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Performance Capacity Testing Of Hush Peeling And Soybean Seed Crusing Machine For Home Industry Scale

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ABSTRACT

The process of peeling and splitting soybeans is a process carried out by industry which uses soybeans to clean the skin and at the same time peeling them using a machine that peels the epidermis and also splits the soybeans can speed up the cleaning process. The machine for peeling epidermis and splitting soy beans uses a pulper as the part that peels and splits at the same time in one machine rotation. This model of machine for peeling epidermis and splitting soy beans is intended for home industries with a processing capacity of 10 kg/hour. The performance capacity test was carried out to test the ability to peel and split soybeans using a tube pulper with soybeans that had been soaked in water for 10 hours previously. Based on the tests carried out, it was found that the peeling and splitting capability of the machine for peeling the epidermis and splitting the soybean seeds was produced based on the initial weight before peeling, the soybeans that were completely peeled were 88.2% and the weight of the waste was 11.8%, peeled in imperfect conditions. broken and not peeled based on the influence of the gap in the peeling space of 2mm.

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1. INTRODUCTION

Soybeans (glycine max) are a type of leguminous plant which is the raw material for making tempeh, tofu, soy sauce, tauco and other processed soybean foods. Soybean plants were first introduced to Indonesia through immigrants from China during the booming trade with China (Suknia & Rahmani, 2020). The soybeans that will be processed for making tempeh and other food ingredients are initially soaked and steamed for 10 to 12 hours before the epidermis is separated from the soybean seeds and the process of making tempeh is carried out manually as in Figure 1(Yokki, Sinuraya, 2021).

Figure 1 traditional tempe making process(Setiawan, 2012)

Based on the paragraph above, the process of peeling and splitting soybeans takes 1 hour so that every 10 kg of soybeans has a hulling efficiency of 90% (Agus Kusnayat, Erna Febriyanti, Mohammad Yasin Abdul Hafidh, Shinta Yulia, Anisa Herdiani, Indra Lukmana Sardi, Sri Martini, Agus Kusnayat, Erna Febriyanti, Mohammad Yasin Abdul Hafidh, Shinta Yulia, Anisa Herdiani, Indra Lukmana Sardi, 2019). This process takes a lot of time and energy so that the ready-to-use soybeans are less than optimal, so a tool is needed that can speed up the peeling and splitting process at the same time, by utilizing rotational force, including a roller as a peeling mechanism so that the soybeans can rub against each other.(Purwantana & Bintoro, 2012).

Soybeans that are processed using a soybean peeling and splitting machine with a rotary peeling model experience 3 possible conditions of peeling, splitting and crushing after grinding based on the size of the soybeans which shows that these possibilities occur if:

a. The size of the soybean seeds to be processed is larger than the size of the splitting gap so that the soybeans become crushed and destroyed.
b. The size of the soybeans which is smaller than the splitting gap means that the soybeans are not peeled and are intact.
c. The size of the soybean seeds corresponds to the size of the gap soybeans will be peeled and split completely.

Factors that influence the performance of peeling and splitting are the speed of the roller and peeling and splitting machine. If the speed increases it will increase the possibility of the soybeans being crushed due to the increase in speed. Conversely, if the speed is less then the soybeans will be difficult to peel (Setiawan, 2012). Based on the problems above, design and calculations are carried out for making the tool, but a manufacturing process is needed to realize the results of designing a tool mechanism. There are many kinds of manufacturing processes, from cutting, joining to assembly processes for each part of the tool.

The manufacturing process carried out in making soybean shelling and splitting machines goes through several processes starting from material preparation, preparation of equipment used in the manufacturing process, as well as the design of the tool itself. Machines for peeling epidermis and splitting soybean seeds that have been built using a manufacturing process need to be tested on machine performance and tool performance by periodically loading the production process so that the resulting mass of seeds that are peeled and completely split with seeds that have not been peeled and have not been split.(Ramadani et al., 2022). Based on these parameters, research was carried out by testing a machine for peeling epidermis and splitting soybean seeds with a total load of 20 kilograms with an increase in the peeling and splitting process every 5 kilograms so that the percentage of the seeds produced could be obtained, before processing and the waste produced.

2. METHOD

The machine for peeling epidermis and splitting soy beans consists of several components as shown in Figure 2.

