

A NON -PROFIT ORGANIZATION

RATS - ROTATING & TURBOMACHINERY SOCIETY

WWW.ROTATINGSPECIALIST.ORG



MAINTENANCE
RELIABILITY
OPERATIONS

TECHNICAL CONFERENCE & WORKSHOPS

Mechanical Seal Upgrade Helps Nickel Mine Combat Severe Service Conditions

Steve Taylor P. Eng., John Crane
Canada



Wednesday October 25, 2023
DOW Centennial Centre - Fort Saskatchewan

Our Featured Speaker



Stephen Taylor, P.Eng.

Canadian and Western US Business Development Manager

John Crane

staylor@johncrane.com

Over 30 years of mechanical seal design and trouble-shooting experience



Objectives of this Presentation

What You'll Learn:

This presentation offers practical strategies to help you:

- Learn from the challenges faced in a nickel mine tailings pump application using slurry seals with face technology to overcome severe slimes processing duties
- Achieve mine KPI productivity goals using mechanical seal strategies to improve reliability
- Boost seal MTBR
- Maximize critical tailings pump equipment lifecycle
- Cut maintenance costs
- Avoid unplanned and planned downtime
- Reduce water and energy waste during mining process

Case Study:

Mechanical Seal Upgrade Helps Nickel Mine Combat Severe Service Conditions



All About the H₂O

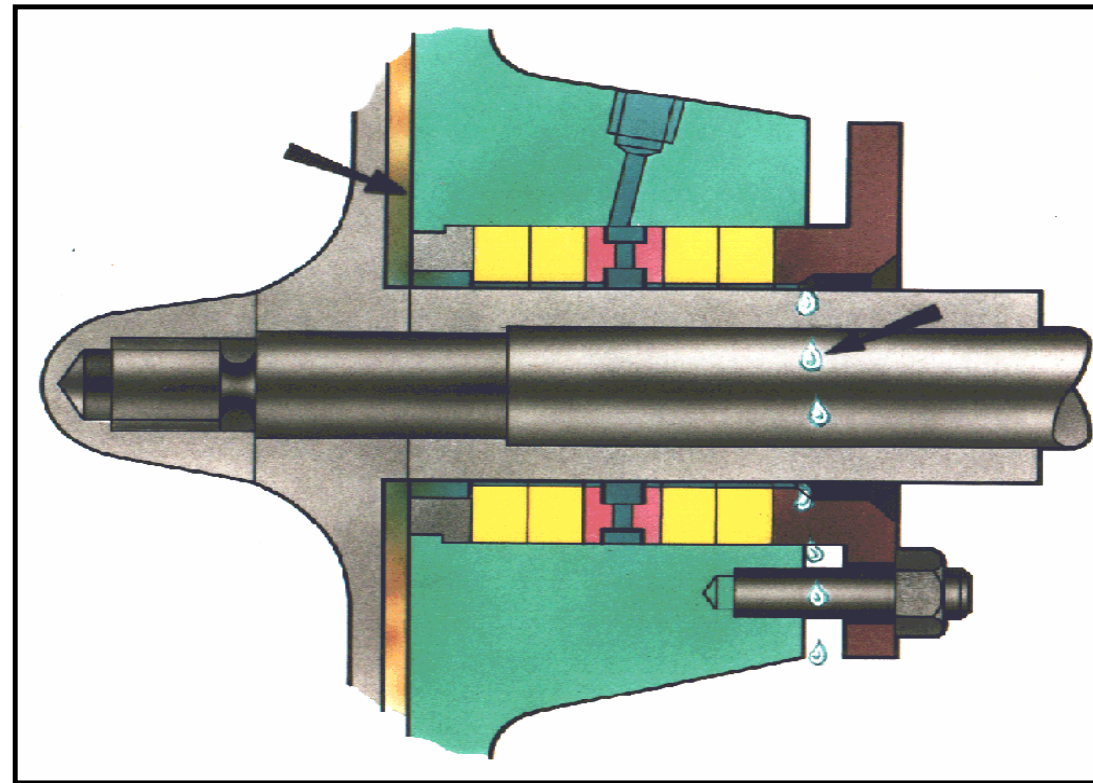


Mechanical seals – valuable tools for water reduction and improving slurry pump reliability
Filter Feed and Tailings Pumps



Mechanical Seals vs. Packing

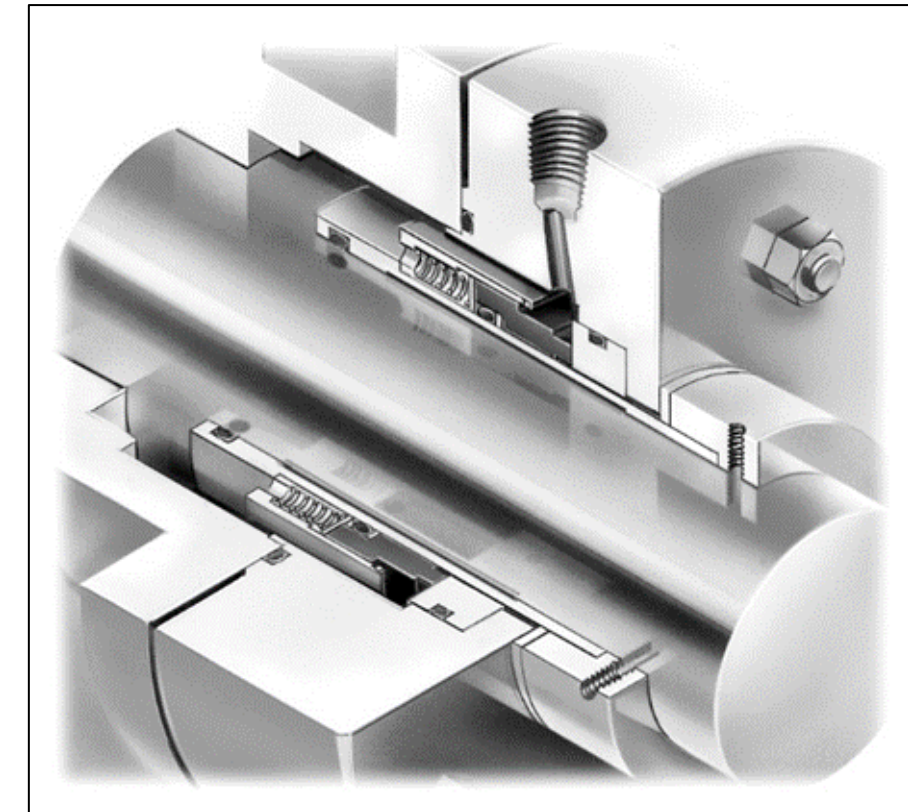
Packing



- High leakage
- Requires frequent adjustment
- Wears the sleeve
- Short life
- Takes time to fit
- Requires seal water



