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DESIGN AND BUILD THE APPROPRIATE TECHNOLOGY MACHINERY FOR SHREDDED FISH PROCESSING

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Abstrak.

Mesin penghasil abon ikan secara otomatis yang bisa memudahkan dalam proses produksi. Sebelumnya proses tersebut dikerjakan secara konvensional pada satu kali produksi. Permasalahan tersebut mendorong peneliti untuk diciptakan mesin dengan penggabungan 3 sistem alat menjadi mesin pengolah abon ikan, antara lain yaitu sistem pemisah daging serta tulang ikan, sistem tungku pemasakan dan sistem pengering abon/*spinner* yang bisa dikontrol secara elektrik dalam proses produksi, selain itu abon yang dihasilkan lebih bersih dan efisien pada satu kali proses produksi. Mesin ini bekerja memanfaatkan tenaga dari motor listrik ¾ Hp yang menjadi sumber penggerak mesin pemisah daging dengan kecepatan putaran 2840 rpm dan mempunyai kapasitas produksi 30 Kg/Jam.

Kata kunci: rancang bangun, abon ikan, kapasitas 30 kg/jam.

Abstract.

The Shredded fish is produced by machines automatically, which can facilitate the production process. Previously the process was done conventionally in one production run. This problem prompted researchers to create a machine by combining three tool systems to become a shredded fish processing machine, including a system for separating meat and fish bones, a cooking furnace system, and a shredded dryer/spinner system that can be controlled electrically in the production process, in addition to the shredded produced more cleanly and efficiently in one production process. This machine utilizes the power of an electric motor of ¾ Hp, which is the driving force for the meat separator machine with a rotation speed of 2840 rpm and a production capacity of 30 Kg/hour.

Keywords: *design, shredded fish, capacity 30 kg/hour.*

Introduction.

Traditional fish preservation is the processing of fish by reducing the water content in the fish's body through simple drying so that the bacteria contained in the fish cannot reproduce so that the processed fish produced can last longer and not spoil quickly. In order to obtain high-quality processed fish utilizing preservation, several suitable treatments are required during the preservation process, such as maintaining the cleanliness of the materials and tools used and using fresh fish. The various ways to preserve fish include salting, drying, smoking, fermenting, cooling/freezing, roasting, frying, and making shredded fish. Shredded fish is a processed food seasoned and processed by boiling and frying. The resulting product has a soft shape, tastes good, and has a relatively long shelf life of over six months. The equipment needed is relatively simple and has the

potential to be developed in many areas of Indonesia which have abundant fishery resources [1]–[3].

Meat Separation Process Using Meat Bone Separator. Explains that the hardness of fish from various preparations affects the length of time or speed of the process of separating meat using a meat bone separator. When the fish is inserted into the opening between the pressure belt and the porous cylinder, a skid often occurs, especially in the whole fish treatment compared to other treatments. In the practice of separating using a meat bone separator, manual assistance is still needed for the fish to get crushed between the pressure belt and the porous cylinder. Apart from being caused by the slippery surface of the fish and the pressure belt and porous cylinder caused by fat, the thickness of the fish also affects the process of separating the meat. The thicker the processed fish, the more often slippage occurs, so it is easier to process split fish using a meat-bone separator [4], [5].

This research discusses the manufacture of shredded machines with three non-conventional system innovations, including a meat-bone separation system, a cooking system and a drying system. the power of the driving motor used is 3/4 HP with a speed of 2840 rpm. The manufacture of this machine is expected to increase production and produce more hygienic results.

Research Methods.

Reseach Design.

In this planning, you must first compile or make a basic concept regarding the machine to be made. With several references from internet media, material surveys and material availability. Furthermore, a search is carried out by understanding how the automatic shredded machine works [6][7]–[9].

Preparation of Tools and Materials.

Before entering the machining process, prepare the tools and materials needed to make the machine. Prepare the tools and materials needed to suit the needs of the machine to be made [10], [11]. The tools and materials used are grinding machines, drilling machines, lathes, electric welding machines, drips, gauges, hammers, vices, gauges and shafts, angle iron, stainless steel, bolts and nuts, belts and pulleys, wood, lava, nails and motors and other supporting equipment.

Dimension Inspection.

Before the assembly process, check the completeness of the materials and tools used. Then carry out the process of measuring and cutting the material according to the size needed so that the processing and assembly process does not experience wrong cuts and sizes.

Materials Cutting.

After all the ingredients are measured, the next step is to cut the material according to the specified size. Cutting the material is carried out by people with expertise and accuracy during the process. Material cutting is done with a cutting machine according to the material used. This process can be seen in Figure 1.

Figure 1. Material Cutting Process

Measurement of Materials and Assembly.
In the measurement process, the material must be ensured correctly, so there is no material shortage and to save on material use. It is done so that there is no inhibition to making the machine . If the primary materials and materials used are ready, prepare supporting tools for assembling raw materials one by one, from forming to welding the other components, as in Figure 2.

Figure 2. Material Assembling Process.

Testing Machine Concept
In this process, checking and testing are carried out to determine whether problems or problems with the machine concept are being made and to ensure conformity with the desired initial concept. It is shown in Figure 3 below.

