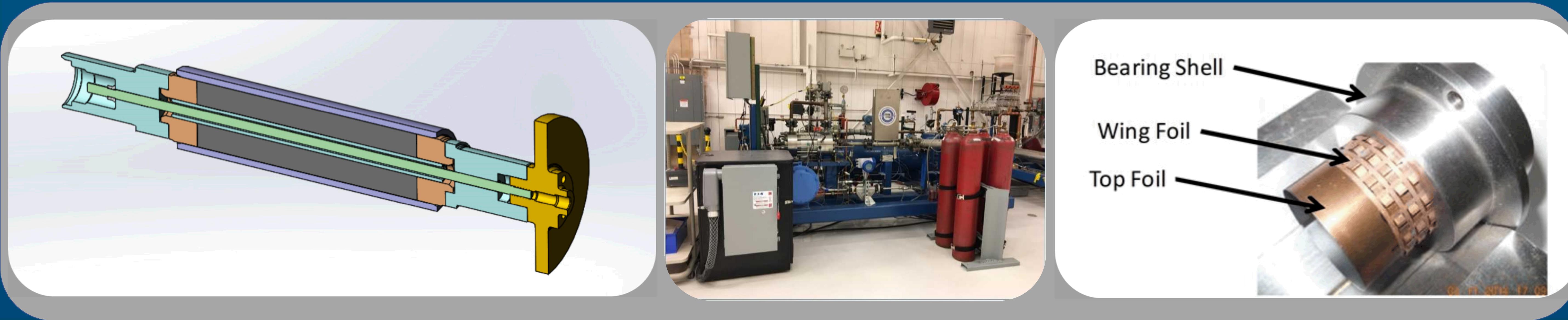


# BEARING TEST PLATFORM

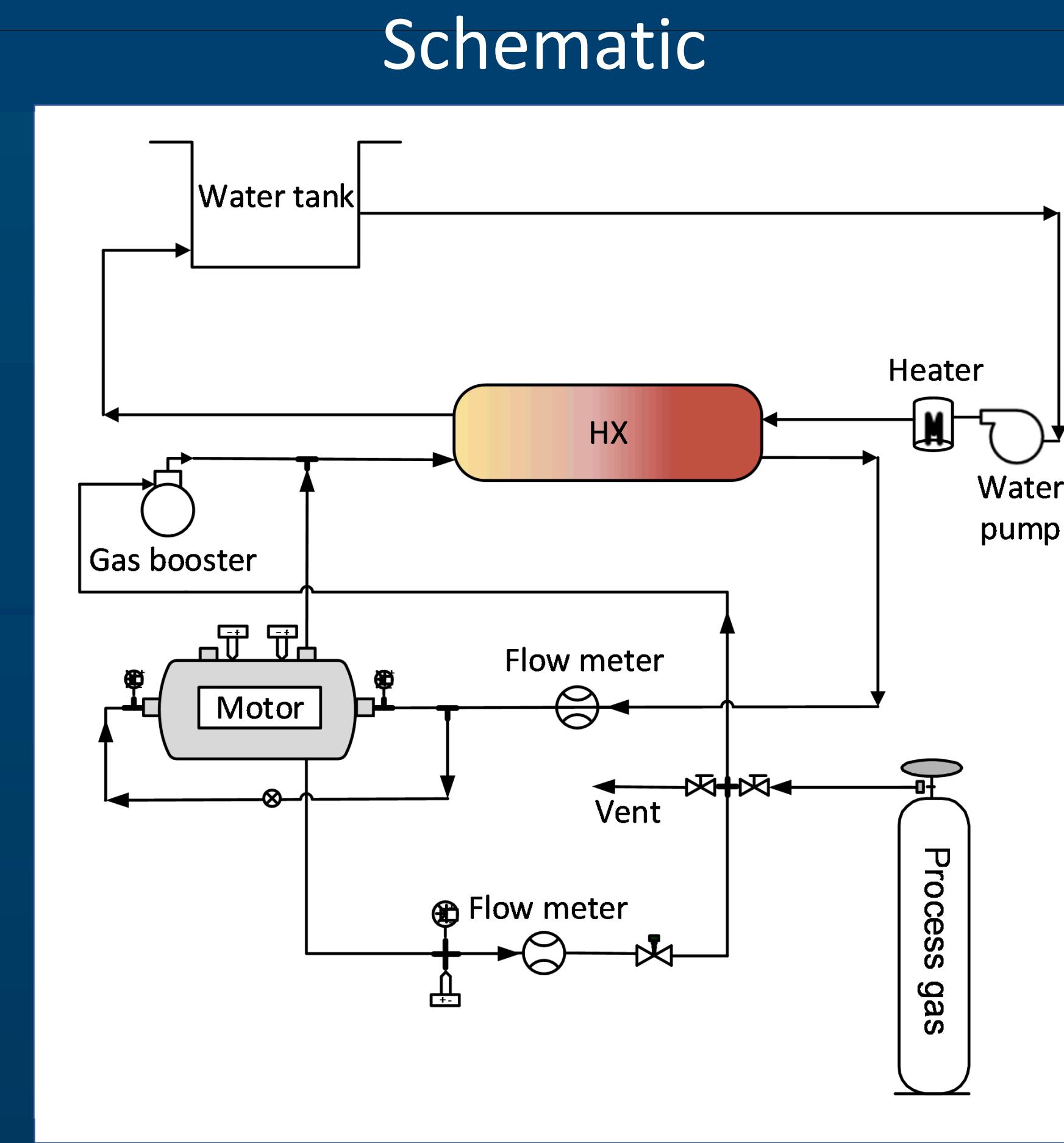


## sCO<sub>2</sub> Brayton Capability at NESL

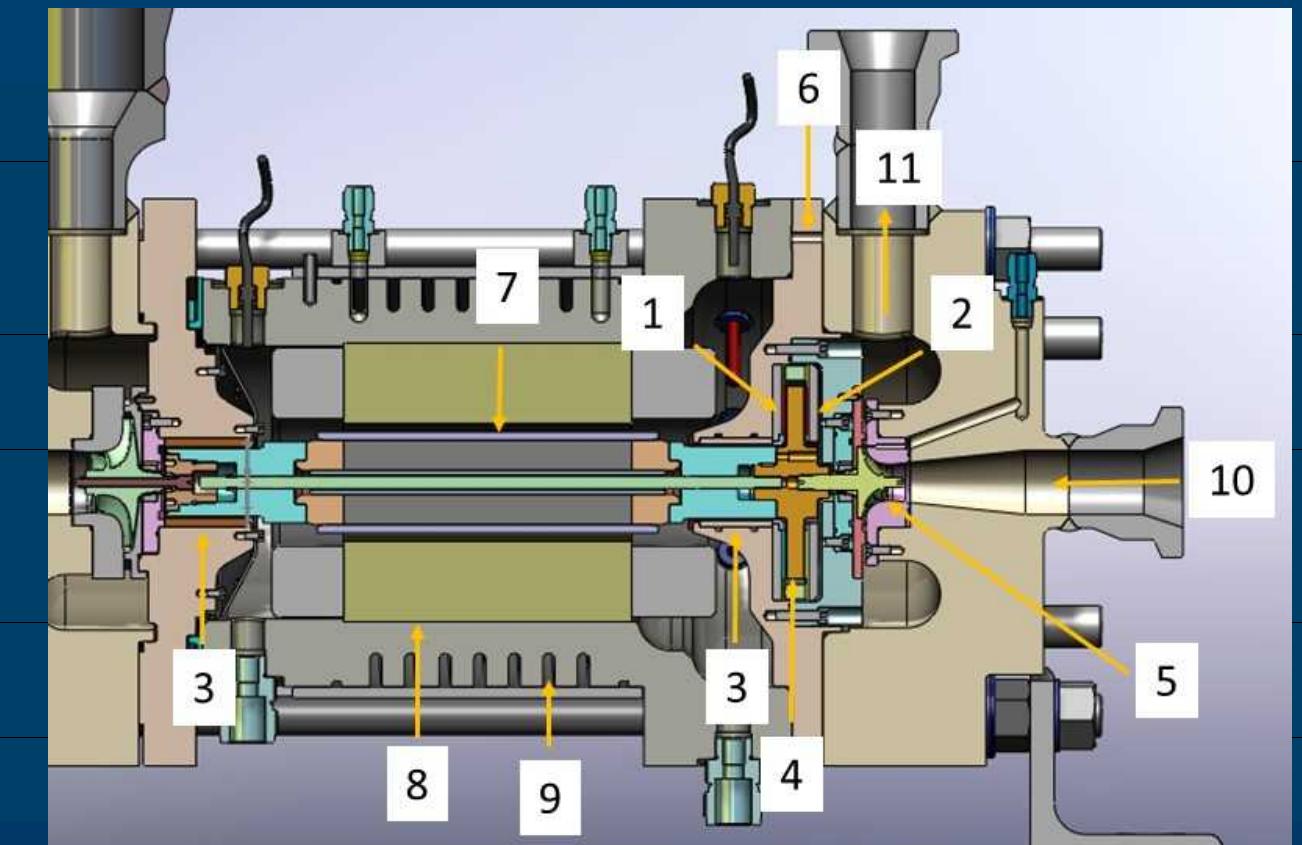
As one of Sandia's component test capabilities, the bearing test platform allows us to evaluate a variety of prototype designs under sCO<sub>2</sub> Brayton power cycle conditions.

