

# ENVIRO-SEAL™ Valve Packing Systems

Extending service life. Meeting environmental requirements.





**ENVIRO-SEAL valve packing systems:**

*Designed specifically to reduce your total cost of ownership for non-environmental and environmental sealing applications while optimizing process control.*

## ENVIRO-SEAL™ Valve Packing Systems

The right choice for extended service life in non-environmental and environmental applications.

**E**merson's Fisher® ENVIRO-SEAL™ packing systems minimize operating expenses over the life of control valves.

ENVIRO-SEAL systems are available for a wide range of pressure and temperature conditions in non-environmental and environmental applications. They're designed to control emissions to below 100 parts per million volume (ppmv), which makes them a good choice for the chemical, oil and gas, and pulp and paper industries.

### Why use ENVIRO-SEAL packing systems?

You must control maintenance and environmental costs in today's competitive markets. A proven way to reduce packing maintenance, enhance process control, and minimize labor costs is to use Fisher ENVIRO-SEAL packing systems in your rotary and sliding-stem valves. Our control valve design and research engineers, the individuals who know control valve sealing technology the best, developed and extensively tested ENVIRO-SEAL systems. Valve users put the systems to work in a wide variety of applications. ENVIRO-SEAL, introduced in the early 1990s, today stands as the system of choice worldwide, both for extended service life and stringent emission control. In addition, ENVIRO-SEAL systems have been tested and certified by international certification organizations.

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## The Design

Avoiding valve trouble requires a packing system that has a managed stress level, ensures proper stem or shaft alignment, contains the correct amount of packing material, and offers packing containment. ENVIRO-SEAL packing systems use four principles in their designs.

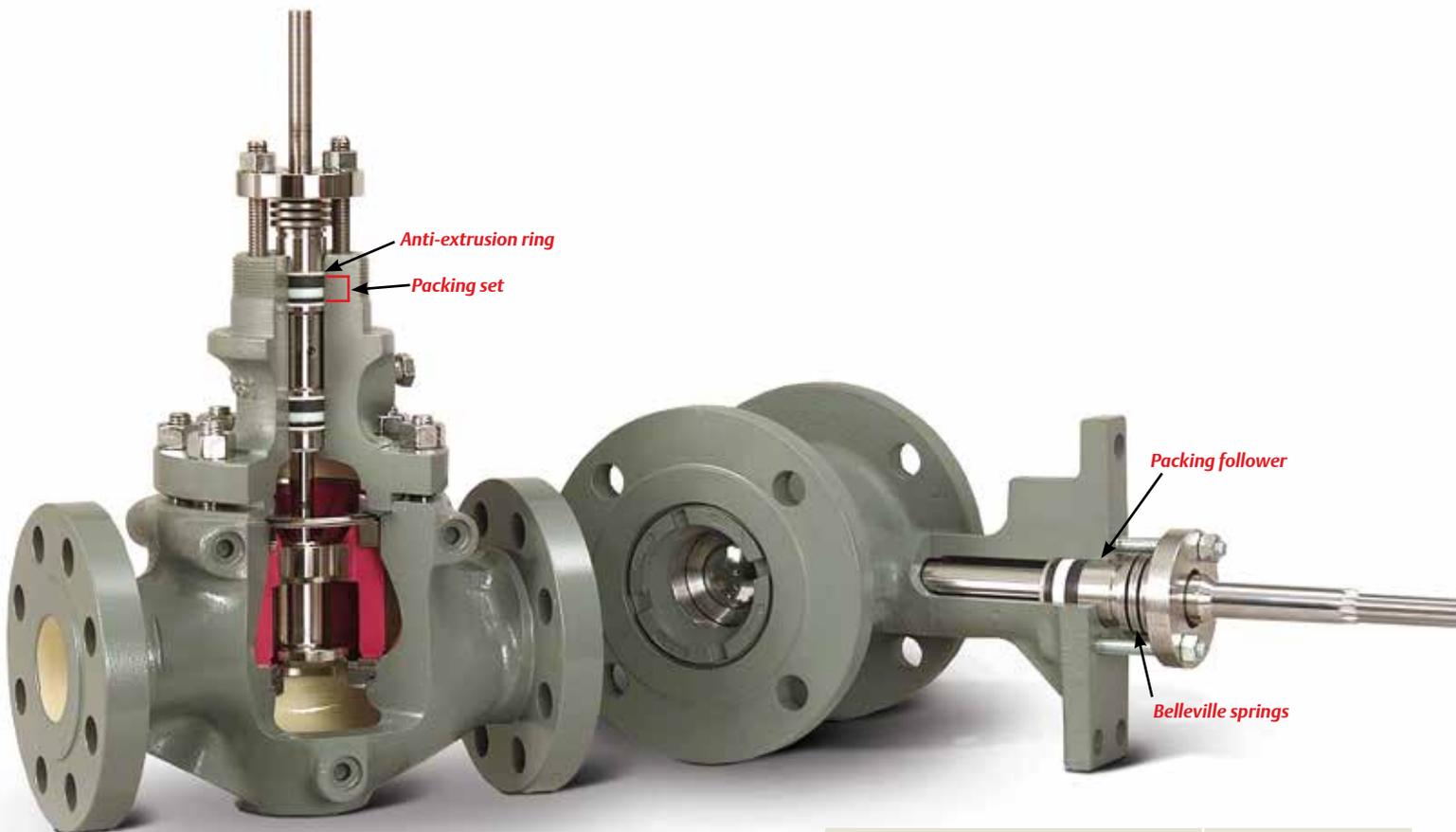
### Four Packing System Principles:

