Valves for Mining Pipelines

Engineered Solutions for Slurry and Water Transport

50 MOGAS INDUSTRIES | YEARS 1973–2023

MOGAS®
SEVERE SERVICE VALVES

Not all end users understand what defines a 'severe service' valve. And not all valve companies have the experience to truly understand the severity of an end user's process.

Global Experience

Slurry and Water Transport

Over 84 percent of installed MOGAS valves—across all industries—are used in solids handling applications.

MOGAS has been providing slurry pipeline **valve solutions** in some of the toughest applications and remote locations worldwide for over four decades. Large pipeline valves (42-inch and larger), small drain valves and high pressure block valves are just some of the types of mining valves MOGAS designs and manufactures.

In the metals and minerals market, valves must operate dependably for long periods of time. Rugged forgings with severe service metal balls and seats ensure a **reliable operation** for handling particulates and sludge.

Four MOGAS T-Series (trunnion) 36-inch, ASME 900 Class valves are installed to support copper operations in the remote desert in Chile.

 www.mogas.com

Slurry | Tailings | Seawater

Solutions for Challenging Environments

Velocity Concerns. Abrasive and Corrosive Particulates.

All of these factors can cause operation and maintenance challenges where dependable operation is paramount for optimal performance. MOGAS has industry experts and engineers with extensive field experience and valve knowledge who partner with end users to offer proven valve solutions for slurry and water transportation.

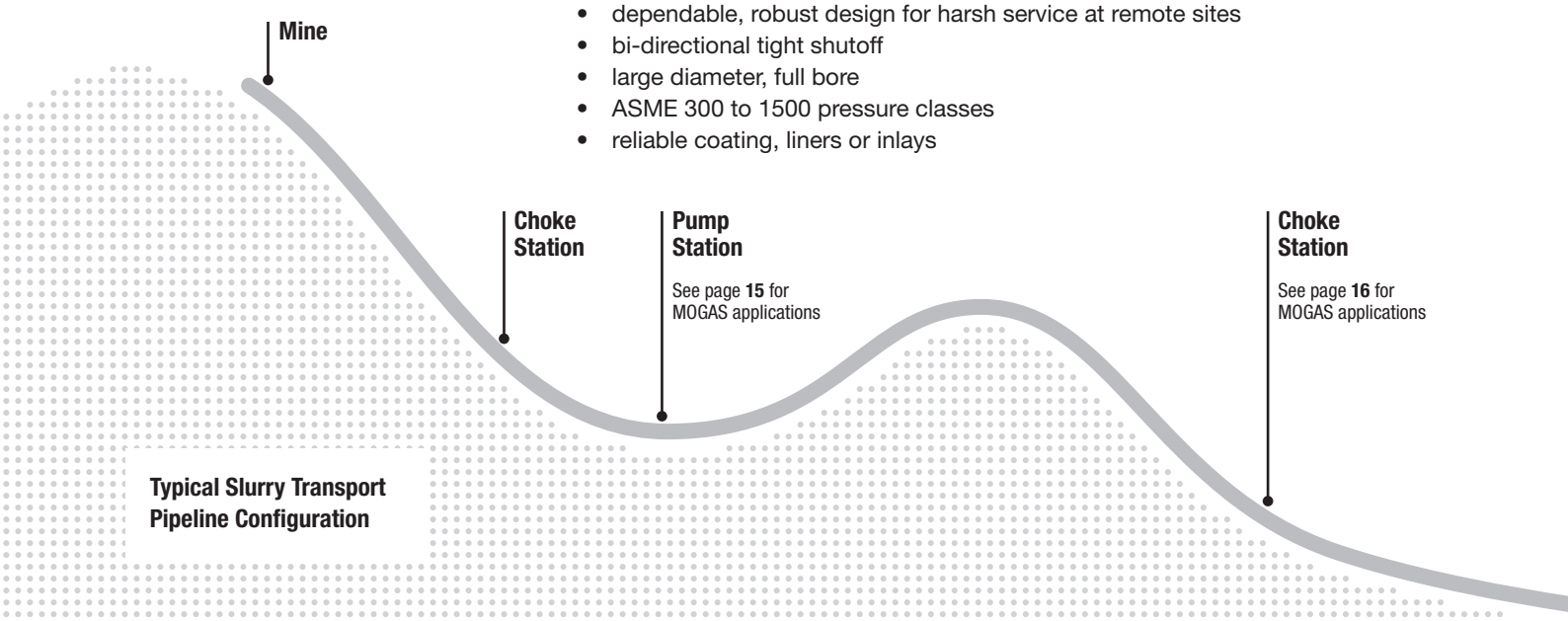
MOGAS valves have proven reliable in harsh slurry service and remote locations from the jungles of Papua New Guinea to the deserts of Chile.

Slurry Transport
When considering the many demanding applications associated with a slurry pipeline, the slurry rheology is a major concern. The deformation and flow of slurry not only affects the pipe materials, pumps, and choke systems, but the valve stations as well. The rate of flow, particulate size and composition (along with concentration levels) can cause operational difficulties — whether the slurry is homogeneous, heterogeneous or complex. Allowances for pigs through the valve's bore is another important operational concern.

Tailings transportation include particle-size pulverized rock, water, trace quantities of metals and processing additives, such as sulfuric acid, that form a corrosive and abrasive slurry pumped through a pipeline for disposal.

Selecting the right valve for these operations is critical for a long-lasting and cost-efficient slurry transport solution. Valve features should include:

- proper material selection, such as forged solid duplex stainless steel or titanium
- dependable, robust design for harsh service at remote sites
- bi-directional tight shutoff
- large diameter, full bore
- ASME 300 to 1500 pressure classes
- reliable coating, liners or inlays



Typical Slurry Transport Pipeline Configuration

MOGAS was first to successfully introduce metal-seated ball valves in the severe service applications of slurry transport pipelines.

These 24-inch ASME 900 Class ball valves in a choke station have a stroke time of 45 seconds to handle copper concentrate with an average flow rate of 1167 liters / second.

MOGAS was first to successfully introduce metal-seated ball valves in the severe service applications of slurry transport pipelines. The CST valve's tracking seat design features sharp leading-edge seat ring technology—proven in decades of heavy coking applications—and Belleville springs for constant ball and seat contact. Combined, these features 'wipe' the sealing surface each time the valve is operated, leaving the sealing surface free of particles.

Mines are increasingly using raw seawater transported to mines located at high altitudes and a hundred miles from the coast.

Water Transport

The transfer of water in mining operations, whether recirculated, desalinated, filtered or untreated, is a severe service not suitable for commodity-type valves. Fouling from water particulates and corrosion from prolonged exposure of chloride ions jeopardize equipment reliability and efficiency.

MOGAS understands the issues caused by seawater in mining operations. In-house subject matter experts and doctorate-degreed scientists in fluid dynamics and metallurgy partner with engineers and reliability experts to offer severe service technology solutions...from installation and commissioning to service & reliability.

Absolute reliability for these CST-1, 6-inch isolation valves is very important due to the punishing effects of slurried ore, as well as being located 1,430 meters above sea level.

These 8-inch ASME 900 Class copper slurry valves have been cycling about 40 times per month against 1500 psi.

