Centrifugal Pump K-Cartridge

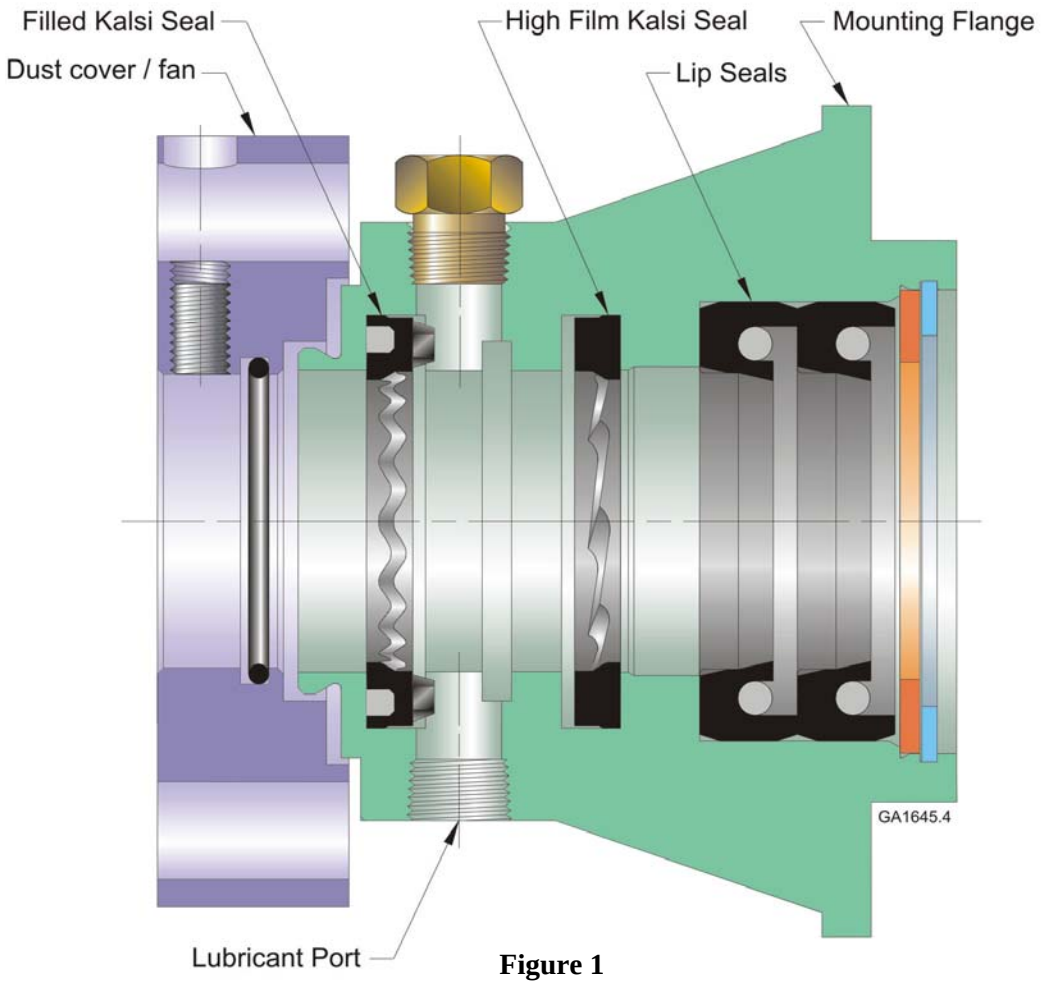

Figure 1
K-Cartridge Assembly

Introduction

The Kalsi K-Cartridge[1] (Figure 1) was developed to address the extreme rotary sealing challenges that are encountered in oilfield well service mixing and charging pumps. The illustrated version of the K-Cartridge replaces the removable stuffing box on Gardner-Denver and Twentieth Century brand 4 x 5" and 5 x 6" centrifugal pumps. The K-Cartridge can be adapted for a variety of applications including pumps with integral stuffing boxes.

[1] Covered by issued and pending U.S. and foreign patents. The products in this brochure are offered under the general terms and conditions that are provided in the offer of sale that is included in the current revision of the **Kalsi Seals Handbook**.

