Low Breakout Torque Kalsi Seal Treatment

Summary

A low friction treatment has been developed for HNBR-based Kalsi Seals[i] that provides the low breakout torque required by some rotary applications.

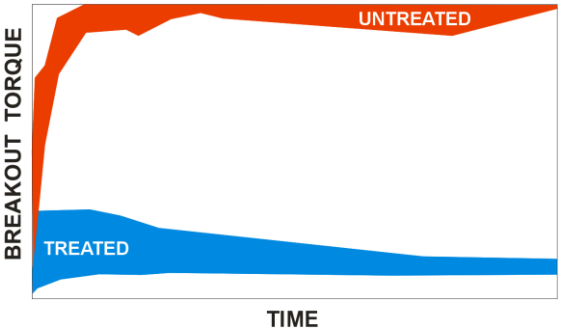

Figure 1
Zero PSI Breakout Torque Comparison
This graph shows a room temperature breakout torque comparison for 0.335" (8.5 mm) cross-section Kalsi Seals at zero differential pressure. The seal material was 87 Shore A HNBR, and the lubricant was AeroShell Turbine Oil 560.

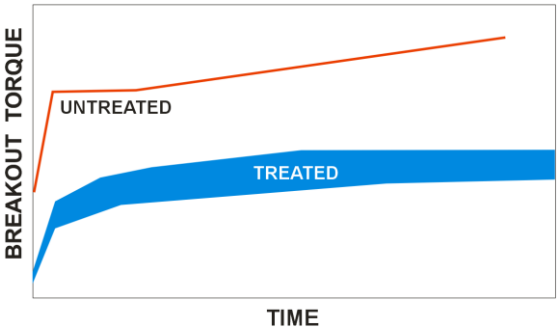

Figure 2
1,000 PSI Breakout Torque Comparison
This graph shows a room temperature breakout torque comparison for 0.335" (8.5 mm) cross-section Kalsi Seals at 1,000 PSI differential pressure. The seal material was 87 Shore A HNBR, and the lubricant was Mobil SHC 632. A significant benefit was also observed when an ISO 32 viscosity grade lubricant was used.

Breakout torque testing results

Figure 1 shows a breakout torque comparison for treated and untreated Kalsi Seals in zero differential pressure conditions. The lubricant viscosity was low, and the elastomer compound was relatively hard, which both tend to increase breakout torque. The low friction treatment significantly reduces seal breakout torque.

Figure 2 shows that a significant breakout torque advantage is also realized in high differential pressure conditions.

Testing for other performance characteristics

Testing was also performed to evaluate the effect of the low friction treatment on compression set and dynamic running torque, and to evaluate breakout torque after prolonged rotary operation. The rotary tests were performed with differential pressure that ranged from 15 to 1,500 psi.

No increase in breakout torque was observed after prolonged rotary operation. A moderate increase in compression set was observed, but the total compression set was much less than occurs with seals made using a low friction XNBR material.

An increase in running torque was observed in low differential pressure testing, but was not apparent in testing at pressures of 500 psi and above. The running torque and compression set effects can be offset, if desired, by pairing the low friction treatment with recent advances in seal geometry that reduce running torque and seal generated heat.

Relevance

Although Kalsi Seals have low running torque due to hydroplaning, breakout torque can be relatively high due to percentage of compression, elastomer properties, and other factors such as low lubricant viscosity. The research program was undertaken to make Kalsi Seals more compatible with applications that are sensitive to breakout torque, such as such as passive oilfield rotary control devices, battery-powered underwater vehicles, and some types of rotary steerable tools used in the oilfield drilling industry.

Thinner viscosity lubricants and harder elastomer compounds typically cause higher breakout torque. The low breakout friction treatment is particularly relevant now that Kalsi Seals have been developed that can use thin viscosity lubricants in high differential pressure surface applications, because such seals require hard elastomer to withstand the differential pressure.

Impact on seal slippage

Rotary testing indicates that an all-over low friction treatment reduces the tendency for seals to slip

relative to the gland. This advantage can be increased by masking the static lip during application of the low friction treatment.

How to obtain treated seals

The low friction treatment can be applied to any HNBR Kalsi Seal as a special order item, if appropriate lead time is available. To specify an all-over low friction treatment, add the designator *"-LF"* to the part number. To specify masking of the static lip during application of the treatment, add the designator *"-LFM"* to the part number. Contact our sales personnel for pricing and lead time.

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[i] "Kalsi Seal" and "Kalsi Seals" are trademarks of Kalsi Engineering, Inc. pertaining to rotary seals. The seals in this brochure are offered under the same general terms and conditions as the "Offer of Sale" that is included in the current revision of the **Kalsi Seals Handbook**.

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