COURSE OVERVIEW DE0545
Carbonate Reservoir Characterization (E-Learning Module)

Course Title
Carbonate Reservoir Characterization (E-Learning Module)

Course Reference
DE0545

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 carbonate reservoir characterization. It covers the pore type inversion using differential, effective medium (DEM) model at “X” field and East Java; the regional geology, literature and Voight-Reuss Hill method; the differential effective medium (DEM), method of estimation V_s, velocity model and crossplot of Vp-Vs correlation; the carbonate reservoirs, fractured reservoirs, carbonate sidewall core, carbonate porosity types, intergranular porosity, vuggy and moldic porosity; and the dolomitization and evidence for fluid flow along fractures in sandstone.

During this course, participants will learn the systematic orthogonal fractures, fracture spacing/bedding, fractures in reservoir simulations and sealed fractures; the estimated ultimate recovery (EUR) map, maximum horizontal stress and acid stimulation of carbonate reservoir; the matrix acidizing, acid fracturing and reservoir efficiency; the permeability distribution of cross-section structure and the relationship between cumulative production rate and time; and the result of simulation by natural flow, result of simulation after stimulation by acidizing and result of simulation after stimulation by acid fracturing.

Course Objectives

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

- Apply and gain an in-depth knowledge on carbonate reservoir characterization
- Employ carbonate reservoir characterization with pore type inversion using differential, effective medium (DEM) model at "X" field and East Java
- Review regional geology and literature and apply Voight-Reuss Hill method
- Describe differential effective medium (DEM), method of estimation V_S, velocity model and crossplot of Vp-Vs correlation
- Recognize carbonate reservoirs and fractured reservoirs including carbonate sidewall core, carbonate porosity types, intergranular porosity, vuggy and moldic porosity
- Explain dolomitization and identify evidence for fluid flow along fractures in sandstone
- Identify systematic orthogonal fractures, fracture spacing/bedding, fractures in reservoir simulations and sealed fractures
- Review estimated ultimate recovery (EUR) map, maximum horizontal stress and acid stimulation of carbonate reservoir
- Employ matrix acidizing, acid fracturing and reservoir efficiency
- Determine the permeability distribution of cross-section structure and the relationship between cumulative production rate and time
- Review result of simulation by natural flow, result of simulation after stimulation by acidizing and result of simulation after stimulation by acid fracturing

Who Should Attend

This course provides an overview of all significant aspects and considerations of carbonate reservoirs for exploration and development geologists, exploration and development managers and geophysicists. Engineers with some geologic background will also benefit from this course.

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.

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

- Carbonate Reservoir Characterization with Pore Type Inversion Using Differential, Effective Medium (DEM) Model at “X” field, East Java
- Regional Geology and Literature Review
- Voight-Reuss Hill Method
- Wood Relation
- Differential Effective Medium (DEM)
- Method of Estimation V_s
- Methods
- Results and Discussion
- Velocity Model
- Crossplot of Vp-Vs Correlation
- Pore Type
- Conclusions
- Carbonate Reservoirs and Fractured Reservoirs
- Carbonate Sidewall core
- Carbonate Porosity Types
- Intergranular Porosity
- Vuggy & Moldic Porosity

- Cretaceous Reefs
- Golden Lane Facies
- Dissolution by Meteoric Water
- Karst and Unconformities
- Persian Gulf Petroleum System
- Arab D Reservoir -Ghawar
- Daily Oil Production 2008
- Dolomitization
- Ordovician Dolomite Cavity, OH
- Trenton-Black River System-Appalachian Basin
- Fractured Reservoirs
- Evidence for fluid flow along Fractures in Sandstone
- Systematic Orthogonal Fractures
- Fracture Spacing/Bedding
- Fractures in Reservoir Simulations
- Sealed Fractures
- Example of Fractured Carbonate Reservoir
- Isopach of Union Oolite, Rhodell Field Area
- Estimated Ultimate Recovery (EUR) Map
- Union Oolite Net Pay Isopach
- Cross-section A – A'
- DEPI #5834 (047-055-00238)
- DEPI #5834 047-055-00238 FMI LOG
- OPEN FRACTURES – DEPI #5834 (FAULT ZONE)
- Maximum Horizontal Stress
- Union Oolite Thrust Model with Fracture Swarm
- FAULT WELL PRODUCTION (Outside Oolite Trend) DEPI #5834 (047-055-00238)
- Take Home Ideas
- Acid Stimulation of Carbonate Reservoir in Northeastern Thailand Using Developed Computer Program

