Contribution ID: **29** Type: **not specified**

Experimental investigation on thermoelectric cooler to evaluate the efficiency of a passive temperature harmonization device

Thursday, 20 November 2025 09:45 (15 minutes)

Abstract. The Peltier modules are used for small scale cooling and refrigeration purposes at both domestic and industrial sectors. Portable refrigerators operated by Peltier element have been constructed, and experiments are conducted on air or/and water as coolants on module efficiency using water pump or fans, but the forced heat dissipation systems used poses problems that limit its application. In this study, experimental approach is used to evaluate the possibility to homogenize temperature in a box using a passive component such as an aluminum tube to evaluate a thermoelectric cooler efficiency. It was revealed that, in the laboratory conditions, the aluminum tube mode is more efficient than module only mode. The introduction of aluminum tube has created two zones (a colder zone inside and a less cold zone outside the aluminum tube). The COP value of aluminum tube mode is approximately 35% - 250% higher than that of module only mode. The introduction of the tube has improved heat exchange, homogenized, and lowered considerably the temperature within the cool box.

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Session Classification: Thursday Morning I

Track Classification: AfPS