# COURSE OVERVIEW DE0953
# Operation of Wells & Production Systems - Basic (E-Learning Module)

## Course Title
Operation of Wells & Production Systems – Basic (E-Learning Module)

## Course Reference
DE0953

## 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 is designed to provide participants with a detailed and basic overview on the operation of wells and production systems. It covers the block diagram, process flow diagram, piping & instrumentation diagram, orthographic drawings, isometric drawings and exploded drawings; the completion, production, abandonment, wellhead, valves and wellhead control system; the well testing and monitoring, operating procedures, well clean-up and procedures and guidelines for shutting in wells; and the operational well testing, test separator, well integrity monitoring, oil recovery techniques, primary oil recovery and gas-lift system.

During this interactive course, participants will learn the progressive cavity pump, ESP system, surface components, electrical supply system, transformer, variable speed drive and tubing head; the separation process, construction of separators, separator instrumentation and control and primary and secondary separation; the separators, importance of demulsification and electrical methods; the crude oil desalting, crude oil dehydration, sealing, level measuring, meters selections, meter recalibration, water analysis and water/oil emulsion treatment; and the hydrate formation and prevention including the different water sources for water injection, chlorination, fire and gas detectors and pressure terminology.

**Course Objectives**

At the end of this course, the Trainee will be able to:-

- Apply and gain a basic knowledge on operation of wells and production systems
- Explain the main purposes and function of wells, wellhead equipment and associated production systems and equipment (including SSV, WCSD (well control safety device), BOP (burn out pit), flow lines and pipeline transit systems)
- Describe operational modes and main parameters of wells and production systems
- Describe oil production flow from wells to crude treatment facilities
- Describe in detail the types of wells and associated equipment
- Explain basic process parameters and variables (flow, level, pressure and temperature)
- Describe basic requirements of sampling and well testing
- Describe basic control and protection systems associated with wells and production systems
- Describe procedures and standards required for wells and production system equipment checks, monitoring, controlling, adjusting, starting, stopping and troubleshooting
- Identify requirements for equipment and systems to carry out handover (preparation) for maintenance and reinstatement after maintenance
- Illustrate block diagram, process flow diagram, piping & instrumentation diagram, orthographic drawings, isometric drawings and exploded drawings
- Discuss completion, production, abandonment, wellhead, valves and wellhead control system as well as apply well testing and monitoring, operating procedures, well clean-up and procedures and guidelines for shutting in wells
- Carryout operational well testing, test separator, well integrity monitoring, oil recovery techniques, primary oil recovery and gas-lift system
- Identify progressive cavity pump, ESP system, surface components, electrical supply system, transformer, variable speed drive and tubing head
- Illustrate the separation process, construction of separators, separator instrumentation and control and primary and secondary separation
- Classify separators, identify the importance of demulsification and apply electrical methods\
- Apply crude oil desalting, crude oil dehydration, sealing, level measuring, meters selections, meter recalibration, water analysis and water /oil emulsion treatment
- Describe hydrate formation and prevention including the different water sources for water injection, chlorination, fire and gas detectors and pressure terminology
- Apply standard transmitter set up diagram, direct measuring methods, back pressure method and ultrasonic sound waves method
- Discuss process control system, control loop, flowlines & manifolds, wellhead & choke, field gathering system, inlet manifold and pigging

## Who Should Attend

This course provides a basic overview of operation of wells and production systems for drilling operations section leaders, field supervisors, drilling engineering supervisors, production engineers, reservoir engineers, well engineers, petroleum engineers, oil field consultant, well servicing/workover/ completion staff and field production staff.

