



# THE CHEMICAL ENGINEERING MAJOR

## Gas Conditioning & Processing

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## **Introduction**

This BTS Gas Conditioning & Processing training course covers the basic concepts and techniques necessary to design, specify and manage gas field production facilities. It includes complete and up-to-date overview of gas conditioning and processing technology and provides a clear understanding of the equipment and processes used in common separation and gas treating systems.

The training course will also cover gas dehydration, sweetening and gas processing operations and the integration between the individual processing operations will be clarified. The gathering, separation and final treatment systems for natural gas will be discussed, as well as the concepts of export quality natural gas, field and fiscal measurements error. The products (Natural Gas, Condensate, Commercial Propane and Commercial Butane, etc.) specifications and the processes available to condition the gas in order to meet these requirements will also be covered.

Hydrocarbon reconciliation and allocation of produced fluids to the contributing reservoirs are explained and supported by exercises to cement the learning of the various topics treated. This BTS training course will enable the participants to develop a “feel” for the important parameters of designing and operating a production facility. The participants will understand the uncertainties and assumptions inherent in designing and using the equipment in these systems and the limitations, advantages and disadvantages associated with their use.

### **This training course will feature:**

- Gas conditioning and processing principles and systems
- Gas liquid separation systems
- Mercury removal units
- Type of dehydration processes: absorption and alternative operating conditions
- TEG equipment: gas scrubbers, glycol contactors, flash tank, filters, glycol cooler, regenerator and stripping gas
- Gas sweetening technologies
- Operation of conditioning systems
- Troubleshooting of equipment used in gas conditioning
- Basics on dew point depression units

# Training Objectives

## What are the Goals?

**By the end of this training course, participants will learn to:**

- Understand the inflow and outflow performance as well as the system analysis in subsurface production operations
- Understand gas treatment process.
- Understand gas dehydration and processing, absorption, refrigeration and fractionation, cryogenics and LNG production.
- Understanding the normal operating conditions of the plant
- Have a good background of oil and gas processing and be able to understand the scope of LNG (NGL) gas processing
- Become familiar with the transfer operations in the gas field and be able to carry-out the measurement techniques
- Understand the conversion factors and be able to learn data analysis
- Acquire in-depth understanding of gas compression, natural gas, slug catcher and NGL recovery
- Define abnormal conditions such as high liquid level, heat loss, tanks getting dry, foams, plugged outlets
- Learn about instrumentation, measurement and control of natural gas and gas liquids in addition to gas facility maintenance
- Handle abnormal conditions such as loss of power, loss of control, loss of air, shortage of man power, foam and hydrate formation, Troubleshoot the problems
- Emphasize the importance of water content in the gas field operations and be able to review & improve gas treatment
- Know the procedure of condensate stabilization
- Apply troubleshooting and safety considerations

## Target Audience

## Who is this Training Course for?

**This BTS training course is suitable to a wide range of professionals but will greatly benefit:**

- Process engineers along with the petroleum and production engineers
- Field operators and technicians
- Other company staff involved in gas treatment and processing

- Process engineers who are new to the profession
- Managers and government officials and others involved with supervising gas processing operations
- Managers involved in the planning and development of new gas processing facilities or modifying existing facilities

## **Training Methods**

### **How will this Training Course be Presented?**

This training course will utilize a variety of proven adult learning techniques to ensure maximum understanding, comprehension and retention of the information presented. The course is designed as a blended environment of presentation; workshops; group work; practical exercises; field application/ analysis and several industry videos showing all processes; and general discussions

## **Organisational Impact**

The outcomes of the training course will improve the performance of the participants and allow them to successfully perform their job in their workplaces. They will:

- Be familiar with the theories behind the technologies of the gas processing and conditioning. That will allow the participants to successfully operate and improve the performance of the plant
- Be aware with the design conditions of the equipment. That will allow the participants to avoid any failure in the operation. They will ensure that the gas processing facilities are operated within the design conditions
- Apply the calculations to the current operating conditions of their gas plants
- Improve the problem-solving skills which allow the participant to deal with the troubleshooting of the equipment
- Understand the criticality of the impurities such as mercury in the natural gas. That will allow the participants to perform the required sampling and testing to safely operate the plant
- Identify the bottle-necking inside the gas processing facilities

# Personal Impact

The training course will improve the knowledge and skills of the participants. By the end of this training course, participants will:

- Understand the gas treatment processes: Understand gas dehydration and processing, absorption, refrigeration and fractionation
- Understanding the normal operating conditions of the plant and define abnormal conditions such as high liquid level in the separators, heat loss, foams, plugged outlets, hydrate formations. In addition, they can handle the abnormal conditions
- Have a good background of oil and gas processing and be able to understand the scope of the gas processing
- Become familiar with the transfer operations in the gas field and be able to carry-out the measurement techniques
- Acquire in-depth understanding of gas compression, natural gas, slug catcher and NGL recovery
- Apply troubleshooting and safety considerations and emphasize the importance of water content in the gas field operations and be able to review & improve gas treatment

## Daily Agenda

### Day One: Introduction to Natural Gas Processing

- Introduction to natural gas processing
- Fundamentals and of natural gas engineering
- Physical properties of natural gas
- Natural gas production
- Impurities in the gas
- Contract terms
- Heating value/ BTU (British Thermal Unit) importance
- Plant normal and abnormal conditions
- Startup and initial operation
- Natural Gas Liquid (NGL), Gas-to-Liquid (GTL), Liquefied Petroleum Gas (LPG)

### Day Two: Gas-Liquid Separation Systems

- Gas-liquid separation system
- Separators (types of separators - separator sizing)
- Common variables such as pressure, temp., flow and level
- Instrumentation, control, and measurement of natural gas and gas liquids

- Control valves & actuators
- Pressure, temperature, and level controls
- Field application of instruments
- Structured approach to the process operation
- Contaminants removal
- Process plant machinery specific plant issues
- Management, planning and control
- Startup and shutdown planning & control

### **Day Three: Mercury Removal Systems / Hydrate Problems / Dehydration of Natural Gas**

- Mercury problem in natural gas
- Process description of the mercury removal units
- Hydrate formation conditions
- Hydrate prevention and mitigation methods
- Water content estimation
- Water dew point control
- Dehydration systems and methods

### **Day Four: Dehydration of Natural Gas / NGL Recovery and Removal of Heavy Hydrocarbon**

- Glycol dehydration unit
- Process description of the TEG (Triethylene Glycol) dehydration unit
- The factors affect the TEG dehydration unit performance
- Trouble shooting of the TEG dehydration unit
- The nature of process problems affecting performance
- Removal of heavy hydrocarbons (LTS & turbo expanders systems)
- Condensate stabilization - refrigeration system - cryogenics applications – turbo-expanders

### **Day Five: Sweetening Systems**

- Removal of acid gases (H<sub>2</sub>S, CO<sub>2</sub>)
- Sweetening systems: membrane system
- Troubleshooting & problem solving
- Risk management
- Introduction to the theory of inventive problem solving
- Effect of maintenance on operation
- Managing, environment, safety and quality concern
- Case studies