

Course No. 1481

Natural Gas Processing, Conditioning & Treatment Technologies

MIDSTREAM OPERATIONS, PIPELINES, STORAGE & LNG
OIL & GAS

DURATION

5 Days

DELIVERY

Classroom



Course Overview

Natural Gas Processing, Conditioning & Treatment Technologies is a specialized technical training course designed to provide professionals with a comprehensive understanding of the technologies, equipment, and operational practices used to process raw natural gas and achieve required pipeline, transportation, storage, or downstream processing specifications. Raw natural gas may contain water, hydrogen sulfide, carbon dioxide, mercury, nitrogen, heavier hydrocarbons, solids, and other contaminants that can affect safety, equipment integrity, product quality, and overall facility performance. Effective gas conditioning and treatment are therefore essential to reliable and efficient gas operations.

The course covers the complete natural gas treatment chain, beginning with feed-gas characterization and inlet separation and progressing through acid gas removal, dehydration, contaminant removal, hydrocarbon dew-point control, hydrate prevention, Natural Gas Liquids (NGL) recovery, condensate stabilization, and fractionation. Participants examine the technical principles behind each process and evaluate how feed composition, pressure, temperature, flow rate, product specifications, and equipment performance influence technology selection and operating strategy.

Particular emphasis is placed on gas sweetening using amine systems, glycol and molecular-sieve dehydration, sulfur-related considerations, mercury removal, hydrocarbon recovery, low-temperature processing, and management of operational challenges such as foaming, corrosion, solvent losses, contamination, hydrate formation, liquid carryover, and off-specification gas. The course also addresses process control, troubleshooting, equipment reliability, process safety, energy efficiency, and the interaction between different treatment units.

By integrating process fundamentals with practical troubleshooting and optimization techniques, the Natural Gas Processing, Conditioning & Treatment Technologies course enables participants to analyze gas-treatment systems as an integrated facility rather than as isolated process units. Participants develop the capability to interpret operating data, identify performance limitations, evaluate treatment alternatives, diagnose common problems, and develop technically justified recommendations for improving gas quality, process stability, energy efficiency, equipment reliability, and plant performance.

Objectives

- Analyze raw natural gas composition, physical properties, phase behavior, contaminants, and product specifications to determine appropriate processing and conditioning requirements.
- Evaluate the complete natural gas treatment sequence from inlet separation through sweetening, dehydration, contaminant removal, dew-point control, NGL recovery, and final gas conditioning.
- Apply gas sweetening principles to assess amine absorption and regeneration systems and identify factors affecting acid gas removal performance.
- Evaluate dehydration technologies including glycol absorption and molecular-sieve adsorption according to water specifications and downstream processing requirements.
- Assess hydrate-formation risks and apply appropriate prevention and control strategies based on operating conditions.
- Analyze hydrocarbon dew-point control and NGL recovery processes using refrigeration, expansion, low-temperature separation, and related processing technologies.
- Evaluate contaminant-removal technologies for mercury, solids, liquids, and other components that may affect equipment integrity or downstream operations.
- Improve troubleshooting capabilities by identifying the causes of foaming, corrosion, solvent degradation, liquid carryover, poor regeneration, contamination, and off-specification gas.
- Assess process-control strategies and key operating parameters affecting gas-treatment efficiency, stability, capacity, and product quality.
- Strengthen process-safety practices by evaluating hazards associated with high-pressure gas, hydrogen sulfide, process chemicals, hydrocarbons, and treatment equipment.
- Evaluate opportunities to improve energy efficiency, chemical consumption, equipment utilization, and overall gas-processing performance.
- Develop an integrated optimization plan for a representative natural gas conditioning and treatment facility by the end of the course.

Who Should Attend

This course is designed for engineers and technical professionals involved in natural gas processing, gas conditioning, treatment operations, production, and process facilities. It is particularly relevant to Process Engineers, Chemical Engineers, Petroleum Engineers, Gas Processing Engineers, Production Engineers, Facilities Engineers, Operations Engineers, Field Engineers, Process Technologists, Gas Plant Operators, Shift Supervisors, Production Supervisors,

and technical specialists responsible for gas-treatment systems.

