Angle Setting Between Two Cutters' Blades of Dried Areca Nut Peeling Machines Due to Increase Its Production

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Angle Setting Between Two Cutters' Blades of Dried Areca Nut Peeling Machines Due to Increase Its Production

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Abstract. Areca peeling machine is developed specifically for the setting angle between the two cutter blades, which creates a shear force in the incision of dried areca nuts so that it can improve the quality of the peeling results. This study aims to obtain energy-efficient technology that can increase the yield of stripping areca nuts on one machine. The research method that will be carried out is to arrange the cutting angle between the two cutters, it is expected that the dried areca nut can be peeled for all available sizes, from the smallest size, 14 mm to the largest one, 46 mm. Based on the results of peeling by setting the formed angles and by adjusting the varying distances obtained data on the size between (1 - 2.5) mm with the angle of 2.87 degrees, it produces 83.3 pieces peeled areca nut. The graph shows that the results are increased, whereas areca nuts are peeled and some are damaged and partially destroyed. From the obtained data of the number of round fruit and dried areca nuts reached 52.59%, and the time in-between and areca nut yield reached 42.77% while the number of dried areca nuts that were not peeled was 25.96%.

1. Introduction

Province of Nanggroe Aceh Darussalam, specifically North Aceh Regency, according to the statistical data on people farms with an area of 398419 hectares of production reaching 4251 tons at 2017 [1]. To bridge this problem, a machine is needed. This proposed machine can help areca farmers who are still conducting the peeling process manually, to rapid their peeled areca nut production increase. The proposed machine in such ways is able to peel quickly. Areca peeling machine is developed specifically for the setting angle between the two cutter blades, which creates a shear force in the incision of dried areca nuts so as to improve the quality of the peeled results. This study refers to the research parameters that have been studied in [2] and [3]such as speed, peeling process, time, engine speed, the gap distance between two drums in the shape of a cutter blade holder, on a dry areca nut paring machine.

This study aims to obtain energy-efficient technology that can increase the yield of peeled areca nuts on one machine. The stages of the research are carried out by adjusting the cutting angle between the two cutter blades. It is expected that the dried areca nut can be peeled for all available sizes. Areca nuts have become a trading commodity, especially areca nuts round in shape or split into two. The process

for the separation of ore with the shell must first be carried out by drying the areca nuts, so then the peeling process is done by means of the cutting process or shell destruction. The method that is often done by local farmers was to remove areca ore that has dried from the shell is by cutting using a machete. This process is done manually and requires a lot of manpower and expertise in peeling the areca nuts.

Based on the road map of the Politeknik Negeri Lhokseumawe specifically for material engineering, which is said appropriate technological innovation and industry with the use of science and technology in order to improve the quality and quantity of production, and improve people's welfare. The machine is easy to operate and produces the best peel quality. Plus, the implementation of updating stripping technology.

Areca peeling machine is an equipment that can speed up the process of peeling the areca nut. Since the size of the areca nut varies, the angle between the two cutters blades is arranged so that all available sizes of the areca nut can be peeled well based on the shear force between the two rotating cutters. By utilizing a speed regulation system, thus, the use of the engine more efficient according to the needs.

Therefore, it is proposed to study the effect of speed and time of rotation on the results of peeling the areca nut to get the angular parameters between the two cutters blades. It is expected that the proposed machine can peel all available sizes of areca nut from the smallest size, 14 mm to the largest size, 46 mm. This study is conducted in order to produce an easy-operate peeling machine, that has relatively cheap price and the peeling process is fast and the results are optimal according to the needs of the community. This research will produce machines that are easily sized to be moved according to the needs of farmers. According to [4] Speed analysis on crank launcher mechanism props. A connecting rod affects the other connecting rods in the system of direct and large mechanisms that are relatively different from each other. The research conducted in [3] by regulating the rotation speed of the stripping machine produces 160 kg / hour at 670 rpm. In reference [5], the authors made a young areca shelling machine using a factorial completely randomized design of 2 factors, namely the amount of spring pressure (10, 20 and 30 kg) and lower blade rpm (280, 350, 420, 490, 560 rpm). The results showed that the magnitude of the spring and rpm pressure of the lower blade on the young areca shelling machine had very significant different effects on all stripping parameters. The best results were obtained at a spring pressure of 10 kg and a lower blade rpm of 560 rpm. The design of the areca peeler machine in [6] resulted in the capacity of peeled areca nut to be 270 kg/hour. The machine uses a 100-mm squeezer roll diameter and a roll length of 400 mm peeler, an electric motor with 0.5 Hp power, 1420 rpm rotation.

