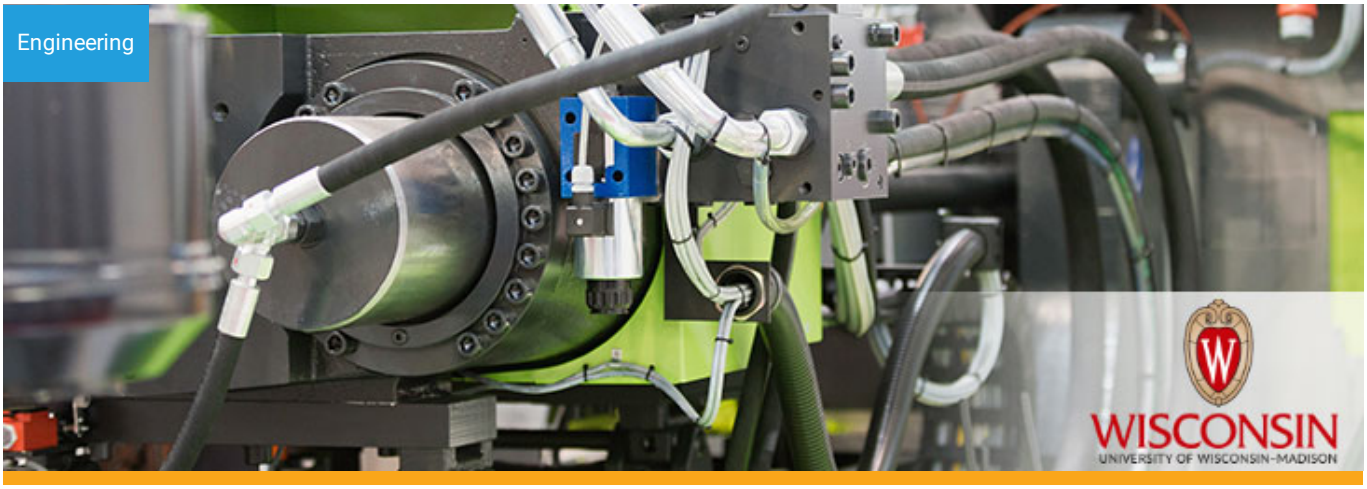
Engineering



New Capacitive Method for More Efficient Power Generation

View U.S. Patent No. 9,184,676 in PDF format.

WARF: P120094US01

Inventors: Daniel Ludois

The Wisconsin Alumni Research Foundation (WARF) is seeking commercial partners interested in developing a varying capacitance rotating electrical machine with increased power density.

Overview

Many commonly used machines require moving and stationary parts to generate electricity. Conventional rotating electrical machines utilize magnetic fields and/or a change in inductance between moving parts to produce electricity; however, moving parts such as slip rings require maintenance and create dust and arcing and magnetic-based generation is expensive and uses rare earth materials, depleting the limited supply.

Capacitive technology has been considered as an alternative method for power generation because of its various advantages over conventional methods including the elimination of magnets, ferrous materials and copper windings; higher operating speeds and temperatures; and higher efficiency of the machines overall. The biggest difficulty in designing capacitive rotating electrical machines is that they generally do not have the power density necessary for most applications unless they are extremely large. An improved method of capacitive power generation that maintains increased power density is needed.

The Invention

A UW–Madison researcher has developed a varying capacitance rotating electrical machine for an improved power generation system. The design comprises a rotor, stators, a spring element and conductive plates. The device utilizes capacitive coupling that is obtained between rotating and stationary capacitor plates by allowing one plate to float on a cushion of fluid (either air or liquid). These “air bearings” allow for much smaller gaps between the plates than existing methods. When combined with high rotational speeds, they enable an increase in power density.

Applications

- Wind turbines
- Electric generators
- Diesel engines
- HVAC systems

Key Benefits

- Provides high power densities for varying capacitance motors
- Potential 50 percent reduction in capital costs because no magnets, ferrous materials or copper windings are needed
- Operates at high speeds and high temperatures
- Machine electrical efficiencies greater than 99 percent are possible
- Does not require slip rings to communicate electrical signals to or from the rotor

- Capacitive plates are spaced only microns apart, reducing the required operating voltage

Additional Information

For More Information About the Inventors

- Daniel Ludois

Tech Fields

- Engineering : Electric machines
- Engineering : Power electronics & control systems

For current licensing status, please contact Emily Bauer at emily@warf.org or 608-960-9842