



Valves for Oil & Gas Industries

Engineered Solutions for Isolation and Control

MOGAS[®]
SEVERE SERVICE BALL VALVES

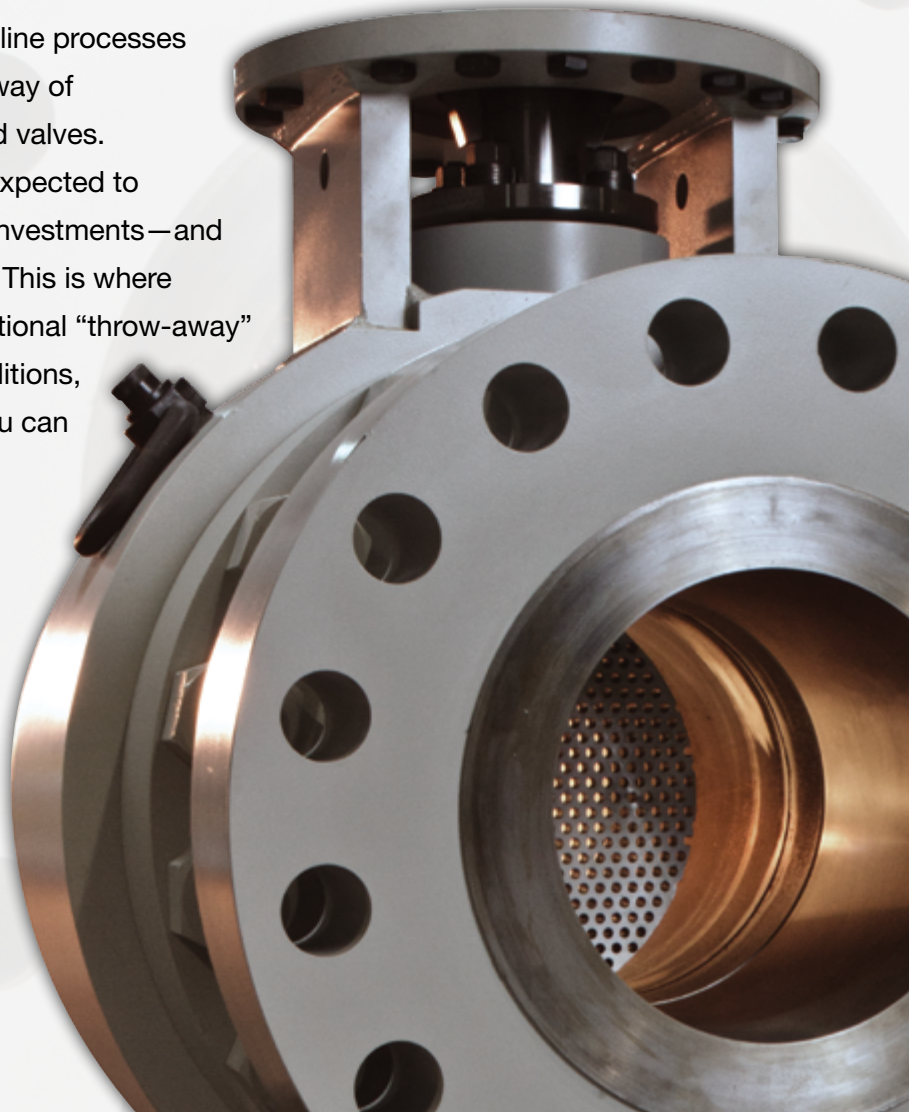
Severe Operating Conditions.

Critical Safety Operations.

Dependability in Remote Locations.

All these factors are key concerns for oil & gas equipment used in upstream, midstream and downstream processes. MOGAS metal-seated isolation and rotary control valves are built for punishing conditions. We understand the crucial need for absolute shutoff and reliable pressure and flow control. Our ongoing application-specific research and development—coupled with in-the-field customer assistance, valve analysis and maintenance / repair service—provides a high level of confidence and support.

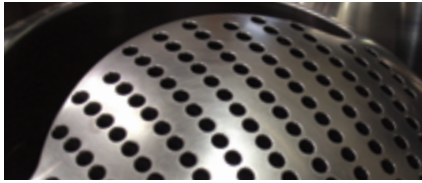
Advanced production techniques and pipeline processes are creating a demand for not only a new way of operating, but new types of equipment and valves. Production and pipeline components are expected to last longer in order to maximize return on investments—and recognize the true total cost of ownership. This is where MOGAS products excel by outlasting traditional “throw-away” valves, performing reliably in extreme conditions, and being supported with field services you can count on.



Oil & Gas Industry Overview

Solutions for Challenging Environments

FlexStream Innovation



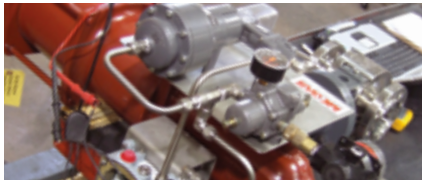
Bi-directional Flow Control



Gas Flow Control



Control Systems Designed In-House



Reduced Footprint



MOGAS metal-seated ball valves have proven successful in these applications and more:

Cavern Fill and Withdrawal

Compressor Anti-Surge

Dryer Sequence (Mol-Sieve)

Emergency Shut Down (ESD)

First Stage Separation

Gas Metering / Gathering Control

High Integrity Pressure Protection Systems (HIPPS)

High Pressure Gas Injection

LNG Feed Gas

Main Gas Storage Flow Control

Plant Depressurization

Positive Isolation Tandem

Severe Pressure Reduction Control

...while handling these conditions and more:

High pressure drops

Multi-phase crude

Erosion

Sour gas

Fugitive emissions

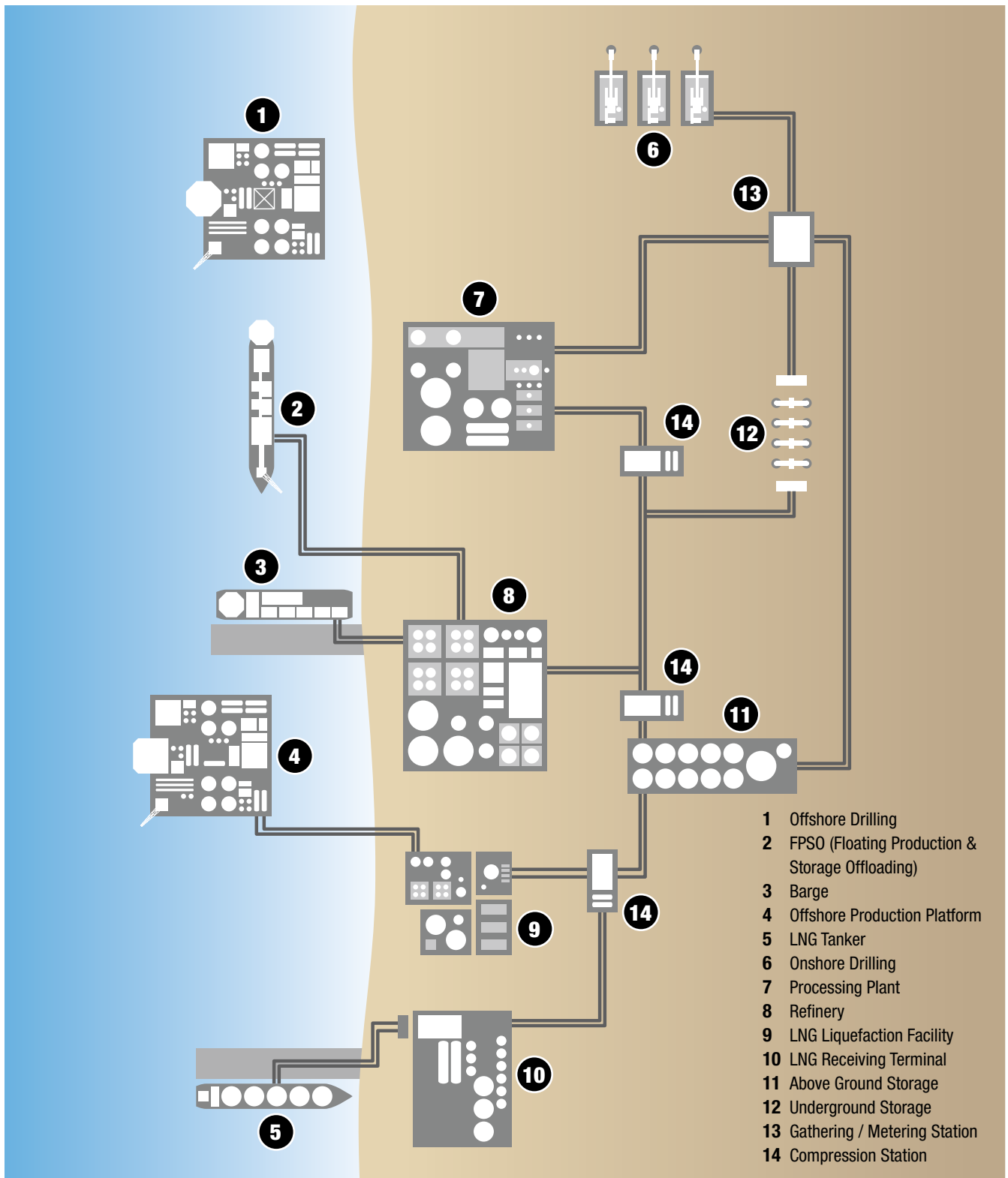
Hydrate formations

High velocity

Noise limitations

Liquefied gas

Vibration



Design Flexibility

C-Series Valve Adapts to Applications

Common Features for the MOGAS C-Series Valve Line

1 Accepts floating ball or trunnion ball design

- Rotating ball does not displace volume or solids
- Straight-through bore path protects sealing surfaces

2 Pressure-energized sealing

- Seat springs maintain constant sealing contact between ball and seats
- Allows for thermal expansion of trim
- Metal seats wipe sealing surface of ball clean during operation

3 Wide seat sealing surface

- Matched ball and seat sets provide total sealing contact for reliable isolation
- Greater sealing contact area withstands minor scratches or abrasions

4 Independent replaceable seats

- Minimizes maintenance and repair costs

5 Blowout-proof stem design

- One piece design meets industry safety standards
- Withstands severe service torques and maximum working pressures

6 Dual-guided stem design

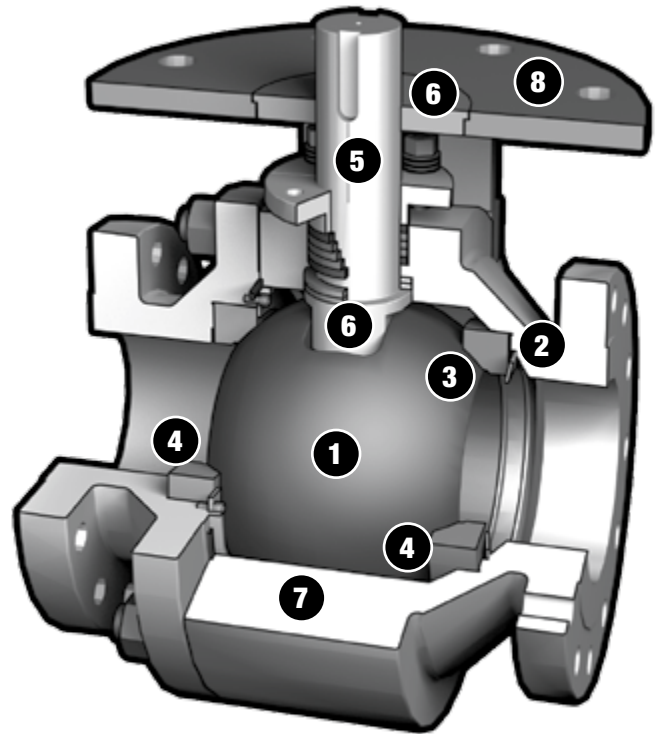
- Pressure-energized inner stem seals serve as thrust bearing and lower stem guide
- Valve stem bushing serves as upper stem guide
- Eliminates lateral movement of valve stem
- Prevents media migration
- Prevents stem packing leaks and risk of fugitive emissions

7 Forged body & end connections

- Greater wall thickness in critical areas provides longer valve life
- 2 or 3-piece designs

8 Heavy-duty mounting flange

- Machined after attaching to ensure precise stem alignment
- Provides structural support for operator mounting
- Provides visual inspection for confirmation of ball position

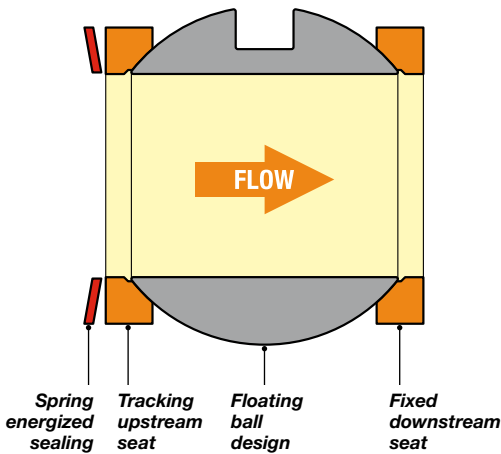


Application Specific Features

Seat designs	Engineered for maximum performance in application-specific conditions
Live-loaded packing	Ensures constant packing energization Prevents stem packing leaks and risk of fugitive emissions
Body Gaskets	Pressure energized body gasket available to meet industry codes
Materials	Application-specific materials available, including exotics Extends valve life
Coatings	Application-specific coatings provide enhanced erosion and corrosion resistance
Liners and inlays	Liners and inlays can be applied to the through-bore or wetted surfaces
Purge ports	Purge ports are available for recommended periodic maintenance
End connections	Available end connections include flanged, welded, hub/clamp or RTJ