Mechanical Seal

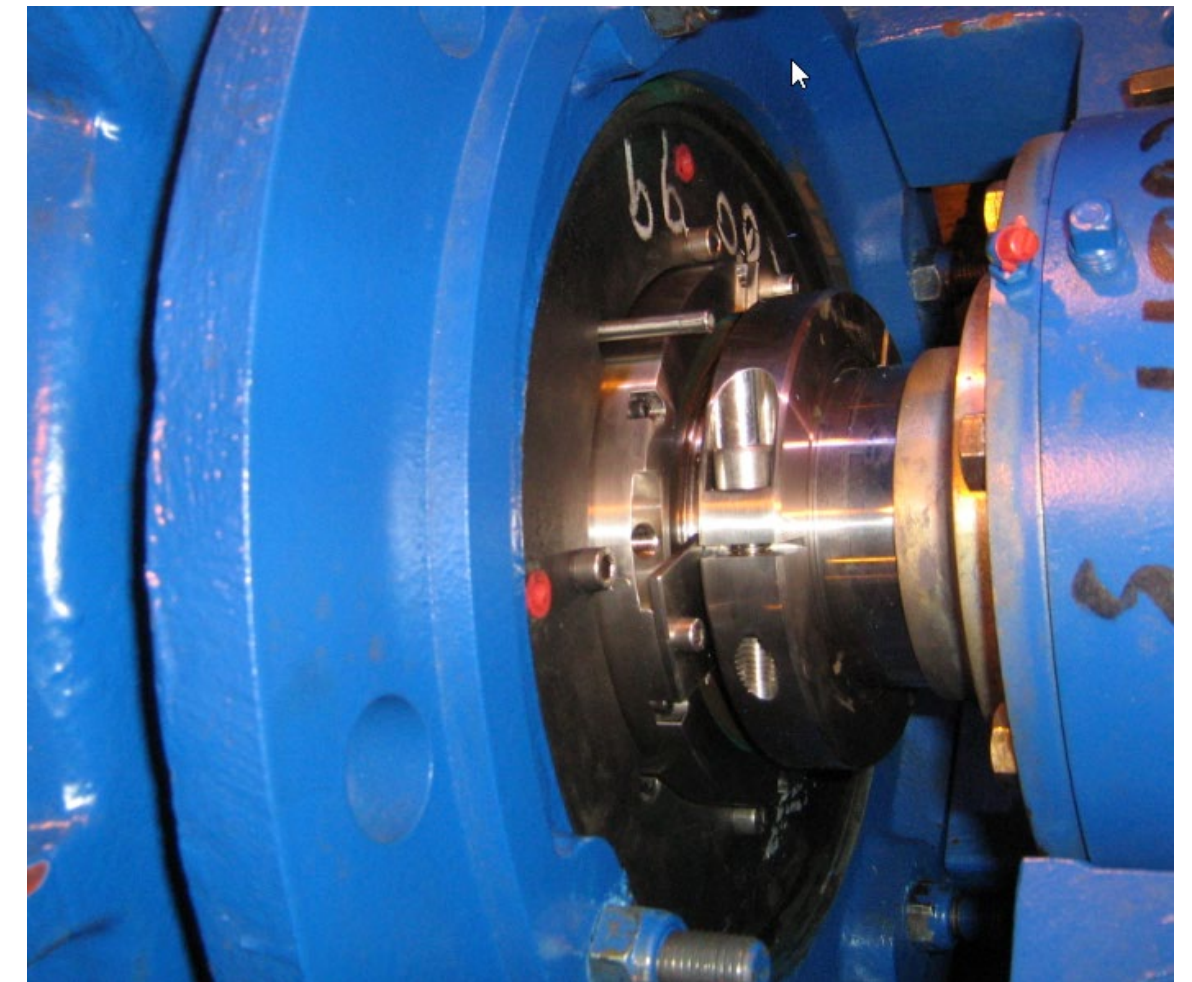


- Minimal leakage
- No adjustment
- No sleeve wear
- Longer life
- Reduced or no seal water