### Features

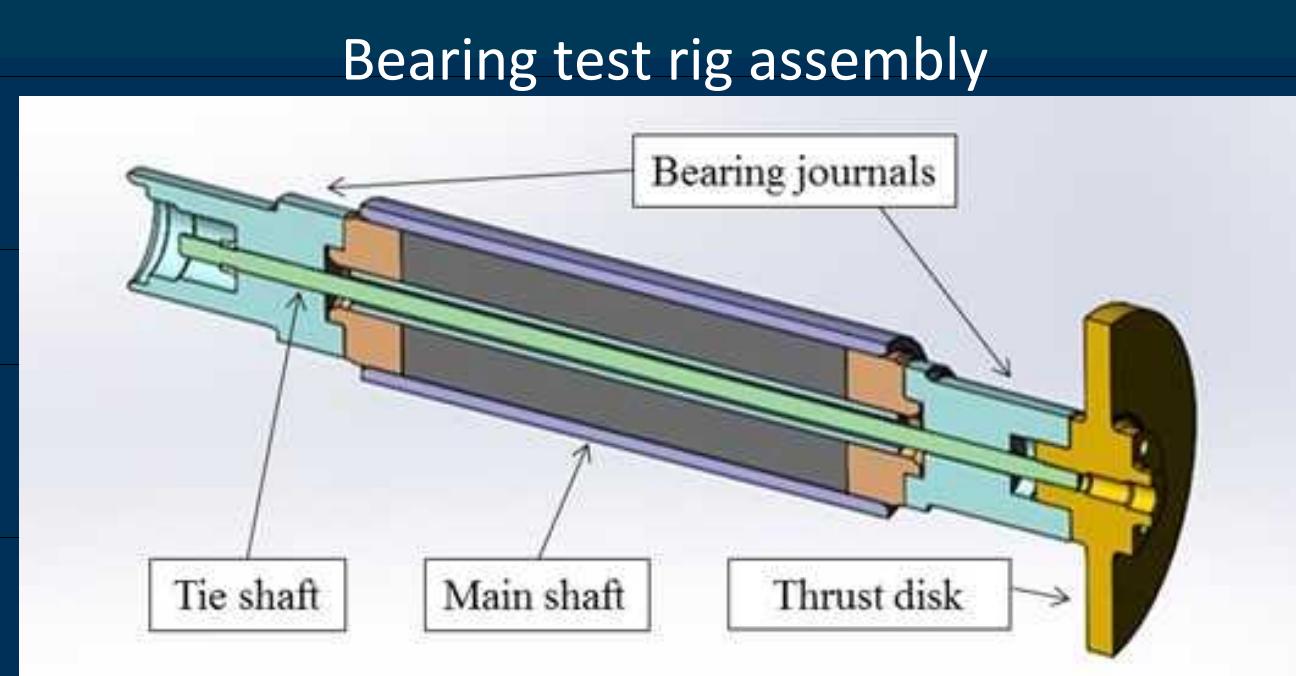
- 400°F (bearing specific)
- 1500 psig
- CO<sub>2</sub> and sCO<sub>2</sub> process gas
- 3.5 kg/s flow rate
- 40,000 rpm
- 2" shaft diameter
- Vibration monitoring



