

# A COMPREHENSIVE GUIDE TO VALVE SELECTION

Considerations and Best Practices  
for Optimal Performance

WHITE PAPER



A FAMILY OF COMPANIES



# INTRODUCTION

Valves are the unsung heroes of process manufacturing facilities, silently controlling the flow of fluids and gases to enable smooth and efficient operations. Choosing the right valve is not a decision to be taken lightly, as it directly impacts the performance, safety, and profitability of the facility. In our industry, where every minute counts, the need for a comprehensive guide to valve selection becomes crucial.

Welcome to our white paper, “A Beginners Guide to Valve Selection: Considerations and Best Practices for Optimal Performance,” designed for MRO engineers and technicians entering the industry and seeking to unlock the potential of their processes.

Join us on this journey as we dive into the world of valves,

explore key factors influencing their selection, review best practices for installation and maintenance, and shed light on emerging trends and technologies. Get ready to embark on a knowledge-packed adventure that will empower you to make informed decisions and maximize the performance of your valves.

## A QUICK SUMMARY OF WHAT YOU WILL FIND IN THIS WHITE PAPER:

- ▶ The impact of valve selection on efficient and safe operations in process manufacturing facilities.
- ▶ **Understanding valve basics:** types, operation principles, and key components.
- ▶ **Factors influencing valve selection:** process parameters, fluid characteristics, flow rates, corrosion/erosion considerations, application-specific requirements, and compliance with regulations and industry standards.
- ▶ **Evaluating valve performance:** assessing reliability, durability, leakage rates, sealing mechanisms, flow characteristics, pressure drop, maintenance, lifecycle costs, and noise/vibration control.
- ▶ **The valve selection process:** conducting needs assessments, evaluating different valve types and configurations, performing supplier evaluations, and considering technical documentation and specifications, and collaboration between maintenance engineers, process engineers, and valve experts.
- ▶ **Best Practices for Valve Installation and Maintenance:** installation techniques, routine maintenance, inspection procedures, troubleshooting, and performance verification contribute to optimal valve operation and longevity.
- ▶ **Emerging trends and technologies in valve selection:** advancements in valve technology, digitalization, smart valve solutions, and integration with process automation systems.

# UNDERSTANDING VALVE BASICS

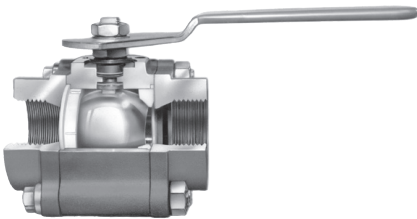
When it comes to process manufacturing, valves play a vital role in regulating the flow of fluids, controlling pressure, and ensuring the efficient operation of systems. It is essential to have a comprehensive understanding of valve basics to make more informed decisions about valve selection and truly optimize system performance.

This section will provide a detailed overview of different types of valves commonly used in process manufacturing, the function and principles of valve operation, and key components and terminology associated with valves.



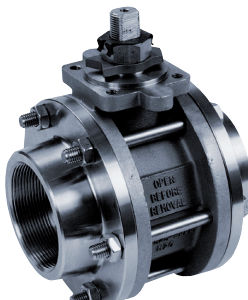
Series 44

3-Piece Regular Port



Series 59

3-Piece Full Port



Series 45 / 59

3-Piece Larger Sizes

## 1

### OVERVIEW OF DIFFERENT TYPES OF VALVES COMMONLY USED IN PROCESS MANUFACTURING:

In manufacturing facilities such as chemical and petrochemical plants, a wide variety of valves are employed to handle different fluid control requirements. This section will explore the most typical valves, including but not limited to:

- ▶ **Globe valves:** Globe valves are known for ability to take high pressure drops and control accuracy in modulating applications.
- ▶ **Ball valves:** These versatile valves offer quick, quarter-turn operation and excellent sealing capabilities. They are ideal for on/off applications and can handle a wide range of fluids.
- ▶ **Butterfly valves:** With their low-pressure drop and efficient flow control, butterfly valves are commonly employed in large-scale applications. Their compact design and cost-effectiveness make them a popular choice in larger diameter pipelines.
- ▶ **Gate valves:** Designed for full open or full close operations, gate valves are widely used in applications where low-pressure drop and minimal flow restriction are critical.
- ▶ **Check valves:** Check valves allow for one-way flow, preventing backflow and ensuring the protection of equipment and systems. They come in various types, such as swing, lift, and ball check valves.

