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Modification Design of Shredded Meat Machine Using 1.5 Hp Motor Driver

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Modification Design of Shredded Meat Machine Using 1.5 Hp Motor Driver

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Abstract. The high level of consumption of processed beef products is a promised business opportunity to be developed. The shift in people's consumption patterns in consuming processed meat products from fresh meat into ready to eat processed products has encouraged some parties to develop technology in terms of processing beef. The way of making shredded meat is still conventional, using bare-hands, knives or forks to slice meat after cooked into a shredded part. Obviously, the process of making shredded meat is taking times, more power, and by pounding using forks is considered to be less safe for workers. The purpose of this study was to obtain a simpler beef machine for raw materials to make shredded meat using 1.5 horsepowers (hp) drive motor. Modified the design of construction by designing the casing cylinder, the hopper inlet and outlet, the tub and the table, developing a new machine that is able to be tested. 1 kg of beef so that the results of the measurement of the sound texture of the fiber consisted of 0.5 mm fiber thickness, 30mm length; 1mm fiber thickness, 35mm long and 1.5mm fiber thickness, 35mm long. The capacity of the results of beef steaming is 3.3 ounces/minute or 1kg per 3 minutes. Therefore, it can be concluded that the more the gap in the casing, the better the smoother the results could be.

1. Introduction

Beef meat is muscle tissue obtained from cattle. Meat is a carcass component composed of fat, bone, cartilage, connective and tendon tissues. The fresh meat is bright red in colors or bright shiny, not pale. Physically the meat is elastic, a little stiff and not soft if held still feels wet and not sticky in the hand and has a very distinctive aroma of beef. Beef as a source of animal protein has a high biological value containing 19% protein, 5% fat, 70% water, 3.5% non-protein substances and 2.5% minerals and other ingredients. The composition of meat consists of 75% water, 18% protein, 3.5% fat and 3.5 non-soluble substances [1]. In general, the chemical composition of meat consists of 70% water, 20% protein, 9% fat and 1% ash [1].

Meat is the main source of essential amino acids. The most important essential amino acids in fresh muscles are alanine, glycine, glutamic acid, and histidine. Beef contains more amino acids, leucine, lysine, and valine than pork and lamb. Beef heated at 70°C experiences the amount of lysine to 90% [1].

The production of shredded meat is still very conventional and traditional that is by using a hand, knife, or meat hammer to feed meat into shredded. By using manual equipment like that, obviously, the process takes a longer time. The manual process of meat steaming is less effective because it takes



more time and energy as well, in addition to meat shredding by pounding and using a fork it is considered less safe for workers.

By the development and application of this technology, it is expected that it is able to support the community of shredded meat makers to become home/small and medium industries so that the availability of this technology triggers the development of science and technology in order to increase the economic income of the community.

2. Literature Review

2.1. Shredded meat characteristic

Livestock commodities generally have a short shelf life because they are perishable. Efforts to extend shelf life and improve taste can be done by processing these foods. With processing, one type of food can be made into a variety of products with different tastes. One of the processed products is shredded meat [2].

Shredded meat is a dry food made from sliced meat and spices [3]. Shredded meat is dried meat which has been sliced into fine fibers and is generally made from beef.



Figure 1. Fiber texture of shredded meat

2.2. Beef Meat

Beef as a source of animal protein has a high biological value, contains 19% protein, 5% fat, 70% water, 3.5% non-protein substances and 2.5% minerals and other ingredients. The composition of meat consists of 75% water, 18% protein, 3.5% fat and 3.5 non-soluble substances [1]. In general, the chemical composition of meat consists of 70% water, 20% protein, 9% fat and 1% ash. Meat is the main source of essential amino acids. The most important essential amino acids in fresh muscles are alanine, glycine, glutamic acid and histidine. Beef heated at 700 C will experience lysine amount to 90% [2] [3].



Figure 2. Fresh dice beef



Figure 3. Boiled process

2.3. Boiled beef

Boiling meat must be done in enough water so that the entire surface of the meat sinks. Do it until the meat is really soft and easy to feed (about 60 minutes) at 100°C.

