What procedures should I use when storing my mechanical seals?

A section of the plant has been shut down because of a temporary change in product mix. New pumps have been installed in a plant addition that will not go on line for some time. In either case, mechanical seal assemblies are installed in the pumps and need to be put in the "sleep" mode for storage. What about the mechanical seal assemblies? Can they be left in the pumps for extended periods and then be ready for startup? How can I ensure that they will be?

In another situation, mechanical seal assemblies have been placed in spare parts inventory well in advance of the need to install them as replacements.

All of the above speaks to the issue of proper seal assembly storage. The mechanical seal assembly is a complex mix of precision metallic and nonmetallic components. *Nonmetallics* include ceramics such as silicon carbide and flexible graphite as well as elastomers such as ethylene propylene rubber (EPR). The direct contact with the process or flush fluids can be particularly problematic for the storage and reuse of some elastomers. Some of these materials are also dynamic sealing elements, while some are static, so they can be affected differently in service. Each has its own unique resistance to aging, and each is essential to effective seal performance. Storage must be based on preserving the integrity of *all* components.

While general rules are noted here, it always is advisable to contact the manufacturers for their recommendations to ensure that the most reliable current practices are employed.

Storage in Pumps: 3 to 24 Months

Generally, mechanical seal assemblies can be stored satisfactorily for this period, provided manufacturers' installation and plant shut down procedures have been followed. Appropriate environmental and plant safety regulations also must be met. Given the above assumptions, storage procedures include:

- Drain all product and flush fluid from the equipment and seal chamber.
- Dry equipment and seal chamber with compressed air.
- Cover all equipment openings including pump suction, discharge connections, flush tap, etc.
- Plug all openings in the seal chamber and gland.
- Mask or cover the clearance between the seal gland and the shaft to prevent dirt and debris from entering the seal cavity.
- Turn the shaft one to two revolutions by hand every three months.

Storage for Over 24 Months

Storage beyond 24 months will require removal of the seal assembly. When storage is longer than 24 months, environmental conditions are more likely to affect the flatness of the rotating and stationary seal faces as well as deteriorate some O-ring and gasket materials. Plant safety procedures and all environmental regulations again must be followed. Specific steps include:

- Drain all product and flush fluid from the equipment and seal chamber.
- Remove, disassemble, and thoroughly clean and decontaminate the mechanical seal.
- Ensure that trapped fluid is removed from disassembled *Cartridge Seals*.
- Dry all parts, package, and store as individual components.
- Store in clean, cool environment.

Secondary Seals

The resistance to deterioration of elastomeric secondary seal materials – such as O-rings, V-rings, and gaskets – under ambient storage conditions varies with the type of elastomer. Standard *SAE ARP5316* lists the maximum recommended shelf life for O-ring and molded secondary seal materials. However, these recommendations are based on storage in an unused, as received, condition, so they are not directly applicable to storage after some period of service in a pump.

Nevertheless, they can serve as a guide to susceptibility of these materials to aging. This specification also contains recommended storage practices. Table 1 shows the maximum shelf life of a number of typical secondary seal materials as specified in this standard.

The premise for Table 1, as listed in the SAE Standard, is that any of the elastomers are properly packaged and stored under optimum conditions. These include:

- Ambient Temperature not exceeding 100 deg-F (38 deg-C).
- Exclusion of contamination.
- Exclusion of any radiation, particularly sunlight.
- Exclusion of ozone from all sources including electrical devices.

Generally, storage in ultraviolet (UV) resistant polyethylene or polyethylene lined Kraft paper bags ensures optimum storage life.

