



DESIGN AND DEVELOPMENT OF KEEP WARM FOOD DELIVERY BAG



BACHELOR OF MANUFACTURING ENGINEERING TECHNOLOGY (PROCESS AND TECHNOLOGY) WITH HONOURS)

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Faculty of Mechanical and Manufacturing Engineering Technology

**DESIGN AND DEVELOPMENT OF KEEP WARM FOOD DELIVERY
BAG**

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**Bachelor of Manufacturing Engineering Technology (Process and Technology) with
Honours**

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DESIGN AND DEVELOPMENT OF KEEP WARM FOOD DELIVERY BAG

WAN SALWANI BINTI W ZAMANI

**A thesis submitted
in fulfillment of the requirements for the degree of
Bachelor of Manufacturing Engineering Technology (Process and Technology) with
Honours**



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

2021

DECLARATION

I declare that this thesis entitled “Design and Development Of Keep Warm Food Delivery Bag” is the result of my research except as cited in the references. This thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

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Date

: 16 January 2022



APPROVAL

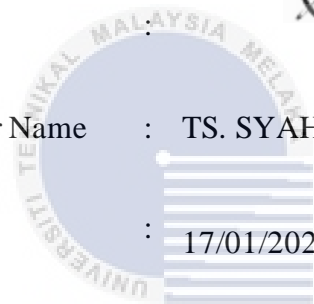
I hereby declare that I have checked this thesis and in my opinion, this thesis is adequate in terms of scope and quality for the award of the Bachelor of Manufacturing Engineering Technology (Process and Technology) with Honours.



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Date : 17/01/2022



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DEDICATION

Dedicated to

My honourable father, Wan Zamani Bin W Idris,

My lovely mother, Siti Zaleha Binti Ali,

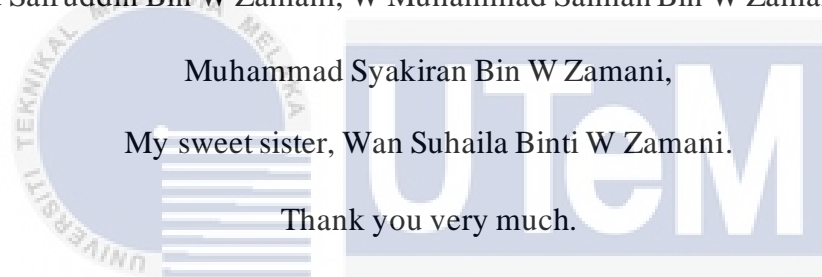
My supportive brothers, W Mohd Safwan Bin W Zamani, W Mohd Sahlan Bin W Zamani,

W Mohd Saifuddin Bin W Zamani, W Muhammad Salman Bin W Zamani and Wan

Muhammad Syakiran Bin W Zamani,

My sweet sister, Wan Suhaila Binti W Zamani.

Thank you very much.



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ABSTRACT

This thesis presents the materials, systems, and design processes of keep warm food delivery bags for the food delivery industry. These keep warm food delivery bags are equipment used by food delivery riders to provide food delivery services in restaurants, the product target group covers all customers, especially food delivery companies. Since most food delivery services are now motorcyclists, this Keep Warm Food Delivery Bag is designed specifically for motorcyclists. One of the problems that need to be discussed is the design of the backpack because if the design is not suitable, it will make it difficult for the user. The selection of materials for thermal bags has also been investigated because the wrong use of materials can cause damage to food. For this product, oxford fabric and pearl cotton have been used as the exterior material. Oxford fabric is wear-resistant, stain-proof, and easy to clean on the inside. As for the interior material, this product use polyurethane foam (PU) insulation and aluminum foil. Polyurethane (PU) foam insulation has many benefits such as resistance to water and moisture, maintaining temperature, low thermal conductivity, and more. The inside of the bag must be at an appropriate temperature for the food. The food business has grown exponentially, the food delivery bags available in the market are not up to date. Many improvements can be made to improve the quality of the bags and meet customer demand. For example, this product adds a heating system by using a pad heating element that is charged using a power bank and adding a cup holder on the beverage section to prevent water from spilling. The products presented in this thesis will add value to the target group, as they are based on the fulfillment of user experience research. The design process was analysed through questionnaires from riders and literature review.

