COURSE OVERVIEW LE0536
Water Management & Quality
(E-Learning Module)

Course Title
Water Management & Quality
(E-Learning Module)

Course Reference
LE0536

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 water management and quality. It covers the produced water treatment, processes and primary, secondary and tertiary treatments; the innovation and oilfield produced water management practices; the origin and constituents of oilfield produced water; the produced water management practice; the hydrogeology and groundwater, aquifer properties/parameters, pores, porosity and permeability; the relation between k and grain-size distribution; the k in geologic formation; and the water transmitting parameter, transmissivity, storage parameter, cone of depression and groundwater exploration.

Further, the course will also discuss the geologic methods, selection of site for a well and remote sensing and applications; the advantages of remote sensing technique, surface geophysical methods and electric resistivity method; the profiling or lateral traversing, seismic refraction method, geologic logging and drilling time log; and the geophysical logging/borehole geophysics, resistivity logs, spontaneous potential logging, radiation logging, natural-gamma logging, gamma-gamma logging, neutron logging, temperature logging and caliper logging.

During this course, participants will learn the types of wells and methods of construction; the fundamentals of produced water treatment in the oil and gas industry; the hydrocarbon production, conventional PW treatment, unconventional PW disposal and unconventional PW treatment; the upstream sludge management, produced water treatment, gravity separation and centrifugal separation; the flotation processes, flotation and filtration process and recycling produced water; the advanced produced water treatment; the membrane distillation, reverse osmosis, resource recovery and oilfield water recycling; the &G exploration and production operations; the wastewater composition, quantity and water management options; the analytical methods applied to oil and gas waste streams; the social responsibility in water management; the sampling and sample handling, sampling methods, sample preservation and sample accountability; the produced water treatment to enhance oil recovery; the petroleum refining and petrochemicals typical wastewater treatment system and technologies; the water quality assessment and drinking water analyzing standards; the required and recommended values for drinking water; and the water classification according to usage.

Course Objectives

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

- Apply and gain an in-depth knowledge on water management and quality
- Carryout produced water treatment, processes and primary, secondary and tertiary treatments
- Employ innovation and oilfield produced water management practices
- Discuss the origin and fate of oilfield produced water as well as the constituents of produced water
- Apply produced water management practice and explain hydrogeology and groundwater, aquifer properties/parameters, pores, porosity and permeability
- Discuss the relation between k and grain-size distribution and describe the k in geologic formation
- Determine water transmitting parameter, transmissivity, storage parameter, cone of depression and groundwater exploration
- Implement geologic methods, selection of site for a well and remote sensing and applications
- Identify the advantages of remote sensing technique and apply surface geophysical methods and electric resistivity method
- Describe profiling or lateral traversing, seismic refraction method, geologic logging and drilling time log
- Explain geophysical logging/ borehole geophysics, resistivity logs, spontaneous potential logging, radiation logging, natural-gamma logging, gamma-gamma logging, neutron logging, temperature logging and caliper logging
- Recognize the types of wells and methods of construction as well as the fundamentals of produced water treatment in the oil and gas industry

- Illustrate hydrocarbon production, conventional PW treatment, unconventional PW disposal and unconventional PW treatment
- Apply upstream sludge management, produced water treatment, gravity separation and centrifugal separation
- Illustrate flotation processes, flotation and filtration process and recycling produced water
- Employ advanced produced water treatment and discuss membrane distillation, reverse osmosis, resource recovery and oilfield water recycling
- Carryout O&G exploration and production operations as well as identify the wastewater composition, quantity and water management options
- Apply analytical methods applied to oil and gas waste streams and demonstrate social responsibility in water management
- Illustrate sampling and sample handling, sampling methods, sample preservation and sample accountability
- Employ produced water treatment to enhance oil recovery
- Recognize petroleum refining and petrochemicals typical wastewater treatment system and technologies
- Perform water quality assessment and discuss drinking water analyzing standards
- Identify the required and recommended values for drinking water and apply water classification according to usage

Who Should Attend

This course covers systematic techniques on water management and quality for analytical chemists, engineers, technicians, scientist, analysts and other technical staff involved in water quality analysis and testing.

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 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

Course Contents

- Produced Water Treatment Overview
- Theme Description
- Processes
- Primary Treatments
- Secondary Treatments
- Tertiary Treatments
- Projects and Innovation
- Oilfield Produced Water Management Practices
- The Origin and Fate of Oilfield Produced Water
- What Is Produced Water? Origin and Source
- Constituents of Produced Water
- Produced Water Management Practice
- Common Produced Water Management Practices
- Final Thoughts
- Recommendations
- Hydrogeology and Groundwater
- Groundwater Movement
- Aquifer Properties/Parameters
- Pores, Porosity and Permeability
- Groundwater Withdrawal
- Relation Between K and Grain-Size Distribution
- Description of K In Geologic Formation
- Water Transmitting Parameter
- Transmissivity
- Storage Parameter
- Cone of Depression
- Groundwater Exploration
- Exploration of Groundwater
- Geologic Methods
- Relationship Between Geology and Groundwater

