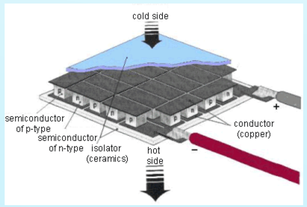
Thermal Energy:
Converting Heat to Electricity

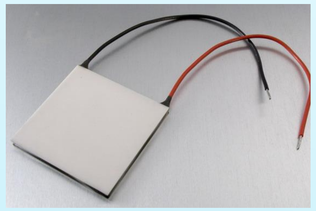
UCI Samueli School of Engineering

Background

In 1834, Jean Peltier discovered that putting a current through a junction between two conductors will cause heat generation. Reversing the effect will result in thermoelectric generation with the use of the Seebeck effect.



Peltier Components



Simple Peltier Design

Goal & Objectives

- Design a body-heat-powered flashlight that will be powered solely from the heat of a human hand.
- Test and analyze different internal fluids & materials for most effective power output
- Achieve an average power output of 2 mW

The Big Picture

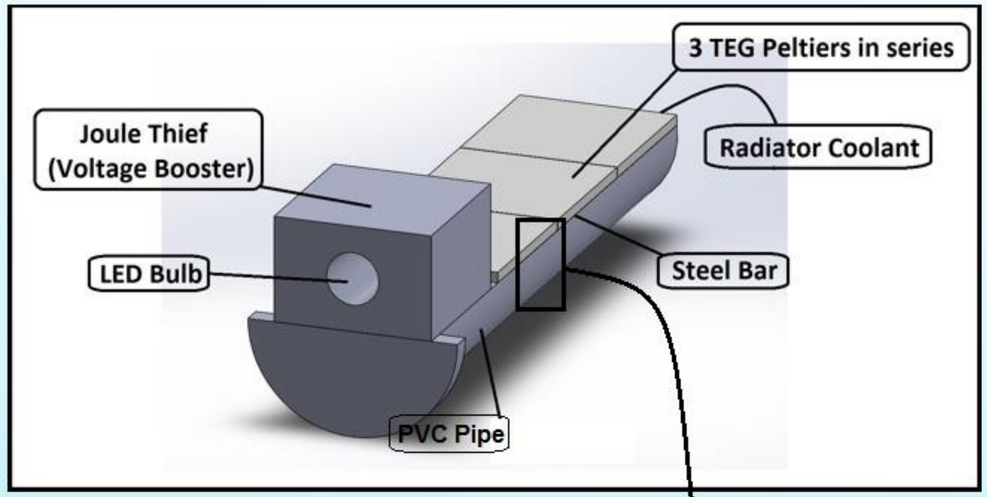
Body-powered flashlights will be useful in situations where electricity & batteries aren't available. Flashlights in survival kits can have depleted batteries and may not be readily available in an isolated environment.

Specifications

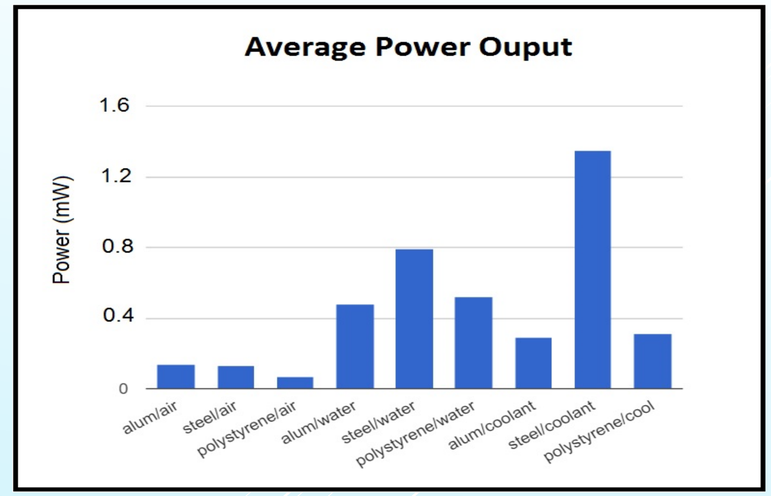
- Full length less than 12"
- 3 Peltiers connected in series
- Replaceable base for Aluminum, Steel, & Plastic
- Resealable fill hole for Air, Water, & Coolant
- Joule thief for voltage boost

