

# Severe Service Control Valve Solutions



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# Advanced Solutions

# Advanced Solutions

## Challenges of traditional designs.

Process plants have increased through-put, causing operating pressures and temperatures to increase as well—making traditional control valves unstable and less reliable. This could lead to problematic plant conditions, such as:

- Safety concerns
- Valve failures before planned outages
- Process shut-downs
- Increased maintenance
- Decreased profitability

## Demand for advanced solutions.

These advanced production techniques and pipeline processes are creating a new way of operating—with demand for new types of equipment and valves to better handle severe service conditions, such as:

- High pressure differentials
- Excessive noise and vibration
- Cavitation or flashing potential
- Limitations of rangeability



# Advanced Solutions

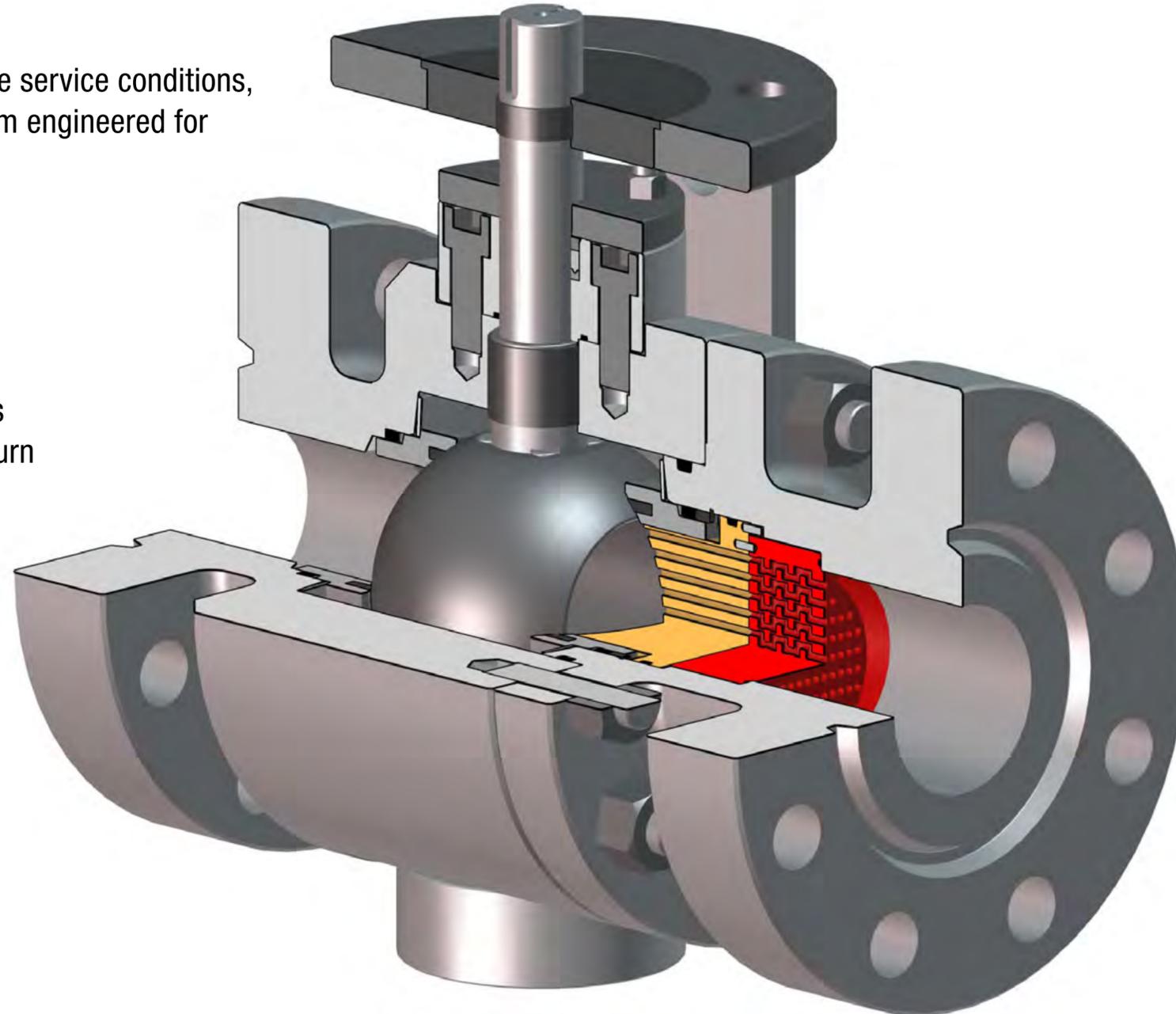
## The innovative solution.

Designed specifically for the demands of severe service conditions, FlexStream® rotary control technology is custom engineered for individual applications to provide:

- Superior velocity control
- Variable characterization
- Exceptionally high rangeability
- Precision modulation

This patented FlexStream® technology expands upon the proven strengths of MOGAS quarter-turn ball valves to offer:

- Application-specific trim engineered for high  $\Delta P$  applications
- Replaceable control element design
- Greater Cv per inch compared to competition
- Smaller dimensional envelope than a traditional control valve
- Dependable emissions control



