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Cutting Machine Manufacturing Design Process

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Abstract

On development, technology created for make it easy work man. In the process of making potato sticks, the cutting process is still done manually using simple cutting tools and human power. This counts less effective in terms of time, security, as well as capacity which generated. Therefore it is necessary to make a potato stick cutting machine to help produce potatoes. So that this study takes the theme design build a potato stick cutting machine which will focus on the process manufacture of the machine. Machine manufacturing process made based on terms of time, cost, and materials used. In the process of making this machine there is a number of component which need made through process machining, welding, painting, as well as assembly. So that results end process manufacture obtained the value of time and cost of making a potato stick cutting machine and the capacity of tool.

Keywords: Machine Cutter Potato, Process Manufacture, Capacity

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1. Introduction

In this increasingly modern era, all human work is greatly assisted with technology. Various kinds of technology based there are many machines created to facilitate human work. One application of technology the can applied by making potato cutting machine (Chávez, Osorio, Altamirano, Raymundo, & Dominguez, 2020). Potato is material food worth economy tall which can bring profit for industry food processed, start from House Eat fast serve as well as groups of Micro, Small, Medium Enterprises (MSMEs) and others. One of example processed the that is potato sticks Which produced with scale industry home (Sugiyanto, Pangestu, Chan, & Uyun, 2022).

Potato sticks are one type of food that is commonly consumed as an addition to staple foods and side dishes. In the production process, potatoes are processed by manually cutting or slicing potatoes into small pieces shaped like matches. Usually for get results with the shape of the cut, the cut is done with how to grate peeled potatoes using a drawstring knife. the process it will take quite a long time and require more effort moment do shrinkage (Faiz et al., 2021). Usually industry home potato sticks produce as much as 30 kg. Where, with the number of one worker in doing Potato chipping can produce as much as 15 kg/hour (Fauster et al., 2018). This manual process too somewhat less secure, because it can make workers' hands scratched by the eyes knife (Ostermeier, Hill, Dingis, Töpfl, & Jäger, 2021). So it can be said that the process of processing potato production is lacking effective in facet time And power (Ali, Muhammad, Salim, & Majid, 2019).

Designing a potato stick cutting machine manufacturing has some significant advantages. In this context, a potato stick cutting machine is a tool used to cut potatoes into uniform stick shapes. By using a potato stick cutting machine, the process of cutting potatoes into sticks can be done quickly and efficiently. This machine can cut large quantities of potatoes in a short time, increasing productivity and reducing the time required for manual cutting. As such, manufacturing a potato stick cutting machine can help improve overall production efficiency.

The potato stick cutting machine can ensure that each potato stick is uniform in size and shape. This is important in the food industry, especially in the case of fast food, where product consistency and quality are crucial. By using a potato stick cutting machine, manufacturers can ensure that each potato stick produced has the same appearance, improving brand image and customer satisfaction.

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A potato stick cutting machine can help improve safety and hygiene in the production process. In manual cutting, the risk of injury for workers may increase. By using a machine, the risk of injury can be reduced as workers do not need to perform manual cutting. In addition, potato stick cutting machines can also be designed to meet strict sanitation standards, ensuring the cleanliness of the products produced.

In the food industry, product demand can fluctuate. By designing a potato stick cutting machine manufacturing, manufacturers can easily adjust production capacity according to market demand. The machine can be set to cut potatoes in varying amounts, allowing manufacturers to deal with changing demand without difficulty.

The potato stick cutting machine can help reduce production costs in the long run. While the initial investment in the machine may be high, the use of this machine can reduce labor costs and improve production efficiency. In the long run, these cost savings can help manufacturers increase their profitability.

Based on this, designing a potato stick cutting machine manufacturing has many advantages, including production efficiency, product consistency and quality, safety and hygiene, production scalability, and cost savings (Rizzo et al., 2018). By using this machine, manufacturers can increase productivity, produce consistent products, and reduce the risk of injury. Therefore, designing a potato stick cutting machine manufacturing is essential in the food industry (WIN, THEIN, & THAW, 2019). So it is necessary to make a research on the design of potato stick cutting machine manufacturing. This research will discuss the fabrication and assembly process of the potato stick cutting machine.

2. Research Methods

The research was conducted from March 2020 to June 2021 including preparation and implementation. The place of implementation of this research is mostly carried out at the author's house as well as welding and woodworking service workshops.

