COURSE OVERVIEW PE1007
Oil Processing Facilities
(E-Learning Module)

Course Title
Oil Processing Facilities
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Course Reference
PE1007

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 oil processing facilities. It covers the API gravity and brent crude oil specification; the production dehydration and desalting, oil stabilization, movement to GOSP and gas/oil separation; the major equipment of a GOSP, H.P. separator, L.P and water/oil separator; the dehydrating and desalting of wet crude oil, wet crude heating and scale inhibitor injection; the GOSP flow sheet, operation, maintenance and training manual; the technical description for electrostatic desalter and the disadvantages of crude oil containing water and salt; the load of transportation and the load of storage for the crude oil; the stabilization of operation during the process and the power consumption of the process; the result in catalyst poisoning in the follow-up processing and stocks formula for water drop settling; and the scaling and block pipes to the equipment including corruption of pipeline and equipment.

Further, the course will also discuss the basic principles of electrostatic desalting as well as the differences and connections between electrostatic dehydrating technology and electrostatic desalting technology; the site and meteorological conditions, crude oil property of blend oil and mishrif formation; the design parameters and system of electrostatic desalter; and the radio-frequency conductance level transmitter, guide-radar level transmitter, temperature gauge and temperature transmitter and differential pressure transmitter.

During this course, participants will learn the zero-load testing on the power supply unit; the short circuit test or earthing of the transmitter, commissioning, operation and optimization; the general inspection before the operation, optimizing for commissioning and operation; the adjustment of transformer output voltage; the daily maintenance, periodic stop inspection and troubleshooting; the basic theory of separation; and the importance of demulsification and the principle of emulsion breaking.

Course Objectives

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

- Apply and gain an in-depth knowledge on oil processing facilities
- Discuss API gravity, brent crude oil specification, oil processing facilities and oil production and treatment
- Illustrate production dehydration and desalting, oil stabilization, movement to GOSP and gas/oil separation
- Identify the major equipment of a GOSP, H.P. separator, L.P and water/oil separator
- Carryout dehydrating and desalting of wet crude oil, wet crude heating and scale inhibitor injection
- Review GOSP flow sheet as well as operation, maintenance and training manual
- Discuss the technical description for electrostatic desalter and identify the disadvantages of crude oil containing water and salt
- Increase the load of transportation and the load of storage for the crude oil
- Ensure the stabilization of operation during the process and determine the power consumption of the process
- Recognize cause scaling and block pipes to the equipment including corruption of pipeline and equipment
- Review result in catalyst poisoning in the follow-up processing and stocks formula for water drop settling
- Discuss the basic principles of electrostatic desalting as well as differentiate the connections between electrostatic dehydrating technology and electrostatic desalting technology
- Determine site and meteorological conditions, crude oil property of blend oil and mishrif formation
- Describe the design parameters and system of electrostatic desalter
- Recognize radio-frequency conductance level transmitter, guide-radar level transmitter, temperature gauge and temperature transmitter and differential pressure transmitter
- Employ zero load testing on the power supply unit, short circuit test or earthing of the transmitter, commissioning, operation and optimization
- Carryout general inspection before the operation and optimization for commissioning and operation
- Adjust the transformer output voltage and perform daily maintenance, periodic stop inspection and troubleshooting
- Discuss the basic theory of separation, the importance of demulsification and the principle of emulsion breaking

Who Should Attend

This course provides an overview of all significant aspects and considerations of oil processing facilities for those directly involved in supervising oil and gas production operations, production personnel, junior staff and other staff who want to increase their understanding of the oil & gas production operation.