# Design Principles

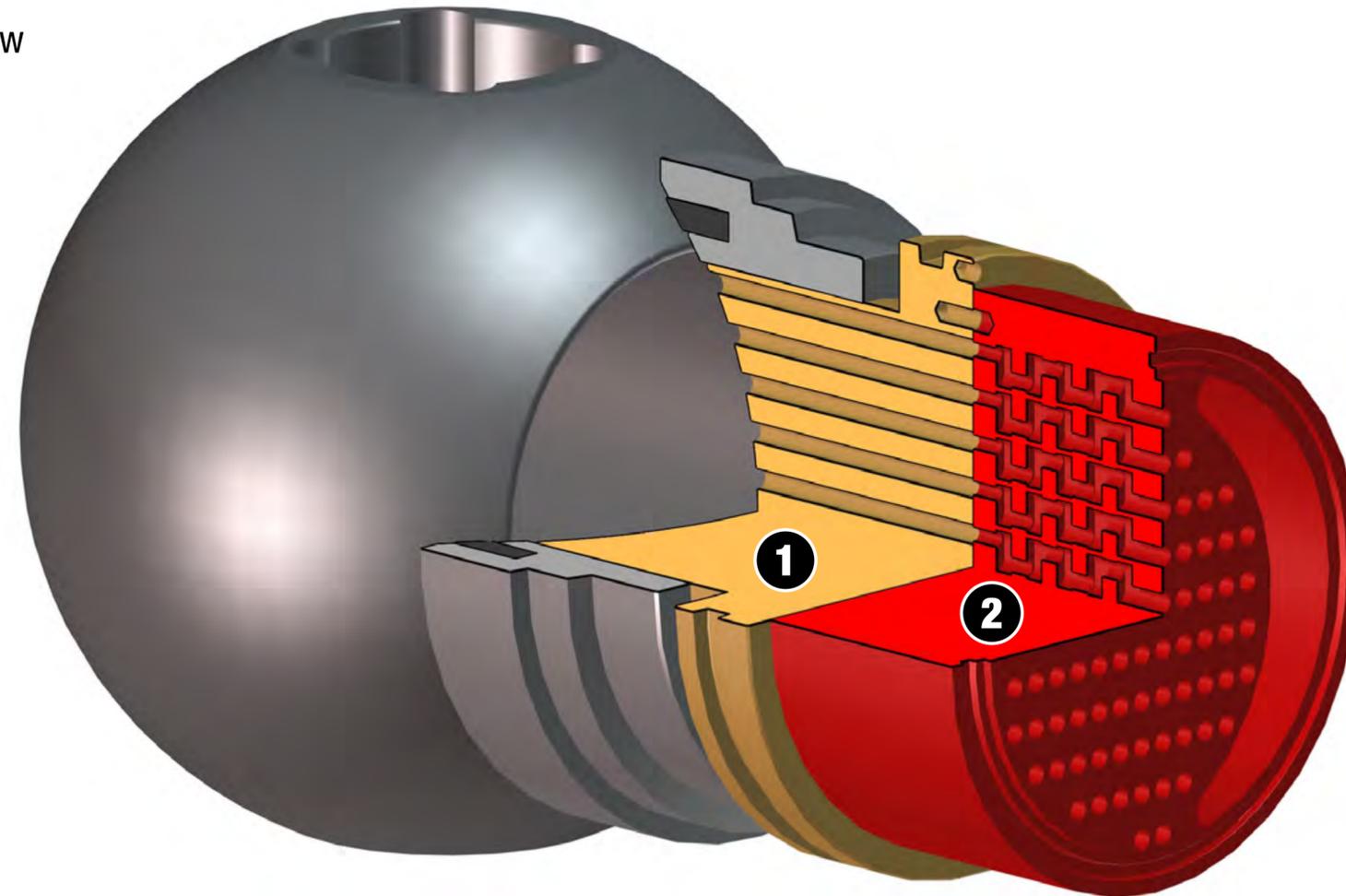
# Design Principles

## FlexStream® control technology.

The internal control elements (or trim) use flow paths of various configurations to control flow and pressure drop. This compact trim configuration, located downstream of the seat, consists of a diffusion element and a control element.

- 1** The **diffusion element** splits and aligns the flow through an arrangement of straight paths.
- 2** The **control element** reduces the flow velocity through an arrangement of tortuous flow paths and open area.

The variable characterization of the control element allows **precise pressure letdown** and **superior velocity control** tailored to specific process conditions.



# Design Principles

## Variable characterization.

Flexstream® technology offers you precise flow control through a combination of variable characterization methods available in the control element.

### 1 Path characterization

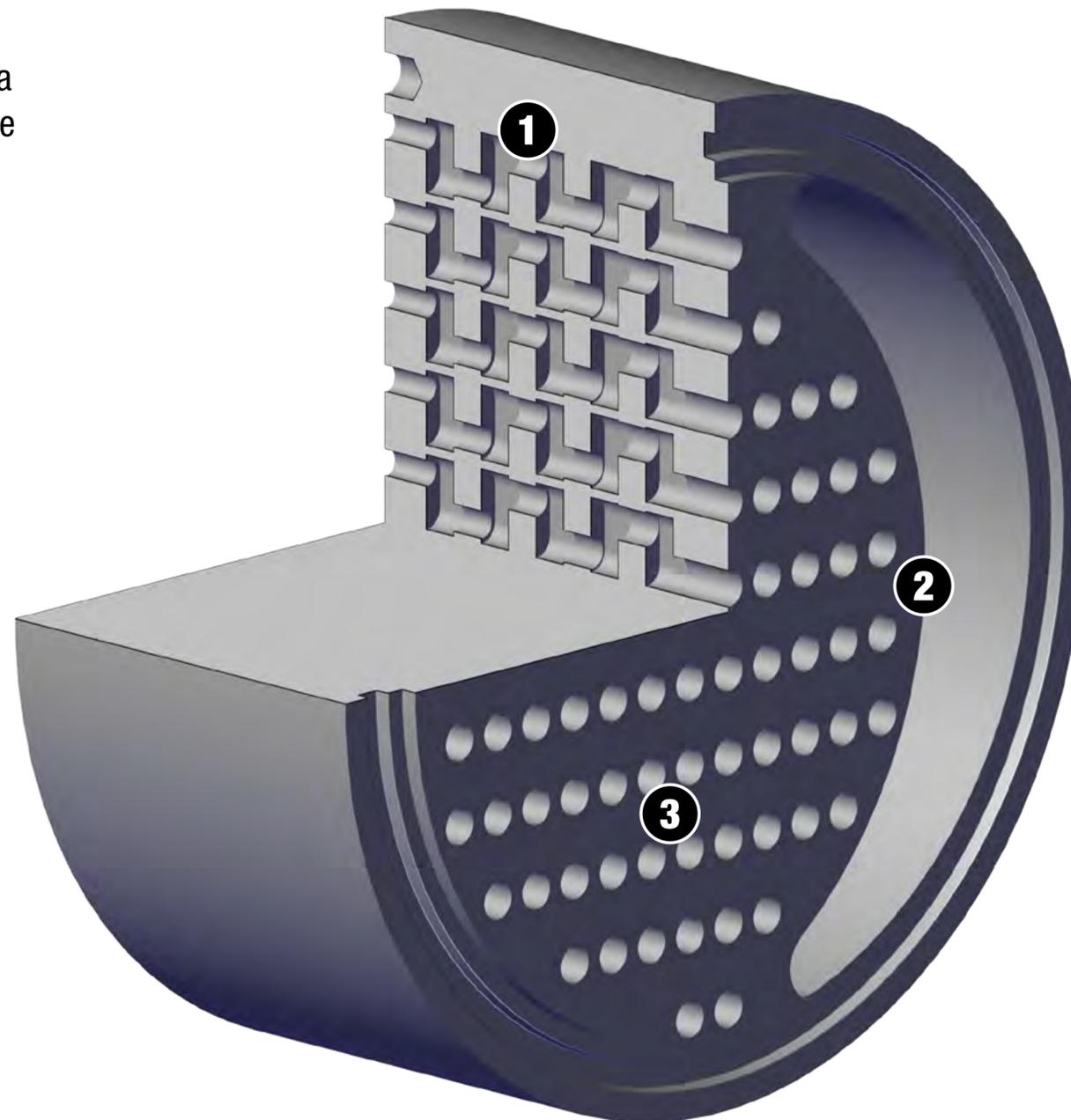
Varies the number of turns, or letdown stages, in the passageways (straight-through or up to 24 turns).

