COURSE OVERVIEW DE0911-6M-IH
Hydraulic Fracturing
(E-Learning Module)

Course Title
Hydraulic Fracturing
(E-Learning Module)

Course Reference
DE0911-6M-IH

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 hydraulic fracturing. It covers the effect of fracturing on production as well as proppant, conventional and unconventional reservoir and unconventional hydrocarbon resources; the unconventional gas production and hydraulic fracturing technique; the coalbed methane, tight & shale gas, fracture propagation and microseismic monitoring of fracs in a horizontal well; the fracture analysis and hydraulic fracturing; the four principal parameters, dimensionless fracture conductivity and proppant selection methodology; and the fracture aperture calculations.

Further, the course will also discuss the effect of RM and RXO, fracture porosity & permeability and the potential environmental impacts; the pros and cons of environmental; the passive seismic analysis for reservoir monitoring and advanced hydraulic fracturing; the hydraulic stimulation of reservoirs, perforation shots, hydraulic stimulation and passive seismic for reservoir monitoring; the focal mechanisms, vertical transverse isotropy and p-wave travel time inversion; the hydraulic fracturing and oilfield life cycle; and the fracture mechanism, rock stresses and bottomhole treating pressure (BHTP).

During this course, participants will learn the dimensionless fracture conductivity, fracture geometry, anatomy of fracture and hydraulic fracturing design; the mini frac analysis, rate test and perforation criteria; the conventional hydrajet/surgifrac tool and conventional and hydra jetting perforations; the fluid efficiency test, finding closure pressure and decisions based on mini frac analysis; the conventional and conductor frac, design key parameters, conductor frac calculations concepts and conductor frac design criteria; the frac treatment, fracturing fluids and materials, base fluids, breakers mechanism and proppant size selection criteria; the conductivity enhancer, foam fracturing, dual hydraulic fracturing, proppant storages and blender components; and the liquid additives system, manifold components, wellhead isolation tool, hydraulic fracturing methodology and proppant placement concepts.

Course Objectives

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

- Apply and gain an in-depth knowledge on hydraulic fracturing
- Discuss the effect of fracturing on production as well as proppant, conventional and unconventional reservoir and unconventional hydrocarbon resources
- Describe unconventional gas production and employ hydraulic fracturing technique
- Identify coalbed methane, tight & shale gas, fracture propagation and microseismic monitoring of fracs in a horizontal well
- Carryout fracture analysis and hydraulic fracturing as well as identify the four principal parameters
- Recognize dimensionless fracture conductivity and proppant selection methodology
- Apply fracture aperture calculations as well as differentiate hydraulic versus mean aperture
- Identify the effect of RM and RXO, fracture porosity & permeability and the potential environmental impacts
- Recognize the pros and cons of environmental and illustrate passive seismic analysis for reservoir monitoring and advanced hydraulic fracturing
- Apply hydraulic stimulation of reservoirs, perforation shots, hydraulic stimulation and passive seismic for reservoir monitoring
- Discuss focal mechanisms, vertical transverse isotropy and p-wave travel time inversion
- Illustrate hydraulic fracturing and oilfield life cycle as well as explain the fracture mechanism, rock stresses and bottomhole treating pressure (BHTP)
- Describe dimensionless fracture conductivity, fracture geometry, anatomy of fracture and hydraulic fracturing design

- Apply mini frac analysis, rate test and perforation criteria as well as identify conventional hydrajet/surgifrac tool and conventional and hydra jetting perforations
- Perform fluid efficiency test, finding closure pressure and decisions based on mini frac analysis
- Recognize conventional and conductor frac, design key parameters, conductor frac calculations concepts and conductor frac design criteria
- Employ frac treatment and identify fracturing fluids and materials, base fluids, breakers mechanism and proppant size selection criteria
- Expedite conductivity enhancer, foam fracturing, dual hydraulic fracturing, proppant storages and blender components
- Recognize liquid additives system, manifold components, wellhead isolation tool, hydraulic fracturing methodology and proppant placement concepts

Who Should Attend

This course covers systematic techniques on hydraulic fracturing for petroleum engineers, production engineers, reservoir engineers, drilling engineers and others who have a basic understanding of hydraulic fracturing and need to enhance their knowledge about fracturing concepts and applications.

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 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 Contents

- Introduction
- The Effect of Fracturing on Production
- Hydraulic Fracturing Preface
- Definitions
- Hydraulic Fracturing (Fracking or Fracing)
- What is Hydraulic Fracturing?
- Proppant
- Conventional Reservoir
- Unconventional Reservoir
- Unconventional Hydrocarbon Resources
- "Unconventional" Gas Production
- Hydraulic Fracturing Technique
- Unconventionals
- Coal Bed Methane
- Coalbed Methane
- Exactly What it Says on the Label
- Extracting CBM
- Extracting Coal Bed Methane/CSG
- Conventional Gas Production Profile vs. CSG
- Tight & Shale Gas
- Shale Gas
- What is Shale?
- Tight Oil
- Fracture Propagation
- Microseismic Monitoring of Fracs in a Horizontal Well
- Fracture Analysis
- Hydraulic Fracturing
- Four Principal Parameters
- Dimensionless Fracture Conductivity
- Proppant Selection Methodology
- Fracture Aperture Calculations

