

PICONTROL SOLUTIONS, LLC

**PROCESS CONTROL
TRAINING COURSES**

**PROCESS CONTROL, ADVANCED PROCESS CONTROL, PID TUNING,
PROCESS CONTROL MONITORING AND OPC COMMUNICATIONS**

LATEST RELEASE

PICONTROL TRAINING COURSES

INTRODUCTION

PiControl Solutions is a modern, premier, advanced control, PID tuning and OPC software applications company. PiControl develops software products, novel, revolutionary control algorithms and also provides training services. PiControl is geared to serve today's industrial needs specifically focused on the control room environment. Many new plants are being built all over the world today. Even more are in operation today. New and young operators and engineers enter the control rooms every year. These young and smart personnel come from diverse academic, vocational and professional backgrounds. They need focused and practical training not available in academic and vocational institutes. Furthermore, certain aspects of experience and knowledge can come only with time. PiControl Solutions has developed powerful, practical training courses in industrial process control and process technology with the following emphasis and goals:

1. Course material easy to understand and master.
2. Value to engineers, technicians, supervisors and managers alike.
3. Focus on relevant practical and high value topics.
4. Transform a novice into a skilled person with numerous years experience in just a week or two of focused training.

PiControl Solutions, LLC is pleased to inform you about the following industrial training courses offered at the locations listed below:

Course Locations:

1. Houston, TX, USA
2. New Jersey, USA
3. Saudi Arabia, Middle East
4. Cairo, Egypt
5. UAE, Middle East
6. Mumbai, India
7. Budapest, Hungary
8. Seoul, South Korea
9. At your plant site, conference center near you or web-based (online)

Note: Not all courses are offered at all locations.

Send an email to info@PiControlSolutions.com for details and specific information.

To register, go to www.PiControlSolutions.Com, then click on Training and then click on Register.

Course Number and Name:

CLASSROOM COURSES:

- APC100:** PID Tuning Certification and Primary Process Control
- APC200:** Advanced Process Control, PID Tuning and Beyond
- APC300:** Control Quality Performance Monitoring and Adaptive Control
- APC400:** Hands-on DCS Training for Control Room Operators
- APC500:** Industrial OPC Software for Communications and Control

ONLINE WEB-BASED COURSES:

- APC200X:** 11:30 AM – 1:30 PM (USA-CST) -4 consecutive days
Advanced Process Control, PID Tuning and Beyond
- APC200Y:** 9:30 PM – 11:30 PM (USA-CST) -4 consecutive days
Advanced Process Control, PID Tuning and Beyond
- APC300X:** 11:30 AM – 1:30 PM (USA-CST) -3 consecutive days
Control Quality Performance Monitoring and Adaptive Control
- APC300Y:** 9:30 PM – 11:30 PM (USA-CST) -3 consecutive days
Control Quality Performance Monitoring and Adaptive Control
- APC400X:** 11:30 AM – 1:30 PM (USA-CST) -2 consecutive days
Hands-on DCS Training for Control Room Operators
- APC400Y:** 9:30 PM – 11:30 PM (USA-CST) -2 consecutive days
Hands-on DCS Training for Control Room Operators
- APC500X:** 11:30 AM – 1:30 PM (USA-CST) -2 consecutive days
Industrial OPC Software for Communications and Control
- APC500Y:** 9:30 PM – 11:30 PM (USA-CST) -2 consecutive days
Industrial OPC Software for Communications and Control

APC100:

PID Tuning Certification and Primary Process Control Training

DURATION:	2 DAYS
Audience:	DCS technicians, Plant Operators, Instrument, Process and Process Control Engineers.
Prerequisites:	Control room experience as technician, operator or engineer is desirable, but not required.
Course Material:	Software Products used in Course - Pitops-PID, Simcet, Process Control CBT and ACSSI.

Course Description and Objectives:

This course addresses needs of control room operators, DCS technicians, process control engineers, applications engineers and anyone else responsible for PID tuning in the plant. Many new personnel enter the control room these days; there are numerous types of processes and different DCS and PLC systems.