Pump Station

Isolation Station

See page **17** for MOGAS applications

Features and Benefits: CST Valve

Solves Common Valve Concerns in Slurry and Water Transport

1 Bi-directional tracking seat design

- Belleville-shaped seat spring maintains constant sealing contact between ball / seats, preventing media contamination during pressure shifts
- Seating surfaces are protected from erosion in the fully opened or closed position
- Field replaceable seats minimize repair time

2 Wide seat sealing surface

- Wide sealing area creates low stress seal, which is key in high cycle applications
- Mate lapping across entire seat face is proven by 'blue' test
- Sharp leading edge seat ring technology proven in decades of heavy coking applications 'wipes' sealing surface each time the valve is operated

3 Dual-guided stem design

- Eliminates lateral movement of the valve stem
- Inner stem bearing serves as lower stem guide and thrust bearing, while flange bushing serves as upper stem guide
- Inner stem bearing prevents migration of abrasive and erosive media into the packing box
- Flange bushing eliminates side-thrusts and packing deformation caused by side-loading from actuator

4 Forged body / end connections

- Greater wall thickness in critical areas provides longer valve life in erosive slurries
- 316 SS overlay in both seat pockets

5 Heavy-duty mounting bracket

- Provides structural support for actuator mounting
- Bracket is permanently attached to valve body then machined to ensure precise alignment
- Maintains proper stem and flange bushing alignment, eliminating side-loading of stem

6 Floating ball design

- Rotates within its own sphere, therefore does not need to displace solids
- Does not require lubrication system to operate

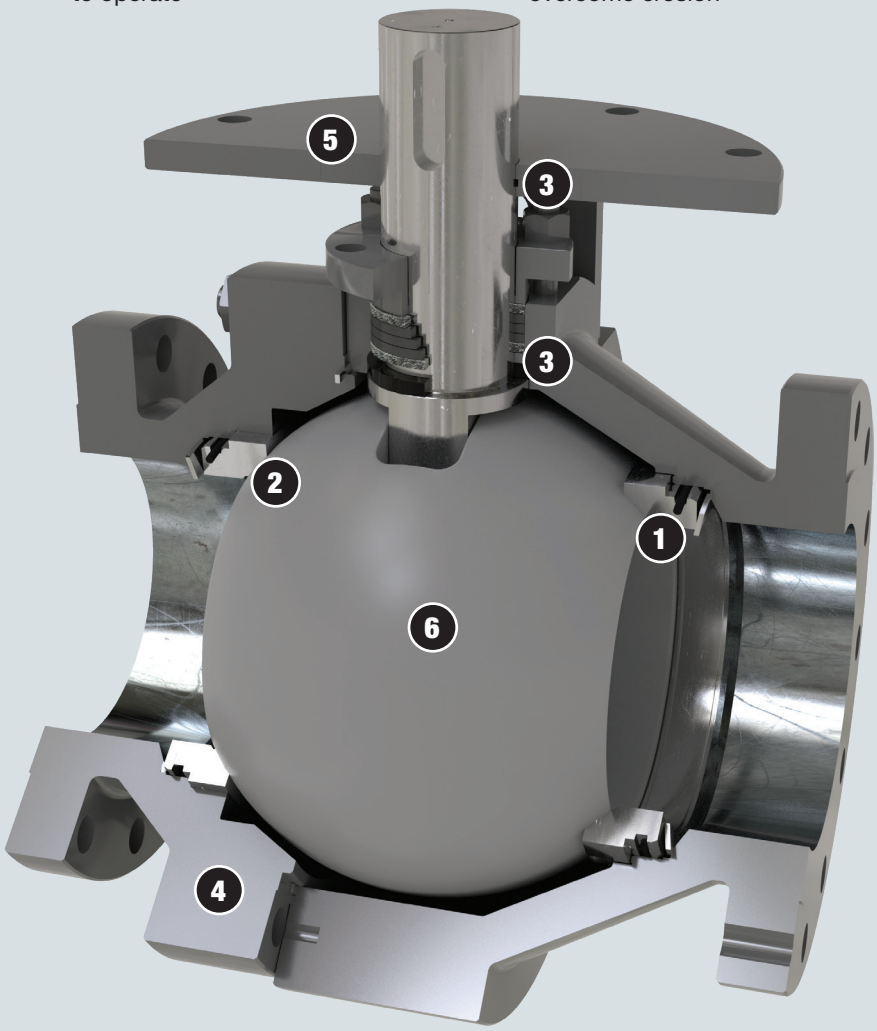
Features Not Shown

Optional materials to handle corrosion / erosion

- Liners and inlays can be applied to the through-bore or wetted surfaces of valve upon request
- With numerous mines using saltwater as the aqueous source for slurry, forged solid duplex stainless steel or titanium materials should be specified

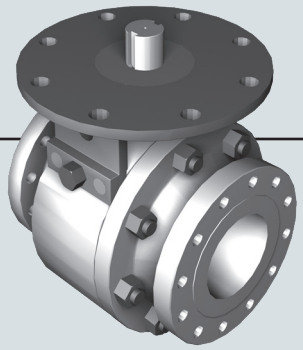
Reliable coating

- HVOF (which is mechanically bonded) Chromium Carbide coatings are applied to overcome erosion



Engineered for Extreme Conditions

Today's Innovation, Tomorrow's Standards



Large size valves in remote locations must perform each time they are called upon, regardless of the frequency of operation or the tortuous media. MOGAS has designed the **CST** valve specifically with these concerns in mind.

Model	CST
Type	Ball valve with dual seats and single, floating ball design. Uni- or bi-directional sealing, as specified. Ball and seats to be matched sets, and interchangeable for valves of the same bore size. Seats must be field replaceable.
Size	2-inch to 36-inch. Full-bore custom sized to match piping.
Class	ASME 150–2500 Class
Ends	RF Flanged
Bore	Full bore / Reduced bore / Ball bore to match specific pipe inside diameter. (Smooth transition from connecting pipe inside diameter to ball bore to be provided.)
Actuator	Manual Operator / Electric / Hydraulic (as required by customer)

Field replaceable seats minimize repair time.

Materials and Options

Item	Standard		Optional	
	Material	**Coating**	**Material**	**Coating**
Body / End Connection	ASTM A105 Carbon Steel with 316 SS overlay in both seat pockets	—	Titanium grades 12 & 2 Super Duplex & Duplex grades F51, F53, Fe2205	Optional hard surfacing, weld inlays or liners may be added to flow path for applications with highly erosive characteristics.
Gasket	Elastomeric O-ring	—	—	—
Ball	17-4 PH	HVOF-applied Chromium Carbide	Titanium grades 12 & 2 Super Duplex & Duplex grades F51, F53, Fe2205	Optional coatings such as Tungsten Carbide, Stellite, and non-Nickel-based coatings can be provided.
Downstream Seat	17-4 PH	Chromium Carbide	Titanium grades 12 & 2 Super Duplex & Duplex grades F51, F53, Fe2205	Optional coatings such as Tungsten Carbide, Stellite, and non-Nickel-based coatings can be provided.
Upstream Seat	17-4 PH	Chromium Carbide	Titanium grades 12 & 2 Super Duplex & Duplex grades F51, F53, Fe2205	Optional coatings such as Tungsten Carbide, Stellite, and non-Nickel-based coatings can be provided.
Load Spring	17-4 PH	—	—	—
Stem	17-4 PH	—	—	—
Stem Packing	Molythane PolyPak	—	—	—
Stem Seal Bearing	Reinforced PTFE	—	PEEK	—
Body Bolting	A193 Gr. B7 / A194 Gr. 2H	—	—	—

Bi-directional Tracking Seat Design

Equal Sealing Performance in Either Direction

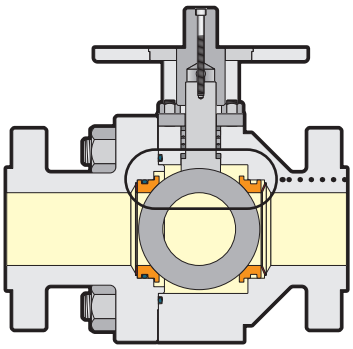
Only the MOGAS tracking seat design provides true bi-directional shutoff without using a check valve.

