COURSE OVERVIEW DE0882
Fluid Separation and Treatment (E-Learning Module)

Course Title
Fluid Separation and Treatment
(E-Learning Module)

Course Reference
DE0882

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 fluid separation and treatment. It covers the gas oil separation and treatment plant; the typical oil production facility flow diagram; the three-phase separation with heating and desalting; the design of an efficient desalting system including stabilization with a fractionation column and desalination; the separator, mist eliminator, gas and liquid capacity and procedure for horizontal separators; the factors prior to oil treatment method selection, vertical and horizontal skimmer schematic and skimmer sizing equations; and the oil-gas-separation troubleshooting and methodology flowchart.

Further, the course will also discuss the separator components, inlet feed pipe and device, gas gravity separation section and processing systems/design separation/metering; the common causes of upsets; the fluid and solids monitoring and analysis, system performance mapping and troubleshooting techniques; the moderate methods and online measurements; the examination of inlet separation technologies for increased reliability; the crude oil dehydration and desalting; the Gastech's dual wave electrostatic desalting process; the pump system schematic, pump discharge conditions, typical water quality standards; and the bacteria found in surface water.

During this course, participants will learn some factors affecting ratio of indicator organisms to pathogens; the viral sources of waterborne disease; the virus detection, chlorination of water, methods of treatment and water treatment processes; the filter operation and the conceptional layout of a sedimentation tank and a roughing filter sedimentation tank; the microbe reductions, cryptosporidium removals and reductions, disinfection and the water cycle; and the water treatment, water disinfection, chlorination, ozonation, chlorination process, measurement and sampling at the inlet structure and disposal of sludge or biosolids.

Course Objectives

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

- Apply and gain an in-depth knowledge on fluid separation and treatment
- Discuss gas oil separation and treatment plant as well as typical oil production facility flow diagram
- Describe three-phase separation with heating and desalting, design of an efficient desalting system including stabilization with a fractionation column and desalination
- Identify separator, mist eliminator, gas and liquid capacity and procedure for horizontal separators
- Recognize the factors prior to oil treatment method selection, vertical and horizontal skimmer schematic and skimmer sizing equations
- Troubleshoot oil-gas-separation and methodology flowchart as well as identify separator components, inlet feed pipe and device, gas gravity separation section and processing systems/design separation/metering
- Identify the common causes of upsets and illustrate fluid and solids monitoring and analysis, system performance mapping and troubleshooting techniques
- Apply moderate methods and online measurements as well as examine inlet separation technologies for increased reliability
- Carryout crude oil dehydration and desalting and Gastech's dual wave electrostatic desalting process
- Identify pump system schematic, pump discharge conditions, typical water quality standards and bacteria found in surface water
- Recognize some factors affecting ratio of indicator organisms to pathogens and viral sources of waterborne disease
- Employ virus detection, chlorination of water, methods of treatment and water treatment processes
- Apply filter operation and illustrate the conceptional layout of a sedimentation tank and a roughing filter sedimentation tank
- Describe microbe reductions, cryptosporidium removals and reductions, disinfection and the water cycle
- Carryout water treatment, water disinfection, chlorination, ozonation, chlorination process, measurement and sampling at the inlet structure and disposal of sludge or biosolids

Who Should Attend

This course provides an overview of all significant aspects and considerations of fluid separation and treatment for drilling engineers, drilling representatives, drilling fluid engineers and contractor personnel, drilling supervisors, mud engineers, cementing engineers (offshore and onshore personnel), tool pushers, managers and technical support involved with drilling operations and responsible for the development, planning and application of the drilling fluids 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, 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 Fee

As per proposal

Course Contents

- Gas Oil Separation & Treatment Plant
- Typical Oil Production Facility Flow Diagram
- Gas Oil Separation Plant
- Three-Phase Separation with Heating and Desalting
- Three-Phase Separation with Three Delivery Pressure Levels, Hp, High Pressure
- Design of an Efficient Desalting System
- separation and Sweetening by Cold Stripping with Associated Gas
- Stabilization with a Fractionation Column and Degasolination
- Three-phase Separation with Stabilization, Sweetening and Mercaptans Removal
- Oil and Gas Separation
- Vertical Separator
- Spherical Separator
- Two Barrels Two-phase Separator
- Separator's Internals
- Inlet Diverter