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ABSTRAK

Tesis ini membentangkan bahan, sistem dan proses reka bentuk produk ini untuk industri penghantaran makanan. Beg penghantaran makanan ini adalah peralatan yang digunakan oleh penunggang penghantaran makanan untuk menyediakan perkhidmatan penghantaran makanan di restoran, kumpulan sasaran produk meliputi semua pengguna terutamanya syarikat penghantaran makanan. Memandangkan kebanyakan perkhidmatan penghantaran makanan kini adalah penunggang motosikal, produk ini direka khusus untuk penunggang motosikal. Salah satu masalah yang perlu dibincangkan adalah reka bentuk beg gelas kerana jika reka bentuk tidak bersesuaian, ia akan menyukarkan pengguna. Pemilihan material untuk thermal beg juga telah diselidik kerana jika penggunaan material yang salah boleh menyebabkan kerosakan kepada makanan. Untuk produk ini, kain oxford dan kapas mutiara telah digunakan sebagai material luaran. Kain oxford tahan haus, kalis kotoran, dan mudah dibersihkan di bahagian dalam dengan kapas mutiara. Manakalah pada material dalaman, produk ini menggunakan penebat buih poliuretana (PU) dan aluminium foil. Penebat buih poliuretana (PU) mempunyai banyak faedah seperti ketahanan terhadap air dan kelembapan, mengekalkan suhu, kekonduksian haba yang rendah dan banyak lagi. Dalaman beg mestilah berada pada suhu yang sesuai dengan makanan. Perniagaan makanan telah berkembang pesat, beg penghantaran makanan yang terdapat di pasaran tidak terkini. Banyak penambahbaikan boleh dilakukan untuk meningkatkan kualiti beg dan memenuhi permintaan pelanggan. Contohnya produk ini menambah sistem pemanasan dengan menggunakan elemen pemanas pad yang dicaj menggunakan powerbank dan menambah pemegang gelas pada bahagian minuman untuk mengelakkan air daripada tumpah. Produk yang dibentangkan dalam tesis ini akan menambah nilai kepada kumpulan sasaran, kerana ia berdasarkan pemenuhan penyelidikan pengalaman pengguna. Proses reka bentuk dikaji melalui soal selidik daripada penunggnag dan kajian selidik.

اوينور سيتي تيكنيكل مليسيا ملاك

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CHAPTER 1

INTRODUCTION

1.1 Background

The food delivery business is rising exponentially because of the convenience for customers. To enhance their business vision, several fast-food restaurants provide delivery services. This is an effective way to increase business because a lot of customers order food from delivery services online. In commercial sectors, a variety of delivery bags are currently available. The large bulk of them has trouble keeping food heated and avoiding moisture. During delivery, moisture might have an impact on the quality of food. It is feasible and desired to improve delivery bags to provide better service to customers to appeal to this rising industry (A. Hasan and Dincer, 2019).

The food bag market is less competitive as the sector grows. There is currently a global market for the goods, and as food transportation patterns continue, consumer equipment enhancement and production will become increasingly vital (Kuljetukseen, 2018). There are no exact estimates for the extent of their Australian business, however, both platforms provide self-reported data: Uber claims to have 80,000 'delivery-partners' throughout its ridesharing and food delivery services, whilst Deliveroo claims to have 3000 self-employed delivery-riders (Veen, Barratt Goods, 2020).

After the spread of COVID-19 in our country, it has transformed the way of life of the community into a new normative environment where most activities are done by online, including ordering food. Various initiatives have been undertaken by the government to ensure that not only is the pandemic eradicated as soon as possible, but also the survival of the individual can be continued. One of them, the government announced to implement the

Movement Control Order (MCO) after the disease was on the rise. This causes many people to use food delivery services as it simplifies their work and saves their time. In addition, the MCO is implemented to protect the general public from spreading the pandemic and help reduce the spread of COVID-19.

