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Effective
Human
Intervention
LEADERS IN TRAINING

Flow Control for Instrumentation Practitioners

Pumps, Valves and Piping

In this workshop, we explore the advantages and disadvantages of managing pressure (head) loss in a system using control valves versus speed-controlled pumps. We'll also dive into the often-overlooked role of pipework, including straight pipe lengths, fittings, and isolation valves, as critical sources of head loss. During this 2-Day workshop you will gain a comprehensive understanding of the entire system and optimize your flow control strategies.

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Flow Control for Instrumentation Practitioners

Instrumentation people are sometimes used to thinking that control valves are the only way of controlling the flow rate of liquids through pipes. This can either be done by inserting a variable pressure loss into a pipeline (a valve), or by varying the pressure (head) in this pipeline (using a pump). Which technique is used, depends very much on the application: if there is a head difference because of the process (including head (height) differences), a pump is obviously superfluous. If head needs to be raised, a control valve may be unnecessary, as the head can easily be varied by controlling the speed of a pump.

In this workshop, we look at the pros and cons of increasing the pressure (head) loss in a system using a control valve, or by varying the head using a speed-controlled pump.

The role of the pipework in the system is often overlooked: straight pipe lengths; fittings; isolation valves; etc., are often ignored as sources of head loss. In this course, we look at the whole system.

CENTRIFUGAL PUMPS

Pumps are often treated as commodities, and provided they produce enough volume, they are ignored. However, there are few plants where pumps are not a headache: maintenance problems, mysterious non-delivery, or even periodic catastrophic pump destruction in some cases. This course looks at why pumps have problems, and how to overcome them through proper sizing, installation, and operation.

PUMP OPTIMISATION

- Basics of hydraulics and pumping
- Types of centrifugal pumps
- Understanding of cavitation, NPSHA and NPSHR
- Pump curves and applications
- Static and dynamic heads; friction losses
- Pumps in series and parallel
- Installation, commissioning, and verification of pumping parameters

PRACTICAL EXERCISES

- Calculation of NPSHA
- Calculation of friction head with various pipes and fittings
- Calculation of an entire pumping system and selection of a suitable pump
- Using computer programs for selection

VALVE TYPES & SELECTION CRITERIA

The dominant criterion in valve selection is pressure drop across the valve - this determines the flow rate. In addition to this though, there are issues such as choked flow, cavitation, and noise.

AREAS COVERED INCLUDE:

- Types of control valves
- Their characteristics
- How installation can affect these characteristics
- Handling of flashing, cavitation, and noise
- Types of actuators and positioners
- Sizing for particular applications

PRACTICAL EXERCISES

- Valve sizing
- Noise calculations
- Flashing and Cavitation calculations
- Selecting anti-cavitation trim

BENEFITS INCLUDE:

- ✓ Participation in an interactive workshop
- ✓ Learning alternative ways of achieving flow control
- ✓ Comprehensive course documentation, with many practical examples
- ✓ Accredited to gain 2 CPD points by SAAMA

CHOICES: HEAD LOSS OR HEAD CONTROL?

One of the prime features of this course is that there is a choice: too often, experience assumes that control valves are the only option for flow control. However, Variable Speed Drives (VSDs) have opened a new world where flow control is concerned.

HERE, IN SOME SYSTEMS HEAD CAN BE CONTROLLED THROUGH CONTROLLING PUMP SPEED, WITH THESE ADVANTAGES:

- The pump is better off.
- Huge energy savings are possible.
- Valve problems like stem stiction are eliminated.
- Positioner problems with dirty air are overcome.
- Flow control remains totally smooth over long periods.

Since the simplest way of controlling pump and speed is through using electric motors controlled by VSD's, this area is touched on including pros and cons of using this technique.

The course will be concluded with an overview of control principles as they relate to Flow Control.

AT THE END OF THIS COURSE, PARTICIPANTS WILL BE ABLE TO:

- Engineer centrifugal pump installations to operate without cavitation
- Select a pump to operate close to its Best Efficiency point
- Troubleshoot pump problems
- Match a valve to a specific application
- Understand the problems affecting valve operation
- Calculate the right size of valve for a particular application
- Determine the root causes of valve problems

ABOUT YOUR COURSE FACILITATOR

Eric Carter founded turboTRAIN, a company specializing in automation-related training in 2005. With over 40 years of experience in engineering, installing, and commissioning automated control systems across various industries, including petrochemical, fuel distribution, iron and steel, food and beverage, and diverse manufacturing companies, Eric is a seasoned professional. He also consults on automation problems and has edited technical publications. As a Fellow of the South African Institute of Measurement and Control, he actively maintains his technical knowledge and bridges connections with suppliers and users of measurement and control equipment. Additionally, Eric applies feedback control principles to business contexts.