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

- API Gravity
- Crude Oil
- Light Crude Oil
- Medium Oil
- Heavy Oil
- Brent Crude Oil Specification
- Oil Processing Facilities
- Oil Production & Treatment
- Production Dehydration and Desalting
- Oil Stabilization
- Movement to GOSP
- Gas/Oil Separation
- Major Equipment of a GOSP
- Production Header
- Test Header
- Major Equipment of a GOSP
- High Pressure Separator
- H.P. Test Separator

- Water/Oil Separator
- H.P. Separator & W.O. Separator
- Knock Out Drum
- L.P. Separator
- Dehydrating & Desalting of Wet Crude Oil
- Wet Crude Oil
- Desalting
- Wet Crude Heating
- Scale Inhibitor Injection
- Dehydration
- Dehydrator & Desalter
- GOSP Flow Sheet
- Large Capacity Desalter
- Desalter Efficiency
- Desalter Highlights
- Emulsification
- Desalter Highlights
- De-emulsification
- Emulsion Formation
- Conductivity
- Water Percentage
- Voltage
- Hydrolysis
- Two Desalters
- Crude Oil Stabilization
- Stabilizer Column
- Reboilers
- Fan Coolers
- Operation, Maintenance & Training Manual
- Technical Description for Electrostatic Desalter
- Disadvantages of Crude Oil Containing Water and Salt
- Increase the Load of Transportation as well as the Load of Storage for the Crude Oil
- Effect the Stabilization of Operation during the Process

- Increase the Power Consumption of the Process
- Cause Scaling and Block Pipes to the Equipment
- Corrupt the Pipe Line and Equipment
- Result in Catalyst Poisoning in the Follow-up Processing
- Affect Product Quality
- Basic Principles of Electrostatic Desalting
- STOCKS Formula for Water Drop Settling
- Droplets Accumulate Electric Force Formula
- Differences & Connections between Electrostatic Dehydrating Technology & Electrostatic Desalting Technology
- AC and DC Desalting Technology
- Design Basis Data
- Site and Meteorological Conditions
- Crude Oil Property of Blend Oil
- Crude Oil Property of Mishrif Formation
- Design Parameters of Electrostatic Desalter
- System Description of Electrostatic Desalter
- Description of Main Equipment
- Electrostatic Desalter Vessel
- Structural Skid, Stair and Platform
- Strong Electric Field
- Bushing
- Insulated Hanger
- Crude Oil Inlet Distributor and Treated Oil Collector
- Transformer
- Anti-Explosion Power Distribution Cabinet and LCP
- Control Valve
- Flow Transmitter
- Radio-frequency Conductance Level Transmitter
- Guide-Radar Level Transmitter
- Pressure Gauge and Pressure Transmitter
- Temperature Gauge and Temperature Transmitter
- Differential Pressure Transmitter
- PSV

- Closed Sampler
- Corrosion Coupon and Corrosion Detector
- Installation and Testing
- Installation
- Installation of the Structural Skid, Vessel, Stairs and Platform
- Installation of the pipelines
- Installation of the HV Electric Field Component
- Installation of Transformer, Anti-Explosion Power Distribution Cabinet, LCP and JBS
- Installation of Instrument
- Electric Test
- Zero Load Testing on the Power Supply Unit
- Short Circuit Test or Earthing of the Transformer
- Commissioning, Operation and Optimization Operating
- Operation
- The General Inspection before the Operation
- Operation Process
- Operation the Valve Open or Closed State Checklist
- Operating Parameters Set Checklist
- Optimizing for Commissioning and Operating
- Operating Temperature
- Operating Pressure
- Oil-Water Level inside Vessel.
- The Transformer Output Voltage Adjustment
- Demulsifier Type and Injection Rate
- Wash Water
- Mixing Intensity
- Stop, Maintenance and Inspection
- Stop Procedure
- Purge
- Daily Maintenance
- Periodic Stop Inspection
- Troubleshooting
- P&ID