2.4. *Meat grinder and presto boiler machine*

A Shredded meat machine is a tool in this study. The working principle of the meat briber is to chop or feed meat, but before the process of shredding, the meat is boiled using presto or boiled conventionally so that the meat is soft. Softening the meat is very important so that later in the shredding process it becomes easier and faster. If it is not softened first then the machine work harder in the process of shredding itself. This must be done especially if the meat material has a hard and tough texture, so the softening process using presto must be done.

In producing shredded meat so that it can produce more meat in a fast time compared to shredding meat using a manual system so as to improve work efficiency. In addition, the texture of the result is better and of better quality when using this shredding machine. This feeder machine is a tool that is needed especially for shredded meat entrepreneurs because in making it, the process of shredding becomes important. The size of the thickness in doing the shredding is adjusted, do not let the flush result be too thin or too thick. To get a meat grinder with the best results, it is desirable, because it has an impact on the yield of the meat produced.



Figure 4. Commercially shredded meat machine

2.5. *Conveyor meat machine and conventional boilers*

This shredding machine can produce even flushes during the fast shredding process. The shredding process is certainly difficult to do if someone does it manually by using hands and hammers, especially those people who are not skilled at doing it. This beef steamer machine for shredded raw material consists of several components including Feeder shaft, feeder rod, casing cylinder, transmission, belt, electric motor, reservoir and frame.

The working method of this beef steamer machine is beef that has been cut into sizes $\pm 30 \times 30 \times 30$ mm and boiled half-cooked, then put in a container. When the engine is turned on, the electric motor will drive the motor pulley, then from the motor pulley it is transmitted to the pulverizes shaft so that the spindle shaft also rotated, and the shredding process occurred. If the beef is already steamed then the engine is switched off, then unlock it between the reservoir and the frame so that the reservoir can be tilted towards the front to make it easier to take the results. The following is the shape of the feeder machine which is equipped with a shaft and a meat tiller which is installed inside the casing.

2.6. *Modification and fabrication design of shredded raw material milling machine*

From the results of the design of the form of the construction of the shredding machine that was fabricated in this study, the construction was different from the existing ones. The modified turtle machine is based on the design of the container tub, which consists of a hopper that functions as the

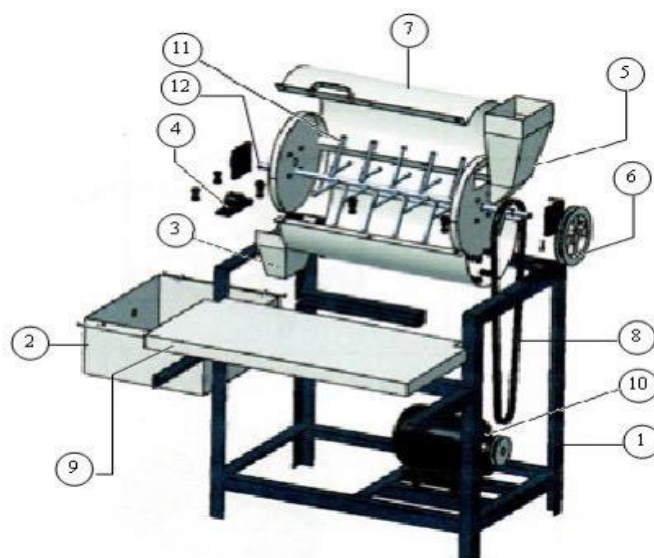
inlet of the meat to be fed, and the outlet of the meat that has been steamed. The shape of the reservoir is in the form of a horizontal cylinder as shown in Figure 5.



Figure 5. Shredded meat machine

The modified design of the meat grinder machine is planned to use an electric motor with 1.5 HP power, rotating shaft drive 1600 rpm which will be transmitted through a belt conveyor and pulley to the feeder shaft which has 21 rods of diameter (ϕ) = 10 mm.