Literature studies are carried out by looking for references in the form of books, journals, and articles related to the research to be carried out. This aims to study and deepen the theories related to how and the process of making a potato cutting tool. In addition, this stage is carried out to obtain information that has been analyzed as a reference material in research. Sources come from primary and secondary sources (Lima, Abreu, & Figueiredo, 2021). Primary source of research results and secondary sources of literature studies (Talodhikar & Potdukhe, 2019). Literature studies are carried out by looking for references in the form of books, journals, and others articles related to the research to be carried out (Licciardello et al., 2018).

To facilitate the manufacturing process, it is necessary to design a product design. The design design that is carried out includes the process of making tool designs and selecting materials that are in accordance with the functions and needs of the tool. In this study, the tool design design will be made using Computer Aided Design (CAD) software. Process manufacture machine cutter potato stick ballad use deep tools the process, namely tape measure, angle ruler, hand grinder, electric drill, welding machine, wrench, jigsaw, wood router machine (Tikuneh & Beri, 2023).

3. Result and Discussion

3.1. Design Component and Material Machine Potato Shredder

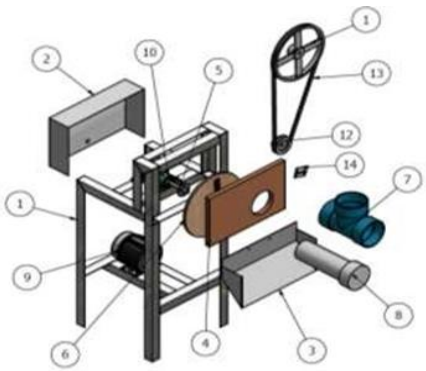
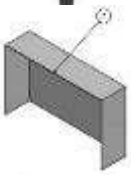
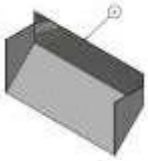
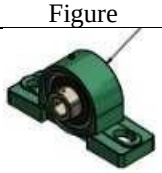


Figure 1. Design Machine Planer Potato

Figure 1 is the design of the balado stick potato masher. The design was designed through solidwork design software (Khrameshin, Enders, & Khrameshin, 2019). As for from the design that has been made contains several components that need to go through the process manufacturing first to get the shape according to the design already made. To find out the components of a potato shredder machine can be seen on table 1.

Table 1. Potato Shredder Machine Components and Materials

No	Component Name	Materials	Figure
1	Frame	Stainless Steel size 0mm×40mm×3 mm	
2	Cutting Room Cover	Stainless Steel 304 with a thickness of 1 mm	
3	Outlet Channel	Stainless Steel 304 with a thickness of 1 mm	
4	Door Cover	Ironwood	
5	Shaft	Stainless Steel 304 with a thickness of 16 mm	
6	Knife Disc	Teak wood	
7	Inlet Channel	PVC pipe	
8	Push Rod	PVC pipe	
9	Electric motor	Aluminum	

No	Component Name	Materials	Figure
10	Pillow Block Bearing	Cast iron	
11	Driven Pulley	Cast iron	
12	Driver Pulley	Cast iron	
13	V-Belt	Rubber	

3.2. Process machining Machine Cutter Potato

Process machining (machining process) machine cutter potato done with several stages which include the cutting process, drilling process, and processing grinding.

3.2.1. Cutting Process

The cutting process is carried out to cut the material to a standard size circulating in the market in accordance with the requirements of the required dimensions. Process This cutting is done with several different types of cutting tools (Yi et al., 2018). Where this tool is used to cut the material according to the type of material used will cut. Whereas For material made from wood done cutting with use jigsaw And machine routers (Haverkort, Linnemann, Struik, & Wiskerke, 2023).

The stages of the cutting process carried out in the manufacture of the balado stick potato masher are presented as follows.

a. Frame

On cutting iron elbow got each cutting as big 80 mm takes 56 seconds. then the length of time the cutting process is on framework exists on table 2.

