COURSE OVERVIEW DE0942
Gas Production Engineering
(E-Learning Module)

Course Title
Gas Production Engineering
(E-Learning Module)

Course Reference
DE0942

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 gas production engineering. It covers the natural gas composition, classification of hydrocarbons and basic properties of common paraffin hydrocarbons; the reservoir fluid types, hydrocarbons, raw natural gas, hydrocarbon gases and unconventional gas reservoir; the conventional reservoir versus unconventional reservoir; the various types of natural gas accumulation and resource triangle; the well planning and well configuration; and the pore pressure and fracture gradient; the geology prediction, pore pressure prediction, casing depth selection and setting depth design procedures.

Further, the course will also discuss the production optimization, well performance and production system. reservoir fluid properties, phase behavior, segments and system analysis; the tubing performance, factor affecting vertical lift, line size criteria and erosional velocity; the system analysis, production rate, tubing sizing and wellhead pressures; the production optimization using nodal analysis and optimization procedure; and the commonly accepted correlations.

During this course, participants will learn the gas manifold system and digital automatic manifold systems; the types of compressors, positive displacement, reciprocating compressors, singleacting and acting compressor, rotary compressors and scroll type compressor; the oil and gas pipeline design, maintenance and repair; the cathodic protection, sacrificial protection and underground metallic piping system for protection; the types of cathodic protection; the galvanic anode system and impressed current systems; the insulation tester and the criteria for cathodic protection; the coating application procedures, integrity management strategy and managing system integrity of gas pipelines; the pipeline transportation systems for liquids and slurries; the API integrity related standards, rule of thumb and the 7 steps strategy of troubleshooting; the root cause analysis techniques, fishbone diagram, fault tree analysis, what if analysis technique and mind mapping; the furnaces, catalysis, catalytic reactors and startup after catalyst replacement/regeneration; the hazard identification and risk assessment, control oil & gas hazard; and the permit to work, emergency action plan and fire protection plan.

Course Objectives

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

- Apply and gain an in-depth knowledge on gas production engineering
- Discuss natural gas composition, classification of hydrocarbons and basic properties of common paraffin hydrocarbons
- Identity the reservoir fluid types, hydrocarbons, raw natural gas, hydrocarbon gases and unconventional gas reservoir
- Differentiate conventional reservoir versus unconventional reservoir
- Recognize the various types of natural gas accumulation and describe the resource triangle
- Carryout well planning and well configuration as well as discuss pore pressure and fracture gradient
- Apply geology prediction, pore pressure prediction, casing depth selection and setting depth design procedures
- Employ production optimization, well performance and production system
- Identify reservoir fluid properties, phase behavior, segments and system analysis
- Identify tubing performance, factor affecting vertical lift, line size criteria and erosional velocity
- Recognize system analysis, production rate, tubing sizing and wellhead pressures
- Apply production optimization using nodal analysis and optimization procedure
- Identify the commonly accepted correlations, correlation recommendations, gas manifold system and digital automatic manifold systems
- Recognize the types of compressors, positive displacement, reciprocating compressors, singleacting and acting compressor, rotary compressors and scroll type compressor

- Carryout oil and gas pipeline design, maintenance and repair as well as cathodic protection, sacrificial protection and underground metallic piping system for protection
- List the types of cathodic protection and explain galvanic anode system and impressed current systems
- Describe insulation tester and identify the criteria for cathodic protection
- Apply coating application procedures, integrity management strategy and managing system integrity of gas pipelines
- Illustrate the pipeline transportation systems for liquids and slurries
- Discuss API integrity related standards, rule of thumb and 7 steps strategy of troubleshooting
- Employ root cause analysis techniques, fishbone diagram, fault tree analysis, what if analysis technique and mind mapping
- Interpret furnaces, catalysis, catalytic reactors and startup after catalyst replacement/regeneration
- Apply hazard identification and risk assessment, control oil & gas hazard as well as discuss permit to work
- Perform emergency action plan and fire protection plan

Who Should Attend

This course covers systematic techniques on gas production engineering for managers involved in the planning and development of new gas reservoir, production engineers, process engineers, petroleum engineers, geologists, geophysicists, field operation staffs, technicians in the gas processing industry, those who are directly involved in supervising gas production operations; and those who are involved in the negotiation of contracts for the sale of Natural Gas, LPG and NGL Products.

