



Design of Portable Clean Water Storage Facilities for Street Vendors

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Abstract. Culinary development in Indonesia is very rapid, it makes the proliferation of street food vendors in big cities Indonesia one of them is *pecel lele*. The street food vendors must provide cutleries because many consumers have the meals for dine-in, therefore there will be activities to wash the dishes. These activities require clean water used for washing, generally, the sellers only bring two drums of clean water, and it is not enough to wash all the dishes used. Moreover, the placement of drums on the floor makes it difficult to pour clean water. The water is used repeatedly so it is not efficient and effective. The purpose of this study is to create a design of clean water storage facilities for street vendors that are used during the activity of dishwashing. The method used was qualitative to determine the needs of users through interviewing and direct observation. The result of this product design was in the form of clean water storage for street vendors with an emphasis on ergonomics aspects, therefore, it provides safety and comfort for the users during dishwashing activities. The result of this design is expected to be a reference for other product designs and a reference for other research on similar topics.

Keywords: Design, Merchant, Street, Water

INTRODUCTION

In Indonesia, the culinary sector has become a great deal and culinary in terms of both meals and snacks have been found in many places, especially around big cities (Wijaya, 2019). Culinary business today is growing rapidly, they are not only sold at restaurants but also in food stalls (Maulana & Prasetia, 2015). Culinary is processed food that might be in the form of side dishes and drinks (Sukerti, Marsiti, & Suriani, 2016).

To fulfill all those functions, human needs healthy and nutritious food intake (Akbar & Aidha, 2020). Healthy and nutritious food should be clean both during the process of making and the food serving (Fajrin, 2017). It is because food is one of the medium of spreading disease., therefore, to get a good condition of food (Campbell, Vermeulen, Aggarwal, Corner-Dolloff, Girvetz, Loboguerrero, & Wollenberg, 2016), it is necessary to monitor hygienic and sanitary conditions of the food, especially in restaurants and street vendors (Yunus, 2015).

A rapid culinary development causes the growth of sellers who offer their products in public places such as streets or are popularly called street vendors. Some popular street food in Indonesia is *pecel lele* (fried catfish served with *sambal* and raw vegetables), fried chicken, roasted chicken, and fried fish. Those food are usually sold at food stalls called *warung pecel lele* (Wantini & Sulistianingsih, 2019). Therefore, this kind of food stall is popular in big cities in Indonesia because the taste of that food is common to Indonesian people. Besides, this food stall is typical with its traditional food stall, moveable chairs, and tables (Iswandi & Mubarat, 2019; Wantini & Sulistianingsih, 2019). The cooking process is done in the food stall. Food sold in *warung* is served on a plate and the drinks are served in a glass (Nataprawira & Karya, 2013). Therefore, washing dishes in the food stall area is needed. The process of washing dishes needs clean water, the sellers usually place the water in a jerrycan and bucket.

Jerrycan and buckets used as water storage were placed in an area where the floor level is parallel to the road surface, so the washing process becomes very tiring and difficult because the sellers should take water by lifting jerry cans and spilling them on the bucket. Usually, the water used for washing is not immediately discarded but is reused for washing other cutleries. This process of dishwashing is because the cutleries are not optimally cleaned. Wantini & Sulistianingsih (2019) claimed that it is categorized as poor sanitation and hygiene.

Based on the description above, it is necessary to design supporting facilities for clean water storage that support the process of more effective and efficient dishwashing so that the cutleries remain clean and hygienic. In general, many supporting facilities facilitate dishwashing activity, but

the existing facilities have not fully facilitated it, especially for clean water storage facilities. The existing facilities use filtered water for the process of washing dishes.

METHODOLOGY

The qualitative method and case study approach were employed in designing clean water storage for street food vendors (Chih-Pei & Chang, 2017). This method was used to explore the activity of *pecel lele* sellers in washing the dishes of the dine-in customers. The data were collected by interviewing the owner of *warung pecel lele* in washing the dishes used by customers. The observation technique was also employed in gathering the data. The observations were done to several *pecel lele* sellers around Bandung to investigate the conditions of clean water storage used. The data gathered were used to identify the problems then need analysis for the design product was employed as the basis of product design.

Supporting facilities are designed to meet the needs and provide easiness for human work and activities (Den Hollander, Bakker & Hultink, 2017). In designing a product, the materials used must be easy to obtain and easy to process and have an ideal visual shape to represent the product (Palgunadi, 2008). To find out the aspects needed in designing clean water storage for *pecel lele* street vendors, several categories of design aspects were grouped as follows (Veiga & Weyl, 2016):

1. Shape

The shape is one of the elements in a design that has a unit dimension or volume and is divided into 2 groups of geometric and organic shapes (Ban, & Jung, 2020). In this product design research, the product must be sturdy, therefore a geometric shape was selected.

2. Materials

Material is used to produce other goods. In general, materials are divided into metallic and non-metallic materials. This design aims at supporting water reservoirs therefore it requires strong and sturdy materials.

3. Color

The perception of the human mind can be influenced by color, causing various reactions and judgments (Welbourne, Morland, & Wade, 2015). In addition, color can also be known as the identity of a product. The design of this product is related to cleanliness or hygienic conditions, therefore to create the impression and perception, cool tone color was selected.

4. Ergonomics

Ergonomics is a scientific discipline that discusses comfort and safety (safety) between products and their users (Susanto & Siahaan, 2015). Human activities when interacting with products will affect attitudes and impacts on humans (see **Table 1**).