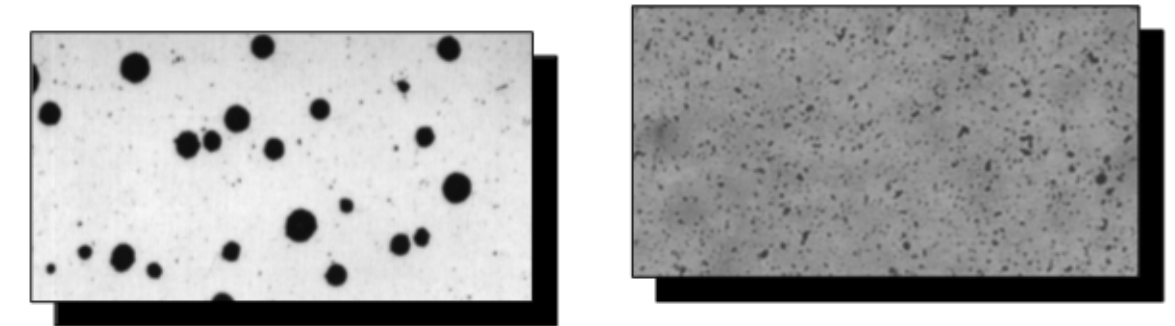
Filter Feed Pump – First install, 2008

Ongoing multi-year runs

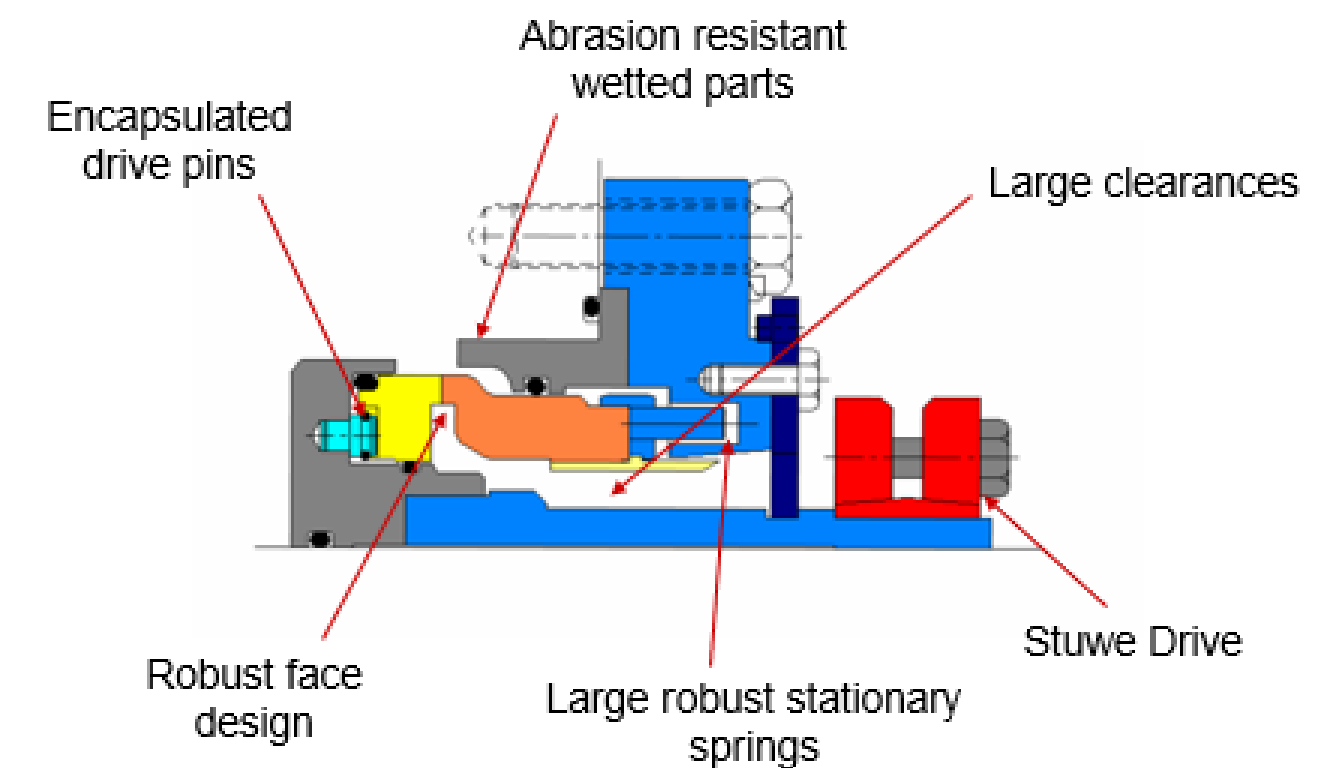


Type 5860 Heavy Duty Slurry Seal

- Engineered seal designed for heavy mineral slurries
- Rotating Seat design
- Seal faces positioned as far as possible into the process fluid
- Springs isolated from slurry fluid
- Optimized design allows high axial & radial flexibility



Controlled porosity vs
standard silicon carbide



K. I. S. S.

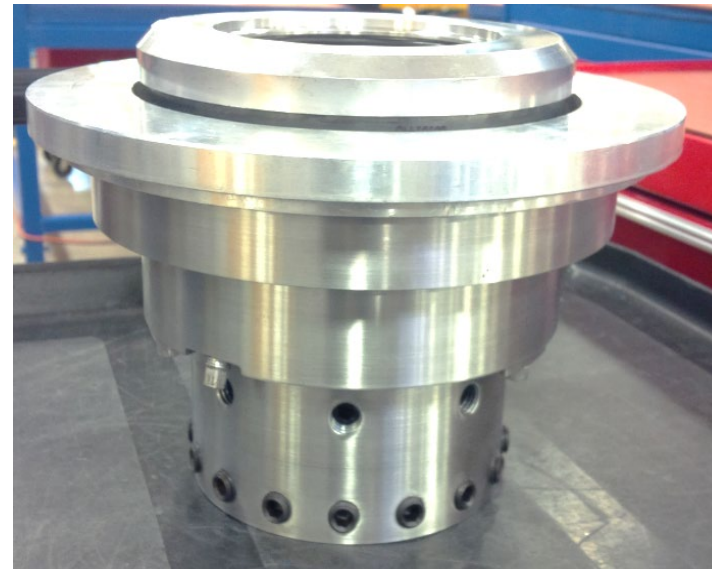
Keep It Simple Seal Engineer



- Robust is best
- Single seal if you can
- If you use water, employ what's on hand
- Avoid/reduce extra support equipment



