

Student: Ogwuafi Ineme- Awaji

Title of the thesis: Design and optimization of a thermo-electrical converter for energy harvesting from water heaters

Evaluation: C - Good

Mr. Ogwuafi Ineme- Awaji has done a good job for his final project. His goal was to develop a system to harvest electrical energy from hot water which is otherwise left cooling down naturally dispersing its energy as heat to the environment (for instance after making infusions).

The purpose to harvest energy using a peltier generator for instance for charging a mobile phone or similar devices, thus he had to produce electricity to a voltage level of 5 V with some hundreds of mA current.

Mr. Ogwuafi Ineme- Awaji has made some calculations to pick up the heat sink to be used for the cold side of the Peltier generator and he verified how they performed using a thermal camera.

Then he characterized the dependence of the voltage produced by the peltier generator vs. time together with the temperature difference ΔT of between the two sides of the generator caused by filling up the cup with boiling water to verify that the Voltage produced was enough to be used for a step-up converter to produce 5 V to charge the mobile phone.

Since it appeared the voltage was enough he tried to charge up the phone using the step-up converter but this failed because the voltage was not enough once the generator was loaded.

Thus he decided to move to a two-step approach: first use the peltier generator to charge a battery and then use the battery with another step-up generator to produce the 5 V to charge the mobile phone.

The system works and the efficiency is decent. The systems used by Mr. Ogwuafi Ineme-Awaji for his project were off-the-shelf devices, mainly evaluation boards for step-up converters. His main contribution was to design the system by selecting components available on the market, make some calculations to estimate how they were gonna work and create measurement systems to evaluate the efficiency of the system.

I would have given as evaluation B but eventually I decided to give C for two reasons:

- the student still required extensive guidance in conducting the experiments;
- the thesis could have been written in a better way (despite multiple iterations it still looks a bit messy).

Prague, May 27th 2022

doc. Ing. Mattia Butta, Ph.D.