# High Temperature Kalsi Seals

## Introduction

Kalsi Engineering has exploited the latest polymer technology to develop new dual material hydrodynamic rotary seals[1] for high temperature, low-to-medium differential pressure service. These seals were developed in response to customer requirements for a reliable sealing solution in the presence of ever-higher temperatures encountered in oilfield downhole equipment, such as mud motors and advanced rotary steerable tools.

Successful 200 hour laboratory tests in the 350° to 400°F temperature range have been performed, and the seals are now available for high temperature applications.

## Seal Features and benefits

The new rotary seal has integrally molded composite construction (Figure 1). While largely constructed of FKM, the seal has a layer of FEPM (TFEP). This arrangement allows the strengths of each material to compensate for weaknesses of the other. Typical FKM materials have excellent high-temperature compression set resistance, but generally poor dynamic running characteristics. FEPM has excellent dynamic running and wear resistance characteristics, but poor compression set resistance. By constructing the majority of the seal body from FKM, the FKM is able to compensate for the poor compression set characteristics of the layer of FEPM without being exposed to rotary motion. Exposure of the FKM to the environment is also minimized, because only the FEPM layer faces the shaft-to-housing extrusion gap clearance.

High Temperature Seals are available in 80 and 90 Durometer Shore A hardnesses, and in a dual durometer configuration that employs 80 Shore A FKM and 95 Shore A FEPM.

## Tooling considerations

Due to molding shrink rate and high temperature lubrication issues, High Temperature Seals should be made from dedicated tooling when possible. Molding shrink rates not only vary from that of HNBR, but also vary significantly among the several available high temperature hardness options. Large diameter seals may require tooling dedicated to the selected material hardness. Alternately, the shaft diameter can be adjusted to match the nominal molded diameter of the selected material. Call for details.

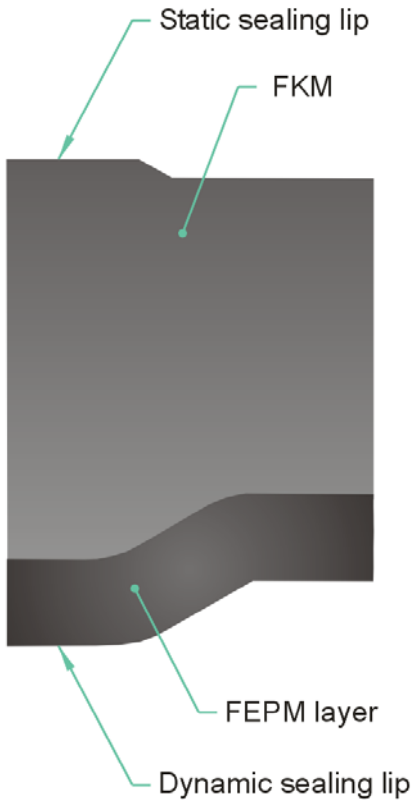


**Figure 1**
**High Temperature Kalsi Seal**
The high temperature Kalsi Seal is a composite seal constructed of FKM and FEPM. The FKM body provides good compression set resistance, while the FEPM dynamic lip provides good dynamic running characteristics.

## Seal implementation considerations

Gland width must be wide enough to accommodate the installed, thermally expanded axial width of the seal. Differential pressure acting from the lubricant side, or axial spring loading, is required to prevent skew-induced wear. Please contact our staff for additional information and application guidelines. Design guidelines are also provided in the **Kalsi Seals Handbook**, which is available online at www.kalsi.com.

[1] Covered by issued and pending patents. "Kalsi Seal" and "Kalsi Seals" are trademarks of Kalsi Engineering, Inc. 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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