This course starts with the very basics of process control, explains the PID equation in the time domain and then trains using three powerful PID tuning, real-time simulation/ optimization and grading software products. In a remarkably short 2-day time, students learn to optimally tune PIDs and make process changes on distillation columns, reactors, tanks, compressors, flow controllers, heat exchangers using modern real-time simulator software.

The software also has automatic grading capability, so at end of the course, the software generates a report card on the PID tuning skills of each attendee.

At the end of the course, attendees will be able to tune PIDs in any DCS/PLC, troubleshoot problems, dampen/eliminate oscillations, improve advanced control performance and maximizing rates, directly increasing the plant's bottom-line profits.

Day 1: (8:30 AM to 4:30 PM)

Introduction to Industrial Process Control

Need for Automatic Process Control

Process Control Dynamics

Basic PID Algorithm

Open loop dynamics using Pitops

PID Equation in Time Domain

Pitops PID simulations

Advanced Forms of PID Algorithms

DCS Attributes and Features

Optimal Tuning Theory and Calculations

Optimal Tuning on Pitops Simulator with Disturbances, Noise and Setpoint Changes

Five lab sessions using Pitops simulator
Tuning lab sessions using Pitops Simulator

Day 2: (8:30 AM to 4:00 PM)

Simulating Noise and Process Disturbances

Transforming process operating information into Controller Tuning

Procedures for conducting Step Tests in the Plant

Estimating Process Dynamics from DCS Trends and Operator Knowledge

Cascade Control

Introduction to Simcet Real-Time Dynamic Simulator

Tuning Practice Sessions on Simcet

Timed tests using Simcet

Certification and Testing

APC200:

Advanced Process Control, PID Tuning and Beyond

DURATION:	4.5 DAYS
Audience:	Process Control Engineers, Advanced Process Control Engineers, Instrument Engineers, Lab Technicians, DCS/PLC Technicians, Managers, Supervisors.
Prerequisites:	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-PID+TFI, PitopsOPC, Simcet, Process Control CBT and ACSSI.

Course Description and Objectives:

The DCS and PLC have many powerful features that still remain under-utilized. This course shows you how to build powerful optimizing controllers inside the DCS or PLC. We use both Pitops, Simcet, Process Control CBT and ACSSI software products during the training.

Students 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 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. This course is designed more for engineers but also will offer tremendous value to operators and technicians. 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 PID controllers in detail.

At the end of the course, students will be able to study a process, P&IDs and then talk to the right people in the plant or control room and then design and build powerful controllers in the DCS and PLC and then calculate DCS parameters, tuning parameters precisely using scientific and process control methods using software products, thus eliminating guesswork and generating precise and optimizing control action.

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

Day 1: (8:30 AM to 4:30 PM)

Introduction to Chemical Process Control
Need for Automatic Process Control
Process Control Dynamics

Transfer Functions
Basic PID algorithm
Process Control Schematics
PID examples in Time Domain
Cascade Control
Tuning lab sessions using Pitops Simulator

Day 2: (8:30 AM to 4:00 PM)

Simulating Noise and Process Disturbances
Various Forms of PID Algorithms
DCS Attributes and Features
Optimal Tuning Theory and Calculations
Optimal Tuning on Pitops Simulator with Disturbances, Noise and Setpoint Changes
Five lab sessions using Pitops simulator
Transforming process operating information into Controller Tuning
Procedures for conducting Step Tests in the Plant
Estimating Process Dynamics from DCS Trends and Operator Knowledge
Introduction to Simcet Real-time dynamic simulator

Day 3: (8:30 AM to 4:30 PM)

Tuning Practice Sessions on Simcet
Feedforward Control
Feedforward Lab Session using Pitops
Practical Rules and Tips
Decoupler Strategies
Cascade Control Lab Session Illustrating an AC-TC Triple Cascade
Constraint Override Control Procedures
How to build correct DCS Configuration for Long Chain Control Schemes
Startup and Chain Activation Procedures in the DCS
Model-based Control
Bias Update for Automatic Control

Day 4: (8:30 AM to 4:00 PM)

GC-based Online Correction
Using Rigorous Models for Closed-Loop Advanced Control
Dead-Time Compensation
Internal Model-Based Control
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

Day 5: (8:30 AM to 12:30 PM)

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 example

Lab Session using Pitops to identify multivariable transfer functions using real plant data with a closed-loop situation

Model-Predictive Control

When to use PID, Cascade PID, Advanced Regulatory, DMC, RMPCT, Rule-Based Control Schemes

APC300:

Control Quality Performance Monitoring and Adaptive Control

DURATION:	4 DAYS
Audience:	Process Control Engineers, Advanced Process Control Engineers, Instrument Engineers, Lab Technicians, DCS/PLC Technicians, Managers, Supervisors.
Prerequisites:	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 - Apromon, Tadpole and Pitops-PID.