Operational Overview and Benefits

Two Kalsi Seals retain a pressurized lubricant that is supplied by a conventional air-over-oil lubricator. Two additional lip-type seals face the pump casing, and help to exclude the cement. All seals run directly on a hard-coated pump shaft.

During rotation, both Kalsi Seals ride on a thin film of oil that minimizes friction and wear. The Filled Kalsi Seal virtually eliminates lubricant loss to the environment. The High Film Kalsi Seal serves as a miniature pump that lubricates and flushes the lip seals. The rotating dust cover/fan protects the Filled Kalsi Seal from debris, and provides forced air-cooling to the seal assembly. The Kalsi K-Cartridge provides longer life, improved reliability and significant cost savings.

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Kalsi Seal Principle of Operation

Figure 2 illustrates the basic principle of operation of the Kalsi Seal™ product line. The Kalsi Seal is installed in a circular housing gland that compresses it against the shaft, eliminating clearance and establishing static sealing in the same manner as other interference-type seals. When the shaft rotates, the seal remains stationary and the seal-to-shaft interface becomes dynamic.

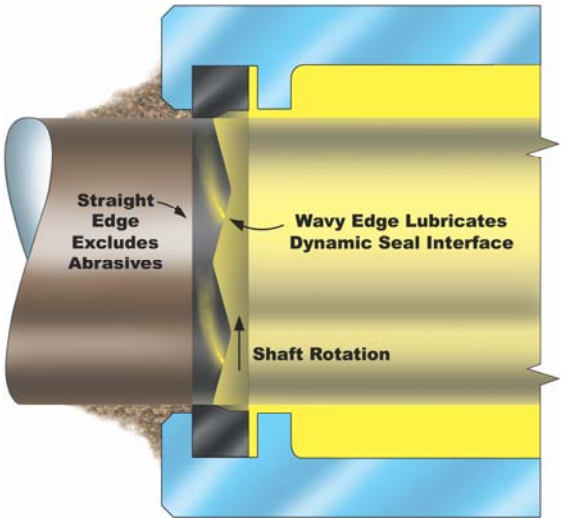

Figure 2

Principle of Operation

All Kalsi Seal configurations hydrodynamically wedge a lubricant film into the seal to shaft interface during rotation to reduce friction and wear.

The dynamic sealing lip has a wavy shape on its lubricant side, and an abrupt circular exclusionary shape on its environment side. This unique geometry dramatically improves seal life by lubricating the dynamic seal-to-shaft interface while excluding environmental contaminates.

As rotation occurs, the rotational velocity of the shaft drags a thin lubricant film past the wavy edge and into the dynamic sealing interface. This hydroplaning effect lubricates the seal and shaft surfaces, and prevents the typical dry rubbing wear and high friction associated with conventional rubber and plastic seals. This prolongs seal and shaft surface life, and makes operating at higher speed and pressure practical. When rotation stops, the hydrodynamic action stops, and a static sealing relationship is reestablished due to the initial compression of the seal.

Kalsi Engineering Company Background

Kalsi Engineering, Inc. has been serving the oil and gas industry since 1978 in the areas of rotary seal technology and consulting engineering services. Our rotary seals are the current state of the art for harsh sealing applications found in the oilfield, manufacturing, construction, utility and mining industries.

The founder and President of the company, M. S. Kalsi, PhD, P.E., was the director of research and development for a well-known oilfield valve manufacturer prior to starting Kalsi Engineering. He became interested in the field of elasto-hydrodynamic lubrication while pursuing his masters and doctorate degrees at the University of Houston. His fundamental research in this area led to the basic lubrication concept that is employed by the Kalsi Seal product line.

The company's pioneering efforts and commitment to continued research and development have resulted in a variety of advanced rotary seal products that have extended the performance envelope to accommodate the ever-higher pressures, speeds and temperatures that are being encountered in the oilfield.

Figure 3

Kalsi Engineering is located in the Houston, TX metropolitan area

Kalsi Engineering's facilities are located in Sugar Land, Texas, and house our consulting engineering offices, mechanical testing laboratory, flow loop, and Kalsi Seal and Kalsi Bearing operations. Our highly experienced staff of mechanical engineers have a variety of complementary skills and industry backgrounds. We are well versed in classical solid mechanics/stress analysis and thermo-fluid analysis. Kalsi Engineering uses state of the art design, analysis and testing software to support our activities.

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