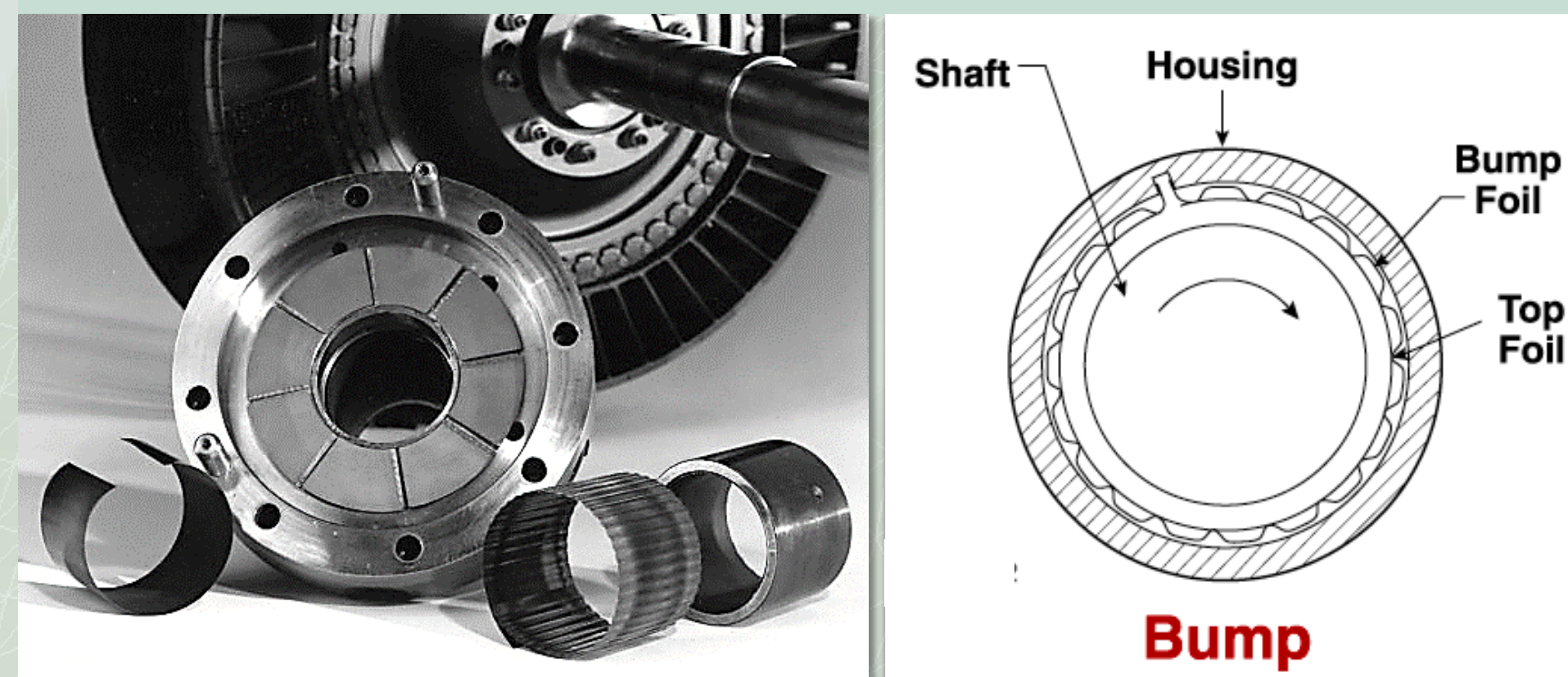
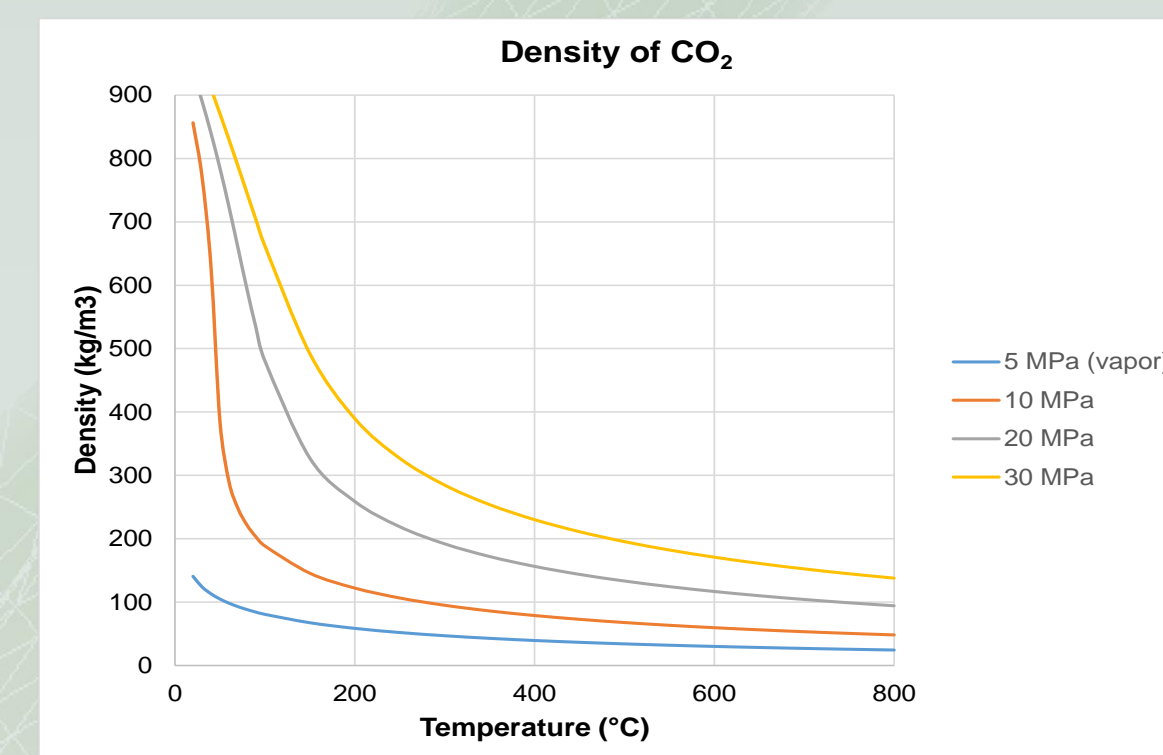