- Hydraulic versus Mean Aperture
- Example
- Effect of Rm and Rxo
- Fracture Porosity
- Fracture Porosity & Permeability
- While Fracture Porosity is Small in Magnitude
- How is a Frac Designed?
- Formation Stresses Shape the Fracture
- Potential Environmental Impacts
- Environmental Pros and Cons
- Passive Seismic Analysis for Reservoir Monitoring
- Advanced Hydraulic Fracturing
- Hydraulic Stimulation of Reservoirs
- Perforation Shots
- Hydraulic Stimulation
- Passive Seismic for Reservoir Monitoring
- Data Example
- Microseismic Event 1
- Focal Mechanisms
- Focal Mechanisms: Event 1
- Focal Mechanisms: Event 6
- Vertical Transverse Isotropy (Polar Anisotropy?
- P-Wave Traveltime Inversion for Homogeneous VTI Media
- P-Wave Traveltime Inversion of Perforation Shot Data
- P-Wave Traveltime Inversion from Synthetic Data
- Conclusions
- Hydraulic Fracturing
- Hydraulic Fracturing Basics
- Oilfield Life Cycle
- What is a Hydraulic Fracture?
- Why Frac?
- Fracturing
- Fracture Mechanism

- What are The Three Earth Stresses?
- Rock Stresses
- Bottomhole Treating Pressure (BHTP)
- Net Pressure
- Predicting BH Pressure
- Dimensionless Fracture Conductivity
- Fracture Geometry
- Anatomy of Fracture
- Modified Tinsely Curves
- Hydraulic Fracturing Design
- Rock Mechanics
- Building a Model
- Formation Pressure Response
- Mini Frac Analysis
- Mini-Frac
- Step Up Rate Test
- Step Down Test
- Determine the Most Efficient Solution
- Perforation Criteria
- Conventional HydraJet/SurgiFrac Tool
- Conventional Perforations
- Hydra Jetting Perforations
- Fluid Efficiency Test
- Finding Closure Pressure
- Decisions based on Mini Frac Analysis
- Conventional Frac
- Conductor Frac
- Introduction
- Conductor Frac Technology
- Design Key Parameters
- Conductor Frac Calculations Concepts
- Conductor Frac Design Criteria
- How to Design?

- Conventional Design
- Pulsing Graph
- Pulsing Job
- Conductor vs. Conventional
- Conductor Frac vs. Conventional Frac
- Customer Feedback
- Conductor Frac
- Gas Well Case history (L. Safa Formation)
- Oil Well Case History (High Perm. Formation)
- Gas Well Case History (High Perm. Formation)
- Conclusion
- Lacustina Formation
- Lacustina Formation Study
- Formation Evaluation
- Lacustina Bed; Depth Interval (3430.0m-3500.0m)
- Rock Mechanics
- Proposed Perforations for Frac Treatment
- Frac Treatment
- Fracturing Fluids and Materials
- Fracturing Fluids
- Base Fluids
- Gelling Agents
- pH Control Agents
- Clay Control Agents
- Surfactants
- Crosslinkers
- Comparison Between Metal and Borate Crosslinkers
- Breakers
- Breakers Mechanism
- Bactericides
- Proppant
- Natural Sand
- Proppant Size Selection Criteria

- PermStim Fracturing Fluid Technology
- PermStim Fracturing Fluid Advantages
- Expedite Conductivity Enhancer
- Fines Migration Experiment
- SandWedge Experiment
- SandWedge ABC
- Conductivity vs. Stress
- Foam Frac
- Foam Fracturing
- CW-Frac TM Technology
- CW-Frac
- Case History (SPE 128322)
- Well C Results
- Settle Frac Technology “Dual Fracturing Technique”
- What We can do if we have
- The Problem
- Dual Hydraulic Fracturing “Settle Frac”
- Dual Hydraulic Fracturing “Settle Frac” Results
- Dual Hydraulic Fracturing “Settle Frac” Pumping Schedule
- Settle -Frac SPE Papers
- AccessFracSM Stimulation Service
- What is AccessFrac?
- BioVert Diverting Agent
- AccessFracSM Intrastage Diversion Systems
- Cluster Efficiency Challenge: 1
- Solution
- Case History
- Equipment
- Frac Tanks
- Proppant Storages
- Components of Mountain Mover
- Blender
- Blender Components

- Blender Fluid Flow
- Dry Additives
- Liquid Additives System
- Sand Screws
- Mixing Tub
- Flow Meters
- Radioactive Densometer
- Proppant Storages
- Components of Mountain Mover
- High Pressure Pumps
- Halliburton Pumps
- HT 400 Pump
- Manifold
- Manifold Components
- Wellhead Isolation Tool
- Hydraulic Fracturing
- Introduction to Fracturing
- Candidates Selections
- Hydraulic Fracturing:
- Guide to Fracturing
- Introduction to Hydraulic Fracturing
- Hydraulic Fracturing Methodology
- Proppant Placement
- Proppant Placement Concepts
- Proppant Transport: Settling
- Design Logics
- Key Concept: Width Equation
- Width Equations (Consistent Units)
- Material Balance +Width Equation
- Pumping Time, Fluid Volume, Proppant Schedule: Design of Frac Treatments
- Facts on HF
- Potential Assessment Impact
- Environmental Effects Monitored in Conjunction with HF Tests

- Impacts from HF Water Cycle on Drinking Water Resources
- Chemicals Used in HF
- Microseismic" HF Monitoring
- HF Monitoring Branett Shale Example
- HF Modeling Using a DFN in Branett Shale