LEVONTO TECHNOLOGIES

Bearing-assist electric machinery.

Oil-Free, Bearingless Motors for Turbomachinery

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The Problem: Electrically-Driven Turbomachinery is Limited by its Bearings

Process Compatibility

Oil/Grease

Ball

Source: SKF

Journal

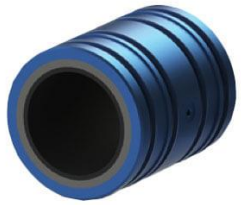
Source: Miba

Oil-Free

Gas Foil

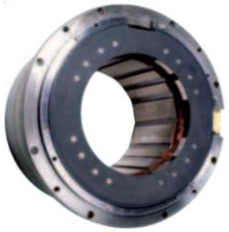
Source: Sulzer

Externally Pressurized



Source: Isotech

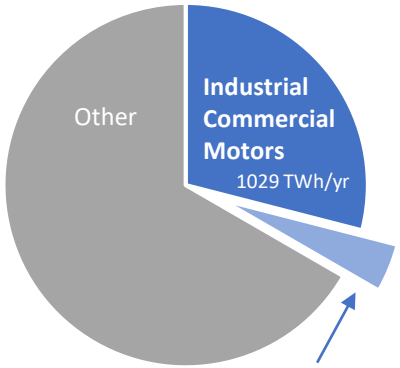
Magnetic



Source: S2M

Low Efficiency

USA Electricity Consumption per DOE



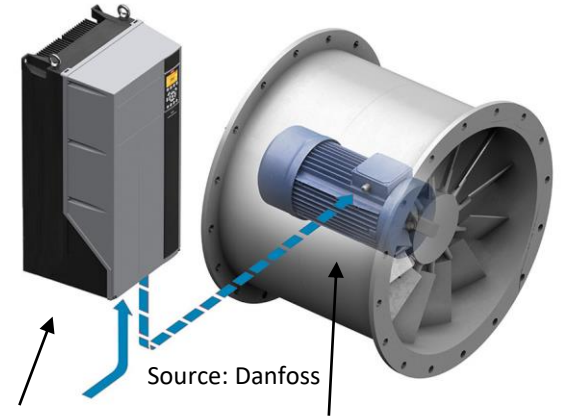
Variable Speed Drive (VSD) potential energy savings: 115 TWh/year

>11% of USA electricity!

Per DOE: VSDs are cost effective in >75% of systems, but only adopted in 10%.

Why?

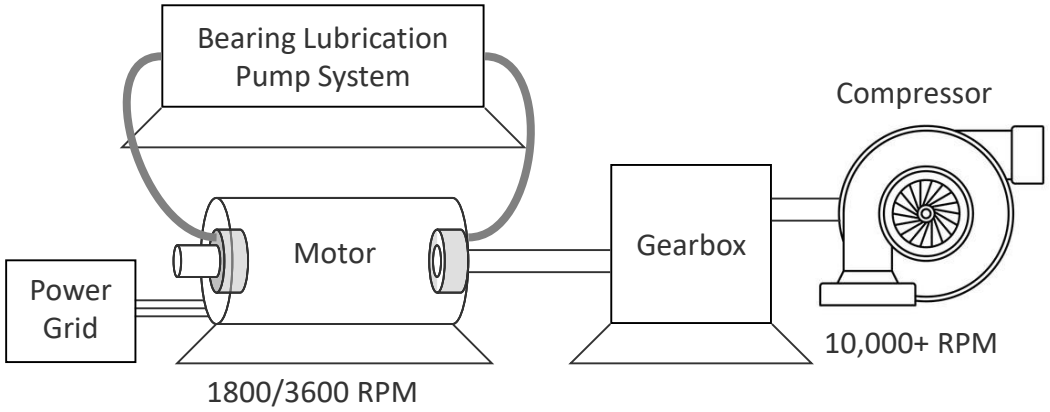
Limited Reliability



➔ VSDs increase motor failure rates by 3x
➔ 60% of motor failures due to bearings

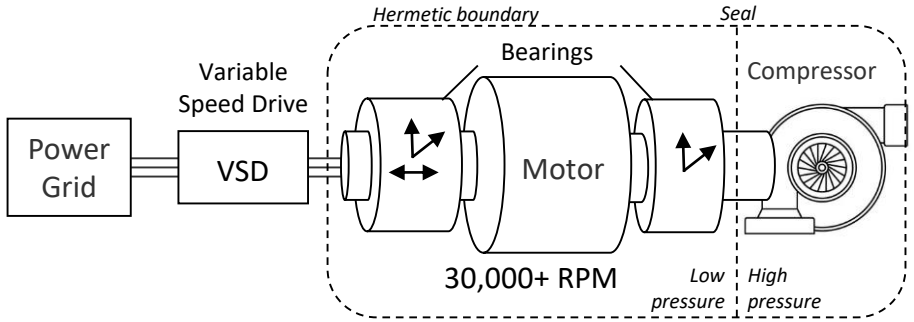
The Problem: sCO2 Power Cycles Make Turbomachinery Hard

