THE SEALING TECHNOLOGY INFOMAGAZINE

FLOWSERVE

Face to Face

THE SEALING TECHNOLOGY INFOMAGAZINE

SPECIAL ISSUE

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As our marketplace evolves, more and more companies recognize that growth demands change. Consolidation, one of the largest and most visible changes, continues to occur with many customers.

Flowserve’s Flow Solutions Division (FSD), the leader in user alliances, recognizes the unusual challenges and unique requirements so common among customers during merger integration activities as well as during other transitions, especially as supply contracts and protocols are modified. The alliance process focuses on reducing total cost of ownership for the user by increasing the reliability of their equipment, minimizing inventory and improving resource utilization. With about 200 user alliance sites in place already, Flowserve has proven its capability to multiply equipment mean-time-between-failures from two- to five-fold, while reducing the customer’s overall investment in assets and maintenance activities. FSD understands that meeting the unique demands of our growing customers requires leading-edge technology. To ensure this, we maintain aggressive research and development programs, which have yielded over a dozen new products in the past few years, some of which are shown in this Face to Face magazine.

During the Achema which takes place in Frankfurt-am-Main in Germany from 22-27 May 2000 we look forward to meeting you in person at our stand: Hall 8, stand number A23-A28.

We hope this issue of Face to Face helps spell out Flowserve’s Flow Solutions Division commitment: To lead the mechanical seal industry into the 21st century by aligning ourselves with our customers’ ever-changing needs.
Flowserve Lift-Off Technology
Mixerpac ML-200
for Agitators

Operating without failure since November 1998

In cooperation with Schering AG, Bergkamen, a dry running double agitator seal was installed in a Pfaudler agitator VS0 16/100. The faces are equipped with APGS grooves and lift off when the shaft turns, so a continuous contact-free and wearless sealing is achieved. The Flowserve cartridge seal Mixerpac ML-200 was delivered with a control panel for the nitrogen barrier gas supply. The seal has satisfied all customer requirements for containment and trouble-free operation.

Operating parameters

- Medium to be sealed: Solvent in vapor phase
- Pressure in the vessel: 1.5 bar
- Barrier pressure: 5.0 bar, barrier gas nitrogen
- Barrier gas consumption: 200 Nl/h (total)
- Temperature in the vessel: 150 °C
- Speed: 128 rpm, constant

Materials

- Faces: Carbon/Silicon carbide
- Metal parts: 1.4571 in contact with product
  1.4122 in contact with barrier gas
- Gaskets: Perfluorocarbon
The latest technology in a modular cartridge design.

The new M-Series cartridge canister double seals from Flowserve Corporation are designed for low-rpm vertical applications in the pharmaceutical, chemical processing, mining, and petrochemical industries. These zero emissions seals have been specifically designed for the high pressures and increased temperatures of current mixer, dryer, and low-speed agitating equipment. M-Series mixer seals are available in three different configurations, all using a back-to-back canister arrangement for ease of installation.

- The MW-200 is a liquid lubricated seal.
- The MD-200 is a contacting, dry running seal that uses a humidified inert gas barrier.
- The ML-200 is a non-contacting, dry running seal that uses an inert gas barrier. This version incorporates Flowserve's Advanced Pattern Gas Seal (APGS) technology.

All three models are based on a modular system and feature interchangeable components. M-Series seals can be easily converted between the wet and dry running versions by changing out the stator and rotor seal faces.

M-Series mixer seals were designed to cover a wide range of applications. Depending on the model, they have an operating temperature range from -40 to 500°F (-40 to 260°C) (liquid), can handle pressures up to 500 psi/35 bar (liquid) with a minimum pressure differential of 25 psi/1.75 bar (liquid), 50 psi/3.5 bar (gas), and can operate at shaft speeds from 0 to 500 rpm. Because mixer applications typically require a high degree of axial deflection, M-Series seals will tolerate runout to 0.125 in. (3 mm) full indicator movement (FIM) and shaft end play up to 0.024 inch (0.6 mm). The seals are available in shaft sizes ranging from 2.000 in. to 6.500 in., in 0.250 in. increments.