When the Movement Control Order (MCO) was in effect, it was naturally more difficult for individuals to crave some favorite foodstuff, particularly if this restaurant required going outside more than a 10 km radius permitted. Due to a variety of circumstances, this was the government's response during the MCO. In consequence, a lot of people ordered food through food delivery services like Grab Food and Food Panda at the start of the MCO, with network scans showing an increase in the amounts of orders each rider was handling. According to Grab Malaysia country head Sean Goh, saw the multi-app company enlisting its Grab drivers as food delivery drivers. People are adapting due to the MCO. In the beginning, about 80 % of customers get their orders delivered to them, with the remainder opting for self-pickup. Over the MCO, these figures have gradually reversed, with about 80 % now opting for self-pickup towards the end of Phase 3 operator.

When deliveries are delivered in colder areas, better delivery bags are critical, as brief exposure to cold temperatures can drastically reduce interior temperatures and create condensation. The most significant aspect in improving the heat retention performance of delivery bags is the types of thermal insulation material. Thermal insulation can reduce the rate at which heat is transferred from the inside of the bag to the outside surface by using a material with low thermal conductivity. Many insulating materials are already available that can perform adequately in the insulation of a delivery bag and keep it warm for hours. Deliveries from restaurants and fast-food places are expected to keep food hot and fresh (A. Hasan and Dincer, 2019).

The purpose of bag delivery is to keep the food warm or cold until it's time to eat it. Hot and crispy foods release latent heat and cool down during production and consumption. In contrast, concluded that food delivery bags should be a high concern. It is a smart way to keep food fresh through the delivery process (Neal, 2003).

1.2 Problem Statement

Keep Warm Food Delivery Bag is the equipment that used for food delivery riders to serve a food delivery service in a restaurant and independent food-delivery business. Bag packs are vital items for motorcycle riders since, unlike cars, motorcycles do not have enough storage compartments. But this is not the only issue; riders frequently complained that the backpack's design made it difficult to reach while riding (Rekha, 2020). Safety is very important for food delivery. The food delivery bag was too large to carry and caused the rider to be unable to see behind due to blocked side mirror vision. This can pose a risk of accident or friction with the car.

Insulation materials are major elements for effective heat retention. Thermal insulators use materials with low thermal conductivities to retain heat by reducing the speed of heat transmission from the inside of the bag to the outer surface (A. Hasan and Dincer, 2019). The use of unsuitable material and system bags is also one of the causes of problems encountered. These causes make customers disappointed in receiving food that is not hot.

Stability is an issue that should be resolved. The food delivery bag is always moving if the rider moves, plus if there is a bump or the rider avoids the pothole. If food or drink spills, it poses a risk to the rider as all that is under his responsibility and will make the customer unsatisfied.

1.3 Objective

To ensure that this project satisfies the goal and requirements, it initiated by concentrating on a few main objectives to achieve which are as listed:

- a) To make the size of the delivery bag suitable to ensure safety and convenience for the riders while riding.
- b) To provide high-quality delivery bags and trustworthy. The bag works well and keeps warm at the appropriate temperature for more than 4 hours by using a heating pad system.
- c) To design a food delivery bag that makes it easier and safer for riders to use the bag with improvements on the beverage section

1.4 Scope of Research

The main focus of this project is on:

- a) The focus of this bag is created for motorcycles, especially in terms of size and design. Motorcycles are the most suitable vehicle used to make food deliveries as they can avoid road congestion and take a short time to reach the destination. The delivery costs are also cheaper than other vehicles.
- b) This bag uses suitable materials and is designed for various types of food and beverages whether hot or cold including fast food, hot food, hot and cold drinks, pizza, and so on.
- c) To study the detail of the existing insulation bag by making a questionnaire to the food delivery rider to get the data.
- d) To ensure that this prototype developed will be achieved based on objective and meet the need of users.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter focuses on the related journal, understanding, and findings of previous research. This is one of the ways to get more understanding about this product. It is because it can help to find suitable material, types of closure, and anything else. The information gathered will become an additional source for the project and do the improvement. A few literature reviews were researched and evaluated to gain a thorough knowledge of this product.

