Comparative Study on Field-Pole Magnetic Circuits and Output Characteristics of Rim-Drive Rotating Machines

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Abstract

The reduction of CO_2 emissions in maritime and port sectors has become an urgent issue, driving the need for electrification and highly efficient rotating machines. In this study, we investigate rim-drive rotating machines incorporating high-temperature superconducting (HTS) technology as a pathway toward carbon-neutral ports.

A kW-class HTS rim-drive prototype was designed using sREBCO-coated conductors, and detailed finite element method (FEM) analyses were conducted to evaluate its electromagnetic characteristics under port-relevant operating conditions. Comparative simulations examined the impact of different magnetic circuit structures and field-pole configurations.

These comparisons indicate that superconducting configurations can provide higher output density and efficiency, while also introducing challenges. These findings clarify performance trade-offs across magnetic circuit structures and highlight the potential of compact, high-efficiency HTS rim-drive machines for next-generation port applications.

This presentation will focus on the design methodology, comparative evaluations, and practical implications for deploying superconducting rim-drive rotating machines in carbon-neutral port infrastructure.

References

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