Trouble Shooting
&
Failure Analysis
Trouble Shooting Sealing Problems
Problems at the Faces
Carbons, Ceramic, Silicon and Tungsten Carbide Faces

• Wear
• Heat
• Hang-up
Problems with Secondary Seals

O-Rings, Bellows

• Cuts
• Overheated
• Compatibility with process
Problems with Drive Elements, Load Elements, Adaptive Hardware
Retainers, Springs, Sleeves, Gland Plates

- Corrosion
- Wear
WIDE WEAR TRACK ON MATING RING

POSSIBLE CAUSES
- Worn bearings
- Excessive shaft runnout
- Bent shaft
- Excessive vibration

CORRECTIVE ACTION
- Restore equipment to manufacturer’s standards
- Operate equipment under stable conditions
INTERMITTENT SEAL FACE WEAR PATTERN

POSSIBLE CAUSES
- Face not flat
- Gland distortion (uneven tightening)
- Uneven mounting surface

CORRECTIVE ACTION
- Resurface distorted seal ring
- Use proper procedure to tighten gland fasteners
<table>
<thead>
<tr>
<th>POSSIBLE CAUSES</th>
<th>CORRECTIVE ACTION</th>
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<tbody>
<tr>
<td>- Inadequate lubrication</td>
<td>- Flush seal with a fluid with good lubricating qualities at an adequate flow rate</td>
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<tr>
<td>- Abrasives in process fluid</td>
<td>- Consider face materials that can withstand abrasive particles</td>
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<td>- Prevent crystallization of process fluid</td>
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**EXCENTRIC WEAR TRACK ON MATING RING**

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<thead>
<tr>
<th>POSSIBLE CAUSES</th>
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</thead>
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<tr>
<td>▪ Rotor not centered with mating ring</td>
<td>▪ Check alignment relationship of rotating to stationary parts</td>
</tr>
</tbody>
</table>
HEAT CHECKING

POSSIBLE CAUSES

- Inadequate face lubrication

CORRECTIVE ACTION

- Provide adequate, continuous lubricating flush to seal
- Consider face material change
FACE BLISTERING and PULLOUTS

POSSIBLE CAUSES

- Process fluid too viscous for the face material
- Adhesive condition caused by fluid physical property change in the interface, resulting from viscous shear or heating of the fluid

CORRECTIVE ACTION

- Provide adequate cooling
- Change face materials
### POSSIBLE CAUSES
- Chemical attack of material or one or more of its constituents

### CORRECTIVE ACTION
- Change materials
FRACTURED or CRACKED SEAL FACE

POSSIBLE CAUSES

- Thermal shock
- Mechanical shock or impact

CORRECTIVE ACTION

- Avoid uneven or over tightening of fasteners
- Maintain consistent flush to seal
- Determine cause of mechanical shock or impact
CHIPS, CRACKS IN SEAL RING

POSSIBLE CAUSES
- Mishandling of parts
- Improper installation

CORRECTIVE ACTION
- Follow proper installation procedure
- Avoid point contact or sudden impact of brittle face materials
O-RING SWELL

POSSIBLE CAUSES
- Chemical attack

CORRECTIVE ACTION
- Change elastomer to one appropriate for the fluid being pumped
POSSIBLE CAUSES

- Improper installation technique
- Sharp steps/surface breaks on mounting surface

CORRECTIVE ACTION

- Use chamfers on shaft and sleeve steps
- Remove sharp edges at keyways, threads, etc.
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<tr>
<td>▪ Thermal breakdown of compound</td>
<td>▪ Cool seal chamber</td>
</tr>
<tr>
<td>▪ Chemical attack</td>
<td>▪ Select elastomer appropriate for process fluid</td>
</tr>
<tr>
<td>SPRING DISTORTED, CRACKED, BROKEN, CORRODED</td>
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**POSSIBLE CAUSES**
- Excessive shaft speed
- Metal corrosion
- Metal fatigue

**CORRECTIVE ACTION**
- Select proper metallurgy for sealing application
- Select appropriate type of spring for application
Improper lubricant used to install the seal…
Evidenced by the heavy transfer of carbon from the Primary Ring to Mating Ring…
Silicone Adhesive used on cup of Mating Ring caused the seal to stick together and locked the Drive Tabs. Seal was unable to flex and failed.
Concentricity and/or bearing/shaft problem. Note tracking on Mating Ring.

Normal Pattern

Too Narrow – Primary Ring running off Mating Ring
Seal is being chemically attacked by the process.

Process is breaking down the Primary Ring and the Elastomer.

Excellent Face Pattern
Installation Issue and Wrong Lubrication

Seal was started on shaft, then removed and re-installed.

The rubber Drive Ring was forced up into the seal...

The wrong lubrication was used as indicated by the transfer of carbon to the Mating Ring.

The seal came apart upon final installation.
This seal operated in a very dirty environment and the Mating Ring bore does not appear to be concentric with the shaft.

Face of Primary Ring scratched and grooved.

Running off the Mating Ring then back on again.

Particles of dirt everywhere.
Heavy Grease Used to Install the Seal
Questions??