What’s Coming Up

- Intro to Mechanical Sealing
- What is Packing and how it works
- What is a Mechanical Seal and how it works
- Advantages and Disadvantages of both
- Repairing and Replacing of each
Where is it used?

- Sealing Rotating Equipment
  - Pumps
  - Mixers
  - Agitators
  - Screens
  - Pressure Vessels
  - Centrifuges
  - Compressors
  - Vacuums
  - Tanks
Pumps

- “The Second Most popular piece of equipment in the world”
How do we keep the product in the volute from the atmosphere?
Sealed Stuffing Box
Typical Dry Pump Assembly
Typical Submersible Pump Assembly
Mechanical Packing
Packing Stuff
Advantage of Packing

- Inexpensive Cost
- Relatively easy to install and maintain
- Common in older pump, fits with no modification
- Can work in extreme run out situations
- Common in older valves
- “That’s What we have always used”
- Required in Fire Pump Applications
Disadvantages of Packing

- Leaks
- Wear on pump, sleeves, and shafts
- Water Consumption
- Process Contamination
- Safety and Sanitation
- Maintenance
- Bearing Failures
- Power Consumption
- Environmental Concerns
- Air intake in Vacuum Applications
- Cost (Wait what?)
But Packing is so Cheap
Or is it?
### An annual cost comparison: Packing vs. Seals

#### Annual Packing Costs:
- Packing
- Shafts and Sleeves
- Bearings
- Lost Pumpage
- Routine Maintenance
- Packing Flush
- Remove Flush from Product
- Additional Power to Drive Packed Pump

\[\text{\$ Total Sealing Expenditures}\]

#### Annual Mechanical Seal Costs:
- New Seal

\[\text{\$ Total Sealing Expenditures}\]

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The Comparison
Mechanical Seals
How It Works

Mechanical Seals:
Four basic components

1. ROTATING FACE
2. STATIONARY FACE
3. COMPRESSION COMPONENT
4. SECONDARY PACKINGS
Under Pressure

Sealing fluid leak paths to atmosphere

Primary Seal: Seal Faces

Gland Gasket

Stationary face “O” Ring

Atmosphere

Shaft “O” ring
Seal Faces

"THE HEART OF MECHANICAL SEALS"
Seal Faces

The three essentials:

1. Flatness
2. Lubrication
3. Proper Compression
1. Seal Faces Flatness

In order to maintain our critical film of lubricant, we must have flat seal faces

- MECHANICAL SEALS SHOULD BE FLAT TO 2-3 HELIUM LIGHT BANDS (.0000115” PER LIGHT BAND)
2. Seal Faces: Lubrication

1. FILM BETWEEN THE FACE IS THE **ACTUAL SEAL** PREVENTING LEAKAGE OF PRODUCT TO ATMOSPHERE

2. FILM KEEPS FACES **RUNNING COOL** AS IT DISSIPATES FRICTIONAL HEAT BACK TO THE PRODUCT

3. IF FILM IS LOST, EXCESSIVE HEAT CAUSES ALMOST IMMEDIATE FAILURE!

FILM OF LUBRICANT (PUMPAGE)

ROTATING SEAL FACE

STATIONARY SEAL FACE
Purpose of Lubrication

- Separate surfaces
- Prevent contact of high surface points
- Reduce friction/heat generation
3. Seal Faces: Proper Compression

To maintain the film of lubricant between the seal faces, it is critical to maintain the proper amount of compression on the faces.
Too Little...

1. SEAL INSTALLED WITHOUT PROPER COMPRESSION:
Seal Faces: Proper Compression

Too Much...

2. Seal is over compressed, the lubricant between the faces is lost. The faces overheat, are destroyed and leak.
Seal Faces: Proper Compression

3. SEAL INSTALLED WITH PROPER COMPRESSION:
Q & A Time