- Alluvial Aquifers
- Selection of Site for a Well
- Remote Sensing
- RS Applications
- Land Cover
- Advantages of Remote Sensing Technique in General
- Surface Geophysical Methods
- Electric Resistivity Method
- Hydrogeology and Groundwater
- Exploration of Groundwater
- Electric Resistivity Method
- Vertical Electrical Sounding (VES)
- Profiling or Lateral Traversing
- Interpretation
- Usefulness
- Seismic Refraction Method
- Exploration of Groundwater
- Geologic Logging
- Drilling Time Log
- Geophysical Logging/ Borehole Geophysics
- Resistivity Logs
- Uses of Resistivity Logs
- Spontaneous Potential (SP) Logging
- Radiation Logging
- Natural-Gamma Logging
- Gamma-Gamma Logging
- Neutron Logging
- Temperature Logging
- Caliper Logging
- Groundwater Withdrawal
- Types of Wells and Methods of Construction
- Well Construction Methods
- Fundamentals of Produced Water Treatment in the Oil and Gas Industry

- Produced Water
- Hydrocarbon Production
- Conventional Vs. Unconventional
- PW from Conventional Wells
- Conventional PW Treatment
- PW Treatment from Conventional On-Shore Wells
- Conventional Wells PW Water Flood
- PW Unconventional Wells
- Flowback and Produced Water
- Unconventional PW Disposal
- Unconventional PW Treatment
- Flowback Water Contaminants
- Fluids Used in Well Operations
- Life Cycle Of Produced Water with Regulatory Issues
- Water in Upstream
- Water in Upstream: Life Cycle in Upstream Operations
- Water in Upstream: Stages of Water Management
- Water as a Product
- Water as a Product: Produced Water Management
- Water as Product: Produced Water as Part of the Solution Opportunities
- Water as Product: Energy Water Initiative (EWI)
- Regulatory Issues: Federal
- Regulatory Issues: States
- Collaboration and Research: Water Knowledge Sharing
- Pw Management: Market & Treatment
- Importance of PW Treatment
- Industrial Water & Wastewater Capex
- Upstream Sludge Management
- Us O&G Water Services by Sector
- O&G Water Services by Sector & Region
- Upstream Capex by Region & Technology
- Upstream Capex by Resource & Spending by Chemical
- PW Volumes by Disposal Options & Off-Shore Pw

- Shale Play Water Market
- Shale Play Water Cycle
- Shale Play PW: Disposal Options
- Fracking PW: Water Treatment
- Shale Play PW: Cost & Water Trends
- Contaminants: Water Treatment Challenges for PW
- Produced Water Treatment
- Where is Produced Water?
- Produced Water - Important Characters and Current Preliminary Treatment Technologies - Oil/Solids/Water Separation
- Introduction
- Important Parameters - Oil
- Important Parameters - Suspended Solids
- Applications - Conventional Vs Unconventional
- Basic Theory
- Importance of Particle Size
- Coagulation & Flocculation
- Gravity Separation
- Centrifugal Separation
- Flotation Processes
- Primary Treatment - Flotation Processes
- Flotation Processes
- Filtration Process
- Walnut Shell Filter
- Summary
- Introduction
- Important Parameters - Oil
- Importance of Particle Size
- Coagulation & Flocculation
- Centrifugal Separation
- Flotation Processes
- Recycling Produced Water
- Produced Water Recycling
- Required Water Quality?

- Water Quality for Reuse?
- Pw Recycle Treatment
- Mid-Stream – a Paradigm Shift
- Disposal Remains a Key Option
- Flowback Water
- Fluids Used for Unconventional Wells
- Advanced Produced Water Treatment
- Treating Produced Water for Beneficial Reuse
- What is Goal of Advanced Treatment
- Treating Produced Water for Beneficial Reuse For Technologies Making Progress
- Forward Osmosis
- Membrane Distillation
- Capacitive Deionization (CDI)
- Humidification Dehumidification (HDH)
- Other Technologies
- Motivation for Advanced Treatment
- Reverse Osmosis
- Reverse Osmosis Treatment Process
- RO Boron Rejection: PH Dependent
- Mechanical Vapor Recompression Evaporator
- Crystallizers
- Vacuum Crystallizers
- Deep Well Disposal
- Reducing,Removing, Reusing, Recovering
- Definitions
- Context
- Consumption and WW Production
- Sustainable Development Goals
- Law, Policy, Governance
- Policy-Making and Implementation
- International Law
- Protecting the Danube and the Black Sea
- Eu Law - Waste / Land