The course is also suitable for Mechanical Engineers, Maintenance and Reliability Engineers, Instrumentation and Control Engineers, Corrosion and Materials specialists, Inspection Engineers, Asset Integrity professionals, Process Safety Engineers, HSE specialists, laboratory personnel, production-chemistry professionals, project engineers, commissioning teams, and technical-support personnel whose responsibilities interact with gas-processing equipment and treatment systems.

Engineering Managers, Operations Managers, Gas Plant Managers, Maintenance Managers, Technical Managers, Asset Managers, Project Managers, and decision makers responsible for gas quality, plant capacity, equipment availability, process reliability, energy efficiency, safety, or facility optimization will benefit from the integrated technical and operational perspective provided by the program.

Learning Outcomes

- By the end of the course, participants will be able to:
- Interpret natural gas composition and determine how water, acid gases, heavy hydrocarbons, mercury, solids, and other contaminants influence treatment requirements.
- Explain the complete process flow of a natural gas processing and conditioning facility and identify the function of each major treatment stage.
- Evaluate inlet separation and feed-conditioning systems and identify conditions that may affect downstream equipment.
- Assess amine sweetening-system performance and diagnose common absorption, regeneration, foaming, corrosion, and solvent-management problems.
- Evaluate glycol and molecular-sieve dehydration systems and determine factors responsible for excessive water content or poor dehydration performance.
- Identify hydrate-formation conditions and select appropriate operational, thermal, mechanical, or chemical mitigation approaches.
- Assess hydrocarbon dew-point control, NGL recovery, condensate stabilization, and fractionation processes.
- Diagnose contaminant-removal and gas-quality problems using process conditions, operating trends, equipment information, and product specifications.
- Evaluate process-control performance and recognize abnormal conditions affecting pressure,

temperature, flow, level, composition, and treatment efficiency.

- Identify major process-safety hazards associated with natural gas treatment and recognize the safeguards required for safe operation.
- Develop practical recommendations to improve chemical utilization, energy efficiency, equipment reliability, plant capacity, and product quality.
- Prepare an integrated gas-treatment optimization strategy based on feed conditions, process performance, operational constraints, and required gas specifications.

Course Outline

DAY 01

Natural Gas Properties, Feed Characterization & Inlet Conditioning

- Understanding natural gas composition and physical properties, including methane, ethane and heavier hydrocarbons, water, carbon dioxide, hydrogen sulfide, nitrogen, mercury, solids, condensates, and other components relevant to gas processing.
- Reviewing gas phase behavior, pressure-volume-temperature relationships, water and hydrocarbon dew points, heating value, compressibility, phase envelopes, condensation, and the influence of pressure and temperature on gas-treatment operations.
- Evaluating natural gas specifications for pipeline transportation, downstream processing, storage, petrochemical applications, and other uses, and understanding how specifications determine treatment requirements.
- Examining inlet separation and feed-conditioning equipment including slug catchers, two-phase and three-phase separators, filters, coalescers, scrubbers, liquid handling, condensate management, and protection of downstream treatment equipment.

PRACTICAL APPLICATION OR DISCUSSION

Analyzing a representative raw-gas composition and developing an initial processing sequence based on contaminants, operating conditions, and required product specifications.

DAY 02

Acid Gas Removal, Gas Sweetening & Sulfur Management

- Understanding acid gas removal requirements and the effects of hydrogen sulfide and carbon dioxide on gas quality, corrosion, safety, downstream processing, transportation, and product specifications.
- Examining amine-based gas sweetening systems, including absorption, solvent circulation, rich and lean amine, flash separation, heat exchange, regeneration, stripping, reboiling, cooling, filtration, and solvent management.
- Evaluating major operating parameters affecting amine performance, including circulation rate, concentration, temperature, pressure, acid-gas loading, regeneration conditions, heat-stable salts, contamination, and solvent degradation.
- Troubleshooting common sweetening problems including foaming, hydrocarbon contamination, corrosion, excessive amine losses, poor acid-gas removal, inadequate regeneration, flooding, entrainment, and unstable operation.

