DESIGN AND FABRICATE AN AUTOMATIC FISH FEEDER

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SUPERVISOR'S DECLARATION

I hereby declare that I have checked this project report and in my opinion this project is satisfactory in terms of scope and quality for the award of the degree of Diploma in Mechanical Engineering.

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Name of Supervisor: MR. NGUI WAI KENG

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Date: 20 NOVEMBER 2009

STUDENT'S DECLARATION

I hereby declare that the work in this report is my own except for quotations and summaries which have been duly acknowledged. The report has not been accepted for any degree and is not concurrently submitted for award of other degree.

Signature:

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Date: 20 NOVEMBER 2009

DEDICATION

To my beloved parents, Mr. Chan Yoke Leong and Mdm. Lee Fong Yin , other siblings, family and friends, without whom and his/her lifetime efforts, in encouraging and supporting my pursuit of higher education in mechanical engineering.

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In preparing this thesis, I was receiving help from many people to get detail information about my diploma project. They have contributed a lot towards my understanding, thoughts, and ideas in preparing and completing my thesis. I would like to take this opportunity to forward my appreciation to those who are helping me in my thesis preparation.

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Then, my deepest appreciation and thank to Faculty of Manufacturing and Technology Management for their cooperation while I am conducting this project at the laboratory. Last but not least for my beloved family and all my beloved friends who helped and inspired me to finish this project.

ABSTRACT

The objectives of this thesis are to design and fabricate a low cost and longer life span automatic fish feeder. This automatic fish feeder is designed to dispense food into the aquarium at a particular time each day. In this project, concepts are generated through the research on the existing patents to improve its limitations. Water power is used as the main mechanism to design this fish feeder. To accomplish the factors of lost cost and longer life span, water wheel is used to transmit the input power from water. In this concept, a water wheel connected with the food container by a shaft. The water from aquarium filter is drip into a rotatable water container with a constant rate. A valve is used to control the flow of water that drip into the rotatable water container. The container empties the water by drop on the water wheel when it is pivoted by the weight of the water. The water wheel is rotating once the water flow through it. A rotational movement of water wheel cause the food container rotates and dispenses the food from a small hole.

ABSTRAK

Objektif tesis ini adalah untuk merekabentuk satu pengumpan ikan automatik yang dapat mengurangkan kos penggunaan dan digunakan dalam jangka masa yang lama. Pengumpan ikan automatik ini direka untuk membahagikan makanan ke dalam akuarium pada waktu tertentu setiap hari. Dalam projek ini, konsep-konsep yang dihasilkan adalah melalui kajian tentang konsep yang telah ada untuk memperbaiki kelemahan produk tersebut. Tenaga air digunakan sebagai mekanisme utama untuk mereka pengumpan ikan ini. Untuk mengurangkan kos penggunaan dan memanjangkan jangka hayat produk, roda air digunakan untuk menghantar kuasa input dari air. Dalam konsep ini, roda air disambungkan dengan bekas makanan oleh aci. Air yang ditapis akan menitis ke dalam bekas air yang fleksibel secara konsisten. Injap digunakan untuk mengawal aliran air yang dititis ke dalam bekas air tersebut. Air dalam bekas air tersebut akan dialirkan pada roda air apabila berat air dalam bekas tersebut mencapai tahap tertentu. Maka, roda tersebut akan berputar apabila air mengalir melaluinya. Putaran roda menyebabkan bekas makanan berputar dan makanan dijatuhkan dari satu lubang kecil.

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LIST OF SYMBOLS

a	Acceleration = $9.81ms^{-2}$
A	Area
d	Distance
ρ	Density
Q	Flow rate
F	Force
g	Gravity = $9.81ms^{-2}$
h	Height
J	Polar moment of inertia
$\dot{m}$	Mass flow rate
M_o	Moment of the force
n	Number of trials
X	Number of successes in *n* trials

p	Numerical probability of success
q	Numerical probability of failure
Π	Pi = 3.142
P	Pressure
P(X)	Probability
r	Radius
c	Radius of shaft
τ	Shear stress
σ	Stress
t	Time
T	Torque
V	Volume

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

This chapter explained about the background of the project, problem statement, project objectives and project scopes. Beside that, this chapter also consists of report arrangement.

1.2 BACKGROUND OF THE PROJECT

An automatic fish feeder is a solid investment for any aquarium. It is an electrical or electronic gadget that is designed to dispense the accurate amount of food into the aquarium at a particular time each day. Some fish feeders can be set to feed the fish more than once a day. Automatic fish feeders are either run on electricity through a power cord or battery operated. The advantage of electrical power feeders is there is no worry about the battery dying while battery operated feeders is without worry of electric shock or power outages. Fish feeders are usually clamped to the wall of the tank just over the water. They consist of a hopper which is loaded with a variety of dry food, a timer which rotates the hopper at regular intervals, or a method of setting the interval between feeding and the amount of food dispensed. This allows the fish to be fed on a regular basis without overfeeding. The mounting technique will vary depending on which model of fish feeder you purchase. Some have mounting brackets that will hook onto the edge of the aquarium while others have suction cups the will attach to the inner walls of the aquarium.

