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Friction and Wear of Materials

Project Proposal:  
Wear of Rotational Dynamic Shaft Seals

Background:

In the course of my work as a Design Engineer at Goodrich Pump & Engine Control Systems, I often need to design mechanisms for dynamic sealing of fluids. For a static seal, a simple o-ring is usually sufficient; however, a dynamic seal requires a more complex arrangement. The purpose of a dynamic seal is to isolate one fluid (aircraft fuel) from another (usually oil or air) by sealing across surfaces that move relative to each other. These seals are usually needed to seal fuel around the external drive shaft interfaces on our products. The surface of the stationary seal is loaded into a flat running surface on the spinning drive shaft.

Many factors must be considered in the design of a dynamic seal, including:
- the materials used for the sealing surfaces
  o structural, thermal, and wear properties
  o compatibility with the fluids being sealed
- the speed of relative movement of sealing surfaces
- the fluid pressures and other forces acting on the seal
- the temperature at which the seal must operate
- the surface finish required to achieve a good seal between parts

Goals:

- to thoroughly study the physics of a dynamic sealing assembly from a tribological perspective
- to explore the effects of different material combinations on the system (different sealing surfaces as well as different fluids being sealed) as well as different operating conditions
- to gain a deeper understanding of the capabilities and limitations of the seals I design