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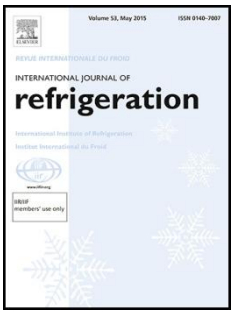

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Performance Evaluation of an Active Magnetic Regenerator for Cooling Applications - Part II: Mathematical Modeling and Thermal Losses

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Highlights

- Main loss mechanisms in AMRs are quantified via a two-temperature porous medium model
- The model was validated using an extensive experimental database presented in Part I
- Casing heat transfer and dead volumes are the main factors affecting AMR performance
- Thermal insulation is an important aspect in the design and evaluation of AMRs

Abstract

In this second part of a two-part paper, a mathematical model of active magnetic regenerators is applied to identify and quantify the main losses taking place in the AMR evaluated experimentally in Part I. Among those losses, the heat interaction with the external environment and the presence of dead (void) volumes between each end of the regenerator and the hot and cold heat exchangers were found to be the main factors that affect the AMR performance. Demagnetizing losses were considered as a function of the matrix geometry, temperature and applied magnetic field. In addition to predicting the time-dependent behavior of the fluid temperature exiting the regenerator during each