Table 2. Frame Cutting Process Time

No	Working Tool Cutting Process	Tools	Time (Seconds)
1	Preparation of Tools and Materials and Settings	Tape measure, marker, roll cable, and Grinding Equipment	90
2	Taking measurements by Design	Working Drawings	360
3	Cutting 2 Elbow Iron with a Size of 1000 mm	Grinding Equipment	112
4	Cutting 2 Elbow Iron with a Size of 750 mm	Grinding Equipment	112
5	Cutting 11 Elbow Iron with a Size of 400 mm	Grinding Equipment	616
6	Cutting 2 Elbow Iron with a Size of 250 mm	Grinding Equipment	112
7	Re-measurement	Tape Measure	240
Total			1642

Based on table 2, total time which needed in process cutting on components framework that is 1642 second ≈ 27 minute.

Figure 2. Process Cutting Iron Elbow

b. Room Cutter Cover

On plate cutting Stainless Steel 304 is obtained for each cut of 100 mm takes 40 seconds. Then the length of time the cutting process on Cover Space Cutter there is on table 3.

Table 3. Time Process Cutting cover Room Cutter

No	Cutting Process Work Steps	Tool	Time (seconds)
1	Take measurements based on design	Grinding	180
2	Cutting two 304 Stainless Steel plates with dimensions of 250mm x 100mm	Grinding	280
3	Cutting one 304 Stainless Steel plate measuring 400mm x 100mm	Grinding	200
4	Cutting one 304 Stainless Steel plate measuring 400mm x 250mm	Grinding	260
5	Re-measurement	Tape measure	30
		Total	950

Based on table 3, total time which needed in process cutting on component cover room cutter ie 950 seconds ≈ 16 minute.

c. Channel Outlets

On plate cutting Stainless Steel 304 is obtained for each cut of 100 mm takes 40 seconds. Then the length of time the cutting process on the channel outlets there is on table 4.

Table 4. Time Process Cutting Channel Outlets

No	Work Process Tool Cutting	Tool	Time (seconds)
1	Take measurements based on design	Grinding	120
2	Cutting plate Stainless 304 as much 2 plates with size 220 x 100mm	Grinding	128
3	Cutting plate Stainless 304 as much 1 plates with size 394x290mm	Grinding	274
4	Re-measurement	Tape measure	30
		Total	552

Based on table 4, total time which needed in process cutting on components outlet channel that is 552 second ≈ 9 minutes.

d. Stem Booster

Table 5. Time Process Cutting Stem booster

No	Work Process Tool Cutting	Tool	Time (seconds)
1	Do measurement based on disign	Figure work	90
2	Cuts pipe PVC as much as 1 with diameter 89mm and size 300mm	Grinding	70
3	Re-measurement	Tape measure	20
		Total	180

Based on table, total time which needed in process cutting on components stem pusher that is 180 seconds ≈ 3 minute.

e. Door Cover

On cutting wood got each cutting as big 250 mm takes 155 seconds. Then the length of time the process of cutting on Door Covers available on table 6.

Table 6. Time Process Cutting Door Cover

No	Work Process Tool Cutting	Tool	Time (seconds)
1	Do measurement based ondesign	Shop drawing	320
2	Cutting wood as much 1 with	Tape measure,whiteboard	403
3	Size 400x250mm cutting stand channel inlet ondoor cover	Gjigsaw	475
4	Re-measurement	Tape measure	35
		Total	1233

Based on table 6, total time which needed in process cutting on component door cover that is 1233 seconds ≈ 21 minute.

Figure 3. Process Cutting Wood

f. Disc Knife

The time taken to make one hole in the frame is 60 seconds and the time taken to enlarge the hole is 40 seconds. Where the number of holes in the frame is 12 holes.

Table 7. Time Process Cutting Disc Knife

No	Cutting Process Work Steps	Tool	Time (seconds)
1	Take measurements based on design	Working drawing, design meter, marker	495
2	Cutting wood with a diameter	Jigsaw	640
3	Cutting wood for 2 knife holders with a size of 6.5 × 3.6 cm	Jigsaw	720
4	Profiling the knife holder with a depth of 4 mm and a width of 5 mm	Wood router machine	620
5	Re-measurement	Tape measure	45
		Total	2520

Based on table 7, the total time required in the cutting process on the knife disk component is 2520 seconds ≈ 42 minutes.

Figure 4. Cutting Process on Knife Plate

3.2.2. Drilling Process

The grilling process in the manufacture of the balado stick potato cutting machine is carried out with two different types of tools, namely a hand drilling machine and a grill-sensitive machine (Yi et al., 2018). In use, hand drilling machines are used to perform drilling with a low level of difficulty, which depends on the type of material and the depth of the drilling hole. While the sensitized grill machine is used to perform heavy drilling processes that cannot be done using a hand drilling machine.

