### Facilities Course Progression Map

#### Basic
- **Overview of Gas Processing – G2**
- **Introduction to Oil and Gas Production Facilities – PF2**
- **LNG Short Course: Technology and the LNG Chain – G20**

#### Foundation
- **Oil Well Pad Facilities (For Facilities Engineers) – OWPF-FE**
- **Applied Water Technology in Oil and Gas Production – PF21**
- **Fundamental and Practical Aspects of Produced Water Treating – PF23**

#### Intermediate
- **Gas Treating and Sulfur Recovery – G6**
- **Practical Computer Simulation Applications in Gas Processing – G5**
- **Onshore Gas Gathering Systems: Design & Operation – PF45**
- **Troubleshooting Oil and Gas Processing Facilities – PF49**

#### Specialized
- **CO2 Surface Facilities – PF81**

#### Offshore Engineering
- **Overview of Offshore Systems – OS4**
- **Fundamentals of Offshore Systems: Design and Construction – OS4**
- **Offshore Pipeline Design and Construction – PL43**
- **Corrosion Management in Production/Processing Operations – PF22**
- **Terminals and Storage Facilities – PL44**

#### Pipeline Engineering
- **Overview of Offshore Systems – OS21**
- **Overview of Subsea Systems – OS2**

#### Process Safety
- **Process Safety Engineering – PS4**
- **Risk Based Process Safety Management – HS45**
- **Fundamentals of Process Safety – PS2**

#### Gas Conditioning and Processing
- **Gas Conditioning and Processing – G4**
- **Gas Conditioning and Processing – G4 LNG Emphasis – G4LNG**

#### Oil and Gas Processing
- **Gas Conditioning and Processing Principles – G3 Virtual/Blended Course**

#### Instrumentation, Controls & Electrical
- **Electrical Engineering Fundamentals for Facilities Engineers – E3**
- **Instrumentation and Controls Fundamentals for Facilities Engineers – IC3**
- **Instrumentation, Controls and Electrical Systems for Facilities Engineers – ICE21**

#### Electrical Engineering Fundamentals for Facilities Engineers – E3
- **Practical PID Control and Loop Tuning – IC74**
- **Flow and Level Custody Measurement – IC73**
- **Valve and Actuator Technologies – IC72**
- **PLC and SCADA Technologies – IC71**
- **Flow Assurance for Offshore Production – FAOP**

#### Onshore Gas Gathering Systems: Design & Operation – PF45
### Mechanical Engineering

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### Operations & Maintenance

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### Project Mgmt.

| Advanced Project Management – FPM62 |
| Advanced Project Management II – FPM69 |
| Advanced Project Mgmt Workshop - APMW |

### Procurement/Supply Chain Management

| Managing Brownfield Projects – FPM42 |
| Project Management for Engineering and Construction – FPM22 |
| Project Controls for Contractors and Owners - PC21 |
| Inside Procurement in Oil & Gas – SC61 |

### Additional courses available in:

- **Production & Completions**
- **Health, Safety, Environment**
- **Petroleum Business**
- **Professional Petroleum Development**
- **Multi-Discipline Training**
Gas Conditioning and Processing – G4  
The Campbell Gas Course®

FOUNDATION  10-Day

The Campbell Gas Course® has been the standard of the industry for more than 52 years. Tens of thousands of engineers have attended our G4 program, considered by many to be the most practical and comprehensive course in the oil and gas industry.

The Campbell Gas Course® textbooks, Volumes 1 and 2, are routinely updated to reflect evolving technologies in this broad industry.

Both hand methods and computer-aided analysis are used to examine sensitivities of technical decisions. To enhance the learning process, about 30 problems will be assigned, reviewed, and discussed throughout the course. Problems will be solved individually and in teams.

DESIGNED FOR
Production and processing personnel involved with natural gas and associated liquids, to acquaint or reacquaint themselves with gas conditioning and processing unit operations.

This course is for facilities engineers, process engineers, senior operations personnel, field supervisors, and engineers who select, design, install, evaluate, or operate gas processing plants and related facilities. A broad approach is taken with the topics.

YOU WILL LEARN HOW TO
- Application of engineering and technology in facilities and gas plants
- Important specifications for gas, NGL, and condensate
- About the selection and evaluation of processes used to dehydrate natural gas, meet hydrocarbon dewpoint specifications, and extract NGLs
- How to apply physical/thermodynamic property correlations and principles to the operation, design, and evaluation of gas processing facilities
- Practical equipment sizing methods for major process equipment
- To evaluate technical validity of discussions related to gas processing
- To recognize and develop solutions for operating problem examples and control issues in gas processing facilities

COURSE CONTENT
- Gas processing systems
- Physical properties of hydrocarbons
- Terminology and nomenclature
- Qualitative phase behavior
- Vapor-liquid equilibrium
- Water-hydrocarbon phase behavior, hydrates, etc.
- Basic thermodynamics and application of energy balances
- Process control and instrumentation
- Relief and flare systems
- Fluid hydraulics; two-phase flow
- Separation equipment
- Heat transfer equipment
- Pumps
- Compressors and drivers
- Refrigeration in gas conditioning and NGL extraction facilities
- Fractionation
- Glycol dehydration; TEG
- Adsorption dehydration and hydrocarbon removal
- Gas heating and sulfur recovery
- Overview and summary

For more information, visit PETROSCKILLS.COM/G3ONLINE

2019 Schedule and Tuition (USD)

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Self-paced, virtual course - start anytime. Tuition US$4325

Gas Conditioning and Processing – LNG

Emphasis – G4 LNG

FOUNDATION  10-DAY

This is the LNG–industry version of our popular G4 course, with expanded coverage of refrigeration and LNG technologies. The course includes in-depth information on basic natural gas conditioning and processing. This is mainly the core G4 Campbell Gas Course® curriculum in an LNG context with the expanded refrigeration coverage. The course covers relevant details of both the mixed refrigerant (APCI) and cascade (CooRacChillin) processes in LNG liquefaction. Other liquefaction processes are discussed including Mixed Fluid Cascade Process, Dual Mixed Refrigerant Process, and Nitrogen (single or dual) Cycles being developed for FLNG projects. This is followed by higher level coverage of the LNG value chain consisting of a gas liquefaction section; LNG run-down to LNG storage; loading berth for LNG export; LNG shipping; and LNG receiving and regasification terminals. Versions of this course have been taught in many of the world’s base-load and peak-shaving LNG plants, such as in Australia, Indonesia, Malaysia, Norway, Qatar, UK, and West Indies.