MOGAS CST Bi-directional Seat Design

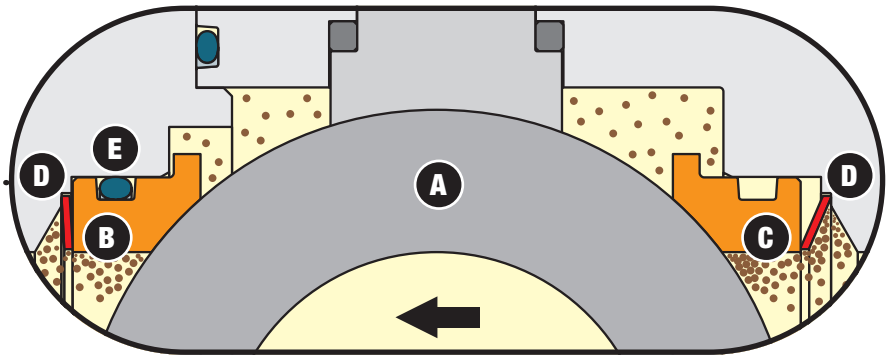
In a **bi-directional** ball valve application, pressure reversal will cause the ball to shift within the body. If a gap forms between the ball and seat sealing surfaces, particles could enter and quickly develop into **severe erosion** due to the high pressure of slurry transport applications.

The MOGAS CST bi-directional seat design is engineered to maintain **constant contact** between the ball and seats during this shift, ensuring **continuous wiping** action that leaves the sealing surfaces free of solids.

Tracking Seat Design



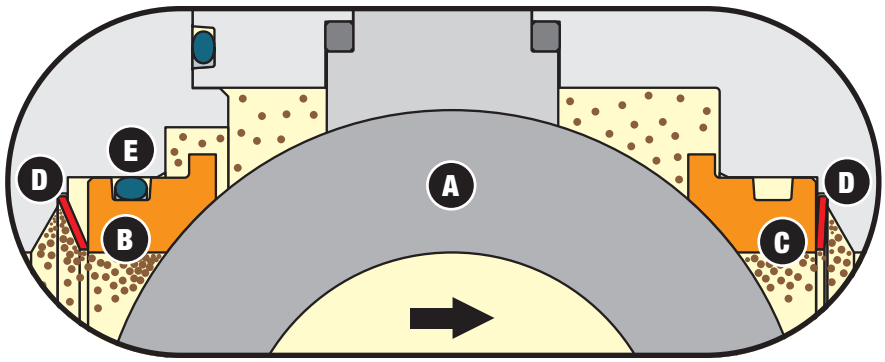
CST Valve Design



Normal Pressure

During **normal pressure**, the ball shifts toward the **primary sealing seat** (normally oriented downstream). The **seat springs** behind each seat apply the needed force to maintain **constant contact** with the ball. In addition, the primary sealing seat employs an **O-ring** to provide a **secure seal** between the seat and body.

A Ball (in closed position)
B Primary Sealing Seat
C Secondary Seat
D Belleville Spring
E O-ring Seal



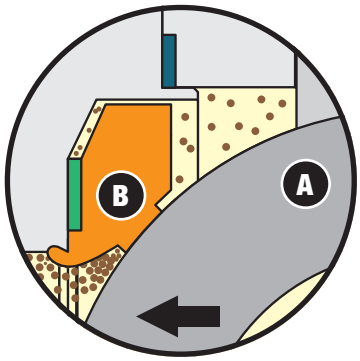
Reverse Pressure

During **reverse pressure**, the ball shifts toward the **secondary seat**. Again, the **seat springs** behind each seat apply the needed force to maintain **constant contact** with the ball, while the **O-ring** provides a **secure seal** between the seat and body.

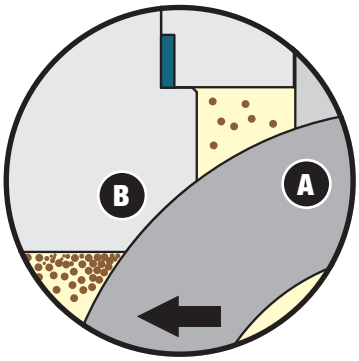
Other Typical Seat Designs Used for Slurry Transport

Slurry transport operating challenges are similar—but the engineered designs to handle them are not. Below are some comparisons of different sealing designs that are used in severe service ball valve applications.

Locked-in Seat Design

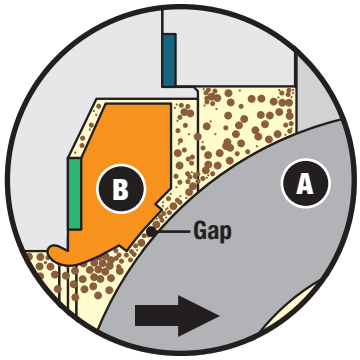


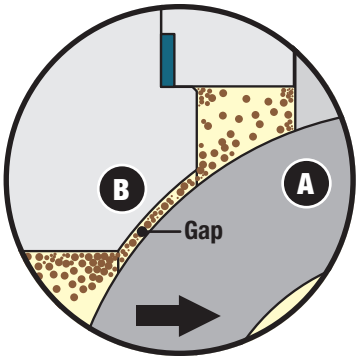
Integral Seat Design



Normal Pressure

Uni-directional **locked-in** seat designs or **integral** seat designs are sometimes incorrectly used in bi-directional applications.





Reverse Pressure

With reverse pressure, locked-in seat designs or integral seat designs will form a **gap** between ball and seat, allowing **particles** to enter the sealing area and create **leak paths** and / or **severe erosion**. Integral seat designs do not allow bi-directional shutoff without a downstream check valve to prevent back pressure.

The MOGAS bi-directional tracking seat design means less equipment to buy, less equipment to fail, and less equipment to repair.