Application Specific Design

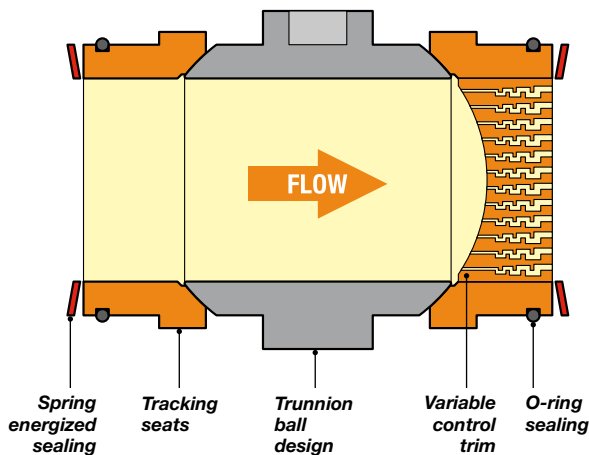
Provides Tailored Trim Solutions



Designed for Reliable Isolation

Metal-seated floating ball designed for on/off applications

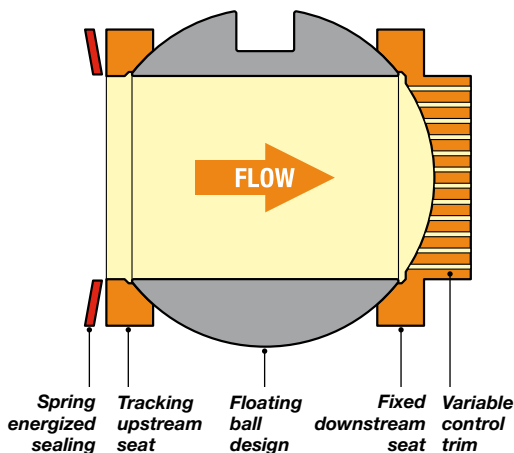
- Pressure energized sealing
- Application-specific seat designs
- Replaceable metal seats
- Wide seat-sealing surface
- Uni-directional or bi-directional sealing
- Size Range: 1/2 to 36 inch (12 to 900 dn)
- Temperature Range: -58 to 1652 °F (-50 to 900 °C)
- Pressure Classes: ASME 300 – 4500 & API 6A



Control for Precision Modulation

Metal-seated trunnion ball designed for temperatures <400 °F

- Pressure energized sealing, plus o-ring sealing
- Variable control trim
- Unlimited rangeability
- Pressure Drop Ratio: >0.3
- Size Range: 3 to 42 inch (80 to 1050 dn)
- Temperature Range: -58 to 400 °F (-50 to 205 °C)
- Pressure Classes: ASME 300 – 2500



Control for Extreme Temperatures

Metal-seated floating ball designed for temperatures >400 °F

- Pressure energized sealing
- Variable control trim
- Unlimited rangeability
- Pressure Drop Ratio: >0.3
- Size Range: 1/2 to 36 inch (12 to 900 dn)
- Temperature Range: 400 to 1652 °F (205 to 900 °C)
- Pressure Classes: ASME 300 – 4500 & API 6A

Rotary Control Technologies

Flexibility for Demanding Environments

The MOGAS family of control valve technologies gives you complete **flexibility** for your specific application. The patented FlexStream® technology expands upon the MOGAS ball valve's proven strengths by adding the capabilities of **precision modulation**, exceptionally **high rangeability** and **characterization**.

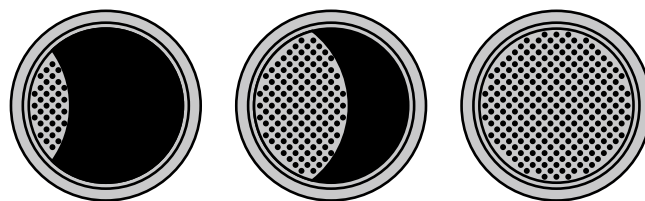
Variable Trim Technology

Flexible design comes from the **variable construction** of the internal trim. The trim is custom engineered to suit high pressure differential (ΔP) applications by changing:

- the number of openings
- the style of letdown passages (straight-through or tortuous path)
- the percentage of the bore that is filled.

Application-Specific Design

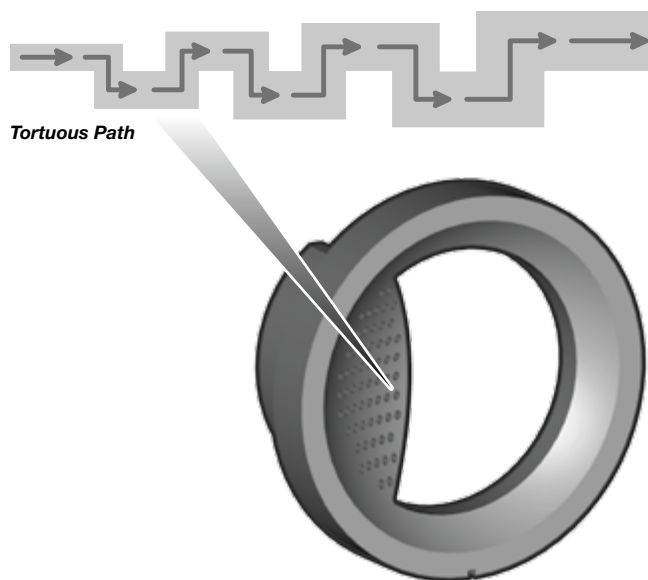
The complete valve assembly can be manufactured as a floating or trunnion ball design in a 2-piece or 3-piece forged body construction, using a variety of corrosion resistant materials and coatings to meet the demands of severe process flow components.



Variable trim technology tailors the percentage of filled bore to application-specific requirements. These examples show a range from 10 percent filled to 100 percent filled.

Controlling Velocity

Pressure can be reduced by turning the fluid flow through a right angle, which absorbs energy and controls velocity. By cascading the pressure over a number of right angle turns, the pressure drop at each stage is evenly distributed. The tortuous path expands at each right angle turn to ensure that any increases in volume (due to pressure reduction) are accounted for, and velocity does not increase through the passageway—even though the fluid may be expanding, eliminating any potential erosion. The larger the pressure drop, the more turns are required to control velocity.



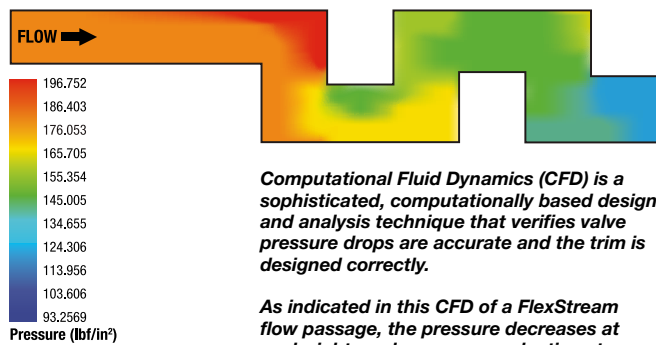
FlexStream technology uses a varying number of passageways engineered within the bore, custom designed to suit high pressure differential applications—providing better control of velocity / noise / vibration / erosion / cavitation.