# UNDERSTANDING VALVE BASICS

## 2

### FUNCTION AND PRINCIPLES OF VALVE OPERATION

When it comes to the basics of valve operation think of it as FSPT: Flow, Pressure, Shut-Off, and Throttling:

- ▶ **Flow control:** Valves regulate the flow of fluids by adjusting the size of the flow passage. The flow can be increased, decreased, or stopped altogether, depending on the valve's position.
- ▶ **Pressure regulation:** Valves maintain desired pressure levels within a system, ensuring optimal performance and preventing damage caused by excessive pressure.
- ▶ **Shut-off and isolation:** Valves provide a means to completely stop the flow of fluid, allowing for maintenance, repairs, and system isolation when necessary.
- ▶ **Throttling (also known as modulation):** Some valves are specifically designed for precise flow control, allowing for the regulation of process media to meet a specific process parameter such as temperature, pressure, flow or level.

## 3

### KEY COMPONENTS AND TERMINOLOGY ASSOCIATED WITH VALVES

When evaluating and selecting valves for different uses, it is essential to become familiar with the components and terminology associated with valves, including:

- ▶ **Body and bonnet:** The main housing of the valve, which contains the internal components and provides structural support.
- ▶ **Disc, ball, or plug:** The movable component that controls the flow by opening or closing the flow passage.
- ▶ **Stem and actuator:** The stem connects the actuator (manual, electric, pneumatic, or hydraulic) to the disc, ball, or plug, enabling the opening and closing of the valve.
- ▶ **Seat and sealing:** The sealing mechanism that ensures tight shut-off and prevents leakage when the valve is closed.
- ▶ **Trim and flow characteristics:** The combination of components within the valve that affects its flow control capabilities, including flow rate, pressure drop, and flow characteristic curves.
- ▶ **Leakage class:** A classification system that defines acceptable levels of leakage based on industry standards and application requirements.

# UNDERSTANDING VALVE BASICS

MRO Maintenance Engineers and technicians are under increasing time constraints and performance demands. Quickly and effectively improving their processes with informed decisions during valve selection will help ensure better performance, enhanced reliability, and improved efficiency.

Throughout this white paper, we will aim to provide practical insights, and recommendations to guide you in making informed decisions regarding valve selection and management.

Next, we will delve into the first section of the guide, “Factors Influencing Valve Selection.” This section will include a deeper look at process parameters and operating conditions, application-specific considerations, and compliance and safety regulations.

By the end of this guide, personnel will have the knowledge and insights needed to make confident decisions that enhance the reliability and efficiency of your process manufacturing operations.

**Our goal is to empower you with the basic knowledge and tools necessary to optimize your valve systems, improve reliability, and drive operational excellence.**



# FACTORS INFLUENCING VALVE SELECTION

Selecting the right valve is essential for ensuring optimal performance, safety, and efficiency in fluid handling systems. Various factors come into play when choosing a valve that can effectively meet the requirements of a specific application. In this section, we will delve into the factors that significantly influence valve selection. We will explore the impact of process parameters and operating conditions, application-specific considerations, and compliance with environmental regulations and industry-specific standards. By understanding and considering these factors, engineers and professionals can make informed decisions that result in reliable and cost-effective valve selection. This chapter will provide an overview of the key considerations and best practices to guide the valve selection process.

Series CL94, CL44, CL 51/52

**Chlorine**



Series C4, C44, and C51

**Cryogenic**



## 1

### PROCESS PARAMETERS AND OPERATING CONDITIONS

As previously stated, valves are fundamental components of any fluid control system and play an essential role in regulating flow, controlling pressure, and ensuring operational efficiency. The selection of the appropriate valve depends on several factors related to process parameters and operating conditions.

#### Fluid Characteristics

Understanding the pressure of the fluid is essential for selecting a valve that can handle the intended operating conditions. Different valves have varying pressure ratings, and exceeding these ratings can lead to valve failure or compromised performance. Consider the maximum and minimum pressures the valve will encounter during normal operation and select a valve that can withstand these pressures.

The temperature of the fluid influences valve selection as it can affect the material properties, sealing capability, and overall performance. High temperatures can cause materials to degrade or lose their structural integrity, leading to leaks or valve failure. Conversely, extremely low temperatures can impact the valve's ability to function properly. In addition, rapid changes in temperature can result in rapid changes in pressure which can severely damage a valve if not designed properly. Selecting a valve made from suitable materials

# FACTORS INFLUENCING VALVE SELECTION

and designed to handle the specific temperature range is one of the most significant decisions to ensure long-term performance and reliability.

Fluid viscosity, or its resistance to flow, affects valve selection, particularly in applications involving thick or viscous fluids. Valves that can accommodate high viscosity fluids are designed with larger clearances and stronger actuators to overcome the resistance and provide effective flow control. Understanding the viscosity of the fluid is necessary for selecting the appropriate valve design and ensuring smooth operation.

