

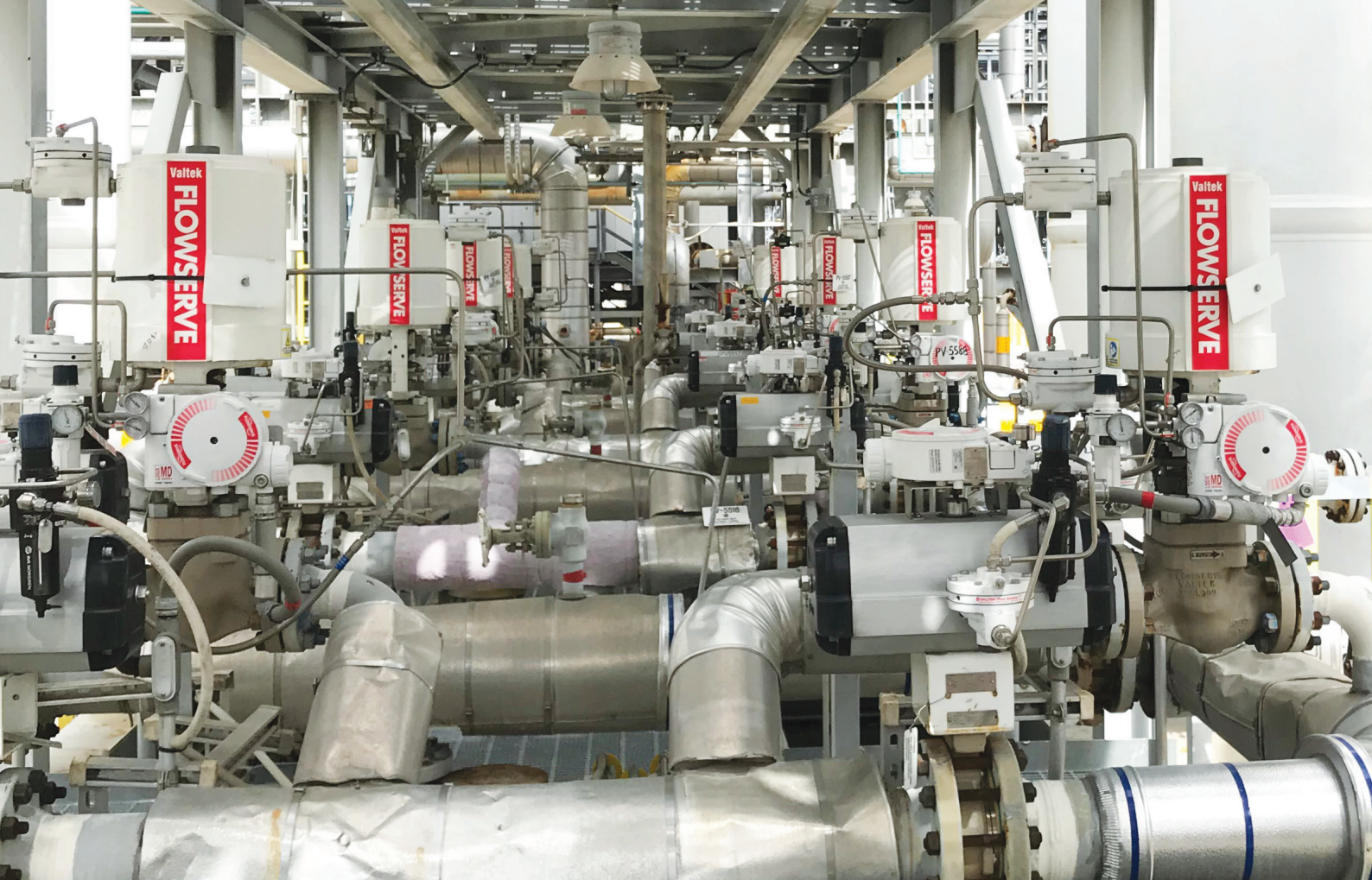


Pressure Swing Adsorption Control Valves

Enhance high-cycle reliability, maximize uptime,
and avoid unexpected costs



Experience In Motion



Ensure control valve reliability in critical PSA applications

Pressure swing adsorption (PSA) applications in chemical plants, oil refineries and other facilities require control valves that maintain tight shutoff amidst high cycles and bi-directional flows.