Clients are invited to evaluate the curriculum for LNG Short Course: Technology and the LNG Chain (G29). The G29 course has more coverage on LNG technology and the LNG value-chain and does not contain the same materials as The Campbell Gas Course® (G4).

DESIGNED FOR
Personnel involved with natural gas processing and LNG production, as well as anyone interested in a solid technical understanding of the principles of an LNG plant.

YOU WILL LEARN
- The basics of LNG gas conditioning and processing
- Selection and evaluation processes used to dehydrate natural gas, remove heavy components and other contaminants, and extract NGLs for LNG plants
- Physical/thermodynamic property correlations and principles, including heating values, etc. as applied to gas processing facilities and LNG plants
- Fundamentals of propane, propane precooled, mixed refrigerants, and cascade systems used in LNG plants
- Key points in other LNG liquefaction technologies
- How to perform and review equipment sizing for major process equipment
- Solutions to operating problems and control issues in LNG and gas processing facilities

COURSE CONTENT
- Basic gas technology principles • Terminology and nomenclature • Physical properties of hydrocarbons • Qualitative phase behavior • Vapor-liquid equilibrium • Water-hydrocarbon system behavior, hydrates, etc. • Thermodynamics of LNG processes • Separation equipment • Gas treatment, CO₂, and H₂S removal • Dehydration of natural gas (TEG and Molecular Sieve) • Heat transfer and exchangers • Pumps and compressors • Refrigeration systems • LNG liquefaction technologies • Fractionation, and more...

2019 Schedule and Tuition (USD)

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Overview of Gas Processing – G2

BASIC  3-DAY

G2 is a versatile overview of the gas conditioning and processing industry. This course is designed for a broad audience and is participative and interactive, utilizing basic technical exercises and terminology to communicate key learning points. This course does not cover the technology and engineering principles in depth, and is only recommended for those needing an overview of the industry and common processes and equipment used.

DESIGNED FOR

As a wide ranging overview, it is suitable for interested parties, such as geologists, reservoir engineers, line managers, and sales of business development staff; related specialists like environmental staff, operational staff, and shift foremen; those new to the industry, such as entry-level (1-2 year) engineers; or anyone interested in a general, technically-oriented overview of the gas processing industry.

YOU WILL LEARN

- An overview of natural gas and world energy trends
- Natural gas sources, makeup, properties, specifications, and related oil and gas terminology
- Markets and uses for NGL, LPG, ethane, propane, butane
- Summary of gas processing costs, and commercial and contract issues in liquids extraction
- How gas is transported and sold
- Overview of the common equipment used in the oil and gas industry, including heat exchangers, pumps, and compressors
- Options for various basic gas conditioning and processing steps, including acid gas removal, dehydration, product fractionation, LNG overview, pipelines, sulfur recovery, and acid gas injection

COURSE CONTENT

Natural gas and world energy trends • Hydrocarbon components and physical properties • The role of gas processing in the natural gas value chain • Heat transfer equipment • Pumps and compressors • Acid gas removal • Gas dehydration • NGL extraction • Fractionation and stabilization • LNG • Pipelines and storage • Sulfur recovery and acid gas injection

LNG Short Course: Technology and the LNG Chain – G29

BASIC  5-DAY

This LNG Short Course is designed for participants requiring moderate technical coverage, coupled with information on LNG commerce and all parts of the LNG Value Chain. Over 5 days, the course covers technical LNG basics and facility operation topics, plus technical, design, and commercial issues. Selected exercises and syndicates are used to reinforce the main topics of LNG trade and technology. Live house versions are available with either increased technical and operational emphasis or increased project and development emphasis. More in-depth coverage for technical, production, and processing personnel is available in our 10-day course, G4 LNG, Gas Conditioning and Processing - LNG emphasis.

DESIGNED FOR

Commercial and managerial staff looking for a concise overview; engineers new to the LNG industry; operations supervision staff and senior plant personnel; specialists looking to broaden their general knowledge of LNG; and staff involved in LNG commerce and interested in LNG technical fundamentals.

YOU WILL LEARN

- What is LNG, why is it produced, and what is the current status of the industry
- LNG facilities world-wide
- The LNG chain and impact of contractual issues on LNG plant design and operation; LNG pricing
- A survey of commercial and contractual issues
- Project costs, feasibility, development, and issues
- Some technical fundamentals of gas processing, such as molecular weight, heating value, Wobbe Index, vapor pressure, multi-component mixtures, thermodynamics
- Refrigeration: single and multi-component refrigeration cycles
- Technologies used in the production of LNG for base-load and small scale production, issues relating to technology selection, and operation
- Equipment used in the production of LNG: heat exchangers, compressors and drivers used for LNG, pumps, and turbo expanders
- To apply knowledge of LNG gas pretreatment, drying, and refrigeration
- About LNG storage, shipping, and terminals, sizing basis, and small scale tanks
- Types of LNG carriers, marine management issues, and LNG transfer
- LNG importing, regasification of LNG and distribution to consumers, basis for sizing, technology selection, and energy integration
- New developments: development of offshore LNG operations to regasification and liquefaction; coal seam gas project issues
- Site selection and HSSE considerations

