Design Of Casava Slicer Machine For Improving Casava Chips Industry

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Abstract. Cassava is a fruit of the plant tubers that grow in the soil. Cassava has a hard texture of the meat.Cassava also be used as a companion in several dishes such as fried foods, spinach village, a variety of snacks, chips and other dishes.The chips are snacks that are popular with the public. The chips are classified as types of food *craker* foods that are dry and crisp with a high fat content.Cassava cutting machine is a tool to cut cassava into thin sheets with a thickness of ± 1 to 2 mm. Not only that, the machine also can produce pieces with the same thickness, and the cutting time becomes fast.The design is the beginning of a series of activities in the process of making the product. The perancanagna stage made important decisions that affect other activities follow. Thus, before a product is made first made the design process that will produce a drawing or a simple picture of product to be made. Keywords: chips, cutting machines, hardness cassava, and designdesign.

1. Introduction

1.1 Background

In today's era of agribusiness is the right choice for the people of Indonesia. As fields considerable effort provide a better hope. This field does not only include matters relating to agriculture before the harvest, but that it is more developed is theprocessing industry of agricultural products. This field turned out to be dominated by small and medium industrial house which is actually the domestic industry.Cassava is a staple food in the country. Where staples can be easily damaged and rotten within approximately two to five days after harvest, if not get a good post-harvest treatment. Keeping the post-harvest treatment, among others dried (made of dried cassava), made of starch and is made of high-value products, such as crackers from tapioca and cassava chips.Today many tools that help entrepreneurs cassava chips still manually so that production is still not optimal. so the authors designed a cutting tool capable of cutting cassava with the same thickness as well as the innovation of the knife that cuts cassava chips are not the same on the pieces as usual and not only to cut the cassava alone but can cuttubers.other With regard so that the machine does not require huge costsand lighten the work of the producer of cassava.

1.2 Formulation Of The Problem

Having regard tobackgroundthe above that can beproblemformulatedis how to design cutting tools cassava with different cutter not only cuts cassava but also other tubers as well as making the tool more affordable.

1.3 Limitation Of Problem

With attention to someproblems encountered in the production of cassava cutting machine is the focus of the issues discussed include cutting forces in cutting, the power requirements of the engine, cutting blades, and transmission systems. Materials used in this tool is cassava.

1.4 *Design Objectives*

In accordance with the formulation of theproblem,so the purpose of making cassava cutting tools are:

1. Make cutlery cassava
2. Modify cutter
3. Knowing the style of cut cassava
4. Determining the necessary electric motor power the machine.
5. Determine the engine transmission circuit.

6. Knowing the work of a

1.5 Benefits Of Design

The benefits are:

1. Produce cassava cutting tools with innovation.
2. Increase the power of creativity, innovation, and expertise students.
3. Increase knowledge theof how to design and create works of technology useful
4. It can help employers cottage industry of cassava.

2. Basic Theory

2.1 Cassava

Cassava is a fruit of the plant tubers that grow in the soil. Cassava has a hard texture of the meat. Cassava also be used as a companion in several dishes such as fried foods, spinach village, a variety of snacks, chips and other dishes.The chips are snacks that are popular with the public.

2.2 Design Design

Design is theof activitiesbeginning of a seriesin the process of making the product. This means that the design of the design work is of no use if the draft is not made.

2.3 Cassava Cutting Machines

for the manufacture of cassava chips (potato tubers, etc.) is required in order to accelerate the process pengirisannya machine, calledCassava Cutting Machines. The capacity of the machine is made for the cottage industry or byconsumers. Cassava cutting machine is a tool to cut cassava into thin sheets with a thickness of 2 mm ± 1 sd

3. Method Design

Activity in the design process is called phase. The phases of theprocessdesignis different from one another.

