Sept05PUMPS&SYSp46-47 8/23/05 12:01 AM Page 46

FLUID SEALING ASSOCIATION FSA

From the voice of the fluid sealing industry

SEALING SENSE

Q. Is failure analysis the best approach to trouble shooting seal failures?

A. Failure analysis is not always straightforward and exact, but it does follow a systematic approach, so it remains one of the best methods to determine the root cause of a seal failure. The basic process is:

Step 1 – Identify the failure that could have caused short seal life. This may not always be seal-design initiated.

Step 2 – Carefully examine possible solutions to the problem. Past experience, feedback from equipment manufacturers and consultation with a knowledgeable seal expert will be valuable in formulating a list of possible answers. Other valuable sources include publications such as *Pumps & Systems*.

Step 3 – Choose an appropriate remedy and take corrective action. Selecting the best one requires an analysis of cost, availability of hardware, and future economic benefits based on total Life Cycle Costs.

Step 4 – Follow up on the problem-solving efforts to assure effective execution.

Q. What are the causes and corrective actions for excessive drive pin wear?

A. Excessive wear of mechanical seal drive pins, drive dents or drive slots can result from heavy loads and large degrees of movement between the drive mechanism and other wear surfaces. High wear rates may also occur with relatively little movement if the drive mechanism is not properly lubricated.

Drive mechanisms that operate in dry-nitrogen or dry-air containing abrasive particles will wear more quickly than those in a clean environment, or those operating in with an oil or water lubricant. Similar conditions arise with drive mechanisms in liquids contaminated with abrasives. The major cause of heavy drive-mechanism wear is excessive face run-out at the shaft-to-stuffing-box location. Corrective actions include:

- limiting shaft endplay, shaft-deflection, and out-of-squareness of the shaft with respect to the stuffing box to 0.003-in (0.076-mm) total indicated run out;
- incorporating hardened drive pins or drive dents in the seal design;
- using seal designs that put the drive mechanism in a better lubricating environment – e.g., substituting double seals for single seals;
- adhering to pressure limitations of the seal design.

Figure 1. Seal with excessive wear on drive pins, dents, and slot

Q. What causes O-ring extrusion in secondary seals?

A. Symptoms of O-rings or other secondary seals extrusion include deformation from being squeezed past the close clearances around the primary seal faces. Frequently, these O-rings or secondary seals will appear cut or, in some cases, peeled.

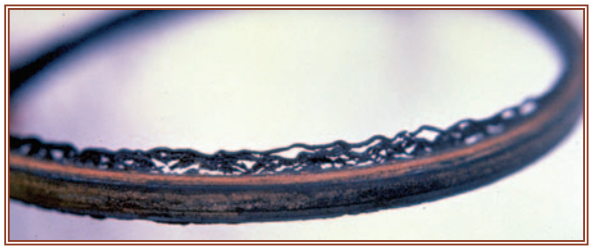

Figure 2. O-ring exhibiting extrusion.

Causes of extrusion include excessive temperatures, pressures, or chemical attack that softens the O-ring, or excessive stresses in the O-ring for the given clearance.

Corrective actions:

- Check O-ring clearances for the application;
- Check the chemical compatibility and temperature limits of the secondary seals;
- Install anti-extrusion rings, if necessary.

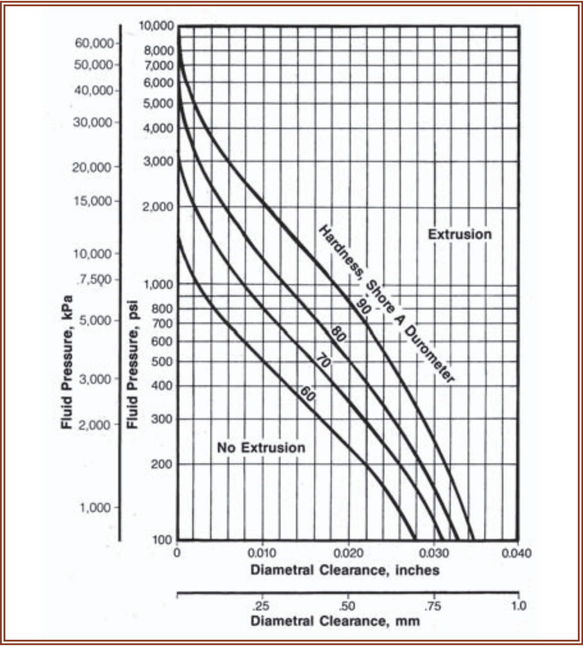

Figure 3. Allowable clearances for O-ring secondary seals.

Q. Can I seal vertical shafts mixers with standard mechanical seals?

A. Top Entry Mixers are generally slower speed services used to mix components in a batch operation. Typically, no additional fluid can be introduced into the mixer. The sealing device mounts above the product and often runs without liquid lubrication. The product will sometimes act to lubricate the seal faces as the fluid level rises to the seal.

Generally, these are sealed with single outside mounted split mechanical seals. In some cases when mixing volatile fluids, dual mechanical seals are used. Mechanical seal manufacturers have developed seal designs for mixers with vertical, as well as other, shaft orientations that accommodate a wide range of mixers and mixer applications

Q. How long should a mechanical shaft seal last?

A. A mechanical shaft seal is a consumable item, which in time needs replacing. While the seal may be the apparent failed component, the real cause of a failure can be some other upset or change or changes in the pump or pumping system. These changes may require the seal to conform to new dynamics for which it may be ill-suited or not originally selected to handle.

If all components associated with the pump in which the seal is installed are in good working condition, the mechanical seal – when properly selected and installed – can last well in excess of 30,000 continuous hours of operation. Many seals have lasted well beyond this length of operation. Employing the proper procedure for seal selection and installation is the key to long mechanical seal life. **P&S**

Next Month: What is the best gasket thickness to use in my pumping system?

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

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 technology issues on rational Total Life Cycle Cost principles.

The Mechanical Seal Division of the FSA is one of six 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. A more recent contribution is the *Life Cycle Cost Estimator*, a web-based software tool for determination of pump seal total Life Cycle Costs (LCC).

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