METALOGRAM
-Mechanical Engineering and Energy-
April 10th 2025. Vol.01 No.02
April, 2025

DESIGN AND DEVELOPMENT OF A FISH SLICING MACHINE FOR A CHIP PRODUCTION ON TOMOY ISLAND

M Jabbar Sadik[1], Bagastian[2], Doan Novri Unedo Sihombing[3], Fardin Hasibuan[4], Muhammad Irsyam[5]
jabbarsadik9@gmail.com[1], bagastian1231@gmail.com[2], doansihombing47@gmail.com[3], fardinhasibuan123456@gmail.com[4], irsyam@ft.unrika.ac.id[5]

[1,2,3,4,5)] *Universitas Riau Kepulauan, Indonesia*

*Corresponding author: jabbarsadik9@gmail.com

Paper History

Received: January 26th, 2025
Received in revised form: March 23rd, 2025
Accepted: April 05th, 2025

ABSTRACT

The production process of fish chips begins with the slicing of fish as the raw material. To improve efficiency and consistency in fish chip production, a slicing machine is needed that can produce fish slices with uniform thickness and good quality. This study aims to design and build a fish processing slicing machine with adjustable parameters to meet the needs of small to medium-sized industries. The designed machine includes main components such as a cutting blade, a drive motor, and a slice thickness adjustment system. The machine prototype was tested to ensure its effectiveness in producing fish slices that meet quality standards. The test results showed that the built machine could improve production efficiency and slice quality, as well as reduce reliance on human labor.

KEY WORDS: *Slicing Machines, Processed Fish, Fish Chips, Machine Design, Production Efficiency*

NOMENCLATURE

Ø	Diameter
rpm	rotation per minute

1.0 INTRODUCTION

line with the changing times, especially in the business sector, it is indeed a new favorite for Indonesian people as a business field that provides quite encouraging prospects. This field does not only cover matters related to fisheries, but what is more developed is the processing industry of fish catch results. One thing that needs to be noted here is that this field is actually dominated by small and medium home industries which are actually home industries.

In addition, because it is increasingly difficult to get a job, it causes workers to no longer hope to work in factories or industries. Prospective workers in general are now turning their attention to becoming new entrepreneurs who do not require large business capital. In this case, the government helps entrepreneurs, both large and small, in all matters, to improve the products produced both in terms of quality and quantity.

The fish processing industry in Indonesia is growing rapidly, especially in the production of fish chips which are increasingly in demand by both domestic and international markets. The fish slicing process is a critical stage in making fish chips, because the uniform thickness of the slices affects the final quality of the chips, including texture and drying time. In general, fish slicing is done manually which.

2.0 LITERATURE REVIEW

A slicing machine is a device used to cut materials into thin pieces of uniform thickness. This machine is widely used in various industries, especially in the food processing industry, such as cutting meat, cheese, bread, vegetables, and other products. Slicing machines are usually equipped with rotating knives driven by motors or other drive systems to cut materials efficiently [1].

Slicing machines work by utilizing cutting knives that rotate or move automatically, allowing food materials to pass through the knife at a certain speed. This machine is equipped with a thickness control, which allows the operator to adjust the thickness of the slices according to needs. Most modern slicing machines use automated technology to increase speed and efficiency, allowing large quantities of materials to be cut with high consistency [2].

The frame of the slicing machine is the main structure that supports the important components of the slicing machine, such as the cutting blade, motor, cutting table, and slice thickness adjuster. This frame must have high structural strength to support various components and withstand loads and vibrations during the cutting process. The frame of the slicing machine is generally made of stainless steel or other alloys that are resistant to corrosion and easy to clean, which is very important in the food industry where hygiene is important [3,4].

METALOGRAM
-Mechanical Engineering and Energy-
April 10th 2024. Vol.02 No.01
April, 2025

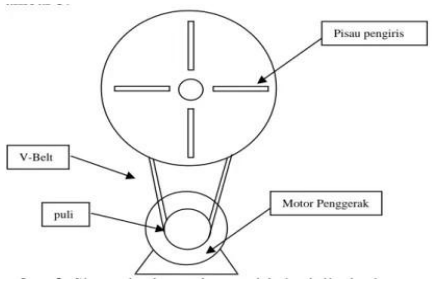

Figure 1. Schematic of how the machine works

2.1 Main Part
The main parts of a slicing machine are:
- Frame body
- Body
- Cutting blade
- Drive motor

2.2 Slicing Machine Frame Requirements
The frame generally has a simple strong construction, consisting of longitudinal and transverse parts. The longitudinal parts generally bind the transverse parts so that the frame construction is stronger and stronger to withstand the load. In order to function as it should, the frame must meet several requirements, including
- Strong and sturdy, so it can support the engine and other components and loads without experiencing damage or changes in shape.
- Lightweight, so it can be lifted/shifted when moved. flexibility value that functions to dampen excessive vibrations or shocks caused by the power be generated.

