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Increasing production capacity at *Lontong* industry "Pak To"

Yepy Komaril Sofi'i[a*], Sudarman[b]
[a,b] Universitas Muhammadiyah Malang
Malang, Indonesia

Email of the corresponding author: yepykomarils@umm.ac.id

Abstract: The program of community empowerment was conducted at *Lontong* industry "Pak To" which is located in Merjosari, Malang. The *Lontong* industry has been producing *Lontong* since 2009. Based on the observation, identification, and interview by the team, this industry had the main problem that they were unable to fulfil the high market demand. As a result, this industry must refuse the orders as they are only able to produce *lontong* in their limited capacity. Considering this condition, the community service team conducted an analysis, design, and manufacture of *lontong* steamer to overcome the industry problems. The *lontong* steamer was designed to cook 500 pieces of *lontong* for production. The material for the *lontong* steamer is a 304 stainless steel plate with 0.6 mm thickness. It was selected for this steamer because it is food grade. 304 stainless steel plate has good mechanical characteristics. It is non-toxic for food and safe for consumption tools. Moreover, this material has long durability for household appliances as it has heat resistance characteristics and relatively has a low corrosion rate. The *lontong* steamer was designed in three main parts: the steamer body, bottom, and lid. The plate was measured and cut in a different dimension for each part. For the steamer body, it was determined 80 cm in height and 50 cm in diameter. Meanwhile, the bottom of the steamer was designed with the same diameter but with a different height, 20 cm. The lid was designed 2 cm wider in diameter than the steamer to make it cover all the upper parts of the body steamer. The purpose is to maintain the stem in the steamer to cook the *lontong*. In the community service program, the team also gave training assistance to the industry regarding *lontong* steamers for safe application. Furthermore, the Standard Operating Procedures (SOP) for the use of *lontong* steamer have also been provided to the industry.

Keywords: *lontong*, *lontong* industry, *lontong* steamer, production capacity improvement

1. Introduction

Lontong is a local Indonesian food that developed among the people of Java [1] other than *ketupat*. Those are dense in texture but soft when eaten. The difference between them is in the wrapping. *Lontong* is made of rice wrapped in banana leaves and steamed over boiling water for several hours [2], while *ketupat* uses coconut leaves with the same process procedure as *lontong*. *Lontong* is commonly served with several Indonesian dishes such as *bakso* (Indonesian meatballs), satay, *rujak*, and *gado-gado* [3]. As mostly it is boiled in banana leaves, the original Indonesian *lontong* has greenish color on the surface and it is still white on the inside as the color of rice [4]. *Lontong* can be found in various regions in Indonesia as an alternative way of eating rice [5]. Although it is also made of rice, *lontong* has an appetizing aroma [6].

In 160 grams of *ketupat*, it contains only 32 kcal of calories [7], 2.24 grams of protein, 0.112 grams of fat, and 43.2 grams of carbohydrates [8]. Not much different from *ketupat*, in 200 grams of *lontong*, it contains 38 kcal of calories [9]. Moreover, it also contains 5.44 grams of protein, 1.64 grams of fat, and 62.12 grams of carbohydrates [10]. Meanwhile, in 100 grams of white rice, the calorie is 175 kcal [11] 3 grams of protein, 0.3 grams of fat, and 39.8 grams of carbohydrates [12]. White rice, *ketupat*, and *lontong* are equally beneficial for the body's energy supply

and can be consumed as staple foods [13]. However, by reviewing the calorie content, consuming *ketupat* and *lontong* tends to be healthier than white rice [14] as it has fewer calories. *Ketupat* and *lontong* also good for those who are in the effort to maintain their weight and have a diet for diabetes [15].