Figure 1. Diagram of the process of designing

1. the project definition, project planning, and preparation of project engineers specifications. Definition of projects and other activities in this phase produces include:
   a. A statement of the problem or the products to be designed
   b. Some of the obstacles that limit the solution to the problem.
   c. Specifications technicians
   d. keterimaan criteria and other criteria are met by the product.
   e. Planproduct
2. Product Concept Planning specifications technical results first phase of the design processbecome the basis of the next phase, namely the concept design phase of products as possible. The resulting product concept is still a phase of the scheme or in the form of sketches. In principle, all the alternative concepts products suchmeet the technical specifications of the product. At the end of the design phase of the product concept, evaluation of the results of thedesign concept of product to choose one or some of the best product

concept to be developed in the third phase, the design phase of the product.

3. Product designer product design phase is the development of alternative in the form of a scheme or sketsaa into products or objects that form the techniques, materials and dimensions of the elements are determined. Product design phase ends with the design detail elementsof the product, which is then poured into detail drawings for the manufacturing process.
4. Documents for Product Creation document or image that product design can take the form of traditional drawings on paper (two-dimensional) or image in its modern form is the digital information stored in computer memory. The information in the can digital-outberupaprintto produce traditional images or can be read by a softwarecomputer. Images of the design of products consists of:
   a. Image all the elements of a complete product to its geometry, dimensions, hardness smoothness of the surface and material.
   b. Image arrangement of the components(assembly)
   c. image array of products.
   d. The specifications make remarks that could not be contained in the image.

4. Discussion

4.1 Design and Image Technology Cutting Machines Cassava

1. Cutting Machines Construction DesignCassavamachine construction design cassava cuttingis determined on the following considerations:
   a. Mesinpemotong singkong tidak employ penggerak manusia sebagai penggerak primarily but replaced with an electric motor power
   b. specification economy with a dimension that is comfortable for the operator and easily adapted to the machine working space dimension length 550 mm x width 500 mm x height 650 mm.
   c. Easy in operation, maintenance and replacement of machine parts.
   d. Cutting blades can be set to determine the thickness of the resultspieces.
   e. In accordance with the desired Mesin pemotong singkong ini tidak apply materials that are harmful to health. Cassava cutting machine does not cause air pollution.

4.2 Mechanical Design Cutting Machine Cassava

1. Style Design Designing for theblades cutting on machine cassava uttingusesplate*steelsteel*size 88 mm x 50 mmx 1 mm. Prior to determining the value of cutting force, it must first know the broad side of a knife that is:

So broad side cutter:

A = ½ Alas. High

A = ½. 1. 4

A = 2 mm^2

Characteristics cassava cassava known that violence was 3.48 kg / mm^2.Then the cutter's style can be searched by the formula

F =. A

F = 3.48. 2

F = 6.96 kg

2. Power Activator driving force is the minimum power necessary for the system to work the machine using an electric motor 1400 rpm so sought after by the formula:

E = F. R

T = 68.28. 1.5

T = 102.42 kg.cm

After then be calculated torque electric motor power (P)

P = T x 2 xn

P = 102.42 kg.cm x 2. 3.14 x 420 rpm

P = 270,142.99 kgcm / min

P = 45.02 kg m / s
P = 0.44kw
P = 0.59Hp
So what is needed is the driving force of 0.59 Hp so that the electric motor used is an electric motor with a round of 1400 rpm and power ¾ hp.
3.Poros. Poros is one part of the transmission system of cassava cutting machine. This shaft has a length of 375 mm.
3. Furthermore, calculated planning cassava cutting machine spindle.

1) P = 0.59 kW HP = 0.44
2) = fc x P Pd
   Pd = 1.5 x 0.44 kw kwPd = 0.66
3) T = 9.74 x 10^5
   = 9.74 x 10^5
   = 459.1714 kg .mm

a. Power is transmitted P = 0.59Hp
   = to 0.44 Kw
b. Shafts Calculation shaft material on the mower using the ST 50 with a tensile strength(σb) = 50 kg / $mm^{2.}$There are two correction factors taken into account, namely *Sf1* and *Sf2*. in terms of torsional fatigue limit is taken *Sf1* = 6, *Sf2*= 2.
4. Based on these considerations, the cutter shaft cookies using: *Sf2* = 2
   a. allowable shear stress allowable shear stress σg(kg / $mm^{2)}$is:
      σg=Σb/*(Sf1 xSf*2) (1)
      = 50 / (6 x 2)
      = of 2.78 kg / mm^2
   b. torsion and bending correction factor correction factor being reviewed from the state of the torque is expressed by K_t at a price of 1.5 to 3.0. These factors are reviewed whether the imposition of a rotating shaft fixed bending moment, experiencing a mild collision, or experiencing severe collision. Then the cutter shaft cassava used:
      K_t= 3.0 because subjected to shocklarge
      K_m= 3.0 for experienceheavy collision
   c. Axle Diameterd_s