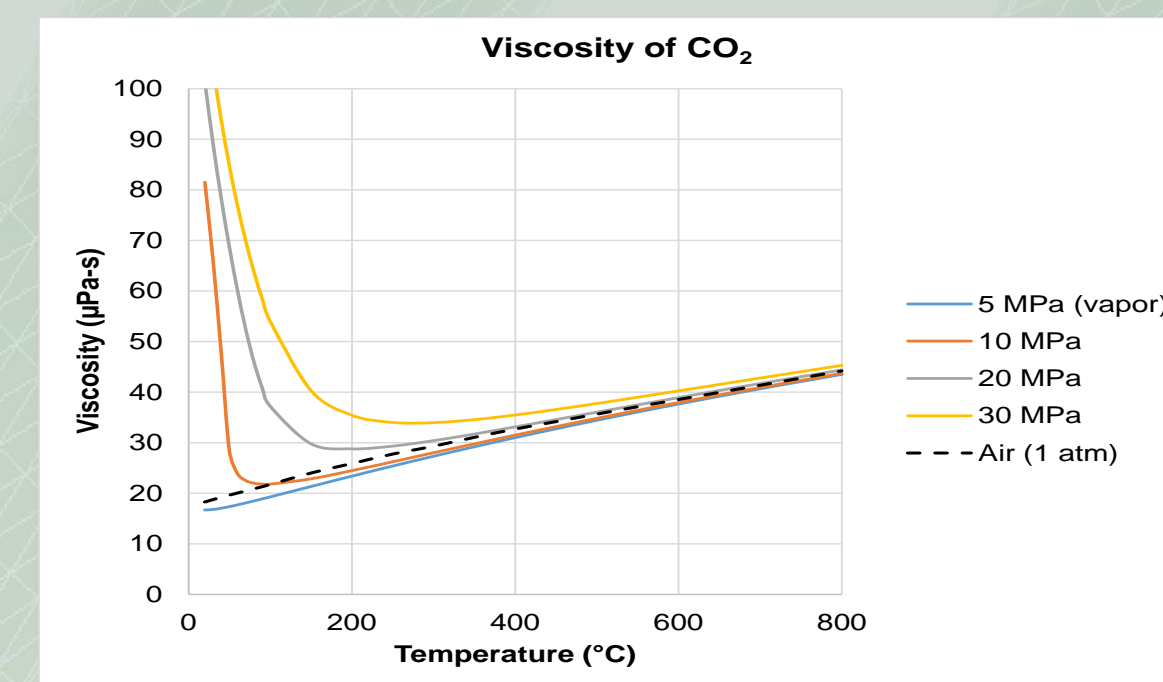