### 2 Fill characterization

Varies the amount of control area within the bore (from 30 to 100 percent).

### 3 Pattern characterization

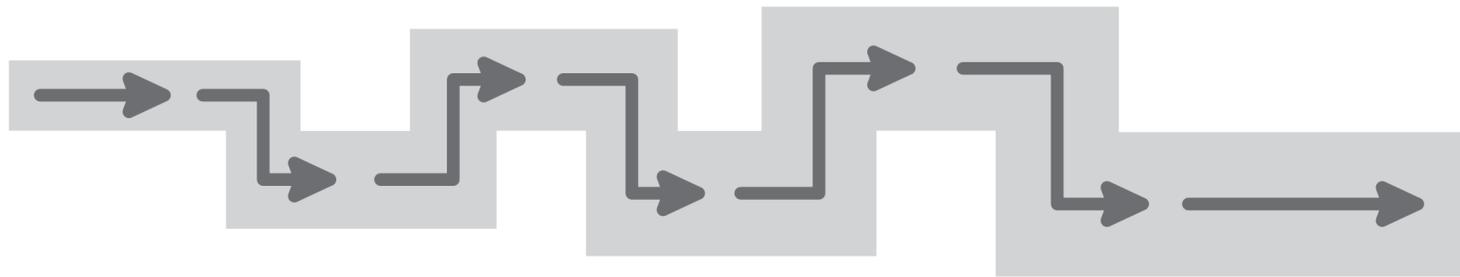
Varies the quantity, style, size and arrangement of passageways that fill the control area.



# Design Principles

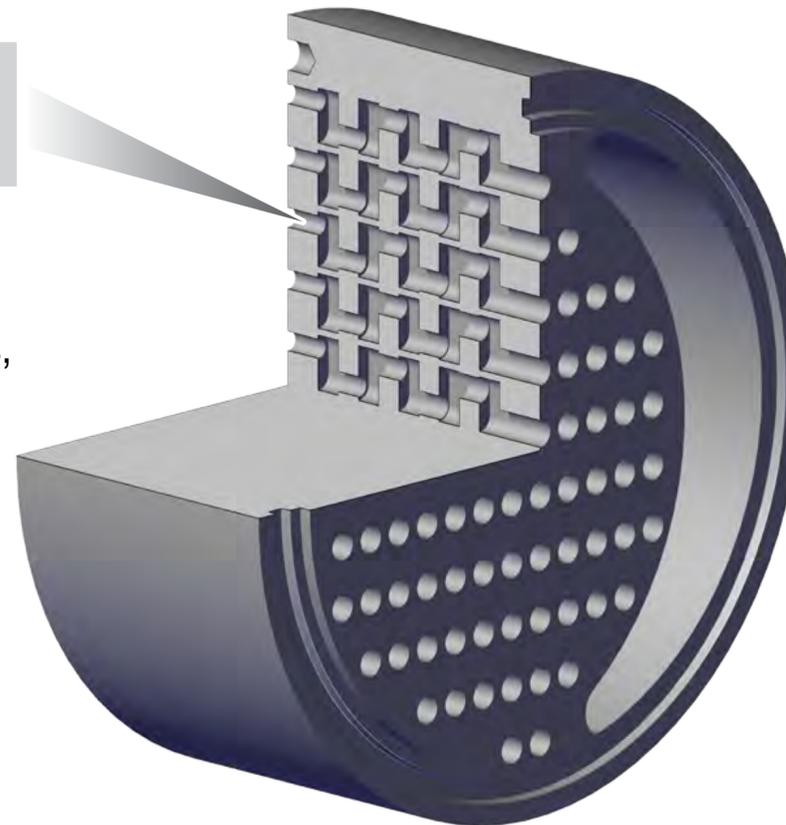
## Path characterization for velocity control.

Pressure can be reduced by directing fluid flow through a right angle, which **absorbs kinetic energy** and **controls velocity**. By cascading pressure over a series of right angle turns—the tortuous flow path—the pressure drop at each stage is evenly distributed. The tortuous flow path expands at each right angle turn to allow for volumetric expansion, ensuring velocity will not be increased.