$$d_s \geq \left[\left(\frac{5,1}{\tau g}\right)\sqrt{(K_M.M)^2 + (K_t.T)^2}\right]^{1/3}$$

$$d_s \geq \left[\left(\frac{5,1}{\tau g}\right)\sqrt{(3.295,5)^2 + (3.1216,526)^2}\right]^{1/3}$$

(2)

needs a minimum diameter 22.96 mm shaftsafe isto use then retrieved the shaft diameter of 25 mm.

5. Pully and V transmission belt (V-belt)
   Diameter puly are:
   .d_1 = 60 mm
   .d_2 = 200 mm
   With n_1 = 1400 rpm then round$n_2$cutterat the plate can be determined:
   .d_1. n_1 = d 2.n_2

.$n_2 = n_1$

.$n_2 = 1400. \frac{d1}{d2}$

.$n_2 = 1400. \frac{60}{200}$

.$n_2 = 420$ rpm

so the disc blade rotation is equal to 420 rpm

4. Transmission-v belt used to reduce rotation of n_1 = 1400 rpm becomes n_1 = 420 rpm. Cassava cutting machine has a large load variations and estimated machine work for 3-5 hours each day so that a correction of 1.5. The process of planning and calculation of V-belts can be observed through Figure.

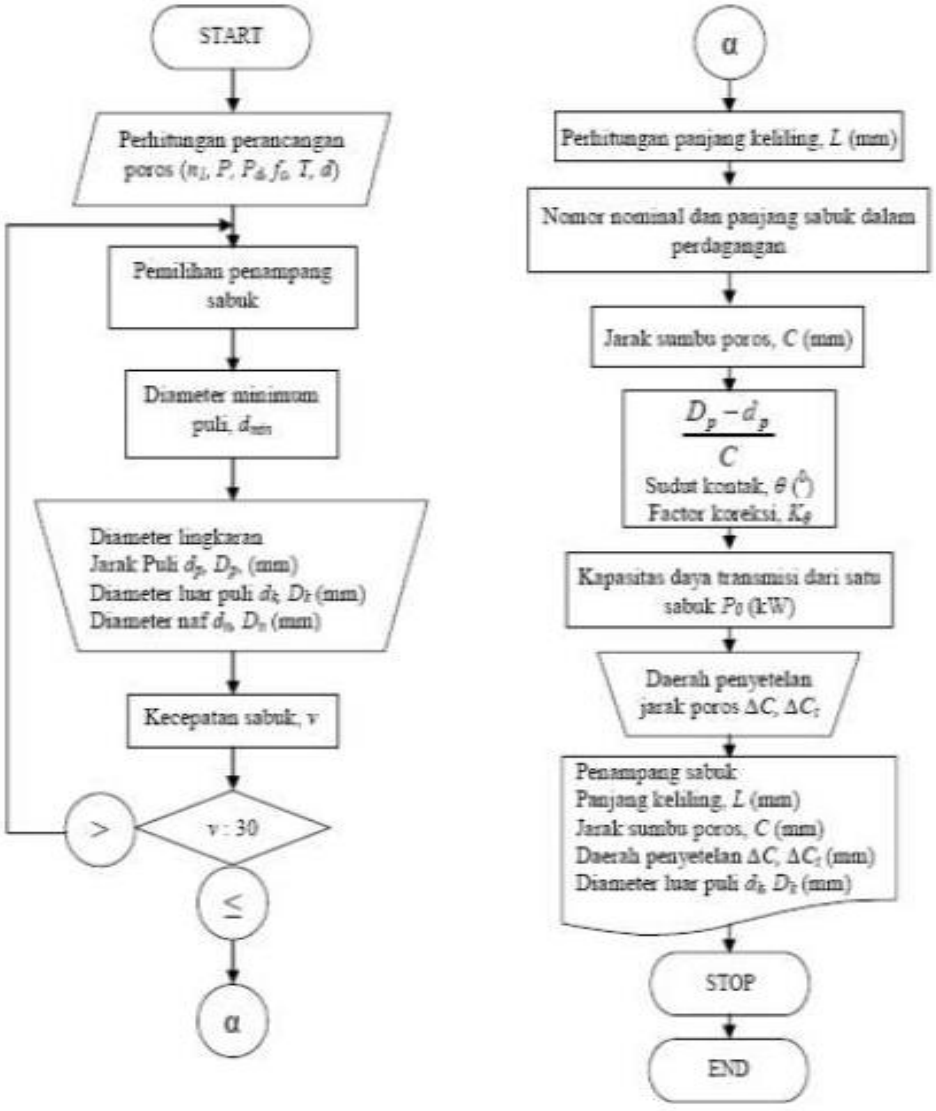

Figure 2. Flowchart for pick-v belt

5. Flow diagram is then used to calculate and determine the type of v-belt is used, then the v-belt design:

Sectional v-belt use: type A pulley diameter

dp = 60 mm

Dp = 200 mm

Speed v-belt V =

$$\frac{\pi dp.n1}{60x1000}$$

$$\frac{3,14 \times 200 \times 1400}{60x1000} \quad (3)$$

V = 14.65333 m / s

f. circumferential length L

L = 2C

L = 2C (3)

L = 2x400 + 260

$$L=2C + \frac{\pi}{2}(dp + Dp) + \frac{1}{\frac{4C}{2}}(dp + Dp)$$

$$L=2C + \frac{3,14}{2}(60 + 200) + \frac{1}{\frac{4C}{2}}(60 + 200)$$

$$L=2x400+260 \frac{1}{4 x 400}(60 + 200)^2$$

$$L=1060 + \frac{1}{1600}(60 +200)^2$$

L = 1102.25 mm