## Flow Rates and Capacity Requirements

Determining the required flow rates is fundamental for valve selection. The flow rate depends on factors such as system design, desired process efficiency, and operational objectives. Oversized or undersized valves can result in inefficiencies, increased energy consumption, or inadequate control. Make sure to consider the anticipated flow rates and select a valve with an appropriate flow coefficient (Cv) that matches the desired flow capacity.

Valves must be selected based on the system's capacity requirements, including the maximum and minimum flow capacities necessary to meet process demands. Understanding the system's capacity range helps prevent flow restrictions, excessive pressure drops, or inadequate flow control. Match the valve's size and capacity with the system requirements to ensure optimal performance.

## Corrosion and Erosion Considerations

Valves operating in corrosive environments or handling abrasive fluids require careful consideration of corrosion and erosion resistance. Corrosion can degrade valve materials over time, compromising their structural integrity and impairing functionality. Erosion, caused by high fluid velocities or the presence of solid particles, can erode valve components and impact their performance. Selecting valves constructed from corrosion-resistant materials, such as stainless steel, specialized alloys, polymer or ceramic linings, and incorporating features like hardened trim and seat materials, can enhance durability and longevity in corrosive or erosive environments.



Series 51 / 52

**Flanged Regular Port**



Series F519 / F529

**Flanged Full Port**



Series F819 / F829

**Flanged Full Port**

# FACTORS INFLUENCING VALVE SELECTION

## 2

### APPLICATION-SPECIFIC CONSIDERATIONS

Valves are at the very heart of controlling fluid flow and ensuring the efficient operation of various industrial processes. The selection of the right valve for a specific application is essential to achieve optimal performance, reliability, and safety.

#### Types of media being handled

One of the primary considerations in valve selection is the type of media that the valve will be handling. Different valves are designed to handle specific types of media, including liquids, gases, and slurries. The properties of the media, such as its corrosiveness, viscosity, and temperature, will dictate the materials of construction and the valve design required for optimal performance. Selecting the correct valve for the application will ensure safe and reliable operation.

#### Valve size and piping requirements

The size of the valve and its compatibility with the piping system is another critical factor to consider, more specifically when sizing for process control applications. The valve must be appropriately sized to handle the anticipated flow rates and pressure conditions within the system. Oversized or undersized valves can lead to inefficiencies, pressure drops, or inadequate control. Additionally, the valve's connection type and compatibility

with the existing piping system should be considered to ensure proper installation and reliable operation.

#### Control requirements

Different applications require different levels of control over media flow. The control requirements can vary from simple on/off operation to precise throttling or modulating control. Determine the desired control mechanism and select a valve that can fulfill those requirements effectively. For example, certain applications may require valves with high turndown ratios to achieve precise flow control across a wide range of flow rates. When selecting the right valve type and actuation method, make sure to understand the specific control needs of the application to ensure the optimal process management equipment.

## 3

### PROCESS PARAMETERS AND OPERATING CONDITIONS

As critical components in industrial process management, valves play a vital role in controlling process media flow within systems and processes. Selecting the right valve for a specific application requires careful consideration of various factors. In this section, we will explore two important aspects that influence valve selection: compliance and safety regulations, including environmental regulations and industry-specific standards.



# FACTORS INFLUENCING VALVE SELECTION

## Compliance with Environmental Regulations

Environmental regulations play a significant role in the design and selection of valves, particularly in industries where fluid handling can impact the environment. Make sure valves meet the required standards to prevent any negative environmental impact. Factors to consider include:

- ▶ **Material Compatibility:** Valves should be constructed from materials that are compatible with the fluids being handled to prevent chemical reactions or contamination that could harm the environment. Understanding the chemical composition and potential hazards of the fluids is essential in selecting the appropriate valve materials.
- ▶ **Leakage Prevention:** Valves should be designed and selected to minimize leakage, as fluid leakage can lead to environmental contamination and potential danger to staff. Compliance with leakage standards, such as the allowable maximum leakage rate, ensures environmental safety.

