Proposed Rotating Vacuum Seal Tests

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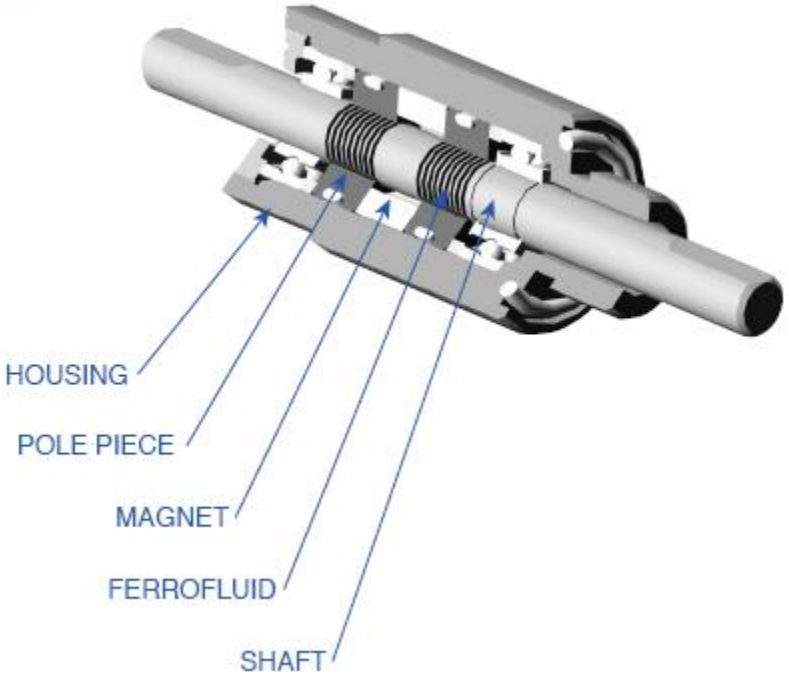
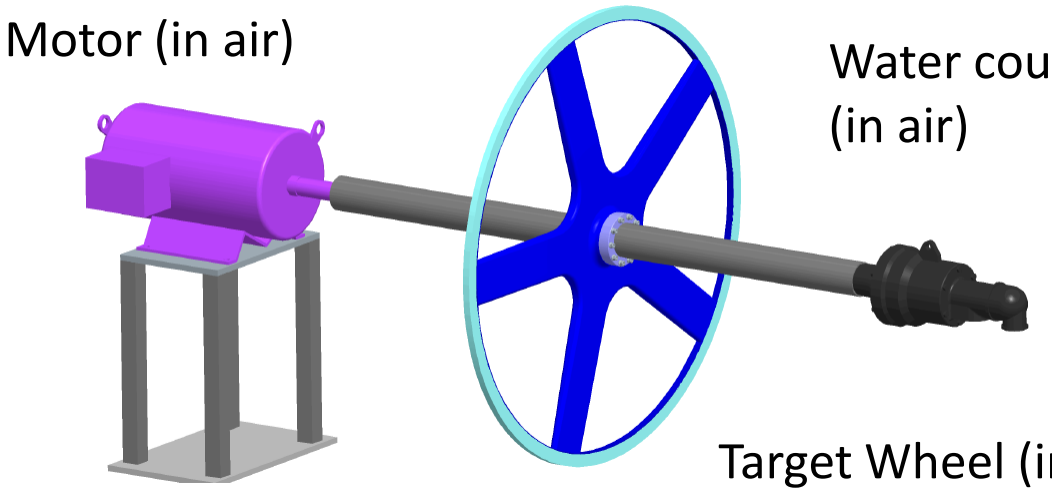
Ferrofluidic vacuum seals are proposed for the rotating target

Temperature range (Uncooled)	20-210°F/-6-100°C[*1]
Vacuum pressure	10^{-9} mbar[*2]
Leakage rate (mbar l/s)	10^{-11} mbar l/s[*3]
Gas compatibility	inert gas[*4]
Housing material	300 series SS[*5]
Shaft material	400 series SS[*6] or 17-4 PH[*7]
Maximum shaft run-out	0.003"/0.076 mm

- Vendors exist who have devices that match our needs
- No spec for interaction with external magnetic fields
- Choice of ferrofluid must be rad hard for our application

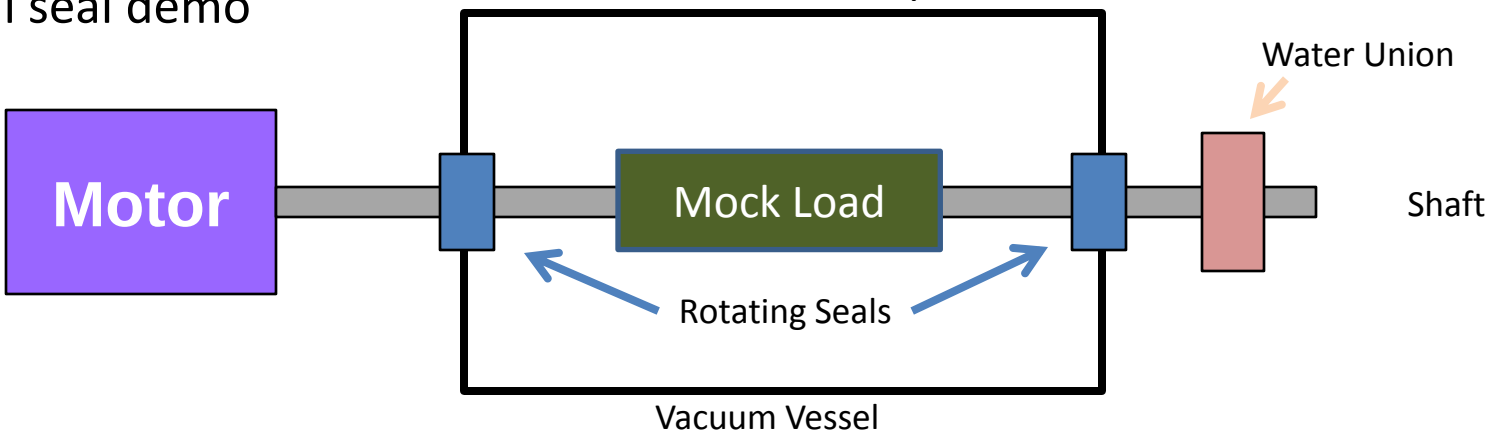


Wheel-less mockup of rotating shaft and seals



Mock Load weight = Target weight
↓Moment of Inertia - ↓Stored Energy
Safe for unattended operation

Minimal seal demo



Status

- Funding for vacuum seal test has been allocated in the US plan but has not yet arrived at LLNL, under current funding:
  - Step 1: Prepare drawings and experimental plan, distribute to working group for comments, go through safety review at LLNL
  - Step 2: Procurement and construction
  - Step 3: Long term operation (6 months) under vacuum at 2000RPM
  - Step 4: Destructive testing with magnetic field
- Next fiscal year (if funding available)
  - Identify partner lab willing to irradiate test setup at target station levels
  - Radiation hardness tests