LOGIC
Journal of Engineering Design and Technology
Vol. 19 No.2 July 2019; p. 68 - 77

p-ISSN : 1412-114X
e-ISSN : 2580-5649
http://ojs.pnb.ac.id/index.php/LOGIC

ORGANIC WASTE CHOPPER TOOL DESIGN USING AUTODESK INVENTOR 2015 SOFTWARE

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Abstract. Autodesk inventor is very suitable to be applied in mechanical component design work, mechanical system design to mechanical strength analysis of mechanical components designed. The problem of this research is how to make the Design of Organic Waste Chopper Tool by using the 2015 Autodesk Inventor Software, and whether the design of the tools made can simplify the process. This research method is to make the Organic Waste Chopper Tool design using the 2015 Autodesk Inventor program which is used to accelerate the process of designing design drawings. The design for making organic waste calculators includes making parts, 3D image components, assembly work drawings, and animations. Therefore, it was concluded that: (a) Manufacture of organic waste chopper design, the first is a design idea, then the drawing process using the 2015 autodesk inventory program includes sketching, drawing components of machine parts, followed by assembly, then rendering and animation. The final stage of the design was included in the "IDW" complete with size, scale, material, work drawings making it easier for designers to make tools, (b) The design of the Organic Waste Chopper Tool using the Autodesk 2015 Inventor Software can simplify the process, (c) Design specifications for Organic Waste Chopper tool are: Multi-Function Waste Counting Machine 01, Capacity 50 kg / hour, Blade type 10 fixed seeds, 27 seeds move 3 seeds, Circule Church 1 seed, 1 inch shaft, FrameUnp 5, Type V - A43 Belt, and V-Block Bearing UCP 6205.

Keywords : Software, Autodesk Inventor, Scale, Dimension, Assembly.

1. INTRODUCTION

Autodesk inventor is a CAD software in mechanical engineering program that is applied to the design of mechanics in 3D. Autodesk Inventor is software specifically designed for the needs of engineering programs such as product design, machinery design, construction design, or other engineering products. This software is a series of refinement software from Autocad and Autodesk Mechanical Desktop [1,2]. This software is perfect for Autodesk Autocad users who want to improve their capabilities because this software has almost the same concept in 3D drawing. Autodesk inventor is one of the CAD (Computer Aided Drawing and Design) software released by an American company called Autodesk. As CAD software, the design steps of a tool include the scale, dimensions, and materials used in the tool [3,4]. Therefore, every planning of making a tool must be based on planning a design [5].

Basically, from the description above, it will be easier to do the depiction using Autodesk Inventor software, so to be need tries to raise the issue about “Organic Waste Chopper Tool Design”. Autodesk inventor is very suitable to be applied in mechanical component design work, mechanical system design to mechanical strength analysis of mechanical components designed.

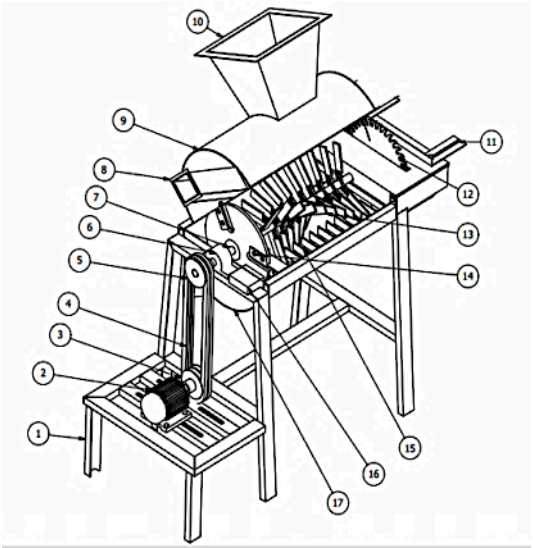
Based on the description above, the problem is how to make the Design of Organic Waste Chopper Tool by using the 2015 Autodesk Inventor Software, and whether the design of the tools made can simplify the process.