The larger the pressure drop, the more turns are required to control velocity. **Path characterization** varies the number of turns, or letdown stages, in the passageways. Up to 24 turns can be used to customize solutions for high-pressure differential applications, providing better control of:

- Velocity
- Noise
- Vibration
- Erosion
- Cavitation

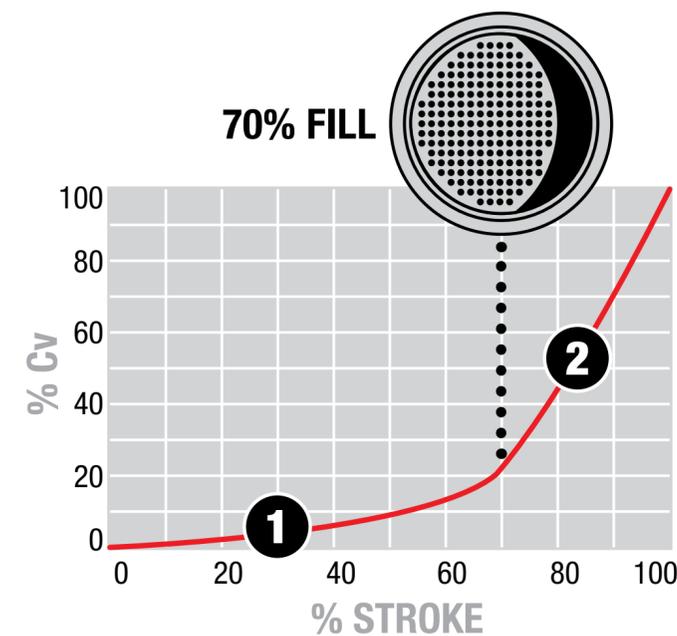
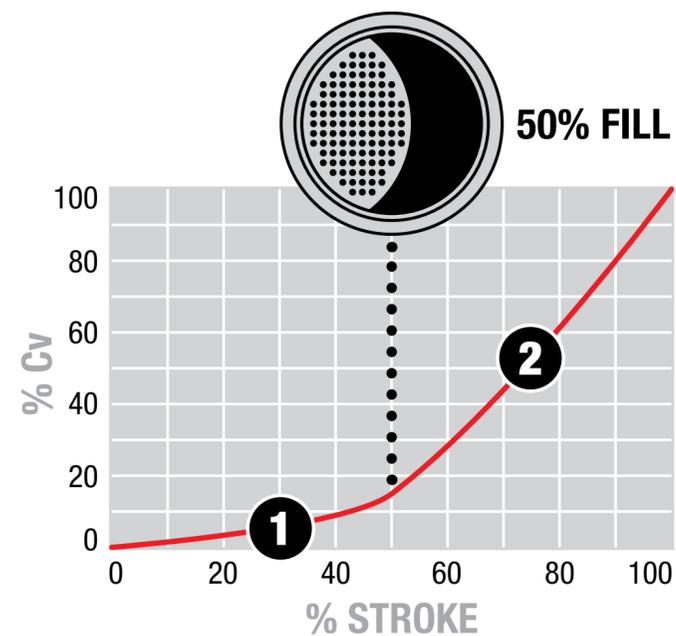
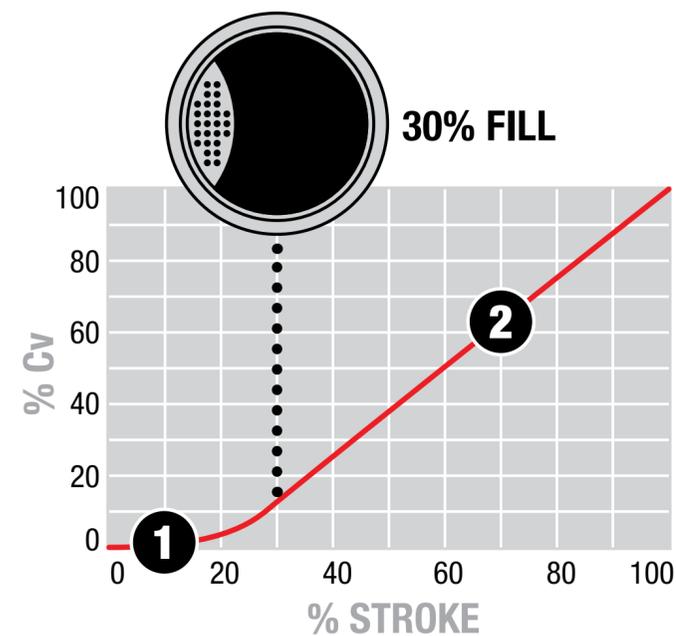
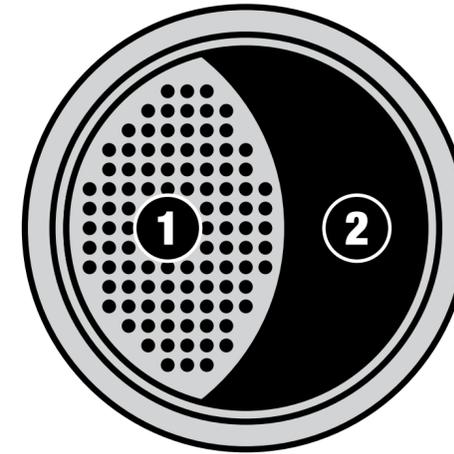


# Design Principles

## Fill characterization for high rangeability.

The control element consists of a **control area (1)** with multi-stage tortuous paths, and an **open area (2)** for unrestricted flow. **Fill characterization** varies the amount of control area within the bore from 30 to 100 percent, depending on flow conditions, pressure drop, noise level and outlet velocity required.

The combination of control area and open area provides exceptional flow control for applications that require **high rangeability**. The control area is used for higher pressure drop, lower flow conditions, while the open area provides lower pressure drop, higher flow coverage and uninterrupted flow capacity required in many applications.

