Process Control for Process Engineers Using Dynamic Simulation

For Process Engineers who want to understand the fundamentals of Process Control by using practical simulation cases.
INTRODUCTION

Process Engineers are heavy users of simulation tools (HYSYS, UniSim, A+, ...) to design new processes or revamps. They mainly work in steady-state mode, but frequently they have to interact with the Control Engineers to discuss how the process will be controlled and operated. Then, many process dynamics and control concepts need to be clearly understood by the Process Engineers to effectively design the production process and their corresponding control philosophy.

Plant designs have become increasingly complex, integrated and interactive. Heat integration, process recycles and minimum hold-ups are typical design features. Whilst such designs optimize steady state operation, they present particular challenges to control and operations engineers. Clearly, the ideal solution is not to just develop a working control strategy, but also to design a process that is inherently easy to control.

Some questions answered during the course:

- How valve’s size affects the process behavior?, What problems are encountered for wrongly sized valve?
- How valve characteristics changes when it is installed?
- How to indentify process responses and non-linear behavior?
- What process parameter determines the ability of a process to reject, or attenuate, disturbances?
- Why process capacitance is good for disturbance rejection, but produces very slow response times?
- Why process Dead Time has no effect on the filtering capability of the process?
- When processes with Dead Time can cause problems in the control?
- What kind of processes can be covered with the Feedback control?
- What is the effect of filtering in the control response?
- What processes can benefit from the PID derivate action?
- How Buffer tanks/surge drums can help to isolate equipment from upstream disturbances?
- What are the limitations of the Feedback control, when the Feedforward control is recommended?

Remember that no fancy Laplace transforms or Nyquist plots are used. The importance of the course is that all questions are answered from the practical side, through the use of already built dynamic models, so attendees can additionally evaluate the usability of the tool for certain dynamic/control analysis. However, no previous knowledge of the tool is required.

COURSE AUDIENCE

The course is intended for process engineers who have been working in industry but are new to process control concepts and that need to develop an understanding of process dynamics and process control theory.

Important note: The dynamic simulation cases that will be used during the course will be given to attendees in a ready-to-work status so, no previous knowledge about dynamic simulation is required to attend this course.
COURSE OBJECTIVES

Plant designs have become increasingly complex, integrated and interactive. Heat integration, process recycles and minimum hold-ups are typical design features. Whilst such designs optimize steady state operation, they present particular challenges to control and operations engineers. Clearly, the ideal solution is not to just develop a working control strategy, but also to design a process that is inherently easy to control.

The main objectives of this course are:

- Learn the fundamental Process Dynamic concepts and practice with them.
- Learn the Basic Control theory and practice with it.
- Make use of Simulation tools (Steady-State and Dynamics) for the development of the basic control layer.
- Learn Classical Advanced Control techniques and practice with them.
- Examine the impact of equipment sizes on process behavior.
- Understand how disturbances will affect the process.
- Study various control schemes to find the best suited one for the process of interest.

TRAINING

Training is an essential element for any organization’s success. Inprocess has a commitment to quality and a reputation of excellence making sure we offer you cost-effective complete training solutions.

Courses delivered by inprocess staff have helped process technicians, engineers, and scientists to understand and apply innovative simulation techniques. We are able to offer both standard and tailored training courses using real world examples.

Inprocess offers a broad variety of training services for implementation, maintenance and updating of knowledge on process simulation technology.

Inprocess courses:

- offer training in the use of Process Simulators as well as acquiring the engineering knowledge and industry best practice to obtain the largest possible benefits from these tools
- are directed at improving your ability and confidence in the use of technology, in parallel with a deeper understanding of the processes with the object of solving industry problems as efficiently as possible.

INSTRUCTORS

The training course will be lectured in English language by experienced inprocess instructors - who accumulate several years of experience in the use of process simulation both at industry and research/university level.
**COURSE CHARACTERISTICS**

Inprocess’ Virtual Classroom courses bring together the benefits of Inprocess’ training philosophy (learn by doing) and the capabilities of online-style training. The full-time presence of the instructor during the five days of the course allows the attendees to gain a complete insight into the course concepts and simulation features, while at the same time letting them interact in a relaxed, informal way with the course instructor. With the course contents distributed over the course of a week, in an easy-to-follow format, the project experience of Inprocess’ simulation expert will facilitate the learning process of the course attendees.

*Highlights of Inprocess’ Virtual Classroom Courses:*

- **Flexibility**: Class sessions are scheduled in half-days, for a whole 5-day week, for two reasons: firstly, to avoid an excessive and mentally-exhausting concentration on training for a full day. Experience shows that the attention of the students in the last hours of the day diminishes, making this time less productive in terms of training. Secondly, because this allows students to devote part of their time to the other tasks of their daily work. As with physical classroom courses, in-house Virtual Classroom courses’ content and length can be tailored to any specific company requirements.