The purpose of this research is to be able to make the design of Organic Waste Chopper Tool by using 2015 Autodesk Inventor Software, as well as knowing the phase of design both in 3D, working drawings, assembly and animation methods.

2. METHODS

2.1 Design Planning

The 2015 Autodesk Inventor program was used to speed up the process of designing design drawings [6,7]. The design of the design for making this organic waste counter tool includes the creation of parts, 3D image components, assembly work drawings and animations (like figure 1).



Information:
1. Frame
2. Electric Motor
3. Pulley
4. V-belt
5. Waste Chimney
6. Bearing
7. Axis
8. Branch entry chimney
9. Upper Cylinder
10. Leaf Chopper Chimney
11. Wood Cutter Set
12. Circular saw
13. Leaf chopper knife
14. Branch cutter knife
15. Motionless knife
16. Cut distance adjusment
17. Lower Cylinder

Figure 1. Organic Waste Chopper Tool Design Plan

The specifications of the tool are planned: The main driver is 220v electric motor, V-belt transmission, U channel iron frame, blade chopper blade model, eser plate casing, capacity 50kg / hour, dimensions 90cm x 40cm x 120cm, weight 180kg.

2.2 Location and Time of Design Making

Design location in the Lab. Computer Design Program of Mechanical Engineering, Politeknik Negeri Bali. Time to carry out 5-month design making (March to July 2017).

2.3 Determination of Data Sources

The data source is obtained from the results of the survey with Ergonomic design, analyze and adjust towards Anthropometric Standards, safety, security, comfort, and aspects related to human physiology, as well as from the Mechanical Engineering Drawing literature by using the 2015 Autodesk Inventor program [8].

3. RESULTS AND DISCUSSION

3.1 Design

How to make a design of an Organic Waste Chopper Tool by using the 2015 Autodesk Inventor Software, through several steps, consisting of:

(a) Frame Design

Click new then select metric then look for standard (mm) like figure 2, then click create then select one of the axis of the plane,

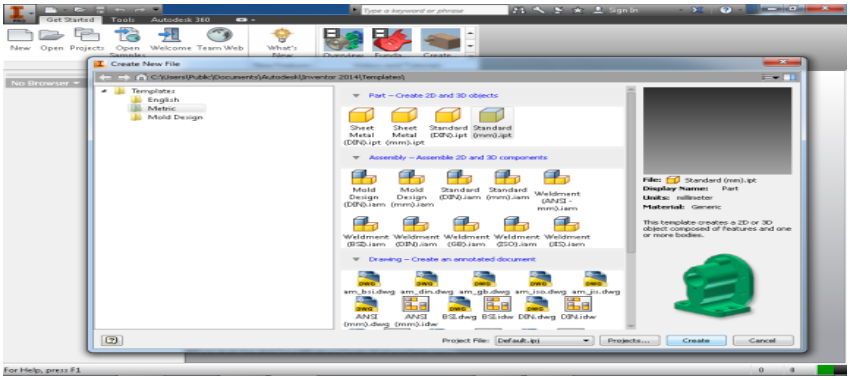


Figure 2. Main Menu

then create a sketch, then open the origin, select the xy plane then drag along 660 mm, and make the sketch according to the image size, open the origin again, select the pull up xz plane along 750 mm then create new, make the sketch according to the image then click finish, like Figure 3.

