Faculty of Electrical and Electronic Engineering Technology

DEVELOPMENT OF PORTABLE COOLER AND WARMER FOOD CARRIER USING PELTIER

SARVINDRAS A/L SELVARAJA

Bachelor of Electronics Engineering Technology with Honours

2021

DEVELOPMENT OF PORTABLE COOLER AND WARMER FOOD CARRIER USING PELTIER

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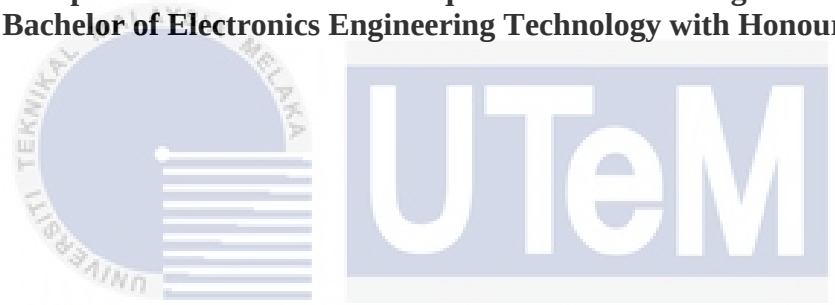
A project report submitted
in partial fulfillment of the requirements for the degree of
Bachelor of Electronics Engineering Technology with Honours



Faculty of Electrical and Electronic Engineering Technology

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA
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Tajuk Projek : DEVELOPMENT OF PORTABLE COOLER AND WARMER FOOD CARRIER USING PELTIER

Sesi Pengajian : 2021

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I declare that this project report entitled "DEVELOPMENT OF PORTABLE COOLER AND WARMER FOOD CARRIER USING PELTIER" is the result of my own research except as cited in the references. The project report has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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I hereby declare that I have checked this project report and in my opinion, this project report is adequate in terms of scope and quality for the award of the degree of Bachelor of Electrical Engineering Technology with Honours.

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Co-Supervisor :

Name (if any)

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DEDICATION

I like to dedicate this thesis to my beloved parents because they have supported me fully since I started to do this thesis. Their love and support have made me more confident to do this thesis.

ABSTRACT

Microcontroller-based automated temperatures configurations for food are now being planned and built. The thermoelectric device (Peltier Module) performs the majority of the heating and cooling functions. One primary controller of a control system is really the PIC16 family, PIC16F887, which sets the food temperature depending on ds1820. It's also meant to make it simple to develop a management system for a household appliance, as well as maintain and update it. The Proteus 8 Simulation software is being used to build circuit for this control system.

ABSTRAK

.Konfigurasi suhu automatik berasaskan mikrokontroler untuk makanan kini sedang dirancang dan dibina. Peranti termoelektrik (Peltier Module) melaksanakan sebahagian besar fungsi pemanasan dan penyejukan. Salah satu pengawal utama sistem kawalan adalah keluarga PIC16, PIC16F887, yang menetapkan suhu air bergantung pada ds1820. Ini juga dimaksudkan untuk mempermudah pengembangan sistem manajemen perkakas rumah tangga, serta menjaga dan memperbaruinya. Perisian Proteus 8 Simulation digunakan untuk membina litar untuk sistem kawalan ini.

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°*C*	-	Celciue
Mm	-	milimeter
W	-	Watt

LIST OF ABBREVIATIONS

PCM - Phase Change Material
COP - Coefficient of Performance
MSAWG- Medium-Scale AWG

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CHAPTER 1

INTRODUCTION

1.1 Background

Nowadays everyone is more comfortable to carry home -cooked meals to school or to work. But some of them have difficulty to maintain cool or preheat the meal that requires additional equipment. The source of the carrier is intending to employ the peltier. Therefore the idea is presented to enable user to be able to maintain cold the food at the same time while being able to reheat their meal that use the same carrier.

1.2 Problem Statement

Food is incredibly vital for the person in everyday life. This is because food is something that offers sustenance. In summer, persons requires cold meals to complete their duty in a lovely setting. Not having proper meals may influence a person's abilities to accomplish a task. This product is manufactured in low entropy, and therefore it is easy to manage for the user. This product is developed in small dimensions for easy handling by the user. That because dimension performs equally as a role for the user. If it features a transportable food container this had made it much simpler for anyone to apply it whenever and everywhere.