The working principle of the beef steamer machine for this shredded raw material is that the meat is first to cut into sizes 30 x 30 x 30 mm or 60 x 60 x 60 mm, and boiled half-cooked, then cooled for a while until the temperature of the meat reaches room temperature. Next, the boiled meat is cooked into the casing cylinder through the hopper. Then the electric motor is turned on until the rotation of the motor pulleys can transmit power to the pulverizes shaft, so that the shredding process occurs. The occurrence of shredding in the casing cylinder is caused by the friction and friction of the rotary motion of the feeder rod which has a gap of 5 mm with the casing cylinder wall. Meat bribery process is carried out within 1 d. 3 minutes. During the process of shredding the meat, some of the meat that has been steamed will fall automatically into the sink through the outlet.



Legend :

1. Order
2. Storage container
3. Outgoing channel
4. bearing (bearing)
5. Hopper
6. Puli
7. Casing cylinder
8. Belt ("V" -Belt)
9. Placemat table
10. Electric motor
11. Shredding rod
12. Shaft the holder of the turtle stem

Figure 6. Design of modified shredded meat machine

- Slicing Machine Main Parts: Steps for Shredding Shredded meat Raw Materials:
1. Components made: The steps for operating a meat grinder machine for this shredded raw material are as follows:
 - Order
 - Casing
 - Storage container
 - Channel out
 - Hopper
 - Placemat table
 - Shredding rod
 - The shaft of the tiller
 2. Standard components:
 - Electric motor
 - Puli
 - Bearing
 - Belt
 - Binder bolts
- a. Prepare the meat ingredients to be used.
 - b. Cut meat with a size: $\pm 30 \times 30 \times 30$ mm/60x60x60 mm, then the meat is boiled for 30 minutes 60 minutes.
 - c. Add the boiled meat into the casing cylinder through the hopper.
 - d. Turn on the electric motor.
 - e. Wait a while until the meat is all tasted.
 - f. The product of the meat will come out by itself through the outlet and is accommodated by a reservoir.
 - g. After all is done, the electric motor can be turned off.
 - h. Clean the casing cylinder from the remnants of the meat.

The Material in used:

Iron elbow profile L 40 x 40 x 3 mm, Stainless steel plate (t) = 0.8 mm, Round bar S25C ϕ 20 mm and Round SS bar ϕ 10 mm.

3. Research Method

3.1. Place and time

This research activity was carried out at the Politeknik Negeri Lhokseumawe campus using Laboratory facilities for Production and maintenance of the Mechanical Engineering Department. Time of implementation in accordance with a predetermined schedule of activities.

3.2. Materials and Tools

3.2.1. *Time and place.* This research activity was carried out at the Polteknik Negeri Lhokseumawe campus using Laboratory facilities for Production and maintenance of the Mechanical Engineering Department. Time of implementation in accordance with a predetermined schedule of activities.

3.2.2. Used materials.

1. Circular saw machine
2. Gurdi Machine (Drilling)
3. Electric welding machine (welding SMAW)
4. Hand grinding machine
5. Plate bending tool
6. Plate cutting tools

4. Results and Discussion

From several steps to make / work on the main components that have been done above, all components that have been done / made and those that are standard are assembled in accordance with the design drawings of the planned construction such as the following works.

4.1. Fabrication

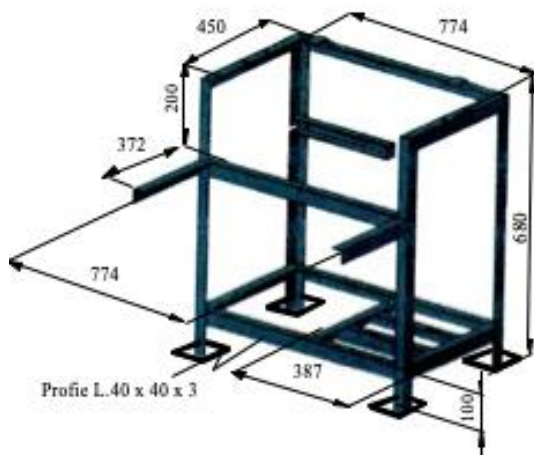
Several mechanical works into the modified shredded machine can be seen in Figure 9 (a-h). From some of the main components of the briber machine construction that have been made, the overall assembly results.