C-Series

Customizable Isolation Valves for Specific Applications

1 Floating 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
- SphereSeal℠ lapping process on ball and seat set provides 100% sealing contact through the full transition between the open and closed position
- Greater sealing contact area withstands minor scratches or abrasions

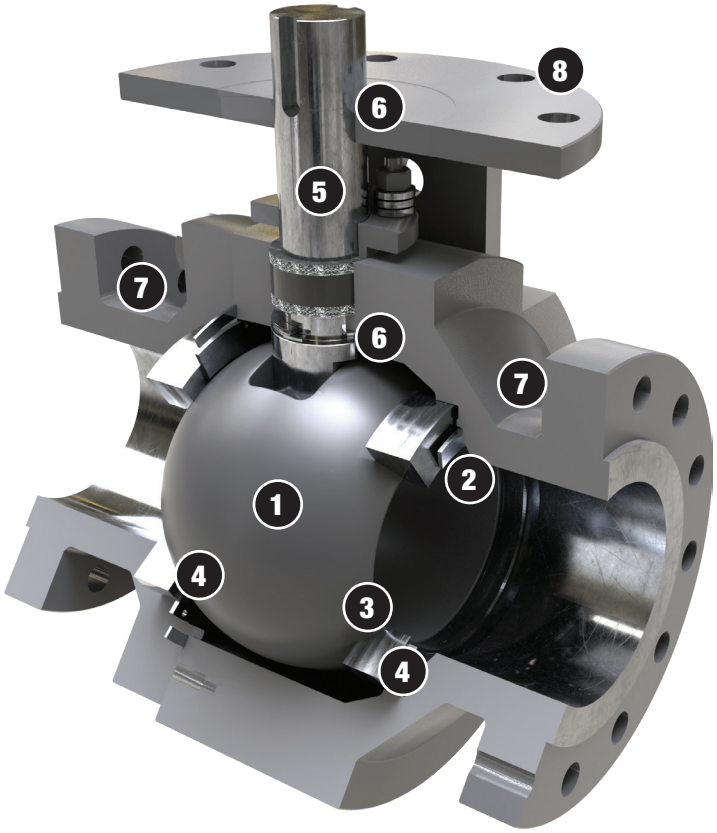
4 Independent replaceable seats
- Minimizes maintenance and repair costs

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 Options

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
End connections	Available end connections include flanged, welded, hub/clamp or RTJ

T-Series

Metal-seated or Soft-seated Trunnion Valves

1 Independent actuator mounting pad attached to body
- Precision machined to ensure precise stem alignment
- Body absorbs torsional load from actuator operation transmitted through brackets

2 Simple disc spring design
- Durable design compared to multiple coil springs
- Particle tolerant
- Consistent support around seat circumference

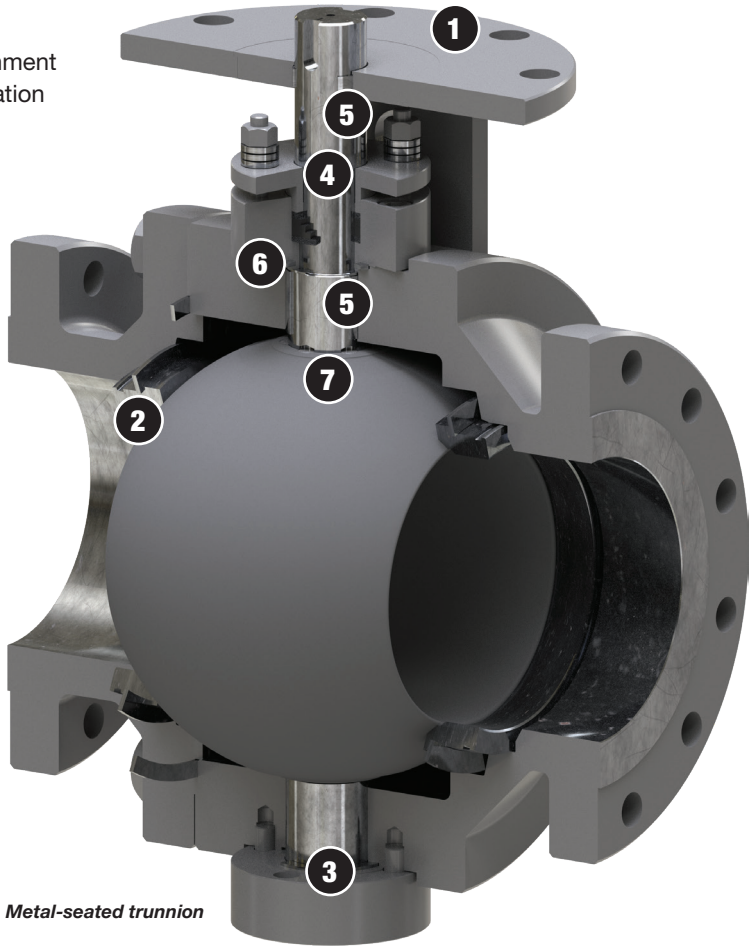
3 Plug / stem lower trunnion design
- Enhances serviceability
- Eliminates complexity and leakage associated with typical plate supported trunnions

4 Blowout-proof anti-static stem
- Unique upper bonnet design minimizes fugitive emissions

5 Independent upper and lower stem sleeve bearings
- Provides full stem support
- Reduces lateral load
- Prevents galling
- Extends packing life

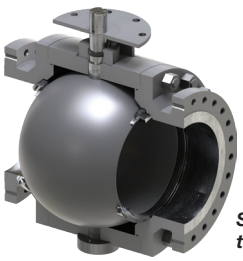
6 Inner stem seal technology
- Reduces friction between anti-blowout shoulder and upper bonnet
- Prevents solids from migrating to soft stem packing, extending packing life

7 Low-hysteresis drive design
- Precision tolerances ensure accurate positional control
- Handles rapid cycling



Metal-seated trunnion

Design
- 3 to 60 inch (80 to 1500 DN)
- Bi-directional
- API 6D or ASME B16.34
- Suitable temperature range: –50 to 400° F (–46 to 204° C)
- Suitable for high-cycle services



Soft-seated trunnion

Options
- ASME 150 to 2500 Class (not all size / pressure class combinations available)
- Metal seated or soft seated
- Fire safe design
- Cast or forged body; 2 or 3-piece
- Process and customer-specific body and trim materials
- Process and customer-specific coatings
- Adjustable or non-adjustable stem packing
- Spiral-wound body gasket or O-ring body joint seals

