Course Title	**Process Design and Equipment Sizing in Oil and Gas Industries**
Course Location	Worldwide in client offices
Course Description	Both Chemical and Process Engineers play a vital role in increasing the standard of plant engineering and are pivotal in developing and optimizing processing facilities. They perform design calculations and equipment sizing leading to preparing process documents (PFD, P&ID, Process Datasheets, etc.). This course focuses on the process design procedures with a particular emphasis on equipment sizing, hydraulic calculations and relief systems. Calculation methods for each part will be presented and be illustrated by selected industrial examples. The course is designed in a workshop style. The key topics of the course that will be covered are detailed below.
Audience	Process, Petroleum, Production and Operation Engineers
Prerequisites	Previous knowledge of chemical engineering is necessary. Operational or design experience in oil and gas industries would be desirable.
Course Length	5 Days
Course Materials	Hard copies of slides and a CD containing course supporting materials, including examples and other useful documents. The participants will be given a certificate indicating their participation in the course.
Course Contacts	Please email us at info@hydrafact.com
Course Contents and Daily Programme	Course content could be tailored depending on participants' background and interest. Please let us know if you wish to add anything to the course contents.

Course Content	***Day 1:***

Introduction

- What is process design in Oil and Gas industries?
- Key steps in carrying out process plant design
- Main process documents
- Tools and techniques for process simulation
- Overview of standards, codes and practices
- Defining a simple process unit to perform all calculations and design procedures

Design Procedure Outlines

- Basis of design
- Simulation
- Thermodynamic package selection
- Physical properties and Equilibrium ratio data
- Defining operating condition
- Flash calculation

- PFD development
- Equipment sizing
- P&ID development
- Line sizing and hydraulic calculation
- Relief and safety system
- Complementary calculations and documents
- Utility area

Equipment Design Procedures and Criteria

- Pressure vessels
- Vessel selection: vertical or horizontal
- Theories and equations
- Calculation procedure for vertical vapour-liquid separators
- Calculation procedure for horizontal 2-phase separators
- Calculation procedure for horizontal 3-phase separators
- Boot calculations
- Vessel internals
- Example 1: design calculations for a typical vertical separator
- Example 2: design calculations for a typical horizontal separator

Day 2:

Equipment Design Procedures and Criteria(continued)

- Fractionators and absorbers
- Type of fractionators and absorbers
- Product specifications

Course Content	

- Operating conditions
- Reflux ratio and number of stages
- Tower sizing
- Tower internals
- Design condition
- Main control loops

- Heat exchangers

- Type of heat exchanger
- Effective temperature difference
- Overall heat transfer coefficient
- Fouling resistance
- Nozzle sizing
- Design software packages
- Design considerations (allowable pressure drop, maximum velocity, overdesign factor, etc.)
- Reboiler types (Thermosiphon or kettle) and design considerations
- Condenser design considerations
- Air-cooled heat exchanger design considerations
- Design condition

- Pumps and compressors

- Pump types and selection: Reciprocating, rotary and centrifugal
- Compressor types and selection: Reciprocating, rotary, axial and centrifugal
- Design overview

Day 3:

Equipment Design Procedures and Criteria(continued)

- Storage tanks

- Type of storage tanks
- Pumping in/out rate
- Networking capacity
- Maximum capacity
- Tank overflow
- Design condition
- Example 3: design calculations for a typical atmospheric storage tank

Line Sizing and Hydraulic Calculation

- Single phase line sizing

- Two phase line sizing

Course Content	

- Pump circuits hydraulic calculation
- Suction pressure
- Net positive suction head(NPSH available and required)
- Discharge pressure
- Differential head
- Break horse power
- Shut-off pressure
- Minimum flow
- Example 4: design calculations for a typical pump circuit

- Compressor circuits hydraulic calculation
- Polytrophic efficiency
- Number of stages
- Suction pressure
- Discharge pressure
- Power
- Settle-out pressure
- Example 5: design calculations for a typical compressor circuit

Day 4:

Line Sizing and Hydraulic Calculation(continued)

- Non-pump circuits hydraulic calculation
- Tower overhead
- Gravity flow
- ΔP flow
- Reboiler circuit
- Example 6: design calculations for a typical non-pump circuit

Relief and safety system

- Definitions

- Relief scenarios
- Blocked outlet
- Cooling water failure
- Instrument air failure
- Fire

- Relief device sizing
- Back pressure
- Relief pressure
- Vapor relief
- Liquid relief

Course Content	- **Flare header sizing** - **Flare K.O. drum sizing** - Example 7: design calculations for a typical K.O. drum ***Day 5:*** **Complementary Calculations and Documents** - **Control valves and other instruments** - **Depressurization** - **Process packages** **Utility area calculations and specifications** - **Steam system** - **Cooling water circuit** - **Instrument air** - **Fuel system** - **Power generation** - **Chemical supply system** - **Drainage system**