Based on the mentioned studies, thus, for peeling the areca nuts in varying size can be done by setting the cutter's blades angle at the proper speed and rotation that is required by the machine.

2. Method

This study is involving the motoric parameters of the used motor and as the machine runs, it follows the proper motor-run procedure.

2.1. Parameters

This study was conducted in Production and Machining Laboratory, Politeknik Negeri Lhokseumawe. The research parameters included the effect of areca nut size and quantity on the angle between the cutter blades, speed and engine rotation must take into account. This is an important part, since for making a dried areca nut peeling machine, the parameters have to be carefully considered. At this stage, the areca peeling machine works based on the varies sizes and quality of the nuts, times, rotation, speed when the machine runs. This proposed machine must also equip with an automatic setting system.

2.2. Proposed machine procedure

The proposed machine is driven by a gasoline motor with 5.5 PK power and 2700 rpm rotation through a 3-14-inch pulley transmission system so that it reaches the engine speed of 600 rpm. This 600-rpm rotation is used as a reference to limit the number of areca nuts that enter into the peeling drum. The

rotation moves the two drums in the same direction, then enters the areca nuts, which have been dried through the hopper continuously for all available sizes. the largest diameter of areca nut is 46 mm and the smallest is 14 mm. The adjusting of the angle is according to those diameters. It resulting in perfect peeling of the shell and areca nut. The main and the second drums' movement are clockwise. they consist of 12 blades. The process runs continuously. In the peeling process, the separation of the peeled areca nuts is channeled through the bottom funnel to be accommodated while the shells are directed by using a fan through the upper channel provided all dust and pulp which is then is accommodated in its place.

By modifying the main cutters' blades angle on the drum as shown in Figure 1, then the machine can peel dried areca nuts and separate the nuts and the shells. The cutter's blades size is 300 mm in length with 12 blades, 150 mm flange diameter with 460 mm shaft length, which is arranged into the main drum with a 191 mm in diameter. The cutter's blades are 18 pieces, the flange diameter 120 mm shaft length 460 mm strung to form a cylinder (second blades drum) diameter 163 mm serves to lead to the skin of the nuts that have been peeled through the exhaust line.

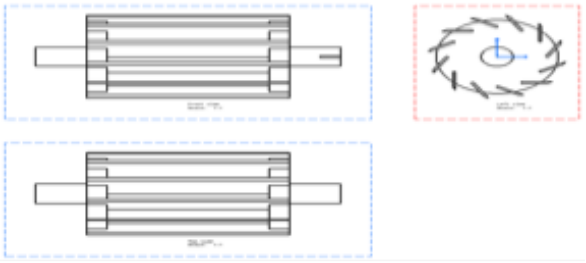

Figure 1. Drum dimensions

3. Results and Discussion

In this study, the appropriate angle shape is examined so that the process of peeling the dried areca nuts is properly done. On dried areca machine Figure 2, the machine has been assembled properly.

Figure 2. Assembled dried areca nut peeling machine

The peeling process is modified so that the nut can be completely peeled off. In the analysis of the angles, the slope between the two blades drums is set at 600 rpm. The areca nut which has been slashed down then rotated at 800 rpm in the form of tight fins, then the retaining fin is also placed on the frame.This study is developed from the previous studies that have been investigated, namely, the distance between straight-set drum cutters obtained by the gap of 2 mm and peeling system, variations

in both rotation and time have also been studied. It is expected that the arrangement of varying angles obtained a machine that can peel all sizes of dried areca nuts.

