Design Tool Typeversatile Perajang Blade Sliding By Using The Principles Of Steinermechanical RALPH

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Abstract. Chips is a kind of snack in the form of thin slices of tubers, fruits, or vegetables, ,Chips belonging to types of food crackers, foods that are dry and crisp with a high fat content.Cassava chopper machine design concept refers to the design concept Darmawanie with several stages, among other needs, the project definition, project and preparation of the technical specifications of the product, product concept design, product design, to document for the manufacture of the product. The next process is to analyze the needs, taking into consideration planning, and pay attention to the demands planning.Chopper machine tuber is a tool to chop the bulbs into thin sheets with a thickness of 1 s / d 2 mm. Not only that, this machine can also produce stick-shaped incision because blades can be changed as needed.PERAJANG tool versatile type of blade sliding by using the principle of mechanical ralph steiner, which is a principle of abstraction based on gear and engine, and this is the latest tool that does not exist, the working principle of this machine is almost identical to the working principle of the crankshaft is to move back and forth from crank shaft.Dengan blade on the right and left, can multiply the number of pieces results from the number of blades and the hopper can be expanded in number. Keywords:Chips, Sliding Blade-type chopper tool, Principle Mechanical Ralph Steiner

1. Intoduction

1.1Background

The planning of appropriate technology must be adapted to business conditions. For businesses that capitalize large middleclass usually employ sophisticated technology results from home and abroad. But the middle to lower the small-cap simply by usingtechnologiesappropriate Because in this way, they are able to compete with large employers with a competitive product value.Chips is one of the favorite snacks in Indonesia. Where the material of manufacture of the chips is very easy to get, either in the city or countryside. Many treatments of materials for chips, among other things made of tapioca flour to cassava, bananas sale for bananas, organic rice to tubers and much more.In designing this tool is made to discuss the problems that occur in the process of making chips. Work activities are divided into seven work stations, of stripping, washing, perajangan, immersion, frying, draining and packing. Equipment used in perajangan station is simple and is done manually. Chopper tool used rectangular and has a slide that has one blade. The toolis moved by means of spot backing advance the material by hand. In the working process is still manual tools and conventional have not beenable to produce maximum results for chopping chips because they use a long time.Based on the above problems, the objectives to be achieved in this design is how to design chips using the chopper apparatusprinciples*MechanicalRalphSteiner* with the same type, the type *Sliding Blade* for chopping the base materialchips using electric motor power to speed up the process perajangan chips chips for employers who still use manual tools, and mitigate karayawan work, as well as to open a new business in a place that has natural resources that quite a lot.

2. Theoretical

2.1 Principle Mechanical Ralph Steiner

Ralph Steiner is not anengineer, he was a photographer who came from Ohio, United States.But he managed to make a mechanical principle in 1930 through the work of an abstraction based gear and engine.

2.2 Design

Designofis the planning of making important decisions that affect other activities that followed. So before a product or appliance is made, it first has to do the design process that will produce a sketch or a simple picture of product to be made. The sketch then drawn back to the drawing rules that can be understood by all parties. Design and construction of a slicing machine chips can be determined based on several considerations, among others, in terms of propulsion, a convenient size for the operator, the degree of difficulty pengoprasian and perawatanya.

2.3*Design Engineering*

Many have tried todefine, in particular the definition of compact and dense, but all these efforts up to now it appears to no avail. The dictionary definition of design is generally the 'make a plan*(tofashion after a*plan),which are only members very little information about the workings of what we call technical design. Next is the combination of both the process and the definition of practical drawn from UK institutions *Institution ofEngineering Designers* and OrganizationsLecturer-Lecturer Engineering, SEED Ltd. *(SharingExperience in Engineering*Design).DesignEngineering is seluruhactivitiestobuildanddefine solutions to the problems that can not be solved in advance, or new solutions for trendingprevious problems have been solved, but in a different way. Engineering designers usethe intellectual ability to apply scientific knowledge remedy and ensure that its products according to market needs and product design specifications agreed, but still can be fabricated with the optimum method. Activities design can not be said to finish before the end product can be used with acceptable levels of performance and the working methods clearlydefined.