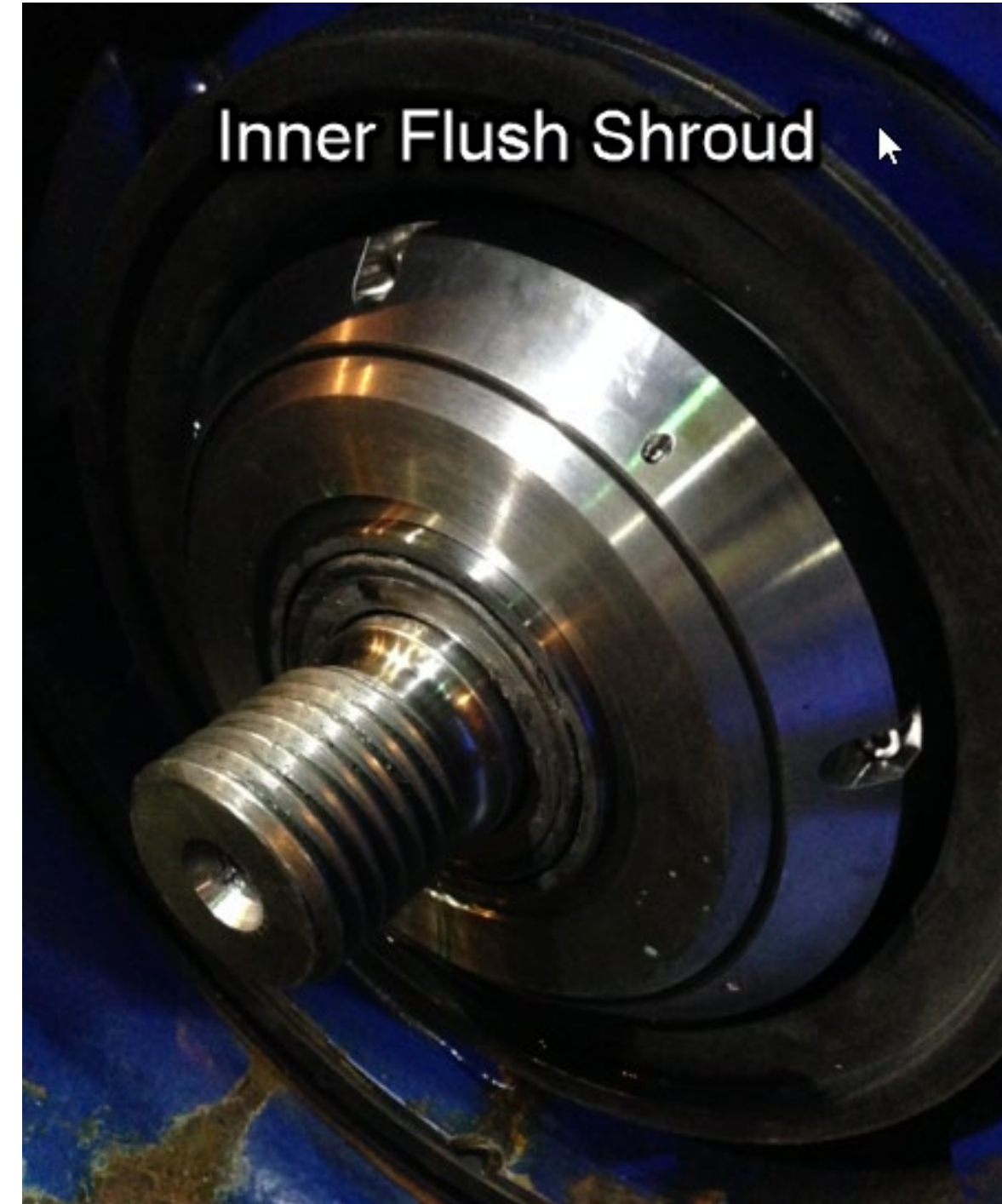
Start of the climb – 5 pump tailings train 150 psi – 700 psi +



A few trials, a few hurdles



Solutions Found



Successful Install – High Pressure Tailings Pump with 100mm Type 5860 Seal Improved MTBR from 9 days to 16 months





← Packed pump



Tailings Slurry 3 to 4 times the sp.gravity of water. ↑

Dynamic Lift cartridge installed →

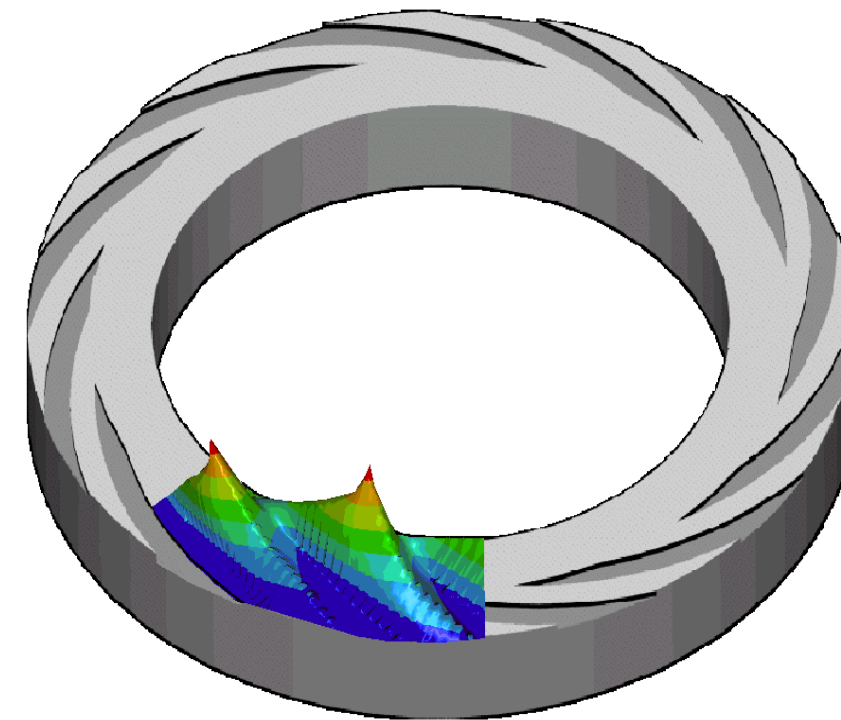


Conventional seal faces damaged from slurry sealing and lack of face lubrication.

