University of Twente
Engineering Technology – Thermal Engineering

Climate change is fake.

You don't think so ?

Then you can help in building a sustainable world by finding an effective way to pump a magnetic-fluid with no moving parts for your master thesis.

What	Experimental design and characterization of a magnetic fluid flow loop. This is a crucial step to realize an efficient room-temperature Magnetic Refrigerator (MR).
Why	MR is ≈ 10 to 20%[1] more energy efficient than the present dominant technology - Vapour Compression (VC). Unlike VC, MR doesn't use any substances with global warming impact.
How	Using commercial, and a self-prepared magnetic fluid.
When	As soon as possible

Brief Description:

Energy required for Refrigeration and Air-Conditioning (RAC) is a significant portion of the total energy consumed worldwide. Presently, Vapour Compression (VC) is the dominant technology used for RAC. It uses harmful refrigerants, and it has reached a matured level, meaning no radical improvements could be expected in it. Among the many alternatives, Magnetic Refrigerator (MR) that works on the principle of Magneto-Caloric Effect (MCE) is a promising candidate.

MCE: There are certain materials whose temperature rises when brought into a magnetic field, while it reduces on removal of the magnetic field. In MR, extensive research has been focused on using the so called Active Magnetic Regenerator (AMR) that involves moving mechanical parts. In our research group, we are designing a MR with no moving parts to improve the system efficiency. For this, we utilize nanoparticles of magnetic materials suspended in a carrier fluid. The fluid motion is achieved by self-pumping using unsteady magnetic fields, which also leads to heating of the nanofluid, a detrimental effect. Your master thesis would focus on interplay between magnetic fields and their heating effect on the nanofluid. Specifically:

a. Literature survey on pumping strategies of magnetic fluids.
b. Identification of critical parameters to test and design of flow loop.
c. Development of a fluid flow test rig.
d. Design and test different flow loops to achieve minimal heating effect in the nanofluid.
e. Report writing - at the end of each of the above tasks.

If you are interested to know more or just wanted to have a chat about the possibilities, send an email to k.rajamani@utwente.nl and we could fix a time to discuss further.

Supervision: Prof. Dr. Ir. Theo van der Meer, Dr. Mina Shahi, and Ir. Keerthivasan Rajamani.

Reference: 1. Gschneidner, K. A.; Pecharsky, V. K., Thirty years of near room temperature magnetic cooling: Where we are today and future prospects. International Journal of Refrigeration 2008, 31 (6), 945-961.