Course Description and Objectives:

A plant can have anywhere from about 50 PIDs in small plants to over 2000 PIDs in large refineries and integrated petrochemical complexes. In addition to simple PIDs, there are cascades, override controllers, model-based controllers and multivariable controllers.

As time goes, even the best tuned PID and other controllers can progressively start to deteriorate. As deterioration worsens, process oscillations can start with small amplitudes that can grow large over time costing the plant significant monetary losses and lost opportunities.

PiControl has developed a revolutionary, state-of-the art, novel process control performance monitoring software named Apromon that identifies all the poorly controlling PIDs, advanced PIDs and complex controllers in the plant. Apromon runs automatically daily and generates easy-to-use reports showing the controller performance. Each controller is assigned a grade from 0 – 100% and also a diagnostic message indicating how that controller is performing. Over 25 control criteria are reported on each tag. PiControl has developed a novel, breakthrough algorithm called TAD (true amplitude detection) that very accurately isolates controllers that are truly oscillating and causing problems. It flags sluggish control or aggressive control action. It also flags excessive output or control valve movement besides a host of other performance criteria.

Using Apromon, a plant's primary and advanced control layer can be maintained far more efficiently with numerous subsequent benefits.

This course also teaches and explains the art of online oscillation detection. PiControl Tadpole software product is a true adaptive control algorithm, so unique and effective; it has absolutely no competitors in the marketplace. With Tadpole, you can accurately identify control problems in an online/real-time manner and take immediate/spontaneous corrective action that is otherwise impossible.

Tadpole also identifies the first-out for the oscillating culprit PIDs and also teaches how to implement true adaptive control inside the DCS or on an OPC server connected to the DCS.

Day 1: (8:30 AM to 4:30 PM)

Modern process control in plants

Process interactions because of mass balance and heat balance integration

Potential for process cycling and sustained oscillations

Causes of process oscillations

Pitops simulations illustrating different oscillation cases

Pitops simulations illustrating excessive control valve movement

Pitops simulations illustrating sluggish control

Definition of various process control quality performance criteria

Explanation of special new terms – crimp, cheat, vacillation, rope length etc.

Component breakdown of PID contributions

Day 2: (8:30 AM to 4:00 PM)

Use of Apromon-Excel

Run example case on Apromon-Excel

More explanation of process control quality performance monitoring criteria

Conduct what-if studies on example using Apromon-Excel

Adjust and understand oscillation tuning parameters

Day 3: (8:30 AM to 4:30 PM)

Use of Apromon-OPC

Run example case on Apromon-OPC

Implement Apromon-OPC using OPC simulation server

More explanation of process control quality performance monitoring criteria

Procedure and tips on implementing Apromon-OPC in a plant environment

Day 4: (8:30 AM to 4:00 PM)

Need for detection of online oscillation in an industrial process

Need for detection of sluggish control in an industrial process.

Precise determination of oscillation

Practical challenges of detecting oscillations reliably

Understanding of PiControl's TAD (true amplitude detection) algorithm

Setting up Tadpole-OPC and configuring it in the real-plant simulation environment

Implementing online adaptive control using DCS, Tadpole and a OPC server-based computer

APC400:

Hands-on DCS Training for Control Room Operators

DURATION:	1 DAY
Audience:	Plant Operators, Process Engineers, DCS technicians, Instrument Engineers and Supervisors.
Prerequisites:	Some control room exposure is desirable, but not required.
Course Material:	Plant's DCS system and consoles.