- (1) Managed Stress - Live-load Belleville springs provide a constant load over the life of the packing material.
- (2) Aligned Properly - Lined packing followers ensure that the valve stem or shaft is held precisely in the center of the packing.

(3) Optimized Amount of Packing - The ENVIRO-SEAL system uses just the right amount of packing depth for the stem or shaft diameter.

(4) Packing Containment - Anti-extrusion rings keep the packing from extruding when it deforms to fill space between the stem and bore.

Choose PTFE, Graphite ULF (ultra low friction) or Duplex configurations for sliding-stem valves. For rotary valves, select PTFE or Graphite configurations.



CAPABILITY	ENVIRO-SEAL
Extended service life	✓
Fugitive emissions control	✓
Tight sealing	✓
High performance level	✓
Low friction	✓
Minimal maintenance	✓
Wide pressure/temperature range	✓
Fits sliding-stem and rotary valves	✓
Accurate control with Fisher valves	✓
Firesafe	✓

## A Case-In-Point

A Canadian urea plant experienced continual stem leakage problems with its NPS 8 butterfly valve that was used to maintain liquid level in the reactor. Plant personnel tried tightening, repacking, and injecting a sealing compound into the packing, which used PTFE rings. Valve stem leakage was severe enough to close down operations twice in one year—at \$500,000 per day in lost production.

The ENVIRO-SEAL packing system was installed as a solution. After one year of service, the ENVIRO-SEAL packing system showed absolutely no sign of leakage. Periodic inspection of the packing follower revealed negligible travel, indicating that the packing was operating without extrusion loss.

By using the ENVIRO-SEAL packing, the plant avoided the potential for a million dollars of shutdown loss per year as well as relieving a major operations and maintenance headache.



Rotary



Sliding Stem



### ENVIRO-SEAL PTFE

Universal chemical compatibility makes PTFE the first choice of chemical plants and pulp mills. >>



### ENVIRO-SEAL Graphite ULF

Extended pressure and temperature capability combined with ultra low friction keeps critical power plant and refining valves operating smoothly. >>



### ENVIRO-SEAL Duplex

High-performance firesafe packing perfected for the refining industry. >>



## ENVIRO-SEAL is Your Low-Emissions (Low-E) Packing Solution

You can no longer select a valve packing system based on price alone. A low-priced system may give months of leak-free service. But when it does start to leak, maintenance costs add up.

ENVIRO-SEAL packing systems keep emission concentrations below mandated limits, such as the U.S. Environmental Protection Agency (EPA) threshold of 500 ppmv to meet Leak Detection and Repair (LDAR) programs. In fact, testing shows ENVIRO-SEAL packing systems can control emissions to below 100 ppmv.

Emerson offers an optional, extended ENVIRO-SEAL warranty for customers required by the EPA to implement an Enhanced LDAR Program (ELP) and limit emissions to 100 ppmv. Contact your Emerson local business partner or sales office for more information.

### Keep Emissions Below 100 ppmv Using FIELDVUE™ Digital Valve Controllers

Maintenance personnel can utilize actuator cycle counts to monitor ENVIRO-SEAL packing systems.

