

# SC-APC-200 SAHOMA CONTROLWARE, LLC

## Advanced Process Control, PID Tuning & Beyond

### Course Description

The DCS and PLC have many powerful features that still remain under-utilized. This course shows you how to tune PIDs and build powerful optimizing controllers inside the DCS or PLC. During the course, we use several industrial process control software products - Pitops, Simcet, Process Control CBT and ACSII.

The course assumes that attendees have completed SC-PID-100 course (SC-PID-100 is a prerequisite for this SC-APC-200 course).

Attendees use real time-series plant data and identify multivariable closed-loop/open-loop dynamics. Then they build various control schemes all inside Pitops software – cascade, constraint override, maximizing and minimizing constraint controllers, selectors, model-based controllers, dead-time compensators and many others.

This course is designed more for engineers but also will offer tremendous value to operators, technicians and supervisors. Software products used in this course are so very easy to use that the course can be comfortably followed by even new and inexperienced technicians. This course also covers advanced functions of PID controllers in more detail.

### Learning Outcomes

At the end of the course, attendees will be able to study a process and its P&IDs and talk to the right people in the plant or control room and then design and build powerful controllers in the DCS/PLC. Attendees will become skilled in PID tuning, feedforward implementation, and parameter specification for all types of controllers in the DCS/PLC.

Further, using scientific process control methods and software products they will be able to calculate tuning and other DCS parameters precisely, thus eliminating guesswork and generating precise, optimized control action.

The course also trains attendees how to be careful while activating and commissioning new control schemes, avoiding mistakes and starting up a control chain in the right sequence.

This course is all you will ever need to use the full potential of the DCS or PLC and build powerful new controllers to stabilize plant operation, push against economic, market, process and equipment constraints. Attendees will also learn when to use traditional advanced control and when to use multivariable model predictive control, a very practical and useful skill.

### Duration:

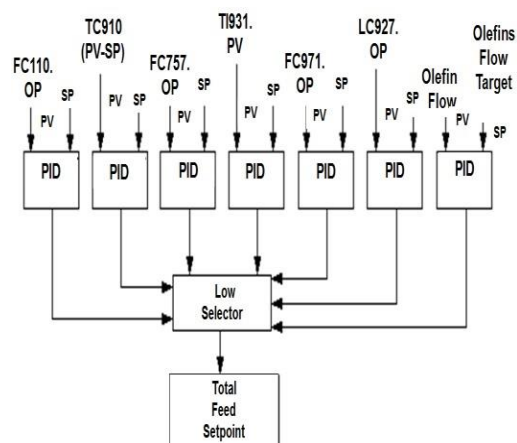
- 2 Days (Classroom)
- 3 Days (Online)

**Audience:** Process Control Engineers, Advanced Process Control Engineers, Instrument Engineers, Lab Technicians, DCS/PLC Technicians, Managers and Supervisors

**Prerequisites:** SC-PID-100 (2 Day Course, 2-Year or 4 Year Degree in Engineering or Operations. 6-12 Months of Plant/Engineering experience is desirable, but not required.

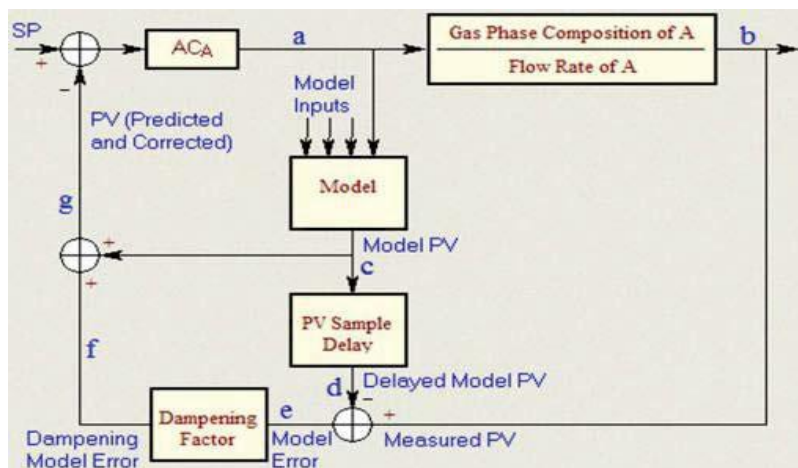
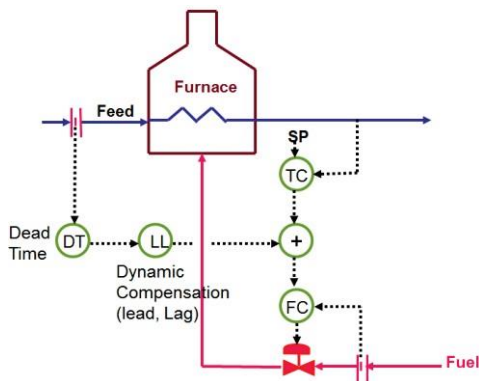
### Course Cost:

- Classroom (\$2,500.00/Student)
- Online (\$1,500.00/Student)



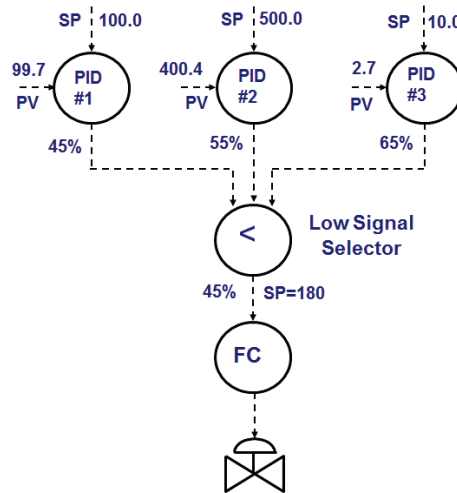
## Day 1

- Process Control Hierarchy
- Advanced Process Control (APC) Options and Strategies
- Need for Automatic Process Control
- Benefits of Process Control
- How to Maximize Throughput and Minimize Utilities using APC
- Feedforward Control Theory and Calculations
- Feedforward Lab Session using Pitops
- Decoupler Strategies
- Advanced Cascade Control
- Cascade Control Lab Session Illustrating an AC-TC Triple Cascade
- Cascade Control Tuning Guidelines
- Constraint Override Selector Control Procedures and Calculations
- How to build correct DCS Configuration for Long Chain Control Schemes
- Startup and Chain Activation Procedures in the DCS
- Practical Rules and Tips for PID and APC Schemes



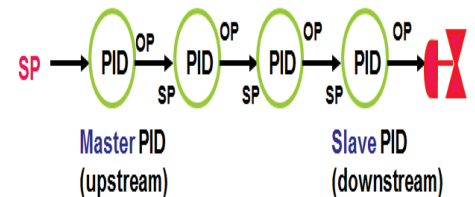
## Day 2

- Model-based Control
- Bias Update for Automatic Control
- Closed-Loop Dynamics
- GC-based Online Correction, PV Sample Hold
- Using Rigorous Models for Closed-Loop Advanced Control with PID Integration
- Dead-Time Compensation
- Internal Model-Based Control and Lab Session Internal Model-Based Control
- Identifying Process Dynamics based on Operator Experience and Knowledge
- Identifying Process Dynamics based on DCS Trends and Historical Data
- Continue Lab (Practical) Sessions on System Identification and Tuning Optimization



## Day 3

- Identification of SISO Closed-Loop Process Transfer Functions
- Multi-Input Closed-Loop Transfer Function Identification
- Identifying Process Dynamics based on analyzing actual Time-Sampled Data
- Lab Session using Pitops to identify first and second order transfer functions using real plant data
- Use Pitops to identify multivariable transfer functions using real plant data in closed-loop mode
- Model-Predictive Control
- When to use PID, Cascade PID, Advanced Regulatory, DMC, RMPCT, Rule-Based Control
- Identifying, Debugging and Troubleshooting PID Tuning and Process Control Problems
- Online PID/APC Control Quality Monitoring and Reporting
- Online Oscillation Detection and Online Control Sluggishness Detection
- PID Control Quality Alerting to Smartphones for Improved Proactive Maintenance



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