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)
- Quizes, 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

- Natural Gas Composition
- Organization
- Hydrocarbons
- What Is Petroleum?
- Reservoir Barrel
- Classification of Hydrocarbons
- Quiz -1
- Hydrocarbon Classification
- Basic Properties of Common Paraffin Hydrocarbons
- Quiz -2
- Properties of Some Alkanes.
- Reservoir Fluid Types
- Hydrocarbons
- Raw Natural Gas
- Hydrocarbon Gases
- A. Kinetic Molecular Theory
- B. Real Gases
- C. Characteristics of Gases
- D. Temperature
- E. Pressure
- Quiz -3
- F. STP
- Exercise -1
- Exercise -2
- Production from a Gas Reservoir
- Unconventional Gas Reservoir
- Quiz – 4
- Conventional Reservoir Vs. Unconventional Reservoir
- What Are Unconventional Resources
- Why Do We Need Unconventional Reservoirs?

- Natural Gas Accumulation Types
- An Illustration on Various Types of Gas Deposits
- Fracking for Natural Gas
- The Resource Triangle
- Quiz – 5
- Quiz – 6
- Summary
- Well Planning
- Types of Well Planning
- Typical Well Configuration
- Pore Pressure and Fracture Gradient
- RKB & MSL
- Well Depth Guidance
- Wildcat to Development Well Correlation
- Geology Prediction
- Pore Pressure Prediction - HydrostaticPressure
- Quiz – 9
- Pore Pressure Prediction - HydrostaticPressure
- Casing Depth Selection
- Setting Depth Design Procedures
- Setting Depth Selection for Intermediate and Deeper Strings
- Quiz – 10
- Production Optimization
- Well Performance & Production System
- Production System
- Quiz – 11
- Reservoir Fluid
- Reservoir Fluid Properties
- Quiz – 12
- Phase Behavior
- Segments
- System Analysis
- In Flow Performance Relationship - IPR Curves

- Tubing Performance (Outflow Performance)
- Factor Affecting Vertical Lift
- Line Size Criteria
- Quiz – 13
- Quiz – 14
- Erosional Velocity
- Quiz – 15
- System Analysis (Combination of Inflow vs. Outflow)
- System Analysis (Combination of Inflow vs. Outflow)
- Production Rate & Tubing Sizing
- Production Rate & Wellhead Pressures
- Production Optimization Using Nodal Analysis
- Applications
- Optimization Procedure
- Nodal Analysis
- IPR & VLP Plot Before Optimization
- Commonly Accepted Correlations
- Correlation Recommendations
- Computer Programs for System Analysis
- Gas Manifold System
- Digital Automatic Manifold Systems
- Header
- Processing Natural Gas
- Types of Compressors
- What is Compressor
- How they are Different from Pumps
- WhyWe Need
- Classification
- Positive Displacement
- Reciprocating Compressors
- SingleActing Compressor
- DoubleActing Compressor
- Intercooler in Multi-Stage

- Diaphragm Type
- Working
- Advantages
- Quiz – 16
- Applications
- Rotary Compressors
- Scroll Type Compressor
- Working Principle
- Advantages of Scroll Compressors
- Advantages
- Disadvantages of Scroll Compressors
- Applications
- Liquid Ring Type
- Advantages
- Applications
- Gas Metering Systems
- Oil and Gas Pipeline Design, Maintenance and Repair
- Overview
- Eclectic Cell
- Example of Corroded Pipe
- Cathodic Protection
- Basic Terms
- Typical Magnesium Anode
- Sacrificial Protection
- Underground Metallic Piping System for Protection
- Basic Terms
- Means of Potential
- Pipe to Soil Potential
- Reference Electrode
- Basic Terms
- Typical Meter Installation Accidental Contact
- Stray Current
- Galvanic Potential of Metals

- Fundamental Corrosion Theory
- Types of Cathodic Protection
- Galvanic Anode System
- Impressed Current Systems
- Determining the Need to Cathodically Protect Gas Distribution System
- Meter Installation Electrically Isolated
- An Insulated Compression Coupling
- Insulation Tester
- Criteria for Cathodic Protection
- Criteria 1
- Patching
- Coating Application Procedures.
- Causes of Corrosion (Shorted Meter Set)
- Causes of Corrosion (Dissimilar Surface Conditions)
- Causes of Corrosion (Galvanic Corrosion)
- Causes of Corrosion (Poor Construction Practice)
- Causes of Corrosionatmospheric Corrosion)
- Pipeline Stress Corrosion Cracking (SCC)
- SCC Propensity
- High Ph SCC Integrity Management Strategy
- If SCC Susceptible
- Near-Neutral PH SCC
- Near-Neutral PH SCC Management
- If SCC Susceptible
- Hot-Tap & Linestop
- Fittings & Accessories. Hot-Tap
- Fittings & Accessories. Linestop
- Hot-Tap Service
- Linestop Services
- Services. Reliability & Experience
- Hot-Tap & Linestop Equipment
- After Sales Service & Spare Parts
- Overview of Mechanical Integrity (MI)

