

UNIVERSITI TEKNOLOGI MARA

**DEVELOPMENT OF A
PROTOTYPE BARBEQUE
GRILL USING WIPER
MOTOR**

MUHAMMAD NAZIRUL BIN MOHD SANI

Dissertation submitted in partial fulfillment
of the requirements for the degree of
Diploma
(Mechanical Engineering)

College of Engineering

Feb 2024

ABSTRACT

Nowadays, the use of grills has become widespread. Therefore, it is not surprising that many types of barbecue grills that have their own qualities can be found on the market. However, the high cost is a barrier to ownership as its large size often contributes to high prices. This will also make it difficult to store after use. The aim of this project is to create a barbecue grill that enhances user-friendliness and durability also emphasizing ease of maintenance. The primary objective is to design a grill that employs the rotisserie method, utilizing a wiper motor to achieve uniform cooking. The advantage of using a wiper motor is that it requires a lower-voltage power supply. Studies have indicated that the environmental impact of barbecue grills is significant, primarily attributed to their extensive charcoal consumption required for uniform cooking. Additionally, the rotisserie technique is less commonly utilized in budget-friendly barbecue grills. The study found that this technique can reduce grilling time and minimize the use of excessive charcoal. The choice of materials significantly influences the product's longevity. As a result, the decision was made to predominantly utilize mild steel in this project, along with a rust-preventing finishing spray. Furthermore, product safety is a crucial factor in ensuring a product's sustainability and reducing pollution can lead to a higher-quality product. A grill that uses less fuel while still maintaining optimal cooking temperatures would be more environmentally friendly and save users money. The use of high-quality and durable materials, such as mild steel, can prevent rusting and increase the grill's resilience. Ultimately, incorporating these improvements can lead to the creation of a better BBQ grill machine that offers a safer, more efficient, and versatile cooking experience, with the added potential for commercial value.

ACKNOWLEDGEMENT

I would like to begin by expressing my gratitude to God, the Almighty, for showering His blessings upon me throughout my research work, enabling me to complete this project.

The completion of this project was a collective effort, and I am deeply thankful to all the individuals who played a role in making it possible. First and foremost, I would like to express my sincere appreciation to my supervisor, Sir Mohd Ghazali Bin Mohd Hamami, for his participation and assistance. He not only provided guidance and encouragement but also helped me choose the title for my Final Year Project.

I would also like to extend my thanks to my friends, housemates, and anyone who provided guidance and support throughout the project, sometimes until late at night. Their collaborative efforts, helpful ideas, and troubleshooting assistance were critical in achieving the outcome. Furthermore, I am grateful to my father for assigning my project and providing feedback and guidance throughout the process.

Last but not least, I acknowledge the contribution of the Assistant Engineer for providing the necessary resources and infrastructure to complete this project. Without their support, this project would not have been possible.

Once again, I express my heartfelt appreciation to everyone involved in this project, for their valuable support and guidance.

TABLE OF CONTENTS

	Page
CONFIRMATION BY SUPERVISOR	ii
AUTHOR'S DECLARATION	iii
ABSTRACT	iv
ACKNOWLEDGEMENT	v
TABLE OF CONTENTS	vi
LIST OF TABLES	vii
LIST OF FIGURES	viii
LIST OF ABBREVIATIONS	ix
CHAPTER ONE : INTRODUCTION	1
1.1 Background of Study	1
1.2 Problem Statement	2
1.3 Objectives	2
1.4 Scope of Study	2
1.5 Significance of Study	3
CHAPTER TWO : LITERATURE REVIEW	4
2.1 Benchmarking/Comparison with Available Products	4
2.2 Review of Related Manufacturing Process	7
2.3 Patent and Intellectual Properties	8
2.4 Summary of Literature	12
CHAPTER THREE : METHODOLOGY	13
3.1 Overall Process Flow	13
3.2 Detail Drawing	17
3.3 Engineering Calculation and Analysis	26
3.4 Bill of Materials and Costing	32
3.5 Fabrication Process	33
3.6 Functionality of Prototype	54

CHAPTER ONE

INTRODUCTION

1.1 Background of Study

Barbeques, or BBQs, have always been trendy. Generally, people consider it a summertime activity [1]. However, in recent years, there has been a surge in the popularity of outdoor cooking. Thus, BBQ grills have become increasingly popular. BBQ grills have become an important aspect of outdoor living spaces. These days, barbecue has been elevated to a glam and gourmet level [1]. This trend is also seen in the increase in demand for outdoor kitchens and built-in grills. One common problem that people might face when owning their BBQ grill is budget constraints. In Malaysia, the average Malaysian spends upwards of RM1,000 on barbecue sets, most of the gas or charcoal variety for people who live in landed properties [2]. Buying a BBQ grill also involves considering factors like storage space. Some individuals have limited space, making the buying process more challenging. A relatively inexpensive barbecue grill in the market is a feasible possibility given the advancements in manufacturing technology. The use of modern materials such as cast iron, stainless steel, and aluminum for constructing grills has made it possible to produce products that are durable, lightweight, and corrosion-resistant at an affordable price range. They have different properties which affect the heat conductivity, and as a result, it influence the method and speed of grilling [3]. Functionality should be a top priority, ensuring the grill has ample space to cook multiple items simultaneously. Proper ventilation is also crucial for preventing flare-ups and ensuring safety while cooking. With careful research on consumer preferences and market trends, products made could bring unique features that enhance user experience. Hence, the project also focuses on the selection of high-quality materials that are durable and heat-resistant at reasonable prices. Overall, the ultimate aim of this project is to deliver a barbecue grill design that combines affordability with versatility, offering distinctive features to enhance the user experience.