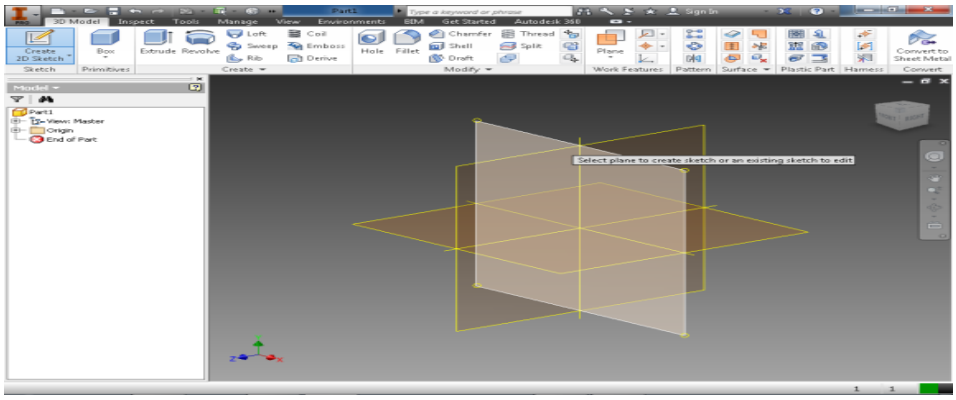


Figure 3. Plane Axis

After finishing sketch, open origin, select the pull up xz plane along 280 mm then click Create new sketch then create a design pattern, open the origin again, select the xy plane then drag along 1000 mm and click Create new sketch in the work plane created then create sketch according to the image then click finish sketch, then click new sketch in work plane 3 in the browser bar, then make sketch according to the design, then click after finish sketch.

Then click new sketch in work plane 3 in the browser bar, then make sketch according to the image with a length of 410 mm so that you can design the desired one, then click save then the file name is saved with the name "order" then click save. Then click new select metric then select standard (mm), then click create, then click place select the file "order". Then click open, then click the menu bar then click insert frame and click yes on the generator frame menu, continue click save. Make file with file name "frame assembly" then click save. After the save menu appears insert in the frame member selection menu select the size variant according to the design that will be made. Then click the sketch line that will be made the frame continue click ok on the create new frame menu, after the save menu appears insert in the frame member selection menu select the size variant according to the design that will be made. Then click the sketch line to be created, click ok on the frame member name. After the save menu appears insert in the frame member selection menu select the size variant according to the design that will be made. Then click the line of the image that will be made the frame, click ok on the frame member name which is the finished frame image then right click on the frame located on the left browser bar then click visibility and the following view is already visibility, then click the design menu then select change to change the position of the frame so that the change menu appears then select the frame we will change its position. Here is the frame view that we have changed. Then select the design menu then click the miter corner which functions as making angles on two frames, then displaying two frames who have cornered and also displayed the frame that

has been mitered, then select the design menu then click trim and extend to face which functions as cutting or lengthening the frame to one of the frame fields, then clicking the trim or extend menu on the select frame member menu we select the blue and face or surface we click the yellow part then click apply, then will trim-extend the other frames, then double-click left on one of the frames that will be sketched, then click the new sketch in the previous frame then make the sketch match the image, then extrude the sketch previously made to make the bolt holes in the frame then click ok, and click the save icon, save the file with the Assembly Frame name and click save (like Figure 4).