## Industry-Specific Standards

Different industries have specific standards and guidelines for valve selection to ensure safety, reliability, and efficient operation. Compliance with industry-specific standards is essential to meet regulatory requirements and ensure optimal performance. Some key industry standards include:

- ▶ **American Petroleum Institute (API):** The API standards provide guidelines for various aspects of valve selection

and usage in the oil and gas industry. These standards cover topics such as valve design, materials, testing, and installation requirements. Compliance with API standards ensures safety and reliability in demanding applications. <https://www.api.org/>

- ▶ **American Society of Mechanical Engineers (ASME):** The ASME standards encompass a wide range of industries and cover aspects of valve design, manufacturing, testing, and performance. ASME standards ensure that valves meet specific criteria for pressure, temperature, and other critical parameters. <https://www.asme.org/>
- ▶ **International Organization for Standardization (ISO):** ISO standards provide international guidelines for various industries, including valve selection and performance. Compliance with ISO standards ensures compatibility and interchangeability of valves across different regions and industries. <https://www.iso.org/home.html>

It is important for engineers and professionals to stay up-to-date with the latest industry standards and regulations to make informed valve selection decisions. Leveraging resources and references from trusted industry sources can provide valuable insights into compliance and regulatory requirements.

# FACTORS INFLUENCING VALVE SELECTION

Valves play a critical role in regulating and controlling material process flow within industrial processes. Selecting the right valve is essential for achieving optimal system performance, safety, and efficiency. However, with numerous options available in the market, engineers and professionals face the challenge of identifying the most suitable valve for their specific applications. In this section, we will explore the key factors that influence valve selection, taking into consideration aspects such as reliability, durability, leakage rates, flow characteristics, maintenance costs, and noise control. By evaluating these factors, engineers can make informed decisions that ensure the long-term success of their fluid handling systems.

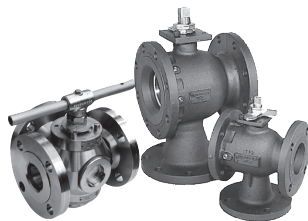
Series 151 and 301

**Wafer Pattern**



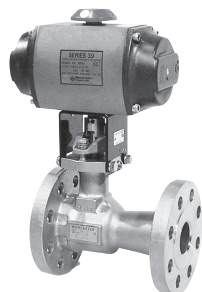
Series D44 / D4, D51, 18 / 19

**Directional**



Series 94, 94-150,  
94-300, 94-600

**Fugitive Emission**



## Five Things to Consider When Evaluating Valve Performance

**1**

### RELIABILITY AND DURABILITY CONSIDERATIONS

Ensuring the reliability and durability of valves is vital in maintaining consistent performance and avoiding costly downtime. Factors such as the material of construction, design features, and the reputation of the manufacturer all play a crucial role in assessing a valve's reliability. Valves built with robust materials and precision engineering tend to exhibit higher durability, withstanding harsh operating conditions, temperature extremes, and corrosive environments. Be diligent and ensure manufacturers have the necessary design, quality and manufacturing resources and processes to ensure consistent quality to applicable industry standards.

**2**

### LEAKAGE RATES AND SEALING MECHANISMS

Minimizing leakage rates is essential for maintaining process integrity and preventing environmental contamination. Valves must provide tight shutoff when closed to prevent unwanted fluid escape. The sealing

# FACTORS INFLUENCING VALVE SELECTION

mechanism employed by the valve, whether it's soft-seated or metal-seated, greatly influences its ability to maintain a reliable seal over extended periods of operation. Proper selection of sealing materials and considering factors like temperature and pressure differentials are critical to mitigating leakage risks. Many valves pass initial testing to applicable standards, the reliability of valves is dependent on the quality of construction and engineering. Many less expensive valves typically sacrifice product longevity for cost. These valves meet design requirements but may fail prematurely. Proper due diligence during the specification phase ensures the valve selected is fit for purpose.

**3**

## FLOW CHARACTERISTICS AND PRESSURE DROP

Understanding flow characteristics and pressure drop is essential for selecting a valve that can effectively regulate fluid flow rates within the desired range. Different valve types exhibit varying flow characteristics, such as linear, equal percentage, or quick-opening, which can impact their suitability for specific applications. Additionally, pressure drop and recovery across the valve should be evaluated to ensure it does not adversely affect system performance or cause damage to piping or excessive energy consumption.

**4**

## MAINTENANCE AND LIFECYCLE COSTS

Assessing maintenance requirements and lifecycle costs is key in determining the overall cost-effectiveness of a valve. Factors such as ease of maintenance, availability of spare parts, and the frequency of required maintenance intervals should be considered. Valves that require less frequent maintenance and have readily available spare parts can contribute to reduced downtime and lower operational costs over the valve's lifespan.