1.3 PROBLEM STATEMENT

Aquarist of the home based aquarium leads a busy life especially those who are away on vacation. They are often difficult to maintain a regular feeding schedule. However, the fish require regular care in order to remain healthy. If fish are not constantly fed small amounts at regular intervals, there can be significant loss of fish due to starvation. But, too much food in the water can easily clog up important filters, and cause you to have to spend more time cleaning your aquarium tank. Thus, they are recruiting a reliable helper to ensure that the fish are properly fed.

There are many different designs and brands on automatic fish feeders on the market, but some limitations on the existing fish feeders need to be improved. Though some feeders are designed specifically to keep food dry, many designs allow moisture to seep into the food hopper. This can cause clumping, and can result the failure of the mechanism. Feeding fry has been difficult. Pendulum and vibratory feeders are not very suitable, due to small particle size of fry feeds. Alternatively, clockwork feeders offer an apparent solution. However, in the presence of humidity, the feed sticks to the large surface area of the belt, and fungus grows. Consequently, a lot of labor is required to keep it running. In addition, the clockwork mechanism has to be wound up daily. Therefore, some improvement or new invention is developing to solve these problems.

1.4 OBJECTIVES

The objectives of this project are included:

i. To design an automatic fish feeder.

ii. To fabricate a low cost automatic fish feeder.

iii. To fabricate a longer life span automatic fish feeder.

1.5 SCOPES

This project development is limited within the following scopes:

i. **A**nalysis the efficiency of the mechanism used on the automatic fish feeder.

ii. Fabricated the automatic fish feeder by using industrial machine and engineering tool which are drilling machine, vertical bend saw, protractor and vernier caliper respectively.

iii. Designed the automatic fish feeder by using engineering software which is Solidworks.

iv. Focus on habits of tropical fish.

1.6 PROJECT ORGANIZATION

Chapter 1 is the introduction of this project. Basically, it discuss about the project background, problem statement, the objectives and scopes.

Chapter 2 is a literature study on automatic fish feeder used to acquire better understanding of each special component. Beside that, it consists with the study of existing product and US patents. Design of the studies is listed for future use in this project.

Chapter 3 is the methodology chapter where the objective of the project is determined. The require concept design is chosen based on objective. Each criteria of concept design is defined by the literature study. The require materials and component are determine based on the chosen concept. Meanwhile, the dimension of component is defined by using measurement instrument for determining the dimension for fabricated part to allow component to assemble together. Fabrication of the feeder is using industrial engines.

Chapter 4 is a chapter of result and discussion on this feeder. This new concept is use to analysis the efficiency of food dispenses. Beside that, the result of testing is used to develop a suitable dimension of the fish feeder. In this chapter, the problem encountered is discussed. The solution manual to use the feeder is developed via the trial run on the feeder.

Chapter 5 is the conclusion and recommendation chapter of this project. This new concept and design of automatic fish feeder is built based on the limitations of the existing products. In this chapter, it included the conclusion of this project and the improvement can be doing for the future invention.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter is provided detail description of literature review done regarding the project title of design and fabrication for automatic fish feeder. The literature review started with the types of mechanism for the conceptualization use. The types of mechanism consists water power, clock system and timer. Each component required on each mechanisms is provided to understanding the characteristics for develop a new design of automatic fish feeder. Beside that, it is explain the characteristic of chosen materials and habits of fish. Furthermore, the study of patents on automatic fish feeder is acquired to define the advantages and disadvantages.

2.2 TYPES OF MECHANISM

2.2.1 Water Power

The nature of water energy is related to kinetic and gravitational potential energy. All around the planet Earth, water is on the move. Water flows downhill under the force of gravity in rivers and creeks. The amount of available energy in moving water is depends on its flow or fall.

Many centuries ago, farmers take advantage of the currents in rivers and streams for a variety of agricultural purposes, including pumping water for irrigation and

grinding grain. Water energy is generated in the form of water clocks and waterwheel. To start the mill, the miller opened a gate to allow water flow over the top of the wheel. Normally, the wheel's diameter is 10 to 16 feet. One type was called the overshot wheel. Water ran down a slanted wooden chute that ended at the top of the wheel. Then the water spilled into paddles which attached to the wheel. Power generate when the water's weight and impact forced the wheel to turn. The water wheel is connected to a massive millstone or metal saw blade via a system of gears. Water for the wheel usually came from a small dam and reservoir, called the millpond. The energy extract from moving fluids when the speed of water which passes through water wheel slowing down. Figure 2.1 show a water wheel is connected to a system of gear to transmit water power.

Figure 2.1: A water wheel is connected to a system of gear

Source: Alice Longstaff Gallery Collection

2.2.2 Water Clock

The water clock does not affected by sunlight, so it could be used to track time on cloudy days or throughout the night. Water clock was like pots made of stones, with long slanting sides that allowed water to drip down at a constant rate through a small

hole in the bottom. Other versions were bowl or cylindrical shaped containers designed to slowly fill with water coming in at a constant rate. The inside surface is marked on with twelve separate columns with consistently spaced to measure the passage of hours as the water level reach them. Some of the water clocks were different. They measured time depends on the amount of water. The wheel turned and indicated the hour of a day as the water level changed. A water clock that depends completely the flow of water has limited accuracy because the rate of flow of water is difficult to accurately control. With no hard to dispose of batteries and no electricity use, water clocks are eco-friendly time machines.