"Pak To" *lontong* industry is located in Merjosari, one of the districts in Malang. It has been producing *lontong* since 2009. This industry was named after the owner's name, Harianto. Steps to produce *lontong* are easy procedures. The preparation begins with cleaning the banana leaves and ripping them into the proper size of sheets to wrap the rice. Furthermore, the banana sheets must be rolled up and shaped like a tube to hold the rice during the cooking process. The rice must be rinsed before it is poured into the banana leaves. Harianto as the owner of *lontong* industry has established cooperation regarding the stock of the main raw materials with the farmers in Njuwet, Malang Regency. The rice used in this production is the premium quality rice to maintain the quality of *lontong*. *Lontong* is produced into two sizes, small and big. It depends on the market demands. The small size of *lontong* is produced with one tablespoon of rice, while the large one is produced with two tablespoons of rice. Afterward, the process continues to steam the wrapped rice into *lontong*. The steaming process uses a simple stove fueled by wood. The steamer is made of aluminum with a diameter of 50 cm, a height of 80 cm, and 0.6 mm thickness. The steaming process runs for 4 hours. Currently, *lontong* products by Harianto can produce up to 1000 pieces per day. However, during Eid al-Fitr, the demand for *lontong* increase up to 4 times per day. The wholesaler price of *lontong* at *lontong* industry "Pak To" is around IDR 1,250 per piece. At this time, *Lontong* industry "Pak To" has several resellers in the Blimbing Market.

Observation, identification, and interviews were conducted. It showed the problems faced by the *lontong* industry. The first is the limited area for steaming *lontong*. Presently, there are three furnaces and three steamers (one small steamer and two large steamers) used in *lontong* industry for production. The small steamer has 300 pieces of *lontong* capacity, while the large steamer has 450 pieces capacity. The second obstacle faced by this industry is the limited number of steamers. This condition makes this industry wait for several hours to cool *lontong* to room temperature before another steaming process periodically. It is difficult when they have orders in large quantities. Furthermore, the other obstacle is the large quantities of orders they must fill in a short time, and of course, they are unable to produce them. This is because the process of producing *lontong* takes a long time and currently, this industry only has three steamers for production.

Figure 1. The use of a wood-fueled furnace in the steaming process

Figure 2. The *lontong* steamer used by the industry

During the pandemic of Covid-19, this industry did not experience a significant decline in market demand. It is because it tends to get new customers and maintains the production of around 1000 pieces of *lontong* per day. This *Lontong* industry has a promising potential as a food business in the long term because *lontong* produced by Harianto is unique in terms of texture. Customers can request the texture of *lontong*. According to Harianto, the texture of *lontong* is the customers' taste. Some customers ask for a soft texture on the inside only, but some other customers ask for a soft texture on the outside and inside. Of course, this industry can fulfill this demand. *Lontong* produced by Harianto will not go stale for up to 19 hours at room temperature. Meanwhile, if it is placed in the refrigerator, it can last for 4 days. Currently, there are several competitors in Merjosari. However, the *lontong* industry "Pak To" can maintain the product quality that it can survive a crisis during the pandemic condition. The existence of this industry can be a resource of living for the surrounding community. This condition brings a positive impact in terms of social and economic.

Reviewing the obstacles faced by the industry, the community service team of Engineering Faculty Universitas Muhammadiyah Malang brought the solution to deal with the problems. It concentrated on increasing the number of *lontong* steamer with a capacity of 500 pieces per process. The larger steamer aimed to increase the production capacity of this industry. While the steaming process is in progress, the workers in charge of steaming can prepare and fill another steamer with *lontong* that is ready to be steamed. Thus, when the steaming process in the first steamer is complete, it can be continued with another steamer without waiting for the previously steamed *lontong* at room temperature.

2. Method

The community service team conducted observation and interview with the owner of *lontong* industry "Pak To" located in Merjosari, Malang. This method was conducted to identify the problems faced by this industry. The observation was conducted in the kitchen regarding the appliances for production, the stove, and the capacity of steamer used by this industry. Observation is an appropriate method to conduct qualitative studies in an industry as it gives real-time data from the phenomenon observed. From the results of these observations, the industry informed their obstacles in producing their products. They were unable to fulfill the market demand in large numbers of *lontong*. All this time, it was only able to

produce 1200 *lontong* per day while the market demand has reached 2000 *lontong* per day. As a consequence, this industry has to refuse the orders and produced the numbers they can fill. Furthermore, the community service team analyzed the need, design, and manufacture of *lontong* steamer to overcome the problems.