M-Series DIN Standards

Flowserve now also has the Mixerpac M-series available with dimensions according DIN standards, with sizes from 40mm to 160mm (glasslined) or 220mm (steel). The same modular internal parts are used for the M-Series and the M-Series DIN designs. Versions with glass lined flange and bearing are suitable for glass lined mixers, while the steel vessel mixer seals are available with and without bearing.
Seal face geometry reduces leakage

The MW-200 liquid lubricated and MD-200 dry running versions both include balanced seal faces capable of handling pressure reversals. The MW-200 incorporates Flowserve's proven APGS face technology and utilizes an inert barrier gas to develop seal face separation at zero rpm. The ML-200's non-contacting seal face design does not produce wear debris. The non-contacting seal faces make the ML-200 particularly suitable for pharmaceutical applications and any other applications where product contamination must be eliminated or minimized. The ML-200 uses a gas barrier auxiliary system consisting of a filter, flow regulator, needle valve, flow meter, and pressure gauge. The seal face pattern provides both hydrostatic and hydrodynamic lift, creating seal face separation under static pressure regardless of peripheral speed.

Advanced design features

The hydraulically balanced stator design of the M-Series mixer seals reduces the hydraulic loading on the stators. This reduced loading lowers the hydraulically induced waviness, extending seal life and reducing leakage throughout the operating pressure range. The seals also maintain equal seal face spring loading with axial shaft movement. The through collar springs help to eliminate seal face overloading due to high spring forces.

ML-200 seals incorporate a low-drag O-ring secondary seal that reduces dynamic O-ring drag. The low-drag O-ring is held in place by an extension spring that permits the O-ring to expand to allow for thermal and chemical swell. All three mixer seal models in the M-Series use carbon rotors. The MW-200 and ML-200 utilize direct sintered silicon carbide stators, while the MD-200 uses high-purity ceramic stators. Food grade and corrosion resistant materials are also available.
Strategic alliance partners lower their rotating equipment ownership costs.

Flowserve offers three types of alliance agreements:

**Fixed fee**
Under a fixed fee arrangement, Flowserve manages a site's mechanical seals for a fixed annual sum. The price includes a site survey and standardization plan and replacement of existing seals with those of a similar type. Seal technology upgrades are included when they can be justified in terms of maintenance costs.

**Preferred source**
With a preferred source agreement, Flowserve pays for most of the survey and management work and provides technical help. In return, the customer agrees to buy more seals from Flowserve and nominates Flowserve as the preferred source under a “one-of-two-choices” purchasing policy.

**Primary source**
The primary source agreement is similar, but here the customers agree to make Flowserve the source for all its mechanical seals. In return, Flowserve offers extra discounts on seals and training and a free just-in-time inventory program.

What actually makes these alliance agreements successful, however, is that both parties benefit economically, creating a win-win scenario.
In 1997 Lindsey Oil Refinery (LOR), part of the Totalina / Elf Group in the UK, began discussions with Flowserve FSD about the benefits of Alliance programmes. At this time, seals from 4 different seal manufacturers were employed on site, each responsible for solving their own seal problems. An enquiry for an Alliance programme was issued by the Refinery in June 1997 and sent to all four seal suppliers used. The enquiry had a number of options, including splitting the site between two seal companies and also the length of the contract. The proposed Alliance was a Fixed Fee type.

The enquiry covered a total of 630 pumps, of which 127 were fitted with Flowserve seals. While we quoted for the various options, it was clear that the major benefits for both Lindsey Oil and Flowserve FSD could be realized if the contract covered all the pumps and ran for 5 years. Over the following months, detailed discussions took place between Lindsey Oil and Flowserve FSD on how the Alliance could be operated. From Lindsey Oil, the major Key Performance Indicators (KPI) were delivery of spare parts (2 hours for critical pumps) and an increase in the average Mean Time Between Failures (MTBF) over the life of the contract. LOR were also interested in our complete package approach involving root cause analysis assistance from Flowserve RED.