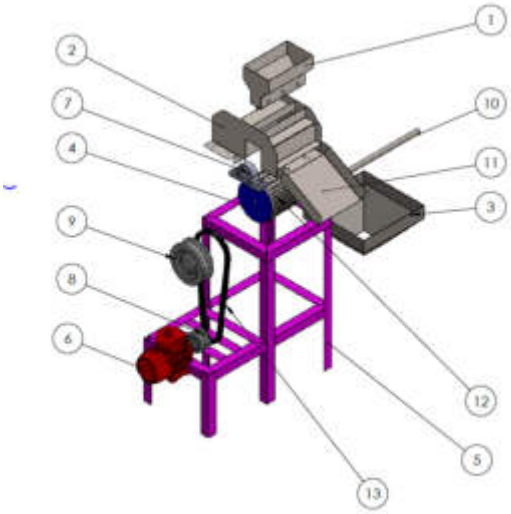

Figure 1. Design of machine for peeling epidermis and splitting soy beans

Based on Figure 2 in c, there are components described in table 1.

Table 1. Components of a machine for peeling epidermis and splitting soy beans

No.	Component Name	Material
1	Feeders	Stainless steel 316
2	Cover	Stainless steel 316
3	Hoppers	ASTM A36
4	Pulper support plate	ASTM A36
5	Frame	AISI 306
6	AC Motor	
7	Pillow blocks	
8	Drive pulley	
9	The pulley is moved	
10	Axis	ASTM A36
11	Sliders	Stainless steel 316
12	Pulper	ASTM A36
13	Belts	

Performance and Performance Testing

The testing steps for the epidermis peeling and soybean seed splitting machine are carried out in several stages, including:

1. Soaking soybeans for 10 hours in water aims to soften the epidermis on the soybeans so that they can be easily peeled.
2. After soaking in water for 10 hours the epidermis has started to soften and is ready to be weighed.
3. Weigh the original weight of the soybeans before peeling and divide each peeling process into 2 kilo grams and record the weighing results as in Figure 3.

Figure 3. Initial weighing process of soybeans

4. After weighing, put the soybeans into the feeder for grinding and record the time for one grinding 5 times in a row with a voltage on the driving motor of 220 Volts and a current of 1.3 Ampere.
5. After grinding, re-weigh the ground soybeans and record them after each grinding.
6. Weigh the waste produced by the soybean shelling process and record each weighing.

3. RESULTS AND DISCUSSION

Based on the manufacturing process carried out in making the machine for peeling epidermis and splitting soybeans, the final result of the machine for peeling epidermis and splitting soybeans is as shown in Figure 4.

Figure 4. Machine for peeling epidermis and splitting soy beans

Based on the peeling and splitting process, each grinder produces 2 kilograms of soybeans with a maximum processing load of 10 kilograms as shown in table 2.

Table 2. Test results of the process of peeling epidermis and splitting soybean seeds

Initial weight (kg)	Input voltage (V)	Input current (A)	Milling time(s)	Final weight (kg)	Waste weight (kg)	Yield percentage (%)	Waste percentage (%)
2,064	220	1.3	75	1,831	0.233	89%	11%
2,028	220	1.3	78	1,804	0.225	89%	11%

2,034	220	1.3	69	1,803	0.231	89%	11%
2,072	220	1.3	80	1,837	0.234	89%	11%
2,013	220	1.3	67	1,705	0.227	85%	15%

Table 2 shows that 5 trials of the machine for peeling epidermis and splitting soybeans were carried out with a weight of 2 kilograms for each process, which took 67 to 80 seconds for one grinding process, resulting in an average weight of ground soybeans of 88.2% of the initial weight. and produces an average waste weight of 11.8% where the waste is partly in the form of crushed soybeans and epidermis from soybeans.

4. CONCLUSION

Testing the performance and performance of the epidermis peeling and soybean splitting machine with a drive motor input voltage of 220 Volts and a current of 1.3 Ampere using a soybean production load of 10 kilograms with testing 5 times with each soybean fed to the peeling machine. 2 kilograms of epidermis and splitting of soybeans produces an average of 88.2% of soybeans that are peeled and split and 11.8% of the weight of the waste produced.

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