LOW MAINTENANCE AQUARIUM: AUTOMATIC CONTROLLER SYSTEM FOR WATER LEVEL SENSOR,TEMPERATURE AND FOOD DISPENSER SYSTEM.

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Supervisor's Name	: Engr. Zarina Binti Mohd Noh
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To my beloved father, mother, and all my siblings and friends.

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ABSTRACT

LOMAQ (Low Maintenance Aquarium) project is built for fish farming with less human interface. The project is based on a microcontroller circuit to control the circuit of equipment used on fish farming. The microcontroller (PIC) has a keypad to act as input made to set the timer to control the equipment. All equipment used is controlled by timer. Equipments controlled are light, water pump and food dispenser. There is a timer sensor to show the temperature of the environment and the data is shown on LCD screen. The system would supply the oxygen and food according to the need of the aquarium and cleans the aquarium periodically. The cutting edge of this system is that human can always give the input according to the needs. There would be input interface in the system where it could be altered according to the current needs. Where else the lighting would be pre set to operate in the given timing. The main idea is to make it as a selling product using PIC as the controller .The advantage of this project is that it's very versatile and very flexible. The system could be integrated with on the market appliance without regarding the brand, type or size. It's also flexible via its need of use. It can be used for large scale or small scale. The project would be done in small scale as a prototype. Main purpose of this project is reducing human interference in maintaining an aquarium. Besides that it would also help to cut cost of electricity usage.

ABSTRAK

Projek LOMAQ (Low Maintainance Aquarium) adalah untuk penternakan ikan dengan kurang pendedahan manusia iaitu separa automatic.Projek ini dicipta berasaskan mikropengawal untuk mengendalikan litar serta peralatan dalam penternakan ikan.Litar mikropengawal PIC mempunyai keypad sebagai input masa untuk mengedalikan peralatan.Kesemua peralatan yang gunakan dikawalkan menggunakan pemasa (timer).Peralatan yang dikawal adalah lampu neon,pam air/oksigen dan kotak pengagihan makanan.Selain itu,terdapat sensor suhu untuk menunjukkan suhu sekitar dan kesemua data akan dipaparkan pada skrin LCD. Bagi pengagihan makanan,sela masa yang diperlukan perlu disetkan menggunakan keypad yang telah disediakan.Apabila sudah disetkan,pengagihan makanan sudah menjadi aktif.Maka ia akan mula aktif dan menyalurkan makanan pada sela masa yang telah disetkan dalam tempoh minit. Had operasi pengeluaran makanan adalah 10 saat sahaja. Maksudnya motor didalam pengagih makanan akan berfungsi selama 10 saat sahaja dan makanan akan keluar dalam 10 saat sahaja. Bagi pembekal oksigen dan penapis oksigen, prosesnya juga sama. Sela masa yang diperlukan disetkan menggunakan keypad yang disediakan. Prosesnya akan aktif mengikut sela masa yang talah ditetapkan. Oksigen akan dibekalkan dan air juga akan mula ditapiskan. Sela masa yang ditetapkan adalah dalam minit.

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LIST OF ABREVATIATION

ADC	ANALOG TO DIGITAL CONVERTER
ALU	ARITHMETIC LOGIC UNIT
BCD	BINARY CODED DECIMAL
CCW	CONTER CLOCKWISE
CH	CLOCK HERTZ
CP	CODE PROTECTION
CW	CLOCKWISE
GND	GROUND
IC	INTEGRATED CIRCUIT
ICSP	IN CIRCUIT SERIAL POGRAMMING
INDF	INDIRECT FILE
LED	LIGHT EMMITING DIODE
PC	PROGRAM COUNTER
PWRT	POWER UP TIMER
PIC	PROGRAMMABLE INTEGRATED CIRCUIT
SQW	SQUARE WAVE

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CHAPTER 1

INTRODUCTION

1.0 Introduction

Human is needed to maintain the aquarium where the maintenance could be neglected if human forget about it or busy with other chores. Besides that, the electricity cost would increase if the aquarium appliances keep on running without any usage. Due to the heat the water will vaporize easily[1]. Besides that, there's no system at the market that could integrate on the market appliance into a single system. Feeding the fish is another problem where need to be on time and for fish breeders need to be there to feed their fish every day, so it makes them bonded to their routine life and they can't left it for a longer journey.

The system would supply the oxygen and food according to the need of the aquarium and cleans the aquarium periodically. The cutting edge of this system is that human can always give the input according to the needs. There would be input interface in the system where it could be altered according to the current needs. Where else the lighting would be pre set to operate in the given timing.

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1.1 Objective of Project

The objective of this project is to build a prototype aquarium system that can detect, monitor and control three important aspects to maintaining a healthy aquarium. The prototype system will control water temperature water level and lighting hence the aquarium environment are always at normal condition for the fish in the aquarium.

- Able to integrate the controller system with the on the market appliance thus create a system that is very flexible and user friendly. Besides that it could
- Able to save time and cost by supplying the oxygen and filter system periodically, and humans have not to worry about it.
- Able to reduce human interference.
- Able to pre set the feeding timing so it will be operating automatically.
- Able to monitor the water level in the tank.
- Able to pump in and out the water to tank according to the need.

1.2 Problem Statement

There are many important aspects inside the aquarium environment need to be controlled and three of the aspects are lighting, temperature and water level. The factor why fish inside the aquarium always die because the fish owners do not care about the quality of aquarium environment..Fish owners don't have time to monitor water temperature, water level that is suitable for aquarium environment. Fish owners don't know how to control the parameter of aquarium environment that are suitable for aquarium environment.