Control valves can cycle as often as every 30 seconds, leading to common failures such as stem or shaft breakage. In addition, inadequate linkage of the valve with its actuator and positioner contribute to mechanical failure in high-cycle environments. Maintenance and unplanned downtime can increase as a result, threatening PSA unit efficiency, throughput and profitability.

PSA unit operators can optimize performance and maximize uptime in control and on/off applications by specifying licensor-approved valves and automation from Flowserve.

Licensor-approved

Flowserve offers proven Valtek control valves and Logix automation to extend equipment life and maintain purity in PSA skids. Our control valve assemblies are approved by the world's leading licensors for use in their high-cycle PSA applications because they have been field-proven and validated through lab endurance testing.

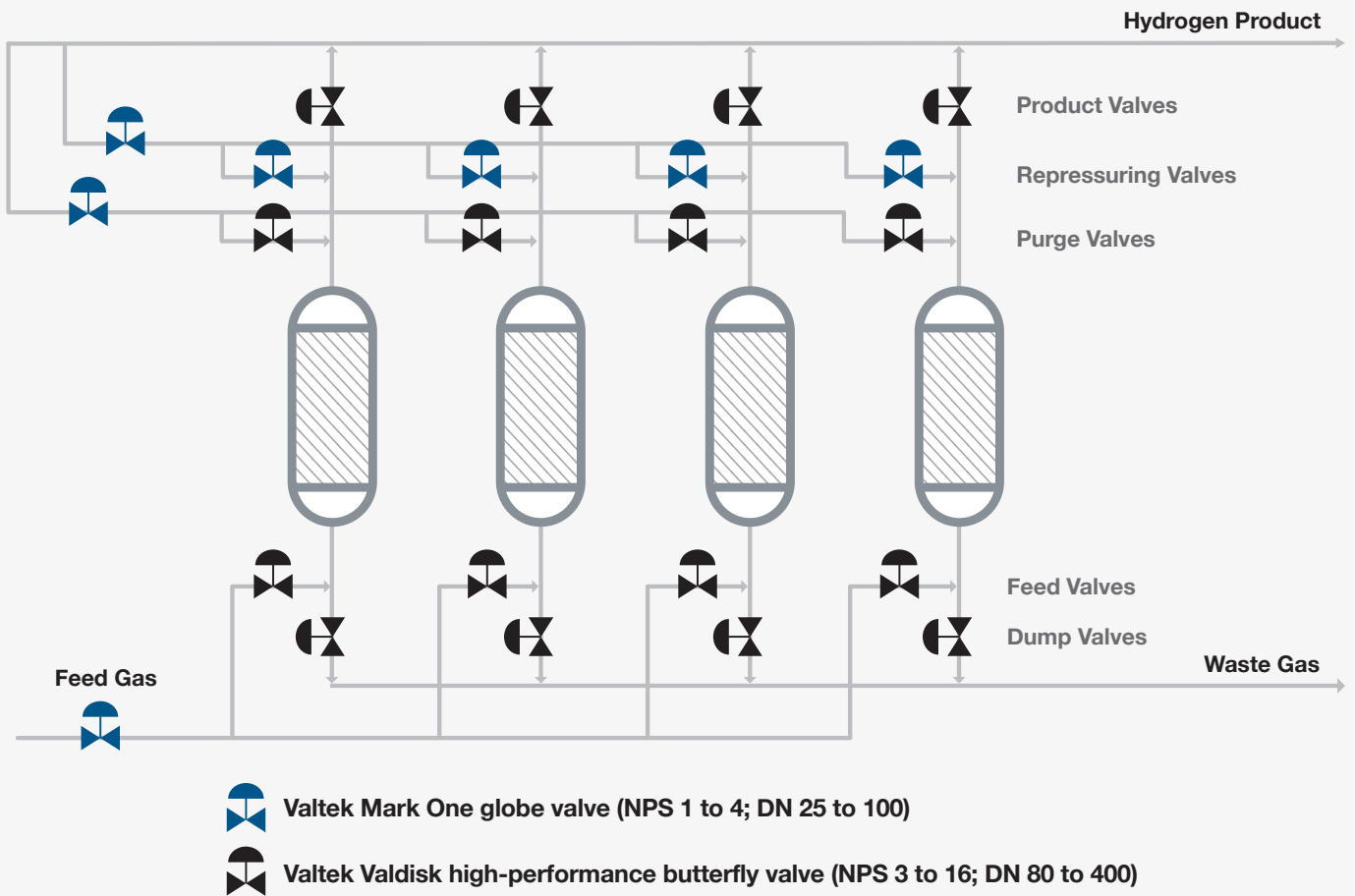
Valtek® Valdisk™ high-performance butterfly valve —

The proven high-cycle soft seat design of the Valtek Valdisk valve delivers reliable bubble-tight shutoff to support high PSA process efficiency. Its thin body enables a smaller overall PSA skid footprint with lower weight and costs.