FIELDVUE™ instruments can count the number of cycles the valve assembly completes. ValveLink™ software keeps a history of these counts. When the valve exceeds a specified number of cycles, ValveLink software can generate a FIELDVUE alert.

Based on actual valve service performance, this alert reminds maintenance personnel to check packing for integrity.



**Low-E Packing Solution**  
*ENVIRO-SEAL packing systems meet ELP fugitive emissions requirements.*

### GX Control Valve with ENVIRO-SEAL Packing System

*The GX control valve and actuator system gives you a single valve that you can use effectively in a wide variety of applications. It meets elevated temperature requirements, up to 371°C (700°F), and can handle rigorous mechanical and thermal cycles. ENVIRO-SEAL packing systems are standard in the GX.*

**FISHER**

Environmental Protection by ENVIRO-SEAL™ Packing



### Engineered Retrofit and Repair Kits Available

*If your maintenance staff is short-handed or just too busy to replace your valve seals, contact Emerson's Instrument & Valve Services for onsite valve repacking.*

**A Case-In-Point**

A refinery in the southern U.S. utilized packing that was firesafe but didn't keep valve emissions below 100 ppmv, as dictated by area regulations.

The plant installed ENVIRO-SEAL Duplex packing systems on four control valves. The valves were in C<sub>3</sub> and C<sub>4</sub> hydrocarbon service and operated at 32°C to 49°C (90°F to 120°F) and a maximum pressure of 21 bar (300 psi).

Three years after installation, leak rates on the four valves have been exceptionally low. The maximum hydrocarbon concentration ever detected was less than 20 ppmv.

The ENVIRO-SEAL Duplex systems have not needed readjusting since they were installed. Company-wide specifications have now been developed that standardize on Duplex packing systems for applications requiring low fugitive emissions, low stem friction, and fire safety.



**Certifications**

ENVIRO-SEAL packing systems have been certified for a broad range of service conditions. They offer excellent emission control capabilities and have been tested and certified by these international certification organizations: Cetim (ISO 15848-1), Yarmouth (ANSI/FCI 91-1, Shell MESC SPE 77/300), and TÜV (TA-Luft).

**ENVIRO-SEAL Bellows**  
 When combined with ENVIRO-SEAL packing, bellows provide the ultimate protection against leakage.



## Peace of Mind by Design

**T**here is a difference between live-loaded packing systems. Ask your control valve or packing supplier to verify that his packing system has passed each of the following tests.

**Was the packing system tested to recognized industry standards?** Fisher ENVIRO-SEAL packing systems have been tested across a broad range of conditions to demonstrate compliance with numerous industry standards including ISO 15848-1, ANSI/FCI 91-1, and TA-Luft.

**Was the packing system engineered specifically for the valve style you intend to use?** Packing performance is influenced not only by valve geometry but also by valve design features. Fisher ENVIRO-SEAL packing systems fit Fisher control valves as shipped. There is no need to force-fit generic, non-OEM packing into your control valve.

**Was the packing system subjected to multiple operating cycles?** The packing system should be subjected to extensive mechanical testing.

**Was the packing system subjected to multiple thermal cycles?** Generally, a packing system that demonstrates continued low leakage after numerous thermal cycles while experiencing thousands of mechanical cycles is sufficiently stable to perform through continued thermal cycling.

**Were packing adjustments made or was the packing system maintained during the performance test?** Packing that must be maintained or adjusted in order to retain its low leak rate jeopardizes the goal of annual LDAR regulation.

**Was the packing system tested at or above the service conditions of your application?** The combination of high pressure and temperature can increase the leak potential and can limit the service life of a packing system.

**Did testing of packing systems for rotary valves include deflection of the valve shaft?** Pressure drop across the valve plug and the resulting side loads imposed in rotary valves can distort packing, create leak paths, and limit packing life.

**Was stem leakage monitored using EPA Method 21?** EPA Method 21 measures the concentration of VOCs near the valve stem and is the only appropriate technique for qualifying LDAR monitoring frequencies in the U.S.

**Were packing system components examined for wear after the completion of each test?** After each test, the valve stem should be checked for scoring, wear, corrosion, or erosion.

