ADVANCED GAS FOIL BEARING DESIGN FOR SUPERCRITICAL CO₂ POWER CYCLES

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

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

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

2. Coatings
   • Standard foil coatings good to 230°C
   • Foil coatings tested to 650°C
   • Testing 1000°C “chameleon coatings”