Valtek Mark One™ globe valve — The industry choice for a simple, reliable, tough control valve, the Mark One globe valve provides superior accuracy, rangeability and options to reduce the impacts of pressure drops.

Logix™ 3800 positioner — This smart digital positioner enables plant operators to leverage the internet of things (IoT) for a connected platform of smart products, software and services. With it, they can quickly respond to equipment issues to minimize disruptions and downtime.

Flowserve control valves used in a typical four-bed PSA process



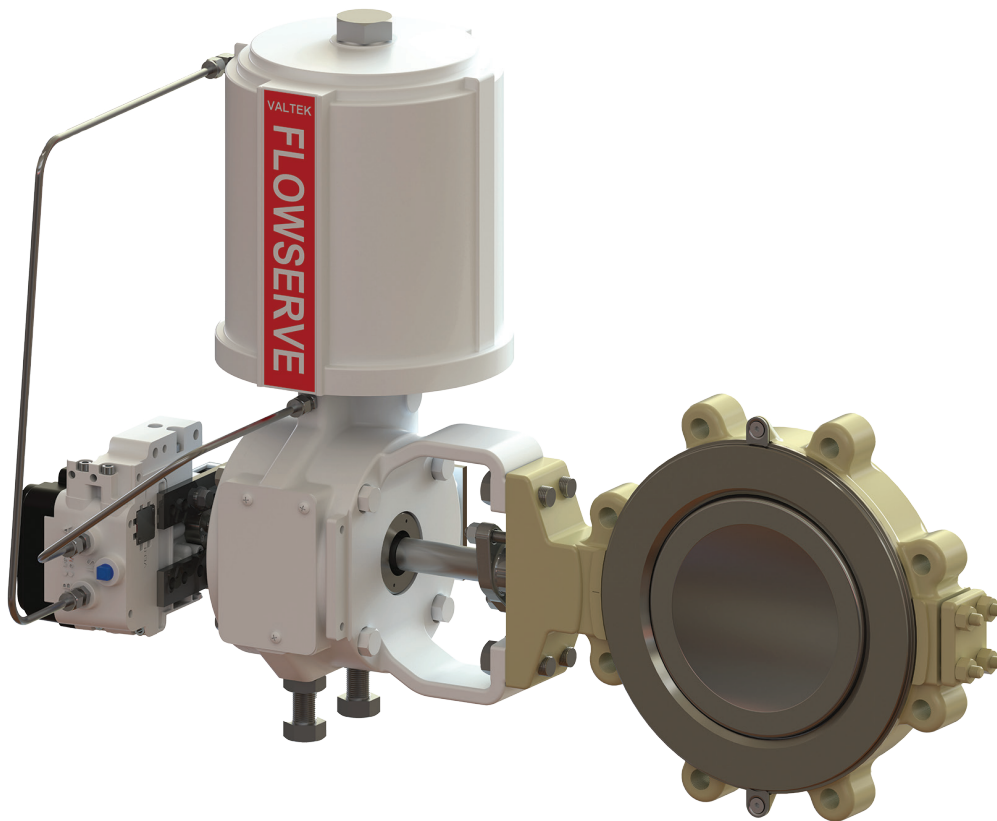
Get the most out of your PSA unit

Maximize PSA skid efficiency and profits — With the proven shutoff reliability of Valtek Valdisk and Mark One valves, plant operators can maintain accurate pressure in the PSA beds and extract purer hydrogen, oxygen and nitrogen (or other gases). Increased gas purity and capacities lead to greater production and higher profits.

Minimize emissions and product losses — The high position accuracy, bubble-tight shutoff and low fugitive emissions of Valtek Valdisk and Mark One valve assemblies enable precise PSA process control while ensuring regulatory compliance and avoiding costs from product losses.