COURSE CONTENT

What LNG is and where it comes from • Physical properties of LNG • Vapor-liquid equilibrium behavior of LNG and refrigerants • Gas pre-treatment • Heat exchangers • Refrigeration • Rotating machinery • Liquefaction processes • LNG storage • LNG shipping • LNG importing

Practical Computer Simulation Applications in Gas Processing – G5

INTERMEDIATE  5-DAY

This full 5-day course covers sweet gas processing and NGL extraction, using a commercial simulator to perform calculations. A basic working knowledge of the commercial process simulation package used (generally UNISIM) is suggested to achieve the course learning objectives. Volumes 1 and 2 of the John M. Campbell textbooks, Gas Conditioning and Processing, are the basis for the material presented; coupled with a ‘red thread’ comprehensive exercise based on a typical gas processing facility (can be applied to onshore or offshore facilities). The exercise is developed in stages as the material is covered. Participants will develop a comprehensive process simulation that includes a few key control process, a mechanical refrigeration process with economizers, heat injection using MEG, and NGL liquid product stabilization with recycle.

NOTE: The individual exercises include condensed gas processing fundamentals drawn from the internationally famous Campbell Gas Course® textbooks Volumes 1 & 2.

DESIGNED FOR

Engineers that require practical in-depth training on natural gas processing and NGL recovery processes, with emphasis on the use and benefits of a simulation package.

YOU WILL LEARN

- To determine the water content and hydrate formation conditions for gas streams using both a commercial process simulator and hand calculation methods
- Techniques to inhibit hydrate formation, including injection of equilibrium inhibitors such as methanol and MEG
- Preliminary design and evaluation of TEG dehydration processes using quick hand calculations
- Process design used to control the hydrocarbon dew point of sales gas streams by removing NGLs using mechanical refrigeration systems
- Various techniques to optimize mechanical refrigeration systems
- How to use the process simulator to evaluate the impact that pressure and temperature changes have on the sizing of process equipment and levels of NGL recovery
- How to use short-cut distillation calculations to provide input to rigorous distillation simulations in order to obtain faster convergence
- Which thermodynamic property correlations are appropriate for various gas processing systems
- Limitations associated with commercial simulation packages and how the results can be quickly checked for relative accuracy

COURSE CONTENT

Physical properties of hydrocarbons • Qualitative phase behavior • Vapor-liquid equilibrium • Water-hydrocarbon equilibrium • Basic thermodynamic concepts • Separation equipment • Heat transfer • Pumps • Compressors • and more...

Gas Treating and Sulfur Recovery – G6

INTERMEDIATE  5-DAY

This course emphasizes process selection, practical operating issues, technical fundamentals, and integration of the sweetening facilities into the overall scheme of gas processing. Sulfur recovery and tail gas processes are also covered, including standard Claus configurations, SuperClaus, EuroClaus, SCOT, etc. Special design and operation topics, such as trace sulfur compound handling and the importance of H₂S:CO₂ ratio, are covered as well. Related topics reviewed during the course include liquid product treating, corrosion, materials selection, and NACE requirements.

DESIGNED FOR

Production and processing personnel involved with natural gas treating and sulfur recovery, requiring an understanding of the principles of these process operations. This course is for facilities engineers, process engineers, operations personnel, and field supervisors, as well as others who select, design, install, evaluate, or operate gas sweetening and sulfur recovery facilities.

YOU WILL LEARN

- Evaluation and selection of processes to remove acid gases (H₂S, CO₂, COS, CS₂, mercaptans, etc.) from gas and NGLs
- The advantages and disadvantages of available gas treating technology and processes
- How to estimate solvent circulation rates, energy requirements, and equipment sizes
- To recognize and evaluate solutions to common operating and technical problems
- Sulfur recovery technologies, including an overview of the Claus Sulfur process
- How to select among the proper sulfur recovery process given differing process conditions
- Tail gas cleanup

COURSE CONTENT

Fundamentals of sour gas processing, sweetening, etc. • Overview of gas treating and sulfur recovery, terminology • Gas specifications and process selection criteria • Generic and specialty amine treating • Common operating and technical problems • Proprietary amine solvents, such as Sulfinol and Flexsorb • Carbonate processes • Physical absorption processes, e.g. Selexol • Metallurgical issues (corrosion) • Other technologies and new developments • Selective treating, acid gas enrichment • Solid bed and non-regenerable treating; scavengers • Liquid product treating • Sulfur recovery processes (including degassing) • Tail gas clean-up (SCOT, CBA, etc.) • Acid gas injection • Membranes • Emerging and new technologies • Course workshop and summary

2019 Schedule and Tuition (USD)

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CROSS-TRAINING

Introduction to Oil and Gas Production Facilities – PF2

BASIC 3-DAY

The scope of the discussion ranges from an overview of the oil and gas industry, hydrocarbon phase behavior characteristics, and different reservoir types, to product specifications and the processes used to meet those. Other facilities considerations are addressed, such as process safety and downstream processing that may impact the production facility selection and operation.

DESIGNED FOR

Those interested in an overview of production facilities, including subsurface professionals, line managers, sales or business development staff, environmental personnel, operational staff, and those new to the industry.