2.4Capacity Machine

To search capacity planned multipurpose chopper machine, use the following equation:

$$Q = m \cdot n \cdot z \qquad (1)$$

Where:

Q = Engine Capacity (kg / h)
m = mass of 1 piece of cassava (kg)
n = Round Disk (rpm)
z = Number of pieces

2.5 Designing Power transmission Gears as

The transmission is generally meant a system of mechanisms used to move the machine element movement that the movement to the second machine element. Gear transmission system is widely used on various machines, because it has a high efficiency, reliability in Operations, transmit power and is not easily damaged. The basic principle of the gear system is a development of the principle of friction wheel transmission. Movement and power is transmitted through the gears,are kinematic equivalent to that transmitted through the friction wheel or disc. The gears used are the worm gear*(wormgear),*the gear combination between the usual gear with gear rod or threaded rod. The advantages of this gear is located on the transmission ratio can be designed very high up to 1: 100. The worm gear has a shaft that intersect each other. Comparison of the gear used to adjust the input shaft speed to output shaft rotation in order to produce good results chopped. When the input shaft rotation number is $_1$ and the amount of rotation of the output $_2$,then the following equation as follows:

$$u = \overline{21} \qquad (2)$$

Where:

u = Comparison Gear$_2$ = Round ShaftOutput$_1$ Round Shaft= Input

2.6 Porosis

Porosis one of the most important part of any machine. Almost all engine power forward together with the rotation. The main role is held by a shaft transmission. Dibedakan shaft into 3 types based on its successor.The calculation of the forces that occur on the shaft using the following equation:

a. Power plans (Pd)

$$Pd = f_c \text{x } P \qquad (3)$$

Where:

Pd = Power planned (kW)
f_c = Factor Correction

P = transmitted power (kW)

b. Moment Plan (T)

$T = 9.74 \times 10^5$ *(4)*

Where:

T = Moment Twist / Torque (kg.mm)
n_1 = rotation shaft (rpm)
Pd = plannedPower (kW)

2.7 Bearing

Placeashaft,rivetedcalled *tap-shaft* or *neck-shaft*(journal),elements of which restedcalled *pads.* These pads can be installed in the machine where the shaft includes or in a separate element that as formulated the so-called *block-bearings.* In bearings in generalwork-reaction *force*. If the reaction force is much more leads perpendicular to the shaft axis line, called abearing*radialpads,* if the reaction force that is far more leads along the axis,bearing his name *the axialis.* At the groove ball bearings, bent his net field in the axial direction with a radius only slightly larger than the radius of the bullet. So there are edges that prevent the fall of the bullet and allow the block is capable of receiving the radial force and the axial force which is somewhat larger. Therefore, the groove ball bearings are suitable for all load directions. Therefore, the bearing is very much application.So that shaft rotation walk safely, then the chopper machine versatile use bearing types of ball bearings, and that the age of L in the amount of rotation can be determined by the following equation:

L =million turnover

Description:

L = Age pads (round)
C = total capacity of dynamic bearing F = force (Kg)
p = bearingsexponent

2.8 Power Engineering and Mobilization

To calculate the engine power (P)first calculated torque (T). ie

T = F x R

Description:

F = Style piece (kg)
R = The radius of the shaft (cm)

After knowing the magnitude of the torque of cutting force, engine power can then be calculated. Engine power (P) is calculated by the following equation:

P = T x 2π xn

Description:

T = Torque of cutting forces (kg.cm)
n = rotation disk (rpm)

2.9 *Cut StyleTrashes Wont*

Stylecutperajangan can be defined as an external force that must be applied by knife in order to achieve the cuts. Planning chopper blade on this versatile chopper machine usesplate *stainless steel* size of 61mm x 18mm x1mm and the angle of the blade at 25o.Prior to determining the value of the force perajangan, it must first know the broad side of the blade, namely:

= 1~2. ,

Where:

A = area of the right triangle ($mm^{2)}$
a = Alas (mm)
t = height (mm)

Based on the characteristic properties of the material, cassava is a material that has a hardness in comparison with other materials with the following data:

Umur panen	Kekerasan ubi kayu (kg/mm^2)			
	pangkal	tengah	ujung	Rata rata
7	3,65	3,50	3,17	3,44
8	3,76	3,46	3.15	3,46
9	3,64	3,48	3,35	3,49
10	3,63	3,50	3,41	3,52

Source: Siti Nurjanah, Susilawati, and Maya Ratna Sabatini Journal of Technology and Agricultural Products Vol.12, No.2 September 2007

So perajangan style can be found using the following equation:

$$F = \sigma . A \quad (5)$$

Where:

F = Force perajangan piece (kg)

σ = Violence cassava (kg / mm$^{2)}$A = area of the blade (mm2)

3 Method Of Designing

3.1 Design Process Flow Chart

A flow chart is amain picture used for the base in the act. As well as on the design required a flow diagram which aims to facilitate the implementation of the design process.According to Tim Carver, OSU student in 2000, the design is a process, not only to build orcreate a tool. So that the design consists of a series of activities that streak, as it is referred to as the design process, (Darmawan2004).Activityintheprocessdesignis called phase. The phases of the design process differ from one to the other. The phases of the design process can be drawn in the following flow diagram:

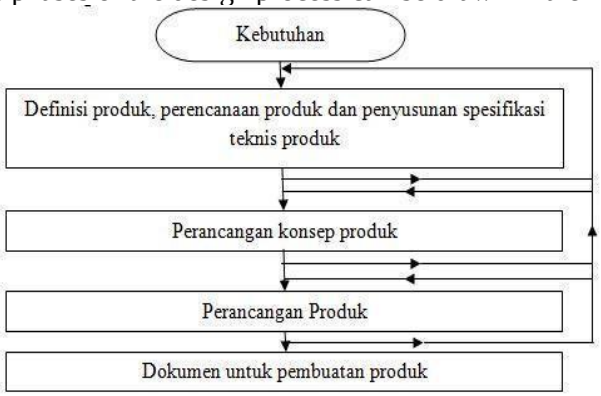


Figure 1. Diagram of the design process by Darmawan 2004

3.2 Statement of Needs

In designing this versatile chopper machine, based on the need to further improve the productivity and economy. This machine is a modified version of an existing chopper machine. This versatile machine perjang created as a production tool that helps employers of home industry for the manufacture of chips. With a working system sederhanam everyone can mengoprasikannya without feeling difficulty.

3.3 Needs Analysis

Based on the statement of need, the necessarystepsto clarify the needs analysis process of designing a versatile chopper machine. The steps include a needs analysis consists of:

A. Statementtakes mesinperajang versatile micro-scale business or home industry withpricesAffordablefor middle-class people.

B. Mobilization Specifications Propulsion no longer using manpower as the main source of propulsion, but by using another driving force. The driving force required to produce chopped ± 1 kg / min.

C. Standard Form
Construction chopper machine has been adjusted with the comfort, security, and ease of pengoprasiannya for users. This machine has a dimension that is not big enough, so that this machine can easily be removed and placed from one place to another.

D. Target Product Excellence
Targets or goals to be achieved in the design and results of perajangan with chopper machine, it is:
1. The process of manufacture can be done easily and quickly
2. Raw materials easily searchable
3. Biayakeseluruhanmanufacture this machine affordable
4. Easy pengoprasian chopper machine versatile, because the machine is quite dioprasikan by one operator.
5. The results can be uniformly chopped
6. knife can be replaced to determine the thickness and type of material to be shredded.
7. Machines capable of improving the quality of production
8. Care and maintenance the machine of does not require special costs.
9. Can be redeveloped to correct the weaknesses in order to better product.