A Greek physicist and inventor, Ctesibius of Alexandria improved the ancient Egyptian clepsydra. The water is dripping into a container raised a float that carried a pointer to mark the hours. Beside that, a rack that turned a tooth wheel is attached to the float. Meanwhile, there have been water clocks that used a siphon to automatically recycle it. Figure 2.2 and 2.3 show two types of water clock.

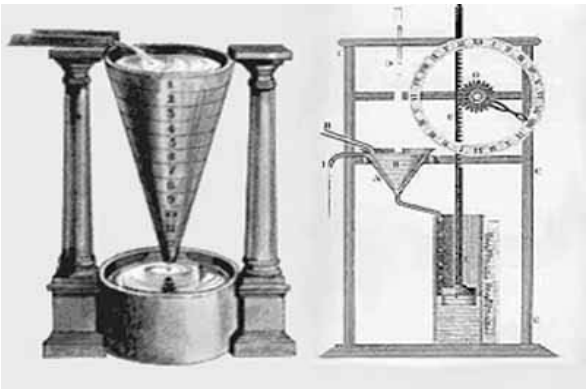

Figure 2.2: Greek water clock

Source: GreenJoyment.com

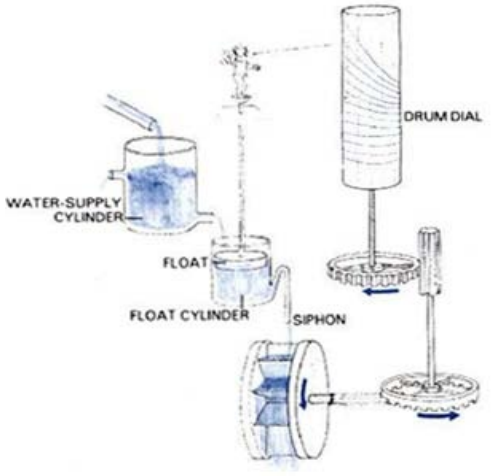

Figure 2.3: An illustration of clepsydra or water clock

Source: ThinkQuest Team (1999)

2.3 WATER WHEEL

A water wheel is produce by a large wooden wheel with blades or paddles that turn on an axle. The purpose of water wheel is slows down the speed of moving water and transmits the energy released from the water to turn a shaft which can be hooked to machinery such as a saw for cutting timbers into boards. Gears, pulley and belts are used in transmission of energy. There have many shapes, sizes and forms of water wheel.

Generally, they can be classified into three main types such as undershot, breastshot and overshot. In undershot water wheel, it had flat blades that allow the water flows along the base of the wheel, retaining the same level all the same time. The flow of the water against the flat blades at the base of the wheel made the wheel turn. In breastshot water wheel, the water flows into the bucket at about the middle of the wheel. In overshot water wheel, it had bowls shaped blades that can catch up the water that is flows to the wheel through a channel or trough. Therefore, the water enters the buckets at the top on the down-running side. However, some water wheel had a penstock that

could be moved back and forth. In one position it would allow the water flow under the wheel and at other times it could be set up to flow over the top of the wheel. Figure 2.4, 2.5 and 2.6 show three types of water wheel.

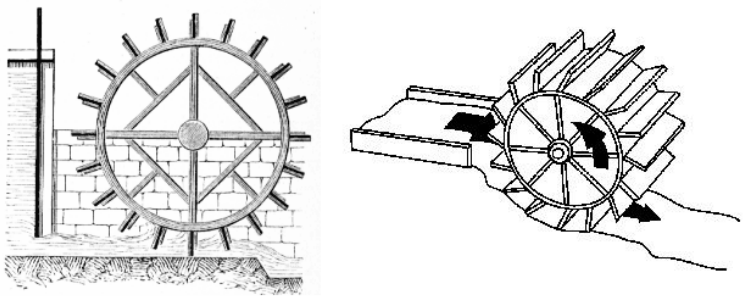

Figure 2.4: Undershot water wheel

Source: hp-gramatke.net & cnx.org

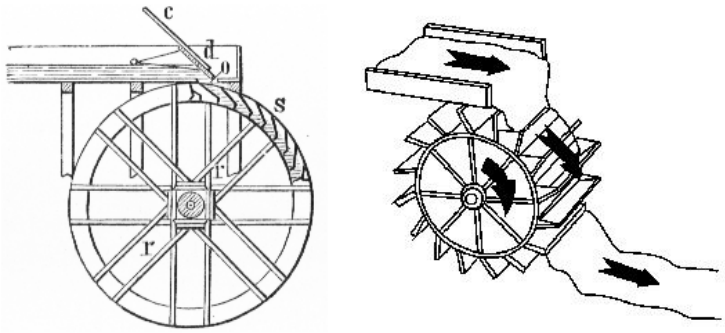

Figure 2.5: Overshot water wheel

Source: hp-gramatke.net & cnx.org