- Operating and Control Philosophy
- Commissioning Spare Parts
- Two Years Spare Parts
- Dual polarity electrostatic treater
- Oil Reception and Process
- Safety Moments
- Basic theory of separation
- The Separation Process
- Construction of Separators
- Separators Instrumentation and Control
- Separation Process / Sections
- Separation in Stages
- Classification of Separator
- Classification According to Duty
- Separation Process
- Separation Theory
- Separators Classifications
- Emulsion
- Electric De-hydration / De-saltation
- Heating
- Storage Tanks
- Oil Reception & Process
- Element 3.2 Oil Dehydration and Desalting
- Oil Field Emulsions
- Importance of Demulsification
- What is an Emulsion:
- Emulsifying Agents
- Sources of Agitation
- Emulsion Stability
- Emulsion Instability & Demulsification
- Emulsion Destabilization
- Increased Temperature
- Centrifugation
- Electrical Methods

- Increasing Residence Time
- Chemical Treatment
- Selection of Demulsifier
- Viscosity
- Specific Gravity
- Water cut
- Droplet size
- Principle of Emulsion Breaking
- Chemical Treating Effect
- Heating Effect
- Settling Effect
- Emulsion Treatment Equipment
- Heat Treater
- Chemelectric Treater
- Typical Crude Oil Demulsifier
- Water Treatment Process
- Water Properties/Contamination
- Water Analysis
- Suspended Solids
- Dissolved Gas
- Dissolved Oxygen
- Dissolved Carbon Dioxide
- Dissolved Hydrogen Sulphide
- Oil Content
- Water pH
- The pH is Extremely Important for Several Reasons
- Mineral Scale Accumulation
- Solid Accumulation
- Bacteria
- Sulphur-Reducing Bacteria
- Aerobic Bacteria
- Facultative Bacteria (FB)
- Main Water Problems
- Corrosion

- How to Avoid Corrosion
- Scaling Tendency
- Water Compatibility (Clay Swelling)
- Emulsion
- Water /Oil Emulsion Treatment
- Chemical Processes
- Physical Processes
- Mixed Processes
- Hydrate Formation
- Hydrate Prevention
- Surface Water: Sea Water
- The Different Water Sources for Water Injection
- Surface Water: Lakes, River
- Subsurface Water: Deep or Shallow Aquifer
- Produced Water
- Injection Water
- Composition of the Produced Water
- Required Treatment for Water Injection
- Surface Water
- Deep Ground Water
- Produced Water
- Chemicals for water Injection (Raw River Water)
- Chlorination
- Sodium Hypochlorite
- Filter Aids
- Antifoams
- Oxygen Scavenger
- Scale Inhibitor
- Corrosion Inhibitor
- Biocides
- Process Control and Process Safety
- Atmosphere Pressure
- Pressure Exerted by Liquids
- Pressure Units

- Pressure Scale
- Pressure Measurements
- Bourdon Tube Pressure Gauges
- Diaphragm Pressure Gauges
- Pressure Transmitter
- Standard Transmitter Set Up Diagram
- Control Loop – Case Study
- Differential Pressure Transmitter
- Pressure Switches
- Ultrasonic Sound Waves Method
- Nucleonic Level Measurement System
- Level Switches
- Volumetric and Mass Flow Rate Flow
- Flow Patterns
- Flow Measurement Devices
- Orifice Plate Flow Meter
- Glass Capillary Thermometers
- Vapour Tension Thermometers
- Thermocouple
- Resistance Temperature Devices (RTDs)
- Radiation Temperature Detectors
- Temperature Switches
- Fixed Roof Tanks
- Non-Pressure Tanks
- Low-Pressure Tanks
- Construction of Fixed Roof Tanks
- Fixed Roof Tank Auxiliary Equipment
- Vents
- Sealing
- Product Mixer
- Tank Heaters
- Level Measuring Device
- Floating Roof Storage Tanks
- Floating Roof Tank Construction