**Was the compression load on the packing measured as each test progressed?** Packing systems based on PTFE sealing elements can gradually lose packing volume. The monitoring of packing load during the test period can detect loss of packing volume and can aid in predicting ultimate packing failure.



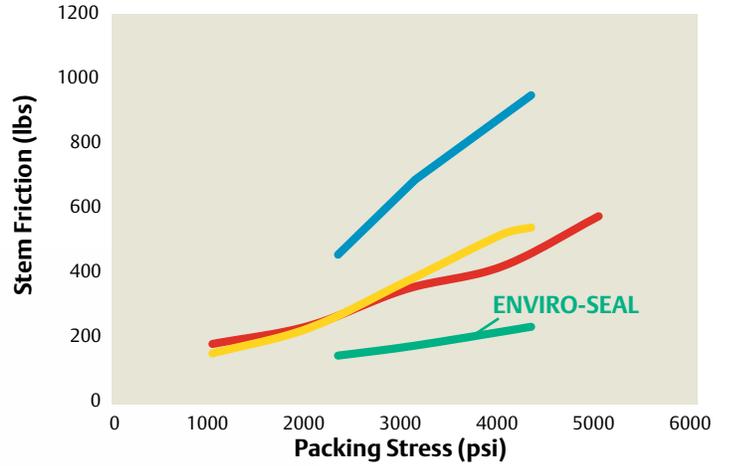
# Performance Testing

- Fisher ENVIRO-SEAL Graphite ULF
- Non-OEM Expandable Graphite
- Non-OEM Wedge-Shaped Graphite
- Non-OEM Flexible Graphite Jacket Over Carbon Core

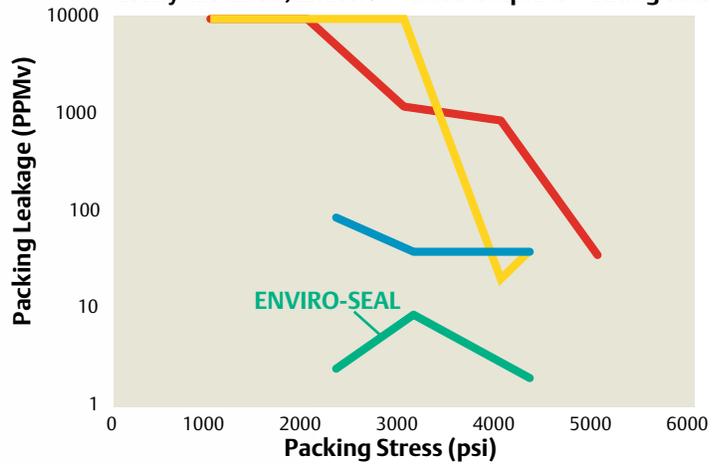
Fisher easy-e™ sliding-stem valve with ENVIRO-SEAL Graphite ULF system



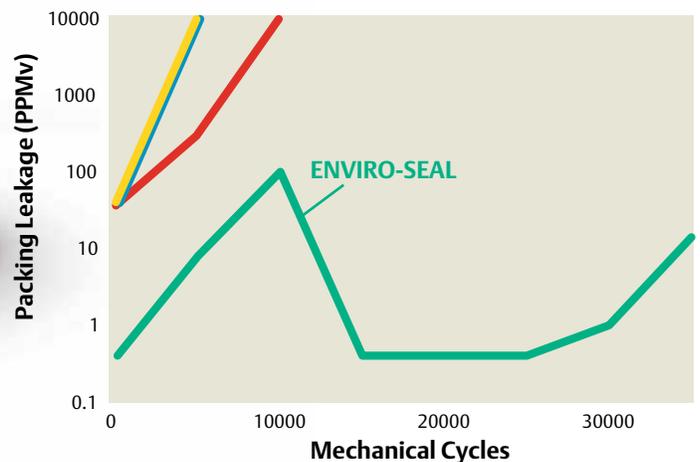
Valve Stem Friction at Ambient Temperature for Newly-Installed, Emission-Rated Graphite Packing Sets



1500 psig Methane Leakage at Ambient Temperature for Newly-Installed, Emission-Rated Graphite Packing Sets



1500 psig Methane Leakage for Emission-Rated Graphite Packing Sets Tested From 70°F to 600°F Without Adjustment



## Standardize Across the Plant

ENVIRO-SEAL packing systems are available in all Fisher valves, which means you can take advantage of their excellent sealing and extended service capabilities throughout your plant.