### Location of motor components



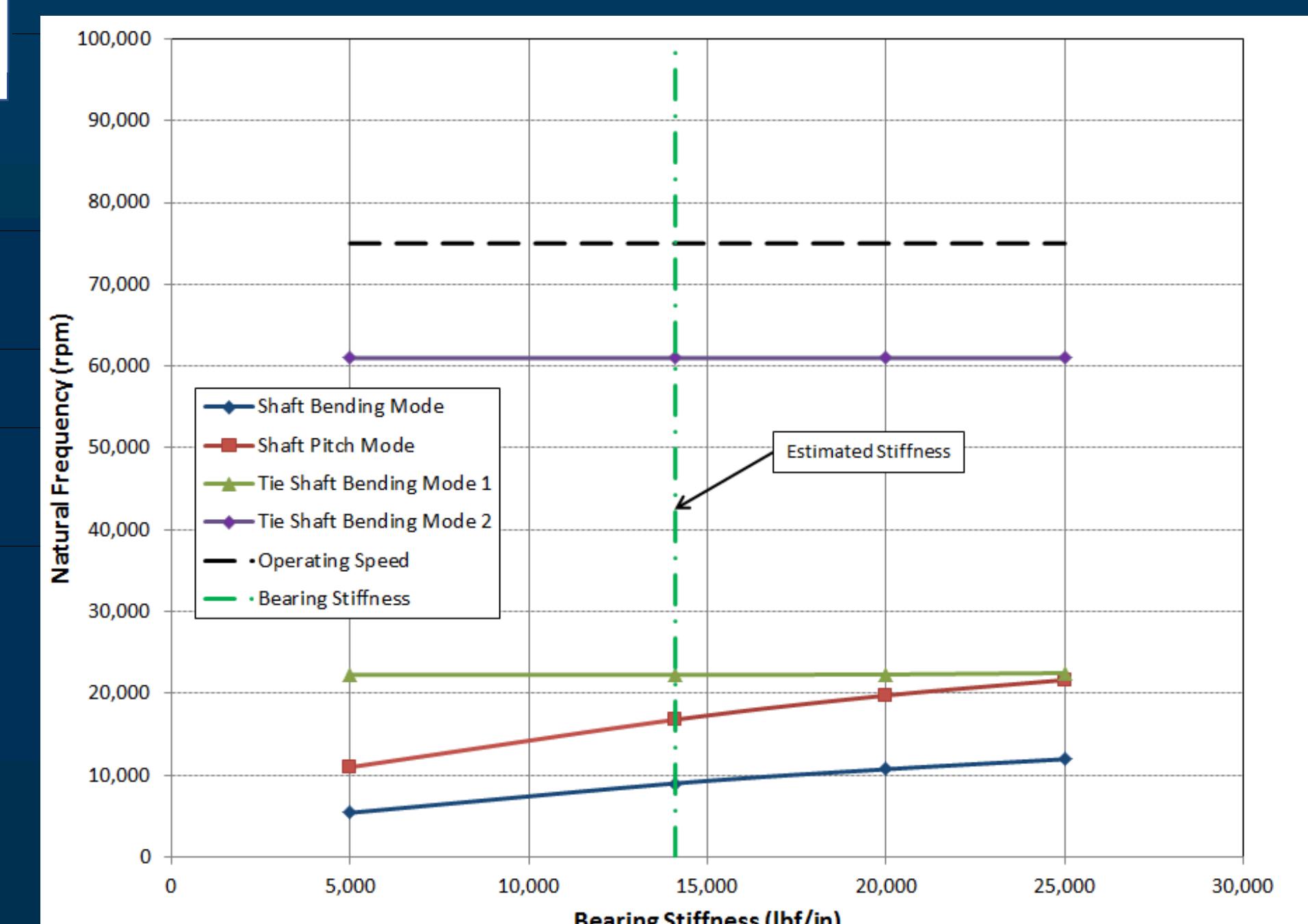
1,2	Thrust bearings	7	Rotor
3	Journal bearings	8	Coil windings
4	Thrust disk	9	Integrated cooling
5	Compressor wheel	10	Inlet
6	Bearing mounting plate	11	Outlet