**5**

## NOISE AND VIBRATION CONTROL

Noise and vibration control is an important consideration in industrial settings where excessive noise can impact worker safety and comfort. Proper valve sizing and operation are critical in limiting noise and vibration in piping systems. Valves subject to very high-pressure drops may be susceptible to producing significant noise. Special valve trims are available to mitigate this issue. Opening or closing valves too quickly under high pressure can cause water hammer and pipe vibration which can contribute to potential pipeline failures. Valves that produce significant noise and vibration during operation

# FACTORS INFLUENCING VALVE SELECTION

may require additional measures to ensure compliance with regulatory standards and provide for proper process safety and a conducive work environment. Evaluating the inherent noise and vibration characteristics of a valve and actuator combination can help in selecting a suitable option that minimizes disturbances.

Selecting the right valve involves a comprehensive evaluation of various factors to ensure optimal system

performance, safety, and efficiency. By considering reliability, durability, leakage rates, flow characteristics, maintenance costs, and noise control, engineers can make informed decisions that align with their application requirements and operational objectives. Understanding the significance of these factors and their impact on valve selection empowers professionals to choose valves that contribute to the long-term success of their fluid handling systems.



# VALVE SELECTION PROCESS

Selecting the right valve for an industrial application is an integral step in achieving optimal system performance, safety, and efficiency. With a wide range of valve types, configurations, and suppliers available, it is essential to follow a systematic approach to ensure the right choice is made. In this article, we will explore the valve selection process, providing a step-by-step guide for effective decision-making. We will also emphasize the importance of collaboration between maintenance engineers, process engineers, and valve experts in achieving the best outcomes. By following this process and fostering collaboration, engineers can confidently select valves that meet the specific needs and performance criteria of their industrial applications.

## 4 Steps in the Step-by-Step Guide for Effective Valve Selection

**1**

### NEEDS ASSESSMENT AND DEFINING PERFORMANCE CRITERIA

The first step in the valve selection process is to assess the needs of the application and define the performance criteria. This involves understanding the fluid characteristics, process parameters, operating conditions, and any specific requirements such as flow rates, pressure ranges, temperature limitations, and material

compatibility. By clearly defining the performance criteria, engineers can narrow down the options and focus on valves that align with the application's requirements.

**2**

### EVALUATING DIFFERENT VALVE TYPES AND CONFIGURATIONS

Once the performance criteria are established, the next step is to evaluate different valve types and configurations. This involves considering factors such as the nature of the fluid (liquid, gas, or slurry), the desired control mechanism (on/off, throttling, or modulating), and the specific application requirements. Various valve types, including gate valves, globe valves, ball valves, butterfly valves, and check valves, offer different advantages and limitations. By comparing their features, benefits, and limitations, engineers can identify the most suitable valve type for the application.

**3**

### SUPPLIER EVALUATION AND SELECTION

Selecting a reliable and reputable valve supplier is one of the most important aspects to ensure product quality, availability, and ongoing support. Engineers should evaluate suppliers based on their reputation, experience, certifications, product range, technical expertise, and

# VALVE SELECTION PROCESS

customer support capabilities. By working with a trusted supplier, engineers can gain access to high-quality valves, technical guidance, and timely assistance throughout the valve selection and implementation process.

## 4

### TECHNICAL DOCUMENTATION AND SPECIFICATIONS

Obtaining detailed technical documentation and specifications from the selected valve supplier is essential for making informed decisions. This documentation should include information on valve materials, dimensions, pressure ratings, temperature ranges, flow characteristics, and any special features or certifications. Careful review of this information helps engineers validate whether the selected valve meets the defined performance criteria and application requirements.

### Importance of Collaboration between Maintenance Engineers, Process Engineers, and Valve Experts

The valve selection process is a crucial aspect of industrial applications, as it directly impacts system performance, safety, and efficiency. By following a step-by-step guide and fostering collaboration between maintenance engineers, process engineers, and valve experts, engineers can navigate the selection process with confidence.

Through needs assessment, evaluation of different valve types, supplier evaluation, and review of technical documentation, engineers can make informed decisions that meet the defined performance criteria and application requirements. The collaborative efforts of their diverse expertise and perspectives, ensure that the selected valves are well-suited to the specific industrial applications, leading to optimal system performance and long-term success.

# BEST PRACTICES FOR VALVE INSTALLATION AND MAINTENANCE

Valves play a critical role in industrial processes, controlling the flow of fluids and gases to ensure efficient operation and system integrity. To maximize the performance and lifespan of valves, proper installation and regular maintenance are essential. This article aims to provide a guide to best practices for valve installation and maintenance. By following these guidelines, engineers and maintenance professionals can ensure proper valve installation, implement routine maintenance procedures, troubleshoot common issues effectively, and perform testing for performance verification. These practices contribute to the reliability, longevity, and optimal performance of valves in industrial applications.