- Separator's Internals – Wave Beaker plates
- Wire Mesh Mist Eliminator
- Typical Mist Extractor
- Centrifugal Mist Eliminator
- Design & Selection of a Two-phase Horizontal Separator
- Exercise – 1
- Investigation
- Quiz – 1
- Gas Capacity
- Liquid Capacity
- Exercise – 2
- Investigation
- Quiz – 2
- Quiz – 3
- Quiz – 4
- Seam to Seam Length and Slederness Ratio
- Procedure for Sexing Horizontal Separators
- Selection of Horizontal Separator
- Quiz – 5
- Quiz – 6
- Quiz – 7
- Quiz – 8
- Quiz – 9
- Quiz – 10
- Model of a Vertical Separator
- Gas Capacity
- Liquid Capacity
- Seam to Same Length and Slenderness Ratio
- Approximate Shell Length from Liquid Level Height
- Vertical Separator
- Determination of Oil Pad Height
- Vortex Breaker

- Three-phase Oil & Gas Separation
- Bucket & Weir Design
- Gas Capacity
- Retention Time
- Settling Equation
- Procedures for Sizing Horizontal Three-phase Separator
- Mist Extractor
- Radial Gas Scrubber
- Vertical Gas Scrubber
- Factors to be Studied Prior Selection of Oil Treatment Method
- Treating Equipment
- Settling Tanks and Skimmer Vessels
- Vertical Skimmer Schematic
- Horizontal Skimmer Schematic
- Skimmer Sizing Equations
- Horizontal Rectangular Cross Section Tank
- Vertical Cylindrical Tank
- Plate Coalescers
- Parallel Plate Interceptor (PPI)
- Corrugated Plate Interceptor (CPI)
- A Typical CPI Pack
- Cross-Flow Devices
- Free-Flow Turbulent Coalescers (SP Packs)
- Deriving Recommendations (Closure)
- Troubleshooting of Oil-Gas-Separation
- Sample Problem - Gas Liquid Separator Sizing with Demister Pad
- Gas-Liquid Separators Sizing Parameter
- Gas Gravity Separation Section
- Droplet settling theory
- The Souders-Brown Approach
- The Design Parameter, KS
- Campbell Book

- KS Correlations
- Mist Extractors
- Troubleshooting Gas-Liquid Separators -Removal of Liquids from the Gas
- Gas-liquid Ratio
- Troubleshooting Methodology Flowchart
- Separator Components
- Inlet Feed Pipe
- Inlet Device
- Gas Gravity Separation Section
- Mist Extraction Section
- Troubleshooting
- Operational Troubleshooting of Separators
- Processing Systems/Design Separation/Metering
- Performance Targets
- Common Causes of Upsets
- Fluid and Solids Monitoring and Analysis
- System Performance Mapping
- Troubleshooting Techniques
- Simple Methods
- Method 1
- Method 2
- Thermal Cameras
- Vessel Sample Points
- White Rag
- Millipore Filters
- Flow Distribution
- Pressure Drop
- Moderate Methods
- Gamma Scans
- Dyes
- Chemical Trials
- Online Measurements

- Computational Fluid Dynamics (CFD)
- Advanced Methods
- Tracers
- Conclusion
- Potential Operating Problem
- Liquid Carryover and Gas Blowby
- Sand
- Paraffin
- Foamy Crudes
- Vortex Breakers
- Typical Vortex Breakers
- Examine Inlet Separation Technologies for Increased Reliability
- Crude Oil Dehydration and Desalting
- Electrostatic AC/DC Dual Wave Dehydrator/Desalter
- Crude Oil Dehydration & Desalting
- Typical PFD for Various Configurations of Desalter Packages
- Quiz – 11
- Quiz – 12
- Quiz – 13
- Quiz – 14
- Quiz – 15
- GasTech's Dual Wave Electrostatic Desalting Process
- Removes
- Design
- GasTech Design Features
- Pump System Schematic
- Data
- Pump Discharge Conditions
- Microbiology of Water
- Some Water Factoids
- The Essentialness of Water
- We are a Burgeoning Human Population Unable to Move Away from its Waste