Accurate Sizing

As with most control valves, the initial sizing and selection process are carried out on customized computer software. Often incomplete requirements can result in improper sizing—providing opportunities for control valve failures. MOGAS has developed a customer-friendly sizing program which has been verified by an authorized third party for accuracy, taking into account the guidelines provided by the relevant ISA and IEC standards developed for control valve selection.

The final selection process takes into account a combination of information provided by the computer and application engineering knowledge provided by MOGAS. In-house Computational Fluid Dynamics (CFD) are used to precisely determine the amount of letdown stages needed per application.

Sample of Computational Fluid Dynamics



Unprecedented Flexibility

In addition to the features and benefits that come with all MOGAS isolation valves, FlexStream rotary control technology provides:

- Pressure control of gases, multi-phase fluids and liquids
- Custom trim engineered for high ΔP applications
- Precision modulation
- High rangeability and characterization
- Multi-stage letdown
- Limitation of velocity and vibration
- Elimination of cavitation
- Reduction of noise
- Reduction of flashing erosion
- Often smaller dimensional envelope than a traditional control valve
- Greater Cv per inch compared to competition
- Dependable emissions control
- Proprietary sizing program

In addition to the features and benefits of a MOGAS isolation valve, FlexStream rotary control technology adds precision modulation, high rangeability and characterization.

Proven Coatings

Not All Coatings are Equal

Harsh sands. Abrasive pipe scale. Dangerous entrapped gases.

Each of these conditions can greatly affect the operations of mechanical equipment. The coatings used in the oil & gas industries (O&G) are often critical to not only the **performance of the valve**, but also the **safety of personnel** in that particular environment.

Often the success of a coating depends upon proper selection of the base material and the coating, along with the method in which the coating is applied—all as a complete system. MOGAS offers a range of mechanically and metallurgically bonded coatings, applied with absolute accuracy for optimum thickness while maintaining precise design tolerances and dimensions.

Through MOGAS, a wide selection of coatings are available to best serve each particular application. Coatings must handle a variety of challenges such as erosion, corrosion, pitting, wear, material build-up, etc. The abrasive nature of certain media and gaseous agents create serious operating challenges in the oil & gas market—challenges that MOGAS meets head-on with experience, world class engineering and the very latest in material science.

MOGAS Coating Recommendations

Environment	Concern	Materials	Solution
Particulates	Abrasive Wear; Erosion	Carbides	Engineered and optimized coatings technology based on application-specific operating conditions
Sour Gas Conditions	Corrosion; Chemical Attack; Delaminating; Embrittlement; Pitting	Carbides; Ceramics; Metallics with Proprietary MOGAS Binders	
High Cycling	Abrasive Wear; Fatigue; Delamination	Stress Resistant	

Note: Coating application methodology (spray & fused, HVOF, plasma, laser, etc.) is determined by application-specific conditions.

Research and Development

To ensure the best coatings solutions are available for our customers, MOGAS has an ongoing research & development program that includes:

- continual field investigations
- coupon testing (with traceability to each coating batch)
- laboratory analysis
- collaborative alliances with selected authorized coaters

As part of ongoing research and development for coatings, MOGAS continually analyzes samples for strength and durability. Some examples of our testing and evaluation includes:

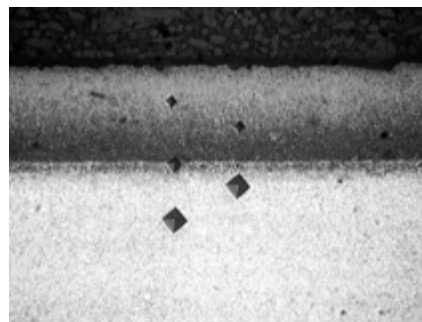
- Abrasion tests
- Slurry erosion tests
- Micro hardness tests
- Adhesion tests
- Corrosion tests
- Porosity analysis
- Impact testing
- Residual stress analysis

MOGAS is known worldwide for its dedicated research in coatings and material science.

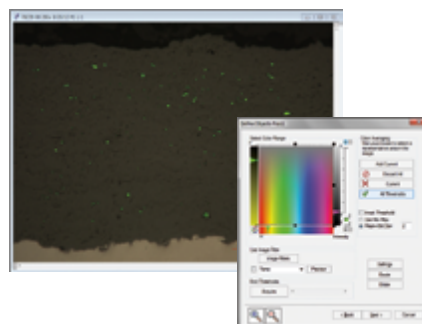
Continual lab testing and evaluation confirms adhesion, compatibility and wear for maximum performance.



Hardness and sensitivity to cracking are verified using Vickers indent micro hardness testing.



Using proprietary software programs, coating porosity is analyzed and validated.



Designed for Safety

Ensuring Confidence and Reducing Risks

Fugitive Emissions Control

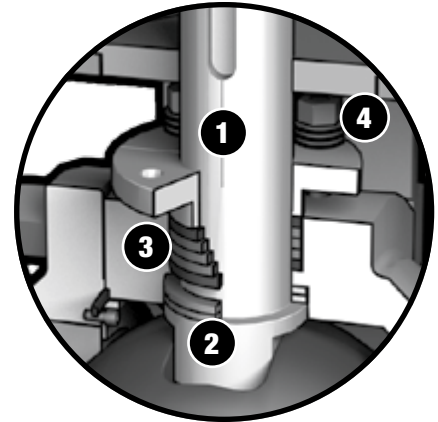
Most pipeline and process plants must adhere to strict legislative and safety requirements (such as ISO 15848-2) regarding fugitive emissions. Under these conditions, leaks to atmosphere—no matter how small—can grow into large concerns. The monitoring and control of these emissions has become a major focus for plant operators. Whether satisfying environmental, legislative or industry guidelines of agencies such as the EPA, TA-Luft, ASME and others, all valves must meet clearly defined requirements to handle the most common valve leak areas: stems and body gaskets.

Often a gaseous release or small drip can harm personnel, equipment or the environment. With this in mind, MOGAS has engineered stem and body gaskets to reduce the risk of unanticipated emissions. Our ball valves have two independent stem seals, as well as special body gaskets, to ensure reliable sealing.