YOU WILL LEARN

• How the reservoir type, drive mechanism, fluid properties, location, and product specifications influence the selection and design of the production facilities
• How to do quick "back of the envelope" calculations to better understand equipment sizing and capacity
• Parameters that affect the design and specification of oil stabilization and dehydration equipment
• Awareness of the parameters that determine flowline/gathering system capacity
• The purpose of separators in a production facility and familiarity with the typical configurations
• Typical design parameters, operating envelopes, common operating problems of oil and gas production equipment, and the effect of changing feed conditions over the life of a field
• To describe oil dehydration/desalting process options and equipment
• Produced water treating options and the dependence on surface vs. subsurface, offshore vs. onshore disposal
• Compressor performance characteristics and how they affect production rates and facility throughput
• Gas dehydration process options, with a particular emphasis on glycol dehydration
• The principles of asset integrity and inherently safe design given the rate, composition, temperature, and pressure of the production stream
• About midstream facilities required downstream of the primary production facility to deliver saleable products to the market, and how these facilities are affected by production rates, composition, and production facility performance

COURSE CONTENT

Overview of oil and gas industry • Qualitative phase behavior and reservoirs • Hydrocarbon properties and terminology • Typical sales/disposal specifications • Flowlines, piping, and gathering systems • Production separation • Oil processing • Water injection systems (including pumps) • Gas handling - compression, dehydration • Measurement and storage • Other facilities considerations - utilities, process safety • Midstream facilities - gas processing, pipelines, LNG

Separation Equipment - Selection and Sizing – PF42

INTERMEDIATE 5-DAY

This course covers the different types of separation equipment typically encountered in oil and gas production facilities. Fractionation equipment and produced water treating equipment are not covered in this course. You will learn where the different types of separation equipment are used based on operating conditions and separation performance requirements. Frequent references will be made to real production facility process flow diagrams (PFDs). Typical operational problems and their solutions will also be discussed. Exercises requiring calculations are utilized throughout the course as well.

Please be aware that due to overlap in content, it is not necessary to take the PF-42 course if you have already taken the PF-4 Oil Production and Processing Facilities course.

DESIGNED FOR

Process Facilities engineers who need skills for design and troubleshooting of separators.

YOU WILL LEARN

• Different types of separation equipment utilized in the oil and gas industry and where they are used
• Separation performance capabilities of the different types of equipment
• How to size the different types of separation equipment
• How to troubleshoot and debottleneck separation equipment
• How to calculate the wall thickness and estimate the weight of separators
• Instrumentation and controls used on separation equipment

COURSE CONTENT

Fluid properties and phase behavior • Phase separation processes • Gas-liquid separation equipment: slug catchers, conventional separators (horizontal and vertical), scrubbers, compact separators, filter separators/coalescing filters • Separator internals: inlet devices, mist extractors, baffles, weirs, etc. • Emulsions • Oil-water separation equipment: conventional 3-phase separators and freewater knockouts, wash tanks • Oil treating and desalting equipment: mainly electrostatic coalescers • Liquid-liquid coalescing filters • Mechanical design aspects: pressure vessel codes, wall thickness and vessel weight estimation, material selection, relief requirements • Operational problems

Relief and Flare Systems – PF44

INTERMEDIATE 5-DAY

REVISED

This intensive course provides a comprehensive overview of relief and flare systems for oil and gas processing facilities. The course begins with the need for pressure control/overpressure protection, continues with the key engineering and design aspects including code considerations, and concludes with selecting and sizing the components of a relief and flare system. The material of the course is applicable to onshore field production facilities, pipelines, gas plants, terminals, refineries, and offshore production facilities. The use of dynamic simulations for relief load determination is discussed and demonstrated.

DESIGNED FOR

Engineers responsible for designing, operating, and maintaining relief and flare systems in oil and gas facilities.

YOU WILL LEARN

• Codes and Standards used in relief systems • Ways to mitigate relief, such as HIPPS • How to do the possible relief scenarios and calculate their relief loads • Commonly used pressure relieving devices, and how to size them • How to calculate relief valve inlet losses • How to fix relief valve excessive inlet losses • How to size relief valve outlet piping and flare headers • How to calculate relief valve backpressure • How to size flare ko drums • How to calculate flare stack height based on radiation limits • flare gas recovery systems • Flare ignition systems available • Advantages of using dynamic simulation for calculating relief loads

COURSE CONTENT

Overview of typical relief and flare systems and key components • Codes and standards as well as good practices typical in oil and gas facilities • Safety implications and causes of overpressure • Overpressure protection philosophy including source isolation and relief • Determination of relief requirements and design • Relief devices • Blowdown/depressurizing - purpose and design/operational considerations • Design and specification considerations for relief valves and header systems, including fluid characteristics, services conditions, material selection, and header sizing • Environmental considerations • Radiation calculations and the impact of flare tip design • Selection and sizing of key components: knockout and seal drums, vent/flare stack, vent/flare tips, and flare ignition systems • Defining need and quantity of purge gas • Flare gas recovery: smokeless flaring, and purge gas conservation • Operational and troubleshooting tips • The use of dynamic simulations to determine relief loads

Onshore Gas Gathering Systems: Design and Operations – PF45

INTERMEDIATE 5-DAY

This course deals with the design, operation, and optimization of onshore gas gathering systems and their associated field facilities, from the wellhead to the central gas processing facility. From a design perspective, the main variables that impact the flexibility and operational characteristics of an onshore gas gathering system will be discussed. Typical operating problems are covered including hydrates, multiphase flow issues, corrosion, declining well deliverability, etc. Exercises will be utilized throughout the course to emphasize the key learning points.

DESIGNED FOR

Production and facilities department engineers, senior operating personnel responsible for the design, operation and optimization of onshore gas gathering systems and their associated field facilities.