Extend service life and lower total cost of ownership —

Valtek Valdisk and Mark One valves provide long service life with little wear, so costly downtime is minimized and turnaround cycles can be extended. And these valve assemblies are RedRaven Ready, which means maintenance intervals and lifecycle costs can be further improved with Flowserve's IoT-enabled, advanced predictive maintenance solution. (See [page 7 to learn more.](#))



Valtek Valdisk high-performance butterfly valve

Flowserve designed the Valtek Valdisk butterfly valve to ensure process variables remain close to the desired setpoints and improve process productivity, plant uptime and employee safety.

Its performance and reliability in PSA applications have been field-proven over 30 years and validated by lab testing.

High cycle performance — Completed one million-cycle test; licensor-approved for use

Improved uptime — A proprietary soft seat design provides long-lasting, tight shutoff in both flow directions, optimizes leakage resistance, minimizes downtime, and improves plant productivity.

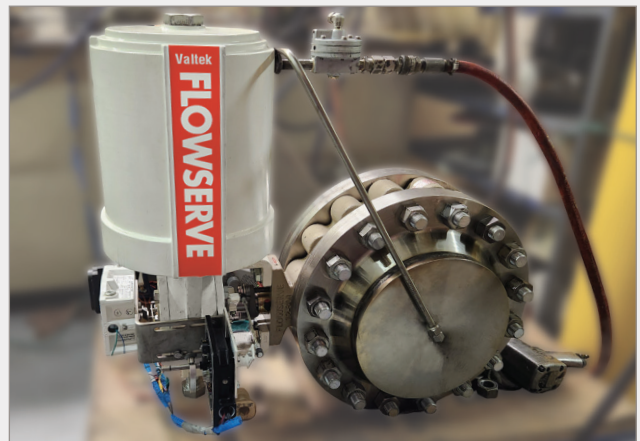
Lower maintenance costs — The double-offset disc design reduces seat and disc wear as well as leakage, extends seat life, and reduces maintenance costs.

High-performance throttling — A high-thrust cylinder actuator coupled with an eccentric-cammed disc enables unmatched, high-performance throttling.

Enhanced reliability — The high-cycle soft seat provides Class VI shutoff and incorporates innovative proprietary key features that extend mean time between repair (MTBR).

Proven reliability through one million-cycle testing

The Valtek Valdisk valve has completed a one million-cycle endurance test and is licensor-approved for use in high-cycle PSA applications.



Testing was conducted under the most rigorous conditions, in accordance with licensor criteria:

- One million open/close cycles
- Control ramp measuring sensitivity, repeatability, linearity
- High-pressure cycling: 350 psi upstream
- Seat leakage criteria: ANSI/FCI 70-2 Class VI
- Stem leakage criteria: zero bubbles

Valtek Mark One globe control valve

The industry-leading control valve for PSA applications, the Valtek Mark One globe valve has been field-proven over more than three decades of successful service. It offers superior reliability and performance with exceptionally tight shutoff in liquid and gaseous services. It also is easy and inexpensive to maintain.

High positioning accuracy — Spring-cylinder actuation enables stiffness and maintains repeatability, controlled high speed and faithful response. The Mark One valve handles up to 150 psig (10.3 barg) supply air and has the thrust to shut off against much higher fluid pressures.

Exceptionally tight shutoff — The spring, supply air pressure and fluid pressure combine to produce exceptionally tight shutoff. A self-aligning seat ring further enhances the shutoff capability.

Easy maintenance and rugged design — With simple top-entry clamped seats, the Valtek Mark One globe control valve is designed for durability and ease of maintenance, reducing critical downtime and minimizing maintenance workloads.



Noise attenuation — The Valtek Mark One valve accommodates a broad spectrum of severe service trim solutions designed to reduce noise and vibration, improving safety.



Logix 3800 digital positioner

Logix positioners have been trusted in PSA applications for more than three decades. The Logix 3800 digital positioner builds on those field-proven designs and represents the next generation of smart positioner technology. With it, plant operators can leverage the IoT to minimize disruptions and downtime. (See page 7 to learn more.)



High cycle performance — Completed one million-cycle test; licenser-approved for use

Application versatility — The Logix 3800 positioner is compatible with linear and rotary valves and actuators, as well as standard communication protocols, including analog position control, HART or Foundation Fieldbus.

