



Lambda Controls

Process Control Optimization Services, Training and Software Tools

Process Control Optimization Course - Training for a General Technical Audience

The **Process Control Optimization** (PCO) course is intended for a general technical audience consisting of *mill instrumentation engineers, process engineers, control system engineers and operations personnel*. It will also be useful to electrical/instrumentation technicians involved in control loop trouble-shooting and/or control loop tuning. This course is designed to improve the ability of course participants to identify and correct process control problems and in particular, control loop problems.

The goal of the PCO course is to heighten the awareness of process variability and the role of the control system and controller tuning, process equipment and process design, in reducing process variability and optimizing process performance.

The PCO course is a four-day course offered on a registration basis at a meeting facility convenient to several Pulp/Paper mills in an area (where feasible). The course can also be held on-site at a mill.

The PCO course is a combination of classroom based lectures and computer based lab work. The lab work consists of controller tuning and process control trouble-shooting exercises using a Personal Computer based process and control system dynamic simulator of a typical stock preparation process. If the course is held on-site at a mill, process data collected on site during the course can be used for classroom discussion. The computer based lab work and discussions of mill data or case studies make up about 50 percent of the course.

PCO Course Description

Understanding how variability propagates from one place in the process to another and the capabilities of the process and the control system to reduce variability requires a basic understanding of process dynamics and control system dynamics. For this reason roughly half of the course is dedicated to presenting process dynamic models, controller dynamics, controller tuning and control loop performance concepts. The major topics include:

- Using bump tests to evaluate control loop health issues such as control valve dynamic performance and control valve backlash and stiction
- Identifying dynamic process models from bump tests
- Using the process model information to tune the controller using the Lambda Tuning method.

With this background covered, the course focus moves to optimizing the control system to improve process performance and tools for analyzing and troubleshooting process variability. The major topics include:

- Tuning strategy development to improve stability in the key process variables
- Troubleshooting techniques to identify and correct controller induced variability problems
- Techniques to assist in the identification and reduction of process and product variability
- Time Series Analysis tools such as the power spectrum to analyze process variability and help locate sources of variability.



LAMBDA CONTROLS

17 Erbsville Road (R3), Waterloo, Ontario, Canada N2J 3Z4
Tel.: (519) 884-6998, Fax: (519) 884-1089, E-mail: inquiries@lambdacontrols.com
Web site: www.lambdacontrols.com



Lambda Controls

Process Control Optimization Services, Training and Software Tools

Control Loop Optimization Course - Training for E/I Technicians

The **Control Loop Optimization** (CLO) training course is intended primarily for pulp and paper mill *instrumentation technicians*, but it is also a good introduction to controller tuning, control loop health and process variability for process and instrumentation engineers.

The primary aim of the course is to provide course participants with a working knowledge of control loop optimization by:

- using bump tests to evaluate control loop health issues such as control valve dynamic performance and nonlinear behavior;
- identifying dynamic process models from bump tests and
- using the dynamic model information to tune the controller using the Lambda Tuning method.

A secondary aim of the course is to heighten the awareness of process variability and to appreciate the role of control loop optimization in reducing process variability.

The CLO course is a four day course held on-site at a pulp/paper mill. The course is a combination of class room based lectures and field based bump test and controller tuning exercises conducted on control loops in the mill. A Personal Computer based data acquisition system is used to collect high quality process data in the field. This data is discussed in class and used to evaluate field instrumentation, to identify process models and to tune control loops. The field work and class discussion of field work make up about 50 percent of the course.

The main topics presented in the Control Loop Optimization course are:

- performing manual bump tests and interpreting the results
- self-regulating (e.g. flow loop) and non self-regulating (e.g. level loop) processes
- first order with deadtime process model for a self-regulating process
- integrator with deadtime process model for a non self-regulating process
- control valve dynamic performance evaluation and nonlinear process behavior
- effect of control loop filtering on bump test results
- PID controller description and different forms of the PID controller
- review of controller tuning methods
- Lambda Tuning method for a self-regulating process
- benefits of the Lambda Tuning method over other tuning methods
- selecting the Lambda value for a control loop
- control loop robustness and reliability
- Lambda Tuning method for a non self-regulating process and level control
- performance limitations of a PID controller
- control loop cutoff period of a Lambda tuned self regulating loop
- guidelines for employing control loop filtering
- tuning cascade control loops
- tuning interacting control loops
- developing a tuning strategy for several interacting control loops
- evaluating process variability
- introduction to time series analysis tools for process variability analysis



LAMBDA CONTROLS

17 Erbsville Road (R3), Waterloo, Ontario, Canada N2J 3Z4
Tel.: (519) 884-6998, Fax: (519) 884-1089, E-mail: inquiries@lambdacontrols.com
Web site: www.lambdacontrols.com