

ABOUT THE INSTRUCTOR

Myke King is a consultant operating independently of any supplier or implementer of control technology

Developer and presenter of Whitehouse Consulting's training courses in process control

Specialties:

- APC (advanced process control) benefits studies, technology selection and project support
- Process control troubleshooting/improvements
- Training in process control from basic techniques, through advanced regulatory control up to multivariable control and real-time optimization

MYKE KING PUBLICATION : PROCESS CONTROL - A PRACTICAL APPROACH

This book was developed from Whitehouse Consulting's well-known training courses. It presents process control design techniques that have an immediate practical application. The theory, originating in the academic world and found daunting by most control engineers, is kept to a minimum.

The book takes a back-to-basics approach. The use of proprietary MPC packages is widespread. Control engineers have invested thousands of man-hours in the necessary plant testing and commissioning. Improving the basic controls is not usually an option once the MPC is in place. Thus poor basic control remains the status quo and becomes the accepted standard to the point where it is not addressed even when the opportunity presents itself. This book raises the standard of what might be expected from the performance of all controllers.

The book is valuable not only to those involved in the implementation of process control but to others, such as process and mechanical engineers, who are involved in the design or support of process plant.

Course Overview

The practical application of advanced control can have a significant impact on process performance. In many processes it can double profitability. Course delegates will learn not only the importance of process control but also how it is applied. Successful implementation depends also on the awareness of others of the benefits and the efforts involved in installation. The courses are of value not only to those directly involved in implementation but also to process management and other technical support groups who have responsibility for maintaining and improving process profitability. Delegates would include control engineers, process engineers, mechanical engineers, instrument engineers, instrument technicians and plant supervisors.

The courses stress the practical application of basic and advanced control techniques, using the minimum of control theory. They comprise a number of relatively short classroom sessions each followed by more lengthy 'hands-on' work. Delegates work in small groups on a process simulated on a PC.

Course offered in two classes, each with 5 days duration:

1. Myke King's Process Control
Advanced Process Control Techniques – Part 1
2. Myke King's Process Control
Advanced Process Control Techniques – Part 2

Course Syllabus

Myke King's Process Control
Advanced Process Control Techniques – Part 1
5 days

Basic Control Techniques

Process Dynamics
PID Control
Signal Conditioning
Level Control
Feed forward Control

Advanced Control Techniques

Dead time Compensation
Non-linear Control
Constraint Control

Myke King's Process Control -Advanced Process Control Techniques – Part 2
(5 days)

Compressor Control**Steam Boiler and Fired Heater Control****Distillation Column Control**

DETAILED COURSE SYLLABUS #1

Myke King's Process Control - Advanced Process Control Techniques – Part 1 (5 days)

I. BASIC CONTROL TECHNIQUES

I.1. Introduction

- course introduction
- benefits of improved control
- regulatory control
- constraint control
- closed loop optimization
- terminology
- hierarchy of control
- case study description

I.2. Process Dynamics

- process gain, dead time and lag
- concept of order
- simplifying approximations
- obtaining dynamics from plant tests
- linearity
- non-self-regulating process

I.3. PID Algorithm

- development of control algorithm
- tuning by trial and error
- tuning criteria
- published tuning methods
- tuning for set point and load changes
- use of proportional on PV algorithm
- manipulated variable response
- cascade control
- split-ranging and dual acting control
- anti-reset windup

I.4. Signal Conditioning

- linearization
- pressure compensation of distillation temperatures
- dealing with steam drum "swell"
- gas flow compensation
- heating value compensation
- filtering noise
- impact on controller tuning

I.5. Level Control

- importance of correct level control
- tight versus averaging control
- determining vessel working volume
- tuning methods
- error squared algorithm
- gap control
- linearity
- problem of noise

I.6. Feed forward Control

- use and advantages
- ratio and bias algorithms
- types of decoupler
- tuning feed forward controller
- impact on feedback controller
- compensation for changing process gain
- dealing with noise
- manipulated variable movement

II. ADVANCED CONTROL TECHNIQUES

II.1. Dead time Compensation

- use of predictive techniques
- Smith Predictor
- Dahlin Algorithm
- Internal Model Control (IMC)
- tuning
- impact of modeling error
- limitations

II.2. Non-linear Control

- limitations of linear algorithms
- gain scheduling
- programmed adaptive control
- process variable linearization
- application to pH control

II.3. Constraint Control

- types of constraint
- PID based techniques
- single input, single output controllers
- multi-input, multi-output controllers
- use of signal selectors
- incremental versus full position algorithms
- 2x2 decoupling
- multivariable techniques

II.4. Inferential Properties

- why inferential are needed
- regressed versus 'first principle' models
- regression techniques
- data requirements
- handling process dynamics
- incorporating process engineering knowledge
- bias updating
- measuring performance

II.5. Optimization

- economic justification
- optimizer structure
- steady state detection
- process model development
- impact of model errors
- output conditioning
- use with constraint control
- available technologies

II.6. Project Execution

- how to determine the benefits of improved control
- introduction to multivariable control and the common pitfalls
- ensuring the basic controls are working well
- work involved in developing inferential properties
- use of on-stream analyzers
- monitoring the performance of all aspects of process control
- organizational impact
- performance guarantees
- vendor selection
- safety considerations
- management of design and commissioning
- post-commissioning work

DETAILED COURSE SYLLABUS #2

Myke King's Process Control - Advanced Process Control Techniques – Part 2 (5 days)

I. Steam Boiler and Fired Heater Control

- process description
- fuel gas flow compensation
- fuel gas heating value compensation
- total duty control with dual firing of oil and gas
- steam drum swell and inverse response
- 3-element steam drum level control
- flue gas oxygen and CO control
- cross-limiting control
- feed forward on feed rate and feed enthalpy
- heater pass-balancing
- steam header pressure control
- basic thermodynamics
- steam system optimization
- Compressor Control
- compressor types
- polytropic head
- equal percentage and quick opening valves
- discharge throttling
- inlet guide-vanes
- speed control
- anti-surge and surge recovery control
- multi-compressor balancing

II. Compressor Control

- compressor types
- polytropic head
- equal percentage and quick opening valves
- discharge throttling
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- anti-surge and surge recovery control
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III. Distillation Control

III.1. Process Technology

- mechanism of distillation
- vapour pressure
- relative volatility
- azeotropes
- key components
- feed quality "q"
- cut and separation
- impact of column design
- modeling correlations
- adjusting product composition

III.2. Basic Controls

- control problems
- maintaining the energy balance
- column pressure control
- condenser duty control
- internal reflux control
- flooded condenser

- hot gas bypass
- inverse response problems
- manipulation of vapour rate
- use of split range control
- maintaining mass balance
- energy versus material balance schemes
- Rijskamp scheme
- overcoming reflux drum lag
- tuning the drum level controller

III.3. Composition Controls

- temperature profile
- locating tray temperatures
- choice of manipulated variable
- pressure compensation
- cut and separation models
- inferential properties
- feed forward on feed rate
- feed forward on feed enthalpy
- feed forward on feed composition
- sigma-T/delta-T control
- steady state decouplers
- relative gain analysis
- dynamic decoupling
- on-stream analyzers
- towers with side streams
- multivariable control packages
- technology suppliers

III.4. Optimization

- available variables
- common constraints
- benefits
- available technologies
- flooding protection
- pressure minimization
- energy-yield optimization

For further information regarding this course please contact:

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