

PRACTICAL PROCESS CONTROL FOR ENGINEERS & TECHNICIANS

OBJECTIVES

At the end of this workshop participants will be able 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 and Instrumentation Technicians
- ◆ Energy Management Consultants
- ◆ Electrical Engineers Electricians
- ◆ Maintenance Engineers Process Engineers
- ◆ Consulting Engineers DCS Personnel

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

PRESENTER

CHRIS WILLIAMSON BIT, BSc., DipEE, Senior Process Control Engineer

Chris has worked in the instrumentation and control environment for the past fifteen years focusing on instrumentation, process control and PLCs. Although eventually obtaining his degree, he commenced work as a licensed electrician and gained valuable practical electrical experience on a hands-on basis.

He has worked on and project managed numerous applications for industry such as automation of the water supply for a town, an energy management system and PLC programming assignments for a number of mining applications. He has also developed numerous courses ranging from PLC Programming and Development and electrical contracting, an enthusiastic and knowledgeable instructor in the area of instrumentation and automation



Technology Training that Works

PROGRAM

BASIC CONTROL CONCEPTS

- ◆ Typical manual control
- ◆ Feedback and feedforward 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
- ◆ (Commence 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

- ◆ Feedforward 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, FEED-BACK & CLOSING