The *lontong* steamer consists of 3 main parts, the steamer body, bottom, and lid. The steamer was made of a 304 stainless steel plate with 0.6 mm thickness. For the steamer body, it was determined on 80 cm of height and 50 cm of diameter. Meanwhile, the bottom part was 50 cm in diameter, and the lid was designed 2 cm wider than the body diameter to cover all the upper parts of the steamer during the cooking process. The 304 stainless steel plate was used as the main material for the steamer because the plate has good resistance and is non-toxic for food. In addition, the use of this material is more durable because stainless steel has a relatively low corrosion rate.

The steamer was tested for cooking *lontong* before it was applied to *lontong* industry "Pak To". The result of testing shows that the steamer with 304 stainless steel material and wider dimension gave a better quality of *lontong* and increased the quantity of the products. The steamer was given to the industry in October 2021 to increase its production capacity. Furthermore, the team provided training and assistance to apply the steamer safely in producing *lontong*. For the guidance in applying and maintaining the steamer, the team also gave the Standard operating procedures (SOP) to the *lontong* industry "Pak To".

3. Result and Discussion

The working principle of *lontong* steamer is generally utilizing the steam from boiled water in a closed steamer to cook the rice to be *lontong*. Heating the steamer can use a wood-fueled stove (Indonesian traditional stove) or an LPG stove. The heat generated from the fire causes heat transfer between the fire and the steamer where the water is boiled. Heated water will reach a boiling temperature of 100^{o}C. After that, the water will change phase to steam. Hot steam is used to cook the *lontong*.

As shown in Figure 1, the lid was designed to cover the upper part of the steamer. The height of the lid was designed 8 cm height that it can seal the steamer to cook *lontong*. The lid used the same material as the steamer to restrain the pressure from the steam during the cooking process. The handle was provided on the lid to facilitate the user opening it from the steamer after the *lontong* was cooked and ready to cool. Moreover, the handles were also provided on the opposite sides of the *lontong* steamer. It aimed to make it easier for the cook to lift it from the stove. Furthermore, the steamer was also provided with a strainer on the inside. It is mounted between the upper part and the lower part of the steamer. It functioned to hold the *lontong* in the upper part to prevent *lontong* sank into the boiling water. It is because the cooking process of *lontong* only needs steam to cook it. Meanwhile, the lower part under the strainer is the place where the water is boiled. The steam of boiled water cooks the *lontong*. The bigger dimension of steamer given to this industry solved their problem because they have an additional appliance to increase their production. This industry can cook 500 pieces capacity for a production process with this steamer.