3.0 RESEARCH METHODOLOGY

The implementation method that will be applied to solve the partner's problems is with the help of technology in the form of a 60 kg/hour capacity fish chips slicing machine. It is hoped that by providing assistance with this fish chips slicing machine, it can improve the quality and quantity of production in developing this fish chips business.

3.1 Manufacturing Tools
This slicing machine is made using the main equipment.
The machines used in the process are:
1. Lathe
2. Welding Machine
3. Drilling Machine
4. Hand Grinding Machine

Apart from that, the hand tools used are:
1. Marker
2. Hammer
3. Vise
4. Wrench and wrench

To adjust the dimensions of the tool made with the calculation results, it is necessary to carry out measurements. The measuring tools used are as follows :
1. Vernier Caliper
2. Steel Ruler
3. Meter
4. Protractor

3.2 Materials Needed
Based on the planning of the materials to be used in making the tool as follows:
1. Stainless steel plate 500mm x 500mm x 8mm
2. Iron L 40mm x 40 x 750 mm
3. Iron U 40mm x 40mm x 1000mm
4. Ø½ inch pipe
5. Pipe Ø 3 inch
6. Shaft Ø 30mm
7. Pully
8. ½ HP Electric Motor
9. V belt
10. Bearings

4.0 RESULTS AND DISCUSSION

4.1 Design Process
The frame construction is one of the design structures or models of what will be made. The frame of this slicing machine has the aim of making it easier for other group members in the process of making a fish processing slicer. The design of this tool frame has several main functions, namely :
- The upper frame serves as a support for the knife and material
- The lower frame functions as a support for the electric motor and a stand for other drive system components
- The legs function as supports for the upper frame and lower frame

4.2 Process Before of Making Fish Processing Slicing Tool Frame
The process of designing the frame of the slicer as an aid in the process of slicing processed fish, this frame is a place to mount all the components of the processed fish slicer [5,6]. The materials used to make this frame are angle iron and Hollow iron. This frame is designed to be able to support the load of the components of the processed fish slicer, it is expected that this frame can be used properly [7]. This frame is made with the size and components used. The steps before making the frame of the processed fish slicer are as follows :
- Determine the materials to be used to make the frame of the fish slicer using angle iron and hollow square iron.
- Determine the dimensions or size of the frame of the fish slicer. The dimensions of the frame are 78.5 cm long, 43.5 cm wide and 55 cm high.
- Determine the location and distance of the seat on each component of the fish slicer.


Figure 2. Cutting frame dimensions

Metalogram | Received: January 26th, 2025| Accepted: April 05th, 2025|
Published by Program Studi Teknik Mesin, Fakalutas Teknik, Universitas Riau Kepulauan

METALOGRAM
-Mechanical Engineering and Energy-
April 10th 2024. Vol.02 No.01
April, 2025

4.3 Frame Making Process

The process of making the frame of this fish slicer goes through several steps. The steps in question are:
- Material marking process
- Material cutting process
- Material assembly process
- Drilling process

Figure 3. Cutting frame material

4.4 Measuring and marking of hollow square pipes and angle iron

The first process is measuring and marking the material to be cut, so that the length of the frame to be used has the same length. In making the frame of the fish slicer, the following measurement stages are required:
- Measurement and marking of material size for cutting the frame
- Measurement and marking of material size for cutting the upper frame
- Measurement and marking of material size for cutting the middle frame
- Measurement and marking of material size for cutting the lower frame
- Measurement and marking of material size for cutting the frame as a support for the frame components of the fish processing slicer

Figure 4. Marking material

4.5 Cutting materials

After measuring, then cutting is done with the specified size, cutting is done using a cutting grinder. The frame cutting stage can be done as follows:
- Prepare the cutting grinder machine
- Prepare the material that has been marked or sized
- Place the material in the vise and position it according to the marking
- Tighten the pressure thread
- Make cuts according to size

