

**Training Title**

**CONTROL & SAFETY RELIEF VALVES: SELECTION, OPERATION & TROUBLESHOOTING**

**Training Duration**

5 days

**Training Venue and Dates**

REF ME070	Control & safety relief valves: Selection, Operation, Troubleshooting	5	24-28 June	\$4,250	Dubai, UAE
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In any of the 5 star hotel. Exact venue will be informed later.

**Training Fees**

4,250 US\$ per participant for Public Training includes Materials/Handouts, tea/coffee breaks, refreshments & Buffet Lunch.

**Training Certificate**

Define Management Consultancy & Training Certificate of course completion will be issued to all attendees.

**WHO SHOULD ATTEND**

Engineers and Technicians of mechanical, electrical and chemical engineering background will benefit largely from this workshop. Maintenance, Operation, people in workshop and R and D personnel are recommended to attend this course.

**INTRODUCTION & DESCRIPTION**

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 particular flow characteristics. 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.

Valves can be classified as manual or control valves. When a manual valve is operated via an actuator it becomes a control valve. Valves in general do control the rate of flow in a piping system, the direction of the flow, or act as a relieving device to protect the system from overpressurization. Valves like check valves would prevent the flow from reversing, thus protecting equipment from reverse flow. Such valves operated automatically without need for any type of actuation. Stop and close valves used mainly to isolate a system in situation of maintenance and/or putting the standby equipment in services. The function of a valve is what determines its design. The right selection of a valve in terms of its type and size, and its pressure class is what affect most the stability and reliability of the system. The nature of the fluid, the type of the process, the level of temperature and pressures are parameters affecting the valve selection.

The flow through a valve will experience different effects, like cavitation, flashing, and noise.

Water hammer is one of the effects that a check valve may cause. Such phenomenon might lead to different kind of problems, some would affect directly the valve itself and other might upset the process as a whole or result in system erosion or corrosion. Vibration and instrumentation false function could also be a result of faulty valve. Some of these problems can be avoided in the stage of selection and sizing of the valve. Others could be eliminated in the process of writing the specifications and through good communications with manufacturer or vendor. Understanding these different types of problems will help troubleshooting the valves and the systems and help curing the problems. Wrong installations could be the reason behind many of valves problem too.

### COURSE OBJECTIVES

- To introduce the participant to different type of Control Valves and Safety Relief Valves.
- To familiarize the participant with the valve characteristics including the valve tightness class and the flow characteristics
- To upgrade the participants understanding of the application, operation and design of different types of valves
- To provide skills, knowledge and understanding of the principles and practices of the related Codes and Standards related to Control Valves and Safety Relief Valves
- To learn the methods for valve selection, specifications and sizing that suit a particular application
- To learn methods of valve testing, inspection and troubleshooting based on the industrial and manufacturer codes and standards

### TRAINING METHODOLOGY:

A highly interactive combination of lectures and discussion sessions will be managed to maximize the amount and quality of information and knowledge transfer. The sessions will start by raising the most relevant questions, and motivate everybody find the right answers. You will also be encouraged to raise your own questions and to share in the development of the right answers using your own analysis and experiences. Tests of multiple-choice type will be made available on daily basis to examine the effectiveness of delivering the course.

Very useful Course Materials will be given.

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- 30% Lectures
- 30% Workshops and work presentation
- 20% Group Work & Practical Exercises
- 20% Videos & General Discussions

### COURSE OUTLINE

The following topics including the valve technology, valve tightness and flow characteristics, control valves and safety relief valves types, operation and troubleshooting will be cover during the five day duration of the course.

## Basics of Valve Technology

### Ch 1 Valves Technology

Types of Valves

Valves characteristics

Sealing performance

Leakage Criterion

Leakage Classifications

Sealing Mechanisms

Valve stem seals

Flow characteristics

Flow through valves

Valve Characterizing Coefficients

Valve flow characteristics

Linear & equal %

Control Valves

### Ch 2 Control Valves

Functions of manual valves

Methods of regulation

Types of control valves

Gate Valves

Plug Valves

Ball Valves

Butterfly Valves

Pinch Valves

Diaphragm Valves

### Ch 3 Control Valves & Actuators

Control Valves Types

Linear Valve Features

Rotary Valve Features

Control Valve Flow Characteristics

Quick Opening Characteristics

Linear & Equal %

Actuation systems

Types of actuators

Pneumatic Piston Actuator

Electric motors

Electro-hydraulic Actuators

Actuator Performance

Valve Positioner

Operation of Positioners

Positioner calibration

Self Operated Valves

### Ch 4 Check Valves

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## Applications

### Types of Check Valves

- Lift check valves
- Swing check valves
- Tilting-disc check valves
- Diaphragm check valves

### Check Valves Operation

#### Water Hammer

#### Selection of Check Valves

## Ch 5 Relief and Safety Valves

### Relief Valves Types

- Pressure-relieving devices
- Automatically operated valves
  - Direct-acting & piloted pressure relief valves
  - Modulating, full-lift, and ordinary pressure relief valves

### Valve Loading

### Safety Valves

### Operation of Direct-acting pressure relief valves

### Blowdown

- Relief valves problems

## Ch 6 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

## Ch 7 Valve Sizing & Selection

### Valve-sizing criteria for manual valves

### Valve-sizing criteria for check valves

### Valve-sizing criteria for throttling valves

### Incipient and advanced cavitation

### Terminal pressure drop ratio

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Percent of Flashing  
Pressure Recovery Coefficient  
Valve Sizing & Selection Procedure  
Selecting a valve type  
Different valve characteristics  
Examples

**Ch 8 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  
1.1. Troubleshooting the Control Valves

**NOTE:**

**Pre & Post Tests will be conducted**

**Case Studies, Group Exercises, Group Discussions, Last Day Review & Assessments will be carried out.**

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