## 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

- Introduction
- Block Diagram
- Process Flow Diagram
- Piping & Instrumentation Diagram
- Abbreviations & Symbols
- As Built Drawings
- Orthographic Drawings
- Isometric Drawings
- Exploded Drawings
- Xmas Tree
- Introduction
- How are Oil/Natural Gas Formed?
- Where is Petroleum Found?
- Oil & Gas Well
- Planning
- Drilling
- Drilling Rig

- Completion
- Production
- Abandonment
- Well & Well Types
- A typical well schematic
- Wellhead
- Casing Head
- Tubing Head
- Master Valve
- Wing Valves
- Swab Valve
- Choke Valve
- Non-regulating/Positive choke
- Manual Choke
- Surface Controlled Surface Safety Shutdown Valve (SC-SSSV)
- Wellhead Control System
- A Typical Wellhead Control System
- Well Testing & Monitoring
- Well Testing
- Portable Test Unit
- Safety
- Operating Procedures
- Well Clean-up
- Flowing into the Separator
- Procedures and Guidelines for Shutting in Wells
- Downhole Shut-in
- Typical Measurements
- Operational Well Testing
- Well Testing Using Test Separator
- Test Separator
- Well Testing Using MFM
- Multiphase Flowmeter (MFM)
- Multi-phase Flowmeter

- Well Integrity
- Well Integrity Monitoring
- ESP & Freeflow Wells
- Oil and Gas Extraction
- Development
- Production
- Abandonment
- Oil Recovery Techniques
- Primary Oil Recovery
- Natural water drive
- Gas-cap drive
- Dissolved gas drive
- Gravity drainage
- Secondary Oil Recovery
- Tertiary Oil Recovery
- Thermal Recovery
- Miscible Gas Injection
- Chemical Injection
- Free Flow Well
- Free Flow Well Operation
- Free Flow Well Start-up
- Artificial Lift Technologies
- Plunger Lift
- Sucker Rod Pump
- Gas-Lift System
- Progressive Cavity Pump
- ESP System
- Surface Components
- Electrical Supply System
- Transformer
- Variable Speed Drive
- Tubing Head
- Downhole Components

- Multistage Centrifugal Pump
- Motor
- Seal Section
- Gas Separator
- Downhole Sensor
- Power Cable
- Basic Theory of Separation
- The Separation Process
- Construction of Separators
- Baffle plate deflector
- Straightening Vanes
- Mist Extractor
- Vortex Breaker
- Weir
- Coalescing Plates
- Water jets
- Sight Glass
- Separator Instrumentation and Control
- Pressure Relief Valves
- Level
- Pressure
- Temperature
- Abnormal conditions
- Normal operating parameters
- Possible problems
- The Separation Process
- The process within a separator can be broken down into 5 steps
- Primary separation
- Secondary separation
- Mist Extraction
- Liquids accumulation
- Water separation @ interface
- Separation in Stages

- Classification of Separators
- Oil field Emulsions
- Importance of Demulsification
- What is an Emulsion
- Emulsifying Agents
- Sources of Agitation
- Emulsion Stability
- Natural surfactants
- Asphaltenes
- Paraffin Wax
- Inorganic Fines
- 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
- Emulsion Treatment Equipment
- Chemelectric Treater
- Typical crude oil demulsifier
- Crude Oil Desalting

- Electrostatic Desalter
- Crude Oil Dehydration and Desalting at Halfaya CPF1 and CPF2
- Crude Oil Treatment Process Flow Diagram
- Electrostatic Dehydrator
- Fixed Roof Tanks
- Construction of Fixed Roof Tanks
- Fixed Roof Tank Types
- Non-pressure tanks Fixed Roof Tank
- Fixed Roof Tanks
- Fixed Roof Tank Auxiliary Equipment
- Vents
- Sealing
- Product Mixers
- Tank Heaters
- Level Measuring Devices
- Floating Roof Storage Tanks
- Floating Roof Tank construction
- Floating Roof Seal
- 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
- Heaters

- Level Indicators
- Pressure Relief System
- Vacuum Relief System
- Spherical Tanks
- Bullet Tanks
- Measuring Meters
- Meters Selections
- Flow Meters
- Direct Volumetric Meters
- Positive Displacement (PD) Meters
- Turbine Meters
- Coriolis Mass Meters
- Ultrasonic Flow Meters
- Meter recalibration
- Water properties/contamination
- Water analysis
- Suspended solids
- Dissolved gas
- Oil content
- Water pH
- The pH is extremely important for several reasons
- Mineral scale accumulation
- Solid accumulation
- Bacteria
- Sulphur-reducing bacteria
- Aerobic bacteria
- Falcultative bacteria (FB)
- Bacteria are problematic for a number of reasons with respect to reducing injectivity, and increasing the corrosion
- Main water problems
- Corrosion
- How to avoid corrosion
- Scaling tendency
- Water compatibility (clay swelling)