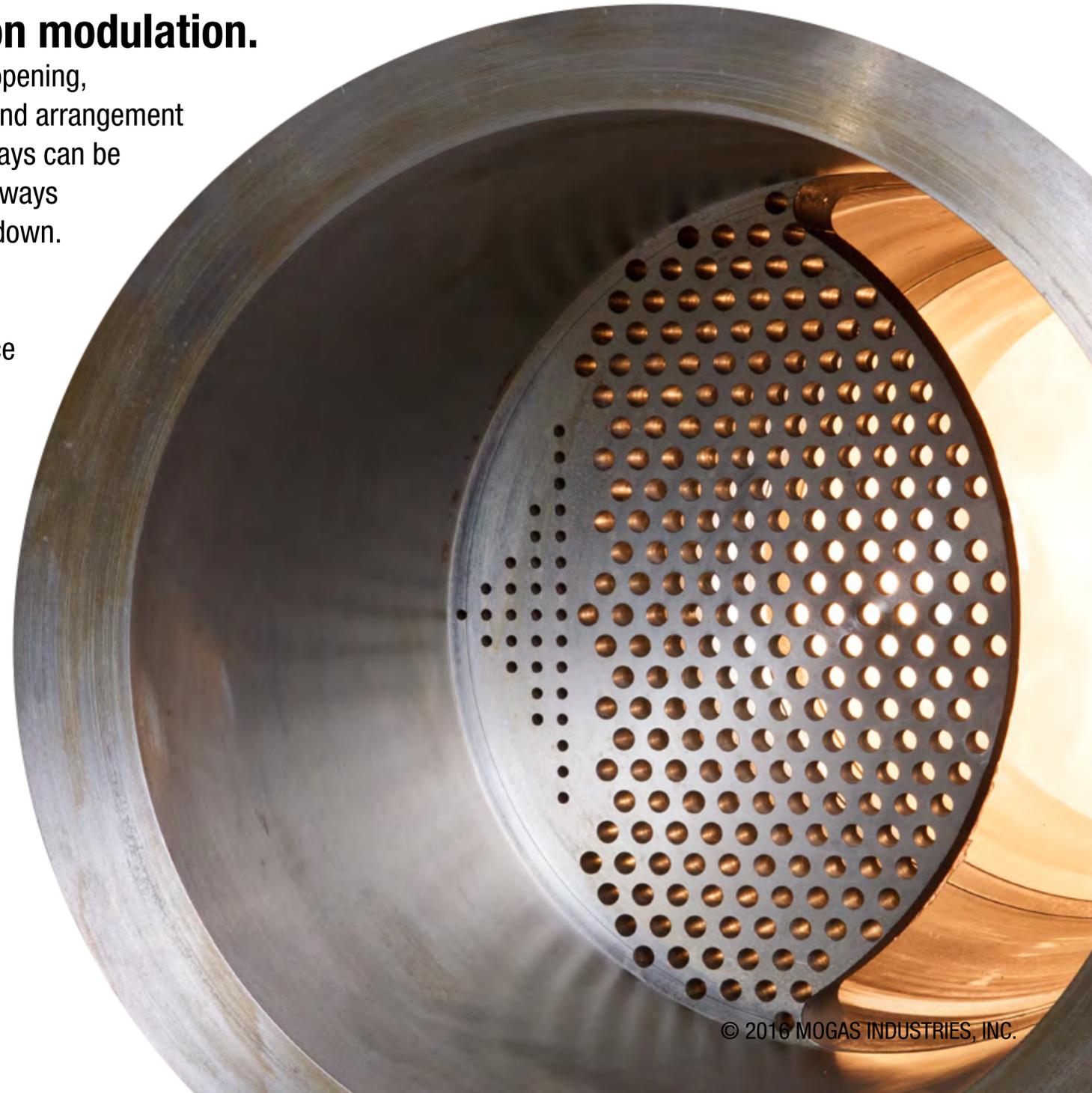


# Design Principles

## Pattern characterization for precision modulation.

To further provide precise control at every stage of valve opening, **pattern characterization** varies the quantity, style, size and arrangement of passageways that fill the control area. Some passageways can be small with several stages of letdown, while other passageways progressively increase in size while reducing pressure letdown.

These combinations of variable characterization allow application-specific designs that provide ideal performance and extended valve life.



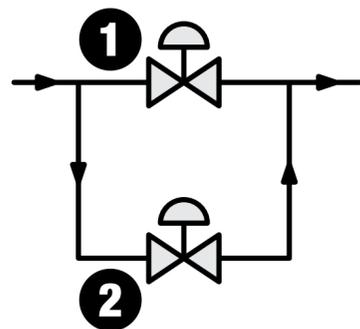
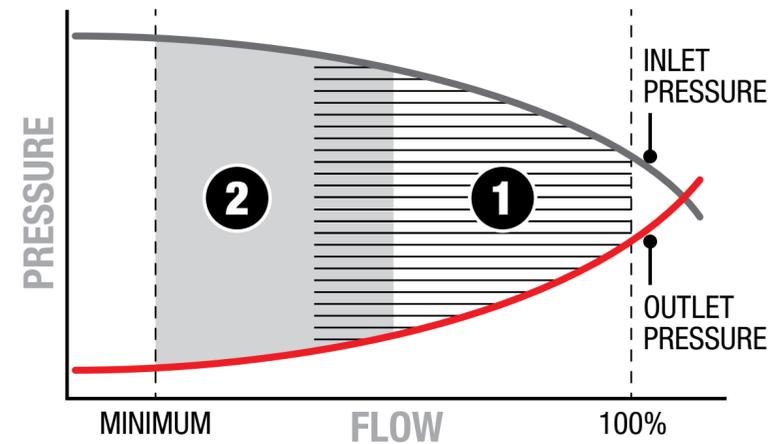
# Benefits

# Benefits

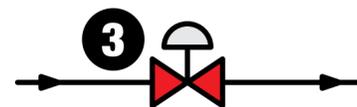
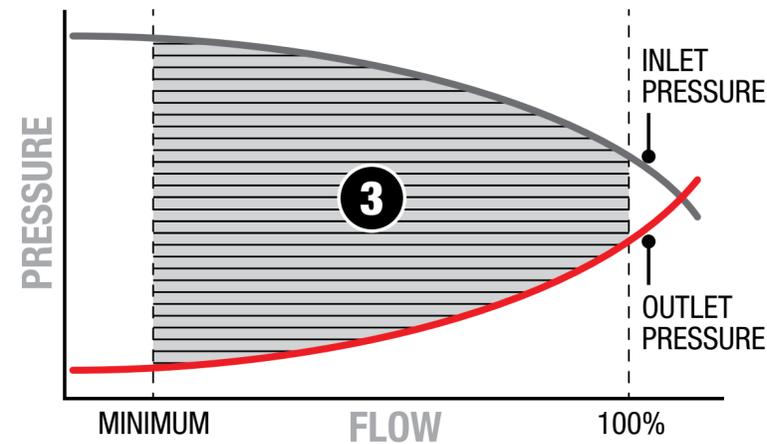
## High rangeability means better process control.

