ProNamics Control Inc.

Pipeline Process Control Optimization & Troubleshooting Techniques

Your technical resource for improving pipeline process control performance

Topics covered include:

- Pumping System Fundamentals
- Process Control Basics
- Understanding Process Dynamics
- Lambda Tuning Procedures
- Nonlinearity
- Pipeline Control Strategies
- Troubleshooting Pipeline Control Problems

Pipeline system pressure and flow control applications are somewhat unique. The pipeline control valves may spend much of their time wide open to minimize pumping costs but also need to respond quickly and accurately to sudden pressure excursions to prevent unscheduled line shutdowns. One key to good pipeline control is careful selection and sizing of the pressure/flow control valves in order to minimize non-linear dynamics and ensure valve stability. The control valve speed and resolution are also key requirements. A structured, scientific approach to control loop tuning is needed to ensure fast, stable controller response to upsets. Finally the control strategy needs to compensate for the high non-linearity resulting from hydraulic design and the wide range of operating conditions.

Course Fees …

CDN	$2,500.00
USD	$2,300.00

(Canadian Taxes Included.) Fees include a full set of course notes.

Course is limited to 20 participants to provide individual attention and allow our expert instructors to address specific mill issues.
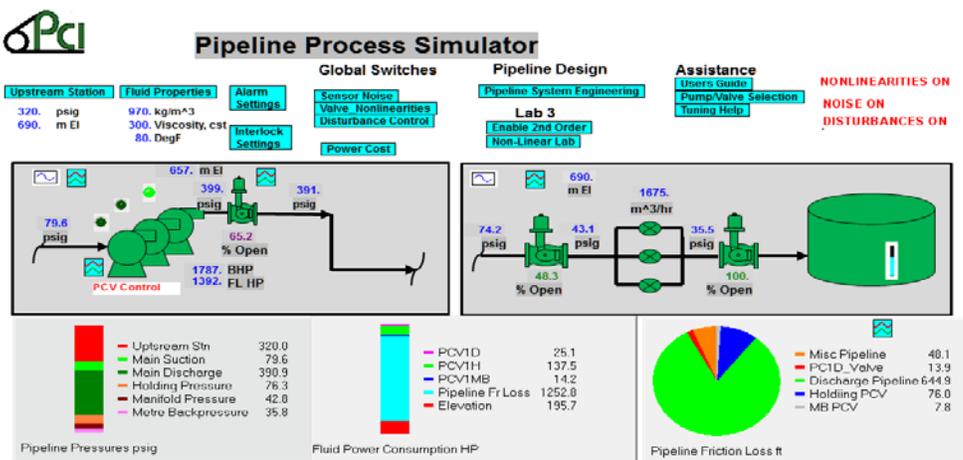
Course Schedule

Day 1

08:00 Pipeline Process Control Overview

08:30 Pump System Fundamentals
- Definitions
- Friction loss, Static Head, System Head,
- Pump Performance - Fixed and variable speed
- Role of the control valve

10:00 Control Loop Fundamentals
- Block diagram overview
- Loop components, sensors, controllers, control valves, VFD's
- Performance guidelines

11:00 Simulator Introduction

12:00 Lunch Break

13:00 Process Dynamics
- Open Loop Bump Testing
- First Order dynamics
- Second Order dynamics
- Filtering

15:00 Lab - Process Dynamics

16:30 Adjourn

Day 2

08:00 Lambda Tuning
- PID control algorithms
- Lambda tuning procedures
- PID controller capability

Day 2 …(Continued)

10:00 Lab - Lambda Tuning

12:00 Lunch Break

13:00 Process Non-linearities
- Control Valve backlash/stiction/ response time
- Valve Flow Characteristics/ VFD
- Impact of Fluid Characteristics

14:00 Lab - Non-Linearities

16:30 Adjourn

Day 3

08:00 Pipeline Control Strategies
- Output Characterization
- Override Control
- VFD/PCV Coordinated Control
- Ratio Control
- Cascade Control
- Dealing with Loop Interaction

10:00 Lab – Output Linearization

11:00 Troubleshooting Control Loop Problems
- Troubleshooting Tools
- Identifying the problem source
- Dealing with complex loops

12:00 Lunch Break

13:00 Lab - Troubleshooting Control Loop Problems

13:00 Course wrap up

16:30 Adjourn

About the Course …

The course begins with a review of pump and pipeline fluid dynamic fundamentals and the basic functioning of the control loop. Open loop bump testing to measure process dynamics, evaluate control valve performance (resolution, speed of response) and develop Lambda tuning constants are core topics. The key pipeline control strategies (override control, ratio control, coordinated VFD/valve control, output characterization) are explained in detail. An analytical troubleshooting technique to identify / correct process control problems is the final topic. Approximately 40% of the course is devoted to a computer-based lab, where the student demonstrates that they have understood the main concepts.

Who Should Attend...

The three day course is intended to strengthen the student's ability to optimize petroleum pipeline process control performance. The course is primarily intended for process and control engineers, instrument and electrical technicians and operations management personnel who want to improve their ability to optimize/troubleshoot pipeline process controls. The course explores the implications of process equipment design on control performance and would be beneficial for maintenance and design engineers.

Course Location…

The course is being held at a conference facility. Attendees are responsible for arranging their own accommodations.

Accommodations …

For convenience, we recommend that registrants stay at the hotel course site.

About ProNamics…

ProNamics Control Inc. is based in Vancouver, BC. The company conducts process and control optimization surveys, prepares process simulations to establish best practices and provides a range of training courses related to process control optimization. Visit our web sites at www.pronamicscontrol.com for more information about our services.

Instructors Include…

Doug Nelson, P.Eng. has over 30 years of industrial process control experience and process control training of operators, E/I techs and process control engineers.

George Jablonsky, AScT is a recognized expert in optimizing and troubleshooting pipeline process control performance.