



Arabian Institute For Training

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# Valves, Actuators and Steam Traps

## INTRODUCTION

- This highly participative training course is designed to provide participants with the skills to understand how valves and actuators are sized, selected and maintained, and how they operate in the most important industrial process plants, such as oil and gas, etc. Emphasis is also placed on the important topic of steam traps, and the aspects related to this.
- The Valves, Actuators and Steam Traps training course is interactive and encourages delegates to participate through questions and answers, along with opportunities to discuss with the presenter specific issues which may result in appropriate solutions.

### Participants will learn:

- How valves operate
  - Dealing with various control and other signals
  - The various classifications of valves
  - Different types of valves
  - Additional equipment associated with valves
  - Manual and software sizing of valves
  - Actuators
  - Valve positioners
  - Cavitation and noise control
  - Selection of valves, based on materials used
  - Controlling valves, using 3-term controller, and valves in assorted loops and applications
  - The basics of steam and steam heating
  - The need for steam traps, and their functions
  - The different types of steam traps
  - Steam trap problems and management
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## PROGRAMME OBJECTIVES

- Understanding the principles, purpose and operation of valves, and valve signals
- Understanding flow conditions and pressure drops related to valves
- Understanding flow conditions, Cv, Pv, cavitation and flashing, associated hardware (filters, regulators, etc.)
- Reviewing valve guiding options
- Understanding the fundamentals of an assortment of valve types (including shutdown and pressure relief valves)
- Being able to interpret P&ID drawings containing valves
- Understanding leakage rates, valve characteristics and how inherent characteristics affect installed characteristics
- Implementing valve sizing, selection and choice of materials
- Understanding the most common and important forms of actuators
- Implementing noise and cavitation control and limitation
- Learning about valve maintenance and faultfinding
- Understanding how PID controller affect control valves, and the individual settings of the controller, and how these valves may be utilized in an assortment of specialized control loops
- Understanding the purpose, requirements and function of steam traps
- Learning about the assortment of steam traps currently available
- Dealing with steam trap selection, specification, safety factors, life-cycle costs, problems and management

## WHO SHOULD ATTEND?

- The Valve, Actuator and Steam Traps training course is designed to provide a practical insight for personnel who interface with valves, actuators and steam traps in the Oil and Gas, Minerals Processing, Mining and Heavy Industries, or work in the engineering consulting industry servicing these clients.
  - It is specifically tailored to suit those who have a basic understanding of electrical principals, and require further knowledge of valve, actuator and steam trap systems to more effectively manage their work and where necessary execute multi-discipline projects. Personnel who should attend are:
    - Project Professionals and Engineers
    - Facilities Engineers
    - Process and Chemical Engineers
    - Maintenance Technicians
    - Design Engineers
    - Mechanical, Electrical and I&C artisans
    - Supervisors and foremen who supervise personnel working on this equipment
  - It is also a useful introduction for inexperienced Electrical, Mechanical and I&C engineers (i.e. graduates and the like) to gain an understanding of the practical issues that they will face in their careers.
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## **TRAINING METHODOLOGY**

- The Valve, Actuator and Steam Traps training course will combine presentations with interactive practical exercises, computer simulations, individual exercises, group exercises, open and closed discussions, video presentations, paper exercise activities, case studies, individual understanding assessments after each chapter, and a comprehensive pre-and post-test, to ensure learning has taken place. Delegates will be encouraged to participate actively in relating their particular work requirements, problems and challenges at their workplace, and in assisting in finding solutions.
- Adequate time will be allocated for group discussions, both during and at the end of each session. This will include detailed case studies and anecdotes based on the subject matter and the facilitator's own experience in the field.

## **PROGRAMME SUMMARY**

- This training course covers a wide range of topics relating to Valves, Actuators and Steam Traps, from basic principles to selection and sizing, and including Operation and Maintenance.
  - It is designed to be beneficial for professionals with either a technical / non-technical background who require an understanding of valves, actuators and steam traps in their working environment.
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## PROGRAM OUTLINE

### Fundamentals of Valves, Signals, Classification and Different Types

- How control valves operate
- The purpose of the control valve
- Principles of a control valve
- Flow conditions inside a control valve
- Pressure drops inside a control valve
- Dealing with valve signals
- Laminar and turbulent flow
- Reynolds numbers
- Vortices and flow separation
- How pressures and flows vary between liquids and gasses
- Understanding Cv
- Choked flow
- Vapour pressure
- Cavitation and flashing
- Requirements of a valve
- Classification of valves by operation, function and application
- Factors to consider in selecting the right valve
- Hardware associated with valves
- Valve guiding, including
  - Cage guided valves
  - Stem guided valves
  - Post guided valves
- In-depth explanation of the following valves:
  - Split-body valves
  - Globe valves
  - Needle valves
  - Angled valves
  - Y-styled valves
  - 3-way valves
  - Diversion option
  - Mixing option

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## Different Types, Additional Equipment, Valve Characteristics and Manual Valve Sizing

- (Continuation from ) In-depth explanation of the following valves:
- Pinch valves
- Gate valves
- Slab gate
- Wedge gate
- Power-seal gate
- Choke valves
- Check valves
- Single-seated and double-seated valves
- Balanced and semi-balanced valves
- Butterfly valves
- High-performance butterfly valves
- Ball valves
- Reduced bore
- Full port
- Rotary plug valves
- Diaphragm valves
- Emergency shutdown valves
- Pressure Relief valves
- Additional hardware
- Valve flanges, bonnets and packing material
- Valves and a P&ID diagram
- Seat leakage rates
- Relationship between pressure and flow
- Equal percentage valve characteristics
- Linear valve characteristics
- Quick opening characteristics
- Inherent vs installed characteristics
- Manually sizing for a liquid application

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## Software Sizing, Actuators, Bench Setting and Stroking, Valve Positioners, Cavitation & Noise Control, Valve Material, Valve Maintenance, Pressure Relief Valves and SIS Valves

- Using valve sizing software
- Using actuators
- Pneumatic actuators
- Diaphragm pneumatic actuator
- Piston pneumatic actuator
- Rack and Pinion pneumatic actuator
- Rotary vane pneumatic actuator
- Hydraulic actuators
- Electric actuators
- Bench setting and stroking
- Purpose of a valve positioner
- Smart positioner
- Cavitation within a valve
- Cavitation control trims
- Disc stacks
- Noise limitation
- Low noise cages
- Diffuser plates
- Gas diffuser silencer
- Sonic chokes
- Material to use
- Control valve maintenance
- Fault finding
- Backlash
- Deadband
- Stiction
- Pressure relief devices
- Safety Instrumented System valves

## Term Controllers and Valves, and Valves in an Assortment of Applications, and Steam Trap Introduction

- PID controllers
  - Selecting valve action
  - The P setting of PID control
  - The I setting of PID control
  - The D setting of PID control
  - Open loop tuning
  - Closed loop tuning
  - Non-formulized tuning methods (trial and error)
  - Assorted control loops using valves
  - Cascade loops
  - Ratio loops
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## Continuation of Steam Traps

- Various types of steam traps
- Mechanical steam traps
- Ball float steam trap
- Inverted bucket steam trap
- Thermostatic steam traps
- Liquid expansion steam trap
- Balanced pressure steam trap
- Bi-thermostatic steam trap
- Metallic steam trap
- Thermodynamic steam traps
- Disc trap
- Impulse trap
- Orifice trap
- Venturi nozzle steam trap
- Comparison between the different types of steam traps
- Steam trap selection
- Steam trap specifications
- Steam trap safety factors and life-cycle cost
- Steam trap problems
- Steam trap management





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