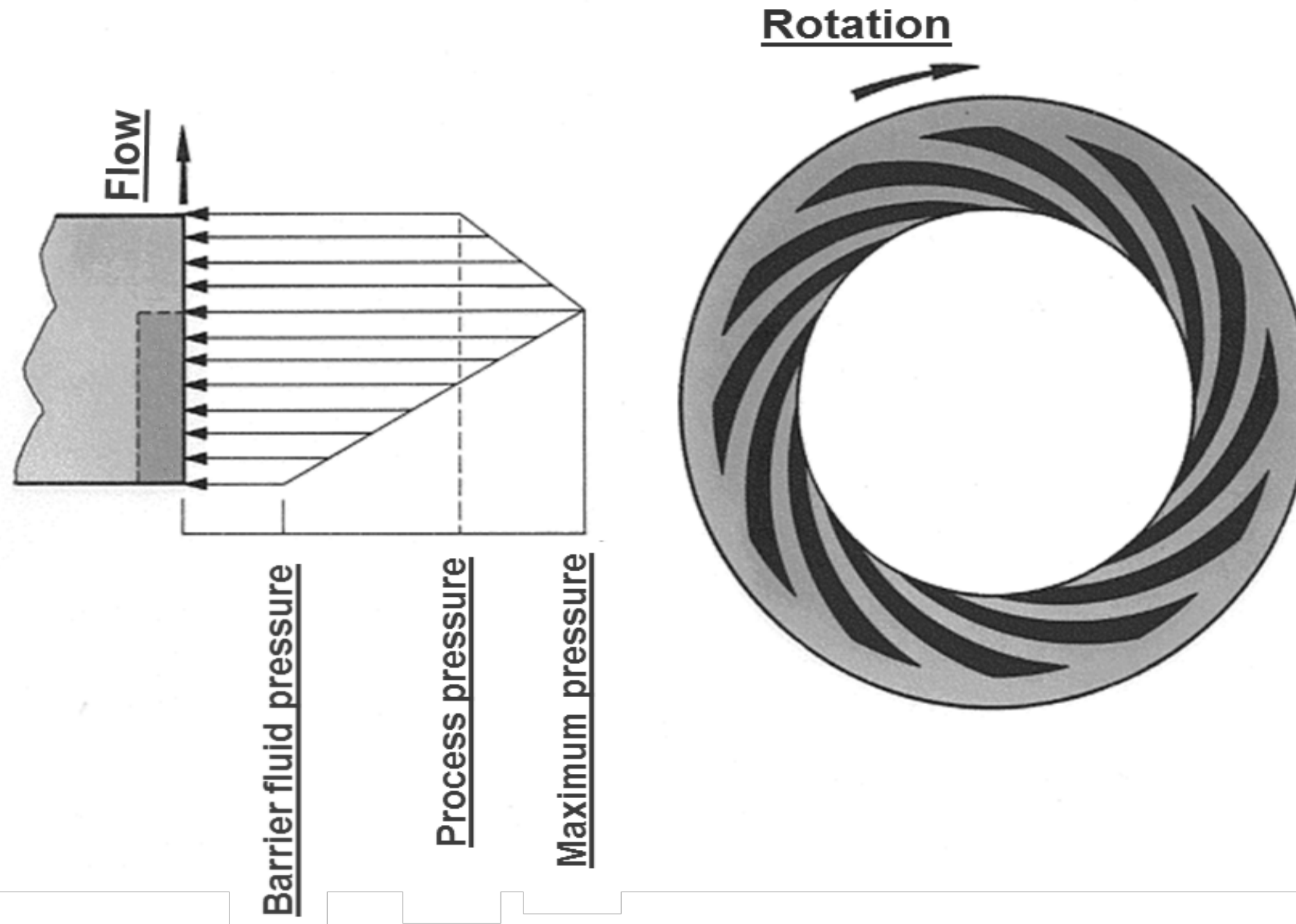


Non-contacting Technology

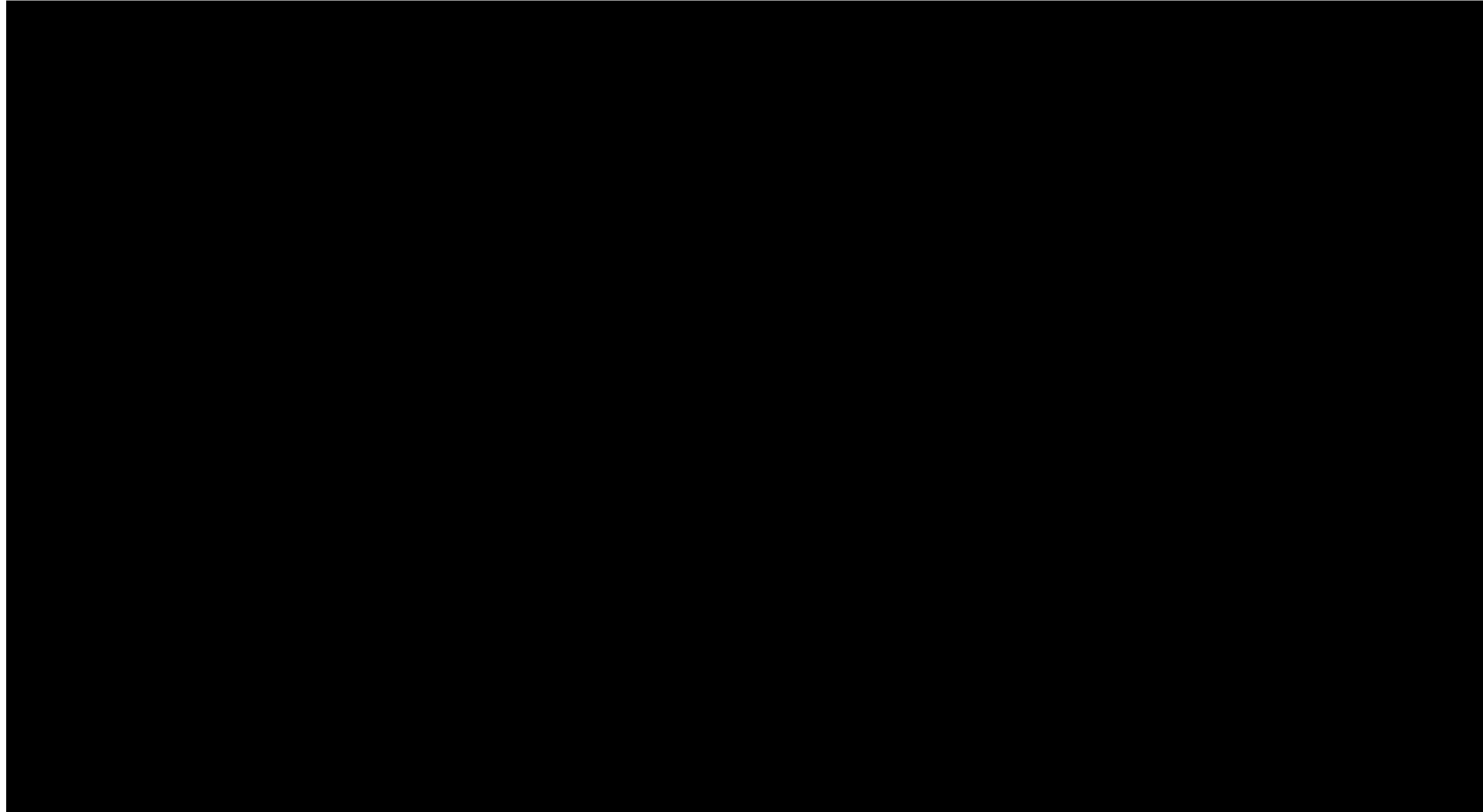
- Spiral grooves channel fluid into the high pressure points
- The pressure points cause the faces to “lift off”
- This allows a small amount of fluid to pump across the faces
- No contact, significant less heat generation



