



**MAESTRO**  
CONSULTANTS

# **CONTROL & SAFETY RELIEF VALVES**

## **COURSE OUTLINE 2025**

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**TRAINING TITLE**

CONTROL & SAFETY RELIEF VALVES

**VENUE**

Dubai, UAE

**DURATION**

5 Days

**DATES**

10 - 14 February 2025

**PRICE**

\$5,250 per attendee including training material/handouts, morning/afternoon coffee breaks and Lunch buffet.

**TRAINING INTRODUCTION**

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 on 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.

### **TRAINING 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 AUDIENCE**

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.

### **TRAINING 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**

- 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
- 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

Troubleshooting the Control Valves

## **TRAINING CERTIFICATE**

**MAESTRO CONSULTANTS** Certificate of Completion for delegates who attend and complete the training course.

## **METHODOLOGY**

Our courses are highly interactive, typically taking a case study approach that we have found to be an effective method of fostering discussions and transferring knowledge. Participants will learn by active participation during the program through the use of individual exercises, questionnaires, team exercises, training videos and discussions of “real life” issues in their organizations.

The material has been designed to enable delegates to apply all of the material with immediate effect back in the workplace.