Inprocess Technology & Consulting Group, S.L.
Pedro i Pons 9-11, 13th floor · E-08034 BARCELONA (Spain)
www.inprocessgroup.com

SC-DS14 - DYNAMIC PROCESS SIMULATION (PETROCHEMICALS FOCUS)

OBJECTIVES

The course content covers the basic needs of dynamics process simulation users from the petrochemical and refining industries, including the modeling of chemical reactors and of complex column configurations. The attendees will learn the fundamentals of dynamic process modeling using commercial dynamic simulators and the main differences between steady state and dynamic modeling will be introduced. Also, the necessary basic control theory will be reviewed briefly. To facilitate an efficient learning experience, all concepts will be studied based on simple & practical hands-on examples. The basic unit operations are introduced in a stepwise manner with the objective of being able to build dynamic process flowsheets by the end of the course. The use of several software functionalities will show users how to explore operating alternatives for the processing plant units that are being studied, including the setup of a Cause & Effect Matrix in the simulation model to mimic the behavior of the plant Safety System

The course has been designed to include many hands-on exercises to facilitate a more efficient and interesting learning experience. Theory is used to introduce the objectives of every module in the course as well as to help attendees to understand how the underlying calculations are performed.

PARTICIPANTS

This course is aimed at engineers who are involved in the design, control and operation of any processing facility. The workshops have been designed with an increasing complexity, in order to help in developing the attendees' learning curve. Although the workshop examples are taken from the Petrochemical industries, the acquired foundations on dynamic simulation can be applied to any process industry. Therefore, the course content is also applicable for process engineers, control engineers, safety, and environmental engineers in other industries, where dynamic process simulation is in use.

Important Note: Participants must be familiar with steady state process simulation to fully benefit from the subjects covered in this course.

CONTENTS

The concepts acquired during the course will allow engineers to build their own process simulation cases to solve problems in their daily design studies. Basing decisions on rigorous simulation results will lead to better and quicker decision making and furthermore improve confidence in the decisions taken. This course enables the attendees to use the dynamic modeling capabilities of dynamic process simulators to model and simulate typical processing facilities, showing the benefits dynamic process simulation can bring in the day-to-day engineering and operating environment.

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THREE-DAYS COURSE AGENDA

MODULE	MODULE TITLE AND SHORT DESCRIPTION	TIME	DAY
1	BASIC CONCEPTS OF DYNAMIC SIMULATION Understanding the foundations of dynamic simulation using Process Simulators: The Pressure-Flow solver; Distributed and Lumped models; Pressure nodes and flow resistances.	2 hours	Day 1
2	DIFFERENCES BETWEEN STEADY-STATE AND DYNAMIC MODELS Discussion of the main differences between the two modelling modes with regards to specifying equipment and flowsheet details. Rules for transitioning from a solved steady-state model to a dynamics one.	1 hour	
3	FUNDAMENTALS OF PROCESS CONTROL Open and closed loop. PID controllers and final control elements. Setup and modification of control strategies.	2 hours	
4	DYNAMIC MODEL OF THE FEED AND REACTOR SECTION OF A DME PLANT Development of an initial Di-Methyl Ether plant model in Steady State. Transition to Dynamics using equipment sizes, control valves, control loops, strip chart graphs, etc.	4 hours	
5	DYNAMIC SIMULATION OF THE COLUMN DOWNSTREAM THE REACTOR Expansion of the previous case by setting up a fractionation column for the reactor effluent. A control strategy will be developed to meet the quality specification for the column products.	4 hours	Day 2
6	ADVANCED SIMULATION ASPECTS OF THE DISTILLATION COLUMN The standard condenser unit of the fractionator is replaced by an expanded overhead system constituted by a cooler, a separator and a pump. The system is developed in dynamics mode. Cascade controllers as well as split range controllers will be installed. Finally, a pressure relief system is configured.	4 hours	
7	OPERATIONAL PERFORMANCE (SCHEDULING OF EVENTS) Several operational performance tests will be programmed and executed using the available tools in simulators to perturb the steady behaviour of the dynamic model. Use of the Event Scheduler.	2 hours	Day 3
8	THE CAUSE AND EFFECT MATRIX IN A DYNAMIC SIMULATION MODEL Preparation of the distillation dynamic model. Installation of the Cause and Effect matrix for safety implementation. Pump curves estimation. Implementation of disturbances with the transfer function operation.	4 hours	