

Dissertation press release

14.09.2020

Design of self levitating magnet free machine

Title of the dissertation Design and Analysis of Bearingless Synchronous Reluctance Machines

Contents of the dissertation Electrical machine is a century old technology that not only has ever increasing presence from household to traditional industry, but also firming its presence in new sectors like marine, vehicle and flights. This brings the most important question for a mature technology like electrical machine – What NEXT? It is well known that one of the biggest challenges of any machine in its service life is its bearing, that limits machine operation as well as requires careful maintenances. So, a machine if operated without a bearing, will bring a significant progress in the technology. However, this will require to levitate the rotating part of the machine while running it. This dissertation explores different characteristics and challenges of a bearingless machine design and finally prototyped it for measurement verification.

In this work, a magnet free rotor is used to design the machine which makes it cheap, robust and easily manufacturable. The thesis focuses primarily to understand how the levitation of the rotor influences the electromechanical behaviour of the machine in comparison to the more traditional ones. Different machine models are built for this analysis. It is found that the levitation has a particular influence on the machine losses and vibration. Also, the machine design needs to ensure a smooth and sufficient levitation force production along with the desired output power. The models developed in this work can be also extended for traditional machines. Moreover, this type of machine can find its utility in high-speed applications and in specific cases where the machine needs to operate in abrasive conditions.

Field of the dissertation Electrical Engineering, Electromechanics

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Time of the defence 16.10.2020 time 12:00 noon

Place of the defence Remote link "<https://aalto.zoom.us/j/63847391102>"

Opponent Professor Olli Pyrhönen, Lappeenranta University of Technology, Finland

Custos Professor Anouar Belahcen., Aalto University School of Electrical Engineering, Electrical Engineering and Automation

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