ProNamics Control Inc.

Pipeline Process Control Optimization Techniques

Ways to Improve Pipeline Process Control Performance

Nov. 30 to Dec. 2, 2010
Edmonton, AB

COURSE TOPICS:

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

Your technical resource for improving pipeline process control performance

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 DESCRIPTION

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. Analytical troubleshooting techniques 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. that illustrates the main concepts.

INSTRUCTORS

George Jablonsky, AScT has over 20 years of industry experience in process control, instrumentation and optimization. He is a recognized expert in optimizing pipeline process control performance. extensive experience in troubleshooting .
Doug Nelson, P.Eng. has over 25 years of industrial process control experience. He has broad expertise in process control training of operators, instrumentation specialists and process control engineers.
Roger Shirt, P.Eng, Ph.D has 15 years of process control and simulation experience in the liquid pipeline and oil sands industries. He is a recognized expert in control valve selection and control strategy optimization.

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 engineers, instrumentation engineers and operations management personnel who want to improve their ability to troubleshoot pipeline process control problems. 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 venue is the Sawridge Inn Edmonton . Attendees are responsible for arranging their own accommodations.

REGISTRATION

Registration fee is $2300 CDN (tax included) or 2100 US for the 3-day course. Attendees need to register 3 weeks in advance to ensure space and materials will be available. ProNamics Control reserves the right to cancel the course based on a minimum number of registrants. The course is limited to 15 participants.

COURSE SCHEDULE

Day One

Lecture 1 — **Pipeline Process Control Overview**
08:00 - 08:30

Lecture 2 — **Pumping System Fundamentals**
08:30 - 10:00
Definitions
Bernoulli's Law, Energy balance, Friction
Pump Performance - Fixed and variable speed

Lecture 3 — **Control Loop Fundamentals**
10:00 - 11:30
Block diagram overview
Loop components—sensors, controllers
Actuators/valves and performance guidelines

Lab 0 — **Simulator Introduction**
11:30 - 12:00

Lecture 4 — **Process Dynamics**
1:00 - 2:30
Open Loop Bump Testing
First Order process dynamics
Second Order process dynamics
Filtering

Lab 1 — **Measuring 1st, 2nd order dynamics**
2:30-4:30
Pump station discharge and suction pressure control controllers
Holding/Manifold Pressure controller

Day Two

Lecture 5 — **Lambda Tuning**
8:00 - 10:00
PID control algorithms
Lambda tuning procedures for 1st order loops
Lambda tuning procedures for 2nd order loops
Examples

Lunch Breaks between 12:00 & 1:00 each day

Day Two (Cont'd)

Lab 2 — **Lambda Tuning**
10:00 - 12:00
Pump station discharge/suction pressure
Holding /Manifold Pressure

Lecture 6 — **Process Non-linearities**
1:00 - 2:30
Control Valve backlash/stiction/ response time
Valve Flow Characteristics/ VFD
Impact of Fluid Characteristics

Lab 3 — **Non-Linear Lab**
2:30 - 4:30
Identifying backlash and stiction
Valve Flow Characteristic / VFD induced process gain nonlinearities

Day Three

Lecture 7 — **Pipeline Control Strategies / Lambda Tuning Application**
8:00 - 10:00
Output Characterization, Override Control
VFD/PCV Coordinated Control
Ratio Control, Dealing with Loop Interaction

Lab 4 — **Output Characterization**
10:00 - 11:00
Pump station discharge/suction pressure controllers

Lecture 8 — **Troubleshooting Pipeline Control Problems**
11:00 - 12:00
Troubleshooting Tools, Identifying the problem source, Complex strategies

Lab 5 — **Troubleshooting Lab**
1:00-4:00
Identifying / solving control problems

Wrap-Up
4:00-4:30

ABOUT ProNamics Control

ProNamics Control 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.

REGISTRATION FORM / CONTACT US: Fax to 604-898-1378

Name: _____ Position: _____

Company: _____ Email: _____

Address: _____

_____

Phone: _____ Fax: _____

Payment: ❒ Full Payment Enclosed ❒ Invoice my company ❒ Paypal (email invoice)

Signature: _____ Date: _____

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