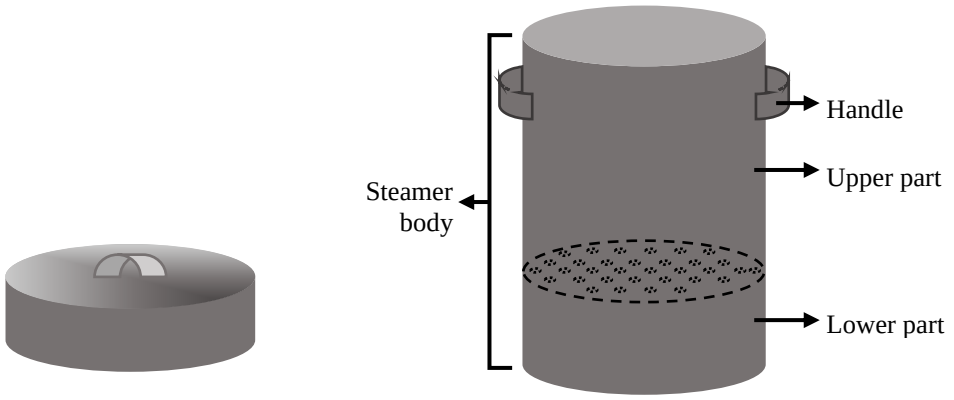

Figure 1. Design of *lontong* steamer. (a) The lid, (b) the steamer

Lontong steamer was manufactured with the determined specifications. The specification of this steamer was decided based on the needs of the industry. The steamer was designed with a bigger dimension with more capacity than the smaller steamer owned by the industry. It is aimed to fulfill the high market demands that it can reach more than 1000 *lontong* per day.

Tabel 1. *Lontong* steamer specifications

Steamer parts	Diameter	Height
Body	50 cm	80 cm
Upper part	50 cm	60 cm
Lower part	50 cm	20 cm
Lid	50 cm	8 cm

(a)

(b) (c)

Figure 2. The manufacturing process of *lontong* steamer. (a) Processing the bottom part, (b) rolling the plate for making the body part of the steamer, (c) welding and assembly the *lontong* steamer.

The process of manufacturing *lontong* steamer was conducted at the Sumber Rejeki Workshop, which is located at Jl. Joyo Taman Sari I No.48 Merjosari, Malang. The manufacturing of the *lontong* steamer initiated with processing the bottom part of the *lontong* steamer (Figure 2. a). A hydraulic machine was used to produce the hollow in the bottom. It is to transfer the steam from boiling water to cook *lontong*. Furthermore, the rolling process of the plate for the steamer body was conducted (Figure 2. b), and for the further process was assembly all parts of the steamer using SMAW electric welding (Figure 2. c). The last process was finishing and cleaning the surface of *lontong* steamer. In this process, the *lontong* steamer is ground and sanded to refine the welding results.

The *lontong* steamer was tested before it was given to the industry. The team and the owner of the industry prepared 500 rolled-wrapping rice to cook to be *lontong*. That uncooked *lontong* was cooked with the same procedure as the smaller steamer. This test aimed to find out that *lontong* is cooked well in a bigger capacity. After four hours of cooking, *lontong* was tasted. *Lontong* had good quality because the 500 pieces of them can be cooked evenly. They had the same texture and were cooked well. Therefore, from the test, the *lontong* steamer used in the implementation of this program is ready for a production capacity of 500 *lontong*/process. From the experimental results, the use of 304 stainless steel gave a better quality of *lontong* compared to aluminum steamer because the lid can seal well the steamer during the cooking process and the steamer has resistance to the steam pressure.

(a)

(b)

Figure 3. (a) Testing the *lontong* steamer, (b) giving *lontong* steamer to the industry

Lontong steamer given to the industry was one unit. By this time, this number is adequate to increase the *lontong* industry capacity. The additional steamer can increase their productions to fulfill the market demand and to develop their business. After giving the steamer to the industry, the team also gave training and assistance to the industry regarding the safe application of the steamer. The standard operating procedures (SOP) for using and maintaining the steamer have also been provided.

4. Conclusion

The problem experienced by *lontong* industry "Pak To" was they unable to fulfill the high market demand because they have limited facilities to produce *lontong*. The community program supported by Universitas Muhammadiyah Malang, especially by Engineering Faculty brought a team to bring the solution for the *lontong* industry to increase its production. The team analyzed and observed the condition of the industry to find out the problems they face. Moreover, the team also interviewed the owner of the industry, Pak Harianto. As a result of the interview and observation, this industry needed to increase production to fulfil the market demand and one of the needs was the production appliance to cook *lontong.* The team was determined the steamer with food-grade material for the industry. It was used 304 stainless steel that is durable to heat temperature and has a low rate of corrosion. The steamer was produced in a bigger dimension to cook 500 pieces of *lontong* for production. Therefore, the *lontong* industry can increase its production to fulfill the market demand.

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