DEVELOPMENT AND EXPERIMENTAL RESULTS FROM A 1 kW PROTOTYPE AMR

C.R.H. BAHL[(a)*], K. ENGELBRECHT[(a)], D. ERIKSEN[(a)], J.A. LOZANO[(a)], R. BJØRK[(a)], J. GEYTI[(a)], K.K. NIELSEN[(a)], A. SMITH[(a)], N. PRYDS[(a)]
[(a)] Department of Energy Conversion and Storage
Technical University of Denmark (DTU)
Frederiksborgvej 399, DK-4000 Roskilde, Denmark
*e-mail: chrb@dtu.dk

ABSTRACT

A novel rotary magnetic refrigeration device has been designed and constructed following the concepts recently outlined in Bahl et al. (2011). The magnet and flow system design allow for almost continuous usage of both the magnetic field and the magnetocaloric material in 24 cassettes, each containing an active magnetic regenerator (AMR) bed. As outlined in Pryds et al. (2009) a small scale AMR test device has been used for materials choice and optimising operation, with each component being thoroughly characterised and tested before implementation.
The prototype design facilitates easy exchange of the 24 cassettes, allowing the testing of different material amounts and compositions. Operating with 2.8 kg of commercial grade Gd spheres a maximum no-span cooling power of 1010 W and a maximum zero load temperature span of 25.4 K have been achieved. For the purpose of actual operation simultaneous high span and high performance is required. At a heat load of 200 W a high temperature span of 18.3 K has been obtained, dropping to a span of 13.8 K at the higher heat load value of 400 W.
Further, the high performance of graded perovskite ($La_{0.67}(Ca,Sr)_{0.33}MnO_3$) regenerators will be shown and the route from small scale two-material experimental tests towards full implementation of six-materials regenerators will be outlined.

REFERENCES

Bahl, C.R.H., Engelbrecht, K., Bjørk, R., Eriksen, D., Smith, A., Nielsen, K.K., Pryds, N., 2011, Design concepts for a continuously rotating active magnetic regenerator, *International Journal of Refrigeration*, 34, 8, 1792-1796.

Pryds, N., Bahl, C.R.H., Smith, A., Do simple magnetic refrigeration test devices lead to more successful prototypes?, Third IIF-IIR International Conference on Magnetic Refrigeration at Room Temperature, Des Moines, Iowa, 2009

Corresponding author	First name: Christian R. H.	Last name : Bahl
	E-mail address: chrb@dtu.dk	
Topic	Devices	