PRACTICAL APPLICATION OR DISCUSSION

Diagnosing an amine-unit performance case involving increasing H₂S or CO₂ in treated gas, abnormal solvent losses, foaming, and changing regeneration conditions.

DAY 03

Gas Dehydration, Hydrate Control & Contaminant Removal

- Understanding water behavior in natural gas, water dew point, hydrate formation, corrosion implications, freezing risks, downstream specifications, and the importance of effective dehydration.
- Evaluating glycol dehydration systems, particularly Triethylene Glycol (TEG), including contactor operation, glycol circulation, rich-glycol handling, regeneration, reboilers, stripping enhancement, glycol losses, contamination, and performance monitoring.
- Examining molecular-sieve dehydration and adsorption systems, including adsorption cycles, regeneration, switching sequences, bed performance, temperature profiles, breakthrough, adsorbent degradation, and applications requiring very low water content.
- Evaluating hydrate prevention and contaminant-control technologies, including temperature and pressure management, chemical inhibition, mercury removal, filtration, solids control, and protection of sensitive downstream equipment.

DAY 03 — CONTINUED

PRACTICAL APPLICATION OR DISCUSSION

Comparing dehydration alternatives and troubleshooting a gas-treatment case involving high water content, hydrate risk, poor regeneration, or early molecular-sieve breakthrough.

DAY 04**Hydrocarbon Dew-Point Control, NGL Recovery & Fractionation**

- Understanding hydrocarbon dew-point specifications and evaluating methods for controlling heavy-hydrocarbon condensation in pipelines, compressors, processing equipment, and downstream facilities.
- Examining hydrocarbon recovery technologies including mechanical refrigeration, Joule-Thomson expansion, turboexpansion, low-temperature separation, and cryogenic processing principles used for enhanced liquid recovery.
- Evaluating Natural Gas Liquids (NGL) recovery and the influence of feed composition, pressure, temperature, recovery objectives, energy consumption, and product economics on process configuration.
- Understanding condensate stabilization and NGL fractionation, including demethanizers, deethanizers, depropanizers, debutanizers, LPG production, condensate products, column operation, reboilers, condensers, and product-quality control.

PRACTICAL APPLICATION OR DISCUSSION

Evaluating a gas-processing configuration to identify opportunities for improved hydrocarbon recovery while maintaining required sales-gas specifications and stable plant operation.

DAY 05**Process Control, Troubleshooting, Safety & Plant Optimization**

- Applying process-control principles to gas-treatment facilities, including pressure, temperature, flow, level, composition, interface and quality control, alarms, trips, operating envelopes, and interaction between treatment units.
- Developing structured troubleshooting approaches using process trends, laboratory results, material and energy balances, equipment condition, alarm history, product specifications, and systematic root-cause analysis.

DAY 05 — CONTINUED

- Managing process-safety and asset-integrity risks associated with high-pressure natural gas, hydrogen sulfide, flammable hydrocarbons, process chemicals, corrosion, overpressure, loss of containment, toxic exposure, and emergency shutdown requirements.
- Evaluating plant-optimization opportunities involving feed-gas variability, treatment efficiency, solvent and chemical consumption, compression, heating and cooling duties, equipment utilization, bottlenecks, energy consumption, reliability, and product quality.

FINAL WORKSHOP, ACTION PLAN, OR IMPLEMENTATION EXERCISE

Participants develop an integrated Natural Gas Processing, Conditioning & Treatment Technologies improvement plan for a representative gas-processing facility, covering feed characterization, inlet conditioning, gas sweetening, dehydration, hydrate management, contaminant removal, hydrocarbon dew-point control, NGL recovery, fractionation, process control, troubleshooting, safety, energy efficiency, reliability, bottleneck identification, and prioritized optimization actions.

Register or Request More Information

Course page: <https://quest-training.com/courses/natural-gas-processing-conditioning-treatment-technologies>

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