Legacy Systems



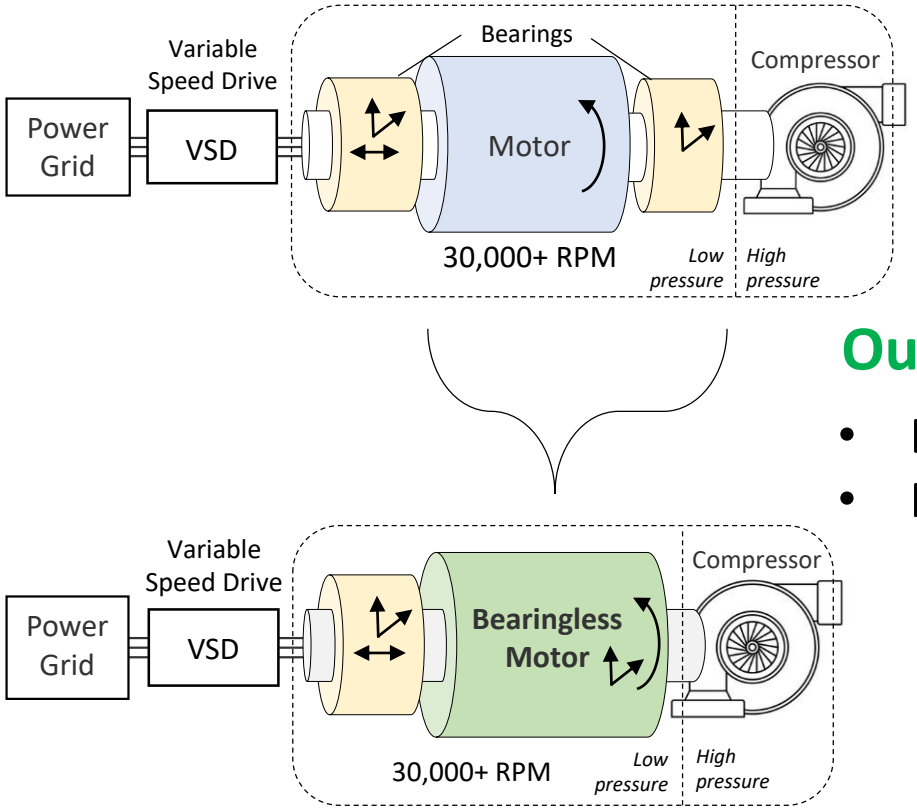
- Total system size is large
- Power density savings of sCO2 is lost
- Gearbox adds complication
- Dry gas seals are expensive

State-of-the-Art Systems



- Hermetic environment leads to smaller system size and takes advantage of sCO2 power density
- No gearbox
- Oil contamination issues requires different bearing technology: magnetic or foil bearings
- Requires pass-throughs through hermetic boundary

The Solution: Bearingless Motors for Sustainable High-Speed Machinery



Maglev Motor
(2 AMB + 1 motor)

Bearingless Motor
(1 AMB + 1 motor)

Our new approach:

- Enable variable speed drives without sacrificing bearing reliability
- Remove friction losses, while also removing oil lubrication