Maintaining control between high- and low-flow extremes can be a challenge for conventional valves, which often require split-range configurations to accommodate the wide range of flow requirements. With its unique control element, FlexStream® offers a rangeability that's almost unlimited, which means you can replace two or more valves with one valve that can do it all.

### TYPICAL SPLIT-RANGE FLOW CONTROL



### FLEXSTREAM FLOW CONTROL

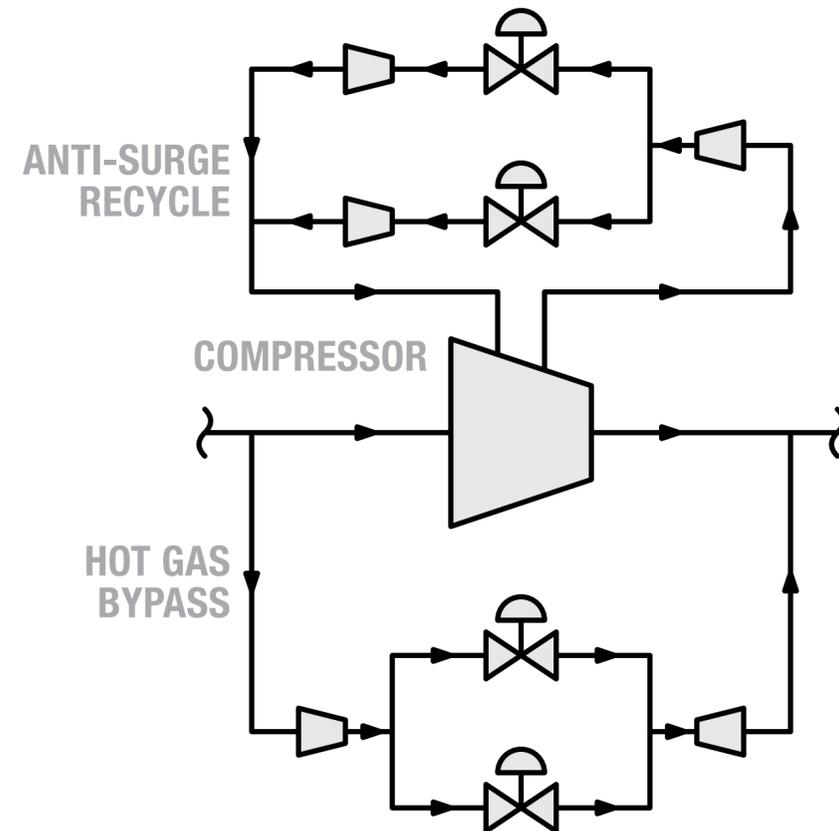


# Benefits

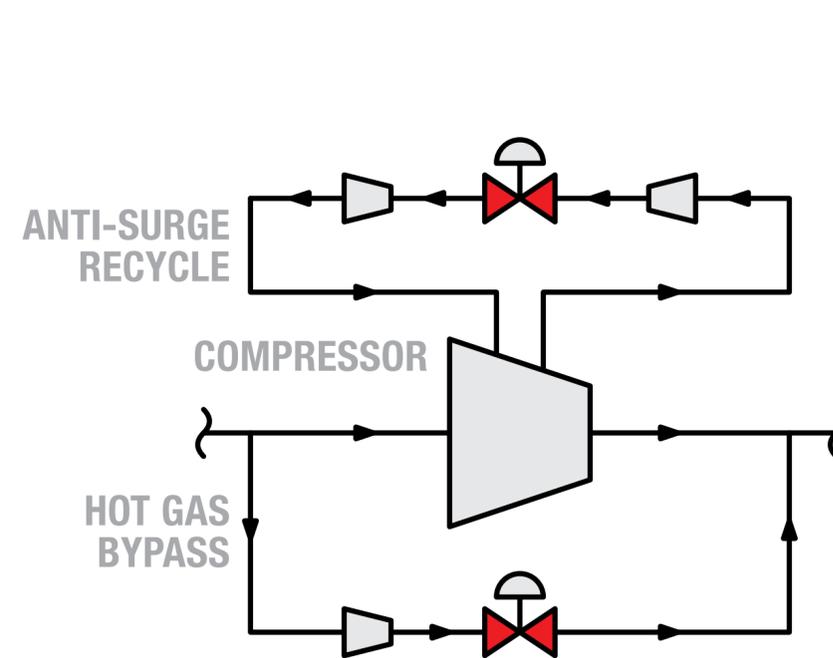
## High rangeability means fewer valves.

Valves using FlexStream® technology excel in applications where a main valve and bypass valve are required, since the exceptionally high rangeability allows you to replace both valves with a single valve, as shown in this example.

TYPICAL CONTROL VALVE CONFIGURATION



SIMPLIFIED FLEXSTREAM CONFIGURATION



# Benefits

## Simplified configuration means less infrastructure.

Thanks to the improved rangeability and characterization, the need for additional valves and bypass configurations is eliminated. Compare this to a conventional rising-stem globe valve, which requires multiple pipe turns and lengthy pipe runs, or sideways mounting, to accommodate valve installation.