YOU WILL LEARN

• The impact of gathering system pressure on gas well deliverability • The impact of produced fluids composition on gathering system design and operation • How to evaluate field facility and gathering system configurations for different gases • To recognize and develop solutions to operating problems with existing gas gathering systems

COURSE CONTENT

Gas well inflow performance and deliverability • Overview of gas well delineation methods for low-rate, low pressure gas wells • Effect of gathering system/abandonment pressure on reserves recovery • Impact of produced fluids composition • Sweet/sour, CO2 content • Rich/lean • Produced water • Hydrates and hydrate prevention • Dehydration • Heating • Chemical inhibition • Multiphase flow basics • Corrosion/materials selection • Gathering system layout • Wellsite/field facilities options • Provisions for future compression

2019 Schedule and Tuition (USD)

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Troubleshooting Oil and Gas Processing Facilities – PF49

INTERMEDIATE 5-DAY

This course will cover how to establish and apply a general troubleshooting methodology as well as how to conduct process/equipment specific troubleshooting. Definitions of good/normal performance will be discussed for each process/ equipment type covered. Data gathering, validation and utilization procedures will be discussed. Criteria to use when evaluating possible problem solutions will also be covered. Real-world exercises will be utilized throughout the class to reinforce the learning objectives. Both onshore and offshore facilities will be discussed. It is assumed that course participants have a solid understanding of how typical oil and gas production and processing facilities work, including the commonly used processes and equipment involved.

DESIGNED FOR

Process/Facilities engineers with 5-10 years of experience, facilities engineering team leaders/ supervisors, and senior facilities operational personnel.

YOU WILL LEARN

• The difference between troubleshooting, optimization, and debottlenecking
• How to recognize trouble when it is occurring
• How to develop a methodical approach to troubleshooting
• To recognize how different components of a facility interact with each other, and the significance of these interactions
• How to gather, validate, and utilize the data needed for troubleshooting
• The criteria to be considered for identifying the best solution when several feasible solutions are available
• Typical causes of problems, and their solutions, for the main types of processes and equipment used in the upstream-midstream oil and gas industry

COURSE CONTENT

Troubleshooting methodology fundamentals and data reconciliation • Gas - Liquid separators • Reciprocating compressors • Amine gas sweetening • Glycol dehydration units • 3-phase separators • Centrifugal pumps • Oil treating • Produced water treating systems • Shell and tube heat exchangers • Centrifugal compressors • Molecular sieve dehydration units • NGL recovery processes

CO2 Surface Facilities – PF81

SPECIALIZED 4-DAY

FIELD TRIP

This course emphasizes the effect of carbon dioxide on the selection and operation of equipment (separators, compressors, and dehydrators), as well as sweetening process equipment. This program, first introduced in 1985, assists those working with carbon dioxide or high carbon dioxide content natural gas. This course is particularly applicable to those persons who operate and/or design enhanced oil recovery (EOR) facilities using CO2 as a miscible agent. Physical and thermodynamic property data for carbon dioxide/natural gas mixtures are discussed. Calculations are performed to illustrate principles and techniques. Midland is a four-day session including a CO2 plant tour on Thursday, contingent on plant availability.

DESIGNED FOR

Engineers and senior operating personnel involved with carbon dioxide/natural gas/CO2 EOR systems.

YOU WILL LEARN

• What to expect over the life of a CO2 EOR system
• Impact of CO2 on the design and operation of oil production equipment
• Physical and thermodynamic properties of pure CO2, and the impact of CO2 in hydrocarbon mixtures
• Dehydrate high CO2-content gases
• Best practices to deal with Dense Phase pipelines, metering, flaring etc.
• How to pump and compress CO2
• Using purification processes, membranes, Ryan-Holmes, amine, hot carbonate, etc.

COURSE CONTENT

Overview of CO2 injection and process facilities • Heavy emphasis on CO2 for enhanced oil recovery • Physical and thermodynamic properties of CO2 and high CO2 mixtures • Materials selection and design consideration in CO2 systems • Process vessel specification • Pumps and compressors • Fluid flow and special pipeline design considerations such as the control of ductile fractures • Dehydration of CO2 and CO2-rich gases • General overview of processes to treat/recover CO2

Fundamentals of Process Safety – PS2

FOUNDATION 5-DAY

The course will cover the fundamentals of Process Safety for all staff levels of processing facilities in the upstream and downstream oil, gas, and petro chemical industry. To identify how different disciplines and roles can have an impact on Process Safety performance, there is a rolling case study (Project COLEX) throughout the course that involves the installation of a separator vessel, and the Process Safety considerations and implications are explored and discussed at the various stages, from design to full operation.

DESIGNED FOR

The course will benefit all staff associated with the operation, maintenance, and governance in production and processing facilities and is relevant to roles, including senior management, project and engineering support teams, HSE support, supervisors, and operator and maintenance technicians. It provides an understanding of the design basis and essentials for safe operations, without addressing the more detailed calculation aspects covered in Process Safety Engineering PS4.

YOU WILL LEARN HOW TO

• Identify the systems and processes required to create process safety in a high hazard installation
• Identify and choose appropriate techniques and tools to qualitatively assess process hazards
• Determine appropriate risk reduction strategies and identify effective risk reduction measures to prevent, control, and mitigate process safety risk
• Recognize and develop systems to manage Process Safety in operations through operating procedures and operating limits, ensuring plant integrity through maintenance and inspection
• Use a management of change process to minimize risk of change
• Identify and monitor key performance measures and verifications to maintain and improve safety performance

COURSE CONTENT

Business context for Process Safety • Risk assessment [hazard identification, hazard scenarios, consequence and likelihood analysis, and risk analysis and tools and techniques]
• Risk reduction measures (barriers) [types and hierarchy of risk reduction measures (barriers)]
• Management of process safety in operations [operating procedures, design and operating limits, human factors, inspection and maintenance, and emergency response]
• Management of change • Learning from previous incidents and near misses • Self-verification and measurement • Process safety key performance indicators • Management review and auditing • Process safety leadership [governance and culture]

Risk Based Process Safety Management – HS45

FOUNDATION 5-DAY

This course introduces process safety management in the oil and gas industry, the elements and benefits of process safety management systems, and tools for implementing and managing a system. In this course the participant will learn to use tools and techniques for managing process safety. The Center for Chemical Process Safety’s (CCPS) book titled “Guidelines for Risk Based Process Safety”, or “RBP Guidelines” will be the text for this course. Participant centered exercises and selected case studies will be used to build on the concepts that CCPS advocates for risk based process safety.