## 1

### PROPER VALVE INSTALLATION TECHNIQUES

Always follow manufacturers recommended installation procedures prior to installing any valve. If manufacturer's instructions are not available, refer to published industry guidelines and piping specification for installation.

#### a. Valve Selection and Preparation

Before installation, make sure that the selected valve is suitable for the application's requirements and meets the necessary specifications. This includes considering factors such as fluid characteristics, pressure and temperature ranges, flow rates, and compatibility with the piping system. Additionally, valves should be inspected for any

damage or defects before installation, ensuring they are in optimal condition.

#### b. Correct Valve Orientation and Alignment

Proper valve orientation and alignment are vital for ensuring optimal flow control and minimizing operational issues. Valves should be installed in the correct direction, with the arrow on the valve body indicating the flow direction. Additionally, proper alignment with the connecting piping system is essential to minimize stress, leakage, and performance issues.

#### c. Secure Valve Mounting

Valves should be securely mounted to provide stability and prevent vibration-related issues. Proper mounting techniques, such as using appropriate brackets or supports, should be employed. Additionally, consideration should be given to factors such as pipe strain, center of gravity and expansion/contraction to avoid stress on the valve and the surrounding components.

## 2

### ROUTINE MAINTENANCE AND INSPECTION PROCEDURES

#### a. Regular Lubrication

Lubrication is crucial for maintaining proper valve operation and preventing excessive friction and wear. Regular lubrication of valve components, such as stems,

# BEST PRACTICES FOR VALVE INSTALLATION AND MAINTENANCE

seals, and bearings, should be performed using suitable lubricants recommended by the valve manufacturer. Care should be taken to follow the manufacturer's guidelines regarding lubrication frequency and quantity.

## b. Visual Inspection

Regular visual inspections allow for the identification of any visible signs of wear, damage, or leaks. Valve components, including seals, gaskets, stems, and actuators, should be inspected for signs of corrosion, erosion, leaks, or other abnormalities. Any issues identified should be addressed promptly to prevent further damage or performance degradation.

## c. Performance Testing

Periodic performance testing and monitoring ensures that valves are functioning as intended and meeting the required performance parameters. This may include testing for leakage, proper sealing, actuation response, and control accuracy. Performance testing can be conducted using appropriate tools and equipment, following manufacturer's instructions as well as established procedures and standards.

## 3

### TROUBLESHOOTING COMMON VALVE ISSUES

#### a. Leaks and Sealing Problems

Leaks are one of the most common issues encountered in valve operation. Proper troubleshooting techniques, such as identifying the source of the leak, inspecting seals and gaskets, and adjusting packing or seal tightness, should be employed to address sealing problems effectively. In cases of severe leaks or valve damage, component replacement may be necessary.

#### b. Sticking or Binding Valves

Valves that stick or bind during operation can lead to process interruptions and performance issues. Troubleshooting methods, such as cleaning valve components, inspecting for debris or foreign objects, and ensuring proper lubrication, can help resolve sticking or binding issues. In some cases, adjustments or repairs to valve components may be necessary.



# BEST PRACTICES FOR VALVE INSTALLATION AND MAINTENANCE

## 4

### VALVE TESTING AND PERFORMANCE VERIFICATION

#### a. Functional Testing

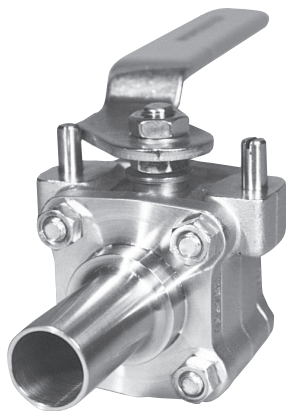
Functional testing involves verifying the proper operation of valves under different conditions. This includes testing for on/off operation, throttling control, and modulating functionality. Functional testing ensures that valves are performing as expected and allows for adjustments or corrections if needed.

#### b. Pressure and Leakage Testing

Pressure testing is essential to confirm the valve's ability to withstand the specified pressure conditions without

leaks or failures. Testing procedures, such as hydrostatic or pneumatic pressure tests, should be conducted following industry standards and guidelines. Leakage testing should also be performed to ensure proper sealing and minimal leakage rates.

Proper valve installation and maintenance practices are essential for ensuring the longevity, reliability, and optimal performance of valves in industrial applications. By following the recommendations outlined in this article, engineers and maintenance professionals can enhance valve performance, minimize downtime, and improve overall operational efficiency. Regular maintenance, inspection, troubleshooting, and performance verification contribute to the extended lifespan and trouble-free operation of valves, ultimately benefiting industrial processes and system integrity.