2.2 Concept of Bag Delivery

The concept of a food delivery bag is to maintain food warm during delivery. Food delivery bags are thermal bags designed for food riders to carry food and deliver food to customers. This bag is heat insulated and has a waterproof capability. Thermal food delivery can maintain the temperature of hot food and keep food warm in the bag. In the subject of food packaging, there are several significant variables to consider, including food quality and freshness preservation, a pleasing appearance, good marketing appeal, proper product identification, storage and distribution convenience, and product identification accuracy (Siracusa *et al.*, 2014).

In comparison to the control delivery bag, the airbags had a 2 to 4 % improvement in thermal retention energy and exergy efficiency. The “airbags” with no ridges had the best thermal retention performance. The maximum energy and energy efficiency attained were 88.7 % and 83.2 %, respectively, compared to 86.7 % and 81.8 % for the control bag. In

summary, the air-insulated bag outperformed the control bag. Another advantage of the air-insulated bag is that it would be less expensive to make because the majority of it is made of air and the structure is made of inexpensive polyurethane foam (Ahmed Hasan and Dincer, 2019).

2.3 Advantages of Food Delivery Services

Home delivery services for restaurant orders have developed beyond pizza restaurants to other restaurant categories as a result of the advancement of digital technology, and ordering meals via apps and websites has become widespread. Apps that allow users to order a range of restaurant meals at home or work in just a few seconds have become extremely popular among city residents in today's fast-paced world (Kuljetukseen, 2018).

Online food ordering allows customers to place an order anytime, from anywhere, and greatly saves time typically spent picking up food. Another advantage of the food delivery offer from the online food ordering facility for customers is the ability to place food orders and favourite food orders easily. In addition, it can reduce waiting time in restaurants, and improve the accuracy of food orders made. With the advantages offered to customers, it can improve your connection with them and eventually result in a higher frequency of food orders.

In addition to customers, restaurants gain from transportation services, with some already adopting home delivery services. Restaurants and cafes will benefit from delivery services. Thousands of restaurant orders are already being dispatched every day in Finland, and broadcasts have recently become a part of the downtown street scene (Salminen *et al.*, 2017).

Although a few months ago, limiting the customer presence during restaurant operations was the only option, during the COVID-19 pandemic, it has become a priority.

While COVID-19, by minimizing customer presence, has the potential to protect customers, employees, and the general public from the spread of the virus. But even if the spread has diminished, customers may continue to enjoy the services offered by online ordering as it can accommodate hectic schedules and allow them to securely purchase a variety of foods to eat with spouses, loved ones, and colleagues.

The majority of online ordering apps and services offer appealing promotions that not only make your current customers satisfied but also help you acquire new customers. Whether online food ordering is hosted on a website or through a third-party service, offering promotions that entice customers can help generate more sales customer also will satisfaction. For customers, online ordering also provides an opportunity to make dining choices close to them and allows them to explore restaurants and foods they may not have known before.

When entrepreneurs began linking restaurants and consumers with their courier services around 5 years ago, the food transportation market shifted dramatically. In recent years, the number of internet food orders has increased dramatically. In the future years, the billionth firm is likely to continue to develop at a rapid pace (Kuljetukseen, 2018).

Although there are no exact estimates accessible for the extent of their Australian operations, both platforms provide self-reported data: Uber claims to have 80,000 'delivery-partners' throughout its ridesharing and food delivery services, and Deliveroo claims to have 3000 (Veen, Barratt and Goods, 2020).

2.4 Function of Keep Warm Food Delivery Bag

Food delivery is more popular than ever, and customers expect chefs and restaurant owners to provide a high-quality restaurant experience within their own homes. This means sending the food in the same condition during which it was received from the restaurant.

However, once the food is collected from the restaurant, the food is no longer as warm as freshly cooked. Packaging systems are designed to preserve the advantages of food processing after it has been completed, allowing foods to travel securely over great distances while being healthful at the time of consumption (Marsh and Bugusu, 2007).