- Types of Floating Roof
- Pan Roof
- Disadvantages of the Pan Roof
- Pontoon Roof
- Double Deck Roof
- Floating Roof Tank Auxiliary Equipment
- Roof Drains
- Tank Drains
- Mixers
- Level Measuring
- Sampling
- Dome Roof Storage Tanks
- Dome Roof Tank Construction
- Dome Roof Tank Auxiliary Equipment
- Mixing Pumps
- Heaters
- Level Indicators
- Dome Roof Storage Tanks
- Pressure Relief System
- Vacuum Relief System
- Spherical Tank
- Bullet Tanks
- Measuring Meters
- Meters Selections
- Flow Meters
- Direct Volumetric Meters
- Positive Displacement (PD) Meters
- Turbine Meters
- Coriolis Mass Meters
- Ultrasonic Flow Meters
- Measuring Meters
- Meter recalibration
- Condensate Stabilization
- Fixed Roof Tanks (Limitation of Use)

- Types of Tanks
- Cone Roof Tanks
- Floating Roof Tanks
- Pan Roof
- Pontoon Roof
- Double Deck Roof
- Accessories
- Roof Drain
- Tank Drain
- Cone Roof Tank – Floating Suctions and Skimmers
- Internal Floating Roof Tank
- Dome Roof Tanks
- Pressure Vessels
- Spheroids
- Spheroids – Diagram
- Spheres
- Cylinders
- Accessories
- Vents
- Dip Hatch
- Manways
- Tank Mixers
- Swing Arms
- Foam Lines
- Foam Chambers
- Flame Arresters
- Temperature Indicators
- Tank Heaters
- Gas Blanketing in Cone Roof
- Water Draw Off
- Cone Roof Tank
- Wind Girders
- Roof Supports
- Roof Drains

- Roof Access Ladders
- Automatic Bleeder Vents
- Rim Vents
- Roof Seals
- Details of Roof Seal
- Automatic Bleeder Vents
- Roof Seals
- Tank Dikes
- Corrosion & Cathodic Protection
- Corrosion
- Corrosion Cell
- Sacrificial Anode System (Galvanic)
- Anode Material
- Advantages and Limitations
- Impressed Current Method
- Limitation of Impressed
- Note
- Methods of Gauging Tanks
- Tank Gauging
- Manual Gauging of Tanks
- Measurement of Oil Level
- Measurement of Water and Sediment Level
- Manual Measurement of Temperature
- Manual Sampling
- Mechanical Float Gauges
- Radar Gauges
- Servo Tank Gauges
- Radar Tank Gauges
- Radar Tank Level Gauges
- Tank Mixers
- Application and Process Variables
- Tank Ratio & Geometry
- Viscosity
- Density Difference

- Time
- Orientation (Relation to Inlet & Outlet)
- Operation of the Swivel Angle Mixer
- Dirty Tanks - Solids Suspension
- Advantages of Mixing
- Flow Pattern for Blending or Homogenizing
- Flow Pattern for Sludge Removal
- Blend Time
- Tank Mixing Pattern
- Impeller Placement
- Tank Blending with Fixed Angle Mixer
- Correct Angle to Achieve Flow Pattern
- Sludge Build-up in Tank with Fixed Angle Mixer
- No Sludge Build-up in Tank with Variable Angle Mixer
- Tank Mixing Requirements
- Multiple Mixers
- Mixer Mounting Considerations
- Swivel Mixer
- Side Entry Mixer
- Tank Jet Mixers
- Reason for Excess Pressure in a Vessel
- Block Discharge
- Fire Case
- Operating Pressure
- MAWP
- Design Pressure
- Set Pressure
- Accumulation
- Overpressure
- Blowdown
- Safety Relief Valves
- Conventional Pressure Relief Valves
- Safety Relief Valves
- Conventional Pressure Relief Valves