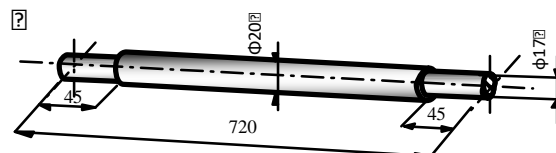
Figure 7. Results of the fabrication machine appear inside



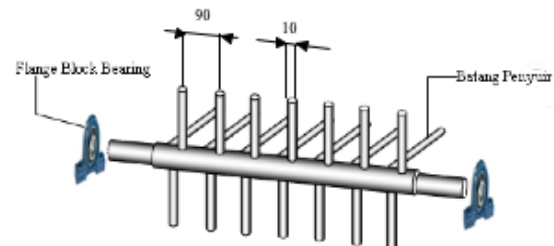
Figure 8. Results of the fabrication machine appear aside



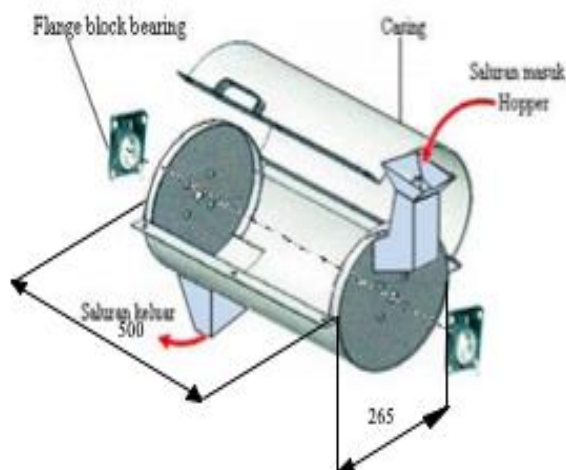
(a) Frame welding



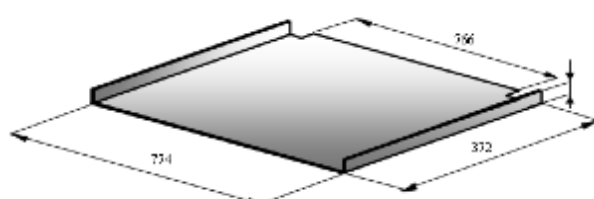
(b) Shredding shaft holder



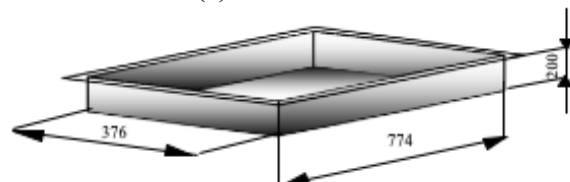
(c) Shredding and welding rods



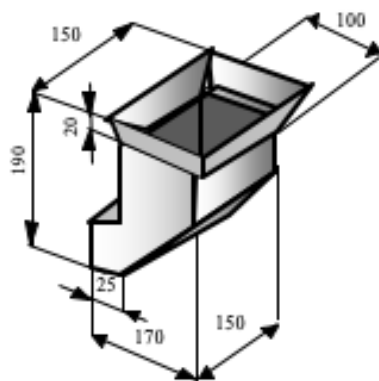
(d) Forming and welding of casings and hoppers



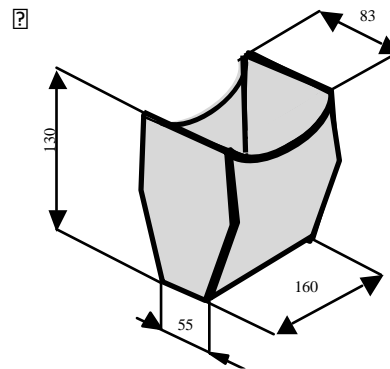
(e) Placemat table



(f) Container



(g) Inlet



(h) Outlet

Figure 9. Fabricating of the shredded machine process

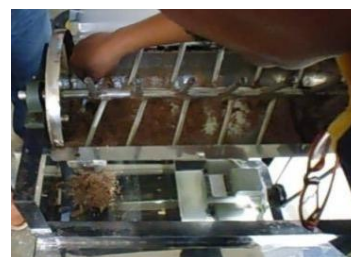
4.2. A step of shredding the meat

The step of the feed process, which starts from the process of preparing the beef until the shredding process for the shredded meat raw material is as follows:

- Preparing raw materials for beef to be used.
- Cut the meat measuring 60 x 60 x 60 mm, then boil the meat for 30 minutes 60 minutes until cooked.
- Insert 1 kg of boiled meat into the casing cylinder through the inlet hopper (see Figure 4.3).
- Turn on the electric motor to move the shafts shaft.
- The process of shredding is done for 1 dd 3 minutes until all the meat is steamed.
- The results of shredded meat are in the form of fibers that will come out by themselves through the outlet and are accommodated into a reservoir.
- After all is done, the electric motor can be turned off.
- Clean the casing cylinder and the turtle stem from the remnants of the meat.



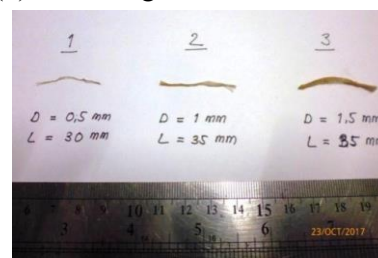
(a) Shredding process



(b) Shredding after 1-3 minutes



(c) Shredded meat



(d) Measurement of Shredded meat

Figure 10. The process of shredding meat into the machine

Table 1 Test results for the performance of the shredding machine

#	Tasks	Specification Data	Explanation
1.	Preparing fresh beef	1 Kg	boiled
2.	Chopping into dice	60 x 60 x 60 mm	Facilitate ripening and feeding
3.	Boiling process	30 ÷ 60 minutes	Time needed for boiling
4.	Shredding process	1 ÷ 3 minutes	The Time required for feeding
5.	Shredded meat	Thickness= 0,5 mm Length = 30 mm	The shapes and sizes vary
6.	Machine capacity test	3,3 Ounce/ min. 1 Kg /3 min.	Production capacity
7.	Motor power	1,5 HP	Standard
8.	Motor pulley rotation	1600 rpm	Standard
9.	The Shredded axis of shredder pulley	300 rpm	Effective rotation
10.	Pulley drive motor	ϕ 3 inch (76,2mm)	Standard
11.	Pulverizes shaft	ϕ 8 inch (203,2 mm)	Standard
12.	The distance of the motor shaft with the spindle shaft	512 mm	Design results

5. Conclusion

From the results of research on the design of beef steamer machines for shredded meat raw materials using a 1.5 HP electric motor, a rotation of 1600 rpm, thus, we concluded that the design concept of the construction of beef briber machine construction for shredded meat raw materials is designed based on a comparison of machine construction changes from what people have already made. Changes in the redesigned construction which consists of the design of the casing cylinder, the inlet and outlet duct hopper, the containment tube and the placemat table. The use of electric motor power (motor drive) used is equal to 1.5 HP, rotation of 1600 rpm, the effective rotation of the shafts is $190 \div 300$ rpm. The drive pulley is 3 inch or 76.2 mm in size, 8 inches or 203.2 mm in size shaft pulley. The shape of the casing, spindle shaft, and rod of the turtle which are constructed from the results of the design function for the feeding process. The gap of the casing wall with the tip of the rod is 5 mm. This gap is from the results of observations and analysis that the closer the gap distance, the better the result of the flow (smooth). So, the results of the bribery that has been tested are as much as 1 kg of beef, so that it shows the results of measurement of the sound texture of the fiber consisting of 0.5 mm fiber thickness, 30 mm length; 1 mm fiber thickness, 35 mm long and 1.5 mm fiber thickness, 35 mm long. Capacity for the results of beef steaming is 3.3 ounces / minute or 1 kg / 3 minutes. Machine construction is simpler and can be developed according to expected production needs.

For further works, we also can expect the works to be done that the manual of the modified machine is compulsory to be prepared, and the safety of the works till the healthy shredded meat proceed have to put into account as well.

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