From table obtained nominal number-V belt that is 45 = 1102.25 mm

Distance axis of the shaft (C) can be expressed as follows:

1) Formula:

b = 2L$_1$ - (Dp + dp) (4)

b = 2 x 1102.25 - 3 14 (200 + 60)

b = 1388.1 mm

2) formula:

C =

$$\frac{b+\sqrt{b^2-8(Dp-dp)^2}}{8}$$

$$\frac{1388,1+\sqrt{1388,1^2-8(200-60)^2}}{8}$$

C = 339.8151 = 300mm

contact angle (θ)

Θ = 180º -

Θ 180º = -

Θ = 160,65º

$$\frac{57(Dp-dp)}{C}$$

$$\frac{57(200-60)}{400} \quad (5)$$

correction factor (K_θ)= 0, 96

Regions setting the shaft axis distance based on the data obtained, it was determined:

ΔCi= 20 mmΔCt= 40 mm

So v-belt for the transmission of cassava cutting machine is the V-belt type A, 45 with a shaft distance of 300 mm.

$$+\frac{\pi}{2}(dp + Dp) + \quad +\frac{3,14}{2}(60 + 200) +$$

$$\frac{1}{4C}(dp + Dp) \qquad \frac{1}{4C}(60 + 200)$$

5. Conclusions and Recommendations

5.1 Conclusions

The results of cassava cutting machine design can be summarized as follows:

1. This is a method of cutting a single cutter with 4 blades that cut cassava on an ongoing basis.
2. Cassava cutting machine transmission system uses an electric motor ¾ Hp 1400 rpm.
3. Using two pulley diameter of 200 mm and 60 mm.
4. Anchored by a V-belt type A-45.
5. Used shaft with material ST 50 diameter of 25 mm.

5.2 Suggestions

Designmower can becassava is presumably enhanced better likematerial cutting bladequality, material constructionand the system works. Starch Content of Cassava (Manihot esculenta) On Various Harvest Using Penenometer, Journal of Technology and Agricultural Products. Vol.12, No.2 September 2007

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