Special Issue

High-Power-Density and High-Reliability Permanent Magnet Synchronous Machine Systems: Design, Control, Applications, and Sustainability

Message from the Guest Editors

Dear colleagues, Achieving both ultra-high-power-density and long-term reliability under extreme operating conditions remains a significant challenge. This Special Issue seeks to consolidate breakthroughs in materials, design methodologies, control strategies, and system integration that address these challenges while aligning with global sustainability goals. We welcome the submission focusing on the following topics:

Design Innovations:
-Compact PMSM topologies for extreme power density;
-Multi-physics co-design: Electromagnetic–thermal–mechanical coupling analysis and optimization.

Reliability Enhancement:
-Fault-tolerant control strategies;
-Degradation modelling and lifetime prediction under thermal/mechanical stress;
-Real-time condition monitoring and AI-driven predictive maintenance. High-Performance Control:
-High-frequency drive systems for ultra-fast dynamic response;
-Robust control under parameter uncertainties;
Applications and Sustainability:
-PMSM systems in electric aviation, deep-sea robotics, and high-speed rail;
-Recycling and eco-design of PMSM components (magnets, windings);
-Lifecycle assessment and circular economy strategies for PMSM production.

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Message from the Editor-in-Chief

Machines is an international, peer reviewed journal on machinery and engineering. It publishes research articles, reviews and communications.
Our aim is to encourage scientists to publish their experimental and theoretical results in as much detail as possible. There is no restriction on the length of the papers. Full experimental and/or methodical details must be provided.
There are, in addition, unique features of this journal: Manuscripts regarding research proposals and research ideas will be particularly welcomed; Electronic files or software regarding the full details of the calculation and experimental procedure - if unable to be published in a normal way can be deposited as supplementary material.

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