

Process Control Optimization Course

COURSE SECTIONS/TOPICS:

Loop Optimization

Process Dynamics

Non-Linearities

PID Controller Basics

Lambda Tuning - First Order Processes

Lambda Tuning - Integrating Processes

Process & Control Optimization

PID Controller Performance

Tuning Strategy Development

Identifying Control Loop Problems

Identifying Process Variability Problems

High process variability compromises the economic performance of pulp and paper processes through reduced production, increased operating costs and off-quality product. A control loop that is well designed, maintained and tuned can play a key role in minimizing process variability. Unfortunately, the control loop often acts to *increase* process variability due to poor valve dynamics, oscillatory controller tuning, and sensor problems.

The instrumentation technician who is given the responsibility of maintaining control loop health and optimizing controller tuning sometimes has little or no formal training in these activities. Tuning the controller by 'guesswork' is a frustrating experience, often resulting in little or no improvement in control loop performance.

The process control optimization course will provide the 'tools' to identify and correct process control problems using sound engineering principles.

COURSE DESCRIPTION

The 4 day course is split into an introductory loop optimization section and a more advanced control optimization section. In the loop optimization section. The attendees will learn how to conduct open loop bump tests, determine 1st order and integrator process dynamics, evaluate non-linearities, and using Lambda tuning methods, calculate Lambda tuning constants. 40% of this section is a computer based lab, where concepts presented are applied using a realistic simulation of a stock preparation area.

The process and control optimization section builds on the concepts introduced in the loop optimization section. The focus is on optimizing the control system to improve process performance. The major topics include:

- Development of tuning strategies to improve stability in the key process variables
- Troubleshooting techniques to identify and correct controller induced variability problems
- Techniques to assist in the identification/elimination of process and product variability
- Time series analysis techniques such as the power spectrum

A process and control optimization 'survey' is conducted on the stock preparation area simulation to consolidate all of the concepts presented. 50% of the process and control optimization section is spent in the lab.

INSTRUCTORS

Doug Nelson, P.Eng. has over 21 years of pulp and paper process control experience. He has authored papers on paper machine dryer control, control valve selection and the uses of process simulation in optimization surveys.

George Jablonsky, ASCT has 18 years of industry experience in process control, instrumentation and optimization in the pulp and paper industry. He has held positions both in operations and maintenance management.

WHO SHOULD ATTEND

The course is primarily intended for pulp and paper mill instrumentation mechanics, process engineers and instrumentation engineers. It is also a good introductory course for the process control specialist.

Attendees have the option to attend the 2 day loop optimization section of the course if this better suits their needs. Please contact us for further details.

COURSE SCHEDULE

Loop Optimization Section

Day One

Introduction

- Lecture 1 Process Control Basics**
Terminology, Control loop components, Process dynamics
- Lecture 2 Process Dynamics**
Control loop elements, 1st Order response, Integrating response
- Lab 1 First Order Process Dynamics**
- Lab 2 Integrating Process Dynamics**
- Lecture 3 Non-linearities**
Control valve backlash and stiction, process inherent non-linearities, impact on control performance
- Lab 3 Non-linearities**

Day Two

- Lecture 4 PID Controller Basics**
Description of PID control action, overview of tuning methods
- Lecture 5 Lambda Tuning - 1st Order**
Benefits of Lambda tuning, calculation of tuning constants, selecting Lambda value, robustness
- Lab 4 Lambda Tuning - 1st Order**
- Lecture 6 Lambda Tuning - Integrating**
Selecting Lambda, calculation of tuning constants
- Lab 5 Lambda Tuning Integrators**

Process & Control Optimization Section

Day Three

- Lecture 7 PID Controller Performance**
Regulatory control, setpoint tracking, filtering
- Lab 6 PID Controller Performance**
- Lecture 8 Tuning Strategy Development**
Defining process objectives, interactive loops, cascaded loops
- Lab 7 Tuning Interactive Loops**
- Lecture 9 Identifying Control Problems**
Controller tuning, loop health, loop design issues

Day Four

- Lab 8 Identifying Control Problems**
- Lecture 10 Identifying Process Variability**
Auto/manual tests, coupling tests, using time series analysis tools
- Lab 9 Process Control Optimization Survey**

Discussion Roundtable and Wrap-Up

Lunch will be provided between 12:00 & 1:00 each day.
There will be coffee breaks in the morning and afternoon.

REGISTRATION

Attendees need to register 4 weeks prior to the course to ensure space and material will be available. ProNamics reserves the right to cancel the course based on a minimum number of registrants. The course is limited to 15 participants.

Please contact us by phone, fax or email for registration and fee information.

Phone: (604) 898-1376

Fax: (604) 898-1378

sales@pronamicscontrol.com

In order to ensure the attendees position, payment by purchase order, check or money order must be received 2 week prior to the course. Cancellations within 2 weeks of the course will be subject to cancellation penalties.

COURSE LOCATION

Visit our web site (www.pronamicscontrol.com) for course schedules and locations. Attendees are responsible for arranging their own accommodations.

ABOUT ProNamics

ProNamics Control Inc. is a Vancouver-based pulp and paper process control consulting company. The company conducts process and control optimization field surveys, prepares process simulations to establish best practices and provides a range of training courses related to process control optimization. Visit our web site at www.pronamicscontrol.com for further information.

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