Training Program:

Practice in PID Control Loop Tuning and & Analysis

INTRODUCTION:

This programme takes an in-depth look at closed loop control. Although the subject of many hundreds of articles, books, and courses, the basic elements of automatic process control are still widely misunderstood. Worse, the majority of control systems are misapplied. Research carried out by ISA and other bodies indicates that up to 75% of all loops will oscillate when operated in automatic.

WHO SHOULD ATTEND?

- Professionals involved in designing, selecting, sizing, specifying, installing, testing, operating and maintaining process instrumentation and control systems
- Automation Engineers
- Chemical Engineers
- Consulting Engineers
- Design Engineers
- Electrical Engineers
- Electricians
- Installation and Maintenance Technicians
- Instrument and Process Control Engineers and Technicians
- Instrument Fitters
- Maintenance Engineers
- Operations Engineers
- Process Engineers
- Process Operators
- Production Professionals
- Project Professionals
- System Integrators
- Other professionals who want a better understanding of the subject matter

COURSE OBJECTIVE:

- This workshop is designed to provide engineers and technicians with the basic theoretical and practical understanding of the process loop and how this can be applied to optimize process control in terms of quality, safety, flexibility and costs.

COURSE OUTLINE:

Basic process considerations

- Definition of terms
- Process lag, capacitance and resistance
- Process reaction curve
- 1st and 2nd order reactions

Process measurement

- Instrumentation cabling
- Do's and don'ts
- Filtering
- Aliasing
- Reaction masking
- Sensor placement
- Correct PV
- Effect of span

Final Control Element

- Choked flow
- Pressure recovery
- Flashing and cavitation
- Valve construction
- Valve characteristics
- Inherent
- Profiling
- Installed
- Cavitation control
- Actuators
- Diaphragm
- Cylinder
- Electric
- Valve positioners
- Deadband and hysterisis
- Stick-slip
- Testing procedures and analysis
- Effect of valve performance on controllability

Fundamentals of Process Control

- ON/OFF control
- Proportional control
- Proportional band vs. proportional gain
- Proportional offset
- Reset
- Integral action
- Integral windup
- Stability
- Bode plot

- Nyquist plot
- Derivative action
- PID control
- Control algorithms
- Load disturbances and offset
- Speed, stability and robustness
- Proportional band vs. proportional gain
- Proportional offset
- Reset
- Integral action
- Integral windup
- Stability
- Bode plot
- Nyquist plot
- Derivative action
- PID control
- Control algorithms
- Load disturbances and offset
- Speed, stability and robustness

Fundamentals of Tuning

- Basic principles
- Open loop reaction curve method (Ziegler-Nichols)
- Default and typical settings
- Closed loop continuous cycling method (Ziegler-Nichols)
- Lambda tuning
- Fine tuning
- Tuning for load rejection vs. set-point rejection
- Tuning according to Pessen

- Tuning for different applications
- Speed of response vs. robustness
- Surge tank level control
- Automated tuning systems
- Self tuning loops
- Adaptive control
- Advanced control algorithms
- Cascade systems
- Feedforward and combined systems
- Ratio control
- Adaptive control systems
- Dead time compensation
- Fuzzy logic control