

Scandinavian Academy
Training Center

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# Course: Process Instrumentation: Process Control & Loop Tuning

| Code | City | hotel | Start | End | price | Language - Hours |
|---|---|---|---|---|---|---|
| CM-553SA | Alula | Hotel Meeting | 2027-03-21 | 2027-03-25 | 13950 SR | En - 25 |

## Introduction

Although the subject of many hundreds of articles, books, and courses, the basic elements of automatic process control are still widely misunderstood.  Worse, the majority of control systems are misapplied.  Research carried out by ISA and other bodies indicates that up to 75% of all loops will oscillate when operated in automatic.

This workshop, Process Instrumentation: Process Control and Loop Tuning, is designed to provide engineers and technicians with the basic theoretical and practical understanding of the process loop and how this can be applied to optimize process control in terms of quality, safety, flexibility and costs.

## Personal impact

**On successful completion of this workshop delegates will be able to:**

- understand the fundamentals of Process Control
- analyze such problems as valve hysteresis, stiction and non linearities
- fully appreciate the effects of proportional, integral and derivative control
- correctly apply both open and closed Loop Tuning according to Ziegler Nichols
- apply Lambda Tuning
- realize the effects of filtering on loop performance
- value the effect of valve sizing on control loop performance
- recognize the effect of different control algorithms on loop tuning performance
- understand cascade and feedforward control

- identify and correct problems with process dead time

## Organisational impact

Following the training and development experience provided by this workshop, participants will return to their organizations equipped with new skills and knowledge that will enable them to understand, analyse, and optimize automatic control when applied to a closed loop industrial control system.

By leveraging these skills your enterprise can expect an improvement in overall productivity, safety, and flexibility, coupled with a reduction in costs, through the ability to analyze problems and successfully tune PID loops.

## Workshop objectives

**Designed for both novice and experienced engineers and technicians, this workshop provides an insight into modern closed loop control practices through an in-depth investigation into the four basic elements of any control system:**

- the process;
- the transducer (sensing element plus transmitter);
- the final control element; and
- the controller.

**Throughout the workshop, participants will learn through active participation using exercises, questionnaires, and practical simulation sessions covering:**

- process reaction
- tuning methods
- diagnostic tools

- affect of different algorithms

## Who Should Attend ?

Professionals involved in designing, selecting, sizing, specifying, installing, testing, operating and maintaining process instrumentation and control systems

- Automation Engineers
- Chemical Engineers
- Consulting Engineers
- Design Engineers
- Electrical Engineers
- Electricians
- Installation and Maintenance Technicians
- Instrument and Process Control Engineers and Technicians
- Instrument Fitters
- Maintenance Engineers
- Mechanical Engineers and Technicians
- Operations Engineers
- Process Engineers
- Process Operators
- Production Managers
- Project Managers
- System Integrators
- Professionals with little to moderate production facility design and/or operations background
- Other professionals who want a better understanding of the subject matter

## What you will learn

- Understand the fundamentals of Process Control
- Analyze such problems as valve hysteresis, stiction and non linearities
- Fully understand the effects of proportional, integral and derivative control

- Be able to apply both open and closed Loop Tuning according to Ziegler Nichols
- Be able to apply Lambda Tuning
- Understand the effects of filtering on loop performance
- Know the effect of valve size on control loop performance
- Recognize the effect of different control algorithms on loop tuning performance
- Understand cascade and feedforward control
- Be able to identify and correct problems with process dead time

# COURSE OUTLINE

### Basic process considerations

- Definition of terms
- Process lag, capacitance and resistance
- Process reaction curve
- 1st and 2nd order reactions

### Process measurement

- Instrumentation cabling
- Do’s and don’ts
- Filtering
- Aliasing
- Reaction masking
- Sensor placement
- Correct PV
- Effect of span

### Final control element

- Choked flow
- Pressure recovery
- Flashing and cavitation

- Valve construction
- Valve characteristics
- Inherent
- Profiling
- Installed
- Cavitation control
- Actuators
- Diaphragm
- Cylinder
- Electric
- Valve positioners
- Deadband and hysterisis
- Stick slip

## Fundamentals of Process Control

- ON/OFF control
- Proportional control
- Proportional band vs. proportional gain
- Proportional offset
- Reset
- Integral action
- Integral windup
- Stability
- Bode plot
- Nyquist plot
- Derivative action
- PID control
- Control algorithms
- Load disturbances and offset
- Speed, stability and robustness

## Fundamentals of Tuning

- Basic principles
- Open loop reaction curve method (Ziegler-Nichols)
- Default and typical settings
- Closed loop continuous cycling method (Ziegler-Nichols)
- Lambda tuning
- Fine tuning
- Tuning according to Pessen
- Tuning for different applications

**Automated tuning systems**

- Self tuning loops
- Adaptive control
- Practical Session

**Advanced control algorithms**

- Cascade systems
- Feedforward and combined systems
- Ratio control
- Adaptive control systems
- Dead time compensation

**The Scandinavian Academy for Training Center** adopts the latest scientific and professional methodologies in training and human resource development, aiming to enhance the efficiency of individuals and organizations. Training programs are delivered through a comprehensive approach that includes:

- Theoretical lectures supported by PowerPoint presentations and visual materials (videos and short films).
- Scientific evaluation of participants before and after the program to measure progress and knowledge acquisition.
- Brainstorming sessions and practical role-playing to simulate real-life scenarios.
- Case studies tailored to align with the training content and participants work nature.
- Assessment tests conducted at the end of the program to evaluate the achievement of training objectives.

Each participant receives the training material (both theoretical and practical) in printed form and saved on a CD or flash drive. Detailed reports, including attendance records, final results, and overall program evaluations, are also provided.

Training materials are prepared professionally by a team of experts and specialists in various fields. At the end of the program, participants are awarded a professional attendance certificate, signed and accredited by the Scandinavian Academy for Training Center.

**Program Timings:  9:00 AM to 2:00 PM**

**The program includes:**

- A daily buffet provided during the sessions to ensure participants comfort.
- A closing ceremony on the final day to distribute certificates and celebrate participants achievements.
- **Note: All prices are exclusive of 15% Value Added Tax (VAT).**

# Our Success Partners

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