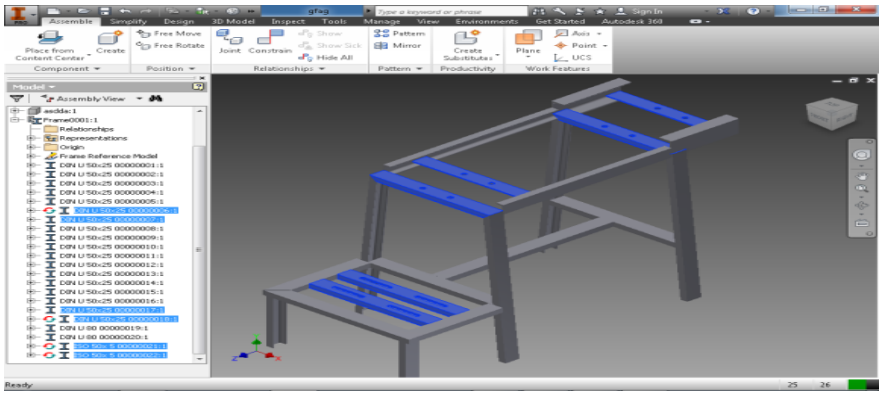


Figure 4. Framework

(b) Upper Casing Design

For the top tube design, first click new then select metric then look for metal sheet (mm). Then click create, then select one axis of the plane and make sketch according to the image then finish sketch, then click contour flange then change distance to 600 mm , continue to click unfold to make the image become a stretched image, then sketch on the stretched image to make an inlet of organic waste, then click the cut menu bar then click the sketch that was created then ok, then click refold to restore the stretched image to its original state. To see the results of the image in the form of a stretch image click "go to plate pettren". To reverse part click "go to folded part" on the top right menu then save the ipt file in a folder with the top case name then click save.

(c) Leaf Chopper Casing Design

Click new then select metric then look for standard (mm). Click click create then select one of the axis of the plane and then make the sketch according to the image then click finish sketch, then open origin click the xy plane then drag up along 25 mm, then right click on the work plane. Then make the sketch according to the image then click finish sketch and then click Loft on the menu bar then on the menu section click icon 1 and icon 2 then click ok. Then click the shell on the menu bar to make solid objects become hollow, set the thickness of the sides as thick as 2 mm then click ok, then click the new sketch in the upper field then make the sketch according to the image then click finish sketch, then click extrude on the menu bar then click sketch the new one is made to make 2 dimensions into 3 dimensions then set the distortion along 2 mm, click ok, then click origin then right click on the xy plane then click new sketch then make sketch according to the image then click finish sketch, then click extrude then select extens all cut icon with 2-way cut and click save with file name casing leaf counter.

(d) Branch Cutter Casing Design

the steps for making the image are almost the same as making the drawing of the leaf chopper casing.

(e) *Assembly* Upper Casing Component

Click new then select standard click metric (mm). Then create, continue click place on the menu bar, then click the component file we want to assemble then click open then the file is opened, Part appears in the assembly menu then right click ok, then click constrain, in selection 1 click radius from the tube cap in selection 2 click on the side of the tube and the two components will merge into one, then click ok then click the save icon to save the file name, (like Figure 5).

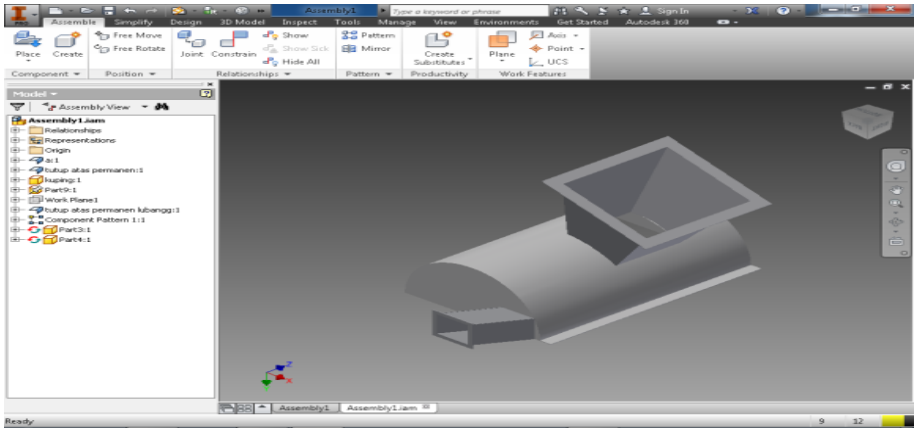


Figure 5. *Assembly* Upper Casing

(f) Lower Casing Design

At the lower casing steps to make the drawing is almost the same as making the upper casing design drawings with different 2 holes.