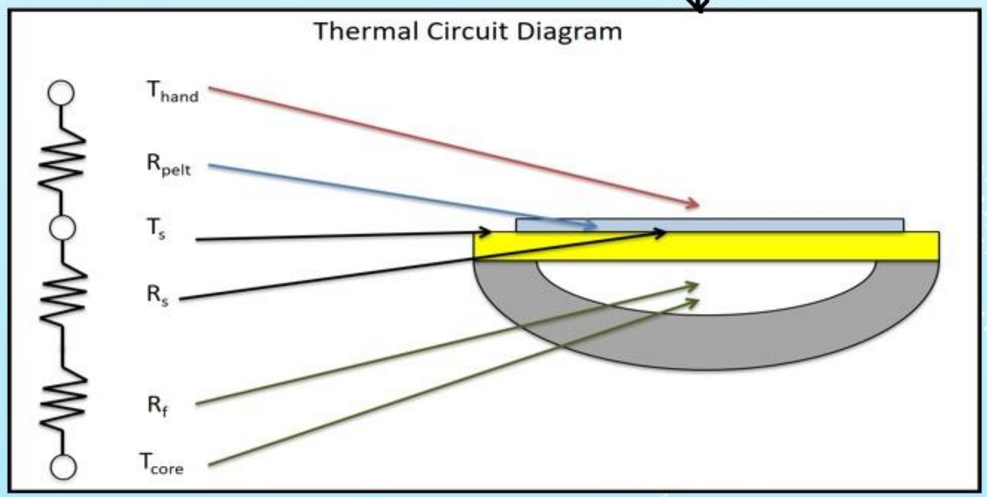
Design & Current Status

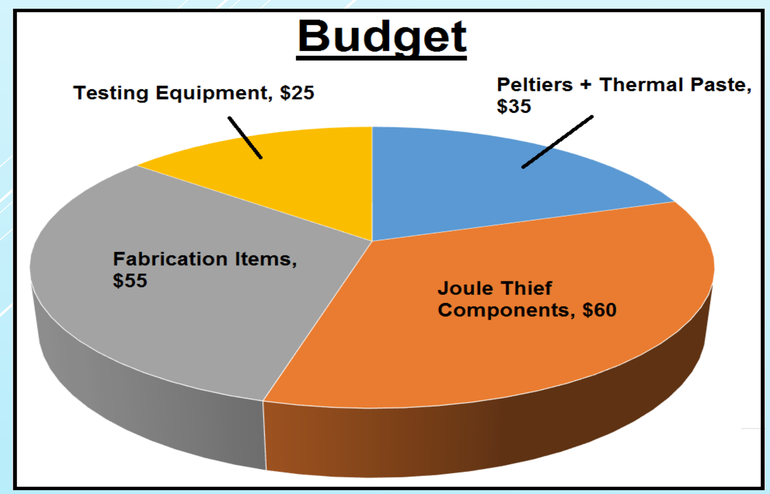
- Testing 3 different fluids with 3 different materials
- Fabrication of 3 prototypes completed
- Tests for Al, Steel, Plastic vs Air, Water, Coolant completed
- 100 second tests were run for power vs time. The power peaks and exponentially decays
- Larger temperature difference for higher power output (~11.9 °F)
- Next step is to improve the step-up voltage regulator (Joule Thief)

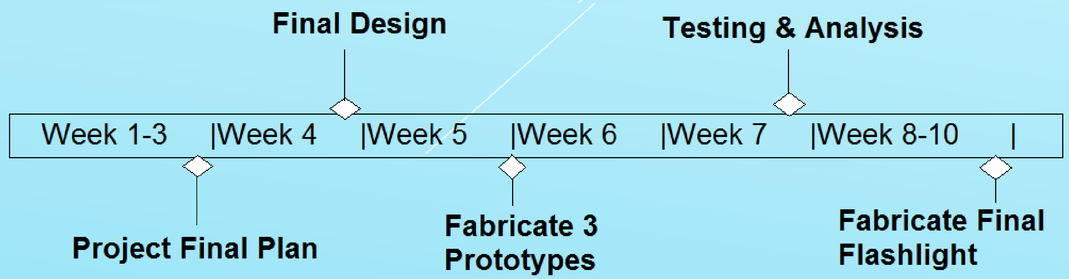


Final Flashlight Design









Team Members

Henry Mak – Team Lead
Victor Chen – Fabrications Lead
Xiaoqian Wang – Test Lead
Nate Chan – Research Expert
Prof. Yun Wang & Jaeho Lee - Advisors

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