The main function of a food delivery bag is to keep the food warm. High-quality heat-insulated bags will maintain the correct food temperature while controlling humidity levels. The insulated thermal bag is capable of blocking external heat and trapping internal heat inside the thermal bag carrier space. The journey from the restaurant may take a long time to reach the customer's home. The importance here is the layer, foam insulation between the outer layer and the inner layer is what keeps the food warm and safe. The type of bag closure and quality materials are also factors in ensuring food keep warm and consistent during delivery. Waterproof food delivery bags will protect food from getting wet. With food delivery bags, food will stay warm for a long time and customers will be satisfied.

One of the functions of a food delivery bag is to make it easy for riders to deliver food right to the destination. Hot food will arrive hot and quick while cold food will arrive without thawing or spilling. If the rider does not have a bag, it will make it difficult for the rider to deliver food, especially if obtaining many orders. Food delivery bags are very important as they can help deliver food to customers and guarantee all customers get quality service. In addition, it can maintain the temperature at an appropriate level. It must provide good quality and service to maintain customer loyalty. It is critical to conduct a thorough investigation into consumer perceptions to provide better services (Chandrasekhar, Gupta and Nanda, 2019)

Whatever the job, safety is very important and should be a priority. In this case, riding a motorcycle on the road requires full focus. If the rider does not have a bag, it can cause the rider to lose focus because he has to think about the food situation. Even if the delivery driver

is an experienced driver and is always careful, it can still pose a risk or danger. This is because it can lead to an accident if the focus is lost, for example too late to avoid other vehicles or not noticing a pothole. So, food delivery bags are equipment that food riders should have to ensure safety.

2.5 Importance of Keep Warm Food Delivery Bag in Industry

Riders consider a delivery bag to be an essential item, unlike a car, motorcycles do not have enough storage spaces. A market study was conducted, and the results revealed that the product's market size will increase from year to year. The evolution of food delivery services, socio-economic trends, and riders' consent to safety are some of the elements that may contribute to this increase (Rekha, 2020). Warm food delivery bags are important in the industry. This is due to the increasing demand for direct home delivery of food. Food quality is one of the most important things that food businesses need to pay attention to material and closure. Bag delivery food is important to protect the food contents from any damage. These bags are also available in a variety of sizes and shapes for a variety of purposes. It also includes a waterproof liner that prevents moisture damage and the ability of the cells in which your food will be stored to keep from getting wet. It is one thing to keep food supplies warm or hot from the pickup point to the delivery point, but if the humidity is not controlled, your customers will receive wet and unpleasant food. Insulated food delivery bags keep food warm while also keeping moisturize at a minimum, ensuring that food delivery does not become wet by the time it reaches your customer. Hot and cold for food or beverages in their respective packaging can be kept at the proper temperature in insulated delivery bags until complete delivery. The food bag market is less competitive as a result of the expanding business. The product now has a global market, and as food transportation trends continue,

consumer equipment development and production will become increasingly significant (Kuljetukseen, 2018).

In recent years and specifically during the COVID-19 pandemic, online food ordering has changed from the desired convenience to a mandatory requirement for business survival. Many people use food delivery services because it simplifies their work and save their time. It also has many options available; they can choose from various types of restaurants and food delivery services. Food delivery services help restaurant operators, the public, and other food vendors to promote their food to customers. This can also help small food traders to run their businesses by selling their food. This is the best way to reach customers

In addition, the health crisis that is plaguing the world has affected the country's economy. The unemployment rate in Malaysia rose to 5.5 percent or more than 860,000 unemployed according to projections released by the Department of Statistics Malaysia last May. As such, those who lost their jobs have registered themselves as food delivery men to cover the cost of expenses. This result is increased demand for food delivery bags.

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2.6 Design Food Delivery Bag in Malaysia

The design of food delivery bag has two parts that need to be researched which is exterior design and interior design. In the exterior design, the shape of the bag and the type of closure bag are very important in the design of the product. While at the interior of the bag, the position of the partition to separate the inside of the bag will be discussed.

2.6.1 Exterior design

Most type of delivery bag is square and rectangular. It is for the balance and suitability of the motor user. Size is usually made not too large for the safety of the user.