ISOLATOR 2.0

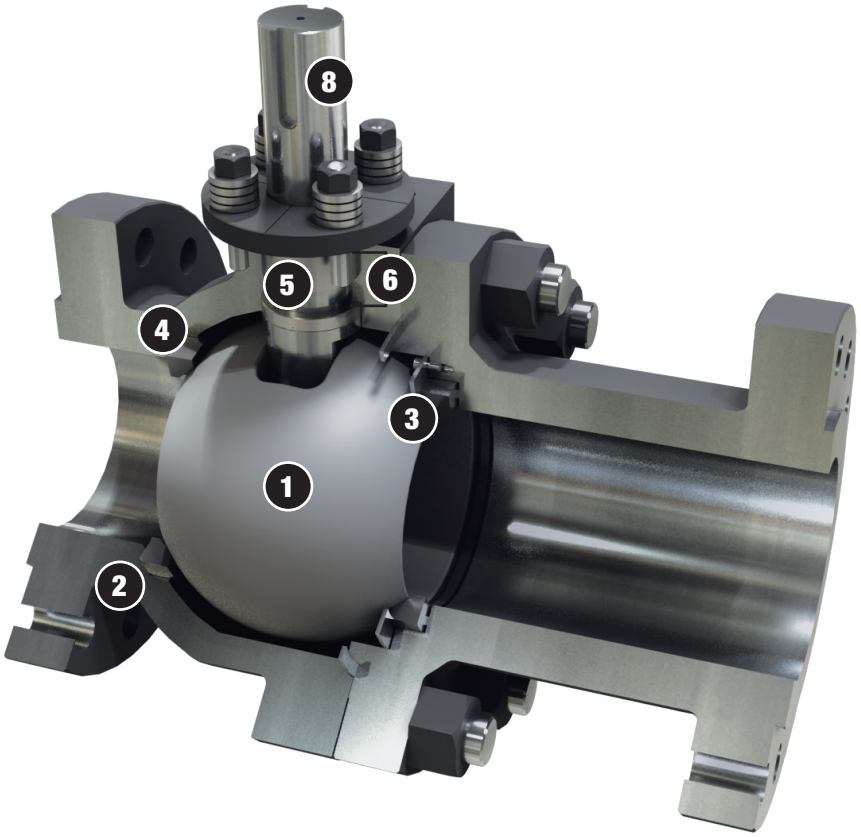
Low Pressure Isolation Valves

1 Floating ball design

- Rotating ball does not cause turbulent redirection or displacement of process fluid in the flowstream, resulting in less turbulent flow
- Straight-through full bore path protects sealing surfaces and packing area from particulate erosion
- Metal seats wipe sealing surface of ball clean during operation preventing solids build-up and clogging

2 Pressure-energized sealing

- Belleville spring in upstream provides constant contact between ball and seat for absolute shut-off and lower operating torque
- Allows resilience during thermal expansion of trim; no graphite seat gaskets



3 Matched ball and seats

- SphereSeal[SM] lapping process on ball and seat set provides 100% sealing contact through the full transition between the open and closed position
- Mate lapping behind seat provides tight sealing
- Optimum seat face diameter allows for lower torque without sealing compromise

4 Independent replaceable seats

- Minimizes maintenance and repair costs

5 Blowout-proof stem design

- One piece design meets industry safety standards
- High strength alloy construction
- Thicker, more robust stem tang eliminates failure at the stem-ball interface

6 Packing box

- Hardened inner steam seal and graphite rings prevent stem packing leaks and risk of fugitive emissions

7 Forged or cast body / end connections

- Greater wall thickness in critical areas provides longer valve life
- Available as raised face flanged, rtj, socketweld and buttweld

8 Live-loaded springs

- Energized Belleville spring washers and gland flange provide constant pressure on packing

Features Not Shown

- Standard design including stem and bore complies to API 608
- Absolute isolation in compliance with API 598
- Fire safe (API 607) and fugitive emissions compliant (API 641 or ISO 15848)

Options

- Mounting bracket and stem adaptor accommodates all types of actuators and accessories, such as electric, hydraulic and pneumatic actuators, and positioners and solenoids.

iRSVP®

Vent and Drain Valves

1 **Mechanical precision stop** prevents misalignment. Actuator torque is transmitted directly through the stem adaptor to the stop and relieves over torqueing.

2 **Integral mounting flange** provides rigid mounting of actuation with no loosening or shifting between bracket and body. True lockout tagout through handlever adaptor and integral mounting flange.

3 **Double-keyed stem** for reliable and more convenient adaptation of gears, pneumatics, hydraulics and motor operators.

4 **Stem bushing** prevents stem blowout and aligns stem radially. **Coated** for wear resistance.

5 **Single scribe line** on gland aligns with open or closed scribe line on stem to indicate proper ball and seat alignment and correct ball direction.

6 **Gland flange** with concentric live loading has ample allowance for adjustments while maintaining sealing integrity. The gland flange, studs and nuts are 316SS for corrosion resistance. Live load springs are Inconel.

7 The **gland thruster** is machined and coated for wear resistance for a continuous tight connection with the stem and packing box to prevent packing extrusion.

8 **Deep stuffing box** with proven 0.125-inch cross-section Chesterton® packing and dual anti-extrusion rings that provide reliable sealing and longevity.

9 **Metal anti-extrusion ring** minimizes packing extrusion.

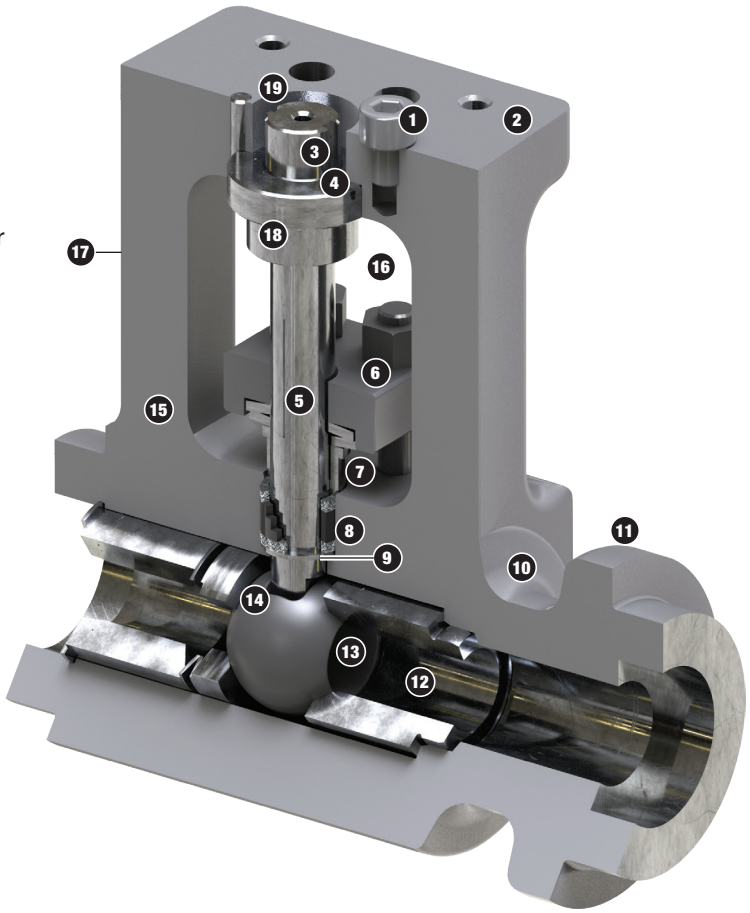
10 Integral **vented body design** protects the valve seat during Post Weld Heat Treatment (PWHT.)

11 **Stop** on downstream end indicates limit for heat ribbons used for stress relief.

12 Proven **press-fit seat design**.
- ASME 1500 = 410SS / Chromium Carbide
- ASME 3100 / 4500 = Inconel 718 / Chromium Carbide

13 **Oversized bore** at seat face allows for rapid thermal expansion without exposing seat face to process flow. **Wider seat faces** increase seal longevity.

14 **Mate-lapped ball and seat** for 100% sealing contact to ensure absolute shut-off.



15 **Forged body** for reliable pressure containment.

16 **Increased clearance** and visibility around packing nuts provides easier access for adjustment. Gland components can be raised for installation of skive-cut packing rings. **Greater length** between stem bushing and packing box bearing surfaces for more precise stem alignment.

