



# Practical Valve Technology



## Introduction:

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Power Plant and other petrochemical industries do deal with different types of valves. All piping systems are fitted with valves for controlling purposes or safety requirements. Understanding the function of each valve type will have an important reflection on the process quality, equipment and plant reliability and the economics of the whole activity. Different application needs to select the appropriate valve type of a particular flow characteristic. Operation of the valve also affects the system and the process. Understanding the problems associated with valves is essential for diagnosis and troubleshooting and the needed maintenance for the particular type of valves. This course will address all aspects of selection, operation and maintenance and troubleshooting of industrial valves.

## Who Should Attend?

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Engineers and technicians of mechanical, electrical and chemical engineering will benefit largely from this workshop. Maintenance, Operation personnel are recommended to attend this course.

## Course Objectives:

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**By the end of this course delegates will be able to:**

- An understanding of different parameters affecting the operation of valves
- The ability to select the right valve for the particular application
- The ability to perform the necessary calculation for valve sizing
- An understanding of the problems associated with valves like flashing, slamming and water hammer
- The ability to perform troubleshooting of systems involving valves
- The ability to decide on the right maintenance plan concerning different types of valves

**Course Outline:**

**Basics of the Valve Technology**

**Valves Technology**

- Types of valves
- Valves characteristics
- Sealing performance
- Leakage criterion
- Leakage classifications
- Sealing mechanisms
- Valve stem seals
- Flow characteristics
- Flow through valves
- Valve flow characteristics
- Linear and equal

**Manual Vs. Automatic Valves**

**Manual Valves**

- Functions of manual valves

- Methods of regulation
- Valve types
- Stopping/starting valves
- Control valves
- Valve end connections
- Valves rating
- Valves seating
- Types of manual valves
- Gate valves
- Plug valves
- Ball valves
- Butterfly valves
- Pinch valves
- Diaphragm valves

## Check Valves

- Applications
- Types of check valves
- Lift check valves
- Swing check valves
- Tilting disc check valves
- Diaphragm check valves
- Check valves operation
- Selection of check valves

## Relief and Safety Valves: Function & Operation

### Relief and Safety Valves

- Relief valves types
- Pressure relieving devices

- Automatically operated valves
- Direct acting and piloted pressure relief valves
- Modulating, full lift, and ordinary pressure relief valves
- Valve loading
- Safety valves
- Operation of direct acting pressure relief valves
- Blow down
- Relief valves problems

## Rupture Valves

- Applications of Rupture Discs
- Rupture discs vs. Pressure relief valves
- Rupture discs in gases and liquid service
- Temperature and bursting pressure relationship
- Pressure tolerances
- Design and performance of ductile metal rupture discs
- Types of Rupture discs
- Prebulged rupture discs
- Reverse buckling discs
- Vent panels
- Graphite rupture discs
- Double disc assemblies
- Rupture disc and pressure relief valve combinations
- Selection of rupture discs
- Operation of Rupture Discs

## Valves Troubleshooting

### Valves Problems and Troubleshooting

- High pressure drop

- Pressure recovery characteristics
- Cavitation in valves
- Incipient and choked cavitation
- Flow curve cavitation index
- Cavitation elimination devices
- Flashing versus cavitation
- Flow choking
- High velocities
- Water hammer
- What causes water hammer?
- Water hammer calculations
- Solutions for water hammer
- Surge protection
- Check valve slamming
- Noise problems
- Clean air standards
- Life loading
- Packing for fugitive emission control
- Troubleshooting the control valves

## Control Valves and Actuators

- Control valves types
- Linear valve features
- Rotary valve features
- Control valve flow characteristics
- Quick opening characteristics
- Linear and equal %
- Actuation systems
- Types of actuators
- Pneumatic piston actuator

- Electric motors
- Electro hydraulic actuators
- Actuator performance
- Valve positioner
- Operation of positioners
- Positioner calibration

### Valve Sizing and Selection

- Valvesizing criteria for manual valves
- Valvesizing criteria for check valves
- Valvesizing criteria for throttling valves
- Incipient and advanced cavitation
- Terminal pressure drop ratio
- Percent of flashing
- Pressure recovery coefficient
- Valve sizing and selection procedure
- Selecting a valve type
- Different valves characteristics