

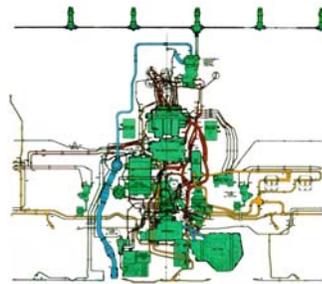


# MAGNETIC BEARINGS

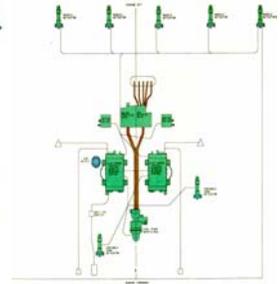
## PIONEERING TECHNOLOGY FOR THE NEXT GENERATION OF ROTATING EQUIPMENT

### Technological Advantages of Magnetic Bearings

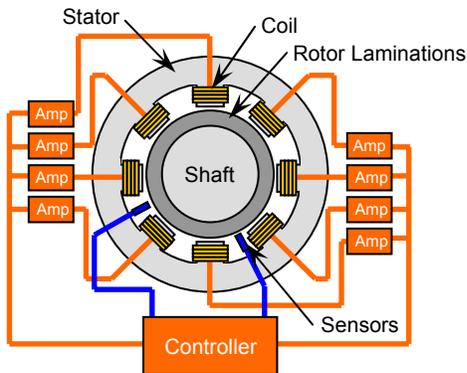
- Elimination of mechanical friction through non-contact forces
- Attainment and sustainability of high rotational speeds
- Longer life, less prone to failure
- Greater reliability, fewer maintenance needs, fewer failure incidents
- Lubrication systems and fluids not needed
- Ability to operate in vacuum and in adverse chemical and thermal environments
- Ability to exercise active control over the forces acting on the rotor
- Ability to acquire diagnostic information during operation



Conventional Oil Lubricated Engine Externals



Electromagnetic Engine Externals



### Parts of an Active Magnetic Bearing

- The rotor laminations and stator are made from a material with good magnetic properties throughout a wide range of temperatures and operating conditions
- Amplifiers are attached to coils around the stator
- Each amplifier/coil is individually controlled by the control system
- Current (directly related to magnetic force) for each coil is controlled as the shaft rotates.
- Allows to adjust stiffness, damping, and shaft position to thousands of an inch during operation – allowing easier speed transitions through system critical's

### Commercial, Military, and Aerospace Applications

- Flywheel batteries for kinetic energy and momentum storage
- Gyroscopes
- Compressors
- Turbomolecular vacuum pumps
- Machine Tools
- Petrochemical turbomachinery
- Specialized biomedical applications (e.g. heart pumps)
- Aircraft turbine engines
- More electric engines
- Auxiliary Power Units (APU)

