



PERFORMANCE OF A PORTABLE THERMOELECTRIC WATER COOLING SYSTEM

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ABSTRACT

A water cooling system based on Peltier Effect has many benefits as being small in size, portable, noiseless, environmental friendly and economical compared to conventional cooling systems. This research focuses on the thermal performance experimental study of a portable thermoelectric water cooling system. During this study, the applied voltage on TE was changed to determine its effect on thermal performance. When the applied voltage increases, the hot side temperature increasing, while on the contrary of that appear on the cold side. This increasing the heat absorbed by the cold side as well as the heat rejected from the hot side, while the coefficient of performance decreasing with increasing applied voltage. The thermal resistance of heat sink is inversely proportional to the applied voltage. The increasing of heat sink fan speed has improved the system performance, where it leads to an increasing in heat absorbed by the cold side and the heat rejected from the hot side. Initial water temperature has a significant effect on the performance of TE water cooling system. The coefficient of performance equal to 0.14 when using initial water temperature of 15°C, while, it increase to be 0.5 when the initial water temperature increases to 30 °C. That is happened due to the decrease in temperature gradient between cold side and hot side.

Keywords: thermoelectric cooler, TEC, Peltier Effect, Coefficient-of-performance, heat sink.

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1. INTRODUCTION

In the Middle East, the temperatures rise significantly especially in summer, therefore cold water is an urgent necessity. Since the means of cooling the water is not readily available in all places, therefore, the provision of a way to cool the water being a small and can be carried easily became a necessary. A cooling system based on Peltier Effect is the best solution where