ACUMEN SEALS & PUMPS

acumenseals.co.uk

40 Reasons Mechanical Seals Actually Fail

A field diagnostic reference from 36 years of fault-finding

Andrew Sykes MCGI — Acumen Seals & Pumps Ltd

> Most maintenance teams have a spares list. Almost none have a failure list. This is the one I wish every plant had before I walked in — the recurring causes behind seal failures across chemical, pharmaceutical, food and defence sites, grouped by where they actually start.

1. Installation errors

The ones that show up three months later, not on day one.

Face damage from dry-fitting — Spinning the rotating face against the stationary face without lubricant during assembly scores both faces before the pump even starts.

Incorrect spring compression — Setting the working length wrong leaves the faces under-loaded or over-stressed, causing early leakage or rapid wear.

Shaft or sleeve misalignment — Coupling misalignment transmits vibration straight into the seal faces from the first revolution.

Contaminated faces on fitting — Fingerprints, dust or grit on lapped faces create micro-leak paths that widen under pressure.

Wrong gland bolt torque — Uneven or over-torqued gland bolts distort the housing and pull the faces out of flatness.

O-ring pinched or rolled — A nicked or twisted O-ring during fitting loses its seal within days, not years.

Reversed rotation on start-up — Running the pump backwards on first start can shear pusher-seal springs or unwind a directional seal.

Skipped run-in procedure — Hard-face seals need a controlled start-up to bed in; skipping it glazes or cracks the faces.

Seal not matched to housing tolerance — A seal built to one dimensional standard fitted into an out-of-spec housing never seats correctly.

No flush line connected — A seal designed to run with an external flush left running dry from day one.

2. Material mismatch

What the datasheet doesn’t tell you about your actual media.

Elastomer swelling — The wrong O-ring compound reacting with the process fluid swells until it locks the seal solid.

Elastomer shrinkage — The opposite failure — a compound that dries out and hardens in the fluid, opening a leak path.

Chemical attack on the face material — Carbon or silicon carbide faces degrading in a fluid nobody checked compatibility against.

Wrong FFKM grade specified — Treating all perfluoroelastomers as interchangeable when each grade has a different chemical and temperature window.

Metal component corrosion — Springs or drive pins in standard stainless failing in a chloride-rich process that needed a higher alloy.

Face material too soft for the media — Abrasive particles embed into a softer face and grind away the harder counterface.

Thermal expansion mismatch — Dissimilar materials expanding at different rates under heat, opening a gap at the worst possible moment.

Wrong secondary seal design — An O-ring fitted where the application actually needed a wedge or bellows design for better tracking.

UV or ozone degradation — Elastomers stored or used somewhere they weren't rated for, perishing long before rated seal life.

Incompatible assembly lubricant — The wrong grease used to ease fitting reacts with the elastomer it touches.

3. Operating conditions

The gap between "designed for" and "running at".

Dry running — Even seconds without fluid film between the faces generates enough heat to crack them.

Cavitation at the seal chamber — Vapour bubbles collapsing right at the faces pit them over time.

Pressure spikes beyond design — A seal rated for steady-state duty hit by transient surges it was never specified for.

Running above the temperature rating — Process upsets pushing past the elastomer's or face material's limit.

Excessive shaft deflection — A pump running off its best efficiency point bends the shaft and rocks the faces.

Solids in the seal chamber — Abrasive slurry reaching faces that were only rated for clean fluid.

Vacuum conditions — A seal designed for positive pressure struggles to hold a vacuum, letting air in instead of fluid out.

Vibration from bearing wear — A failing bearing elsewhere on the pump transmits vibration straight through the shaft.

Speed above design limit — Running faster than the seal's rated surface speed overheats the faces.

Frequent start-stop cycling — Thermal and mechanical shock from repeated starts wears a seal built for continuous duty.

4. Maintenance habits

The small things nobody checks until it's too late.

No failure record kept — The same seal gets replaced three times with nobody asking why.

Spares bought on price, not spec — A cheaper equivalent swapped in without checking it matches the original duty.

No inspection of the old seal on removal — Failed parts binned before anyone reads the story they're telling.

Ignoring early leakage — A slow weep treated as normal until it becomes a full failure.

Skipping alignment checks after coupling work — Realignment forgotten after unrelated maintenance disturbs the shaft.

No baseline vibration data — Nothing to compare against when a seal starts failing early, so root cause never gets found.

Stock seals stored wrong — Elastomers left in a hot store room or under UV light, perished before they're even fitted.

One-size-fits-all PM schedule — Every pump on the same inspection interval regardless of duty severity.

No handover of process changes — A seal specified for one duty, then the fluid or rate changes and nobody tells maintenance.

Reactive-only culture — Seals only looked at after they fail, never as a planned inspection point.

If your seals are failing and nobody can tell you why with any confidence, get in touch.
Andrew Sykes — Acumen Seals & Pumps Ltd — acumenseals.co.uk