17 **Nameplate** is color coded to identify standard materials, and are permanently attached to mounting flange leg, visible above insulation. Nameplate location indicates high-pressure end in the closed position.

18 Stem with **integrated thrust bearing** supports greater axial load. Reliable wear life. **Coated** stem for wear and gall resistance. Marked with open and close to clearly show operating position.

19 **Bore of mounting flange** accommodates adaptor and protects recessed stem from damage and unseating ball. Adaptor blanks provided by MOGAS.

Big Valves

For Large Pipelines

Long distance slurry pipelines for moving mineral concentrates and water over rugged terrain is often more economical than trucking or rail due to topography constraints and environmental concerns. To capitalize on these investments, the pipe sizes are maximized. The various elevations and distance involved make pipeline operations challenging. Therefore, large bore valves with dependable performance become vital to the success of the whole transportation process.

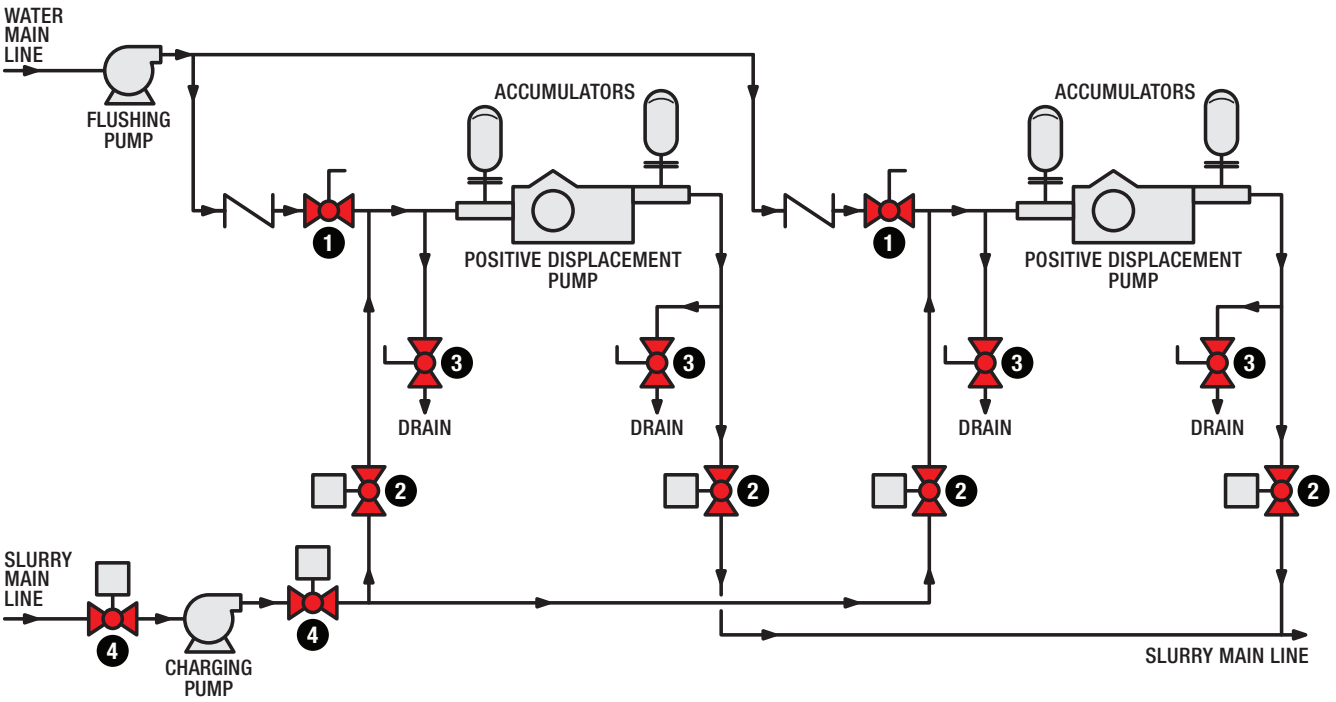
Simply taking a commodity valve and trying to “size it up” to a large bore valve will not ensure the proper longevity or operational performance when needed. This is where **experience makes the difference**. With half a century of manufacturing, installing and maintaining large severe-service valves, MOGAS provides a high level of confidence and support for operators in the slurry and water transport markets.

Experience makes the difference when designing and manufacturing large-bore ball valves.

Many design considerations are needed for each valve component before simply enlarging a smaller size valve. For example, this 36-inch bore is considerably larger compared to the 24- inch ball, while the stem slots have different ratios due to performance requirements.

Pump Station

Performance That Protects



This hydrotransport pump station has 6-inch and 8-inch ASME 1500 Class MOGAS metal-seated ball valves, as well as numerous 2-inch ASME 1500 Class drain valves, which have all been operating since 1994.

Valve Specification

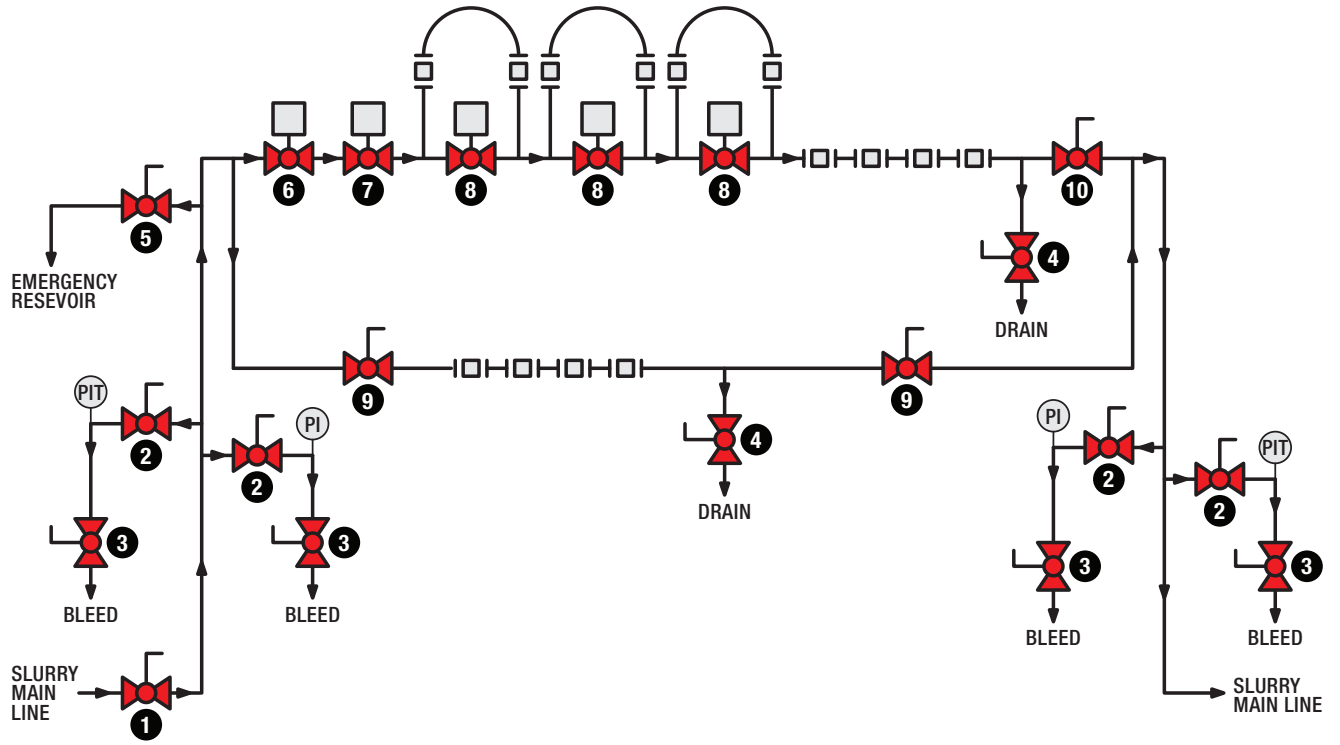
Valve Number	Valve Description
1	Charge Valve
2	Pump Isolation Valve
3	Drain Valve
4	Charge Pump Isolation

