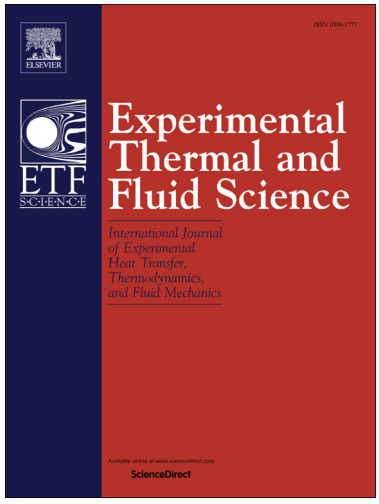

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PII: S0894-1777(16)30277-1
DOI: http://dx.doi.org/10.1016/j.expthermflusci.2016.10.005
Reference: ETF 8891

To appear in: *Experimental Thermal and Fluid Science*

Received Date: 15 March 2016
Revised Date: 24 August 2016
Accepted Date: 2 October 2016

Please cite this article as: S. Wang, Y. Li, Y-Z. Li, J. Wang, X. Xiao, W. Guo, Conception and experimental investigation of a hybrid temperature control method using phase change material for permanent magnet synchronous motors, *Experimental Thermal and Fluid Science* (2016), doi: http://dx.doi.org/10.1016/j.expthermflusci.2016.10.005

Conception and experimental investigation of a hybrid temperature control method using phase change material for permanent magnet synchronous motors

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Abstract

The big temperature rising is the principle problem that constrains the application of the permanent magnet synchronous motors with high power density in more-electric aircrafts and all-electric aircrafts. This paper proposed a novel conception of a hybrid temperature control method using phase change material for the permanent magnet synchronous motors. The design models of a hybrid cooling casing in cylinder-shape were developed, and a prototype case optimized with paraffin as the phase change material was built. A set of experimental equipment was constructed to verify the thermal managing performance of the hybrid cooling method. The impacts of different heat loads and various working duty cycles on the cooling effectiveness of the casing were analyzed experimentally and parametrically. Results indicate that the hybrid temperature control method performs well in extending the duration of work time and decreasing the temperature rising of the motor, and the design models developed in this paper could be suitable in designing other parallel systems.

Keywords: Temperature control, experimental study, phase change material, permanent magnet synchronous motors, more electric aircrafts