(g) Waste Casing Design

Click new then select *metric* then look for *sheet metal* (mm) .ipt then click *create* then select one of the axis of the plane and make *sketch* according to the image then click ***face*** on the menu bar then click *profile* and click the newly created *sketch* then click *ok*, then click *icon flange* on the *edge column* select one side that will add the length of the plate with a length of 120 mm, and click the next side then click *flange* along 175 mm, then click *unfold* to see the stretch of part, then click the *new sketch* on the surface of the part and make the sketch according to the image , then click the cut icon then click the new sketch then click ok. Then click refold to restore the stretch image to its original state and click "go to plate pattern" and click the save icon to save the *file name*.

(h) *Assembly* Lower Casing Component

For the assembly of the lower casing components the steps for making the drawing are almost the same as making an image of the upper casing component assembly, (like Figure 6).

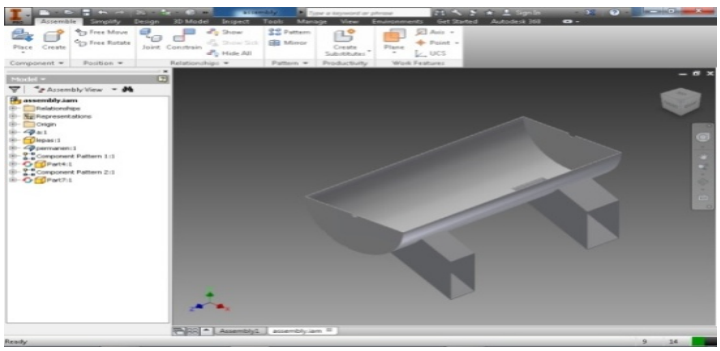


Figure 6. Assembly Lower Casing

(i) Axis Design

Click *new* then select *metric* then look for *standard* (mm) .ipt, then click *create* and select one of the axis of the *plane*, then create a circular *sketch* with a diameter of 25.4 mm according to the image, then click *extrude* with a distance of 1000 mm, then click one right side of the *new sketch*, continue to sketch with a diameter of 25 then click finish sketch, then click the extrude icon, then cut along 130 mm, after finishing extrude click the *thread menu* then click the *surface* with a diameter of 25 mm to make a thread. On the reverse side click on the surface then right-click *new sketch*, continue to make the sketch according to the image and then click *extrude* on the sketch that was created earlier, and click the *save icon* for the *file name*.

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(j) Branch Chopper Knife Design

Click new select *metric* then look for standard (mm) .ipt, then click *create* and select one of the axis of the *plane*, then create a sketch with a diameter of 300 mm according to the image, then click the *extrude icon*, then select the 10 mm thick *extrude*, continue click the *new sketch* on the surface of the part then make the sketch according to the image then click the *extrude icon* select the cut on the field that was previously sketched, then click the *circular pattern icon* then click the *features* that were extrude then click the *circle side* and change *placement to 3* with 360 degrees then right-click on the surface of the *part* then click *new sketch*, make sketch with a diameter of 50 mm Then *extrude* as thick as 20 mm, then click the *filled icon* on the menu bar then click on the part that will make a radius according to the image, then right click on the surface then click new sketch, *continue* to make a circular sketch with a diameter of 25.4 mm, *extrude* cut on that field, and click *chamfer* on the bottom of the component that was previously made uat. Then click the edge on the edge of the part and give a distance of 5 mm, then click the *circular pattern icon*, then click on the *features* that were *extrude* and click the *side of the circle* and change the *placement to 3* with an angle of 360 degrees, then click *origin select xz plane* then visibility, then Click the *plane* on the menu bar then *drag the plane xz up along 25 mm*, then click *new sketch* on the work plane that was created then create a circle sketch according to the image, then extrude cut on the sketch circle until it translates according to the image, and click the thread icon to make the thread thread on the hole that was made, click the save icon with the name of the branch chopper knife.

