

APC200: Advanced Process Control, PID Tuning and Beyond

Duration:	3 Days Classroom or 21 hours Online
Audience:	Process Control Engineers, Advanced Process Control Engineers, Instrument Engineers, Lab Technicians, DCS/PLC Technicians, Managers and Supervisors.
Prerequisites:	PID100, 2-year or 4-year degree in engineering or operations. A few months of plant/ engineering experience is desirable, but not required.
Course Material:	Software Products used in Course - Pitops, Simcet and Training Slides.

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 ACSSI.

The course assumes that attendees have completed PID100 course (PID100 is a prerequisite for this APC200 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. PiControl 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.

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