Department of Electronics & Telecommunication Engineering

University of Moratuwa

EN2110 - Electronics III

PROJECT REPORT

Group 12

HOT PLATE TEMPERATURE CONTROLLER

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1. Introduction

The Electric Hot Plates, a novel way to cook foods, have become a widely used technology in the culinary industry. The Electric Hot Plate market has witnessed rapid growth ever since 2017. Technological innovations and advancements have also further optimized the performance of these products, making them more widely used for mainstream applications.

While being a popular method worldwide, hot plates have become more and more famous within Sri Lanka in the post-pandemic era. Due to the lack of other facilities at a reasonable price in the country, the population is leaning towards more alternative methods, including hot plates.

The project's objective is to build a temperature controller with PID using a microcontroller and power electronics. In this method, a feedback error control mechanism is used to give the sum of the proportional (P), integral (I), and differential (D) changing error value between the expected output and the current output. This output will be used to maintain the temperature of the hot plate at the required value.

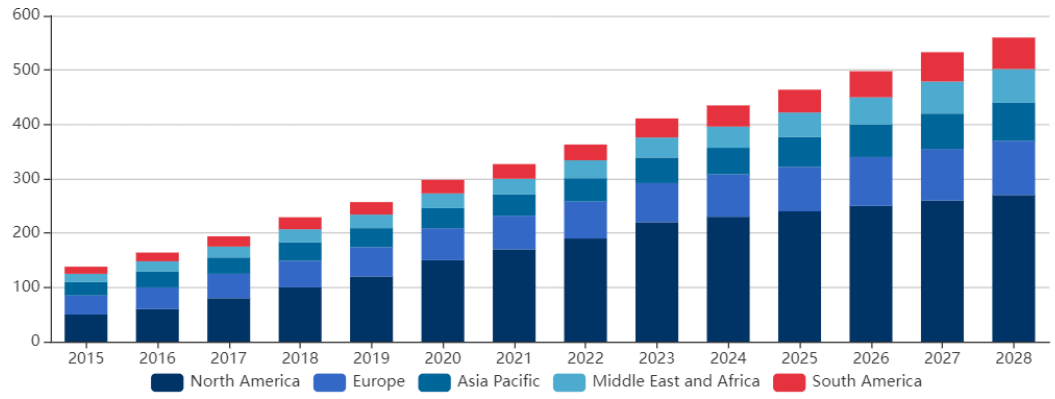
2. Market Survey

Global Market

Today, the hot plate has been a very useful and a demanded equipment in the world. It has been estimated to be worth USD 1280 million by 2028, with a CAGR of 6.6%. The global Heating Plate market has been segmented based on various factors.

These hotplates are in many types, single hotplates, double hotplates, and other classes. Among these, single hotplates have the largest segment with a share of about 50%. Ceramic, stainless steel, cast aluminum, carbon fiber are mostly used in making hot plates. These are mainly used in the Chemical industry, electronic industry, and Laboratories.

Based on region, the market of hotplates is segmented into North America, Latin America, Europe, Asia Pacific, Middle East, and Africa. These regions can be further categorized. North America has the best market for these hot plates.



Due to the Covid-19 pandemic, the hotplate market size has been widened in every region. Therefore, by today, there are a lot of competitors in this field. Phillips, SKF, Aroma-housewares, CHINABEST, Weibang, Andong are the key players in the global hot plate market. This competition will lead to a more trended and developed product shortly.

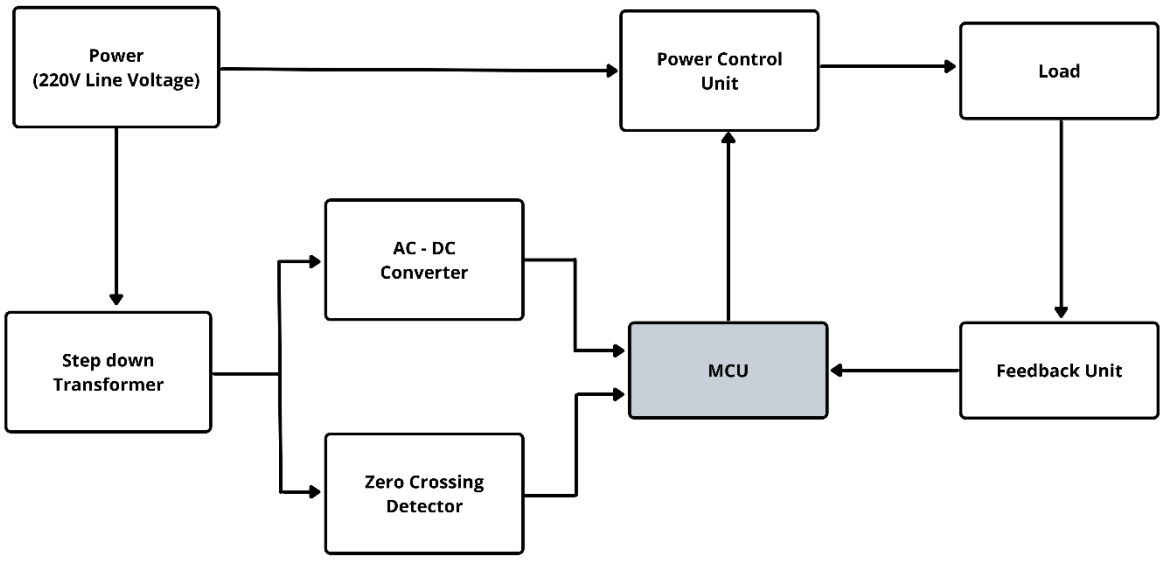
Local Market

In the meantime, Sri Lankan domestic hot plate market was almost non existing before the pandemic in 2019. It was considered a luxury product, and most people favored the traditional gas-based methods. But after the pandemic and with the increase of gas prices and gas tank explosions, the market is turning towards alternative methods. Due to more and more people trying to buy hot plates due to this, the prices of them are getting higher. Nowadays, a hot plate is harder to find, even for a very high cost.

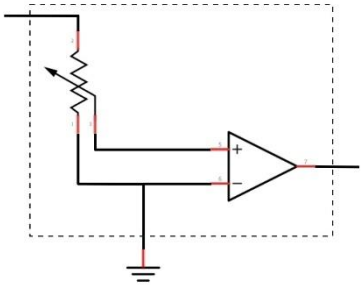
3. Specifications

Input voltage	**220/240V, 50/60Hz**
Max output power	2000W
Temperature range	50-300 C

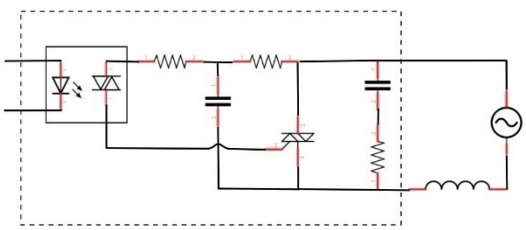
4. Block Diagram



- A PID controller is used to control the temperature of the hot plate.
- A microcontroller with power electronics is used for this implementation.
- A zero-crossing detector is used to sync the control signal with the supply waveform.



Zero Crossing Detector



Power Controller Unit