1.3 Project Objective

The fact-finding conducted for this project, goals of the project and planned design tactics will be discussed below. Based on fact-finding and communication with the customer, the most important customer needs have been identified. For this product, it is highly desirable for it to be easy to use, portable, and have a low cost. The customer requires that the product has cooling and heating capabilities with a variable temperature setting and a user-friendly interface. The major aims of this research are :

1. To design a transportable colder and hotter food carrier.
2. To reduce power usage.

1.4 Scope of Project

The program's purpose is to construct a mobile colder and heated food carrier that uses a Peltier module as well as helps improve its efficiency using a variety of techniques such as changing the insulation material, heat sink design, air flow direction, electric current quantity, and using Phase Change Material (PCM) as a cooling source. The cooling and heating rates of the food carrier, as well as the heating value, were employed to assess the effectiveness of the movable transporter in this topic..

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Technological improvement on semiconductors had elevated to the improvement that being produced in semiconductors enterprises and have been one of the primary reasons of dependency in today's globe. Minimal power utilization and shrinking of the integrated circuits are the major traits that leads the list as to how this field is a top quality one. During in the period of history, many disciplines of research had worked together to develop significant technological breakthroughs. The most popular pairings comprising Mechanical and Electronics, termed Mechatronics. Refrigeration systems is one such illustration wherein downsizing is made practicable with the usage of present semiconductors, which also focusses on lowered power consumption. Amongst the many strategies, employment of Peltier Module was its best appropriate one as per our analysis. In this project, we aim at giving a biohydrogen production, propitious and a simple approach for conducting either cooling (Refrigeration) and warmth effects in a more effective method via the utilization of solar energy. The Thermoelectric unit seems to be more inexpensive, static and easy to maintain. It is reliable and eco-friendly. A prototype is developed and constructed accordingly. All the parameter are empirically acquired and the results are subservient with the conventional one.

Every existing project have their own benefits and downsides and each one of them employ various ways but still striving for the same end. This project seeks to make it mobile and user friendly which separate it from any other current project. Numerous project design were researched and the outcome will be applied for new improvements for this project.

2.2 Review on Existing Project

This project came up with new upgrade from previous project that fit with industry requirement currently. With the aid of existing project, a contrast can be established by picking the best out of the best and learnt from their short of to come up with superior output. Each project employed various components and approaches but nevertheless concluding with the same objective concentrating on mailbox improvements. In addition, deeper knowledge from this current project essential to minimize excessive duplication that just make it obsolete.

2.2.1 Thermal cooler cabinet with thermal position variablity experimental performance

M. Mirmanto [1] did an experimental performance investigation on thermally cooler box with varying positions of both the passive heatsink module in 2018 from Current era University.The cooling box's cooling system includes a peltier module type Group sessions-12706, a heatsink-fan, an interior heating element, and a 380 ml bottle of water. The interior cooler box size utilized was 210 mm of height, 175 mm of length and 130 mm of width, and also the colder box walls are 50 mm thick. The experiment lasted roughly 18,000 seconds at ambient temperature. The power usage remained stable at around 38.08 W. The findings revealed that the Coefficient of Performance (COP) dropped over time, and the optimal thermoelectric site for this investigation was on the wall.

This cooling knowledge is an effective technique for many implementations from fresh sustaining the beverages to the cooler infrared detectors in semiconductors, industry and in medical sectors such as for medical procedures or preserving the pharmaceuticals in wonderful conditions. The simplest equipment employing the

cooling is the freezer, although, some refrigerators use compression technologies, e.g.domestic refrigerators. The compression materials require high COP, but, its compactness is still terrible, it is hefty as it comprises substantial components, and it requires significant power. Hence, when moveable objectives, illumination, energy levels, small, easy maintenance, and lifespan are in worry, then circumstances described are not suited. For such needs, the thermoelectric cooling system(TEC) may take the function. However, there is a restriction to the piezoelectric cooling mechanism. Its COP is too feeble and much lower than anybody. The freezers based on the compressor have a huge COP, and therefore they are ideal for suitable for large but maybe a little lot not moveable. The TEC may also be provided by d.c (DC) electrical sources like solar cells or batteries.