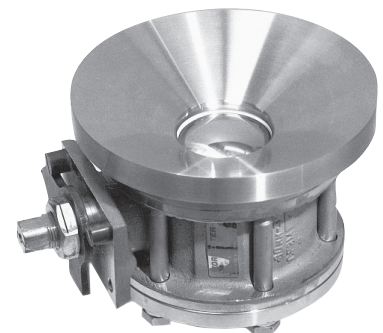
Series WK70

**High Purity**



Series WK74

**High Purity**



Series TB59

**Tank Bottom**

# EMERGING TRENDS AND TECHNOLOGIES IN VALVE SELECTION

Valves are at the heart of any system that is controlling fluid and gas flows in various industrial processes. As technology continues to advance, so does the field of valve selection. This section explores the emerging trends and technologies in valve selection, focusing on advancements in valve technology, the rise of digitalization and smart valve solutions, and the integration of valves with process automation systems. Understanding these trends and technologies is important for engineers and professionals involved in valve selection, as it enables them to make informed decisions that enhance process efficiency, reliability, and overall system performance.

## 1

### OVERVIEW OF ADVANCEMENTS IN VALVE TECHNOLOGY

The field of valve technology has witnessed significant advancements in recent years, driven by the need for improved performance, increased reliability, and enhanced control capabilities. These advancements include:

#### Advanced Materials and Coatings:

Manufacturers are making advancements in using advanced materials and coatings to improve the durability, corrosion resistance, and wear characteristics of valves. Maintaining regular communication with manufacturers and their representatives, industry groups, and regulatory agencies can provide valuable insight and knowledge, ensuring longer service life and reduced maintenance requirements.

#### Enhanced Design Features:

Valve designs are evolving to optimize performance and address specific application requirements. Innovative design features such as reduced weight, compact size, improved sealing mechanisms, and streamlined flow paths contribute to better efficiency, lower pressure drops, and enhanced control accuracy.

## 2

### DIGITALIZATION AND SMART VALVE SOLUTIONS

The digital revolution has had a profound impact on various industries, and the valve industry is no exception. Digitalization and the advent of smart valve solutions are transforming the way valves are selected, monitored, and controlled.

#### Intelligent Valve Positioners:

Smart valve positioners equipped with advanced sensors and communication capabilities enable real-time monitoring and precise control of valve positions. These positioners provide valuable feedback on valve performance, enable predictive maintenance strategies, and optimize process efficiency by ensuring accurate valve positioning.

#### Wireless Valve Monitoring:

Wireless technology enables remote monitoring of valve conditions, including factors such as temperature,

# EMERGING TRENDS AND TECHNOLOGIES IN VALVE SELECTION

pressure, and flow rates. This data can be collected and analyzed to identify trends, detect anomalies, and proactively address potential issues, improving overall system reliability and reducing downtime.

## Valve Asset Management Systems:

Valve asset management systems integrate data from various valves within a facility, providing a centralized platform for monitoring, maintenance planning, and performance optimization. These systems use predictive analytics, enabling condition-based maintenance and reducing unnecessary downtime.

## 3

### INTEGRATION WITH PROCESS AUTOMATION SYSTEMS

The integration of valves with process automation systems offers significant benefits in terms of control, efficiency, and data analytics.

#### Fieldbus and Industrial Ethernet Protocols:

Valves equipped with fieldbus or industrial Ethernet protocols can seamlessly communicate with process control systems, enabling real-time control and data exchange. This integration enhances the accuracy and responsiveness of valve control, enables remote monitoring and configuration, and facilitates system-wide optimization.

#### Integration with Control Systems:

The integration of valves with control systems, such as distributed control systems (DCS) or programmable logic controllers (PLC), allows for centralized control and monitoring of valve operations. This integration streamlines system management, enables advanced control strategies, and provides a comprehensive view of the entire process.

#### Data Analytics and Optimization:

By leveraging data collected from valves, process automation systems can perform advanced analytics and optimization algorithms. This enables the identification of performance trends, predictive maintenance planning, and continuous process improvement.

The field of valve selection is rapidly evolving, driven by advancements in technology and the increasing demand for improved efficiency and reliability. Understanding the emerging trends and technologies discussed here will inform and empower professionals involved in valve selection and system optimization. By embracing advances in valve technology, harnessing the power of digitalization and smart valve solutions, and integrating valves with process automation systems, engineers can make informed decisions that lead to enhanced process performance, reduced maintenance costs, and increased operational efficiency.