- **Mentorship**: For the rest of the day, when lessons are not being given, the instructor will be available to solve any doubts that the students might have and will address all questions posed by the students the following day, clarifying anything that might have remained unclear and making sure that all the main targets of the module have been achieved. This ensures that no student is left behind during their learning path.

- **Topic focus and Experience**: Inprocess’ experts, with several years of experience in using process simulation to solve engineering or operational issues, will be giving the simulation lessons, focusing in each of them on the questions that are most relevant to their daily practice (e.g. distillation, rotating equipment, heat transfer, etc.). It is worth mentioning that Inprocess is a company dedicated to helping clients in using process simulation to achieve their business objectives. Therefore, the know-how of our engineers is based on an extensive problem-solving background and not only on expertise in software functionalities and user interfaces.

- **Learning assessment**: Final tests, with questions regarding the concepts addressed during the course, are available on request. This is a useful tool for companies in order to be able to track the increase in knowledge of the attendees and to keep track of their learning curve.

*Virtual Classroom Training Characteristics*

- **Documentation** of the course sent by email and readily available for each student in the class.
- **Easy access** to the Virtual Classroom through web browser or by downloading the WebEx app in the desktop. Invitations will be sent to each attendee after enrolment on the training course is confirmed.
- **2-way screen sharing** in real time (instructor – student; student – instructor). This facilitates solutions to any doubts or questions and makes every attendee feel part of the training experience through all the questions or issues posed.
- **Chat available** to interact with the instructor and the rest of attendees in real time. This allows Inprocess to keep a record of the questions and issues raised, ensuring that no one is “left behind” while progressing in the training.
- **Full presentation control**: Drawings, comments, arrows, highlighting and many more tools are used by the instructor to focus on the different concepts explained and demonstrated during the course. These annotations can be saved as snapshots that can be made accessible to the attendees. This ensures that the most important tips, the answers to specific questions, and everything outside the scope of the training material is kept on record for the students.
- **Student station remote control**. The online connection allows the instructor (under request) to take control of the student’s workstation. This will facilitate both the troubleshooting of individual cases and specific problem solving.
# Modules Content

<table>
<thead>
<tr>
<th>Module Number</th>
<th>Module Title and Short Description</th>
<th>Time</th>
<th>Day</th>
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<tbody>
<tr>
<td>1</td>
<td>Introduction to the Dynamic Process Simulator</td>
<td>2 hours</td>
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<td>2</td>
<td>Final Control Elements</td>
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<td>3</td>
<td>Fundamentals of Process Control</td>
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<td>4</td>
<td>Process Dynamic Gain, Dead Time and Capacitance</td>
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<td>5</td>
<td>Feedback Control</td>
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<td>6</td>
<td>Controller Tuning and Practice</td>
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<td>7</td>
<td>Using Cascade Control</td>
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<td>8</td>
<td>Using Feed-Forward Controllers</td>
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<td>9</td>
<td>Using Ratio Controllers, Split-Range Controllers and Override Selectors</td>
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<td>10</td>
<td>Typical Control of Equipments</td>
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HOW TO REGISTER

To book your place at the course please, send us an email to: training@inprocessgroup.com detailing:

- Course name and dates
- Name
- Company/Department/Position
- Phone number
- email
- Short (less than 50 words) background description
- Need for proforma invoice?
- Attach the completed Appendix A that you will find at the end of this brochure

After receipt of the registration request, places will be reserved for 10 days. After payment of the course fee, the registration is firmly confirmed.

For an optimal learning experience, the number of available places is limited to 10 attendees. Please, register as soon as possible in order to ensure your participation.

COURSE VENUE

The course will be given online from Inprocess’ headquarters office:

Gran Via de Carles III, 86 (Torre Est), 9th floor 1st door
E-08028 Barcelona.

To connect to the training, once the inscription to the training is confirmed, the attendee will receive through email an invitation to the meeting with the access code and password. The attendee shall log in to the meeting with its personal email and with its full name as user.

Cisco Webex software can be downloaded for free from its website (https://www.webex.com/downloads.html/) or directly by connecting to the meeting using the browser (user will be guided the first time through a easy to follow process to log in to the meeting without the need of the installation of the software)

COURSE PRICE

This 5 day course is priced €1,650. All prices and rates quoted in this document are exclusive of taxes and duties.

PAYMENT

All bank transfers to:

Deutsche Bank
CCC: 0019 0020 9240 1029 4972
IBAN: ES17 0019 0020 92 4010294972
SWIFT: DEUTESBBXXX

Send us an email with a copy of the bank transfer to inform us about the payment (training@inprocessgroup.com)
Appendix A: Workflow for Order

Please fill in and sign the information below: Order (page 7) and email or fax to us at least 1 month before start of the training.

Please provide complete and clearly printed contact and billing details:

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<tr>
<th>Contact Information</th>
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Purchase order (number / date):

¨ is enclosed      ¨ will follow by mail

¨ my company does not require a purchase order