### Support and Service

Emerson Process Management Educational Services offers training for technicians, engineers, and others responsible for installing, troubleshooting, and replacing parts on valves and actuators.

Whether it's diagnostic services, valve repair, or parts, we understand the relationship between our prompt service and your profitability. With locations throughout the world, Emerson can provide the valve maintenance you need, when you need them.



*Fisher eccentric plug rotary control valve  
with ENVIRO-SEAL PTFE packing system*

## The Next Step

If you like the advantages given by ENVIRO-SEAL packing systems, call your Emerson local business partner or sales office.

Highly skilled and experienced applications experts are ready to help you take advantage of the many benefits of ENVIRO-SEAL systems. Visit [www.Fisher.com](http://www.Fisher.com) to locate an office near you.

When you need process automation products, turn to Emerson Process Management for an extensive lineup of measurement and analytical instruments, final control devices, and systems and software.

ENVIRO-SEAL systems help reduce maintenance costs and extend service life in non-environmental and environmental applications. The temperature ratings shown in the table below apply to the actual packing temperature, not the process temperature. ENVIRO-SEAL packing systems can be used across the full temperature capability range of Fisher control valves.

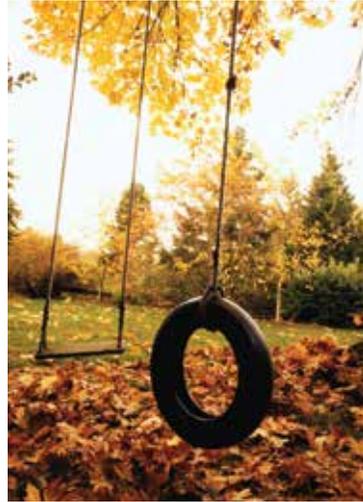
### Packing Pressure and Temperature Selection Guidelines<sup>(1)(2)</sup>

Valve Type	Packing System	Non-environmental Service <sup>(3)</sup>		Environmental Service <sup>(3)</sup>	
		Metric	Imperial	Metric	Imperial
Sliding Stem	ENVIRO-SEAL PTFE	-46 to 104°C 259 bar 104 ≤ 232°C decreasing to 103 bar	-50 to 220°F 3750 psi 220 ≤ 450°F decreasing to 1500 psi	-46 to 93°C 52 bar 93 ≤ 232°C decreasing to 30 bar	-50 to 200°F 750 psi 200 ≤ 450° decreasing to 450 psi
Sliding Stem	ENVIRO-SEAL Duplex	-46 to 104°C 259 bar 104 ≤ 232°C decreasing to 103 bar	-50 to 220°F 3750 psi 220 ≤ 450°F decreasing to 1500 psi	51.7 bar -46 to 232°C	750 psi -50 to 450°F
Sliding Stem	ENVIRO-SEAL Graphite ULF	207 bar -198 to 371°C	3000 psi -325 to 700°F	103 bar -7 to 315°C	1500 psi 20 to 600°F
Rotary	ENVIRO-SEAL PTFE	103 bar -46 to 232°C	1500 psig -50 to 450°F	103 bar -46 to 232°C	1500 psig -50 to 450°F
Rotary	ENVIRO-SEAL Graphite	207 bar -198 to 371°C	3000 psig -325 to 700°F	103 bar -18 to 315°C	1500 psig 20 to 600°F

1. Neither Emerson, Emerson Process Management, nor any of their affiliated entities assumes responsibility for the selection, use, or maintenance of any product. Responsibility for proper selection, use, and maintenance of any product remains solely with the purchaser and end user.

2. Complete specifications can be found in Fisher Bulletin 59.1:061 ENVIRO-SEAL Packing Systems for Sliding-Stem Valves and Fisher Bulletin 59.3:041 ENVIRO-SEAL Packing Systems for Rotary Valves.

3. The values shown are only guidelines. These guidelines can be exceeded, but shortened packing life or increased leakage might result. The temperature ratings apply to the actual packing temperature, not to the process temperature.



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**Emerson Process Management**  
Marshalltown, Iowa 50158 USA  
Sorocaba, 18087 Brazil  
Chatham, Kent ME4 4QZ UK  
Dubai, United Arab Emirates  
Singapore 128461 Singapore  
[www.Fisher.com](http://www.Fisher.com)