- Definition
- Description
- Mechanical Integrity Management Program (MIMP)
- Regulations, Standards & Codes
- OSHARegulation 1910.119
- Managing System Integrity of Gas Pipelines (ASME B31.8S)
- Pipeline Transportation Systems for Liquids and Slurries (ASME B31.4)
- API Integrity Related Standards
- Wrapping Up
- Troubleshooting
- Training Goals
- What Is Troubleshooting?
- Introduction
- Why Do We Need Successful TS?
- Advantages of Successful TS.
- Safety and Troubleshooting
- Types of Troubles
- Categories of Troubles
- Properties of Troubles
- Five Key Elements Common to the TS Process
- Five Key Elements
- Characteristics of Skilled Problem Solvers
- Use of Computational Techniques
- Review
- Initial Questions of Troubleshooting
- Laboratory Analysis
- Important Note
- General Rules of Thumb and Typical Causes
- Meaning of Rule of Thumb
- Common Faults for First Time Startup
- Frequency of Failures Based on Type of Equipment
- Important Note
- Rules of Thumb for People

- 7 Steps Strategy of Troubleshooting
- Engage Yourself of Hook Up
- Advantages of Systematic Approach
- TS Strategy
- How to Select an Action
- Review
- TS/Root Cause Analysis Techniques
- Fishbone Diagram
- Fault Tree Analysis
- Advantages of FTA
- Case Study
- Fault Tree Analysis
- 5 Whys
- What-If Analysis Technique
- Applications of What-If Analysis
- Mind Mapping
- Process Trouble Shooting Sheet
- Fishbone Diagram
- Review
- 1. Rules of Thumb for Centrifugal Pumps TS
- What are Centrifugal Pumps?
- Important Terms
- Minimum Flow
- Capacity
- Centrifugal Pumps TS Rules of Thumb
- Capacity Curve
- Distillation
- Sections of Distillation Tower
- Rules of Thumb for Distillation Column
- Instruments Sensors Faults
- Control Valve Faults
- Rules of Thumb for Furnace Operation
- Furnaces

- Case Study
- Rules of Thumb for Catalytic Reactors
- Catalysis
- Terms
- Reactor Problems
- Catalytic Reactors
- Startup After Catalyst Replacement/Regeneration
- Rules of Thumb for Reactors
- Case Study
- Reciprocating Compressor
- 10 Important troubleshooting Guidelines
- Why HSE is so Important in Oil & Gas
- Gas Processing Associated HSE Issues and Controls
- Piper Alpha Platform, UK North Sea
- BP Macondo – Deepwater Horizon, US Gom
- Understanding Hazard and Risk
- Risk
- Hazard Identification and Risk Assessment
- Sample of Consequence Table
- Sample of Risk Assessment Table
- Controlling the Hazard – Principle
- Oil & Gas Hazards
- Case Study 1
- Controlling Oil & Gas Hazard
- Human Factor in Hazards Control
- Bosiet
- Incident Definition.
- Swiss Cheese Models
- Occupational Injury
- Occupational Injury Triangle
- HSE Statistics
- Permit to Work (PTW)
- Permit to Work Sample

- Permit to Work Flow Chart
- Personal Protective Equipment
- Safety Campaign
- Emergency Action Plan
- Osha Requirements
- What are the Most Common Types of Emergencies?
- What is Your Emergency Response Procedure?
- Key Questions
- When Does it Begin?
- Evacuation
- Procedures
- Alarm System
- Training Requirements
- Fire Protection Plan
- Workplace Fire Hazards
- Housekeeping
- Training Recommendations
- Summary
- Gas Sales Agreements
- Types of Natural Gas
- Petroleum Contract Provisions
- AIPN 2012 Model JOA Natural Gas Provisions
- AIPN 2012 Model JOA
- Challenges to Implementing Gas Projects
- Crude Oil Value Chain
- LNG Value Chain
- Challenges to Implementing Gas Projects