Ergonomics Theory	Solution	Design
Muscular and mental fatigue	<ul style="list-style-type: none"> - Simple (not having too many features) - Compact product - Comfort 	The design concept used follows the anthropometric data (average) of Indonesians
Visual fatigue	<ul style="list-style-type: none"> - Shape - color - Materials 	The shape adapts to the human body, the color is adjusted to the user's activities, and the material used can create a sense of comfort
Physical fatigue	<ul style="list-style-type: none"> - Practical - Effective and efficient 	The product is easy to store, move and use

Table 1. Product Analysis

RESULTS AND DISCUSSION

Based on the results of interviews and observations related to the activity of washing dishes at *pecel lele* street vendors, it was found that in general, washing dishes was carried out on the pedestrian floor around the food stall. It did not interfere with other activities of the street vendors. They brought clean water by storing it in jerry cans and buckets which will later be reused to wash dishes that have been used by the customers. During the process of washing dishes, the street vendors pour the water in jerry cans into a bucket that was specifically used for washing dishes. Generally, the street vendors used the water many times, this was because of the volume limitation of jerry can used as the water storage. Besides, this process required a lot of energy as the street vendors always needed to lift the jerry can to place the water in the bucket every time they needed to wash the dishes. This process caused injury to the body, therefore, it is necessary to design ideal clean water storage to be able to facilitate the activity of washing dishes and provide work safety.

In every product design, designers are required to identify the target users of the designed products (Fariyanto, Suaidah, & Ulum, 2021), based on the functional aspects, this clean water storage is portable storage that can be easily moved as the street vendors are not permanent. To produce the product design that meets the formulated needs, product development is needed (Irvan, 2015). Based on the shape aspect, geometric shape is easy to identify, measurable, systematic, and

rigid (Palgunadi, 2008). Therefore, the geometric shape of a simple box was considered the most appropriate to represent that this clean water storage is concise, strong, and sturdy following the functional aspects that have been adopted, which are easy to use as well as practical and easy to maintain. Material is an aspect that affects the durability of a product (Palgunadi, 2008; Puspita, Sachari & Sriwarno, 2016). This clean water storage focused on supporting the water, therefore, this designed product used iron material to make it sturdy to support the heavy load of the storage that is full of clean water. The iron used was 4x4cm hollow iron with 0.8 mm thick. Rubber material was used in this product at the bottom of the trusses to make the product remain steady while it is used. The addition of a hydraulic jack that can withstand loading of 1 ton. This hydraulic jack was attached to this product to provide easiness for the users in lifting the frame of clean water storage. The perception of the human mind can be influenced by color, and create various reactions and judgments. Color implementation of this product was based on its function (Hartadi, Swandi & Mudra, 2020) as a support for the activities of *pecel lele* street vendors when washing dishes so the blue color was chosen which represents cleanliness and health. Ergonomics was applied to the planning and design process so that there was a relationship between objects and users that creates work comfort and safety (Ginanjar, Fathimah & Aulia, 2018; Wijaya, 2019). Therefore, this product was designed by considering the size of the human body (average) of Indonesians to achieve work comfort and safety.

T.O.R (*Term of Reference*)

Several useful limitations to meet the expectation of the design process are presented as follows:

A. Product Considerations

- Product perception: have a strong, sturdy, and safe product structure and shape. Ladhari, Souiden & Dufour (2017) control the emotions and attitudes of users.
- Product goal: the product was made in the form of portable clean water storage for street vendors, especially for traditional food stalls or *warung pecel lele*.
- Working Condition: The product works as prop and clean water storage

B. Product Limitation

- Comfort Factor: provide easiness and comfort for storing and using clean water.
- Place Factor: this product is used outdoors for street food vendors, especially for traditional food stalls or *warung pecel lele*.
- Function Factor: used only for clean water storage.

C. Product Description

- Target Users: the street food vendors that provide dine-in service.
- Product Size: the dimension of the product is 60 x 60 cm, which stores one drum of clean water with a capacity of 200 liters.

- Materials: 4x4cm of hollow iron with 0,8mm thick and 1mm iron plate
- Color: cool tone color was considered, then blue color was selected.

Design Brief

This stage was a design process or product visualization till the final product had been established. This approach was used as a guide in designing to solve the problems and identify the product (Kelley, 2020) (see **Table 2** and **Picture 1**).

1	Prepare the ingredients/materials (Styrofoam, ruler, cutter, pencil, hacksaw, and sandpaper)
2	Measure and make sketch patterns on Styrofoam
3	Cut the pattern that has been formed
4	Use sandpaper to finish

Table 2. Research process model



Picture 1. Final Design.

CONCLUSION

Generally, street vendors only use one jerry can to place clean water for dishwashing, so the water is used many times, and it is not recommended. Therefore, supporting facilities are needed to accommodate efficient and effective clean water and can accommodate a lot of clean water so that it provides easiness for dishwashing. The design of this clean water storage is based on an analysis of user needs related to the needs during the activity of dishwashing. Then this design used a qualitative case study approach to understand user needs related to dishwashing. This design aims to meet the needs of users in carrying out activities to wash dishes. This design concentrated on the shape aspect, it was a simple geometric box because it represented a strong and concise product. This

design also counted the color aspect used, which used cool tone color. Blue was selected as this product closely relates to water. Besides, this design paid attention to the aspects of materials used, therefore iron was chosen because of its strength for clean water reservoirs. The iron used was a 4x4cm hollow iron and 0.8mm thick and an iron plate with a thickness of 1mm as the pedestal of the clean water reservoir. This design also paid attention to the ergonomics aspect as the basis of the design. Systemically, this design used a foldable system that aims to provide easiness to be used and stored. This clean water storage facility can be used as a reference to design other similar products and other research on similar topics.

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