(k) Leaf Chopper Knife Design

Click *new* select *metric* then look for *standard* (mm) .ipt, then click *create* and select one of the axis of the *plane*, then create a *sketch* with a length of 130 mm and a width of 30 mm according to the image then *finish sketch*, then click the *extrude icon* then select the field will be extruded 5 mm thick then click *ok*. Then click *chamfer*, then *chamfer* the edges of the knife with a *distance* of 2.5 mm then click *apply* and right click on the surface of the *part* then click *new sketch*, then create a *sketch* with a circle with a diameter of 8 mm according to the image, then click the *extrude icon* then cut on the *sketch* field that was created, and click on the *icon* with the *file name* leaf chopper knife.

(l) Circular Saw Design

For the circular saw design the steps - the steps for making the drawing are almost the same as the making of the knife chopper design drawings with different shapes and the number of 40 gear.

(m) *Assembly* Knife Component with Axis

Steps for making drawings Assembly of knife components with axis is almost the same as making assembly drawings on the upper casing components (like figure 7).

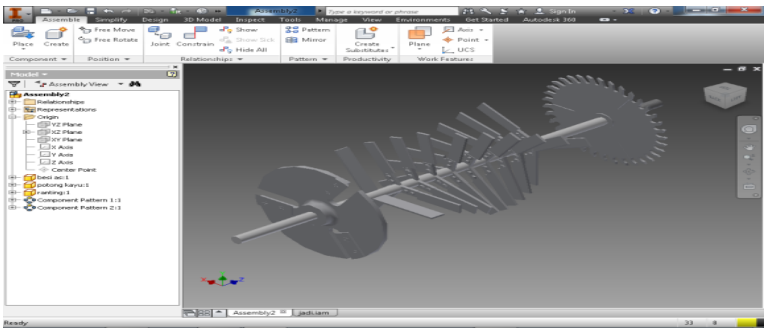


Figure 7. *Assembly* Knife with axis

(n) *Assembly* All Components

start clicking *new* select *metric* Then find the *standard* (mm) iam, then click *create*, then click *place* on the *menu bar* then click the component *file* that we want to *assemble* then click *open* and click *assembly* display then *ok*, then click the *constraint* icon select *join* menu, and *selection* 1 shows on the width of the bearing, then click *selection 2* on the iron side U, then click *apply*, and open the *constraints* again, select the *join* menu, in *selection* 1 click on the iron U field, the xyz axis will be locked, then click *apply* , then set the distance by measuring *distance*

assembly according to the image, and so on for the assembly steps of the other components and finally click the *save icon* with the file name *assembly component*, (like figure 8).

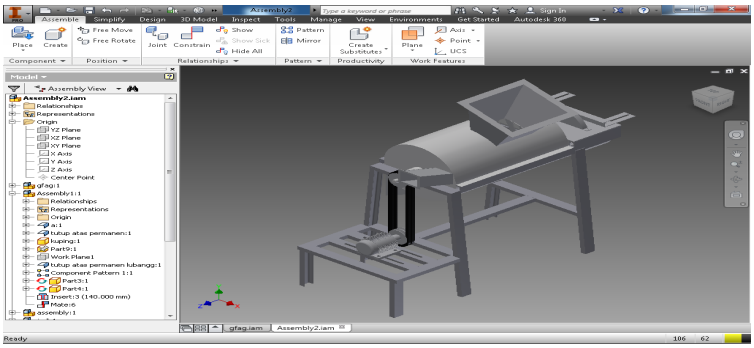


Figure 8. *Assembly* All Components

3.2 Working Drawing (Projection).

Working drawings are images that are used as a reference in the process of working on a product.

(a) The Making of Axis

In the process of making this transmission axis, using steel material ST 42 Ø 25.4 mm, (such as work Figure 9).