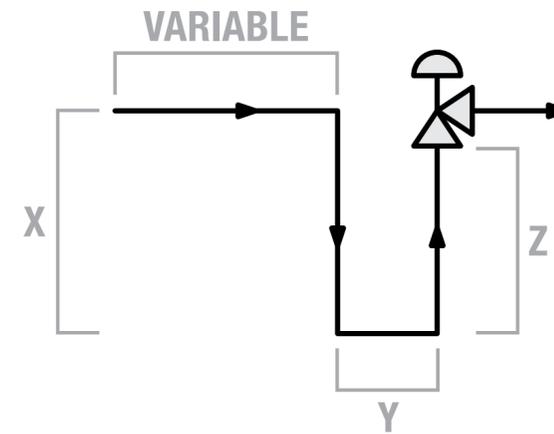
Simplified configuration means:

- Reduced material and infrastructure costs
- Less weight
- Less piping support
- Greater installation flexibility
- Reduced spare parts inventory

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### CONVENTIONAL CONTROL VALVE CONFIGURATION

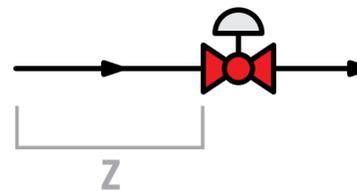
REQUIRES PIPE LENGTH  $>X+Y+Z$



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### SIMPLIFIED FLEXSTREAM CONFIGURATION

REQUIRES ONLY PIPE LENGTH Z



# Benefits

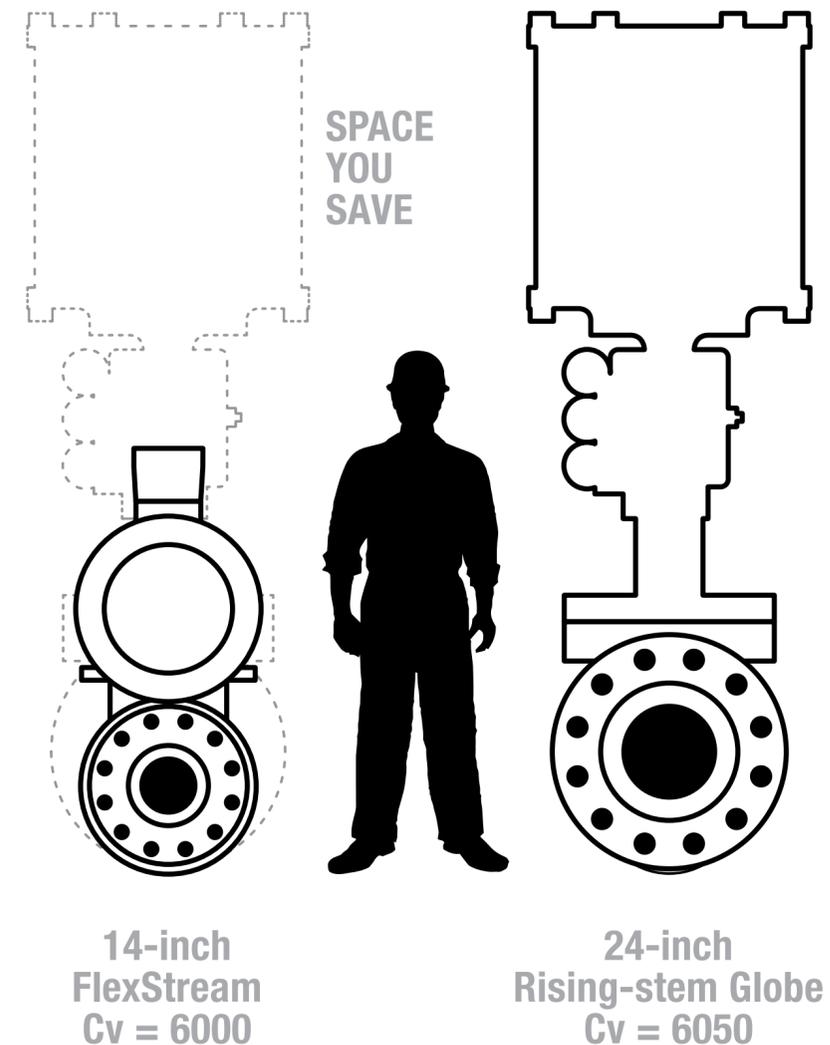
## Smaller envelope means cost savings.

With FlexStream® technology, big control comes in a smaller package. Variable characterization offers reduced bore and valve sizes, resulting in a smaller overall dimensional envelope than conventional rising-stem globe valves. The more compact design allows for cost savings that can be repurposed for other plant needs.

A smaller overall dimensional envelope means:

- Smaller bore
- Smaller valve body
- Less weight
- Reduced height
- Reduced pipe size and supporting hardware

## SMALLER ENVELOPE WITH EQUIVALENT Cv



# Technical Specifications

# Technical Specifications

## Design parameters

ASME / ANSI B16.34 and B16.10

## Sealing design

Uni-directional or bi-directional

## Operating design

Floating ball or trunnion ball design

## Body design

2 or 3-piece forged body

## Pressure class

ASME Class 150 – 4500

## Temperature range

-238 to 1650° F (-150 to 900° C)

## Size range

2 to 42+ inches (50 to 1050+ DN)

## Materials

Application specific from advanced metallurgy

## Coatings

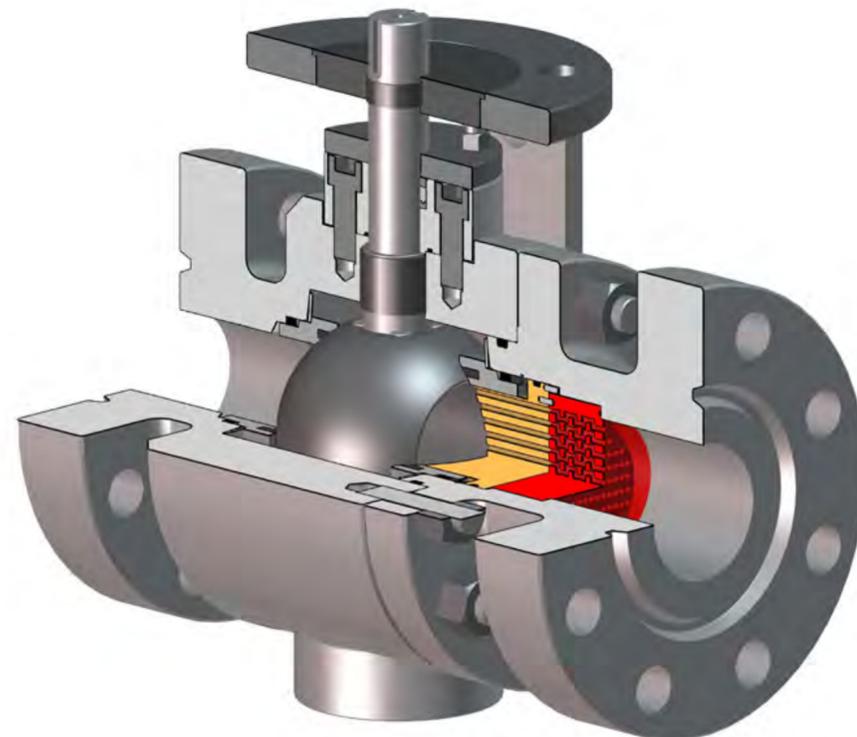
Application specific from proprietary and patented coatings