Lateral rotordynamics analysis performed on bearing test rig assembly to ID system natural frequencies

### Rotordynamics

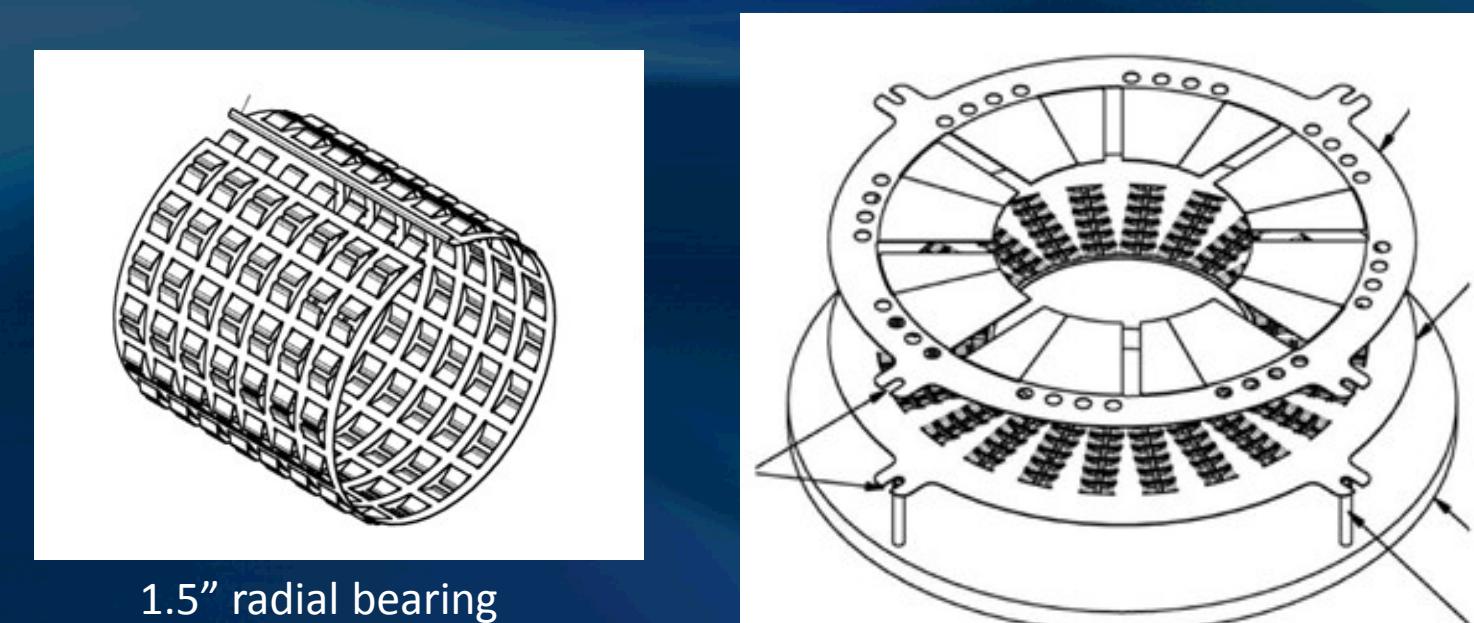
- Original Capstone bearing bump foils estimated to have 14,000 lb<sub>f</sub>/in stiffness with 4 lb<sub>f</sub>·s/in damping coefficient
- Shaft bounce (cylindrical) mode, shaft pitch (conical) mode, and both tie shaft bending modes do not overlap liftoff (25,000 rpm) or maximum theoretical speed (75,000 rpm)
- Shaft modes offer good opportunity to verify bearing properties
- For testing, unbalance will be introduced in the thrust disk using roll pins



### Current status

- Test platform shakedown and Capstone bearings benchmark testing are nearing completion
- Sandia has received Xdot prototype radial bearings for testing
- Sandia is working with Xdot on a thrust bearing design to double bearing thrust capacity

### Bearing prototypes



### Technical challenges

- Solvent nature of sCO<sub>2</sub> removes coatings and oils from bearing
- Few qualified bearings to operate in a sCO<sub>2</sub> environment



Journal bearing wear