Course Description and Objectives:

Many new and inexperienced control room operators enter the plants every year. Most of the focused DCS and operations training focuses on the mechanics of how to use the DCS but does not cover many of the intricate details that distinguish a new operator from an experienced operator. We teach the operator many important details such as how to start up a complex control scheme, meaning of SP tracking, PV tracking etc. Learn how to detect control problems and tackle them. Understand when to call for urgent process control support. Master the art of prevention of careless mistakes that could cause a shut-down. Fully utilize features like trending, event monitoring, history and other advanced features that can make the operator's time more effective.

Day 1: (8:30 AM to 4:30 PM)

Analog input, output and regulatory tag details, parameters and attributes
Digital input, output and regulatory tag details, parameters and attributes
Continuous control programs
Discrete control programs
PID equation- how it works
PID parameters, nonlinear control, gap action, special forms of PID
Preventing mistakes when entering data into DCS
Event history
Trending system
Alarm rationalization, management and enforcement
Troubleshooting common problems
Smart messaging and advisory

APC500:

Industrial OPC Software for Communications and Control

DURATION: 3 DAYS

Audience: Process Control Engineers, Application Engineers, Analyzer Technicians, DCS technicians, Instrument Engineers and Supervisors.

Prerequisites: None.

Course Material: OPC training slides, various OPC software products - PiBridge, PiConect, PiLims, PiLogger, Chromatiq and OPC explorers, OPC browsers, OPC Tunneling concepts.

Course Description and Objectives:

OPC (OLE for Process Control) is now the latest, most modern and powerful communications protocol for the industry. Using OPC, many data transfers can be quickly and effectively facilitated. In addition, many powerful, custom applications can be developed and implemented on a OPC server-based computer connected to the DCS. This course shows you how to use OPC for many important DCS connected applications, e.g.: bringing online data from gas chromatographs into the DCS, allowing operator entered data on a operator HMI screen to get downloaded into the DCS. Connect to independent OPC servers together easily with special software. Pull and push data to and from DCS or PLC to host computers. Learn how to use signal processing and validation for increasing safety and reliability in a chemical process. At the end of the course, you will be able to connect any OPC server together, transfer data two-way to DCS, perform custom calculations directly on an OPC-server and then talk to the DCS, decipher, troubleshoot and solve OPC problems.

Day 1: (8:30 AM to 4:30 PM)

History and Vision behind OPC technology

Basic Concepts of OPC

OPC Specifications

Benefits of OPC Solutions

Connection Parameters in OPC Servers

Configuration of OPC Clients

OPC Redundancy

OPC DA and HDA

OPC Client and Server Architecture

OPC Tunneling Technology

Windows Security

OPC options and industry vendors

Day 2: (8:30 AM to 4:00 PM)

COM and DCOM

Troubleshooting DCOM Problems

Systematic Detailed Procedure for Correctly Setting DCOM Configuration

OPC Diagnostics

SCADA applications using OPC

OPC Alarms and Events

Server-Client-Server (SCS) OPC Applications

PiBridge OPC Client Connector

Connecting different OPC servers together

PiConect Human-to-Excel/DCS Interface

Building powerful custom process applications using OPC

Converting any Excel spreadsheet from office/control room and make it online using OPC

Day 3: (8:30 AM to 4:30 PM)

Online Analyzer Signals in Chemical Processes

Online Signal Validation using PiControl's Chromatiq Product

Using validated signals for closed-loop advanced process control

Laboratory Information Management Systems (LIMS)

Using OPC as a modern, new method for implementing LIMS

Overview of PiLIMS Laboratory Data Information Management System

Fast Data Monitoring for Debugging Process Problems and Equipment Shutdowns

OPC Product PiLogger for Fast Data Monitoring

Expert-System Rule-Based Advisory using OPC

Additional Industrial Applications using OPC

Online process optimization using OPC

Fieldbus, Ethernet, OPC comparisons

Practical industrial communications case studies

ONLINE WEB-BASED COURSES:

APC200X, APC200Y:

Advanced Process Control, PID Tuning and Beyond – Condensed online version of course APC200

APC300X, APC300Y:

Control Quality Performance Monitoring and Adaptive Control – Condensed online version of course APC300

APC400X, APC400Y:

Hands-on DCS Training for Control Room Operators – Condensed online version of course APC400

APC500X, APC500Y:

Industrial OPC Software for Communications and Control – Condensed online version of course APC500