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

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

DEEP GROOVE ON SEAL FACE



POSSIBLE CAUSES

- Inadequate lubrication
- Abrasives in process fluid

CORRECTIVE ACTION

- Flush seal with a fluid with good lubricating qualities at an adequate flow rate
- Consider face materials that can withstand abrasive particles
- Prevent crystallization of process fluid

EXCENTRIC WEAR TRACK ON MATING RING



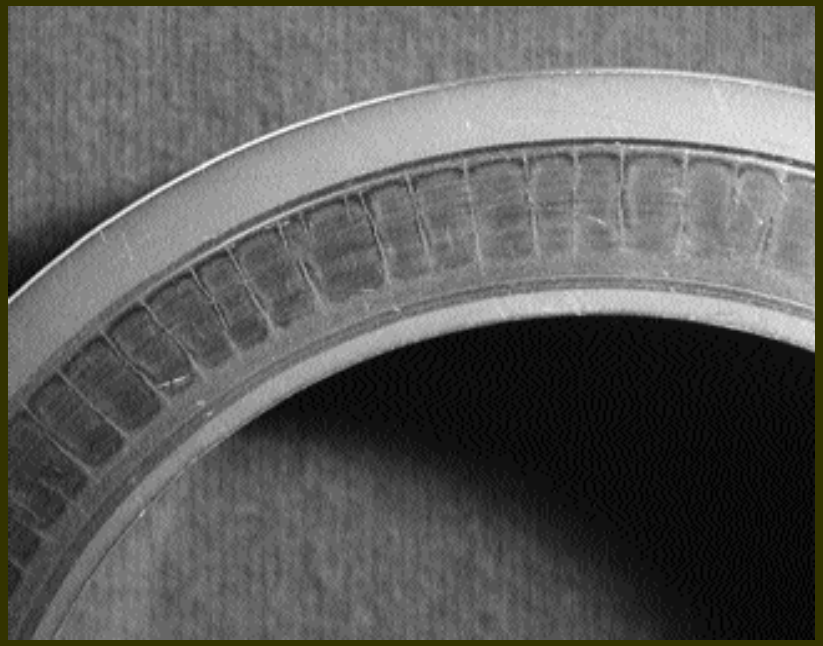
POSSIBLE CAUSES

- Rotor not centered with mating ring

CORRECTIVE ACTION

- Check alignment relationship of rotating to stationary parts

HEAT CHECKING



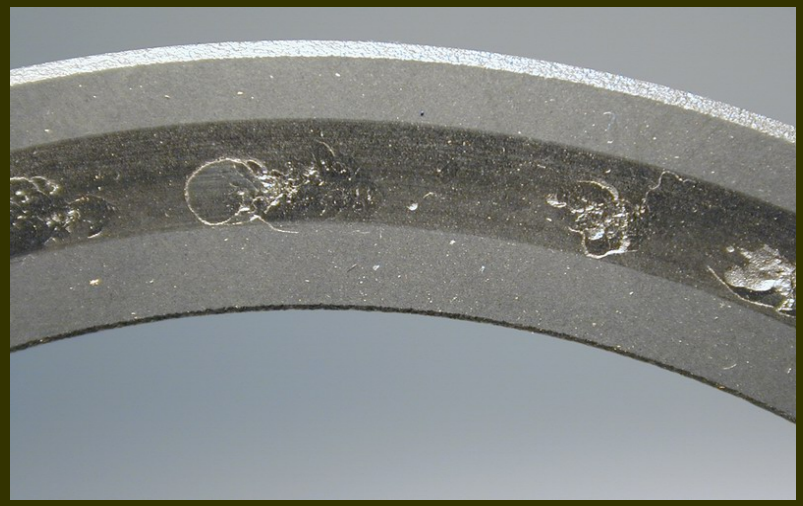
POSSIBLE CAUSES

- Inadequate face lubrication

CORRECTIVE ACTION

- Provide adequate, continuous lubricating flush to seal
- Consider face material change

FACE BLISTERING and PULLOUTS



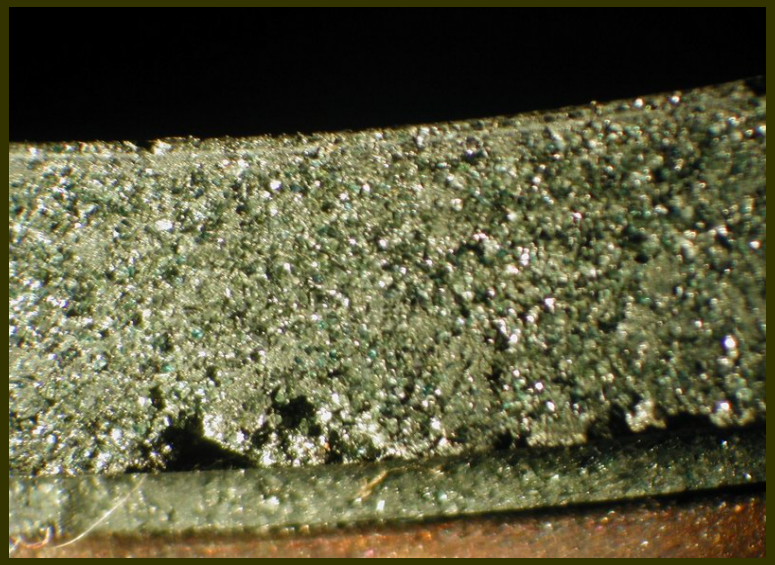
POSSIBLE CAUSES

- 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

PITTING, LEACHING, or GENERAL CORROSION



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

ELASTOMER WITH CUTS & NICKS



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.

HARD or CRACKED ELASTOMERS



POSSIBLE CAUSES

- Thermal breakdown of compound
- Chemical attack

CORRECTIVE ACTION

- Cool seal chamber
- Select elastomer appropriate for process fluid

SPRING DISTORTED, CRACKED, BROKEN, CORRODED



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.



Seal is being chemically attacked by the process.



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??