MERCURY

Process Control of Chemical Engineering Operations in Oil & Gas Industry

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Process Control of Chemical Engineering Operations in Oil & Gas Industry

Course Content:

Unit 1: Introduction to Chemical Engineering Controls:

- Overview of chemical engineering process control background
- The objectives of control
- Definitions & terminology
- Design methodology for process control
- Failures in process control; case studies of three major disasters
    - Bhopal case
    - Three Mile Island case
    - Texas city case
- Current significance:
    - Introduction
    - Automation
- Introduction to distributed control system DCS:
    - Control system hardware

Unit 2: Modeling Basics:

- Verbal modeling:
    - Process description
    - Control specifications
    - Connections
    - Prerequisite information regarding a process
    - Step-by-step method for describing controls and their purpose
    - Alternative method of verbal modeling
    - The Barkel method of verbal modeling
- Degrees of freedom:
    - Importance
    - Calculation procedure
    - Applications
- Incidence graphs:
    - Introduction
    - Monotonicity
    - Consistent graphs
    - Inconsistent graphs
    - Partially consistent graphs
    - Sensors & Actuators
- Measurement devices:
    - Industrial applications
    - Temperature control: thermocouples
    - Pressure control: pressure switch
    - Composition control: ratio control
    - Level control: level switches
    - Flow control: flow meres
- Temperature sensors:

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    - Thermometers
    - Residence temperature detectors
    - Thermocouples
    - Pyrometers
- Temperature regulators:
    - Regulator structure
    - Regulator operation
    - Types of temperature regulators
    - Resistance temperature detectors
- Pressure sensors:
    - Sensor selection criteria
    - Process
    - Environment
    - Pressure range
    - Sensitivity
- Pressure measuring methods:
    - Height of liquid methods
    - Elastic distortion
    - Electrical methods
- Types of sensors:
    - Elastic sensors
    - Electric sensors
    - Differential pressure cells
    - Vacuum sensors
- Semi-batch reactor problem:
    - Shutdown point
    - Types of semi-batch reactor sensors
- Level sensors:
    - Visual level sensors
    - Common uses
    - Benefits of visual level sensors
    - Restrictions
    - Sight tube indicators
    - Float type level sensors
    - Buoyancy types
    - Static types
    - Formulas
    - Valve-based level sensors
- Electrical level sensors:
    - Conductive level sensing
    - Capacitance level sensing
    - Radiation-based level sensors
    - Flow sensors
    - Ultrasonic flow meters

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Unit 3:Mathematics for Control Systems

- Measurement devices:
    - Dirac delta
    - First-order differential equations
    - Second-order differential equations
    - Optimization

- **Unit 4:Optimization:**
    - Definition
    - Engineering application
    - Optimization across an organization
    - Optimization design
    - Constraints
    - Optimization situations
    - Real-time optimization
    - Industry experience
    - Pilot plant experience
- Linear optimization:
    - Introduction
    - characteristics
- Non-linear optimization:
    - Introduction
    - Quadratic optimization
    - Iterative methods
    - Applications