

PRACTICAL PROCESS CONTROL FOR ENGINEERS AND TECHNICIANS



YOU WILL LEARN HOW TO:

- Understand the fundamentals of process control and new techniques
- Tune PID control loops
- Correct stability problems
- Understand cascade loops and feed-forward control
- Identify and correct problems with dead time in the process

WHO SHOULD ATTEND:

- Instrumentation and control engineers
- Building service designers
- Automation engineers
- Control technicians
- Electrical technicians
- Instrumentation technicians
- Process operators
- Electrical engineers
- Electricians
- Maintenance engineers
- Process engineers
- Consulting engineers
- DCS personnel
- Energy management consultants

Those involved in the design, implementation and upgrading of industrial control systems.



The Workshop

This practical two-day workshop covers all the essentials of process control and tools to optimise the operation of your plant and process, including the ability to perform effective loop tuning.

Practical process control is aimed at engineers and technicians who wish to have a clear, practical understanding of the essentials of process control and loop tuning, as well as how to optimise the operation of their particular plant or process. These persons would typically be primarily involved in the design, implementation and upgrading of industrial control systems. Mathematical theory has been kept to a minimum with the emphasis throughout on practical applications and useful information.

Pre-requisites

Knowledge of basic electrical concepts would be useful.

Practical Sessions

This is a practical, hands on workshop enabling you to work through practical exercises which reinforce the concepts discussed.

The Program

BASIC CONTROL CONCEPTS

- Typical manual control
- Feedback and feed-forward control
- Block diagrams

INTRODUCTION TO SENSORS AND TRANSMITTERS

- Selection and specification of devices
- Pressure transmitters
- Flow meters
- Level transmitters
- Temperature sensors

INTRODUCTION TO CONTROL VALVES

- Basic principles
- Rotary control valves
- Ball valves
- Control valve characteristics and specifications

BASIC PRINCIPLES OF CONTROL SYSTEMS

- On/off control
- Modulation control
- Principle of closed loop control
- PID control modes

Practical Session

STABILITY AND CONTROL MODES OF CLOSED LOOPS

- Cause of instability in control loops
- Change of stability through PID control modes
- Methods to improve stability
- Principles of closed loop control tuning

Practical Session

DIGITAL CONTROL PRINCIPLES

- Principle of incremental control algorithms
- Identifying control blocks in the time and frequency domain
- Multiple outputs through digital algorithms

Practical Session

IDEAL PID VS REAL PID

- Non-field-interactive or ideal PID
- Field-interactive or real PID
- Distinguish between process noise and instability
- Selection of ideal or real PID

Practical Session

TUNING OF CLOSED LOOP CONTROL

- Tuning constants calculation according to Ziegler and Nichols
- Open loop tuning procedure
- Closed loop tuning procedure
- Damped oscillation tuning method
- Fine tuning of practical control loops
- Tuning considerations for controllers with saturation and non-saturation output limits

Practical Session

CASCADE CONTROL

- Equation types for cascade control
- Initialisation and PV – tracking
- Use of multiple outputs in cascade control
- Tuning procedure for cascade control

Practical Session

FEED-FORWARD CONTROL

- Feed-forward balance – a control concept
- Tuning procedure for feed-forward control

Practical Session

COMBINED FEEDBACK AND FEED-FORWARD CONTROL

- Concept of combined control with incremental algorithms
- Tuning procedure for combined control

Practical Session

LONG DEAD-TIME IN CLOSED LOOP CONTROL

- The problem of long dead-time in closed loops
- Use of process simulation for process variable prediction
- Tuning procedure for control loops with long dead-time

Practical Session

ALARM HANDLING AND PROCESS SECURITY

RANGE OF CONTROL AND INSTRUMENTATION IN INDUSTRIAL PROCESS CONTROL

INTRODUCTION TO STATISTICAL PROCESS CONTROL

- Introduction in the use of statistics in process control
- Standard deviation: static value alarm

Practical Session

PRACTICAL APPLICATIONS

- Tools of statistical process control
- PLC systems
- Stand alone loop controllers

Practical Session

EXPERT SYSTEM AND MODEL BASED SELF TUNING CONTROLLERS

- Basis auto tuning
- Expert system control
- Model based adaptive control

SUMMARY, OPEN FORUM AND CLOSING