3.4 Design Considerations

Based on theneeds analysisabove, considerationdesign done on the multipurpose chopper machine include:

1. consideration Geometry geometry considerations include engine has a length ranging from 850 mm, width 480 mm and 480 mm.
2. Material Considerations consideration in the selection of material that is readily available materials and a cheap price, in accordance with common standards, have a long shelf life and good mechanical properties.
3. Ergonomic considerations Pertimbanga ergonomics include, in accordance with the needs of the machine, easily moved and easily dioprasikan.
4. Consideration production
   a. production considerations may include, machines can be manufactured by small workshops, spare parts readily available and inexpensive.
   b. Users do not require special care or treatment that is difficult to merasat this machine.
5. Environmental Considerations
   a. Chopper machine does not cause air pollution.
   b. At the time beroprasi, this machine does not give rise to a noisy sound.
6. Safety considerations
   a. Constructionversatile chopper machine was designed in accordance with the working position is safe and comfortable, so that safety is assured.
   b. During the production process chopper machine does not produce hazardous residual materials.

3.5 Limitations

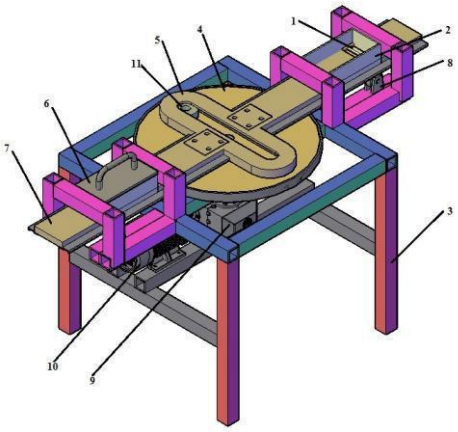
As a tool created with little experience in machine design and manufacturing processesrelyon conventional machines, so that this tool has limitations in terms of both technical and pengoprasiannya manufacture.Things that became the limitations of multipurpose chopper machine include:

1. Components are made they may not correspond with the desired size due to limitations of equipment.
2. Beroprasi machine is semi-automatic, the electric motor only serves to rotate the disc and move the blade, while the hopper to pour the ingredients into the manual.
3. The time needed for each kilogram of material could be different with desire.

4. Product views are not as good and good as design drawings orsketches, dikerenakan limited equipment.

4. Design Calculation Of results

4.1 Chopper machine Versatile Image Technology



Description:
1. Eye Knife
2. Hopper
3. Framework
4. Dish
5. TracksBearing
6. pembeban
7. Skate Board
8. BearingsPengstabil
9. *Gear Box*
10. Electric Motor
11. BearingPusher

4.2 Mechanical Design EngineeringMultipurpose Chopper

Mechanical perancaganis a basic step that is very important in the design of chopper machineSerbagunaini.tujuandariteknikthis design is to obtain data required in building construction chopper machine versatile.

4.3 Trashes wontstyle

Wont style can be defined as an forceexternalmust be applied by knife in order to achieve the cuts. Designing for the knife perajangan onthis versatile chopper machine usesplate*stainless steel* size of 61mm x 18mm x 1mm, and the angle of the blade at 25o.Prior to determining the value of the force perajangan, it must first know the broad side of the blade, namely:

$$A = {}_{2}\, a \cdot t$$

A = area of the right triangle a = 1 mm
t = 2 mm
So that

$$A = {}_{2}\, a \cdot t$$
$$A = {}_{2}\, 1 \cdot 2$$
$$A = 1\ mm^2 \qquad (6)$$

to the nature of the material, cassava is one of the materials that have a higher level of violence dibandingkandengan other materials.In Table 3.1, the average hardness largest cassava contained in cassava harvesting age of 10 months is 3:52 kg / mm2.So that the force perajangan can be searched as follows:

$$F = \cdot A \qquad (7)$$

Where:

F = Force perajangan
= 3.52 kg / mm^2
A = 1 mm^2

so that: F = · AF = 3.52 · 1 F = 3.52 kg

4.4 Planning Gear For Transmission

Gears are used in this design is the gear thatcan change the input rotation of the electric motor at 1400 rpm to 70 rpm in the rotation output. So chosen *gearbox* with gear ratio 1: 20