When hydrotransporting mineral concentrates such as copper, nickel, iron or gold, the long distant slurry pipelines most often will require various types of pump stations. When the topography cannot accommodate a gravity flow pipeline, either centrifugal pumps or positive displacement pumps must be used.

When maintenance is required on an inoperable pump, a reliable isolation valve is required on the suction and discharge sides of the pump to prevent the slurry from creeping into the pump. The flow will be diverted to other trains of piping to maintain operational efficiencies. These valves must isolate against full operating pressure of the abrasive media. With the MOGAS CST bi-directional seat design, the seat tracks with the ball for 100 percent contact.

Pressure Letdown Choke Station

Proven Designs for Critical Service



More than 120 C-Series valves, 2 to 24 inch, ASME 150–1500 Class, were installed on this concentrate line choke station to process copper slurry.

When engineering a long-distance pipeline with significant changes in elevation and diverse terrain, choke stations become an integral part of the design. Choke facilities are used for reducing pressure in a slurry pipeline and provide back-pressure necessary to prevent slack flow in the pipe.

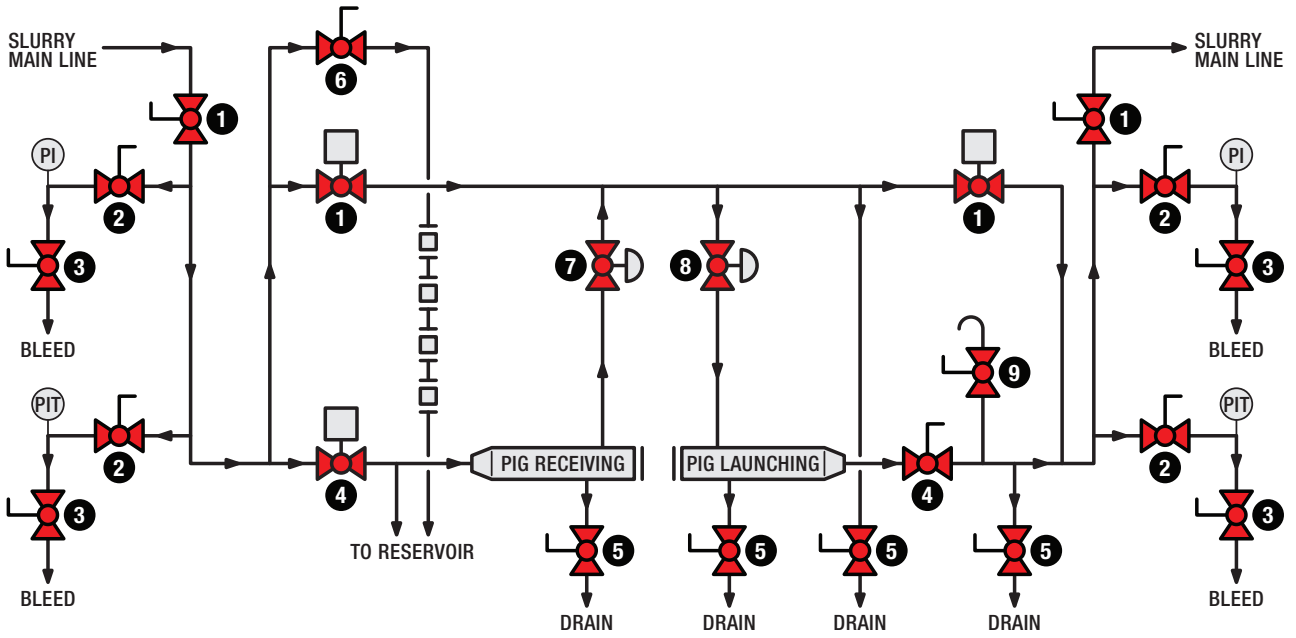
The isolation valves used at the choke station must operate under high differential slurry flow conditions. When shut off, dependable isolation with no leak-by is critical to the overall operation of the slurry pipeline. With the MOGAS CST bi-directional seat design, the seat tracks with the ball for 100 percent contact. This prevents build-up behind the downstream seat and ensures evacuation of solids around upstream seat during cycling.

Valve Specification

Valve Number	Valve Description
1	Choke Station ESD Valve
2	Instrument Isolation Valve
3	Instrument Bleed Valve
4	Drain Valve
5	Emergency Dump Valve
6	Choke Loop Cut Valve
7	Choke Loop Seal Valve
8	Choke Loop Isolation Valve
9	By-pass Isolation Valve
10	Main Slurry Line Isolation

Isolation Station

Handling Abrasive Flow Streams



Multiple C-Series valves, 8-inch, ASME 1500 Class, cycle 28 times a month under differential pressures to successfully isolate copper slurry.

The ability to consistently isolate pre-determined sections of a slurry pipeline or isolate major equipment can help eliminate unnecessary expenses. Another means to optimize operational profits is using **p**ipeline **i**ntelligent **g**auges, or "pigs", to provide inspection of the internal piping.

For slurry pipelines that must be pigged, full bore ball valves are used, as they allow free passage of the pigs. These pig launching and receiving stations are at regular intervals along the pipe, often in remote locations. A reliable trip isolation valve and pipeline block valve with quick quarter-turn operation is required for each station. With a MOGAS metal-seated ball valve, the recessed seats are protected from continual exposure to the abrasive process flow and pigging operations. Also, the sharp leading edge design of the seat ring "wipes" the sealing surface each time the valve is operated to eliminate any troublesome build-up.

Valve Specification

Valve Number	Valve Description
1	Main Isolation Valve
2	Instrument Isolation Valve
3	Instrument Bleed Valve
4	Pigging Isolation Valve
5	Drain Valve
6	Emergency Dump Valve
7	Pig Receiver Discharge Valve
8	Pig Launch Charge Valve
9	Vent Valve

Case Study – Seawater Transport

Reliability Performance

Challenge

A South American mining operation was commissioned, with commercial production to start the following year. The mine operated with the use of seawater transported through a pipeline from the cooling systems of a power plant 90 miles away. Fouling occurs in seawater and damages equipment through:

- crystallization (from calcium carbonate, calcium sulphate and other salts)
- corrosion from oxidation
- biological growths from bacteria and organisms
- the settling of particulates, such as silt, mud and sand

These fouling factors, coupled with galvanic corrosion and debris-packed coil springs behind the seat, compromised the seal of the thermoplastic polymer seat. The valve began to leak past the O-ring at the end connection and body. Because the valve was located near the sea, corrosion to all external ferrous materials escalated.