Pressure Profile of the USP Face



Dynamic Lift Up-stream Pumping



Watch: www.johncrane.com/products/seal-face-technology-solutions/dynamic-lift-up-stream-pumping



Dynamic Lift Up-stream Pumping Face Technology

Advantages

- The USP Dynamic lift grooves deliver self generated and self sustained lubrication to inboard seal faces
- The technology is non-contacting reducing heat and wear at the inboard faces for longer life
- Continuous flow across faces maintains a clean seal environment
- Low buffer pressure reduces demand on seal components like drive elements and secondary seals
- Lower total heat generation results in a much simpler support system
- Seal compensates for pressure variations to maintain seal gap
- Standard Type 5860 slurry seal can be upgraded to a 5860/8-1 USP
- Technology is available for applications up to 900 psig, 60 barg
- The energy consumption is much less than standard double seal

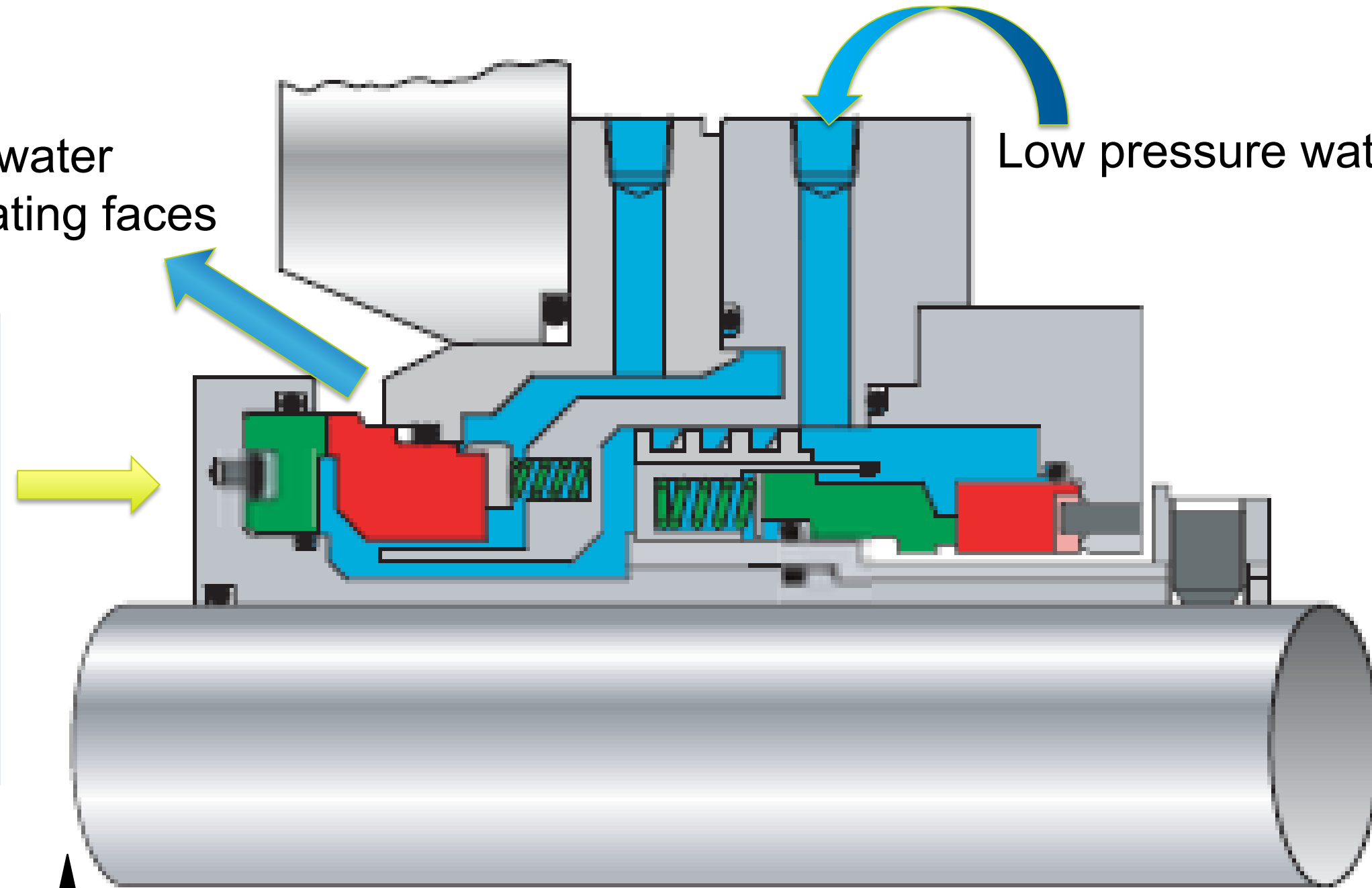
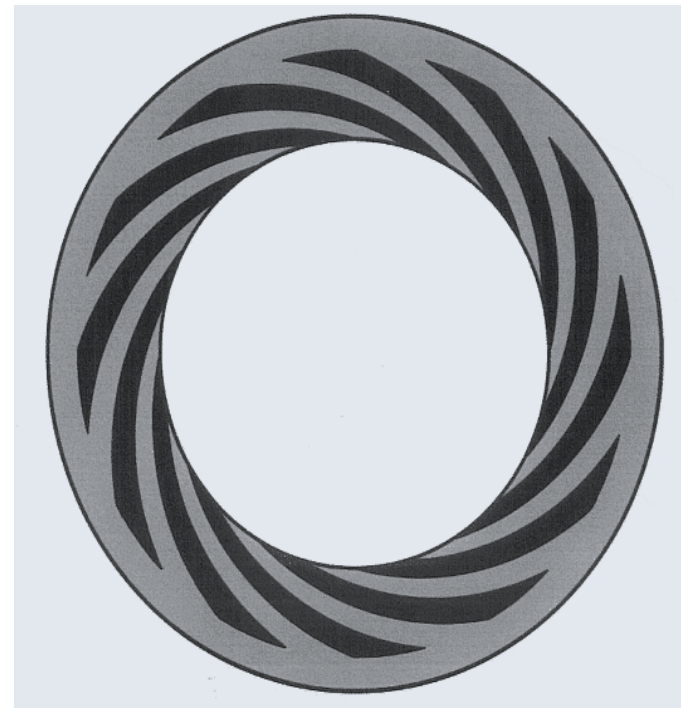
**Slurry seal
technology
reduces mine
water and energy
consumption**



