



Arabian Institute For Training

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# Process Engineering for Non-process Engineering Professionals

## INTRODUCTION

- Process engineering (also referred to as chemical engineering) is at the heart of much of the chemical, oil, gas, and petrochemical industries. The process (chemical) engineer is interested in the transportation and transformation of solids, liquids and gases, but must also be familiar with many of the other engineering disciplines including mechanical, electrical and instrumentation. Of specific importance are separation processes including distillation, heat transfer, hydraulics and fluid flow, reaction engineering, but also process control and economics. These are the fundamental principles of process engineering.
- This programme considers the areas of process engineering that are most commonly encountered, and will provide an understanding of the fundamentals to the non-specialist, and a refresher to practising engineers, with examples that will be drawn from a range of process industries including oil and gas processing, petrochemicals, chemical manufacturing.

### In this programme you will:

- Learn to interpret flowsheets and process flow diagrams
  - Develop and understand mass and energy balances in process design
  - Learn about fluid flow, pumps and compressors, and mixing
  - Discuss heat transfer equipment and their design, including heat exchangers
  - Understand distillation and separations used in oil and gas processing
  - Discuss effluent minimisation and treatment
  - Learn how to control processes
  - Perform a basic economic analysis of a project
  - Understand the safety and environmental responsibility on process engineers
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## PROGRAMME OBJECTIVES

Using case studies from the oil, gas and chemical industry to illustrate the material, participants attending the programme will:

- Learn to interpret flowsheets and process flow diagrams
- Understand the use of mass and energy balances in process design
- Gain a basic understanding of fluid flow, including pumping and mixing
- Study examples relevant to the oil and gas industry
- Design a heat exchanger and know advantages/disadvantages of different types
- Understand distillation and separations used in oil and gas processing
- Appreciate the need to control environmental pollution from industry
- Learn how to control processes
- Perform a basic economic analysis of a project

## WHO SHOULD ATTEND?

- Practising or lapsed chemical engineers wanting to refresh their fundamental knowledge
- All those working in the chemical, petrochemical, oil and process industries with a need to understand and discuss fundamental process engineering and technology issues with the process engineering specialists or other professionals
- These will include geo-scientists, petroleum engineers, production engineers, trainee process engineers, R&D chemists, plant chemists, plant operators, EHS specialists and economists
- Case studies and examples will cover a range of levels, making the programme also suitable non-technical staff.

## TRAINING METHODOLOGY

- In addition to formal lectures, videos and discussions, the participants will learn by active participation through the use of problem-solving exercises, group discussions and analysis of real-life case studies.

## PROGRAMME SUMMARY

- This programme identifies the areas of process engineering that are most commonly encountered and are fundamental to its understanding, enhancing process design and operation and enabling fruitful dialogue between the non-specialist and the engineer. Programme examples will be drawn from a range of process industries including the oil and gas processing, petrochemicals and chemical manufacturing industries.
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# PROGRAM OUTLINE

## Process Engineering Fundamentals

- Introduction
- Basic Concepts to remember
- Flow Diagrams
- Piping and Instrumentation Diagrams (P&IDs)
- Process Equipment
- Introduction to mass and energy balances
- Batch vs Continuous
- Risk Assessments and Hazard Studies
- Flammability and Electrical Area Classification
- Workshop Session

## Fluid Flow

- Pressure and Head
- Bernoulli's Theorem
- Flow of Liquids
- Reynolds number, pressure drop in pipes
- Compressible flow
- Introduction to Thermodynamics
- Principle of process relief devices and process design of relief systems
- Two-phase and Multi-phase Flow
- Pumps and Compressors
- Mixing and Mixers
- Workshop Session

## Heat Transfer

- Thermal conductivity
  - Conduction and convection
  - Insulation
  - Heat transfer coefficients
  - Heat exchangers, type and sizing
  - Chemical reactions
  - Reaction kinetics
  - Introduction to catalysis and Green Chemistry
  - Workshop session
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## Introduction To Separation Processes

- Distillation basics
- Phase behaviour and vapour / liquid equilibria
- Distillation Equipment
- Distillation Troubleshooting
- Gas / Liquid separation
- Absorption and adsorption
- Solid Liquid separation
- Air and water pollution control
- Effluent treatment
- Workshop Session

## Process Control & Economics Basics

- Measured variables
  - Simple feedback control
  - SIS and SIL
  - Process Utilities
  - Air
  - Water and cooling water
  - Steam
  - Electricity and power generation
  - Process Economics
  - Preliminary economic analysis
  - Fixed and variable costs, break even
  - Calculating raw materials usage
  - Scale up and six tenths rule
  - Estimating the cost of process equipment and plants
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