- Emulsion
- Water /oil emulsion treatment
- Hydrate formation
- Hydrate prevention
- The different water sources for water injection
- Surface water: Sea water
- Surface water: lakes, river
- 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
- The chlorine is dosed for 2 main reasons
- Sodium Hypochlorite
- Filter Aids
- Antifoams
- Oxygen Scavenger
- Chemicals for water injection
- Scale Inhibitor
- Corrosion Inhibitor
- Biocides
- 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
- Pellistors
- 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
- Flammable Gas detection –(Hydrocarbon Processing Areas)
- Flammable Gas detection (Non-Hydrocarbon Processing Area (Utilities) and Buildings)
- Output devices
- Reason for excess pressure in a vessel
- Block discharge
- Fire case
- Pressure Terminology
- Operating pressure
- MAWP
- Design pressure
- Set pressure
- Accumulation
- Overpressure
- Blowdown
- Types of Pressure Relief Devices
- Safety relief valves

- Conventional pressure relief valves
- Working principle
- Pilot - Operated Pressure Relief Valve
- Relieving cycle
- Piston - Type Pilot - Operated Pressure Relief Valve
- Diaphragm - Type Pilot - Operated Pressure Relief Valve
- Balanced Bellows Pressure Relief Valve
- Balanced bellows pressure relief valve with auxiliary balancing piston
- 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
- Blowdown Valve
- Atmospheric pressure
- Pressure exerted by liquids
- Pressure Units
- Pressure Scale
- Bourdon Tube Pressure Gauges
- Diaphragm Pressure Gauges
- Pressure Transmitter
- Standard Transmitter Set Up Diagram
- Control Loop – Case Study

- Differential Pressure Transmitter
- Pressure Switches
- Level
- Direct measuring methods
- The most common indirect methods
- Other indirect methods
- Dip Tapes and Dip Sticks
- Gauge Glasses
- Magnetic float indicators
- Differential Pressure Cells (DP Cells)
- Displacer
- Back Pressure Method
- Ultrasonic Sound Waves Method
- Nucleonic Level Measurement System
- Level Switches
- Flow Measurement
- Volumetric and Mass Flow Rate Flow
- Flow Patterns
- Flow Measurement Devices
- Orifice Plate Flow Meter
- Venturi Tube Flow Meters
- Advantages
- Disadvantages
- Pitot Tube Flow Meters
- Turbine Flow Meters
- Paddle Wheel Flow Meters
- Ultrasonic Flow Meters
- Positive Displacement [PD] Flow Meters
- Variable Area Flow Meters
- Temperature measurement
- Temperature Units
- Measurement Devices
- Glass Capillary Thermometers

- Bimetallic Thermometers
- Gas and Liquid Filled Thermometers
- Vapour Tension Thermometers
- Thermocouple
- Resistance Temperature Devices (Rtds)
- Radiation Temperature Detectors
- Temperature Switches
- Process Control Valves
- Linear Rising Stem
- Globe valve
- Needle valves
- Needle valve - Advantages
- Control valve packing
- Rotary Action Control Valves
- Ball control valves
- Butterfly valve
- Pneumatic Diaphragm Actuators
- Advantages
- Disadvantages
- Piston Hydraulic Actuators
- Electrical Actuators
- Motor Operated Valves (MOV's)
- 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
- Flowlines & Manifolds
- 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)
- Check Valves (Non-Return Valves)
- Sample Points
- Trunk line
- Field Gathering System
- Inlet Manifold
- Pigging
- Pigging History
- Uses & Types of PIG
- Utility Pig
- Inline Inspection (ILI) Tools / Smart Pig
- Gel Pig
- Plug
- Pig Launchers and Receivers
- Wellhead Flowline and Pig Launcher schematic

- Barred Tee
- Pigging Operation
- Safety
- Typical procedure for pigging operation
- Steps to be followed at pig launcher end