Stem Seal Design

A special safety feature is the **stem seal design**. MOGAS incorporates independent stem seals which include:

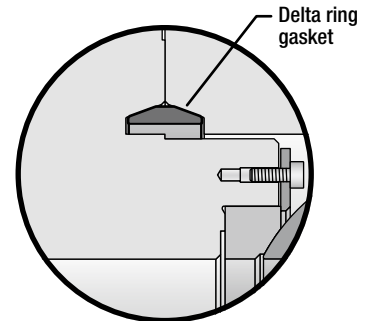
- pressure-energized and mate-lapped stem seal bearing
- stem packing that uses two anti-extrusion rings and three application-specific packing rings
- optional lantern rings, piped to a detector
- live loading system



- 1 Stem
- 2 Stem seal bearing
- 3 Application-specific stem packing
- 4 Live loading system

Pressure-Energized Gasket

MOGAS offers a pressure-energized **delta ring gasket** for high-pressure applications. This solid metal, tapered ring combines high surface loading with the strength of the seal material to provide considerable stored energy and tight sealing—even in systems where vibration or thermal cycling might weaken other sealing components, leading to potential leak paths.



Safety Integrity Level (SIL) Certified

Industry experts began to address functional safety in oil & gas plants and pipelines while formalizing an approach for reducing risks with the development of IEC standard 61508. An emphasis on quantitative risk reduction, life-cycle considerations, general practices and equipment performance were all integral components to the evaluation. A SIL is a measure of a safety system's performance, in terms of probability of failure on demand. MOGAS C-Series severe service ball valves have been reviewed by Exida—a certification and research firm specializing in critical safety systems and related equipment—and have received a certification for certain failure rates based on the severe service applications that MOGAS isolating ball valves have been operating within over the past 40 years.

Fire Tested for Dependable Performance

Fire in process plants can cause disastrous consequences—thus the necessity for various industry standards and specific end user requirements. The operation of valves, while in the midst of flames and extreme heat, is a significant part of any plant's safety program. MOGAS ball valves are designed to withstand the punishing effects of emergency fire situations.

Several sizes and ASME classes of MOGAS valves have been fire tested and qualified to meet these stringent requirements. Whether API standard or particular customer fire test specifications, MOGAS works with end users to ensure all testing procedures are adamantly followed. After the burn is completed, both the operability and the performance of the valve are evaluated. When fire testing is complete, all documentation and certifications are available for review.

Quality Assurance / Quality Control

MOGAS maintains a fully implemented and certified Quality Assurance / Quality Control program. While MOGAS is certified to ISO 9001:2008 standards, we also reference many industry organizations for standards, codes and approvals, such as:

- API
- ASME
- ATEX
- CRN
- DIN
- FCI
- GOST
- IEC (SIL)
- ISA
- ISO
- NBBI
- PED



MOGAS is dedicated to maintaining and continually improving their Quality Management System to satisfy the requirements of their customers and applicable industry standards.

Recently a 4-inch ASME 1500 Class MOGAS valve, along with a 10-inch ASME 600 Class valve, were sent overseas for a customer-specific fire test.



This 4-inch ASME 1500 Class ball valve was surrounded by fire for a pre-determined amount of time.



After time requirements were met, the fire was extinguished according to safety procedures.



The final step in the fire test was verifying the ability to operate the valve and documenting the performance of the valve. The MOGAS valve not only passed on the first attempt, but exceeded the customer's critical requirements.



Designed for Safety

Ensuring Confidence and Reducing Risks

Positive Isolation Design (Double Block & Bleed)

This valve arrangement usually involves an isolation valve in combination with a bleed / vent valve that will then interface with other components farther down the pipe. This sequence is used to first isolate / block the upstream flow from reaching downstream components and then bleed off / vent any remaining trapped inline flow. Positive isolation valves that are used in severe service must withstand extreme conditions with dependable, repeatable metal-to-metal sealing designs.

A MOGAS positive isolation design can either consist of two isolation valves with a spool piece in-between (with a bleed port), or can be constructed as one of our customized, uniquely engineered Max-Series using two balls contained within one body. Piping configurations, process conditions and material requirements will usually drive the design choice.



This 3-inch tandem valve was customized for positive isolation (double block & bleed) service. (The bleed port is not visible here.)

Emergency Shutdown

An Emergency Shut Down valve (also referred to as ESV, ESD, or ESDV) is an actuated valve designed to stop the flow of hazardous fluids or gases upon the detection of a dangerous event. This provides protection to people, equipment or the environment. ESD valves are required by law on any equipment placed on an offshore drilling rig to prevent catastrophic events.

Key features include:

- Metal-seated sealing
- Designed to handle thermal shock
- Proven fire-safe design
- Tight shut-off
- Anti-blowout proof stem
- Compact Design
- Suitable for fast acting response actuation
- Certified design for use in SIL 3 applications

Flare system

The objective of a flare system is to burn waste gases that are either uneconomical to recover / retain—or released during planned or unplanned over-pressuring of plant equipment. Waste gases are released to the flare via flare headers and burned as they exit the flare stack.

One of the major safety issues addressed with utilizing a dependable isolation valve is flashback protection. In this situation, absolute tight shut-off is required. However if de-pressurization is needed, a reliable severe service rotary control valve may be necessary. MOGAS offers both isolation and / or control valves for important process safety associated with flare systems.

Designed for API Spec 6A

Floating Ball Valve

Required Results

Valves that can isolate high pressures, entrained particulates, and the harshest of environments, such as sour gas, in a variety of wellhead, well fracture, distribution and manifold applications.

Process

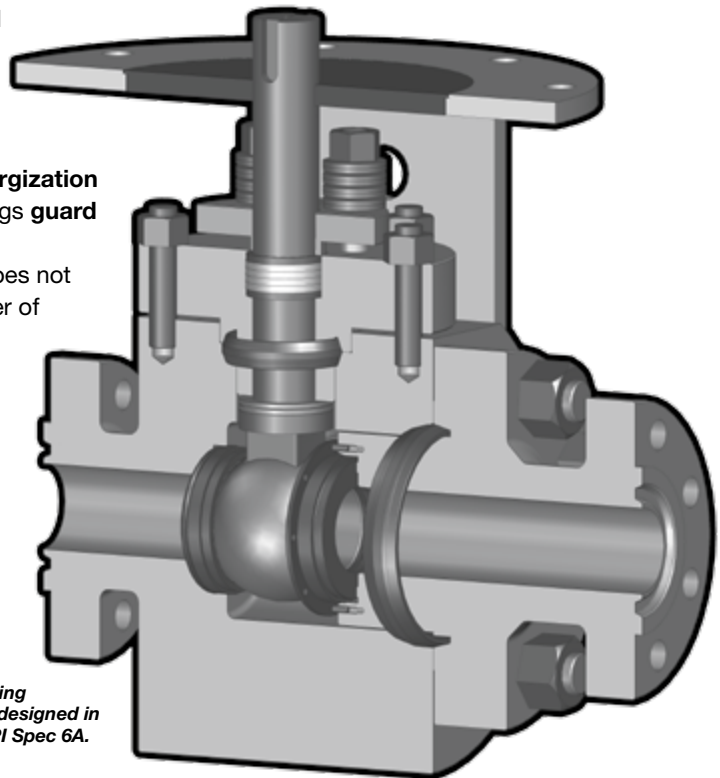
These valves are expected to handle some of the toughest operating conditions in the Oil & Gas industry. Therefore they must be designed and manufactured to meet the stringent API 6A requirements in terms of materials, quality, inspection, cycle duty and safety levels—and must be certified to receive an API licensed monogram.