Throughout the course, participants will be challenged to think how their process safety management system can be enhanced and modified to meet the concepts of risk-based decision making. An individual action plan will be developed to apply the information from the course to the workplace.

DESIGNED FOR

HSE professionals, operations and maintenance technicians, engineers, supervisors and project managers requiring a basic foundation in developing and managing process safety. The more technical aspects of process safety engineering are covered in PS4, Process Safety Engineering.

YOU WILL LEARN HOW TO

• nifty processes applicable to Process Safety Management (PSM) and describe relevant terms used
• Identify which standards are to be applied for managing process hazards
• Apply programs and tools for managing a PSM system
• Choose appropriate decision making methods and tools to identify process hazards
• Describe and use techniques available for control of hazards associated with process designs
• Describe the criteria and methods of selecting equipment and safe guarding controls
• Research and apply the performance parameters for the safety systems in operations
• Explain the role of all disciplines and their contribution to the management of potential HSE hazards

COURSE CONTENT

Process safety culture and competency • Compliance with standards • Understand hazards and risk • Operating procedures and safe work practices • Asset integrity and reliability • Management of change • Conduct of operations • Incident investigation (associated with plant failures) • Measurement and metrics • Management review and continuous improvement

2019 Schedule and Tuition (USD)

CROSS-TRAINING 5-DAY

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2019 Schedule and Tuition (USD)

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Piping Systems - Mechanical Design and Specification – ME41

INTERMEDIATE 5-DAY

This 5-day, intermediate level course for engineers and piping system designers reviews the key areas associated with the design of piping systems for oil and gas facilities. The course is focused on four areas: codes and standards, pipe materials and manufacture, piping components, and piping layout and design. Applicable piping codes for oil and gas facilities (ISO, B31.3, B31.4, B31.8, etc.), piping size calculations, pipe installation, and materials selection are an integral part of the course. The emphasis is on proper material selection and specification of piping systems.

DESIGNED FOR
This PetroSkills training course is ideal for mechanical, facilities, plant, or pipeline engineers and piping system designers who are involved in the design of in-plant piping systems for oil and gas facilities.

YOU WILL LEARN
• To apply piping system codes and standards
• About line sizing and layout of piping systems in various types of facilities
• How to specify proper components for process and utility applications
• To compare alternative materials of construction
• About the process of steamtrapping, pipe manufacturing, and material specifications
• Joining methods and inspection techniques
• Key considerations for flare and vent systems, including PSV sizing

COURSE CONTENT
Piping codes and standards (ANSI/ASME, API, ISO) • Pipe materials and manufacture • Basic pipe stress analysis methods • Valves and actuators • Welding and non-destructive testing • Line size specifications (single-phase and multiphase flow) • Pipe and valve material selection • Piping layout and design • Manifolds, headers, and flare/vent systems • Non-metallic piping systems • Operations and maintenance considerations of facilities and pipelines

Mechanical Specification of Pressure Vessels and Heat Exchangers – ME43

INTERMEDIATE 5-DAY

FIELD TRIP

This 5-day, intermediate level course for facility engineers and project engineers reviews the key areas associated with the mechanical design of pressure vessels and heat exchangers for oil and gas facilities. The course is focused on vessels, heat exchangers built in accordance to ASME VIII Div 1, considering material selection, key design calculations, and manufacturing processes. The course is not aimed at process engineers sizing equipment (PF-42 covers these elements), although a brief review of the sizing correlations is included. The course is delivered from the perspective of a vessel fabricator to better understand the dos and don'ts of ideal mechanical specification of pressurized equipment by owner/operators, in order to optimize material utilization and minimize construction costs. The Houston session features an afternoon field trip to a large pressure vessel fabricator.

DESIGNED FOR
Mechanical, facilities, construction, or project engineers and plant piping/vessel designers who are involved in the specification and purchasing of pressure vessels, heat exchangers, and other pressure-containing equipment for oil and gas facilities.

YOU WILL LEARN
• About ASME B&PV code and the commonly used sections relevant to oil and gas equipment
• To specify correct and commonly used materials according to ASME II
• How to design vessel shells, heads, nozzles, and heat exchanger details
• How to provide accurate equipment specification documents and review documentation for code compliance
• Key fabrication processes used in the workshop and how to simplify construction through correct vessel specification
• About welding processes and inspection requirements per ASME IX

COURSE CONTENT
Vessel codes and standards (ASME B&PV Code, TEMA, API) • Vessel material selection, corrosion mechanisms, heat treatment, and basic metallurgy • Essential design calculations for vessels and heat exchangers • Welding process overview and inspection requirements • Constructability and operability considerations • Vessel integrity, evaluation, and re-purposing of pressure-containing equipment according to API/ASME

Fundamentals of Pump and Compressor Systems – ME44

INTERMEDIATE 5-DAY

This is an intensive 5-day course providing a comprehensive overview of pumps and compressor systems. The focus is on equipment selection, type, unit, and station configuration; and integration of these units in the process scheme and control strategy in upstream and midstream oil and gas facilities. The material of the course is applicable to field production facilities, pipelines, gas plants, and offshore systems.

DESIGNED FOR
Engineers, senior technicians, and system operators designing, operating, and maintaining pump and compressor systems in oil and gas facilities.

