Chapter C13

Testing & support

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Individual chapters of the Kalsi Seals Handbook are periodically updated. To determine if a newer revision of this chapter exists, please visit www.kalsi.com/seal-handbook.htm.

1. You are responsible for testing the seals in your application

This handbook provides sealing information and options for additional evaluation by individuals having engineering proficiency. It is not practical for Kalsi Engineering to test its rotary sealing products (or the related engineering information herein) under every conceivable combination of service conditions and implementation variations that may be encountered in customer applications. Many oilfield downhole service conditions are virtually impossible to simulate on the surface, and the specific conditions vary depending on tool design. For example, heat transfer is dependent on equipment geometry and materials. It is therefore incumbent upon the customer to fully evaluate the sealing product to their own satisfaction before using the product in production items. This evaluation may include both laboratory testing and field testing of prototypes.

2. Prototype testing

One critical aspect of laboratory prototype testing is providing ambient thermal conditions, including heat transfer conditions, which are equivalent to the range of actual field operating conditions. Most Kalsi Seals applications involve exposure to environmental fluids, and in most applications the fluid is flowing, and/or the piece of equipment is immersed in a fluid. A common mistake in laboratory testing is to simply test the equipment dry, or with stagnant fluid conditions that do not represent actual field heat dissipation conditions. This may result in overheating of the rotary seals due to seal and bearing generated heat, since the heat is not dissipated as it would be in the field. To prevent rotary seal damage, the test apparatus should simulate the heat dissipation conditions encountered in the field. If field heat dissipation conditions are not duplicated in a test apparatus, avoid rotary seal damage by testing at lower speed to check out basic equipment functions.

When performing laboratory prototype testing, it can be useful to monitor the lubricant temperature near the rotary seals via thermocouples to understand the local ambient temperature that the seals are exposed to. The lubricant temperature near a seal will typically be higher than that of the environmental fluid due to the heat generated by the rotary seals and bearings. See Chapter D8 for additional information about heat transfer considerations.

3. General application support

Experienced Kalsi Engineering personnel are available to provide general rotary seal technical support, and can review your design to suggest ways to implement the seals. In

order that they may best assist you, please forward drawings showing the rotary seal locations in your application, and fill out the application questionnaire that is provided on our web site seal literature page. This will allow our staff to work closely with you during the seal implementation process, and help you to avoid common pitfalls.

If problems are encountered with an application, please forward the seals, a completed application questionnaire and an installation sketch to Kalsi Engineering. In many cases, we can quickly diagnose an implementation problem by reviewing the used seals and the application information. Each seal should be tagged to tie it to a specific sealing location, equipment serial number, and operating conditions (if known). If possible, the seal part number and batch inspection number should also be recorded.

4. Engineering and technician training

Kalsi Engineering provides two training courses. One course is targeted at designers and engineers and provides comprehensive instruction for properly implementing Kalsi Seals. The second course is intended to provide guidance to the technicians that install the Kalsi Seals. The courses can be attended at Kalsi Engineering's facilities, the customer's facilities, or online.

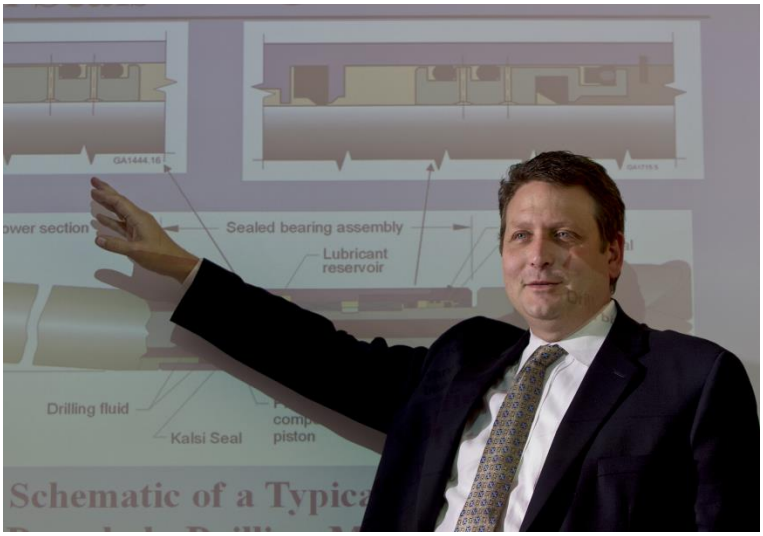

Figure 1

Engineering and shop training classes

Kalsi Engineering provides free training classes. One class is geared toward engineers and designers, and the other is geared toward shop personnel.