Foil Bearings

- Spinning shaft rides on thin film of process fluid
- No petroleum oil or grease
- No rotating parts
- Uses high lubricity coating for start/stops
- Transient overload capacity
- High speeds without rotordynamic instability



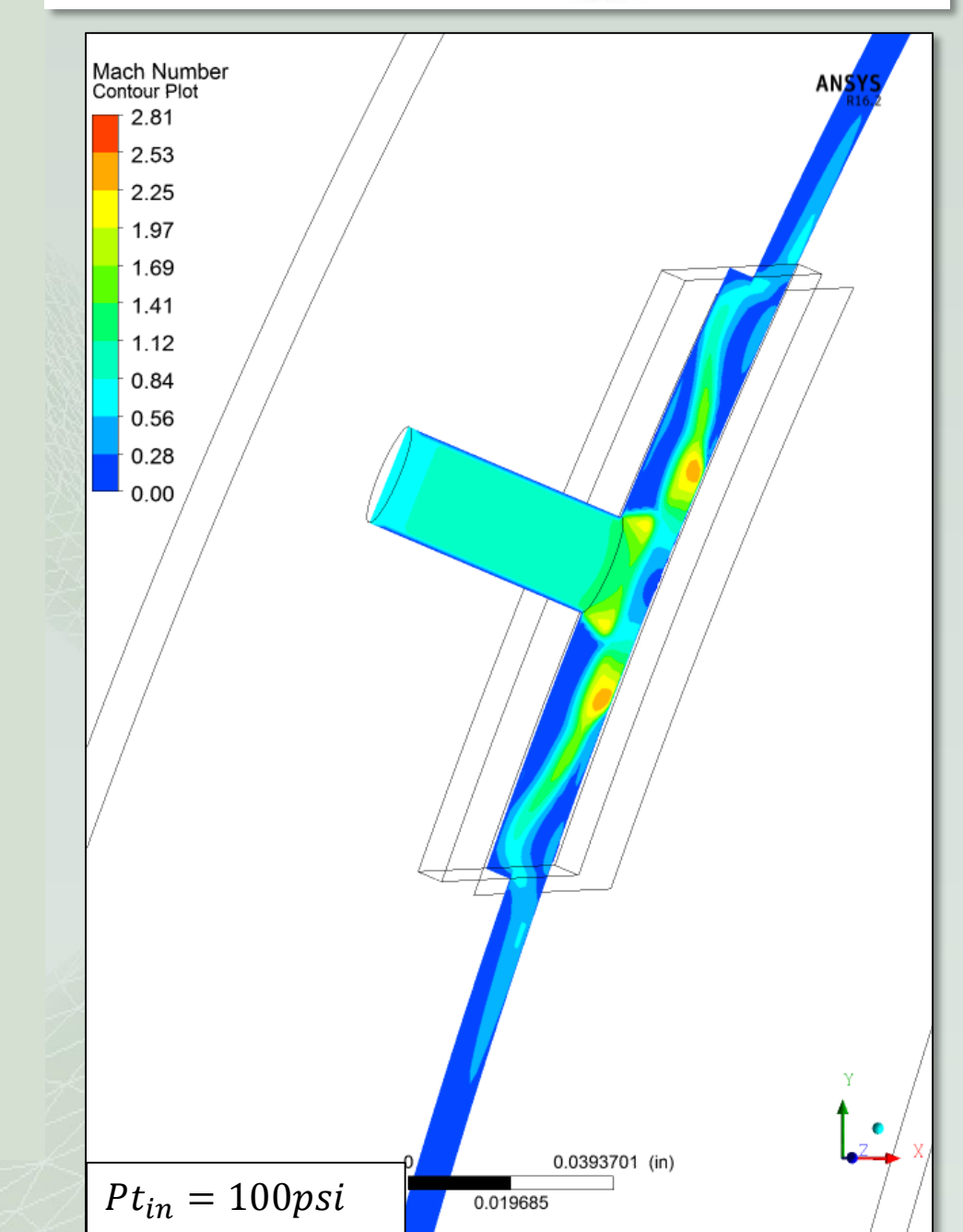
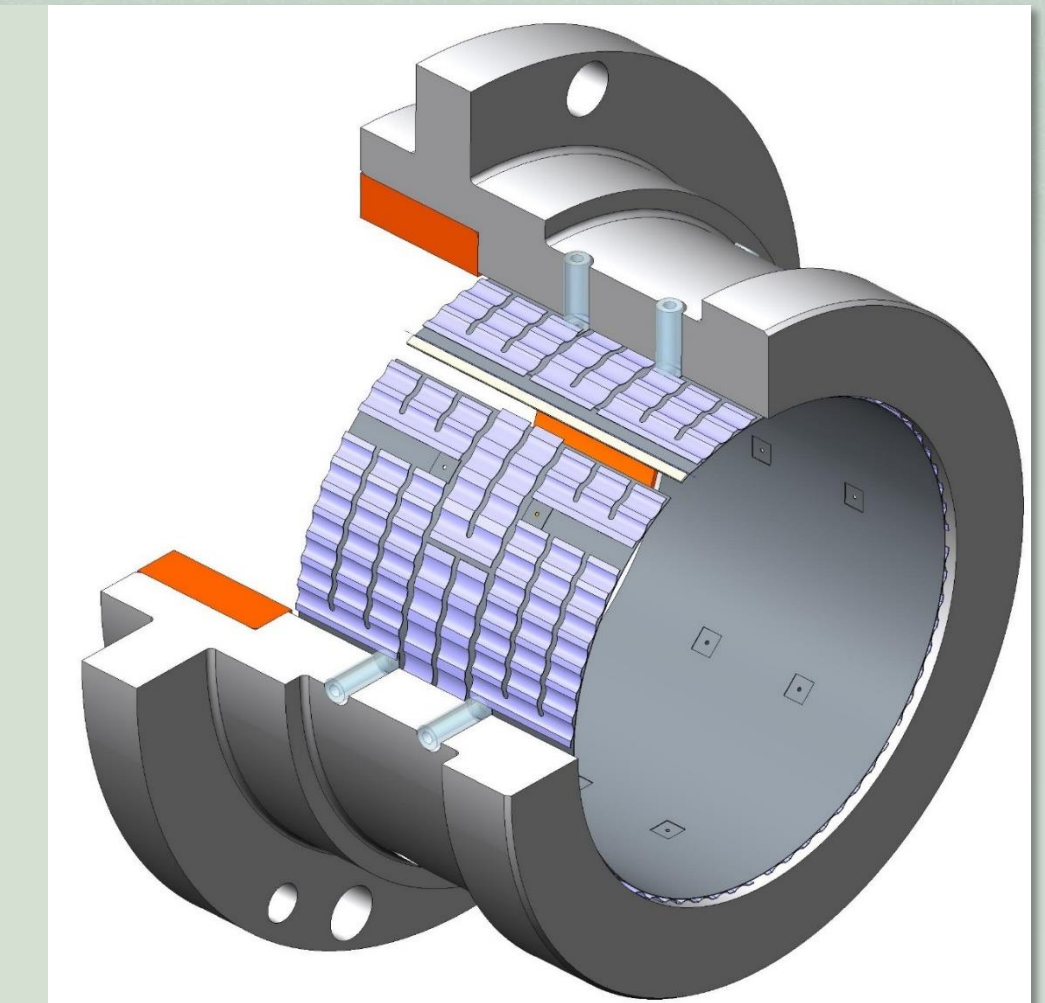
Supercritical CO₂ as a working fluid