# CONCLUSION

This white paper was written to provide valuable insights for professionals in process manufacturing facilities who are responsible for selecting valves to help optimize their facility production capabilities. Valve selection is a critical aspect to ensure efficient and safe operations, and this white paper has explored various factors and best practices to consider.

**Following is a summary of the main points:**

- ▶ Valve selection is crucial for efficient and safe operations in process manufacturing facilities.
- ▶ Understanding valve basics, including types, principles of operation, and key components, to make the best-informed decisions.
- ▶ Factors influencing valve selection include process parameters, fluid characteristics, flow rates, corrosion/erosion considerations, application-specific requirements, and compliance with regulations and industry standards.
- ▶ Evaluating valve performance involves assessing reliability, durability, leakage rates, sealing mechanisms, flow characteristics, pressure drop, maintenance, lifecycle costs, and noise/vibration control.
- ▶ The valve selection process involves conducting a needs assessment, evaluating different valve types and configurations, performing supplier evaluations, and considering technical documentation and specifications. Collaboration between maintenance engineers, process engineers, and valve experts is critical.
- ▶ Proper valve installation techniques, routine maintenance, inspection procedures, troubleshooting, and performance verification contribute to optimal valve operation and longevity.
- ▶ Real-world examples and case studies highlight successful valve selection and implementation, offering valuable insights and lessons learned.
- ▶ Emerging trends and technologies in valve selection include advancements in valve technology, digitalization, smart valve solutions, and integration with process automation systems.
- ▶ Continuous evaluation and improvement in valve performance should be prioritized to achieve long-term efficiency and safety.

By following these key learnings and incorporating best practices, maintenance engineers and managers can make informed decisions, optimize valve performance, and ensure efficient and safe operations in process manufacturing facilities.

In summary, by considering factors influencing valve selection, evaluating valve performance, following the valve selection process, adhering to best practices for installation and maintenance, and staying informed about emerging trends and technologies, maintenance engineers and managers can ensure the optimal performance of valves in their manufacturing facilities. Ongoing evaluation and continuous improvement in valve performance should be prioritized to achieve long-term efficiency and safety in all industrial processes.

# RESOURCE LIST

“Future Trends in Control Valves,” Valve World: <https://valve-world.net/future-trends-in-control-valves/>

Valve Maintenance and Life Expectancy Tips: <https://www.process-heating.com/articles/94036-valve-maintenance-and-life-expectancy-tips>

“Innovations in Control Valve Technology,” ISA Interchange: <https://blog.isa.org/innovations-control-valve-technology>

Five ways to improve process valve safety in manufacturing facilities: <https://www.plantengineering.com/articles/five-ways-to-improve-process-valve-safety-in-manufacturing-facilities/>

“Digitalization Trend Generates Demand for Valve Actuators,” ARC Advisory Group: <https://www.arcweb.com/press/digitalization-trend-generates-demand-valve-actuators>

“5 Factors to Consider When Choosing a Valve” - <https://blog.dwyer-inst.com/2019/06/26/5-factors-to-consider-when-choosing-a-valve/>

“Industrial Valves” - [https://www.globalspec.com/learnmore/flow\\_control\\_flow\\_transfer/valves/industrial\\_valves](https://www.globalspec.com/learnmore/flow_control_flow_transfer/valves/industrial_valves)

“Valve Selection for Fluid System Sampling System Design” - <https://www.swagelok.com/en/blog/valve-selection-fluid-system-sampling-system-design>

“Valve Selection Best Practices” - <https://www.valin.com/resources/articles/valve-selection-best-practices>

Valve Durability is Critical to a Long, Useful Service Life: <https://insights.globalspec.com/article/9927/valve-durability-is-critical-to-a-long-useful-service-life>

Tips for Industrial Valve Maintenance: <https://southernvalve.com/news/tips-industrial-valve-maintenance/>

Your Guide to Valve Maintenance and Troubleshooting: <https://www.swagelok.com/en/blog/valve-maintenance-and-troubleshooting>

“What Are the Latest Trends and Innovations in Directional Control Valves?,” LinkedIn: <https://www.linkedin.com/advice/3/what-latest-trends-innovations-directional-control>

“Innovative Trends in Control Valve Automation,” Thomas Insights: <https://www.thomasnet.com/insights/innovative-trends-in-control-valve-automation/>

“Fluid Control 2023: Automation Trends in Control Valves,” Electric Solenoid Valves: <https://www.electricsolenoidvalves.com/blog/fluid-control-2023-automation-trends-control-valves/>



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For more information or to speak to our team, please  
contact: [info@relevantsolutions.com](mailto:info@relevantsolutions.com)

1.888.605.1458



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