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Jamesbury®

Taking Valve Sealing Technology To An Xtreme®

Metso
North America

Taking Valve Sealing Technology to an Xtreme

A long-lasting valve sealing technology relying on advanced materials and complementary seat geometries extends the range of standard, high-performance soft seat designs into higher temperature/pressure ranges without increasing the valve owner's costs.

New materials and seat geometries improve severe service valve cost/ performance and life expectancy

Developed by *Jamesbury* for its soft-seated on/off ball and butterfly valves, the *Xtreme* sealing technology is capable of dramatically reducing the number of applications that require costly, special seat designs and higher torque output actuators in chemical processing and many other industries with severe service requirements.

Unique Fluoropolymer

The foundation for the *Xtreme* sealing technology is *Jamesbury's* exclusive, flexible-lip seat design that, for the better part of five decades, has been considered the most reliable of valve sealing technologies. This design is a substantial improvement on conventional, non-flexing "jam" seats and seats that have stiff internal components prone to fatigue, corrosion and wear. It is reported that flexible-lip sealing valve technology delivers bubble-tight shut-off for a decade or more.

The *Jamesbury* polymer laboratory team researched new polymeric materials that allows the company to achieve greater single-piece, polymeric seat manufacturing efficiencies while, at the same time, improves the temperature/pressure performance of the seat. This allows *Jamesbury* to offer its customers a soft seat that delivers tight shutoff over a wider range of operating conditions than its standard PTFE and glass-filled PTFE seats without increasing costs.

This fluoropolymer material exhibits superior recovery, the ability of a material to bounce back after compression, and cycling at high temperatures. Fluoropolymer has 50% better recovery than either PTFE or filled PTFE at 450°F. This property is important in maintaining close contact between the seat and the ball or disc of the valve, especially in services where high temperatures and pressures are involved. This unique formulation for improved recovery properties is the basis for the *Xtreme* sealing technology.

Since the material performs well in high temperature/pressure ranges where standard polymeric seats were not used previously, in the development of this product, *Jamesbury* evaluated the seat geometry under a different set of operating conditions. No modifications were required for the Wafer-Sphere® high-performance butterfly seat geometry. However, much to the surprise of the original engineers, there was considerable room to improve the "legendary" seat design in the ball valves.

With the aid of finite element modeling, seat geometry was modified for each ball valve size. In one instance, as many as nine modifications were made, adding and subtracting material to optimize sealing capacity of the valve at high temperature and pressures. In each case, care was taken not to compromise the valve's pressure relief features. Once the geometry was optimized for each ball size, Metso fine-tuned manufacturing processes so the new seat could be produced with consistent quality and without a cost increase to the customer. This makes it possible to offer *Xtreme* seat technology for the *Jamesbury* 2-1/2" to 48" *Wafer-Sphere* butterfly valves, 1/4" to 2" Eliminator Series and Series 4000, and 1/2" to 12" standard and full bore flanged ball valves.

Break-Through Performance

Butterfly and ball valves equipped with the *Xtreme* technology seat deliver a number of performance and cost advantages versus PTFE, standard filled PTFE and special PEEK (polyetheretherketone) seats.

Expanded Pressure/Temperature Range.

Because the *Xtreme* seat material has better recovery at higher temperatures than PTFE and filled PTFE, it maintains continuous contact with the valve's ball or disc for better sealing, even at higher temperatures and pressures. Pressure/temperature curves improve significantly for every size of ball and butterfly valve.

The standard *Xtreme* seat delivers sealing performance comparable to special PEEK seats up to 500°F. A 4000 series valve with an *Xtreme* seat is rated at 1200 psi at 300°F (versus 700 psi for a filled PTFE seat). At 500°F, filled PTFE does not perform at all, while the Xtreme seat is rated to 350 psi.

Xtreme technology allows butterfly valves with standard *Xtreme* seats to go where they have never gone before. An ANSI Class 300 *Wafer-Sphere* valve with filled PTFE seats is rated up to180 psi at 500°F. With *Xtreme* seats, the *Wafer-Sphere* valve is rated for up to 350 psi. This is a remarkable 100% increase and gives cause for users to consider the cost/performance advantages of butterfly valves for services where they were not previously applicable.

Lower-Torque.

A lower coefficient of friction and reduced stiffness, particularly in comparison to PEEK seats, translates to lower torque requirements for valves equipped with *Xtreme* seats. In many instances, it is possible to reduce actuators by one or more sizes.

For example, a 2" 4000 series valve with a PEEK seat requires 75 pounds of torque to operate. The same valve equipped with an *Xtreme* seat requires only 25 pounds. The actuator specification in this instance is reduced by three sizes.