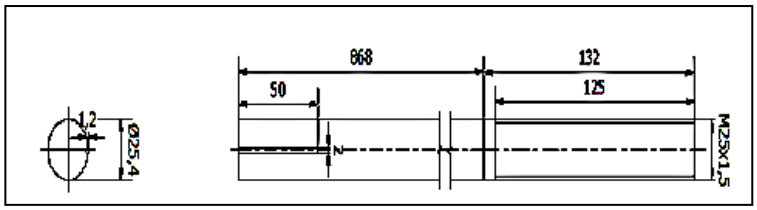


Figure 9. Axis

(b) The Making of Framework

Making frames using Iron Unp 50 mm x 32 mm x 23 mm, (like working Figure 10).

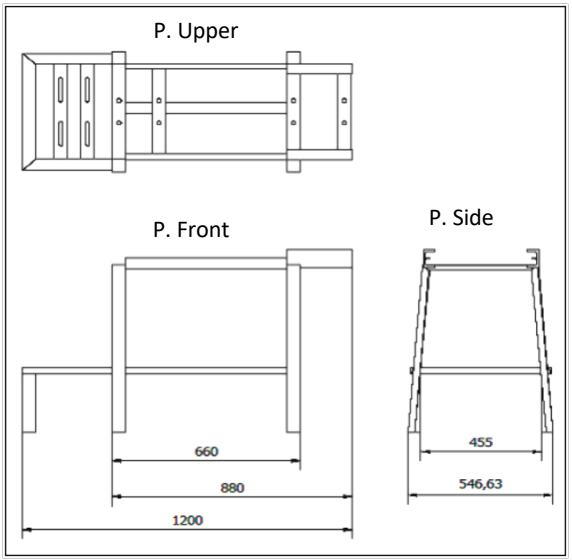


Figure 10. Frame

(c) The Making of Leaf Chopper Knife

In the process of making knives, cut the strip plate 40 mm x 32 mm with a length of 150 mm as many as 27 pieces, on the cut-off machine, (like image 11).

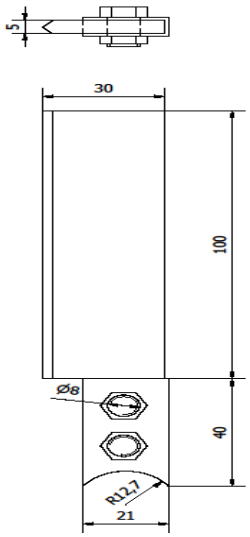


Figure 11. Leaf Chopper Knife

(d) The Making of Branch Cutter Knife

In the process of making this knife, using an 8 mm thick plate of eser cut with a length of 100 mm as many as 3 pieces, on the cut off machine with an angle of 450, (as shown in image 12)

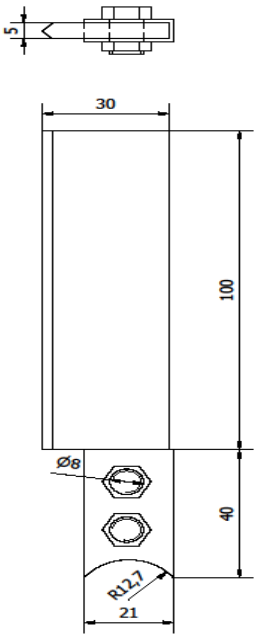


Figure 12. Branch cutter knife

(e) The Making of Casing

In the process of making this tube, cut the eser plate 2400 mm x 1200 mm x 2 mm with a length of 600 mm x 600 mm as many as 2 pieces, on hydraulic cutters, 1800 semicircular shapes, (as shown in Figure 13).