YOU WILL LEARN
• Selecting the appropriate integrated pump and compressor units (drivers, pumps, compressors, and auxiliary systems)
• Integrating the pump or compressor units with the upstream and downstream piping and process equipment
• Evaluating pump and compressor units and their drivers in multiple train configurations, parallel and series
• Identifying the key local and remote control elements of pumps and compressors as well as their drivers
• Defining the major life-cycle events, such as changes in flows, fluid composition, and operating conditions that can affect equipment selection and operating strategies
• Assessing the key pump hydraulics and compressor thermodynamics, and their effect on selection and operations
• Identifying significant operating conditioning monitoring parameters and troubleshooting techniques

COURSE CONTENT
Types of pumps, compressors, and drivers, and their common applications and range of operations • Evaluation and selection of pumps and compressors, and their drivers for long-term efficient operations • Unit and station configuration including multiple trains in series and/or parallel operations • Integration with upstream and downstream process equipment, local and remote control systems, and facilities utilities • Key auxiliaries systems including monitoring equipment, heat exchangers, lube and seal systems, and fuel/power systems • Major design, installation, operating, troubleshooting, and maintenance considerations

Compressor Systems - Mechanical Design and Specification – ME46

SPECIALIZED 5-DAY

This 5-day, specialized level course is for facility design engineers, operations engineers, and technicians seeking an in-depth understanding of centrifugal, reciprocating, and screw compressors. This course provides basic knowledge of compressor types and associated auxiliary systems, mechanical design of equipment, operating and performance characteristics, control and monitoring systems, maintenance practices, and codes and standards.

DESIGNED FOR
Mechanical, facilities, plant, or pipeline engineers and technicians needing an in-depth understanding of the different types of compressors.

YOU WILL LEARN
• How to apply thermodynamics to compressor performance and operating characteristics
• How to size, specify, and select compressors
• Compressor auxiliary systems
• Series and parallel application of compressors
• How to integrate compressor systems into process facilities used in the oil and gas industry
• How to use state-of-the-art monitor and control devices in the operation, maintenance, and troubleshooting of compression systems
• How to apply maintenance practices to improve compressor reliability
• Shop and field performance testing
• Compressor economics including DPEX vs. CAPEX considerations

COURSE CONTENT
Types and application of compressors • Selection criteria of dynamic and positive displacement compressors • Compressor thermodynamics and operating characteristics • Performance curves and off-design evaluations • Key compressor components and other auxiliary systems • Equipment specifications • Compressor controls and monitoring devices • Driver and gear involvement • Installation, operation, maintenance practices, and troubleshooting • Economic considerations

2019 Schedule and Tuition (USD)

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2019 Schedule and Tuition (USD)

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2019 Schedule and Tuition (USD)

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Instrumentation, Controls and Electrical Systems for Facilities Engineers – ICE21

FUNDATION 5-DAY

This foundation-level course provides an introduction and overview of electrical systems, instrumentation, process control, and control/safety systems typically encountered in oil and gas facilities. The focus is to understand terminology, concepts, typical equipment configurations, and common pitfalls in order to improve communication with electrical and I&C professionals. This course covers similar content to our E3 and IC3 courses, but at a more conceptual level. This course is not a prerequisite for taking E3 or IC3, but rather a replacement for those that are not able to take both E3 and IC3.

DESIGNED FOR
Process, chemical, and mechanical engineers, (i.e. non-instrumentation and non-electrical disciplines), as well as other technical and non-technical professionals with little or no background in I&C systems. Electrical and Instrumentation Engineers should consider E3 and IC3 for more in-depth coverage.

YOU WILL LEARN
• Fundamentals of electricity, such as voltage, current, resistance, power factor, and single/three-phase power systems
• Electrical specifications, such as voltage selection, load lists, and power
• How to read one-line diagrams and understand the function of the components of power distribution, including transformers, switchgear, MCCs, VFDs, and power distribution
• The function and considerations of infrastructure components, such as cable, conduit, cable tray, and duct banks
• Awareness of the concepts behind classification of hazardous locations and equipment specifications
• Safety risks and mitigation strategies for power systems, including short circuit and overcurrent protection, ground faults, shock hazards, and arc flash
• Fundamentals of control systems, sensors, controls, and final elements
• Key requirements for instrument specifications such as accuracy, signal selection, process conditions, material compatibility, installation considerations, capabilities and limits, and relative cost
• Basics of specification of shutdown and control valves
• Control system functions, limitations, and architectures, including PLC, DCS, SIS, RTU, and SCADA; common networking systems, including Ethernet, Modbus, and Fieldbus
• Exposure to the typical documentation and drawings necessary for the design specification, installation, operation, and maintenance of electrical instrumentation and control systems

COURSE CONTENT
Fundamentals of electricity – Control system fundamentals • Field measurement and control devices • Hazardous area classification for oil and gas applications • Programmable electronic systems (PLC, DCS, SIS, SCADA) • and more...

Electrical Engineering Fundamentals for Facilities Engineers – E3

FUNDATION 5-DAY

This course applies fundamental electrical engineering principles to oil and gas facilities. The course is designed for Facilities Engineers who interface with electrical systems, and provides practical insight and development of new Facilities Electrical Engineers. Through the use of individual and group problem solving, attendees will learn about power transformers, motors, generators, one-line diagram interpretation, protection and coordination of electrical equipment, site and standby generation, electrical safety, and hazardous areas identification. Participants will gain a better understanding of electrical power systems in oil and gas facilities. This course is a more in-depth version of the content of ICE21 and IC21 is not a prerequisite for taking this course.

DESIGNED FOR
Those facilities personnel who interface with facility electrical power systems, including project engineers, operation leads, instrumentation, controls personnel, and electrical engineers who are new to electrical power systems within oil and gas facilities.

