

HANDLING CHEMICALS & CHEMICAL PROCESSES

- Tips, Tricks and Tools



YOU WILL LEARN HOW TO:

- Gain the valuable know-how used by chemical engineers to troubleshoot chemical processes and process equipment
- Understand process design activities
- Design a simple plant from the ground upwards
- Understand the role of safety in a Process or Chemical Plant
- Understand the fundamentals of Chemistry, Chemical Processing and Chemical Engineering
- Understand chemical formulae, equations and process calculations
- Get an overview of Thermodynamics, Fluid mechanics and Heat transfer applications
- Understand mass transfer phenomena
- Perform simple process calculations
- Get a first hand look at a chemical disaster and learn how to avoid this

WHO SHOULD ATTEND:

- Process Development Engineer
- Industrial Engineer
- Electrical Engineer
- Mechanical Engineer
- Civil Engineer
- Control & Instrumentation Engineer
- Plastics & Material Engineers
- Maintenance Engineers
- Food Scientists
- Environmental Engineers
- Environmental Technicians
- Chemists
- Chemical Plant Operator
- Maintenance Supervisor
- Laboratory Technician
- Shift Tradespeople



THE WORKSHOP

This will provide you with practical knowledge (including tips, tricks and tools) covering the fundamentals of Chemistry, Chemical and Process engineering. It will greatly assist you in communicating more effectively with your chemical engineering colleagues. In industry, handling chemicals is considered a hazardous occupation. Chemical engineers are a trained set of specialists who have spent years in understanding the nature and behavior of chemicals and chemical process systems. If you are a non-chemical engineer we aim at bringing this knowledge to you in a two-day interactive workshop.

PRE-REQUISITES

An elementary understanding of engineering concepts such as fluid flow, heat and mass transfer is useful; however a revision will be undertaken at the commencement of the course.

Please bring a pocket calculator for solving problems during the practical sessions.

WORKSHOP OBJECTIVES

At the end of this workshop, participants will be familiar with the following aspects:

1. The fundamentals of Chemistry and Chemical Engineering (using practical tips and tools) with regards to:
 - Stoichiometry & Reaction Kinetics
 - Thermodynamics
 - Heat Transfer
 - Mass Transfer & Fluid Flow
 - Unit Operations
 - Process Control
2. Quick tips in understanding Process Design considerations for:
 - Pumps
 - Heat Exchangers
 - Reactors
 - Agitators
 - Filtration Equipment
3. Practical application of the Principles involved in Design and Process revamp
4. Troubleshooting various Processes and Process Equipment
5. Understanding why safety is of paramount importance - troubleshooting a real-life disaster

PRACTICAL SESSIONS

- Chemical formulae and equations
- Designing a chemical processing unit
- Troubleshooting a chemical disaster

THE PROGRAM

DAY ONE

INTRODUCTION: CHEMISTRY, CHEMICAL PROCESSING AND CHEMICAL ENGINEERING

STOICHIOMETRY

- Dimensions and Units
- Processes and Process Variable
- Process Data Representation and Analysis
- Basic Chemical Calculations
- Material Balance without chemical reactions
- Material Balance with chemical reactions
- Energy Balance
- Combustion

CHEMICAL KINETICS

- Basic definitions
- Kinetics of homogenous reactions
- Interpretation of batch reactor data
- Introduction to reactor design
- Single ideal reactors
- Design for single reactions
- Design for multiple reactions
- Temperature and Pressure effects
- Non ideal flow
- Mixing of fluids
- Solid-catalyst reactions
- Reactivating catalysts

FLUID MECHANICS

- Fluid statics and its applications
- Fluid-flow phenomena
- Basic equations and fluid flow
- Transportation & Metering of fluids
- Agitation & Mixing

HEAT TRANSFER & ITS APPLICATIONS

- Heat transfer by Conduction in solids
- Principles of heat flow in fluids
- Heat transfer to fluids without phase change
- Heat transfer to fluids with phase change
- Radiation heat transfer
- Heat-exchange applications
- Evaporation

MASS TRANSFER AND ITS APPLICATIONS

- Equilibrium-stage operation
- Distillation, Leaching & Extraction
- Introduction to Multi component distillation
- Principles of diffusion and Mass transfer between phases
- Gas absorption
- Humidification operations
- Adsorption
- Drying of solids

DAY TWO

CHEMICAL ENGINEERING THERMODYNAMICS

- Fundamental quantities
- First Law of Thermodynamics
- Volumetric properties of pure fluids
- Heat Effects
- Second law of Thermodynamics
- Thermodynamic properties of fluids
- Thermodynamic properties of homogenous mixtures
- Phase Equilibria
- Chemical reaction equilibrium
- Thermodynamics of flow processes
- Conversion of heat into work by power cycles
- Refrigeration & Liquefaction
- Thermodynamic analysis of processes

UNDERSTANDING A PROCESS FLOW SHEET

- Process Flow Diagrams (PFD's)
- Piping and Instrumentation Diagrams (P&ID's)
- Process Legends used in flow sheets

PROCESS EQUIPMENT DESIGN

- Design considerations
- Storage vessels
- Pressure vessels
- Reactors
- Heat Exchangers
- Evaporators and Crystallisers
- Distillation and Fractionation Equipments
- Agitators
- Filters
- Dryers

PROCESS CONTROL AND INSTRUMENTATION

- Quantities of Measurement
- Process Instrumentation
 - Temperature
 - Pressure
 - Level
 - Flow

SAFETY, THE ENVIRONMENT AND THE CHEMICAL INDUSTRY

- The Bhopal Chemical Disaster
 - Long term effects of chemical pollution
- Practical Sessions*

SUMMARY, OPEN FORUM AND CLOSING

ON-SITE TRAINING

- ✓ **SAVE** over 50% by having an IDC workshop presented at your premises.
- ✓ Customise the training to **YOUR** workplace.
- ✓ Have the training delivered when and where you need it.

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