



PE051: Integrated Design & Simulation of Chemical Processes

Training Description:

The objective of the course will be to introduce the important concepts related to process design and simulation, and, how to formulate and solve the various associated sub problems using a systematic approach.

The course will provide the participants with a good background to solve various types of process engineering (design & simulation) problems and the methods and tools that can be used to solve them.

The course will cover very briefly, issues such as detailed equipment design, costing & sizing and economic analysis. The methods and tools needed for simulation, design and analysis of continuous chemical processes producing bulk chemical (and petrochemical) products will only be covered in this course, although, some topics related to design of specialty or high value chemical products (pharmaceutical, agrochemical, aroma, etc.) will be briefly covered under separation process design and selection of solvents.

Training Objectives:

By the end of the training, participants will be able to:

- ✓ Perform process simulation using a software package
- ✓ Utilize different techniques for complex process simulation
- ✓ Complete collaboratively a preliminary process design within a given time frame
- ✓ Understand the method for generation of process flow sheets
- ✓ Understand different ways to model process flow sheets
- ✓ How to verify process design through process simulation
- ✓ Set stream temperatures and pressures; perform simple mass and energy balance
- ✓ Familiarize important design issues related to various types of distillation operations
- ✓ How to make quick design decisions for reactors plus analysis based on attainable region concept
- ✓ Obtain the base case design and the corresponding mass-energy balance for the process flow sheet
- ✓ Design of distillation columns plus exercises on design of distillation columns (ICAS-PDS plus PROII)
- ✓ verify the economic feasibility of the designed process
- ✓ Generate one design alternative that is better than the base case design

Training Designed for:

This course is intended for all Engineers, Section Heads, Managers in the field of process, production and instrumentation & control. Maintenance Personnel, Design Engineers, Chemical Engineers, Chemists, R&D, Lab Analysts, Senior Operators, Shift Controls, Shift Supervisors, Technicians, Plant Operators and those who are connected with process simulation and design.

Training Requirement:

"Hand's on practical sessions, equipment and software will be applied during the course if required and as per the client's request."

Contents can be adapted to your specific wishes. It is therefore possible to focus on specific modules of the training course as per client's learning needs and objectives. Further, it should be forwarded to us a month prior to the course dates.

Training Program:

DAY ONE:

- ❖ Pre-Test
- ❖ Introduction to Process Simulation and Design
 - Introduction to process simulation & design
 - A general overview of the important issues related to process simulation and design and their connection to chemical products will be given
 - Method for generation of process flow sheets (plus tutorial)
 - Two methods on how to generate alternative process flow sheets will be discussed
 - Process simulation – mass and energy balance
 - Introduction to PRO-II and ICAS
 - Introduction to design problem and work on design
 - Form groups and start work on the design problem

DAY TWO:

- ❖ Process Simulation: Numerical & Computational Issues
 - Modeling of process flow sheets
 - Different ways to model process flow sheets; choice of variables to specify; choice of models; degrees of freedom analysis
 - Process flow sheet decomposition (plus tutorial)
 - Methods for identifying recycle-loops and calculation order will be discussed
 - Flow sheet simulation with a process simulator (plus tutorial with ICAS & PROII)
 - How to verify process design through process simulation
 - Set stream temperatures and pressures; perform simple mass and energy balance
 - Objective would be to have a preliminary mass & energy balance completed on the simple flow sheet

DAY THREE:

- ❖ Process (Equipment/Operation) Design
 - Process design – reactor design and analysis (plus tutorial with ICAS-MoT)
 - How to make quick design decisions for reactors plus analysis based on attainable region concept
 - Process design – separation process design (plus tutorial with ICAS-Utility)
 - How to make quick design decisions for separation tasks
 - Design of distillation columns plus exercises on design of distillation columns (ICAS-PDS plus PROII)
 - Important design issues related to various types of distillation operations
 - Convert the simple flow sheet to a more rigorous version, perform a new mass-energy balance and verify if the design matches specifications

- Objective is to obtain the base case design and the corresponding mass-energy balance for the process flow sheet

DAY FOUR:

❖ **Supplementary Methods & Tools for Process Simulation & Design**

- Sizing and costing calculations
- Use of software and formula to obtain quick estimates of process equipment and operating costs
- Process analysis for environmental impact assessment (plus tutorial with ICAS)
- Use of a method to quickly evaluate the environmental impact of a process flow sheet will be discussed
- Perform economic evaluation of the base case design and also compute its environmental impact (task 5)
- Objective is to verify the economic feasibility of the designed process

DAY FIVE:

❖ **Generation of Better Design Alternatives**

- Method for selection of solvents (plus tutorial with ICAS-ProCamd)
- A computer-aided method to systematically analyze and select solvents will be discussed
- Process analysis with respect to heat & mass integration (plus tutorial with ICAS)
- Method for heat & mass integration will be discussed (only to provide an introduction to this topic and to highlight its importance)
- Generate one design alternative that is better than the base case design; make the final design conclusions; add design summary; finalize report
- Objective is to combine the results (reports)
- Review of the design problem solution and course

❖ **Course Conclusion**

❖ **POST-ASSESSMENT and EVALUATION**

Training Methodology:

This interactive training course includes the following training methodologies as a percentage of the total tuition hours:

- 30% Lectures, Concepts, Role Play
- 70% Workshops & Work Presentations, Techniques, Based on Case Studies & Practical Exercises, Gamification, Software & General Discussions
- Pre and Post Test

Training Certificate(s):

CMCT Internationally recognized certificate(s) will be issued to each participant who completed the course.

Training Fees:

TBA as per the course location - This rate includes participant's manual, hand-outs, buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Note: The 5% VAT (Value Added Tax), will be effective starting 01st of January 2018 as per the new regulation from the UAE Government. The VAT applies for all quotation both for local and abroad.

Training Timings:

Daily Timings:

07:45 - 08:00	Morning Coffee / Tea
08:00 - 10:00	First Session
10:00 - 10:20	Recess (Coffee/Tea/Snacks)
10:20 - 12:20	Second Session
12:20 - 13:00	Recess (Prayer Break & Lunch)
13:00 - 14:00	Last Session

For training registrations or in-house enquiries, please contact:

Aisha Relativo - Training & Career Development Manager

aisha@cmc-me.com / training@cmc-me.com

Tel.: +971 2 665 3945 or +971 2 643 6653 | Mob.: +971 52 2954615