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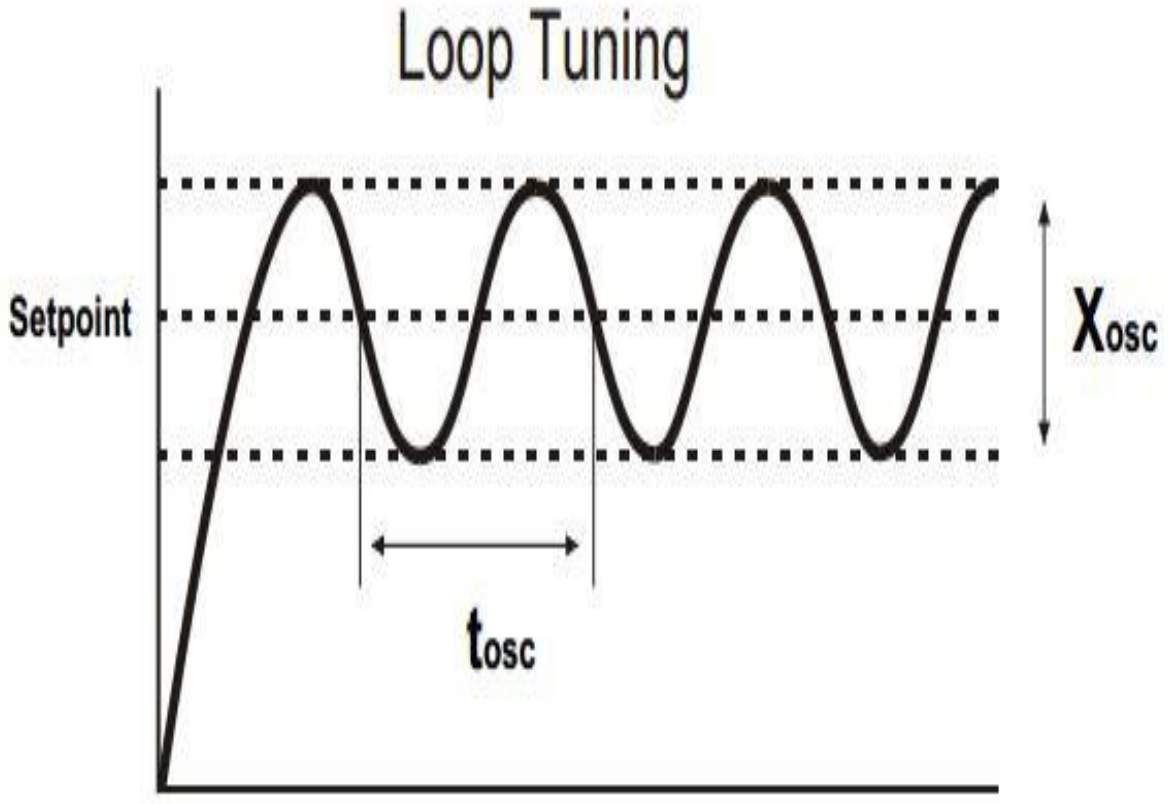
Tuning Control Loops And review the Feedback



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Tuning Control Loops And review Feedback

Course Objective

- Explain the fundamentals of controller gain or proportional band, integral and derivative actions and the application of each
- Explain the operation of the components in a closed loop control system including static and dynamic functions
- Identify the requirements for open loop and closed loop stability
- Use three methods to tune a control system for stated quality control
- Understand the functions of cascade control loops and the advantage of cascade control over single element feedback control
- Tune a cascade control loop for optimum control
- Understand the principles and design features of feedforward control
- Tune a feedforward control system for optimum control
- Identify the advantages of feedforward control over feedback control
- Understand the operation and function of ratio control systems
- Tune ratio control systems
- Tune a controller by trial and error
- Improve on the trial and error method by using analytical methods
- Apply the ultimate sensitivity tuning method to properly tune feedback controllers

- Determine tuning constants by using procedures to improve as found settings
- Run response curves on a process
- Measure gain, dead time and process lag of a process
- Determine what controller gain or proportional band, integral, and derivative actions are best to control this process
- Understand the difference between set point change and load change
- Identify when tuning changes may be needed for improved control and state reasons for this
- Recognize when advanced controls are beneficial
- Explain feedforward control and list the benefits
- Run plant tests to determine feedforward relationships
- Calculate the feedforward constants
- Explain what adaptive or scheduled gain is and its benefits
- Calculate adaptive gains for non-linear processes
- Explain the function and operation of dead time compensators
- Tune dead time compensators
- Use different methods to improve control of processes with dead time
- Identify when process changes may be needed for improved control

Target Audience

- Plant Operators
- Operation Engineers
- Process and Utility Supervisors
- Project Engineers & Technicians
- Technical Supervisory

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Course Outline

- Control Modes: Proportional, Integral and Derivative
- Dynamic and Steady State Considerations: Gain, Dead Time and Time Constant
- Tuning Control Systems: Closed Loop Tuning Using Ziegler Nichols Method, Evaluation and Control Criteria
- Cascade Control: Primary Loop, Secondary Loop, Design and Tuning Criteria
- Ratio Control: Applications and Implementation
- Feedforward Control: Criteria, Applications, Tuning, Implementation, Material and Energy Balances
- Safety Concerns and Procedures when Operating Control Systems
- Relationship of Controller and Process: Four components in a closed loop system, Interaction of changes of each component, and Benefits of Good Control
- Rules for Improved Trial and Error Tuning
- Analysis of Closed Loop System: Tuning Using Oscillation Techniques
- Analysis of Open Loop System: Tuning Using a Response Curve Generated by a Step Change, Tuning Using a Response Curve Produced by a Load Change, and Working with Unusual Response Curves
- Process Characteristics and Related Tuning Requirements
- Understanding Changes that may be Required in the Process and Suggest Alternative Methods
- Relationship of Controller and Process: Various Parts of Processes and Interaction of these Parts

- Description and Benefits of Feedforward Controllers: Tests Required to Obtain Feedforward Constants, Calculation of the Feedforward Constants
- Description and Benefits of Adaptive or Scheduled Gain: Methods to Tune Controllers with Adaptive Gain. Use of Adaptive Gain to Provide Control of Non-linear Processes. Using Adaptive Gain to Provide Special Effects. Limits, Step Changes, Transmitter Failure Protection, Surge Control, etc.
- Analysis of Processes with Excessive Dead Time: Dead Time Compensatory. Tuning Dead Time Processes with PID only. Small Changes to a Process to Provide Improved Control
- Application of Error Squared Controllers for Level Control.
- Understanding Changes that may be Required in the Process
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