

**Training Title**

**GAS PROCESSING, GAS SWEETENING & SULPHUR RECOVERY & TROUBLESHOOTING**

**Training Duration**

5 days

**Training Venue and Dates**

REF PE061	Gas Processing, Gas Sweetening & Sulphur Recovery & Troubleshooting	5	07 – 11 July, 2019	\$4,500	Dubai, UAE
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In any of the 5 star hotels. The exact venue will be intimated once finalized.

**Training Fees**

- 4,500 US\$ per participant for Public Training includes Materials/Handouts, tea/coffee breaks, refreshments & Buffet Lunch

**Training Certificate**

- Define Management Consultancy & Training Certificate of course completion will be issued to all attendees.

**TRAINING DESCRIPTION**

The Gas and Liquid Contracts that exist (or are being negotiated) will determine the objectives of the processes that you will have to incorporate into any new facility and how you have to operate any existing facility. There exists a variety of processes that will condition your Natural Gas and Hydrocarbon Liquids to satisfy the Contract requirements. The objective of this course is to make you aware of the options available to you so that you can evaluate all the processes that will satisfy your objective to determine which particular process is the best from a capital cost and operating cost perspective.

**TRAINING OBJECTIVES**

Upon completion of this course, you will gain knowledge of the processes available to process your Natural Gas and Hydrocarbon Liquid Products.

**WHO SHOULD ATTEND**

This course is designed for project managers, plant managers, plant supervisors, technical staff, and contractor personnel involved in project planning, process selection and operation of Natural Gas Production. The greatest benefit arises from considering all the processes that will accomplish your process requirements to determine which one is the best for your particular application from a capital cost and operating cost perspective. You will also be able to see which processes are available to you to de-bottleneck or modify

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existing processes. The practical techniques and examples provide useful insights that are valuable at any stage of project execution and operation.

## DAILY OUTLINE

Gas & Liquid Process Selection

Contract Terms

Basic Consideration

Gas Contracts

- ✿ Quantity
- ✿ Quality
  - o Heating Value
  - o Sulphur Content
  - o Maximum Temperature
  - o Water Content (H<sub>2</sub>O Dewpoint)
  - o Hydrocarbon Dewpoint (HCDP)
  - o Other (N<sub>2</sub>, He, Ar, CO<sub>2</sub>, Hg, O<sub>2</sub>)

Liquid Contracts

- ✿ Commercial Ethane
- ✿ Commercial Propane
- ✿ Commercial Butane
- ✿ Butane-Propane Mixes (LPG)
- ✿ Propane HD-5
- ✿ Natural Gasoline

Overall Production System

Solution Gas

Associated Gas

Non-Associated Gas

Gas Processing Module

Gas Conditioning Module

- ✿ H<sub>2</sub>O Removal (Dehydration)
- ✿ H<sub>2</sub>S & CO<sub>2</sub> Removal (Gas Sweetening)
- ✿ Nitrogen Removal
- ✿ Mercury Removal
- ✿ Oxygen Removal

NGL Extraction Module

- ✿ Products
- ✿ Absorption (Lean Oil)
- ✿ Adsorption (HRU)
- ✿ Condensation
  - o Mechanical Refrigeration
  - o Mixed Refrigerants

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- o Turbo Expander
- o Twister
- o JT Refrigeration
- Stabilization Module
- Product Treating Module

## Characterization of Natural Gas & it's Products

### Physical Properties of Pure Components

#### Ideal Gas Laws

- ✿ Boyle's Law
- ✿ Charles' Law
- ✿ Avogadro's Principle
- ✿ Dalton's Law
- ✿ Combined Ideal Gas Law

### Physical Properties of Mixtures

#### Equations of State

- ✿ Van der Waals
- ✿ Redlich-Kwong (RK)
- ✿ Soave Redlich-Kwong (SRK)
- ✿ Peng Robinson (PR)
- ✿ Benedict-Webb-Rubin-Starling (BWRS)

### Thermodynamic Properties

- ✿ Entropy
- ✿ Enthalpy

### Equilibrium Ratio (K Value)

### Separation

#### Types of Separators

- ✿ Horizontal
- ✿ Vertical
- ✿ Spherical
- ✿ Centrifugal
- ✿ Cyclone
- o Reverse Flow
- o Axial Flow
- o Recycling

#### Filter

#### Liquid Coalescer

### Water Vapour Removal (H<sub>2</sub>O Dewpoint Control)

### Water Content

- ✿ HC Liquids
- ✿ Natural Gas
- ✿ Effect of H<sub>2</sub>S & CO<sub>2</sub>

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**Hydrate Formation Temperature**

- ✿ Effect of Propane
- ✿ Effect of H<sub>2</sub>S & CO<sub>2</sub>

**CaCl<sub>2</sub> Dehydrators**

**MeOH Injection**

**EG Injection**

**IFPEX-1**

**TEG Dehydration**

**Solid Desiccant Dehydration**

**HCDP Control**

**Adsorption (HRU's)**

- ✿ 2 TOC
- ✿ 2 TCC
- ✿ 3 TOC
- ✿ 3 TCC
- ✿ 3 TOC w/TGC
- ✿ 3 TCC w/TGC
- ✿ Purge Cycle

**JT Refrigeration**

- ✿ LTX
- ✿ LTS

**Mechanical Refrigeration**

- ✿ Variations

**Twister**

**Refrigeration Compressors**

- ✿ Compression Cycle
- ✿ Single Stage
- ✿ Single Stage w/Economizer
- ✿ Two Stage
- ✿ Types
- ✿ Drivers

**Gas Sweetening**

**Terminology**

**Safety Precautions**

**Types of Contaminants**

**Process Selection**

**Chemical Reaction Processes**

- ✿ Amines
  - o Chemistry
  - o Typical PFD
  - o General Considerations

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- o Amines Used (MEA, DEA, DGA, MDEA, TEA, DIPA, Formulated Solvents)
- o Control Variable
- ✿ Caustic Wash
  - o Chemistry

NGL Extraction

Low Temperature Mechanical Refrigeration

JT Refrigeration

Refrigerated JT Expansion

Adsorption (Lean Oil)

Turbo Expander

- ✿ Typical PFD
- ✿ Solid CO<sub>2</sub> Formation
- ✿ Solid Desiccant Dehydrator
- ✿ Inlet Compression
- ✿ Gas/Gas Exchangers
- ✿ Expander
- ✿ Re-Compressor
- ✿ De-Methanizer

Gas to Liquids

Sulphur Recovery

Claus Plan

Modified Claus Plants

- ✿ Typical PFD – 3 Stage
- ✿ Process Considerations
- ✿ Mechanical Considerations
- ✿ Instrumentation

Tail Gas Clean-up

- ✿ Incineration
- ✿ Super Claus 99
- ✿ Super Claus 99.5
- ✿ SCOT

Liquid Redox

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**NOTE:**

**Pre & Post Tests will be conducted**

**Case Studies, Group Exercises, Group Discussions, Last Day Review & Assessments will be carried out.**

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