In the drilling process, hole making begins with using a small drill bit first. After the hole is made, continue using a drill bit that is larger than before, then changing the drill bit to a larger size is done gradually until the hole diameter is as desired. This aims to make the process is more precise, neat and also easier during drilling (Haverkort, Linnemann, Struik, & Wiskerke, 2023).

The components that are subjected to the punching process include the frame, the cover of the cutting room and the shaft. Generally, the purpose of this hollowing serves for the incorporation of components using bolts and nuts. However, the hole in the cover of the cutting room aims to make the shaft path to the cutting room. The following are the stages of the drilling process carried out in the manufacture of the balado stick potato cutting machine.

a. Frame

The time taken to make one hole in the frame is 60 seconds and the time taken to enlarge the hole is 40 seconds. Where the number of holes in the frame is 12 holes.

Table 8. Drilling Process Time on the Frame

No	Cutting Process Work Steps	Tool	Time (seconds)
1	Preparation and settings equipment	Tape measure,whiteboard	60
2	Ddo measurement based ondesign	Shop drawing	480
3	Punching hole beginning ironelbow with diameter 3 mm as much 16 hole	Tape measure,whiteboard	960
4	angle iron re-driling with diameter 6 mm as much 4 hole forstand machine	Machine drill hand	160
5	Angle iron re-drlling with diameter of 10 mm as many as 12 holes for bearings and support holderrsmachine	Machine drill hand	360
		Total	2020

Based on table 8, total time which needed in process hole making on component framework that is 2020 seconds ≈ 34 minutes.

Figure 5. Process Drilling Frame

b. Cover Room Cutter

The time taken to punch one hole in the cover of the cutting chamber is 60 seconds and the time taken to enlarge the hole is 30 seconds. Where the number of holes on the cover is 5 holes (Sapuan, Hassan, & Sebari, 2020).

Table 9. Time Process Auger on cover Room Cutter

No	Work step Process Tool drill	Tool	Time (seconds)
1	Do measurement based ondesign	Shop drawing	60
2	Punching hole beginning plete stainless stell 1mm thick with 3mm diameter as much as 1 hole for the shaft path and 4 hole for hinge	Tape measure,whiteboard	300

	Drilling repeat plate stailess steel 1mm thick with a diameter of 10 mm for trck shafts to roear cutter		
3	Drilling repeat plate stailess steel 1mm thick with a diameter of 10 mm for trck shafts to roear cutter	Machine drill hand	30
4	Angle iron re-drlling with diameter of 20 mm as many as 1 holes for track shafts room cutter	Machine drill hand	30
5	Re-measurement	Tape measure	60
		Total	480

Based on table 9, total time which needed in process making hole on component cover room cutter ie 480 second ≈ 8 minute (Silva et al., 2022).

c. Shafts

The time needed to make one hole in the shaft is 60 seconds and the time needed to enlarge the hole is 40 seconds. Where Lots perforation on Shafts is 4 hole.

Table 10. Time Process Auger on Shafts

No	Work Step Process Tool Drill	Tools	Time (Second)
1	Do Measurement Based on Design	Working Drawings, Vernier Callipers	60
2	Plate Pre-Punching 5 mm Thick with Diameter 3 mm as much as 4	Sensitive Drilling Machine	240
3	Re-Drilling 5 mm Thick Plate with Diameter 5 mm as much as 4	Sensitive Drilling Machine	160
4	Making 4 Threaded Holes	Tap Tool	240
5	Re-measurement	Vernier Callipers	30
		Total	730

Based on table 10, total time which needed in process hole making on component shafts that is 730 seconds ≈ 12 minute (Meng, Wang, Malik, & Wang, 2022).

Figure 6. Process Drilling Shafts

d. Disc Knife

Time which needed for make a hole on disc knife is 50 seconds and the time it takes to enlarge the hole is 30 second. Where lots of holes on disc knife is 5 hole.

Based on table 10, total time which needed in process making hole on component disc knife i.e. 460 seconds ≈ 8 minute (Tiwari, Thakur, Joshi, Raigond, & Arora, 2022).

3.2.3. Grinding Process

Grinding process is a smoothing process on the surface contained irregularities and roughness due to machining and welding (Ansah, Amodio, De Chiara, & Colelli, 2018). Process This grinding is done on several components with different sanding eyes different adapt by type material which will done refinement (Cerit & Demirkol, 2021).