Performance Features

- A high degree of safety is required to ensure that environment and operators are protected.
- Recessed metal seats are **shielded from continual exposure** to the process flow and particulate erosion
- **Ball is wiped clean** with each operation of the valve by sharp leading edges of seat ring dismissing particulate build-up
- Robust forged bodies and end connections **have greater wall thickness in critical areas**
- Heavy duty mounting bracket minimizes stresses and **maintains precise stem alignment**
- Blow-out proof stem is **fully supported**
- Dual delta gasket sealing between the body and end connect as well as the body and bonnet **protect against any body leakage**
- **Packing area is protected** from potential particulate erosion
- Live loaded packing ensures **constant packing energization**
- Application-specific materials and proprietary coatings **guard against corrosive and abrasive conditions**
- **Quick-quarter turn operation** of non-rising stem does not pull destructive particles through the interior diameter of packing area
- Sealing surfaces (ball and seat face) are in **permanent contact** throughout its 90-degree operation



MOGAS has been granted authorization from the American Petroleum Institute to use the API Spec 6A monogram for product specification levels 1 through 3; License number 6A-1466.



This 10,000 psi floating ball valve has been designed in accordance with API Spec 6A.

Gas Injection

MOGAS Valve Applications

Required Results

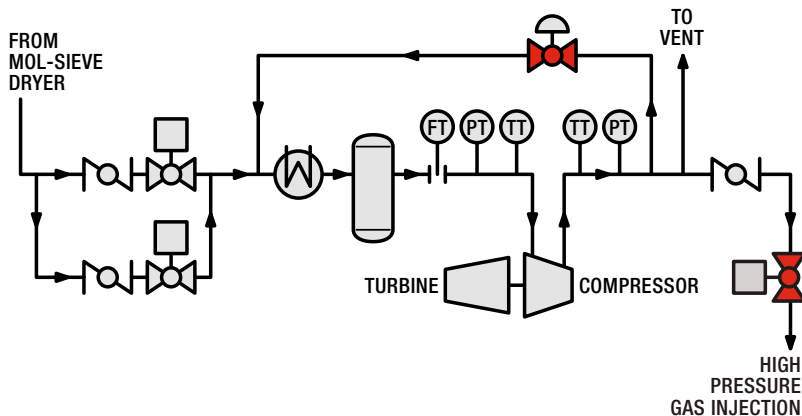
Valves that can handle high pressures, entrained particulates, and harsh environments, such as sour gas, during a variety of methods used to increase production of gas and oil reservoirs and extend the life of conventional wells.

Process

These valves are used during EOR (Enhanced Oil Recovery) and EGR (Enhanced Gas Recovery) methods which are used to substantially improve extraction efficiencies and maximize well output. After primary and secondary recovery methods are applied, this tertiary recovery introduces fluids or gases (miscible carbon dioxide, oxygen, air or steam) that reduces viscosity and improves flow. Like valves designed for API Spec 6A, they are expected to handle some of the toughest operating conditions in the Oil & Gas industry. Therefore they are designed and manufactured to meet the stringent API 6A requirements in terms of materials, quality, inspection, cycle duty and safety levels and are certified to receive an API licensed monogram.

Performance Features

- Recessed metal seats are **shielded from continual exposure** to the process flow and particulate erosion
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Gas Transport & Storage

MOGAS Valve Applications

Required Results

Equipment needed for this application are both control valves that can handle different pressures, pressure drops and media with entrained particulates, as well as full bore isolation valves with repeatable dependable tight shut-off.

Process

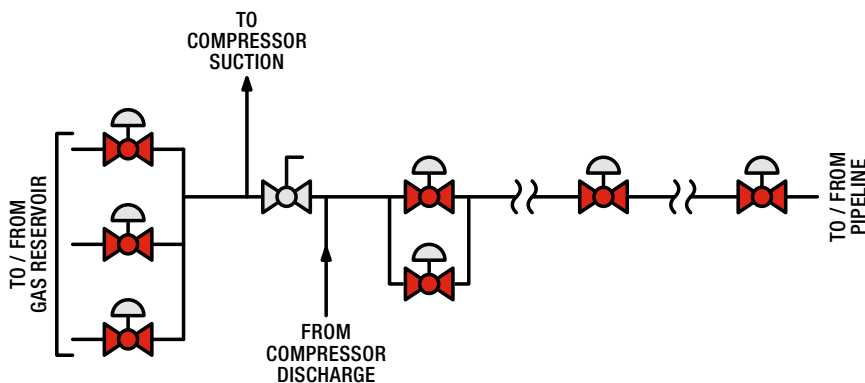
Valves used in distribution pipelines and underground storage must be able to operate dependably when called upon. Often located in remote locations or subject to environmental elements, maintenance is also a concern. MOGAS pipeline and storage valves are available as either floating or trunnion designs, depending upon size and operating conditions. In the rotary control technology, the let-down stages are manufactured in either the ball or seat components. These control valves must handle bi-directional differential pressures for applications that require filling and withdrawing through the same control valve. In addition, they must be able to provide exceptional rangeability across a wide range of pressure or flow cases.



These large-bore MOGAS valves have been operating successfully for years in this major underground storage cavern.

Performance Features

- Recessed metal seats are **shielded from continual exposure** to the process flow and particulate erosion
- **Packing area is protected** from potential particulate erosion
- Two hard coated and lapped metal thrust bearings serve as a **pressure energized inner stem seal** and **prevent galling** between body, stem and the inner stem seals.
- **Quick quarter-turn operation** of non-rising stem does not pull destructive particles through the interior diameter of packing area
- Live loaded packing **ensures constant packing energization**
- Sealing surfaces (ball and seat face) are **in permanent contact** throughout its 90-degree operation
- Secondary stem bearing guide **eliminates movement and packing deformation** caused by side-loading of stem by the actuator
- Non-rising stem design allows for **greater number of cycles** and **mitigates fugitive emissions**
- Repairability can be **handled quickly** with trim sets comprised of minimal components



Dryer Sequence (Molecular Sieve)

MOGAS Valve Applications

Required Results

Valves that can handle high and low temperatures, entrained particulates, thermal shock and high cycling with dependable shut-off over many years of service.