Design Innovations Required to Apply Technology

1. Hydrostatic Boost

- Injects process gas into bearing
- Greatly increases load capacity and stiffness
- Compliant foil minimizes hydrostatic gas leakage
- Provides direct cooling
- Enabled by innovative inner/outer foil design



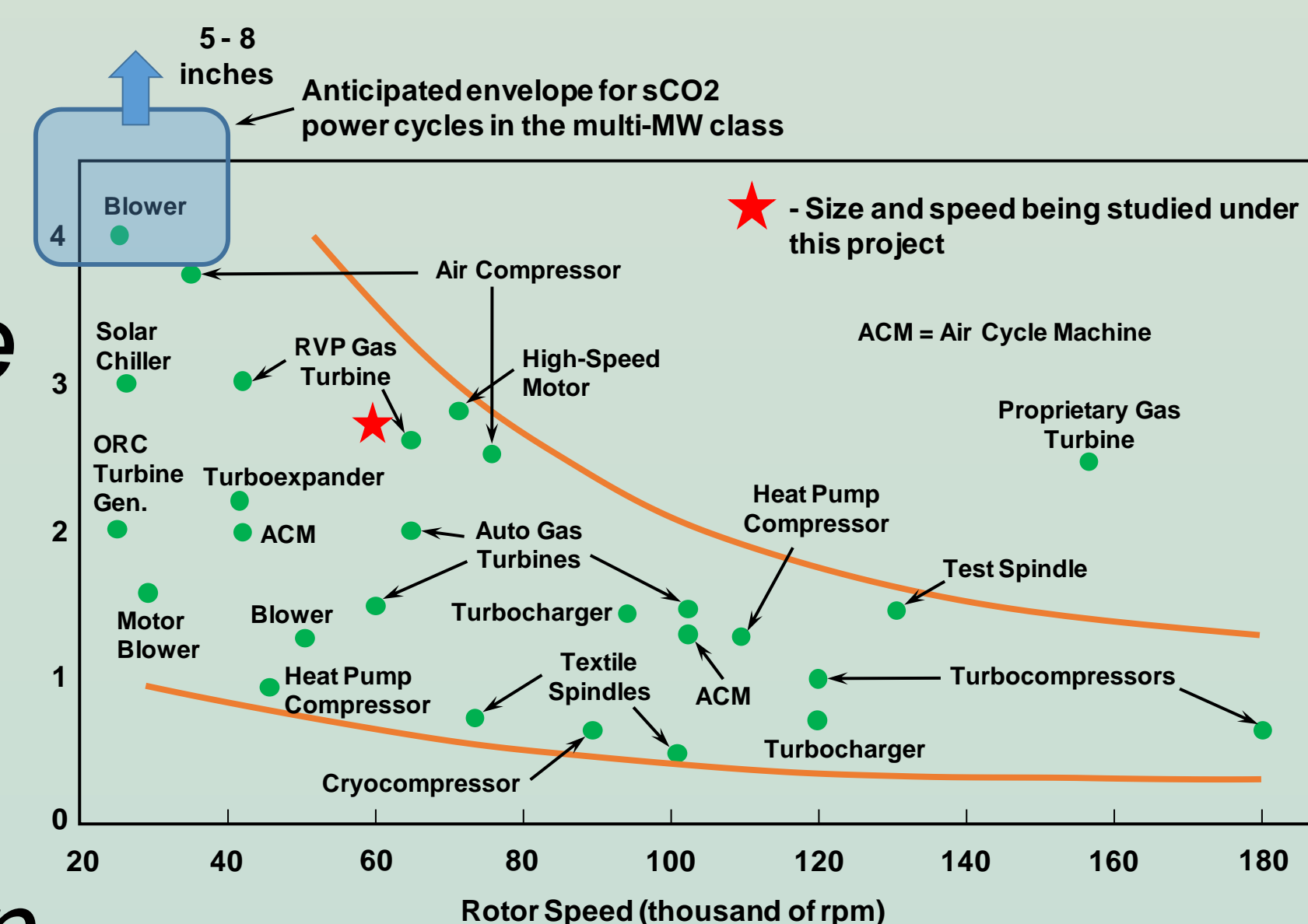
Plot of CFD Results of a Single Hydrostatic Nozzle