- Working principle
- Conventional Pressure Relief Valves
- Pilot - Operated Pressure Relief Valve
- Working Principle
- Relieving Cycle
- Diaphragm - Type Pilot - Operated Pressure Relief Valve
- Balanced Bellows Pressure Relief Valve
- Working Principle
- Power - Actuated Pressure Relief Valves
- Temperature - Actuated Pressure Relief Valves
- Pressure Vacuum Vent Valves
- Rupture Disk
- Application of Rupture Disks
- Primary Relief
- Secondary Relief
- Combination Relief
- Types of Rupture Disks
- Conventional Rupture Disks
- Scored Tension - Loaded Rupture Disks
- Composite Rupture Disks
- Reverse - Acting Rupture Disks
- Graphite Rupture Disks
- Rupture Pin Relief Valves
- Buckling Pin Relief Valves
- Blowdown Valve
- Fire and Gas Detectors
- Smoke Detectors
- Heat Detectors
- Flame Detectors
- Ultra-Violet Flame Detector
- Advantages of UV Detection
- Limitations of UV Detection
- Infra-Red Flame Detector
- Advantages of IR Detection

- Limitations of IR Detection
- IR/UV Flame Detector
- Advantages of UV/IR Detection
- Limitations of UV/IR Detection
- Fusible Plug Detector and Sprinklers
- Manual Alarm Call Points
- Gas Detectors
- Pellistor Catalytic Gas Detector
- Infrared Absorption Gas Detector
- H2S Gas Detectors
- Electrochemical Cell Toxic Gas Detector
- Solid State (MOS) Toxic Gas Detector
- Portable Gas Detector
- Fire and Gas Detection System
- Alarms, Executive Actions, Annunciation
- Fire Detection – (Hydrocarbon Processing Areas)
- Fire Detection (Non-Hydrocarbon Processing Areas (Utilities) and Buildings)
- Alarms, Executive Actions, Annunciation
- Flammable Gas detection (Non-Hydrocarbon Processing Area (Utilities) and Buildings)
- Output Devices
- Flowlines & Manifolds
- Oil Fields in the Middle East
- Wellhead & Choke
- Choke
- Fixed (Positive) Choke
- Adjustable Chokes
- Needle Type Adjustable Choke
- Rotary (Disc) Type Adjustable Chokes
- Flowlines
- Flowline Design
- Flowline dimensions
- Construction of Flowlines
- Flowline Corrosion Protection

- Internal Abrasion
- High Internal Pressure
- Scale Deposits
- Flowline Servicing
- Remote Gathering Manifold Station (RGMS)
- RGMS
- Remote Gathering Manifold Station (RGMS)
- Check Valves (Non-Return Valves)
- Sample Points
- Trunk Line
- Field Gathering System
- Inlet Manifold
- Process Control Valves
- Linear Rising Stem
- Needle valves
- Needle valve - Advantages
- Disadvantages
- Control Valve Packing
- Rotary Action Control Valves
- Ball Control Valves
- Butterfly Valve
- Pneumatic Diaphragm Actuators
- Piston Hydraulic Actuators
- Electrical Actuators
- Motor Operated Valves (MOV's) Applications
- Solenoid Valves
- Valve Positioner
- I/P Converter
- Process Control System
- Level Control System
- Flow Control System
- Temperature Control System
- Types of Signals
- Pneumatic Signal Transmission

- Electronic Signal Transmission
- Open Loop Control
- Closed Loop Control
- Cascade Control
- Pigging History
- Uses & Types of PIG
- Utility Pig
- Uses & Types of PIG
- Inline Inspection (ILI) Tools / Smart Pig
- Gel Pig
- Plug
- Characteristics of the Pipeline
- Pig Launchers and Receivers
- Barred Tee
- Pigging Operation
- Safety
- Typical Procedure for Pigging Operation
- Steps to be followed at Pig Receiver End
- Fire and Explosion
- Ignition Sources
- Oxygen
- Combustible Material
- Hydrogen Sulphide (H2S) Awareness
- Nitrogen (N2) Awareness
- Personal Protective Equipment (P.P.E)
- Positive Isolation
- Safe Draining
- Vessel Entry
- Temporary Hose Connections
- Static Electricity
- Pyrophoric Iron Sulphide
- Purging