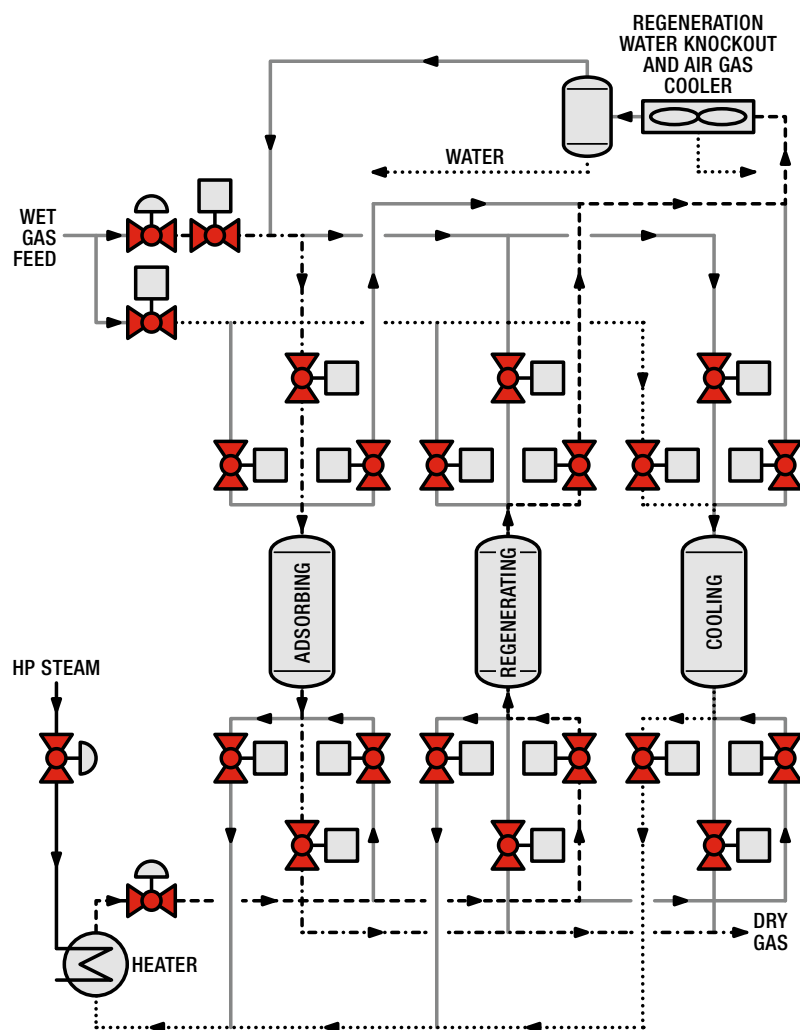
Process

Molecular sieve dehydration (MSD) is used to remove water from natural gas. There are multiple columns filled with desiccant and the gas feed is cycled through adsorption, regeneration and cooling vessels.

Performance Features

- Recessed metal seats are **shielded from continual exposure** to the process flow and particulate erosion
- **Ball is wiped clean** with each operation of the valve by sharp leading edges of seat ring dismissing particulate build-up
- **Packing area is protected** from potential particulate erosion
- Materials and coatings on ball and seats have **compatible thermal growth rates** (rapid temperature changes) to prevent bond failure and valve seizure
- **Quick quarter-turn operation** of non-rising stem does not pull destructive particles through the interior diameter of packing area
- Live loaded packing **ensures constant packing energization**, even after several thermal cycles
- Sealing surfaces (ball and seat face) are **in permanent contact** throughout its 90-degree operation
- **Withstands thermal shock** with sufficient clearance between seat back and seat pocket
- Non-rising stem design allows for **greater number of cycles** and meets EPA VOC emissions standards

- FEED GAS 1
- FEED GAS 2
- FEED GAS 2nd STAGE
- OPTIONAL PROCESSING FLOW



Compressor Anti-Surge

MOGAS Valve Applications

Required Results

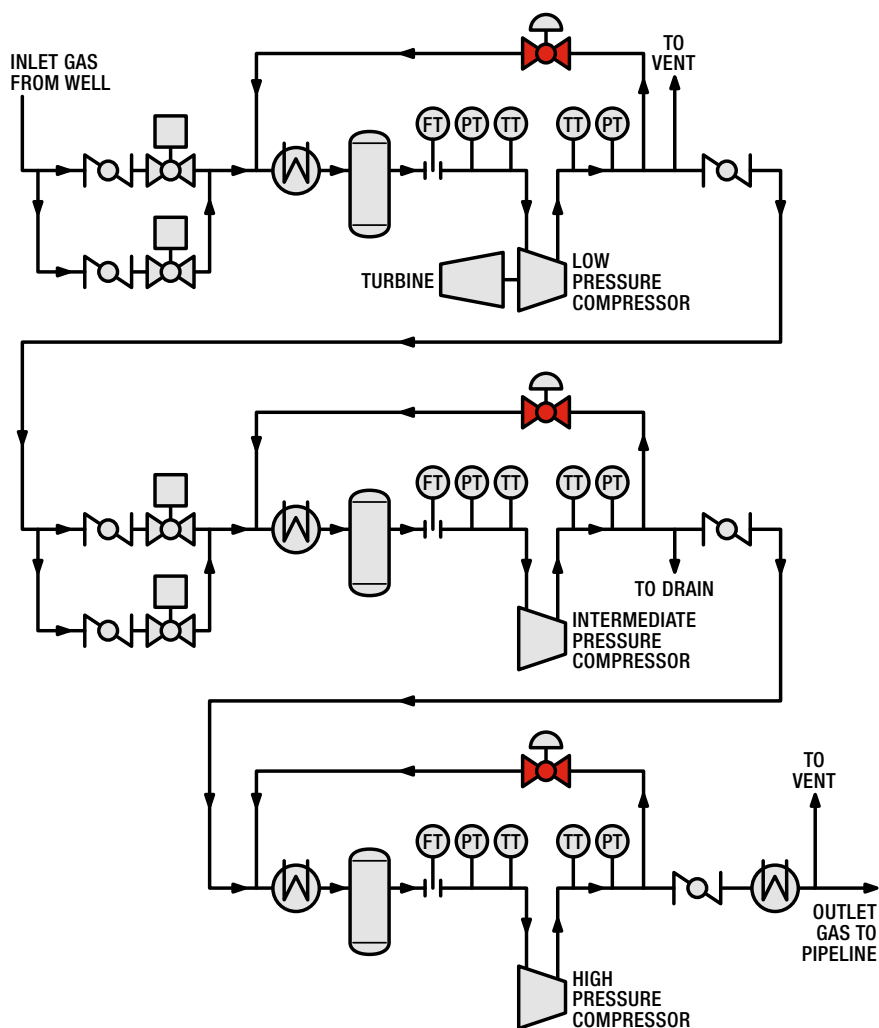
Rotary control valves that can handle high ΔP in liquids, gases and multi-phase flow to combat energy absorption, velocity, cavitation and noise. In certain installations they must also withstand high temperatures as well as high pressures, corrosive applications, abrasive entrained particulates and other critical conditions. These control valves must provide accurate positioning during compressor commissioning and throughout the normal operation of demand changes on the compressor.

Process

Compressors are a crucial part of many processes where the media requires compression in order to move along the system. These compressors are set for particular conditions where any instability in the control valve will create a system trip. In the event of a trip, the control valve must open extremely fast to ensure that the gas is recycled around the compressor to avoid internal damage to the compressor. Anti-Surge / recycle control valves should always be designed to minimize the valve's internal forces that may work against precise control, stability and fast operation. If the anti-surge control valves are inadequate, costly investments in the compressor will be jeopardized or even destroyed.