Table 10. Time Process Auger on Disc Knife

No	Work Step Process Tool Drill	Tools	Time (Second)
1	Do Measurement Based on Design	Working Drawings	120
2	Initial Holes in the Knife Plate with a Thickness of 18 mm with a Diameter of 5 mm include 4 Holes for the Bolts and 1 Hole for the Shaft	Drilling Machine	250
3	Re-Drilling with a Diameter of 10 mm for the Shaft Hole	Drilling Machine	30
4	Re-Drilling with a Diameter of 16 mm for the Shaft Hole	Drilling Machine	30
5	Re-measurement	Ruler	30
		Total	460

Figure 7. Frame Smoothing Process

Table 11. Time process to grinding on Machine Cutter Potato

No	Work Step Refining Process	Tools	Time (Second)
1	Preparation and Setting Up Equipment	Workpieces, grinders, sandpaper bits	120
2	Carry Out the Smoothing Process on the Frame	Grinding Equipment	720
3	Carry Out the Process of Smoothing the Cutting Chamber Cover	Grinding Equipment	360
4	Carry Out a Smoothing Process on the Outlet Channel	Grinding Equipment	330
5	Carry Out the Smoothing Process on the Door Cover	Grinding Equipment	960
6	Carry Out the Smoothing Process on the Knife Disc	Grinding Equipment	780

Based on table 11, total time which needed in process refinement on the potato stick balado cutting machine component, namely 3270 second ≈ 55 minute.

Figure 8. Smoothing Process of Cutting Room Cover

3.2.4. Assembly Process

a. Welding

Welding is done to join two metal components become one part in a manner permanent. Process welding on machine cutter Balado stick potatoes use two different types of welding machines (Ethica et al., 2020). The welding machine used that is type weld arc fire electricity (shielded metal-arc welding) For iron-based welding and Gas Tungsten Arc Welding (GTAW/TIG) type for welding stainless steel . The type of electrode used in electric arc welding is Nikko Steel R260 with a diameter of 2 mm and has a length of 300 mm (Ştefan et al., 2020). While the electrodes for TIG welding machines use stainless wire with a wire diameter of 2 mm (Hill, Ostermeier, Töpfl, & Heinz, 2022). Following is porses making component Which through process welding (Dehghannya & Ngadi, 2021):

1) Order

Process welding on framework with long 40 mm needed time 12 second for weld connection.

Table 12. Time Process Welding on Order

No	Work Step Welding Process	Tools	Time (Second)
1	Preparation and Setting Up Equipment	Welding Machine, Angled Ruler	120
2	The Process of Forming a Frame by Connecting Each Piece of Iron Cutting using the Spot Welding Method	Electric Arc Welding	1380
3	Repeat Measurements at Each Connection	Angled Ruler	420
4	Permanent Welding of the Frame with a Total Weld Length of 1924 mm	Electric Arc Welding	577
		Total	2497

Needed in process welding on components framework that is 2497 second ≈ 42 minute.

Figure 9. Process Welding Order

2) Cover Room Cutter

Process welding on cover room cutter with long 100 mm needed time 33 second for weld connection.

Table 13. Time Process Welding on cover Room Cutter

No	Work Step Welding Process	Tools	Time (Second)
1	Preparation and Setting Up Equipment	Welding Machine, Angled Iron	120
2	The Process of Forming a Cutting Chamber Cover by Connecting Stainless Steel Plates using the Spot Welding Method	Stainless Steel Welding	420
3	Repeat Measurements at Each Connection	Angled Ruler	120
4	Welding Stainless Plates that have been Permanently Formed with a Total Weld Length of 1100 mm	Stainless Steel Welding	363
		Total	1023

Based on table 13, total time which needed in process welding on component cover room cutter i.e. 1023 seconds ≈ 17 minutes (Kumari, Bhattacharya, Agarwal, Paul, & Chakkaravarthi, 2022).

3) Channel Outlets

Process welding on channel outlets with long 100 mm needed time 33 second for weld connection.

Table 14. Time Process Welding on Channel Outlets

No	Step work process tool welding	Tool	Time (second)
1	Processs forming channel outlets with use method welding point	Las stainless steel	540
2	Measurements repeat on every ruler connection	Elbow	120
3	welding in a manner permanent plate stainless steel which already formed and be measured repeatwith total long welds 530 mm	Stainless welding steel	175
		Total	835

Based on table 14, total time which needed in process welding on component cover cutting room i.e. 835 seconds ≈ 14 minutes.

