

Message from Editors

WITH the rapid development of aerospace, industrial robots, numerical control machine tool and other high-end equipment, electrical machine system, as the core power source, requires a higher torque performance. High torque density means that the machine has a smaller size and weight, which is critical in aerospace, electric vehicles and other applications where machine volume and mass requirements are stringent. In industrial robots and numerical control machine tools, low torque pulsation has an important effect on positioning accuracy and running smoothness. In this context, high torque performance machine system has gradually become an important research and development branch in the field.

However, high torque performance machine system contains many challenges. Limited by the current density and heat dissipation condition, the torque density of the machine is difficult to further breakthrough. In addition, the suppression of pulsation often leads to the decrease of torque density, and it is difficult to balance the high torque density and low torque pulsation. On the other hand, under the requirements of machine system integration development, the integration degree of the machine system is high, and multi-physical factors coupling effect become strong. Since the model accuracy of the machine system is poor, high-quality design and control is difficult to achieve. The above key problems pose severe challenges to the design, analysis and control of high torque performance machine systems.

To further promote the development of high torque performance machine systems, the joint efforts of industry and academia are needed to make breakthroughs in new machine topology, machine principle, application of new materials, optimization algorithms, advanced control strategy and so on. In addition, the influence of coupling factors of multi-physics fields such as electromagnetic-fluid-thermal on torque performances and multi-physics field analysis in high torque performance machine systems need to be deeply considered as well.

The special issue (SS) “High Torque Performance Machine Systems” is aimed to help and progress high torque performance machine systems by providing a forum for both academia and industry to exchange their experience and latest research. Five selected papers are included in this SS at first, and a few more in later issues. These papers embody the advantages and application prospects of high torque performance machine systems.

We would like to take this opportunity to express our gratitude to the authors, reviewers and editors for their support and understanding throughout the paper submission and review process. It is our hope that this special issue could excite more interests and bring valuable ideas on the advanced high torque performance machine systems, and the valuable research results of related researchers will contribute to a safer, happier and brighter future for humanity.

Professor Wenxiang Zhao
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Guest Editors

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