfate Ba SO3 and Strontium Sulfate SrSO4
- Sodium Chloride NaCl
- Prediction and Identification of Scale
- Scale Removal
- Removal Methods
- Mechanical Removal Methods
- Chemical Removal Methods
- Removal Methods
- Conclusions
- Action to Solve Scale Problems
- Course Recap
- Workover Planning & Problem Recognition
- What is a Workover?
- Workover Methods
- Conventional
- Non-conventional
- Reasons for Working Over a Well
- Service Unit Functions
- What is the Tools used for Well Analysis?
- Well Analysis Tools
- Characteristic of Problem Wells
- Declining Total Production
- Water Control Problem Identification & Solutions - Problem Types
- Water Production Mechanisms
- Well Analysis
- The Well Maintenance Requirements for a Completion
- Stimulation
- Workover Involving Drilling
- Workover Operations
- Summary of Common Problems & Workover Operations