

SENIOR DESIGN ORGANIZATION SYNOPSIS – SPRING 2013

MAGNETOCALORIC REFRIGERATION

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Faculty Advisor: Dr. Boesl

Abstract

The magnetocaloric effect refers to the thermal behavior of certain materials when exposed to a magnetic field. The magnetocaloric alloys used were developed by Dr. Benjamin Boesl and a team of graduate students at Florida International University. The material specimen is maneuvered in and out of a magnetic field and paired with various heat exchangers in order to produce a refrigeration cycle. Thermo-fluid analysis, as well as mechanical design, of the apparatus were simulated and tested.

Objective

The objective of this project was to design a device which would cyclically magnetize a magnetocaloric material of choice and then employ various heat exchangers. With the use of various heat exchangers, this cycle produced classic refrigeration effects without the use of potentially harmful refrigerants.

Project Timeline & Division of Labor

Task Name	Members	Start Date	End Date	Q1			Q2			Q3			Q4		
				Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
<input checked="" type="checkbox"/> Magnetocaloric Refrigeration		01/07/13	11/22/13	[Red bar spanning all quarters]											
Project Formulation	EG-ML-FI	01/07/13	02/06/13	[Orange bar]											
Research & Development	EG-ML-FI	02/06/13	05/31/13	[Yellow bar]											
Conceptual Design	ML-FI	03/11/13	04/19/13	[Green bar]											
CAD Model	EG	04/01/13	04/19/13				[Purple bar]								
Software Simulation	ML-FI	04/15/13	04/25/13				[Brown bar]								
Proof of Concept	ML	04/30/13	05/14/13				[Black bar]								
Design Optimization	EG-ML-FI	05/01/13	05/29/13				[Orange bar]								
Component Testing	FI	06/01/13	07/05/13				[Yellow bar]								
Prototype Fabrication	EG-ML-FI	07/01/13	09/27/13				[Green bar]								
Prototype Testing	EG-ML-FI	08/26/13	10/18/13							[Blue bar]					
Prototype Optimization	EG-ML-FI	09/23/13	11/08/13										[Purple bar]		
Final Report	EG-ML-FI	07/01/13	11/22/13							[Brown bar]					

Expected Outcomes

- ✓ Design and manufacture a mechanical device which will circulate a material specimen into and out of a magnetic field
- ✓ Design and manufacture efficient heat exchangers
- ✓ Optimize design and evaluate all data collected
- ✓ Finalize manufacturable product ready for proposal