Performance Features

- FlexStream's **rangeability is rated at greater than 500.1**
- MOGAS control valves can stroke to a fully open position **in less than a second**
- When not in full-stroke mode, MOGAS control valves can still **meet stroking time and stability** requirements.
- Recessed metal seats are **shielded from continual exposure** to the process flow and particulate erosion
- **Noise abatement** up to 85dBA during recycle, 105 dBA at trip instance
- **Packing area is protected** from potential particulate erosion
- Materials and coatings on ball and seats have **compatible thermal growth rates** (rapid temperature changes) to prevent bond failure and valve seizure
- **Quick quarter-turn operation** of non-rising stem does not pull destructive particles through the interior diameter of packing area
- Live loaded packing **ensures constant packing energization**, even after several thermal cycles
- Sealing surfaces (ball and seat face) are **in permanent contact** throughout its 90-degree operation
- Non-rising stem design allows for **greater number of cycles**
- **Stem integrity** is maintained with anti-blowout stem design while **fugitive emissions are mitigated**



Valve Type Comparison

Feature	MOGAS FlexStream®	Linear Globe Valve
Stroke	Quarter-turn gives excellent stability	Over-travel results in poor control
	Quarter-turn gives excellent control	Plug mass results in poor stability
Design	Designed for overcapacity	Limited overcapacity capability
	Compact construction	Infrastructure issues due to size and weight
Rangeability	Virtually unlimited	Inefficient use of space
	Rotary construction efficiently uses space	Design not suited to compressor curve (linear)

HIPPS

MOGAS Valve Applications

Required Results

Relief valve configurations that can provide protection involving large flow rates and high pressures. These arrangements usually include full port emergency shutdown valves, sensors, fail-safe actuation, flow control technology, and other coordinated components.

Process

High Integrity Pressure Protection Systems (HIPPS) are designed to reduce the risk that can arise if the pressure of a system exceeds its design pressure. With today's requirements for higher flow rates and pressures, the ability to lock-in pressure using a performance-based, non-descriptive framework and life-cycle data is required. These systems include emergency shutdown valves, pressure sensors, fail safe actuation, partial-stroke testing and a logic solver—all with built-in redundancy in a skid mounted package.

These HIPPS systems are used in the Oil and Gas Industry as well as LNG facilities and Transport & Storage systems to ensure the safety of pipelines, piping, vessels and process packages. Regardless of what application, any containment loss due to overpressurization is a critical issue.

Critical Pressures Require Serious Solutions

HIPPS ensure that a continuous measure of safety is deployed to reduce the operational risk associated with the probability of a hazardous event. This is handled by examining the probability of failure on demand (PFD), using Safety Instrumented System (SIS) to calculate the Safety Integrity Level (SIL). The SIL corresponds to a certain tolerable PFD.

Dependable Isolation is a Must

These systems provide protection against overpressurization in situations when the actual pressure could exceed the design pressure.

There are three main components of a HIPPS safety system:

1. The sensors, which are used to detect high pressure (a hazardous situation)
2. The logic solver, which determines the proper steps to take to alter the final element
3. The final element, which performs the necessary steps to bring the process back to a safe state of being. The final element involves the valve, actuator and solenoids.

A typical MOGAS HIPPS package includes the following:

- Emergency shutdown valves
- Pressure sensor voting system
- Solid state PLC or hard-wired relay logic system
- SIL 3 FM certified IEC 61508
- Class 1 Zone 2 IIC T4
- Fail-safe actuator
- Skid-mounted system can be provided, if desired

Service

Global Capabilities



We provide exceptional service for unique locations—everyday, everywhere.

Service Excellence in Action

When you select MOGAS products, service is a big part of what comes with them. The MOGAS commitment to service means more than basic repairs. It also means timely access to our knowledgeable and experienced team of experts—anytime, anywhere in the world. And when our team becomes part of your team, you can trust that we will do everything we can to come through for you.

When you have a problem, our technical advisors get to the root of it. They will look at your entire application to accurately identify and solve the issue. Using a comprehensive approach helps you improve equipment reliability and operational efficiency, as well as reduce costs. Our core services include:

Project Support

- Installation, startup and commissioning
- Shutdown planning and implementation
- Procurement and contract management

Preventive Maintenance

- Complete system inspection
- Routine maintenance, valve repacking
- Valve asset management

Repair, Refurbish & Customization

- 24-hour emergency response
- Troubleshooting
- Valve performance analysis
- 3D finite analysis
- High pressure testing
- Online repair documentation

Asset Management Plan

Optimize Your Investment

Getting more **value** for every dollar is now more important than ever. To help **minimize your total cost of ownership** while truly benefiting from predictive maintenance, MOGAS offers the **MORE™ Asset Management Plan**—a totally customizable valve purchase and service plan. Whether you buy a few valves or several hundred valves, you can choose from a variety of options to help optimize your investment.

On-site Services

- Start-up and commissioning assistance
- Field support and troubleshooting
- Quarterly walkdowns
- Major shutdown planning

Managed Inventories

- Revolving dedicated inventory (located and managed at MOGAS facility)
- On-site inventory (for emergency use)

Walkdown Evaluations

- On-site inspection of installed valves
- Customized reports

Valve Management Program (Online)

- Initial setup, input, links to P&ID and maintenance reports
- Repair history
- Performance analysis reports
- Incident reports
- Valve repair cost
- Valve torques
- Revised bills of material
- Revised drawings
- Predictive / preventive maintenance recommendations

Training

- Lunch-n-learns
- Valve installation & operation (hands-on)
- Maintenance & troubleshooting

Get **MORE™**...with **MOGAS®**

MANAGING OPERATION & REPAIR EXPENSES

- *Improved Safety*
 - *Enhanced Reliability*
 - *Predictive Maintenance*
 - *Anticipated Budget*
 - *Less Downtime*
 - *Value Pricing*
-

Confidence for Tomorrow

A Warranty is Not a Performance Guarantee



CONFIDENCE

PREDICTABILITY

RISK FREE DECISIONS

IMPROVED SAFETY

ENHANCED RELIABILITY

LESS DOWNTIME

ANTICIPATED BUDGETS

Only from MOGAS

Due to continuous years of research and development, coating improvements, proven manufacturing techniques and application experience, we now offer an unprecedented application-specific PERFORMANCE GUARANTEE on our metal-seated isolation and control valves. Years of continual valve performance analysis, field reports and statistical service data from around the globe provide the information required to guarantee our valves for a performance time period. Now every MOGAS valve comes with a statistically driven, application-specific PERFORMANCE GUARANTEE...
plus a Lifetime Warranty on materials and workmanship.

Severe Service

The MOGAS Definition

- Extreme temperatures
- High pressures
- Abrasive particulates
- Acidic products
- Heavy solids build-up
- Critical plant safety
- Large pressure differentials
- Velocity control
- Noise control

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