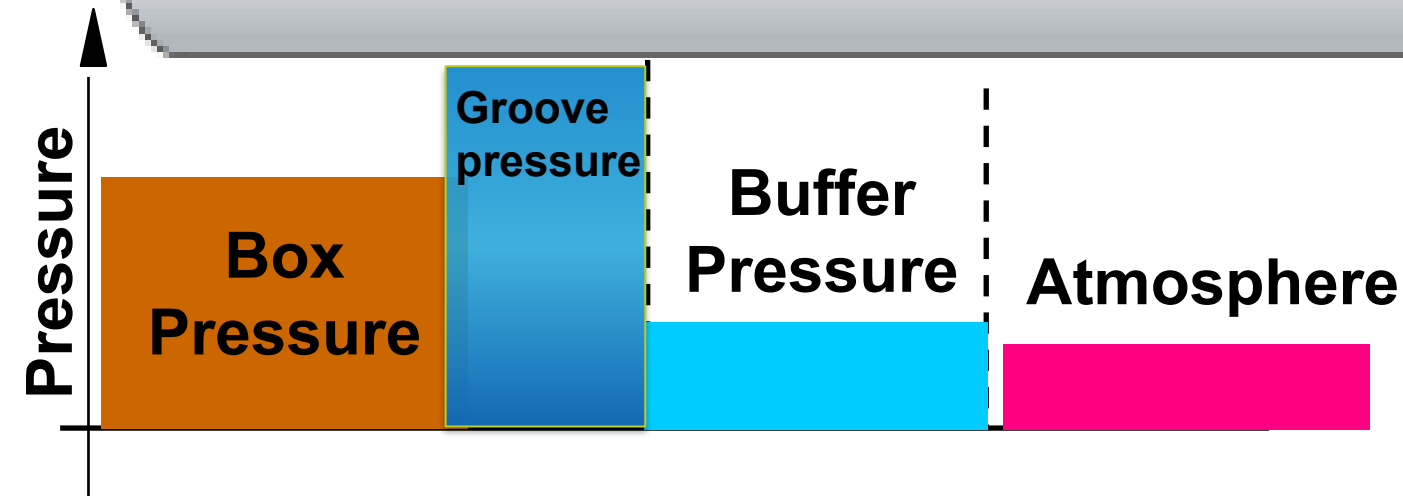
A heavy duty application of Dynamic Lift Up-stream Pumping

