AN INTRODUCTION TO COMPRESSOR OIL SEALS: FACE CONTACT TYPE

By Tom Keating, PE

Although there have been advancements in the science of compressor sealing, oil seals and their associated support systems are still widely employed due to their simplicity and reliability.

Compressor oil seal assemblies are designed to have a high pressure primary seal at one end and a secondary seal at the other end. Oil is pumped into this annular area formed by the sealing elements. The oil is at a higher pressure than the process gas. This forms a high pressure barrier to prevent the gas from escaping the pressurized casing. The compressor oil seals are essentially liquid buffer seals that are designed to minimize the amount of seal oil that passes into the compressor.

Face contact seals have a stationary and a rotating face, which provide the seal between the process gas and seal oil. A small amount of seal oil is forced between the two sealing faces to provide lubrication and cooling due to the seal oil differential pressure (usually 40-80 psid). This contaminated or "sour" seal oil (mixed with the process gas) is drained to seal oil traps for reclamation or disposal. Sour oil leakage rates are typically five to ten gallons per day per seal. A process labyrinth seal prevents the oil from entering the compressor. The stationary face, otherwise known as the "seal", has a secondary seal consisting of a process compatible elastomer o-ring. The secondary seal must slide on the seal housing or sealing element face as the rotor moves axially. Springs are used to load the seal faces in operation in addition to the hydraulic load, as well as when the unit is not in operation. Face seals have typical maximum surface velocity and seating pressure limitations: 350 feet per second and 500-1500 psia, respectively.

A floating bushing seal is typically used on the atmospheric side of the seal to maintain the seal housing pressure. The oil that passes through the outer seal is drained directly back to the lube oil reservoir because it is not contaminated with process gas ("sweet"). The bushing seal clearance is designed to provide the correct differential pressure on the process

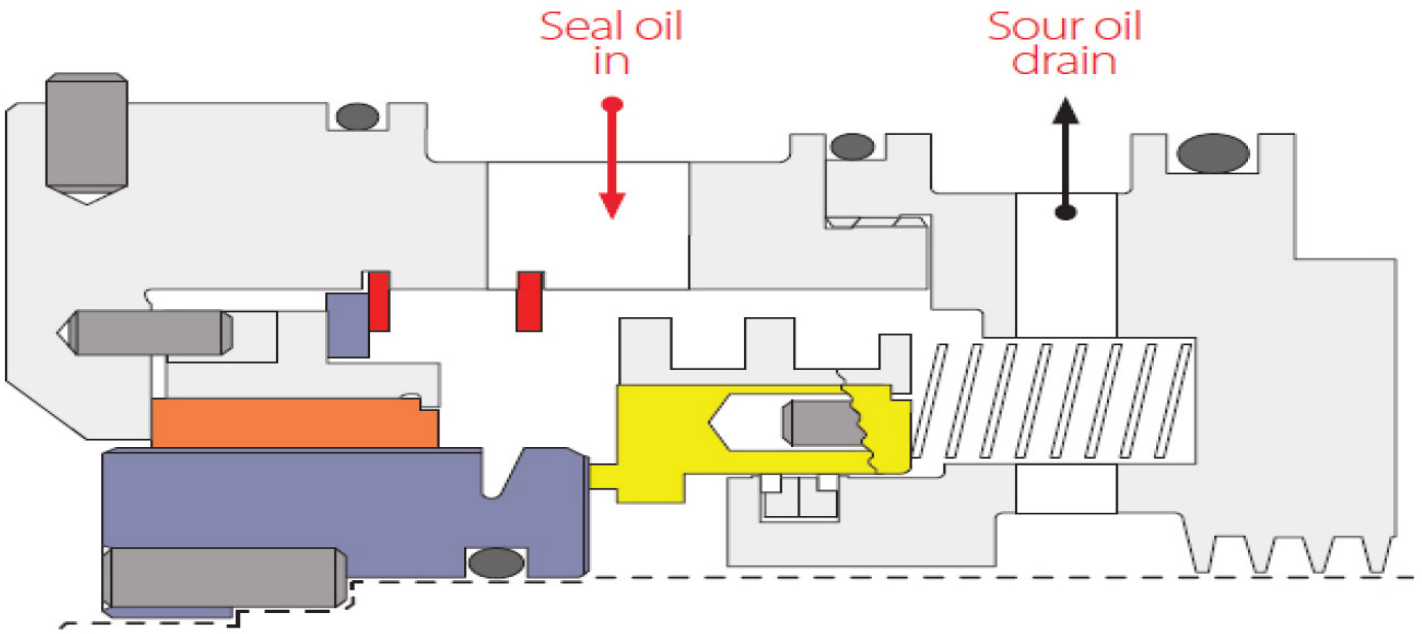

Figure 1

seal while at the same time providing enough oil flow through the bearing area to cool the seal (normally around five to ten gpm).

Alternatively, some compressor seal designs use a complementary face contact seal ("double seal" configuration) on the atmospheric side. This is usually required for high surface velocities, when the oil flow cannot be sufficiently controlled with a bushing seal. Depending on the seal design and application, the outer seal oil flow may require a separate drain to the reservoir. This flow requires an orifice or control valve to maintain the seal oil differential pressure.

For more information:
Email: RMS@rotatingmachinery.com
Tel: 484-821-0702

Headquarters
2760 Baglyos Cir.
Bethlehem, PA 18020

Houston Office
16676 Northchase Dr., Ste 400
Houston, TX 77060

Rotating Machinery Services, Inc.

rotatingmachinery.com
Tel: 484-821-0702
Parts: rms@rotatingmachinery.com