Designing and Fabrication of Integrated Fish Feed Machine 2 in 1 to Efficiency and Feed Quality

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Abstract. One important component of fish farming business is fish feed. The costs required in procuring fish feed are very large, namely 60–80% of the total cost. An increase in efficiency for fish feed is to make the fish feed yourself using a fish feed making machine. The first stage is the design process by making machine designs based on observations and literature studies. The next stage is the function test and analysis of the test results. The result of the designing and fabrication fish feed machine 2 in 1 with dimensions (1521.59 x 604.30 x 1062) mm, using v belt transmission and gears, have production capacity of 300 kg/hour. Fish feed machine 2 in 1 has an adjustable blade so that it produces coarse and fine fish feed. Using this machine improves the quality of fish feed and production cost efficiency.

Keywords: Fish feed machine · Design · efficiency · Feed quality

1 Introduction

Fish farming is one of the main types of work for people in Indonesia as an archipelagic country that has a large water area. One important component of fish farming business is fish feed. The costs required in procuring fish feed are very large, namely 60–80% of the total production cost. Fish feed determines the profit of the fish farming business. Efficiency in the procurement of fish feed can be increased by finding alternative raw materials, increasing the independence of fish farmers through the manufacture of feed independently [1].

The biggest cost in fish farming operations is fish feed. For grouper cultivation, which is 0–2 months old, grouper eats soft-textured fish feed, for soft-textured fish feed, fishpond entrepreneurs must use factory feed. Meanwhile, groupers aged 3–6 months use coarse-textured fish feed, to get coarse-textured fish feed, aquaculture entrepreneurs must do milling at the fish feed mill [2]. The fish feed milling process can be seen in Fig. 1. The high operational costs make the profits obtained smaller.

The existing fish feed milling machines are only capable of grinding coarse-textured fish feed [3]. To overcome this problem, this community service activity makes a 2 in 1 fish feed machine, namely a fish feed machine that can produce two types of texture of fish feed, namely soft and rough show in Fig. 1.

Fig. 1. Fish feed milling process

The need for fish farming entrepreneurs is a fish feed machine that has a dual function, namely, a machine that can grind coarse and soft textured fish feed, because what is available is only a coarse textured fish feed machine. Besides, the need to make fish feed independently to reduce production costs [4]. The solution to this problem is a 2 in 1 fish feed machine, which is a multifunctional fish feed machine that can make fish feed with coarse and soft textures. Literature study is used to design a 2 in 1 fish feed in order to get a machine that is suitable for the purpose.

Some of the research results used as library materials in designing 3 in 1 process soybean machines include: Okolie [5] Design and production of a fish feed pelletizing machine, The important components of the pelleting machine are the hopper where the feed meal is fed into the machine and the pelleting chamber in the form of worm auger or screw shaft which is seen to propel the feed. Kurniawan [6] Induction of Fish Pellet Making Machine To Improve Feed Community Program In Catfish Farmers In Mojokerto. Syarifudin [7] Design and construction of a 3 in 1 fish pellet printing machine, testing for this machine is carried out by operating the machine without adding pellet dough. The engine rotation on each pulley is measured and tested for the capacity of the pellet molding machine. Muo [8] A Design and Fabrication of Fish Feed Pelleting Machine.

From the review of some of the literature above, it shows that existing machines can only grind and cut fish feed in a coarse form, so if you need a fine form of fish feed, you have to buy it. Buying fish feed causes high production costs [9]. Based on this, it is necessary to conduct research through technological engineering to make fish feed that is able to make fish feed in coarse and fine forms so as to optimize the cost efficiency of fish farming production [10].

2 Method

The engineering method for designing a "2 in 1 fish feed machine" which is used to improve the efficiency and quality of fish feed is carried out in stages as shown in Fig. 2.
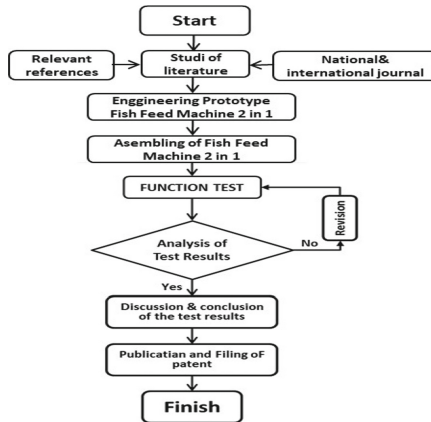
Fig. 2. Fish feed machine flow chart.