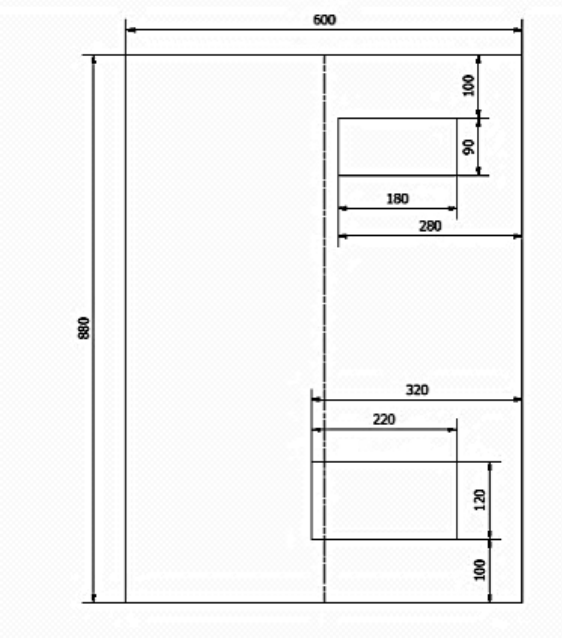


Figure 13. Casing

3.3 Plan Design Results

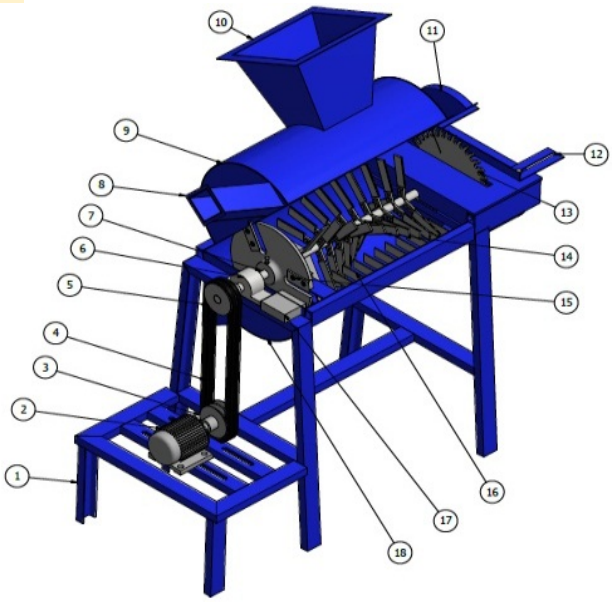
(a) Design Result Product

Based on the planned design construction as shown in Image 1, the results of designs and plans can be seen as shown in Figure 14, and 15 and its specifications.

Figure 14. Multifunctional Organic Waste Chopper Products

Specifications of Organic Waste Chopper:

Type Multi Function Waste Counter Machine 01, Capacity 50 kg / hour, Blade Type 10 fixed seeds, 27 seeds move 3 seeds, Circule Church 1 seed, 1 inch shaft, FrameUnp 5, Type V - A43 Belt, and V-Block Bearing UCP 6205.



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16. Cut distance adjusment
17. Lower Cylinder

Figure 15. Organic Waste Chopper Tool Design

4. CONCLUSION

4.1 Conclusionz

a. Manufacture of organic waste chopper design, the first is a design idea, then the drawing process using the 2015 autodesk inventory program includes sketching, drawing components of machine parts, followed by assembly, then rendering and animation. The final stage of the design was included in the "IDW" complete with size, scale, material, work drawings making it easier for designers to make tools. With design drawings complete with working drawings (projections, scales and dimensions) can simplify the process of making tool parts and can reduce the risk of errors in the process of making tools.
b. The design of the Organic Waste Chopper Tool using the Autodesk 2015 Inventor Software can simplify the process.
c. Design specifications for Organic Waste Chopper tool are: Multi-Function Waste Counting Machine 01, Capacity 50 kg / hour, Blade type 10 fixed seeds, 27 seeds move 3 seeds, Circule Church 1 seed, 1 inch shaft, FrameUnp 5, Type V - A43 Belt, and V-Block Bearing UCP 6205.

4.2 Recommendation

In making the design, it is better to make the right size of equipment, especially between the hole and the shaft so that when the assembly process can blend easily. Each component size must take into consideration the ingredients on the market so that later in making the tools used the ingredients are easily available, and each component of the image must be as complete and clear as possible so that the reader is easy to understand.

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