Table 1
Shelf Life of Secondary Seal Materials

Material	Shelf Life
PTFE Glass Filled PTFE Graphite Filled PTFE Silicone (Q) Fluoroelastomer (FKM) Perfluoroelastomer (FFKM) Flexible Graphite	UNLIMITED
Chloroprene (CR) Acrylonitrile Butadiene (NBR) Ethylene Propylene Rubber (EPR)	15 YEARS

Exposure to process and/or flush fluids can influence the sealing properties of elastomers, and consequently shelf life, so before reinstalling them into any seal assembly it is particularly important that they be thoroughly inspected. All O-rings, V-rings, gaskets, etc. must be checked for deterioration, cracks, swell, hardness and compression set. Over time, constrained elastomers, such as those in a groove, will take a set. The resultant decrease in sealing force can impact performance. Secondary seals more at risk are those completely encased in hardware, such as those that seal the two faces. Those that mate with the pump components, such as the sleeve, are less at risk.

Manufacturers should be consulted to ensure that their condition is acceptable for reuse, should there be any

Fluid Sealing Association

Sealing Sense is produced by the **Fluid Sealing Association** as part of our commitment to industry consensus technical education for pump users, contractors, distributors, OEMs, and reps. As a source of technical information on sealing systems and devices, and in cooperation with the **European Sealing Association**, the FSA also supports development of harmonized standards in all areas of fluid sealing technology. The education is provided in the public interest to enable a balanced assessment of the most effective solutions to pump systems technology issues on rational Total Life Cycle Cost principles.

The **Mechanical Seal Division** of the FSA is one of five with a specific product technology focus. As part of their educational mission, they develop publications such as the *Mechanical Seal Handbook*, a primer intended to complement the more detailed manufacturer's documents produced by the member companies. Joint FSA/ESA publications such as the *Seal Forum*, a series of case studies in pump performance, are another example as is the *Life Cycle Cost Estimator*, a web-based software tool for determination of pump seal total Life Cycle Costs (LCC). More recently, the *Sealing Systems Matter* initiative has been launched. It is directed to support of the case for choosing mechanical seals that optimize life cycle cost, safety, and environmental compliance.

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question. Replacement can be the most prudent course, considering the potential serious impact of an in-service failure of any of these critical components.

Wear Faces

The wear faces of the seal rings and inserts should be tested for flatness with a helium light source and optical flat, prior to installation. Normally, all surfaces should be within two light bands. Faces may have to be relapped by an approved method should they be out of flatness. The manufacturer should be contacted for specifics if this requirement is not met. Static testing of the assembly also may be required.

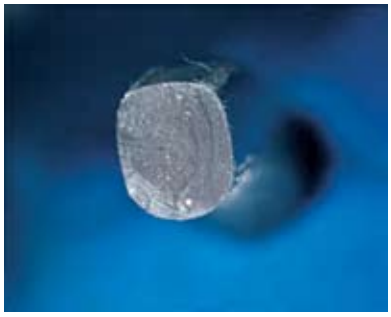

Figure 1. Cross section of O-ring showing compression set.

Reassembly

Once the components have been checked to be acceptable for reuse, they can be reassembled and reinstalled in the pump in accordance with manufacturers' recommended procedures.

Conclusion

The storage of mechanical seal assemblies, whether in an as received or in service condition, requires practices that prevent deterioration of critical sealing properties. Exposure to process and flush fluids can limit shelf life and reuse of some elastomeric secondary seal and gasket materials, depending on type and length of exposure.

This article is intended to provide general guidelines and convey important considerations for storage. The *FSA Mechanical Seal Handbook* referenced on page 69 also is a valuable source for troubleshooting conditions noted in this column. The most prudent course, always, is to contact your mechanical seal manufacturer for specific instructions on proper storage procedures to ensure reliable start up and long term operation.

Next Month: *When and where do I apply lip seals to my pumps?*

We invite your questions on sealing issues and will provide best efforts answers based on FSA publications. Please direct your questions to: sealingquestions@fluidsealing.com.

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JOHN W. DUFOUR: John Dufour retired from Amoco Oil Company after twenty-five years of service, and is currently the president and owner of Dufour Consulting Services.

PERRY C. MONROE, Jr., P.E.: Perry Monroe, Jr. has over 39 years of experience in Turbomachinery repair techniques. He formed Monroe Technical Services as a Consultant specializing on rotating machinery design, troubleshooting, new installations, and repairs.

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