Table 1. Variable determination of fish feed machine

| Determinant Variable	Information	Output
Fish feed machine frame 2 in 1	Stainless steel material	Sturdy, attractive appearance,
Energy sources	Diesel Engine 10 HP	Reliable and strong
Transmission system	Pulley and V-belt gears	Can be shifted for the knife Smooth sound
Double knife	Better cutting ability	Coarse and fine grind
Inlet (hopper) tilt angle	Fish feed entry point	The speed/capacity of the flow of fish feed entering the machine
Blade distance can be adjusted	The blade can move forward and backward	Produces fish feed in coarse and soft texture

2.1 Engineering Prototype Fish Feed Machine

To simplify the manufacturing process, the variables to be identified for the design of the 2 in 1 fish feed machine. The data on the identified 2 in 1 fish feed machine variables are presented in Table 1.

After the data on the determinant variables for designing are identified, the next step is to design a 2 in 1 fish feed machine. The design of the machine can be seen in Fig. 3.

2.2 Manufacture and Assembly of Fish Feed Machine 2 in 1

The next stage after making the machine design is the manufacture of machine components and their assembly, so that a 2 in 1 fish feed machine is produced which is capable of producing fish feed in coarse and soft textures. The manufacturing process is targeted within 2 months. The fish feed milling process is shown in Fig. 4.
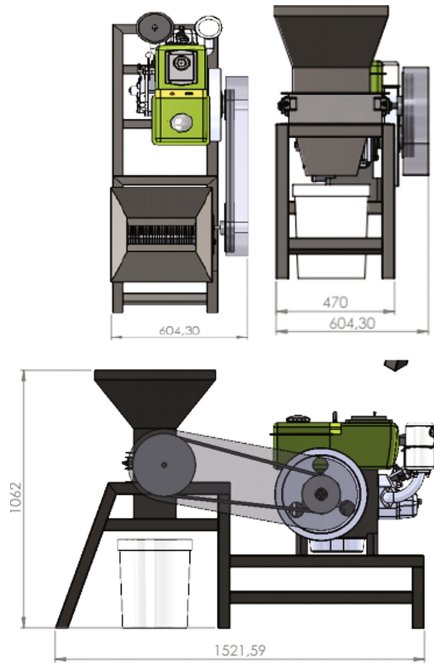
Fig. 3. Desain Fish Feed Machine 2 in 1

Fig. 4. Fish Feed Machine 2 in 1 process

2.3 Function Test

Function test is carried out after the manufacture and assembly of the machine is complete. The purpose of the function test is to determine the optimal performance of the 2 in 1 fish feed machine. The function test was carried out by simulating various engine speed settings and blade gear settings in order to be able to obtain coarse and soft textured fish feed. This function test aims to obtain data about the best quality and quantity of the fish

feed milling process. The quality of the machine is said to be good if it produces coarse and soft textured fish feed, good quantity if it produces a lot of feed in a certain time.

2.4 Analysis of Test Results

After the function test has been completed, the next step is the engine function test. At this stage an analysis of the engine work system will be carried out. Analysis is carried out on the movement of the machine and the stability of the machine. Analysis was also carried out on the shape of the milling results. If the results of the analysis show a discrepancy, it is necessary to revise it until you get the appropriate results.

3   Result and Discussion

Fish feed making machines available in fish farms today are only able to make fish feed in rough form. This condition makes it difficult for fishpond entrepreneurs who need fine form of fish feed for fish aged 1–3 months.

The availability of the available fish feed making equipment is only capable of producing 150 kg/hour due to the hopper power of the small fish feed machine.

The process of making coarse and fine fish feed which is carried out separately is very ineffective and inefficient. Besides a small production capacity, a long time, causing high production costs and less than optimal product quality. Based on these data, it shows that the available feed equipment is not efficient and the quality of fish feed is not optimal. For the quality of fish feed and cost efficiency, a 2 in 1 fish feed machine is designed which is able to produce fish feed in coarse and soft forms.

Fish feed machine designed as follows: (1) dimensions (1521.59 x 604.30 x 1062) mm, (2) using a 10 HP diesel engine drive, (3) v-belt transmission, (4) hopper width 470 mm, (5) the grinding blade can be adjusted so as to produce the desired mill, production capacity of 300 kg/hour.

4   Conclusion

The 2 in 1 fish feed machine has dimensions (1521.59 x 604.30 x 1062) mm, a production capacity of 300 kg/hour, a diesel engine power of 10 HP and a transmission using a V belt and gears. The 2 in 1 fish feed machine has an adjustable blade so that it produces coarse and fine fish feed. Using this machine will improve the quality of fish feed and production cost efficiency.

Authors' Contributions. All authors contributed to manuscript, Arif contribute to writing, Wahyu making conceptualization, and Heru did review for submission.

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