YOU WILL LEARN
• Fundamental concepts of electricity including voltage, current, resistance, inductance, capacitance, and power factor
• The key components of facilities electric power distribution, which include circuit arrangements, low and medium voltage switchgear, and single-phase and three-phase schemes
• Transformer operation, components, turns and voltage ratios, losses, efficiency, rating, and connections
• The difference between direct current, induction and synchronous current motors, motor enclosures, and how to select, start, protect, and control motors
• The principles of protecting electrical equipment, including time current curves, fuses, circuit breakers, and coordination
• The purposes and sizing criteria for backup power, including generators and UPS power systems
• The considerations and sizing criteria for on-site power generation, which includes standby, prime, peak, and co-generation
• What grounding and bonding systems are, with an overview of ignition sources, shock protection, separately derived systems, and subsurface grounding
• The concepts, terminology and application of hazardous area classification standards, equipment protection methods, and installation requirements for NEC and IEC projects

COURSE CONTENT
Fundamentals of insulation and conduction • Direct current, alternating current • Transformers power and instrument • Motors induction and synchronous • Power distribution • System protection and coordination • Standby power systems • Power generation • Variable speed drive principles • Grounding, bonding, and electrical safety • Hazardous area identification

Instrumentation and Controls Fundamentals for Facilities Engineers – IC3

FUNDATION 5-DAY

This course applies fundamental instrumentation and control engineering principles to oil and gas facilities design and operation, and is designed to accelerate the development of new Facilities Instrumentation and Control Engineers. Through the use of individual and group problem solving, attendees will learn about field measurement devices, valves and actuators, documentation, programmable logic controllers, power supplies, PLC, SCADA, DCS, SIS, hazardous areas, and installation methods. This course is a more in-depth version of the content of ICE21 and IC21 is not a prerequisite for taking this course.

DESIGNED FOR
Facilities and Project Engineers as well as newly graduated Electrical, Controls and Instrument Engineers (0-5 yrs.) with a need to improve basic understanding of instrumentation and control systems within oil and gas facilities.

YOU WILL LEARN
• Operating principals and specification criteria for field measurement devices including level, pressure, temperature, and flow
• Final elements and actuators including control loops, control valves, shutdown valves, actuators, and transducers
• P&ID symbols and instrument tags, loop and logic diagrams, pitfalls and best practices
• ISA symbology, and creation of instrument and I/O lists
• Signal types and wiring requirements for analog/digital inputs and outputs as well as other signals such as thermocouple, RTD, pulse, and digital communications
• Typical control system functions, limitations, and architectures for PLC and DCS systems including programming methods such as ladder logic and function block
• Process control basics with an emphasis on control loops, types, and configurations for common oil and gas process equipment such as separators, pumps, distillation towers, filters, compressors, compressors, heat exchangers, and fired heaters
• Understanding of the PID algorithm, loop tuning, and advanced process control techniques such as feedback, cascade, selective, and ratio control
• Supervisory Control and Data Acquisition (SCADA) Systems to include telemetry, RTUs, internet, and web based communications
• Common networking systems including Ethernet, Modbus, and Fieldbus
• Risk mitigation, technologies, and architecture of Safety Instrumented Systems (SIS)
• The concepts, terminology, and application of hazardous area classification standards, equipment protection methods, and installation requirements for NEC and IEC projects

COURSE CONTENT
Fundamentals of control signals and wiring • Control system basics • and more...

Fundamentals of Offshore Systems Design and Construction – OS4

FUNDATION 10-DAY

This 10-day course provides a fundamental understanding of the technology and work processes used for the design and construction of all types of offshore systems, including consideration of asset development, surveillance, and management. The content includes the full range of water depths from shallow water to ultra-deepwater and will also address life-cycle considerations in all phases of offshore field development and operation. All major components required for offshore developments, such as fixed and floating platforms, drilling rigs, workover equipment, pipelines, risers, process, and utilities and construction equipment are discussed. Emphasis is placed on the multi-discipline team approach needed to manage the myriad interfaces of offshore facility design, construction, and operations. Individual and group exercises are used throughout the course. A case study for an offshore project development is included.

DESIGNED FOR
Individuals with a basic awareness of offshore engineering and operations. Technical staff, project engineers, engineering discipline leads, engineering specialists, and operating staff find this course accelerates their capability to contribute on offshore field development, design, engineering, and construction projects and field operations.

YOU WILL LEARN HOW TO
• Identify the key facilities parameters that must be evaluated for field evaluation
• Recognize the best applications and characteristics of each type of offshore fixed and floating structure
• Account for the effects of the ocean environment on facilities design, construction, and operations
• Identify the impact space, loads and forces have on the structural design and global performance of offshore structures and how they influence their cost
• Describe the impact of topside facilities (well construction, well servicing, processing, and utilities) on the design of the supporting structure and outline the topsides design process
• Recognize and manage key design and operational interfaces between the major components of offshore facilities systems
• Understand and apply the key design, construction, and installation issues associated with fixed and floating platforms and how to apply the lessons learned to your work

COURSE CONTENT
Offshore systems overview and field architecture selection • Well construction and servicing equipment and operation • Flow assurance • Topsides facilities • Oil and gas transportation facilities • Compression facilities • Subsea systems • Production operations • Infrastructure impact on design and operations • Effects of the ocean environment • Introduction to naval architecture • Structural design processes and tools • Construction plans and execution • and more...

2019 Schedule and Tuition (USD)

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2019 Schedule and Tuition (USD)

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TO VIEW OUR COURSES IN OTHER DISCIPLINES, VISIT:

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- Geophysics
- Petrophysics
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- Well Construction/Drilling
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Facilities

- Process Facilities
- Offshore & Subsea
- Pipeline Engineering
- Instrumentation, Controls & Electrical
- Mechanical Engineering
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Petroleum Business and Professional Development

- Petroleum Professional Development
- Petroleum Business
- Project Management

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- Basics of Static Mechanical Equipment
- Casing Design Workshop
- Completions and Workovers
- Foundations of Petrophysics
- Gas Conditioning and Processing Principles
- NODAL Analysis Workshop
- Process Safety Engineering
- Production Operations 1
- Production Technology for Other Disciplines
- Scale Identification, Remediation and Prevention Workshop

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