One of the major challenges for Flowserve FSD to achieve the aims of the Refinery was local support. The UK Quick Response Centre (QRC) is located in Manchester, which is 120 miles away from LOR’s location and between is hills that often have snow on them during the winter. The solution to the above problem was for Flowserve FSD to manage the stock on site and have an office in the pump maintenance workshop. Modern communication packages would allow information to be passed between our site office and the QRC. Capabilities to overhaul seals on site were to be installed. In this basis, a contract covering all the 630 pumps for 5 years was placed with Flowserve FSD in September 1998.

During this 2 month period, Flowserve FSD had set up the office in the workshop, transferred the stock to a new location and taken on new employees to run the contract. This exercise was successfully completed and Flowserve were ready to start the contract on time. Permanently based on site are Tony Rannard (Applications Engineer) and Sylvia Daniel (Alliance Administrator). The local Sales Engineer is Andrew Mathias, who has been heavily involved with the contract, since day one. The photograph shows this team outside the Flowserve FSD Office.

At the annual review after one year of operation, LOR expressed their pleasure in the success of the Alliance. The stock management has worked well with parts available when LOR required them. The MTBF had increased by over 20% over the first year (this was much higher than the contract figure of approximately 9% increase after 1 year). Since running the Alliance, Flowserve FSD has targeted bad actors to enable the KPI’s to be achieved and to date 48 competitor seals have been replaced by Flowserve seals where they were more suitable for the operating conditions.

This Alliance has been a great success for both LOR and Flowserve. The “win-win” philosophy of Flowserve together with our commitment to work closely with LOR to increase the reliability of the pumps has resulted in a delighted customer.

Written by Steve Petter Regional Sales Manager - UK, Ireland, Nordic Countries and Anglo Africa.
ISC cartridge seals are available in pusher, elastomer bellows, and metal bellows configurations for a wide range of operating conditions. For additional versatility, tandem pressurized and non-pressurized versions are also available. The dual seal configuration features a reverse balance design to maintain positive seal face closing forces during pressure reversal conditions. Stationary and rotating bellows assemblies are available for the metal bellows variant, and the ISC seal utilizes a common gland on all configurations. The single pusher and single metal bellows versions also use a common shaft sleeve, as do the dual pusher and dual metal bellows versions.

In today’s market, standard cartridge seals have become more of a commodity product. “The greatest challenge during the development of the ISC seal was to work within the market framework, while providing the highest value and quality standard cartridge seal for general purpose applications.”

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The Innovative Standard Cartridge (ISC) seal: To provide customers with a standard cartridge seal line that features interchangeable sealing configurations and a common platform, the Flow Solutions Division of Flowserve Corporation has introduced the new Innovative Standard Cartridge (ISC) seal line. With fewer parts required to support a multitude of sealing applications, the ISC platform seal effectively reduces the user’s inventory by promoting standardization.

The Innovative Standard Cartridge seal (ISC) seal.

Flow Solutions Division
Innovative Standard Cartridge seals feature a common gland and sleeve together with interchangeable components for the various seal configurations.

In today’s market, standard cartridge seals have become more of a commodity product. “The greatest challenge during the development of the ISC seal was to work within the market framework, while providing the highest value and quality standard cartridge seal for general purpose applications.”

The interchangeable design of ISC cartridge seals permits users to standardize on one seal platform throughout a process facility, even though different pump applications have different sealing requirements. This standardization reduces spare parts requirements, lowering inventory costs. Process equipment can also be converted from one product service to another by simply changing the appropriate seal components, thereby increasing equipment versatility.
ISC seals can be applied to many services. They are designed for general purpose applications in the chemical processing, pulp and paper, petrochemical, food and beverage, and wastewater industries. Depending on the particular model, ISC cartridge seals can operate at pressures up to 350 psi (2.4 bar) and at temperatures ranging from -40°F (-40°C) to 400°F (204°C).