Three repair attempts at significant costs were made by the original valve manufacturer to replace the sealing components with metal seats. Each repair survived for one day, and the OEM's customer support waned after each attempt.

Solution

Ultimately, the solution came from industry and field knowledge, valve expertise, insanely customer-centric service and innovative valve designs. MOGAS design standards are ideal for corrosive environments, and has experience with seawater applications. Replacement valves were provided with a nickel-based super alloy inlays on all sealing surfaces and through the bore. These valves also used a metal-seated ball valve (not soft seating), supported by a live-loaded disc spring to maintain a tight seal. All external components were painted with an improved paint specification above industry standards to insulate from the salty humidity.

Results

The single biggest reason the end user chose MOGAS was because of their proven customer service. Recognized industry-wide as experts in severe service technology, MOGAS service personnel local to the area were quickly on site to identify the problem and offer a lasting solution.

Conditions	
Application:	Seawater Transport
Temperature:	85° F (30° C)
Pressure:	2,220 psig (153 bar g)
Valve Model:	T-Series (Trunnion)
Valve Size:	36 inch (900 DN)

Material loss in the seat pocket was caused by galvanic corrosion, allowing leakage around the valve seats.

Fine silt packed the coiled spring pockets preventing free motion and an effective seal

Case Study – Slurry Transport

Increased Cycle Count

Challenge

Long distance slurry pipelines for moving mineral concentrates over various elevations and long distances is often more economical than trucking or rail due to topography constraints and environmental concerns. To capitalize on these investments, the pipe sizes are maximized. Therefore, large-bore dependable valves are vital to the success of the slurry pipelines.

Three months after the main choke and choke loop pressure letdown stations were commissioned at a large copper-gold-molybdenum mining operation, ongoing repairs were required for all eight competitor valves. Valves in this position were expected to perform for at least 180 cycles without repair. These failures and leakage problems were caused by the valves' integral seat design, which form a gap between the ball and seat allowing particles to enter the sealing area in the reverse pressure. This problem cost this customer an average of $800,000 to $1M per year in maintenance repairs.

Solution

Even with MOGAS' 40-year history of successfully engineering large valves for the slurry transport market, MOGAS proposed to lease a test valve to be placed alongside a series of competitor valves.

In January 2013, a 36-inch, ASME 300 Class model CST-1 valve was installed in the first loop of the control station. In this model's proven bi-directional seat design, the seat maintains 100% contact with the ball in both normal and reverse pressures. This prevents build-up behind the downstream seat and ensures evacuation of solids around upstream seat during cycling.

Results

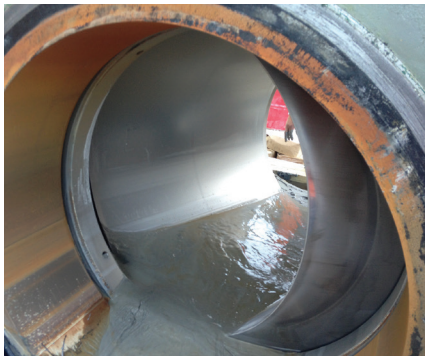
One year later during decommission, the MOGAS valve was inspected. It had performed 818 cycles; far more than the 180 cycle count required in this application. The MOGAS valve was then removed and installed outside the loop, in the main choke station replacing the competitor valve, where it further performed 215 cycles for the next two years.

After three years of continuous operation, the MOGAS valve had successfully performed 1033 cycles. On inspection, the ball and seat were in good repair, so only the gasket and packing box were replaced and the valve was put back in to service.

Advantages to installing a MOGAS valve:

- No downtime due to increased cycle time and continuous operation
- No repair or maintenance of ball and seat
- Increased cycle count and greater revenue

Conditions	
Application:	Slurry Transport
Temperature:	77° F (25° C)
Pressure:	650 psig (4483 kPA)
Valve Model:	C-Series (CST-1)
Valve Size:	36 inch (900 DN)



After one year the MOGAS valve performed 818 successful cycles—over four times the cycle count required in this application.

Under the same process conditions, the competitor's valve underperformed and required frequent maintenance due to erosion.

Service

Global Capabilities

Annual maintenance costs on installed MOGAS valves are about 1 percent of initial investment.

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

Confidence for Tomorrow

A Warranty is Not a Performance Guarantee

CONFIDENCE
PREDICTABILITY
RISK FREE DECISIONS
IMPROVED SAFETY
ENHANCED RELIABILITY
LESS DOWNTIME
ANTICIPATED BUDGETS
LIFETIME WARRANTY

Only from MOGAS

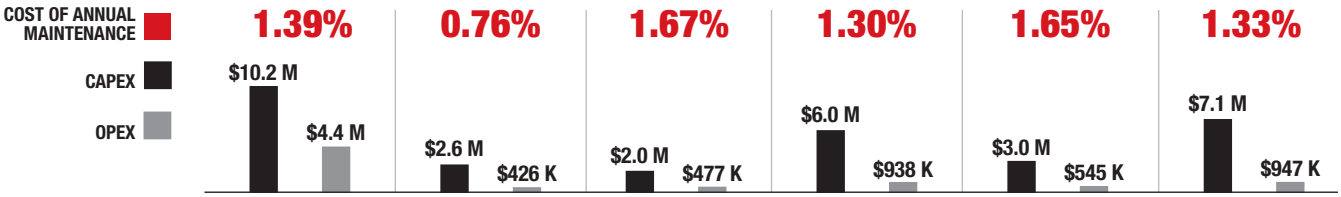
Due to continuous years of research and development, coating improvements, proven manufacturing techniques and application experience, we now offer an unprecedented application-specific PERFORMANCE GUARANTEE on our metal-seated isolation and control valves. Years of continual valve performance analysis, 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.

Total Cost of Ownership

Not All Valves are Alike

Total Cost of Ownership

Several analytical methods can be used to justify the purchase of capital equipment such as critical valves. But it really comes down to getting the 'expected performance' you purchased. In the case of large pipeline valves, this concern becomes magnified. The availability of the hydrotransport system and the operational integrity of the pipeline directly affect a company's bottom line.



	PLANT A	PLANT B	PLANT C	PLANT D	PLANT E	PLANT F
Number Valves	110	80	79	78	93	294
Valve Sizes, in	2 – 30	2 – 8	2 – 10	4 – 8	2 – 10	1 – 12
Years in Operation	31	21	14	12	11	10

Price *versus* Operational Availability

Management only wants to invest in equipment that allows them to make money. This means presenting technical features and benefits in a way that helps them understand the return on investment or the avoidance of outrageous loss of revenue. Below is an example of what it could potentially cost a company when an underperforming valve purchase is made.

How much money will it cost you to choose a valve that does not perform when needed?

Question How much money could be lost if a pipeline has to be down due to valve failure?

Answer In 2022, typical copper production at a site was 324,700 tons per year. With mining concentrate valued at US$8,825 per ton, production loss will be US$327,109 per hour.

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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