

CHAPTER

8

AUTOMATIC FISH FEEDER

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8.1 INTRODUCTION

Aquaculture in Malaysia has developed rapidly since the 1920s and is now an important industry in Malaysia (Food and Agriculture Organisation [FAO], 2005). High demand for protein and a shortage of food supply are not the only reasons why the aquaculture industry is keen on exploring and improving technology. Aquaculture is also important as a form of export revenues and increases local production. However, difficulties in land acquisition, the lack of skilled labour, and problems with diseases are obstacles that impede the development of Malaysia's aquaculture industry.

Efficient feeding can be achieved by implementing an automatic feeding system. There are two basic concepts of automatic fish feeding systems: fixed feeders and mobile feeders. A fixed feeder system has a single dedicated storage and dispenser unit allocated to every pond and situated above the water surface. Distributing the feed into the individual units from the main storage is required. A high-pressure pipe feeder is one example of a fixed feeder system. Mobile feeders combine the delivery and dispensation of feed into a single process. It requires more complex control compared to the fixed feeder and offers more flexibility as well as approaches for different environments and layouts of ponds.

8.1.1 Problem Statement

The use of technology in aquaculture feeding regimes is important to enhance the productivity and work management with increased efficiency and reduced manpower. The supply of pelleted feed is a major expense in aquaculture operations. Research has shown that the feeding costs are higher than the worker's salary, logistics, or medication expenses every month. This problem is made worse if the worker continues to feed manually.

On top of this, poor feeding practices such as feeding with hands might transfer bacterial infections to the water and spread disease. Delayed feeding and inconsistency of feeding quantity can influence product quality. The growth rate would be bad such that the fish would not achieve maximum potential, fish are less mature, and reproductive system disorders resulted. There are also problems with feeding during bad weather since workers might be exposed to the rain. Furthermore, the poorly controlled feeding mechanism might result wastage of the pelleted feed. Thus, a proper fish feeding management is vital to maximize efficiency in aquaculture activities.

Efficient feeding practices could be achieved by implementing an automatic feeding system. There are two basic setups of automated fish feeding systems: the fixed and the mobile feeders. The fixed feeder systems have a dedicated storage and dispenser unit set by the pond. It requires workers to transfer the feed from the main storage regularly. The high-pressure pipe dispenser is an example of a fixed feeder system. Using this system, the pelleted feed might easily get stuck within the pipe due to the complicated structure of the piping. Other examples of fixed feeder systems are simple feeder, floating feeder, and demand feeder generally only suitable for use in large and limited fishponds. In other words, each tank requires an individual feeder unit, and this requires high capital and high maintenance. Therefore, fixed feeders are not suitable for small tank setups such as canvas or concrete tanks. Moreover, existing fixed feeders are unable to deliver different types of pelleted feed together—This causes difficulties for the breeder.

Boat and belt feeders are categorised as mobile feeders. The mobile feeder combines the delivery dispensation process into a single process. Mobile feeders have relatively more complex controls compared to fixed feeders but are more flexible and offers different approaches for different pond layouts and environments. Typically, boat feeders are suitable for marine aquaculture. Terrestrially belt feeders require the installation of a moving belt above the fishponds which has a high installation fee. Belt feeders also have high energy and maintenance costs.

Most aqua culturists feed fish manually because existing automatic machines are not effective or expensive. This study attempts to meet the market needs whilst avoiding problems with existing designs. A study on existing products is needed to overcome the problems and to achieve the objective of designing a commercially viable automatic fish feeder for aquaculture. Factors that need to be enhanced are the cost, ergonomic design, safety, and its ability to function at a predetermined time consistently and accurately.

8.1.2 Objective

The objective of this study is to design a programmable automatic feeding device.

8.1.3 Scope and Limitation

The scopes of this study are:

- (1) Performing studies on fish farms and existing fish feeding devices.
- (2) Designing a feeding system according to the engineering design process.
- (3) Simulating the final design concept using SolidWorks software.
- (4) Producing and testing a prototype.

8.2 DESIGN PROCESS

This section explains the conceptual design process.