## End connections

Welded / Flanged / Clamped / Custom

## Actuation

Pneumatic / Hydraulic / Electro-hydraulic / Electric



# Technical Specifications

## Standards and certifications

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|             |                         |  |
|-------------|-------------------------|--|
| <b>API</b>  | API 6A (ISO 10423)      | Specification for Wellhead and Christmas   |
|             | API 6D (ISO 14313)      | Specification for Pipeline Valves  |
|             | API 14 RP C             | Recommended Practice for Analysis, Design, Installation, and Testing of Basic Surface Safety Systems for Offshore Production Platforms   |
|             | API 521 (ISO 23251)     | Pressure-relieving and Depressuring Systems  |
| <b>NACE</b> | NACE MR0175 (ISO 15156) | Requirements and recommendations for the selection and qualification of carbon and low-alloy steels, corrosion-resistant alloys, and other alloys for service in equipment used in oil and natural gas production and natural gas treatment plants in H <sub>2</sub> S-containing environments |
| <b>ASME</b> | B16.5                   | Steel Pipe Flanges & Flanged Fittings  |
|             | B16.10                  | Face to Face & End to End Dimensions of Valves   |
|             | B16.11                  | Forged Fittings Socket Welding and Threaded  |
|             | B16.25                  | Butt-welding Ends  |
|             | B16.34                  | Valves – Flanged, Threaded & Welded End  |
| <b>ANSI</b> | FCI 70-2                | Control Valve Seat Leakage   |
| <b>ISA</b>  | S75.01                  | Flow Equations For Sizing Control Valves   |
|             | 5208                    | Pressure Testing of Metallic Valves  |

# Applications

# Applications



## Oil & Gas Exploration & Production

- High Pressure Separator Letdown
- Water and Gas Injection
- Pump Recirculation
- Choke and Gas Lift
- Compressor Recycle



## Oil & Gas Production & Handling

- Compressor Recycle and Anti-surge
- Compressor Hot Gas Bypass
- Feed Gas Regulation
- Depressurization (Modulating and On/Off)
- Pressure Control



## Oil & Gas Transportation & Storage

- Tank/Cavern Fill and Withdraw
- Pump Recirculation
- Metering Flow Control
- Pressure Control
- Pipeline Fill



## Oil & Gas Floating LNG / FPSO

- Compressor Recycle and Anti-surge
- Compressor Hot Gas Bypass
- Depressurization (Modulating and On/Off)
- Pressure Control

# Applications



## Oil & Gas SAGD

- Feed Gas Regulation
- HP Steam Separator
- Boiler Blowdown
- Steam Header
- Steam Injection



## Refining

- Emergency  
Depressurization
- Compressor Anti-surge/  
Recycle (Wet Gas  
Compressor)
- Hydrocarbon Gas-to-Flare
- Coke Drum Blowdown
- Feed Gas Regulation



## Chemical / Petrochemical

- Compressor Recycle and  
Anti-surge
- Blowdown to Flare
- Vent Discharge
- Depressurization
- Pressure Control



## Power Generation

- Main Feedpump  
Recirculation
- Condensate Recovery/  
Pump Recirculation
- Feed Water Regulation
- Deaerator Level Control
- Flashtank Level Control

# Success Stories

# Success Stories



## Cutting POx depressurization time in half.

An autoclave plant needed a depressurization valve for its POx (Gold) process. FlexStream offered unprecedented rangeability in excess of 300:1. With tortuous-path technology, our installed customized control valve cut depressurization time in half compared to its linear predecessor—all while staying well within strict noise, velocity and thermal-shock limits.



## One feed-gas valve doing the job of two.

For a feed-gas process, an LNG plant needed a control valve with extreme rangeability—nearly 800:1. With its unique trim design, FlexStream was the clear choice. Our rotary control valve also offered a more compact footprint, with a single 24-inch valve able to do the job of two 36-inch linear globe valves. Reduced size and weight made installation safer, with virtually no overshoot. The flexible design also meant fast opening and closing.



## Saving space on an anti-surge application.

Our customer needed a solution for a compressor recycle and anti-surge application. Due to the extremely high rangeability of FlexStream, we successfully replaced two 60-inch conventional globe valves with one 40-inch valve using FlexStream technology, saving the additional pipe, support and weight for a lower installed cost.

# The MOGAS Difference

# The MOGAS Difference

## Our expertise...

### **EXPERIENCE**

We only build valves for the severe service market—and always have.

### **SUPPORT**

Anytime. Anywhere. Servicing what we build helps us make better valves.

### **KNOWLEDGE**

Advanced solutions prompted by client partnerships.

### **INNOVATION**

Application-specific designs born from investigative analysis.

## Your confidence...

### **QUALITY**

Quality processes ensure our valves are built to last.

### **SAFETY**

Safe environments are a priority—in your workplace and ours.

### **VALUE**

Lower cost of ownership is an investment for the long term.

### **RESULTS**

Our valves perform in demanding conditions—we guarantee it.

# The MOGAS Difference

**Our valves perform in demanding conditions  
...we guarantee it.**



Continuous years of research and development, design innovation, advanced manufacturing techniques and field experience allow us to offer an application-specific PERFORMANCE GUARANTEE on our isolation and control valves...plus a lifetime warranty on materials and workmanship.

# The MOGAS Difference

For more information, visit us online at  
[www.mogas.com](http://www.mogas.com)



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Canada  
China  
Europe  
Middle East  
Singapore  
USA

**MOGAS**®  
**SEVERE SERVICE BALL VALVES**