Metal components for the ISC seal are fabricated from 316 stainless steel, and the metal bellows version utilizes Alloy C-276 bellows capsules. Carbon stators and direct sintered silicon carbide rotors are standard. The seals fit standard ANSI pumps and are available in shaft sizes ranging from 1.125 inches to 2.750 inches.

According to Rob Philips, Flowserve Product Development Manager, “One of the greatest opportunities when developing the ISC platform seal was in taking advantage of the successful design features of existing Flowserve ANSI product offerings and merging them into the new ISC design to produce a highly reliable, robust seal. Working with engineers from all of our former seal organizations brought a wealth of experience and design knowledge. Our challenge was to incorporate the best of everyone’s input.”

ISC seals are also available in pusher (bottom), elastomer bellows, and metal bellows (top) configurations.
Flowserve has once again raised the bar for high-pressure sealing in compressors, supplying a GAS PAC dry gas seal for a hydrogen recycle compressor in a new Butanediol plant. Sundyne Compressors has supplied the hydrogen recycle compressor. The machine is an HMC-5000 horizontal, two-stage overhung, integral gear-type compressor. Normal operating pressure will be 295 bar. Outlet pressures range from 277 bar to 352 bar. Maximum settle-out pressure is 325 bar. Inlet temperature is 45 ºC and outlet is 48 ºC.

Flowserve and a competitor received orders to develop a seal for this high-pressure application. The competitor designed a triple seal since they could not achieve to seal this such a high pressure across a single stage. At Flowserve’s location Pacific Wietz mechanical seal facility in Dortmund, Germany, there is a long history experience in designing and manufacturing gas lubricated dry running seals for compressors up to 250 bar. Based on this well proven GAS PAC design Flowserve designed a tandem seal with internal labyrinth. It is capable of sealing the full pressure with only one set of faces and requires a less expensive gas supply control panel. This is because there is no need for complicated, staged pressure regulation or a high volume flow of final stage inert gas. Each stage of the tandem seal is capable of handling the full pressure, unlike staged triple seals. The tandem seal can also be designed shorter axially than the triple, which means shorter shafts and casings.

In summary, the Flowserve HHP Tandem seal with interstage labyrinth has many advantages over a triple seal, all of which will equate to savings for the user. The tandem seal can be designed shorter axially than the triple, which means shorter shafts and casings.

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**Testing Conditions**

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Dynamic leakage: 40 l/min
Educational services

The Flowserve Educational Services Learning Resource Center (LRC) provides a complete technical training environment. Facilities include four state-of-the-art classrooms designed for 20 students with over 370 m² of attached static labs equipped with hundreds of pumps, valves, mechanical seals and other modern processing equipment. In addition, four 84 m² power labs, equipped with complete pumping systems, allow students to experiment, test, modify, verify and gain hands-on learning opportunities unequalled in any other technical training center in the world.

We provide state-of-the-art, cost effective training that makes your organization more productive, efficient, and profitable.

Adults learn only by hands-on experimentation that results in personal discovery of theories, concepts, and practices. For this reason, we have designed our curriculum to effectively utilize the adult learning process.

First, students receive instruction in a classroom setting. Qualified and experienced trainers teach from first-hand experience the essentials of pumps, seals and valves.

Next, students are given an opportunity to implement their classroom theory in the attached Static Labs. Finally, students move into one of four Power Labs, where complete, working flow systems are set up and can be modified to simulate virtually any actual workplace environment. It is in the Power Labs where students can experiment and discover for themselves the real value of the theories they’ve learned.

In addition, our curriculum is objective-based. Students undergo pre- and post-testing to evaluate knowledge, understanding, and skill level. Students and their supervisors can be assured that completion of a Flowserve LRC course means increased productivity and skill on the part of the student, resulting in improved productivity and profitability for the company.

Local support

To give best response and local support, Flowserve use an extensive network of quick-response centers with integrated engineering and manufacturing capabilities. Flowserve’s major facilities are ISO 9000 accredited, and we pride ourselves on our continuous efforts to drive costs down below industry averages while providing high-quality products and services.