- All Microbes Live in an Aqueous Environment
- Water Quality in TN (2004)
- Terminology
- Typical Water Quality Standards
- Most Probable Number
- Knox County Tennessee
- Bacteria Found in Surface Water
- Pathogens of Most Concern on Fresh Produce
- Waterborne Infectious Disease
- Other Important Water Transmitted Organisms
- Protozoa Found in Surface Water
- Giardiasis and Cryptosporidiosis
- Some Costly Cases
- Life Cycle of Cryptosporidium
- Agricultural Water
- Water Quality Evaluation Log
- Public Health and Water Supply
- Fecal Coliform/Fecal Streptococci Ratios for Humans and Other Animals
- Characteristics of a Useful Indicator
- Bacterial-Indicator Organisms Common Groups
- Indicator Organisms
- Problems with the Coliform Indicator Test
- Some Factors Affecting Ratio of Indicator Organisms to Pathogens
- Direct Tests for Pathogens
- Viral Sources of Waterborne Disease
- Virus Detection
- Chlorination of Water
- Methods of Treatment
- Chlorine Terms
- Chlorine Dosage
- Free Residual Chlorine
- Bottom Line

- Electrolysis of Water
- Conventional
- Alternate
- How do We Store Electricity?
- Why is Hydrogen such a Big Deal?
- Electrolysis of Water
- What do We Need?
- Chemical what Happens
- What is a PEM
- Proton Exchange Membrane
- Demo
- How do We Use the Hydrogen?
- What are We Going to do?
- Design a Power Plant
- What Industry Wants to Make
- Electrolysis of Water
- Take Away's
- Water Treatment Process – 1
- Water Sources and Water Treatment
- Summary of Mainline Water Treatment Processes
- Water Treatment Processes: Storage
- Water Storage and Microbial Reductions
- Typical Surface Water Treatment Plant
- Chemical Coagulation-Flocculation
- Coagulation-Flocculation
- Microbe Reductions by Chemical Coagulation-Flocculation
- Cryptosporidium Removals by Coagulation (Jar Test Studies)
- Exercise- 3
- Investigation
- Granular Media Filtration
- Exercise- 4
- Investigation

- Slow Sand Filters
- Microbial Reductions by Slow Sand Filtration
- Filter Operation
- Conceptional Layout of a Sedimentation Tank and a Roughing Filter Sedimentation Tank
- Microbe Reductions by Rapid Granular Media Filters
- Microbe Reductions by Chemical Coagulation-Flocculation and Filtration of River Water by Three Rx Plants in The Netherlands
- Cryptosporidium Removals by Sand Filtration
- Cryptosporidium Removal by Coagulation and Direct Filtration
- Reported Removals of Cryptosporidium Oocysts by Physical-Chemical Water Treatment Processes
- Cryptosporidium Reductions by Coagulation and Filtration
- Membrane Filters
- Cryptosporidium Reductions by Membrane Filtration
- Adsorbers and Filter-Adsorbers
- Cryptosporidium Removals by Sand Filtration
- Cryptosporidium Reductions by Membrane Filtration
- Water Softening and Microbe Reductions
- Microbial Reductions by Softening Treatment
- Disinfection of Microbes in Water
- Disinfection Kinetics
- Disinfection and Microbial Inactivation Kinetics
- Factors Influencing Disinfection of Microbes
- Effects of Water Quality on Disinfection
- Inactivation of Cryptosporidium Oocysts in Water by Chemical Disinfectants
- Exercise- 5
- Investigation
- Disinfection
- Water Treatment Process – 2
- Drinking Water Treatment
- Importance of Water

- So What is it About Water that Makes it so Important to Us?
- Where Does the Water Come from?
- The Water Cycle
- Drinking Water in U.S.
- Surface Water Treatment Plant
- Water Treatment
- Water Disinfection
- Chlorination
- Ozonation
- Ultraviolet Radiation
- Complete Cycle of Water Treatment
- Design of a Chlorination Process
- Water Treatment Process – 3
- Purpose
- Wastewater Treatment
- Preliminary treatment
- Bar Screen
- Grit Chamber
- Mesh Screen
- Measurement and sampling at the inlet structure
- Suspended Solids
- B.O.D. = Biochemical Oxygen Demand
- Secondary Treatment
- Disposal of Sludge or Biosolids