High pressure water
Lifting & lubricating faces

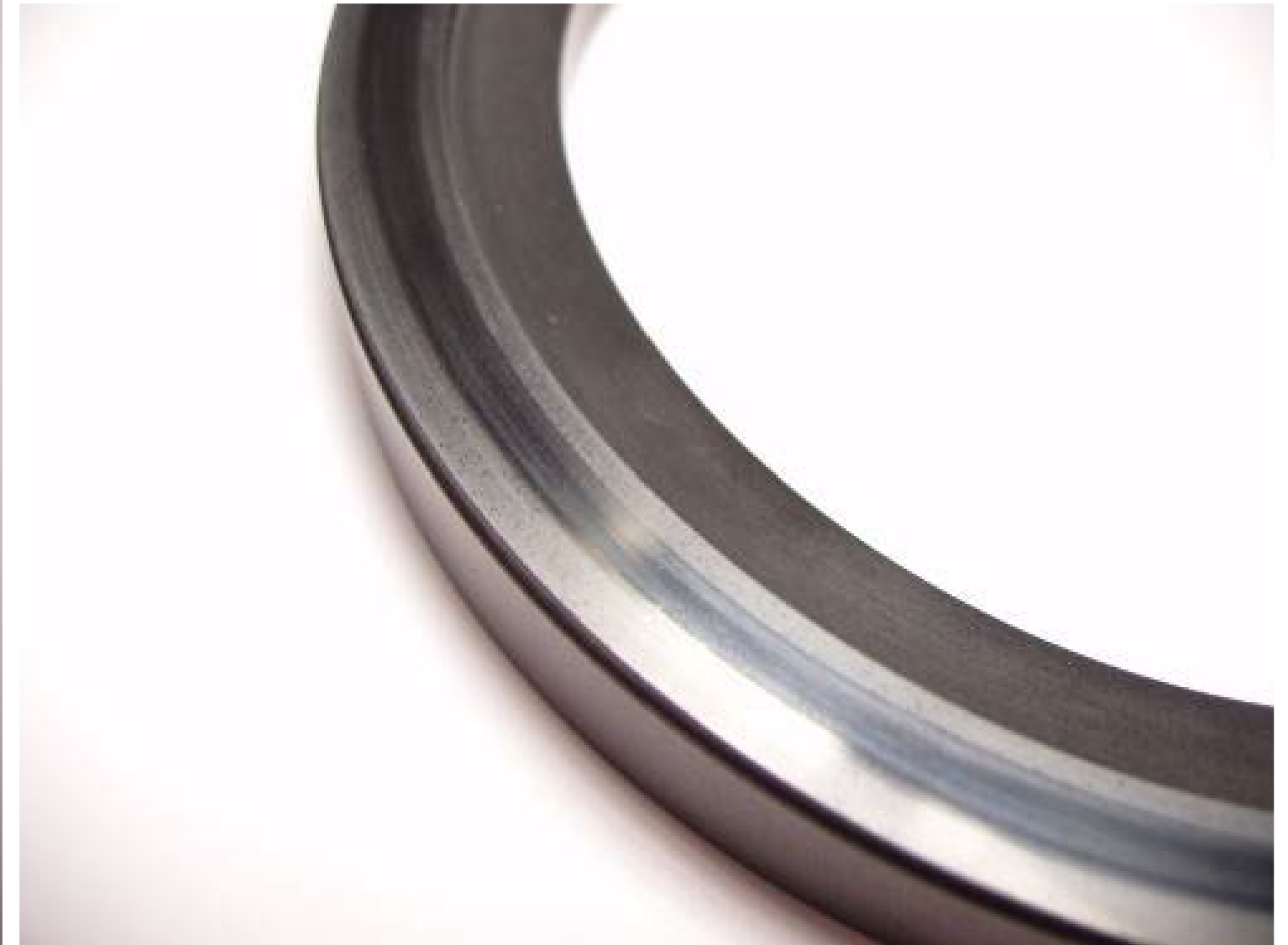
Low pressure water in



Barrier water pressurized
and pumped by spiral
groove upstream across the
inboard seal faces



Undamaged spiral grooved face and primary ring from high pressure high solids tailings application



A cleaner installation

Utility water reservoir



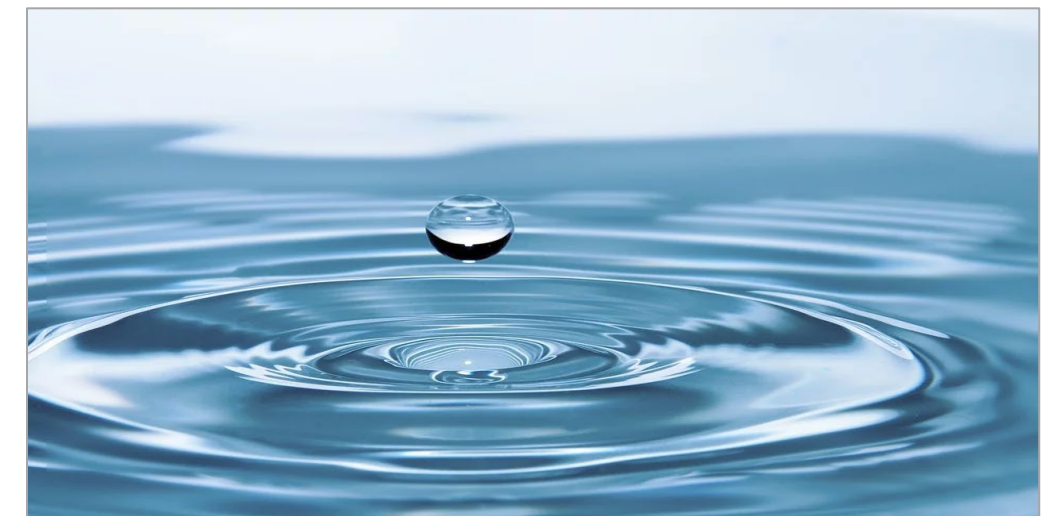
Water to the seal

Water from the the seal



Benefits

- Provides reliable sealing for slurries, abrasives, solids, low lubricity, scaling and toxic fluids
- Achieves the intent of a dual pressurized seal with a simple unpressurized support system
- Water usage is low (1 to 2 gallons per day vs. up to 15 gpm) so process contamination is low and predictable
- No external flush water pumps required





Thank You To Our Sponsors

RATS is a non-profit organization, run by a volunteer board of directors. The founding premise of RATS is in the social networking and community building of people within the rotating equipment and turbomachinery industries.



RATS

ROTATING AND TURBOMACHINERY SOCIETY

A NON-PROFIT ORGANIZATION

THANK YOU FOR PARTICIPATING IN OUR PRESENTATION

Please fill out the feedback form to help us improve the next event.
All presentations will be available to download from the RATS website.
A portion of MRO proceeds fund scholarships through our partnered institutions:



RATS is proud
to support



DOW Centennial Centre - Fort Saskatchewan

**2023 MRO Technical
Conference & Workshops**
MAINTENANCE - RELIABILITY - OPERATIONS

WWW.ROTATINGSPECIALIST.ORG