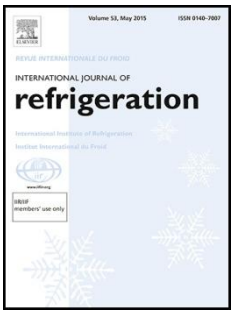
Accepted Manuscript



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PII: S0140-7007(16)30217-1
DOI: http://dx.doi.org/doi: 10.1016/j.ijrefrig.2016.07.009
Reference: JIJR 3382

To appear in: *International Journal of Refrigeration*

Please cite this article as: Paulo V. Trevizoli, Alan T. Nakashima, Guilherme F. Peixer, Jader R. Barbosa Jr., Performance evaluation of an active magnetic regenerator for cooling applications - part I: experimental analysis and thermodynamic performance, *International Journal of Refrigeration* (2016), http://dx.doi.org/doi: 10.1016/j.ijrefrig.2016.07.009.

Performance Evaluation of an Active Magnetic Regenerator for Cooling Applications - Part I: Experimental Analysis and Thermodynamic Performance

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Highlights

- The performance of an active magnetic regenerator (AMR) test apparatus is discussed
- Tests with 195.5 g of Gd gave a maximum cooling capacity of 53.7 W at 1 Hz
- Maximum system temperature spans of the order of 30 K were obtained.
- Peak values of COP and η_{2nd} were found in terms of utilization and frequency.

Abstract

In this first part of a two-part paper, a new active magnetic regenerator (AMR) laboratory apparatus is presented and evaluated. The setup is composed of a nested Halbach cylinder magnetic circuit (maximum magnetic flux density of 1.69 T) assembled in phase with a double effect displacer that provides the cold and hot blows to the regenerator. A single packed-bed regenerator with 195.5 g of gadolinium spheres is used in a discontinuous (i.e., reciprocating) cycle. The system performance is evaluated in terms of characteristic curves (i.e., cooling capacity as a function of temperature span), coefficient of performance and second-law efficiency as a function of the utilization factor and operating frequency. Maximum values of *COP* have been identified for a given