The dried areca nuts are taken randomly and then weighed 1.5 kg, calculated the number of nuts which are poured slowly into the hopper, recorded the processing time and measured the rotation using a tachometer. After adjusting between the main drum cutter and the second one which forms a tilt angle at the position of the main drum cutter it remains in the straight position while the second cutter drum in the sloping position starts from a gap distance of 2-2.5 mm (0.96^{O}angles), 1.5-2.5 mm (1.91^{O} angles), 1-2.5 mm (2.87^{O} angles). The test runs three times.

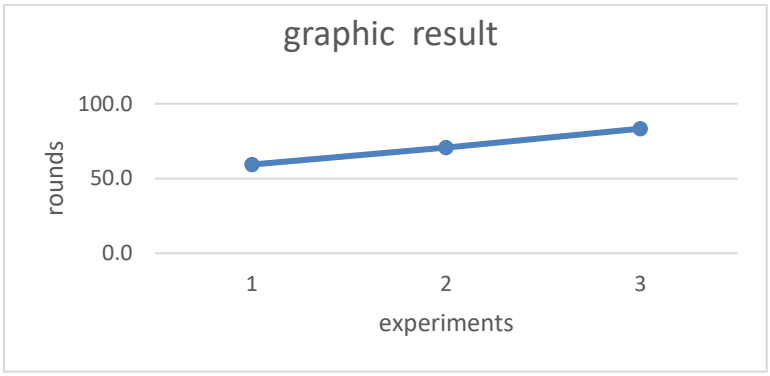

Figure 3. Variation of angle

Based on the results of stripping by setting the angles formed by adjusting the varying distances obtained data on the size between 1-2.5 mm with the angle of 2.87^{O} produces areca nut pared 83.3 pieces. From the graph shows the results that increase with the size of the angle formed can strip all sizes of the type of betel nut that has dried. Areca seeds are peeled and some are damaged and partially destroyed.

From the data obtained from the results of stripping the number of round fruit and dried areca beans obtained results reached 52.59%, and the relationship between time and areca nut yield reached 42.77% while the number of dried areca nuts that were not peeled was 25.96%.The test was continued at 2.87^{O} with a distance 1.5-2.5 and a constant 600 rpm rotation carried out testing, areca nut was randomly weighed as much as 2 kg per sample so the data was obtained as in figure 4.

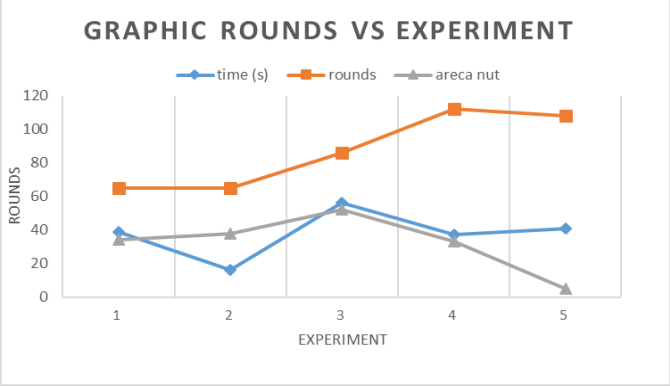

Figure 4. Test of angles based on peeling results

4. Conclusion

The proposed areca nut peeling machine has main cutter blades' diameter is 191 mm and second cutter blades' diameter is 163 mm rotated at 600 rpm with both main and second cutters' direction is the same (clockwise). Then the process of separating the shell and nuts is rotating at 800 rpm. Thus, the results of the research conducted can be summarized as i) the machine can peel for all types of arecanut; ii) the best angle form of the evaporation result is $2.87^{O}$with a distance of 2, 5 and 1 mm; iii) the peeling machine can peel dried areca nuts with an efficiency of 49%.

For further study, the peeling machine must work automatically as it has a removal system. Besides, this study needed to achieve optimization due to distribute the machine to the farmers.

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