Motor + AMB = Bearingless Motor

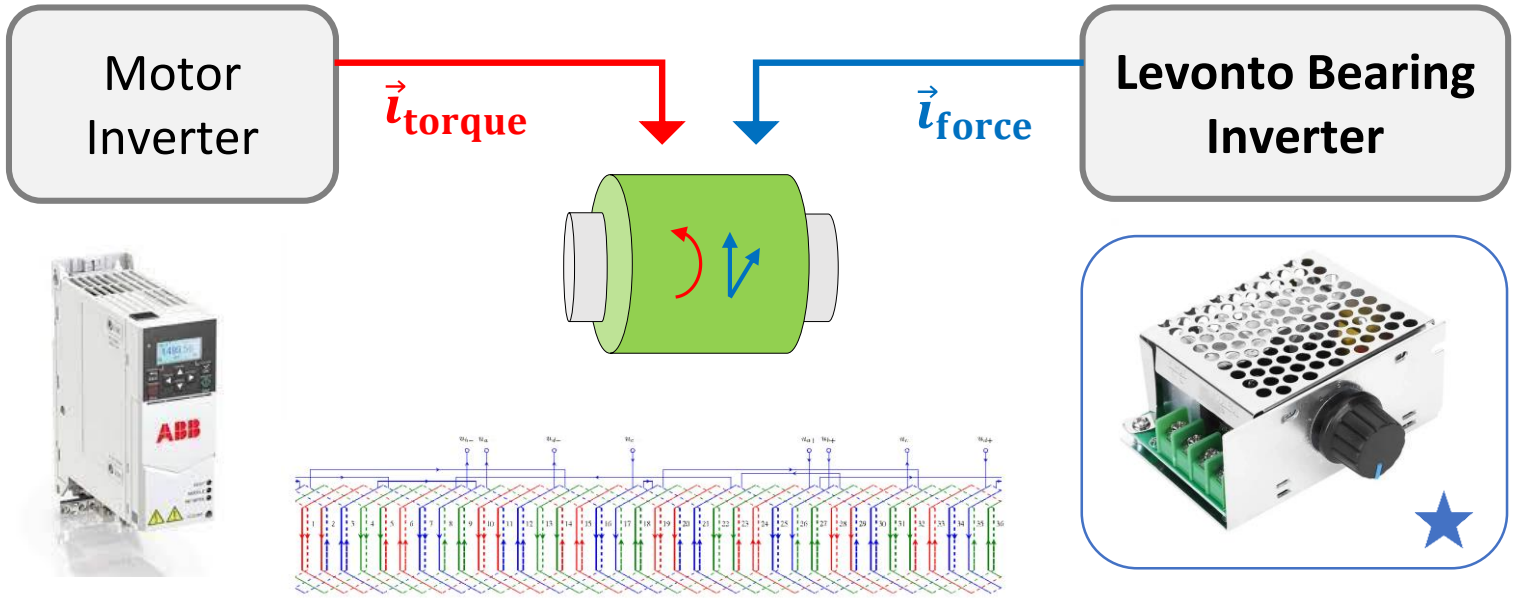
AMB: Active Magnetic Bearing

Bearingless motor technology enables cost-effective oil-free bearing solutions.

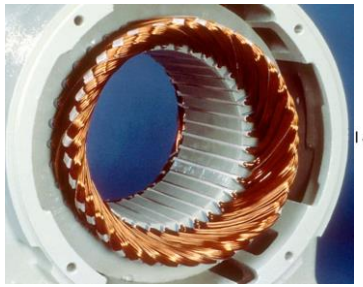
Levonto's Unique Motor Windings Enable Force Production on Rotor

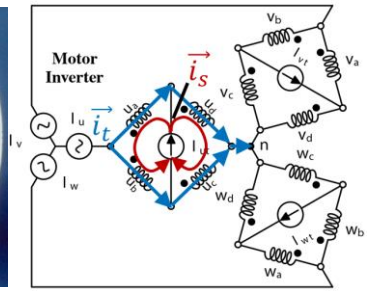
Standard 3-phase motor drive

Levonto electronics to create force



Source: ABB.com





Decoupled torque and force:

Motor drive does not need to know machine is bearingless.

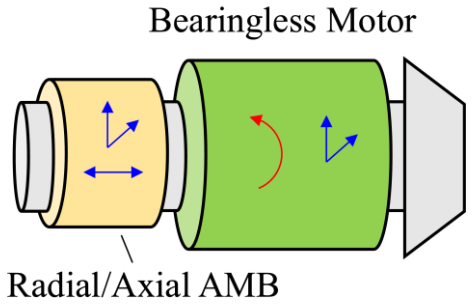
Specialized stator winding configuration required in otherwise conventional motor.

Technical Innovations

- ★ Standard VFD
- ★ Single stator winding
- ★ No performance degradation
- ★ Unload rotor weight with 5% power conversion reduction

Customer Application Approaches for Bearingless Motors

Approach #1: Bearing Removal



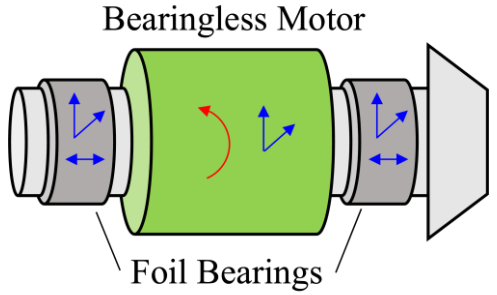
Replace existing motor *and bearing* with our technology

Value Proposition:

- Reduced size
- Less components
- Lower cost

Enables customers to be competitive in the market.

Approach #2: Bearing Assist



Replace existing motor with our technology

Value Proposition:

- Higher reliability
- More stability
- Better rotor dynamics

Enables customers to serve more markets.

Interested in Learning More? Contact Us!

www.levonto.tech

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