So:

$$u = \overline{21} \qquad (8)$$

$$u = {}_{1400}{}^{70;}\ u = {}_{20}{}^{1}$$

Then the output shaft rotation is 70 rpm

4.5 Power Engineering and Mobilization

To calculate the engine power (P)first calculated torque. Based on the book Robert L. Mott 2009.81**,** torque equation is as follows:

T = F xr (9)

Where:

F = 3.25 kg r = 0.8 cm

So:

T = F xr
T = 3.25 x 0.8
T = 2816kg.cm

SoPower Engineering (P) can be calculated as follows:

P = T x 2 xn (10)

Where:

T = 2,816kg.cm
n = 70 rpm

Thus:

P = T x 2 xn
P = 2816 x 2·x 703:14
P = 1237.91 kg.cm/menit
P = 0.20631833 kg m / s
P = 0.0020233 kw
P = 0.002713Hp

Soelectric motor is used with the electric Motor Power = 0:25 Hp

4.6 Capacity Pieces machine

Q = m · · (11)

Where:

m = 2 g = 0.002 kg
n = 70 rpm
z = 2

So:

use pads type of bullet, and that the expected life of L in the amount of turnover.Bearings used are bearing kinds of cartridges with numbers 61 908- 2RS1 outer diameter D = 47 mm, d = 30 mm, B = 9 mm, Nominal capacity of 742.85 kg Specific Dynamic and Static Specification Nominal capacity is 464.28 kg. Based on the book Jack. Stolk, C.Kros. 1994, p. 332, the equation is as follows:

Q = 0.002 ·70·2
Q = 0:28 kg / min
Q = 16.8 kg / hour

4.7 Shaft

a. Power Plan (Pd)

Pd = *f*cx P (12)

Where:

*f*c = 0.8
P = 0:25kw Hp = 0.18735

So :

x 0.18735 Pd = 0.8
kw Pd = 0.14988

b. Moment Plan

$T = 9.74 \times 10^5$ (13)

Where:

C = 7:28 kN (Table SKF)

= 7280 N
F = 100.55 N
P = 3 (for ball bearings)
Thus:

$$L = \frac{}{100.5}^{7280\ 3} \quad (14)$$

$L = 72.40^3$
L = 379 503 million round.
F = (X, Fr) + (Y, Fa)
X =00:56
Y=1.55
Where:
Pd = 0.14988 kw
$_1$ = 1400 rpm
Therefore:

$$T = 9.74 \times 10^5 \frac{0.14988}{1400} \quad (15)$$

$T = 9.74 \times 10^5 \cdot 1.0 \times 10^{-4}$ kg.mm
T = 104.27 kg.mm

4.8. Bearing

Order tools work seamlessly, then the chopper This versatile tool
F = (0.56 x 98.1) + (1:55 x 29.43)
F = 54 936 N + 45.61 N
F = 100.55N
kgF = 10:26

5 Conclusion and Suggestions

5.1 Conclusion

The versatile chopper machine design can be summarized as follows:

1. Methodperajanganperajangan this machine is a double withblade that cuts back and forth.
2. This versatile design chopper machine uses power from the electric motor of 0.25 hp.
3. Chopper machine versatile transmission system is changing the electric motor rotation of 1400 rpmto 70 rpm, using a *gearbox*with gear ratio 1: 20.
4. Cutting capacity multipurpose chopper engine capable of producing chopped by calculation as much as 16.8 kg / hr for materials such as cassava.

5.2 Suggestions

Designversatile chopper machine is already liking, but in terms of qualityof materials, performance, and system of work / function is still to be repaired due to limitations of equipment and materials during the manufacturing process, so the need for an innovation to every time. Therefore, to be able to make better design of this machine, it needs further thought with all the considerations and also quite a long time. Some suggestions for steps that can build up and repair these machines are as follows:

1. Adding round the output to the engine capacity more.
2. Multiply the number in the hopper forsystems*Sliding Blade* can use more than two hopper

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