- Eu Law – Water
- Resource Recovery
- Water Reuse
- Water Reuse – The EU
- Water Reuse for DW
- Conclusions
- Oilfield Water Recycling: Challenges, Research, and Collaborations
- O&G Exploration & Production Operations
- Water Use in Exploration & Production Operations
- Wastewater Generation in Exploration & Production Operations
- Wastewater Composition
- Wastewater Quantity
- Water Management Options
- Oil & Gas Exploration and Production: Potential Beneficial Reuses
- Limitations: Cost of Treatment
- Collaborative Programs to Advance Reuse
- Industry-Academia Partnership
- Academia – Industry Collaborative Research
- Example of Ongoing Research: Advancing a Web Based Decision Support Tools (DST) for Water Reuse in Unconventional O&G Development
- Example of Ongoing Research: Engineered Osmosis for Advanced Pretreatment of O&G Wastewater
- Example of Ongoing Research: Engineered Osmosis for Advanced Pretreatment of O&G Wastewater
- Example of Ongoing Research: Forward Osmosis – Reverse Osmosis System Analyzer
- Example of Ongoing Research: Advanced Biological Pretreatment
- Analytical Methods Applied to Oil and Gas Waste Streams
- Research Needs
- Practical Examples of Oilfield Water Recycling
- Water Management – The Past…
- Water Management – The Present…
- Water Management – The Future…
- Recent Tx Rule Changes
- Saltwater or Freshwater?

- Charting a Logical Path
- Saltwater Recycling Example
- Saltwater Recycling Example – Solids Control Essential
- Saltwater Recycling Example
- View Into 40,000bbl Clean Containment
- Saltwater Recycling Example Plug in at SWD
- Freshwater Recycling Example
- Freshwater Recycling Example – Texas Installations
- Recycling to Freshwater
- Recycling Center – Hub for Water
- New Trends
- Concluding Remarks
- Demonstrating Social Responsibility in Water Management
- Water Management in the Social Context – the (Not So) Technical Issues
- What are the Issues?
- How is Water Use Communicated?
- How is Water Protection Communicated?
- How is Water Protection Communicated?
- The Future of Produced Water Reuse
- Challenges and Opportunities For Reuse
- Water Samples
- Sampling and Sample Handling
- Types of Samples
- Sampling Methods
- Sample Contamination
- Sample Preservation
- Sample Holding Time
- Transmittal of Samples to the Laboratory
- Sample Receipt
- Disposal of Completed Samples
- Reporting Data
- Sample Accountability
- Preparations for Boiler Water Samples

- Collection
- Preservation and Storage
- Course Recap
- Produced Water Treatment to Enhance Oil Recovery
- Serving All Sectors of the Petroleum Industry
- Oil & Gas Production Produced Water Treatment Process Map
- Oil & Gas Production Produced Water Treatment
- Oil & Gas Production Water Injection/Reinjection Process Map
- Oil & Gas Production Steam Assisted Gravity Drainage (SAGD)
- Petroleum Refining and Petrochemicals Process Water Treatment
- Petroleum Refining and Petrochemicals Typical Wastewater Treatment System
- The Petroleum Industry Leader in Technology and Application Experience
- Petroleum Refining and Petrochemicals Wastewater Treatment Technologies
- Wastewater Treatment Plants: Wastewater Resource Recovery Facilities?
- Wastewater Treatment Plants
- Urban Wastewater Treatment Directive (91/271/Eec1)
- Water Framework Directive (2000/60/Ec2000)
- Conventional Wastewater Plant… Today
- Climate Change Impact on WWT
- WWT Impact on Climate Change
- Global Greenhouse Gas Emissions by Source (USA)
- GHG Emissions
- A New Paradigm for WWTP is Now Necessary
- What Can We Get from Wastewater?
- Energy
- Nutrient Recovery
- Phosphorous
- Nitrogen and Phosphorous
- List of Materials that can be Potentially Extracted from Wastewater
- Membrane Bioreactor (MBR)
- A New Paradigm for WWTPS
- Water Quality Assessment
- Drinking Water Analyzing Standards

- Required and Recommended Values for Drinking Water
- Water Classification According to Usage
- Goals
- Consents 1 Based on EU 91/271
- Consents 2 - Metals Mg/L
- Justifiable Allowances
- Outside Urban Wastewater Directive
- Overview of International Clean Water Acts
- World Bank Effluents Guidelines & Standards
- BP's Environmental & Social Action Plan
- Discharged Wastewater Quality Standards
- Course Recap
- Zero Liquid Discharge
- Chemical for Reuse
- Need for ZLD
- Benefits of ZLD
- ZLD Options
- Key Steps of ZLD Process
- RO Method
- MVC Method
- MVR Evaporator
- Process
- Crystallization
- Sludge Management
- RO Reject Management
- Mechanical Vapor Recompression Evaporation Plants
- Salt Recovery and Reuse
- Re-Use of Sewage
- Emerging Technologies of ZLD
- Forward Osmosis
- Applications of ZLD