

GAS CONDITIONING & PROCESSING



**PCE136
Process and
Chemical
Engineering**

COURSE TITLE

GAS CONDITIONING & PROCESSING

COURSE DATE/ VENUE

04th-08th Mar 24'

COURSE REFERENCE

PCE136

COURSE DURATION

05 Days

DISCIPLINE

Process and Chemical Engineering

COURSE INTRODUCTION

The rapidly increasing worldwide demand for natural gas as an energy source requires expertise in gas engineering technology, which involves several production operations such as dehydration, acid gas removal, recovery of natural gas liquids and the production of liquefied natural gas. In addition, one involved in such industry needs to be familiar with different gas sources, specifications, storage requirements, transportation and distribution

This course will start by defining what natural gas is, its properties, specifications and end uses. Then, typical gas processing operations will be discussed, including dehydration, acid gas removal, recovery of ethane, propane and NGL (natural gas liquids), and liquefied natural gas (LNG) operations. Sulfur recovery, tail gas conditioning and process control will also be discussed. Typical equipment and facilities that are found in typical natural gas processing operations will also be discussed including compressors, vessels, relief systems and safety systems. Finally, the fundamentals of gas transportation and distribution will be discussed.

COURSE OBJECTIVE

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

- ✓ Gain a deep knowledge of the properties, specifications and end uses of natural gas.
- ✓ Gain a deeper understanding of typical natural gas processing operations, including:
 - ✓ Discuss about Dehydration, Acid gas removal
 - ✓ Discuss about Recovery of ethane, propane and NGL (natural gas liquids)
 - ✓ Discuss about Sulfur recovery
- ✓ Gain a deeper understanding of the production of liquefied natural gas (LNG).
- ✓ Gain a deeper knowledge of the different equipment and facilities found in natural gas processing plants.
- ✓ Discuss about fundamentals of gas transportation and distribution.

COURSE AUDIENCE

Technical and non-technical personnel involved in the activities of natural gas industry. Specifically, technical, operations and maintenance personnel who had limited exposure to this area, or professionals involved in other areas of the gas industry who require a comprehensive overview of natural gas processing will find this course ideally suited for them.

COURSE CONTENT

DAY 1

- What is natural gas?
- Origins
- Properties
- Specifications
- End uses and markets for natural gas
- Environmental advantages
- Physical behavior of natural gas systems

- Physical and thermal properties
- Phase behavior analysis
 - Pure substances
 - The phase rule
 - Behavior of mixtures
 - Vaporization by gas pressure
 - Molecular theory of gases and liquids
 - Natural gases
 - Density of natural gas
 - Density of liquids
 - Dense phase
 - Surface tension
 - Viscosity
 - Thermal conductivity of gases
 - Thermodynamic properties
 - Sampling and analysis

DAY 2

- Natural gas processing plant
 - Flowsheet
 - Equipment and components
- Heat exchange in gas processing
 - Heat transfer theory
 - ✓ Mechanisms of heat transfer
 - ✓ Process heat duty
 - Heat exchangers types
 - ✓ Shell and tube
 - ✓ Double-pipe
 - ✓ Plate and frame
 - ✓ Aerial coolers
 - Fired heaters

- Heat recovery units

DAY 3

- Hydrates
 - Determination of hydrate formation temperature or pressure
 - Condensation of water vapor
 - Temperature drop due to gas expansion
 - Thermodynamic inhibitors
 - Kinetic inhibitors and anti-agglomerators
- Low temperature exchange (LTX) units and line heaters
 - LTX units
 - Line heaters
 - Heat duty
 - Fire-tube size
 - Coil size
 - Standard size line heaters
- Condensate stabilization
 - Partial pressure
 - Multistage separation
 - Multi flashes
 - Cold feed distillation tower
 - Distillation tower with reflux
 - Condensate stabilizer design
 - Trays and packing
 - Condensate stabilizer as a gas processing plant
 - LTX unit as a condensate stabilizer

DAY 4:

- Acid gas treating
 - Gas sweetening processes
 - ✓ Solid bed absorption

- ✓ Chemical solvents
- ✓ Physical solvent processes
- ✓ Direct conversion of H₂S to sulfur
- ✓ Sulfide scavengers
- Process selection
- Design procedure for iron-sponge units
- Design procedure for amine systems
- Amine absorber
- Amine circulation rates
- Flash drum
- Amine reboilers
- Amine stripper
- Rich/lean amine exchanger
- Amine cooler
- Amine solution purification
- Materials of construction
- Gas dehydration
 - Water content determination
 - Glycol dehydration
 - ✓ Process description
 - ✓ Choice of glycol
 - ✓ Design considerations
 - ✓ System sizing
 - Solid bed dehydration

DAY 5

- Gas processing
 - Absorption/lean oil
 - Refrigeration
 - Choice of process
- Compressors

- Types of compressors
- Specifying a compressor
- Reciprocating compressors process considerations
- Mechanical design of pressure vessels
 - Design considerations
 - Inspection procedure
 - Specification and design of pressure vessels
- Pressure relief
 - Relief requirements
 - Type of devices
 - Valve sizing
 - Installation
- Valves, fittings and piping details
- Safety systems
 - Hazard tree
 - Developing a safe process
 - Failure mode effect analysis (FMEA)
 - API recommended practice 14C
 - Manual emergency shutdown
 - Hazard analysis
 - Safety management systems
- Gas transportation and distribution

COURSE CERTIFICATE

TRAINIT ACADEMY will award an internationally recognized certificate(s) for each delegate on completion of training.

COURSE FEES

£5,500 per Delegate. This rate includes participant's manual, Hand-Outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

COURSE METHODOLOGY

The training course will be highly participatory and the course leader will present, guide and facilitate learning, using a range of methods including formal presentation, discussions, sector-specific case studies and exercises. Above all, the course leader will make extensive use of real-life case examples in which he has been personally involved. You will also be encouraged to raise your own questions and to share in the development of the right answers using your own analysis and experiences. Tests of multiple-choice type will be made available on daily basis to examine the effectiveness of delivering the course.

- 30% Lectures
- 30% Workshops and work presentation
- 20% Case studies & Practical Exercises
- 10% Role Play
- 10% Videos, Software or Simulators (as applicable) & General Discussions