5. Consulting engineering support

Kalsi Engineering can also provide comprehensive engineering and analysis on a consulting basis, depending on staff availability. Our laboratory is equipped with a number of computer-controlled rotary seal test fixtures (Figure 2) that are routinely used for quality control, research and development. These fixtures are available on a for-profit basis to evaluate rotary seal performance with customer specified lubricants, process fluids, environmental temperatures and other application-specific conditions.

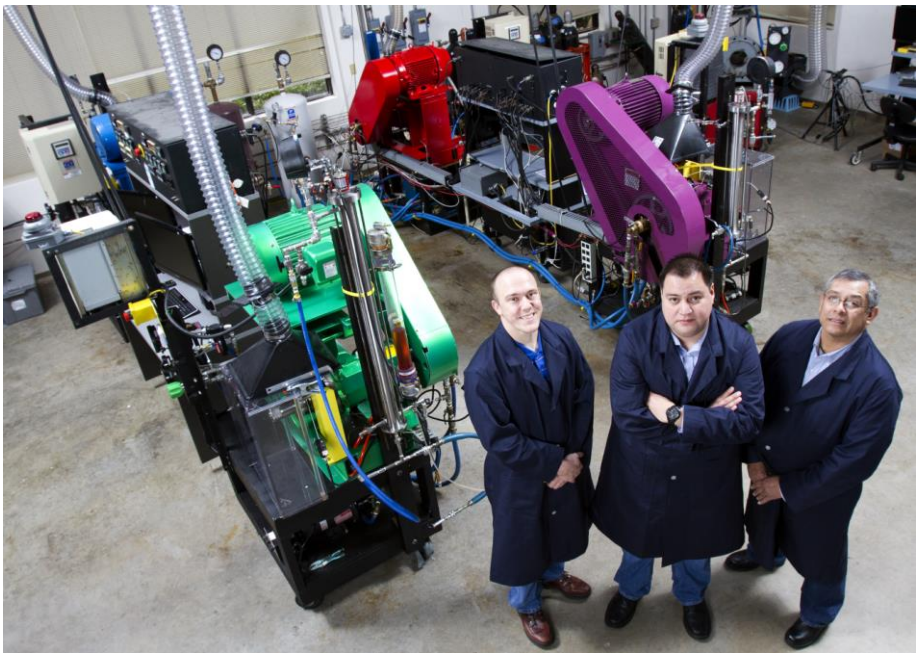

Figure 2
Rotary seal testing laboratory

Kalsi Engineering performs an average of 10,000 hours of rotary seal testing every year. Much of the testing is aimed at developing seals capable of surviving ever harsher conditions. These fixtures are available on a for-profit basis to evaluate rotary seal performance with customer specified lubricants, process fluids, environmental temperatures and other application-specific conditions.

6. Seal test fixture capabilities

Figure 3 shows the standard test fixture used to perform most of our instrumented rotary seal testing. The fixtures are capable of testing seals up to 5” (127 mm) in diameter against various environments. We have, at various times in the company’s history, produced test fixtures for specific applications, such as rotary seal housings, large diameters, or pump simulation.

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All of our test fixtures test two seals at a time, so there is no net axial hydraulic load on the shaft. This arrangement allows high differential pressure tests to be performed without axially loading the fixture bearings, and allows multiple specimens to be tested.

The tests are ordinarily conducted on easily replaceable wear sleeves, which can be concentric or intentionally eccentric. The test fixture shafts incorporate a rotary coupling to allow water to circulate under the wear sleeves in order to simulate the circulation of drilling fluids through downhole mud motor applications, and to maintain the desired temperature at the seal-to-sleeve interface.

The test fixture shafts are driven by a variable speed AC motor capable of operating within a range of zero to 3,600 rpm. An automatic data acquisition system is employed to record all pertinent data. The data is transmitted, in real time to a proprietary data processing program which produces Excel spreadsheets of the test results. Recorded data includes the frictional torque generated by the operation of the seals, bulk oil, seal carrier, environment, and coolant water temperature, hydrodynamic pumping-related seal leakage, shaft speed, and lubricant pressure.

Figure 3

Kalsi Engineering seal test fixture

Our seal test fixtures are fully instrumented for 24 hour operation, and can test rotary seals up to 5” (127 mm).

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