The use of the TEC comprises thermoelectric refrigeration, electronic and car cooling systems, temperature of the reaction, photo - voltaic hybrids cooling building cooling system, fresh water generation and cooling system for medicinal applications. In construction for TECs, the cooling capacity or the COP are two key parameters. The COP of the whole system varies greatly from COP of the thermally modules (TE). There are numerous approaches that may be employed for boosting the TEC performance.

In the current year, different kinds of investigations and research on the TEC have been done for raising the TE performance, and numerous articles and papers have been supplied the assess the TEC performance. Nevertheless, the COP that is attained by the researchers so far is lower than 1. For so, investigations on the TEC require extra careful and detailed examination.

The experimental setup as shown id figure 2.1 consists of a cool container, a heat sink-fan, a batteries, a multitesters, and 400 cc of water. The cool box was

constructed of styrofoam with a diameter of approximately 50 mm. This box was also utilized. The interior cooler box was 210 mm of height, 175 mm of length and 130 mm of width in size. All temperature was recorded via a precision of 0.5°C in an oilbath utilizing K-type temperature sensors validated against RTD 100 probes calibrator. A pan, a 1500 W heater, and a Controller were used to generate the oil bath. The current and voltage provided to the thermoelectric were measured using a voltmeter . The thermoelectric cooling heatsink were installed on the OT, OB, and OW of the cooler box.

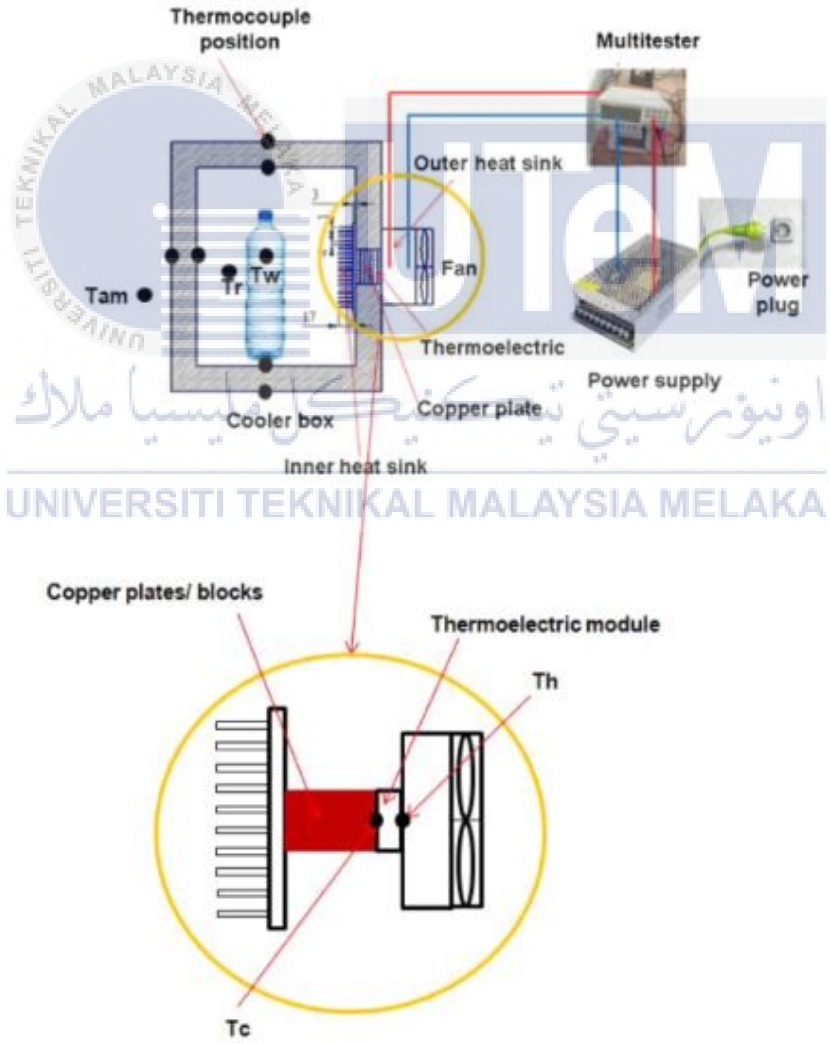

Figure 2.1 : Thermoelectric cooler box with thermoelectric position variations.[1]