Proceedings of the International Conference on Industrial Engineering and Operations Management
Toronto, Canada, October 23-25, 2019

Temperature Regulation of the Human Body using Thermoelectric Peltier Modules

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Abstract

Thermoelectric Peltier is a solid-state module that functions based on P and N type semi conductive elements. The thermoelectric module can lower temperatures through the Peltier effect, wherein applied voltage and current results in a transfer of heat from one side of the module to the other. Optimal positioning of the Peltier module on a person's neck would allow localized cooling of the carotid arteries, which supply blood to the brain. The maximization of the module's surface area also maximizes the cooling time for a given use period. To wick away heat from the deposited end several methods were tested. The bare module, with a fan, aluminum plate, and a combination of both with thermal compound were tested. Bare Peltier temperatures reached a minimum of 61.1 °F with a maximum of 90.9 °F in a room that was roughly 75 °F. These data points were taken over 5-minute sessions at 5 second intervals. With the bare module, the lowest temperatures only lasted for 100 seconds before surpassing the starting temperature. With the combination cooling elements test, the minimum temperatures lasted for nearly the entire 5-minute duration. That resulted in 3 times longer cooling compared to the bare Peltier. The best results from testing included adding thermal compound with an aluminum plate and a cooling fan to the module. This resulted in a minimum temperature of 45.2 °F and a max temperature of 74.3 °F. This had a difference of nearly 16 °F for both minimum and maximum values.

Keywords: Peltier, Thermoelectric, Temperature

Biography

Brandon Soundara is an undergraduate at Middle Tennessee State University. He is currently working on his B.S in Mechatronics Engineering with a minor in Mathematics. Brandon had previously interned at Althea US as an industrial electronics technician repairing MRIs, CT scanners, and X-ray machines. Currently, he works with Blakely Construction Services as a contractor for Tennessee Government's Metro Water Service as an industrial electronics technician.