2. Coatings

- Standard foil coatings good to 230°C
- Foil coatings tested to 650°C
- Testing 1000°C “chameleon coatings”

Why Foil Bearings for Supercritical CO₂?

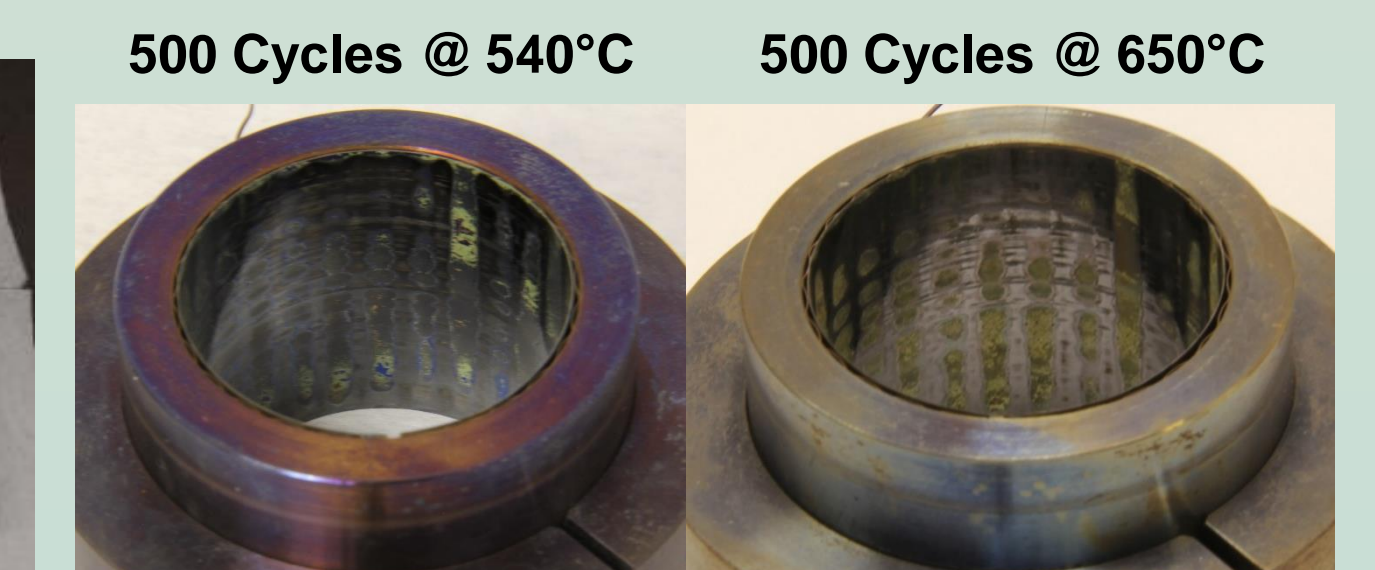
- No wear during steady-state operation
- No lubricant, so no contamination issues or lube support systems
- Can tolerate high pressure & temperature
- Permits hermetic sealing
- No maintenance
- Base technology proven since 1960's



Pin-on-Disk Test Samples



Top Foil Test Sample



Start-Stop Test Samples

