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SMART Food Warmer

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ABSTRACT

In the modern era of technology, food delivery services have committed a lot to today's society as it offers convenience and time-saving. However, one of the major problems faced by most food delivery service companies is getting a low-star rating due to the food delivered being cold as the delivery duration may take longer than expected. The current packaging procedure using thermal insulated bag may fail to insulate food effectively and is unable to reheat the food if the restaurant failed to provide a freshly made meals. Thus, SMART Food Warmer is invented to counter this issue. The objective of this product is to increase the efficiency of food delivery services by providing a simple and efficient method for heating food and beverages without the need of external heat sources. The normal thermal insulated bag is improvised with a container installed inside. Peltier module is used as the heating element, in which will activate when switch is on. The Peltier module is standardized to reach certain temperature and remain to prevent overheating. Food that has turned cold was used to demonstrate and it was found that it reached the standard of freshly made meals after 10 minutes in an operating SMART Food Warmer. The main target audiences are food delivery services companies, food delivery runners and food business owners. In conclusion, improvising food delivery services is essential in order to meet consumer needs and adapting to changes in the market and regulatory environment. Hence, companies can improve their growth, enhance customers' satisfaction and build a strong, sustainable business.

Keywords: food delivery; cold food; peltier module; smart food warmer; customer satisfaction.

1. INTRODUCTION

The increasing demand of food delivery services today has also increased the demand for innovative solution that allows consumers to receive the best service. Big companies are competing to give the best in order to be the first choice for everyone using their service. Previous study shown dissatisfaction of customer for the food received from delivery company (Holmes, 2019). Conventional thermal insulated bags have been used all this time to maintain the temperature of the food during transportation. But the issue faced by most of industry player is they are not able to re-heat meals to ensure freshness upon consumption, particularly if the restaurant fail to provide a freshly made food. Our main question is "How does the design and components of a portable food warmer make use of a Peltier affect its efficiency and usability for maintaining food temperature during transportation?" This question is our attempt to dive into the problem such as the effectiveness of thermal insulation, users experience with the device's controls, and overall performance in keeping food at desired temperatures. This helps

investigating the optimization of the design and components function factors to enhance the efficiency of the SMART food warmer. Hence, an approached has been made by innovating a food warmer that integrate the thermal insulation with advanced heating capabilities using Plaiter module (Corpuz et al., 2022). The Peltier module is widely used to generate both heating and cooling effects when an electric current passes through it, particularly to generate heat for food warmer (Yan-Wei et al., 2017).

SMART Food Warmer is beyond merely keeping the food warm as it is able to actively reheat meals while maintaining their freshness at an optimal temperature. This innovation idea seeks to explore the design, functionality, and potential application of this improvised food warmer that is believed to significantly represent the advancement in food delivery services industry. This product is aimed to increase good consumer experience in using delivery services at the most convenient state, receive the food with high quality and freshness, besides but it can also become a potential impact on outdoor dining experiences and emergency food provisions.

2. METHODOLOGY

The components needed to build this SMART food warmer are Peltier, battery compartment, dry cells, switch, container, and insulated bag. Moving on to the build-up of the product, Connect the switch to a connector. The other end of the connector should be connected to the battery compartment. The purpose of the connector to connect the controller easily to the battery compartment. Place the Peltier into an insulated bag. Then, this device should be connected to the switch where the users can turn the device on or off. The insulated bag is used to evenly distribute the heat produced by the Peltier throughout the container. Also, it provides thermal insulation to prevent heat loss from the food warming device, which is the Peltier, helping to maintain the desired temperature inside the container. The container function is to store the food that needed to be warm. Position the switch and battery compartment at the side of the insulated bag. This arrangement allows easy access to the switch and facilitates connection to the battery compartment.

3. RESULTS AND DISCUSSION

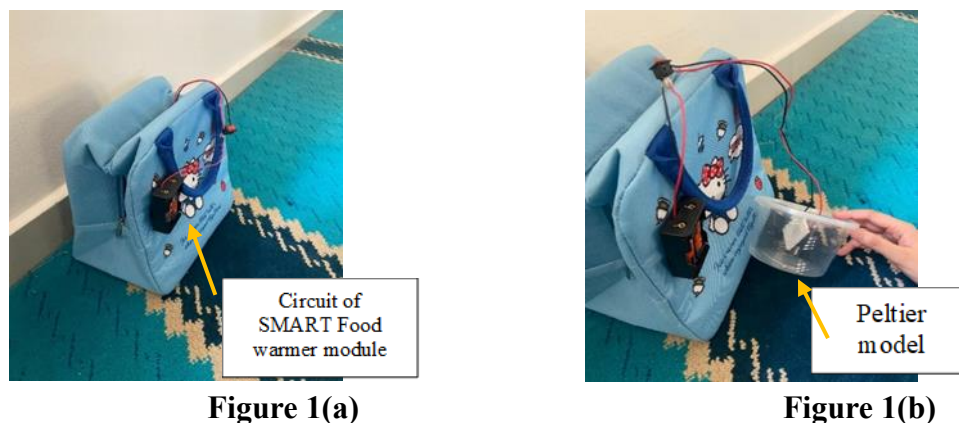


Figure 1. (a) SMART Food Warmer with Peltier is kept inside a container. **(b)** SMART Food Warmer with Peltier outside a container.

From Figure 1 (a), we can see that the Peltier is kept inside a container to keep the food hygienic and the Peltier from any damage such as moisture, oil and food residues. This is a convenient way to keep our food warm without needing an open flame or hot water. Unlike traditional methods that rely on passive insulation or external heat source, Peltier devices actively regulate temperatures, ensuring the optimal conditions for the food. This feature is particularly valuable in scenarios where maintaining a specific temperature range is critical. Furthermore, SMART Food Warmer offers an eco-friendlier alternative to single-use packaging. By reducing reliance on plastic containers or aluminum foil, this bag helps minimize waste generation and environmental footprint.

There are some future recommendations on how we are planning to improve our SMART food warmer, one of them is by integrating smart technology into food warming devices to enable remote monitoring and control via smartphone apps. This would allow users to monitor temperature levels, adjust settings, and receive notifications remotely, enhancing convenience and control. Other than that, we plan on developing food warming containers with multiple compartments and adjustable temperature zones to accommodate various types of food simultaneously. This would provide flexibility for users to warm different dishes at optimal temperatures without compromising flavour or texture. By improving food freshness during delivery, this may help food delivery companies in several ways. It makes customers happier because they get better-tasting food, which means they're more likely to order again and recommend the service to others. Good reviews and word-of-mouth promotion bring in new customers and build the company's reputation.

We used light material for the thermal bag which is convenience for the users to carry even with a heavy load. In addition, the outer layer of the bag last longer and less likely to peel. The starting price of our smart food warmer is rm 35. We believe that the price is reasonable since we provide the thermal bag in a big size. Hence our target audiences are food deliveries service company, food delivery runners, food businesses owners, and those who frequently went for outdoor activities. Furthermore, we believed that our products are on the same league as any other products, yet even better since it can keep food fresh and hot.

4. CONCLUSION

In conclusion, addressing the challenge of maintaining food freshness during delivery is crucial for ensuring customer satisfaction and food quality. By prioritizing innovative solutions in improving temperature control mechanisms and packaging that integrated with Peltier module, we innovated the idea of SMART Food Warmer so that it can enhance the overall experience of food delivery and ensure that consumers receive meals that are delicious, nutritious and well freshness, henceforward achieve the aim for the customer fully satisfaction.

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