- Data and Methods
- Matrix Acidizing
- Acid Fracturing
- Reservoir Efficiency
- Results and Discussions
- Permeability Distribution of cross-Section Structure
- The Relationship Between Cumulative Production Rate and Time
- Result of Simulation by Natural Flow
- Result of Simulation After Stimulation by Acidizing
- Result of Simulation After Stimulation by Acid Fracturing
- Economic Evaluation
- Reservoir Efficiency Results with 5 Production Wells
- Cash Flow Expenditure Cost Detail
- Economic Evaluation Results Summary with 5 Production Wells
- Multilateral Stimulation Technology - A New Approach to Stimulating/Revitalizing Production in Carbonate Reservoirs
- Fishbones MST – Jetting
- Dreamliner MST – Drilling
- Addressing Challenges
- Product Portfolio
- Track Record
- Case Histories
- First Carbonate Installation – USA
- CB Jones #2, Austin Chalk Formation
- 16 Months' Production
- Fishbones MST installation #2 in USA
- Eagle Ford Formation - Buda Formation
- Buda Well Production Before and After Fishbones
- First Dreamliner MST Installation
- Simfish
- Expanding Global Presence

- Halliburton - Reservoir Solutions - Reservoir Knowledge Center
- Collaborative Well Testing
- Planning
- Testing
- Real-Time Reservoir Solutions (RTRS)
- Res 20/20
- Well Test Analysis Overview
- Underbalanced Applications–Real-Time Reservoir Evaluation (RTRE)
- Examples of Downhole Solutions
- Openhole Test Installation
- SmarTest™ System Installation
- Cased Hole Test Installation
- Harsh Environment Test Installations
- Offshore Well Test Installation
- Deepwater/Floating Vessel Well Test Installation
- Land/Jack-up Well Test Installation
- FasTest™ System Installation
- Shoot and Pull Test Installation
- STPP™-GH Single-Trip Perf/Pack System
- Sandstone vs. Carbonate Petroleum Reservoirs: A Global Perspective on Porosity-Depth and Porosity-Permeability Relationships
- Data
- Geographic Distribution of Petroleum Reservoirs, Sorted by Lithology
- Porosity-Depth
- Values of Statistical Trends Shown in Figures 2 and 4 for Siliciclastic (SI) and Carbonate (CB) Reservoirs
- Arithmetic-Average Reservoir Permeability (md) vs. Average Porosity
- Porosity-Permeability
- Interpretation
- Porosity Controls
- Permeability Controls

- Source Rock
- Definitions of Source Rock Types
- Characterizing Source Rocks
- Determining Source Rock Potential
- Types of Source Rocks
- Maturation and Expulsion
- Mapping Source Rocks in Sedimentary Basins
- World Class Source Rock
- Reservoir Rock
- The Properties of Reservoir Rocks
- Types of Reservoir Rocks
- Sandstone Reservoir Rocks
- Carbonate Reservoir Rocks
- Siliciclastic Reservoir
- Shallow and Deep Marine Reservoir
- Lacustrine Reservoir
- Eolian Reservoir
- Fluvial Reservoir
- Deltaic Reservoir
- Carbonate Reservoir
- Depositional Environment of Marine Carbonate
- Reef Reservoir
- Reef Habitat in the Shallow Sea. Adapted from Alamsyah
- Clastic Limestone
- Dolomite
- Afanitic Limestone
- Another Type of Reservoir
- Reservoir Rock Properties, Interpretations and their Significance on a Petroleum System
- Other Factors Affecting the Volume of the Reservoir Rocks
- Methods for Determining Rock Properties

- Reservoir Rock Properties Calculation Formula
- Reservoir Porosity
- Reservoir Permeability
- Cap Rocks
- Types of Cap Rock in Petroleum System
- Characteristics of the Caprock
- Seal Capacity & Permeability
- Faulting & Fracturing
- Seal Thickness and Continuity
- The Preferred Seal Type I - Halite Caprocks
- The Preferred Seal Type II - Multiple Confining Layers
- Cautionary Note - The Importance of High-Quality Seismic Surveys