Figure 5. Cover cutting

4.6 Frame assembly

After cutting, the fish slicer frame is assembled by welding using electric welding. The welding stage on the fish slicer frame is divided into several stages as follows:
- Welding of frame legs with lower frame
- Welding of frame legs with upper frame
- Welding of lower frame supports
- Welding of upper frame supports
- Welding of supporting iron plates and component holders

Figure 6. Body cover installation

4.7 Performance of processed fish slicing machine

The performance test of the machine showed that the machine was able to cut processed fish with a uniform thickness, between 1 mm to 3 mm, according to the settings made. The cutting speed of processed fish varies depending on the type of processed fish texture used. Mackerel which has a harder texture takes a little longer to cut than tilapia.

Table 1. Results of slice thickness and cutting speed tests

Type of fish	Slice Thickness (mm)	Cutting Speed
Parrot fish	1 – 3	12
Mackerel	1 - 3	15

5.0 CONCLUSION

Overall, the fish processing slicing machine designed in this study makes a significant contribution to the production efficiency and quality of fish chips. This machine not only increases the productivity of the fish processing industry, but also provides a solution for more efficient and economical fish

Metalogram | Received: January 26th, 2025| Accepted: April 05th, 2025|
Published by Program Studi Teknik Mesin, Fakalutas Teknik, Universitas Riau Kepulauan

processing, especially for SMEs. Thus, this fish processing slicing machine has the potential to be widely applied in the fish processing industry, especially to meet the growing market demand for high-quality processed fish products.

Figure 7. finished making

5.1 Fish Chips Quality

Fish chips produced from machine-cutting exhibit a crispier texture and more consistent flavor compared to chips produced manually. The main advantage of machine-cutting is the uniformity of the slice size, which allows for more even frying.

5.2 Impact on Productivity

This processed fish slicing machine can increase the productivity of the fish processing industry, especially for SMEs, with a production capacity of up to 12-15 kg per hour. This is much more efficient compared to manual cutting which only produces around 5-7 kg per hour. This machine reduces dependence on manual labor, thus significantly increasing production capacity.

REFERENCE

[1] Bizzy, I., & Santoso, B. (2018). Inovasi Teknologi untuk Meningkatkan Kinerja dan Kualitas Produk Usaha Mikro Kecil Menengah di Desa Ulak Kerbau Baru Kecamatan Tanjung Raja Kabupaten Ogan Ilir Provinsi Sumatera Selatan. *Prosiding Semnas SINTA FT UNILA*, *1*, 312– 316.

[2] Hartadi, B., Herlina, F., & Royani, A. (2020). Perancangan Mesin Otomatis Pemotong Kerupuk Ikan Haruan. Al Jazari : Jurnal Ilmiah Teknik Mesin, 5(1), 18–21. https://doi.org/10.31602/al-jazari.v5i1.3080

[3] Hugas, M., Garriga, M., & Monfort, J. M. (2002). New mild technologies in meat processing: High pressure as a model technology. Meat Science, 62(3), 359–371. https://doi.org/10.1016/S0309-1740(02)00122-5

[4] Ismail, S.O., Ojolo, S.J., Ogundare, A.A., & Oke, P.K. (2016). Design and Development of an Improved Plantain Slicing Machine. *The Journal of Engineering Research, 18*.

[5] Chiabuotu, C.C., Opara, U.V., Azubuike, J.O., Ekpechi, D.A., Okonkwo, B.U., Nwangwa, J.M., & Uzor, A. (2023). Design and Development of an Integrated Plantain Processing Machine. Journal of Applied Chemical Science International.

[6] Ibiyeye, D.E., Adedipe, J.O., Yusuf, I.O., Adesida, O.A., Akala, A.O., Ogunbamowo, P.O., & Roberts, A.E. (2024). Design and Development of a Manual Pineapple Processing Machine Capable of Peeling, Coring and Slicing Pineapples for Small and Medium Enterprises. Journal of Applied Sciences and Environmental Management.

[7] Anyanwu, C.N., Kalu, C.A., Okonkwo, V.C., Ume, J.I., & Onyekwelu, I. (2018). Design and development of fluted pumpkin (Telfairia occidentalis) leaves slicing machine. Nigerian Journal of Technology.