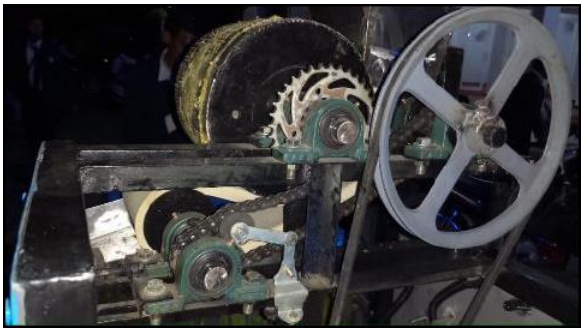
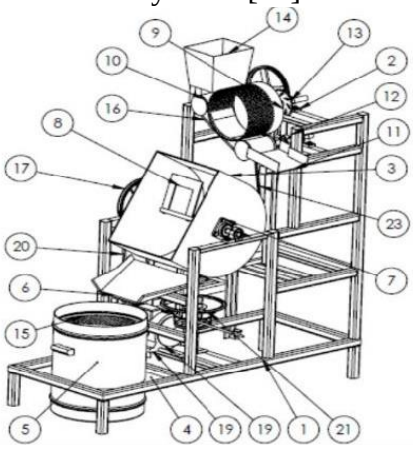


Figure 3. Machine Concept Testing Process.

Product Design
Details of tools and materials make an automatic shredder machine. This machine is modified by combining three work systems [12].



No	Details	No	Details
1	Machine Frame	13	Main gear rollers
2	Bearing	14	Flesh Entrance
3	Furnace	15	Spiner Hole
4	Spinner Plate	16	Belt 1
5	Spinner Tube	17	Furnace Pulleys 1
6	Furnace to Spinner Bridge	18	Furnace Pulleys 2
7	Furnace Bearing	19	Drive Motor
8	Furnace Mixer	20	Belt 2
9	Separation Roller	21	Stove
10	Roller support 1 & 2	22	Pulley Motor Rollers
11	Discharge Path	23	Belt 3
12	Gear Rollers		

Figure 4. Automatic Shredded Machine Design.

Results and Discussion.

Energy and Cost Analysis.

The length of the twister rod is 130 mm. The diameter of the chopper shaft is 12.7 mm, so the chopping area is 1.26 cm². The shear stress of the meat is determined to be 2.8 kg/cm². The number of chopper rods on the meat chopper that hits the meat per chopping round is seven sticks, so the total chopping force on the rod for 1x rotation is 246.96 N. The motor power that meets the requirements for this meat chopper machine is 1 HP with a rotation of 1400 rpm.

Tabel 1. Energy and Cost.

Force (N)	Power (kW)	Cost (Rp)	Caloric (kCal)	Efficiency (%)
246.96	535.6	260	1533	16

The performance of the combustion system in the roasting process with a temperature of 146°C has a temperature bias of 19°C. It indicates that the supply of heat energy is sufficient for the process. the heat required in the roasting process of 30 kg of fish meat to become shredded is 1,533 kcal. The energy needed to evaporate water from the roasted shredded ingredients is 226 Joules. Heat efficiency in roasting fish meat into shredded is 16%, which means that the heat efficiency is sufficient to produce good quality shredded roasting. Shredding shredded using a spinner pulling oil depends on how long it takes to dry. The results of the first test were carried out for testing the motor driving the spinner machine, namely by measuring the motor's input rpm with the spinner engine's output. The rotation speed of moving the basket was obtained in one rotation of 1.280 rpm. It dramatically affects the timeliness of draining the oil contained in shredded.

The testing time tested for one production is 15 minutes. The energy required per hour is 0.0175 kWh at the cost of Rp. 22.75. The energy required in the optimal alleviation time, namely in the 15th minute, requires the energy of 0.0175 kWh and costs Rp. 22.75. The test was conducted for 15 minutes with a sample mass of 100 grams. In the 15th minute, the change in the fat content of the shredded meat was seen to be constant, with a fat content of 29.49%. According to the Indonesian Industrial Standards (SII), the full-fat content in shredded meat is 30%. It can be said that alleviation using spinner pulling oil can remove the shredded oil content within 15 minutes, which is the optimal time for alleviation and shredded is feasible to produce.

Meat Bone Separator Process Efficiency Test.

By comparing the theoretical separation process capacity (KPT) and the adequate separation process capacity (KPE) of fish meat and bones with the following calculation,

Tabel 2. Process of Separation of Meat Bone Separator

No	Process	Detail	Value
1	KPT		11.22 gr
2	KPE	theoretical	8.3 gr/s
3	EF		73.9%

Based on table 1 above, it can be seen that the higher the ability to separate meat, the more input-output can be estimated so that the fish produced in each production can be used optimally.

Conclusion.

The automatic shredded fish machine has 3 combinations of machine functions, each of which works efficiently due to shorter time but maximum results. The production process is carried out quickly and easily because the process does not use manual methods so it is more efficient and able to increase production effectiveness. The process of making fish floss uses an automatic shredded machine with an electric motor as the main activator, so it's faster, doesn't require more energy and the result is more clean, because the construction of the machine is simpler and can be developed according to the expected production needs. Machine materials, especially rollers, blades, and

containers for shredding fish meat, are made of stainless steel, a material that is safe for food ingredients.

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