Longer-Lasting.

Although it was not an original design objective, *Xtreme* seats provide longer leak-free performance. Each valve must be evaluated on a case-by-case basis. However, cycle life improvements measured to date range from 50% to 500%. For example, a *Wafer-Sphere* butterfly valve was tested at full ANSI class 150 pressure and at ambient conditions; the valve exhibited a five times increase in cycle life. Series 4000 ball valves with filled PTFE and *Xtreme* seats tested with 400°F steam at 240 psi also yielded improved performance with *Xtreme*, showing twice the life of filled PTFE seats.

Excellent Chemical Resistance.

The chemical compatibility of *Xtreme* seats is equivalent to filled PTFE. This offers another advantage over PEEK seats, which have limited chemical resistance. As a result, *Xtreme* technology can be expanded to a broader range of applications in the PEEK temperature range.

Lower Permeability.

In high temperature monomer service, the media can work its way into PTFE and filled PTFE. The trapped monomer can polymerize and create a crust of solidified material. This solidification process is referred to as "popcorning" and can cause mechanical damage to the seats. Popcorning can be minimized by using *Xtreme* material because of its lower permeability compared to PTFE and filled PTFE.

Bottom Line

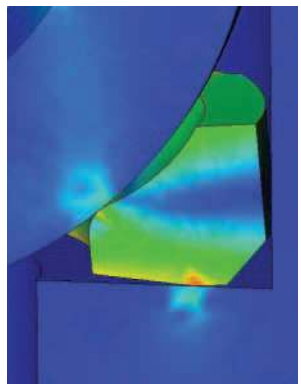
Jamesbury's unique, single-piece, polymeric seat design has been widely recognized for its long-lasting, leak-free performance. *Jamesbury's Xtreme* seat offers numerous opportunities for long-term cost reductions through:

- Seat material consolidation
- An extended cycle life
- Smaller actuator requirements
- The ability to utilize high-performance butterfly valves and ball valves in a wider range of applications

Xtreme technology could be the most significant improvement in soft seat technology since *Jamesbury* introduced the flexible-lip seat design nearly a half century ago.

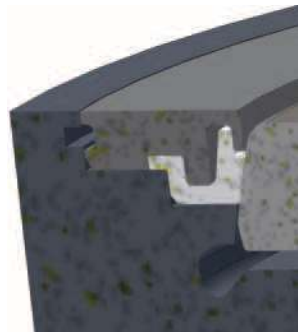
In a butterfly valve, the disc is downstream of the seat and line pressure pressurizes the full cross-section of the seat. The seat then follows the natural deflections and contour of the disc. Increased line pressure enhances sealing, even though the same pressure moves the disc away from the seat. Line pressure is not the only source of disc and seat deflections. Temperature changes or natural differential temperatures between the cooler body and hotter disc can also cause increased seat loads. Clearances designed into the seat provide essential relief.

The sealing principles are similar for ball valves. In addition, the *Jamesbury* seat design has intrinsic pressure relief, which enables the valve to vent itself when higher temperatures cause gasses to expand within the valve. This important safety feature protects people and equipment by eliminating the potential for valves rupturing.



Finite element analysis of a ball valve.

Ball valve with *Xtreme* seat.



Wafer-Sphere with *Xtreme* seat.

Europe
Vanha Porvoontie 229, P.O.Box 304
FI-01301 Vantaa Finland
tel. +358 20 483 150, fax + 358 20 483 151

North America
44 Bowditch Drive, P.O.Box 8044
Shrewsbury, MA 01545, USA
Tel. +1 508 852 0200, fax +1 508 852 8172

South America
Av. Independência, 2500- Iporanga
18087-101, Sorocaba-São Paulo, Brazil
Tel. +55 15 2102 9700, fax +55 15 2102 9748/49

Asia Pacific
20 Kallang Avenue, Lobby B,
#06-00 PICO Creative Centre
Singapore 339411, Singapore
Tel. +65 6511 1011, fax +65 6250 0830

China
19/F, the Exchange Beijing, No. 118
Jianguo Lu Yi, Chaoyang Dist
100022 Beijing, China
Tel. +86-10-6566-6600, fax +86-10-6566-2575

Middle East
Roundabout 8
Unit AB-07, P.O.Box 17175
Jebel Ali Freezone, Dubai, United Arab Emirates
Tel. +971 4 883 6974, fax +971 4 883 6836

For further information please contact
one of our regional offices or visit our
web site **www.metso.com/valves**