Figure 10. Process welding cover Room Cutter

b. Assembly Non Permanent

After all component finished through process machining, welding, until painting, done process assembly non permanent. On stages this these components will be assembled into one part using bolts and myrrh. Following is the time required to assemble cutting machine potato stick ballad. Total time which needed For assemble machine cutter potato stick ballad that is 1560 sec ≈ 26 minute (Waghmare, Suryawanshi, & Karadbhajne, 2023).

Figure 11. Process assembly

3.2.5. Painting Process

The painting process is a follow-up step after the components are made machining and welding processes. This painting is done with the aim of coating the engine components to prevent corrosion. Besides giving color paint on component machine is Wrong means For beautify tool (Shravani, Krishna, Bollam, Vatambeti, & Saikumar, 2022).

On manufacture machine cutter potato stick ballad, divided paint into two types of paint. The first painting uses the intended pilox paint framework which made from iron and channel inlet which made from pipe pvc. Whereas component made from wood use linseed oil for coat so that more durable and no easy moldy (Figure 11).

Figure 12. Process Painting disc Knife

Stages painting use pilox done only stay spraying onto the components to be painted. While the painting process linseed oil with method polish in a manner equally to part wood with cloth. During the painting process the time it takes for all components until they are painted, namely 33 minutes and 30 minutes of time needed For paint until truly dry up (El-Sayed, El-Maaty, & Abdelhady, 2023).

Figure 13. Process painting framework

Table 15. Time Whole Making Machine Cutter Potato

No	Process	Time (minute)
1	Process cutting	113.8
2	Process auger	61
3	Process gringing	54.5
4	Process welding	77
5	Process assembly	26
6	Process painting	63
	Total	397

Based on table 15, the total time required for make machine balado stick potato cutter which is 397 minutes ≈ 6.6 hours.

Figure 14. Machine cutter potato stick ballad

3.2.6. Manufacture Cost

Making a potato stick balodo cutting machine requires a lot of money process manufacturing. Cost the divided become two category that is cost materials and repair costs. Material costs are costs incurred to procure the required materials. Workshop service fee is cost which issued for do process manufacture relying on service operator workshop, where cost service this includes wages power and cost electricity. Here are details costs incurred in purchase components which needed:

Table 16. Price Component on Machine Cutter Potato

No	Materials and Components	Number	Units	Price (rupiah)
1	Motor electricity AC 0,75 HP	1	Pcs	720.000
2	Pillow block bearing	2	Pcs	60.000
3	Shaft stainless steel 16 mm	500	Mm	55.000
4	Pulley 3 inch	1	Pcs	31.000
5	Pulley 10 inch	1	Pcs	85.000
6	V-Belt	1	Pcs	30.000
7	Iron elbow 4×4×3	2	Batang	180.000
8	Plat stainless steel 304 1 mm	105x90	Cm	265.000
9	Pipes pvc 3 inch	500	Mm	20.000
10	Pipes pvc 4 inch	500	Mm	25.000
11	Connections pipe Q	1	Pcs	26.000
12	Hinges 2 inch	1	Set	5.000
13	knife	2	Pcs	16.000
14	Bolts and nuts	16	Pcs	16.000
15	pilox	1	Pcs	30.000
	Total			1.564.000

Table 17. Cost Electricity in Making Machine Cutter Potato

No	Machine	Power Input (Watt)	Time Processing (o'clock)	Cost kWh (Rupiah)	Cost (rupiah)
1	Grinding hand	580	1.51	1.444,70	1.264,80
2	Drill hand	350	0.78	1.444,70	391,87
3	Electric welding	900	0.96	1.444,70	1.247,86
4	Jigsaw	550	0.62	1.444,70	493,97
5	Machine routers	530	0.17	1.444,70	131,87
	Total				3.530,37

Then cost service workshop can is known with exists mark time total tool manufacturing and operator hourly wage costs. Based on table 4.17 the total time is 6.6 hours. Operator hourly wage costs are assumed based on the average minimum wage of IDR 25,000/hour (Kumari et al., 2022). Hence the service fee workshop can counted as following:

Cost Service workshop = Wages per O'clock x amount worker x total time machining = Rp 25.000,- x 1 x 6,6 O'clock = Rp 165.000,-

So that the total cost of making a potato stick balado cutting machine can be counted with sum up cost component machine, service workshop, and cost electricity. Total cost = Rp 1,564,000.00 + Rp 165,000 + Rp 3530.37 = Rp 1,732,530.37

After all component machine finished assembled, so done testing machine cutter potato stick ballad. Testing machine done with method perform five attempts to cut potatoes which will be timed. Potato diameter used in this test namely size 80 mm and 90 mm. Following results test try cutting potato:

Table 18. Results Test Try

No	Potato weight (grams)	Time (second)
1	210	6.12
2	217	7.01
3	257	7.31
4	232	6.55

5	234	6.74
∑	230	6.75

With the efficiency value can is known worthy or nope tool this used for cut. According to guidelines energy efficiency for industry in In Asia, the efficiency of a tool or machine for industry is said to be good or feasible operated is if the efficiency value is between 60-70% or higher in over it again. Based on these guidelines, then the potato stick cutting machine this balado can be said to be suitable for use by the community. Plus, productivity Which generated by machine can minimize time cutting potato compared to with use cutting through process conventional (Kumari et al., 2022).

Based on results process making machine potato stick ballad which has carried out obtained the total cost incurred in making this machine is as big Rp 1,732,530.37. Cost this rated affordable for industry small scale home like MSMEs Where matter this comparable with capacity machine resulting from. When compared with cutting machines that have been circulating in the market, that machine composer for own cost Which Far cheaper. Based on a source from one of the online stores, prices for cutting machines in figure 2.5 is IDR 5,924,000 and has a capacity of up to 500 kg/hour. With type machine cutter which almost the same with composer for, the productivity of the machine is far superior. But if you look at the price difference, machine which composer for more economical For industry scale small Where capacity production Which needed No too big. Based on study earlier which related with making machine potato cutter, then there is a difference in the tools that are made. From the journal compiled by Roshan M. Hatwar et al. obtained, the production capacity of the machine made to produce 60 kg/hour of potatoes in the form of slices with a thickness of 2 mm. While the production capacity generated by the machine that made composer as big 120 kg/hour potato with results piece form stick with a thickness of 2.5mm (Dehghannya & Ngadi, 2021). Then the comparison of the difference in production capacity produced that is 60 kg/hour.

4. Conclusion

Making machine cutter potato there is a number of process, namely the cutting process, using grinding tools, jigasaws, and router machines trimmer. Cutting using a grinder is done on the material metal and PVC, such as iron angles, stainless steel plates, and PVC pipes. Then cutting using a jigsaw machine and a router trimmer machine done on material wood. Process Auger, use tool drill hand and auger sensitive. Drilling by using a hand drill carried out on the frame components, cover room cutter, and disc knife. Whereas drilling with use machine auger sensitive to do on components shafts. Process grinding, use tool grinding. On process refinement surface this done on component frame, cover room cutter, channel outlets, door covers, and disc knife. The welding process uses an electric arc welding machine and stainless welding steel. Welding process using a machine weld arc fire electricity done in splicing component framework. Whereas process welding with use machine weld stainless steel done for splicing component cover room cutter and channel outlets. Process assembly non permanent, done for unite all components into one piece using bolts and myrrh. Where is the process this use 18 bolt, 12 myrrh, And 4 bolt screw. Time needed for manufacture potato cutting machine automatic is 397 minute or 6.6 O'clock. Cost manufacture in making machine cutter potato sitk ballad includes component costs, workshop service fees, and electricity costs. So total cost which issued as big Rp 1,732,530.37. Based on the test results of the potato cutting machine, the capacity is obtained effective machine by using motorcycle electricity 0.75 HP of 122 kg/hour. Process assembly non permanent, done for unite all components into one piece using bolts and myrrh. Where is the process this use 18 bolt, 12 myrrh, and 4 bolt screw. Time needed for manufacture potato cutting machine automatic is 397 minute or 6,6 O'clock. Cost manufacture in making machine cutter potato sitk ballad includes component costs, workshop service fees, and electricity costs. So, total cost which issued as big Rp 1,732,530.37. Based on the test results of the potato cutting machine, the capacity is obtained effective machine by using motorcycle electricity 0.75 HP of 122 kg/hour.

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