Simplified calibration and commissioning — An innovative, quick-calibration button automatically configures the zero, span and gain of the positioner for most valves in less than 60 seconds.

Increased uptime — With five pressure sensors, the Logix 3800 digital positioner enables operators to identify and assess the severity of developing problems in valves and actuators so action can be taken before a critical event.



Responsive service backed by global support network

PSA is a demanding application for valves. Even the best valves on the market can fail due to the high-cycle rates and bi-directional flow pressures.

An offline PSA bed can shut down as much as 20% of a refinery's capacity. Costs can add up quickly if spare parts and adequate technical support and services are unavailable to avoid or minimize unplanned downtime. Lost production can cost millions of dollars.

It's critical then that plant operators have a dependable and capable partner who provides technical support and services that minimize planned and unplanned downtime. The Flowserve global network of Quick Response Centers offers remote and/or on-site technicians to quickly troubleshoot issues and make repairs.

Shorten lead times with proven project management expertise

Plant operators and their engineering, procurement and construction (EPC) consultants also face project delays and missed production targets when equipment manufacturers do not deliver, install and commission valves on time.

Flowserve possesses the engineering prowess and project management expertise that enable us to offer shorter lead times and deliver valves on agreed-upon schedules.

We also operate multiple production facilities around the world with proven records of delivering valves according to agreed-upon lead times. Regional operations make coordination of inspection and testing easy, and lower shipping costs to the end destination.

Advanced predictive maintenance with RedRaven

PSA processes are vulnerable to production constraints and unplanned costs when control valves fail. On a typical large-scale hydrogen plant, a 1% decrease in PSA unit availability and production due to unplanned downtime could potentially lead to a direct negative impact of \$3 million to \$5 million annually.

These risks can be minimized with RedRaven, the advanced predictive maintenance solution from Flowserve.

Increase valve uptime with condition monitoring

Conventional maintenance practices have been reactive after equipment failure occurs. This often leads to PSA beds being taken offline, compromising production rates and increasing costs. Valve failures can also lead to hydrocarbon leaks, resulting in regulatory fines and hazardous plant conditions.

Combined with the Logix 3800 digital positioner, RedRaven monitors and analyzes the condition and performance of valves to alert you when the equipment on PSA skids deviates from normal operating ranges. Each control valve in the PSA process is connected to the Flowserve monitoring center and assists operations and maintenance by providing continuous performance insights so plant operators can keep PSA processes running at peak efficiency.

- **Proactively identify** upcoming valve failures and take preventive action before they cause an interruption.
- **Eliminate** expensive repairs and unexpected downtime.
- **Increase** equipment and system uptime.
- **Monitor** valve performance in near/real time from anywhere.
- **Make better-informed decisions** to improve plant efficiency, productivity and profitability.
- **Ensure compliance** with health, safety and the environment (minimizing emissions).
- **Reduce** maintenance costs and required planning time.





Flowserve Corporation
5215 North O'Connor Blvd.
Suite 700
Irving, Texas 75039-5421 USA

Flowserve Corporation has established industry leadership in the design and manufacture of its products. When properly selected, this Flowserve product is designed to perform its intended function safely during its useful life. However, the purchaser or user of Flowserve products should be aware that Flowserve products might be used in numerous applications under a wide variety of industrial service conditions. Although Flowserve can provide general guidelines, it cannot provide specific data and warnings for all possible applications. The purchaser/user must therefore assume the ultimate responsibility for the proper sizing and selection, installation, operation, and maintenance of Flowserve products. The purchaser/user should read and understand the Installation Instructions included with the product, and train its employees and contractors in the safe use of Flowserve products in connection with the specific application.

While the information and specifications contained in this literature are believed to be accurate, they are supplied for informative purposes only and should not be considered certified or as a guarantee of satisfactory results by reliance thereon. Nothing contained herein is to be construed as a warranty or guarantee, express or implied, regarding any matter with respect to this product. Because Flowserve is continually improving and upgrading its product design, the specifications, dimensions and information contained herein are subject to change without notice. Should any question arise concerning these provisions, the purchaser/user should contact Flowserve Corporation at any one of its worldwide operations or offices.

©2023 Flowserve Corporation. All rights reserved. This document contains registered and unregistered trademarks of Flowserve Corporation. Other company, product, or service names may be trademarks or service marks of their respective companies.

VABR001062-01 (EN/A4) June 2023