1.3 Scopes of Project

The scopes of this project are electronic component, electrical devise, computer software and mechanical design. The electronic components used in this project were PIC18F452 as a microcontroller, LM35 as a temperature sensor, light dependent resistor (LDR) as a lighting sensor, LM324N as a water level sensor, LCD 16x2, 5V relay and basic electronic component such as resistor, capacitor and others.

The electrical devices used in this project were pump, 200 watt heater, lamp and fan (12V). This project used microC language to program the microcontroller and MPLAB v8.10 as a compiler to create the source code and hex file for the microcontroller. Besides that Altium 2004 is used to design the circuit layout for the printed circuit board (PCB).

1.4 Methodology

This project can be divided to hardware and software. The hardware parts consist of four systems. The systems are monitoring system, control system, display system and output system. The monitoring system consists of temperature sensor circuit, water level sensor circuit and lighting sensor circuit. Temperature sensor will sense the water temperature inside the aquarium. The function of water sensor is to detect low water level inside main aquarium and reserve tank. Besides that the function of lighting sensor is to detect light intensity outside the aquarium. All sensors will send analog data to microcontroller.

The Control System consists of PIC18f452 as a microcontroller, Crystal H49S 20MHz as oscillator, 5V regulator used to regulate high voltage to 5V, reset button and other basic components. The control systems functions to process data analog receive from monitoring system and send digital data to display system and output system.

The Display system consists of LCD 16x2, LED, Buzzer and push button. The LCD 16x2 has 2 rows and each row can display 16 characters. First row displays temperature value while second row displays the condition of the output. There are five LEDs used inside the display system. One of the LEDs wills ON if the pump is ON or the heater is ON or the lamp is ON or the fan is ON. Besides that the buzzer and the LED will ON if the water level inside reserve tank is low.

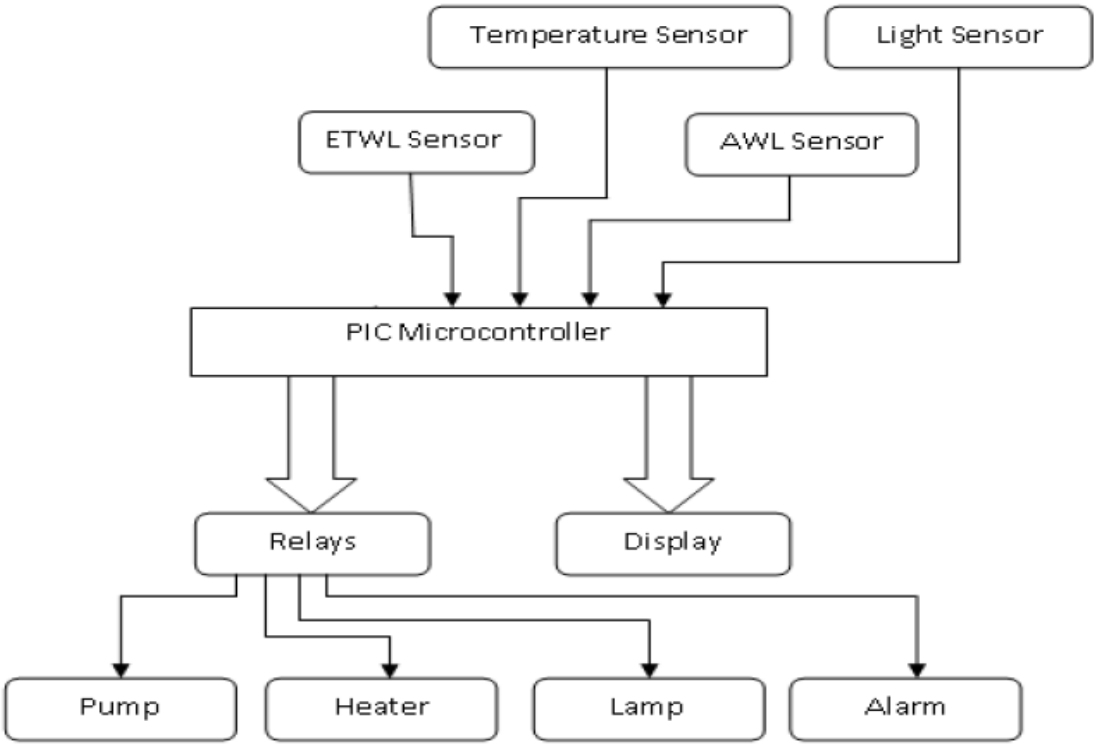

Figure 1.1: The block diagram of the system

There are two push button used to ON the pump and heater manually. The output system consists of relay circuits. There are four relay used to control the pump, the heater, the lamp and the fan. The control system will control the relay by sending 5V output to the relay. UIC00A USB ICSP PIC PROGRAMMER is used to download the hex file to the microcontroller.

1.5 Expected outcome of the project

A system that is able to monitor and carry out the maintenance of an aquarium automatically with less human interference. Where human could key in the data or settings required through an interface. A system that is so flexible and user friendly where it's easy to use and able to change the configuration as user defines.

1.6 Thesis Out Line

Chapter 1 explain about the, objective of the project, scope of the project and problem that must be solve while doing this project.

In Chapter 2, the explanation is focusing about the components that have been use in the circuit to create a standard control system . This chapter also explains the function of each component in detail.

In Chapter 3, the explanation is about the methodology of the project. The explanation is more to the operation of the system , sensors application and flow chart of control sequence before creating a PIC program.

Chapter 4 explains about the simulation and result from the simulation. Before simulating the circuit, the source code programming for PIC18f452 must be burn into the PIC using the PIC burner.

Finally , the last chapter explanation about the future recommendation and the conclusion for the project.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

The origins of aquarium keeping have been around for about as long as keeping food fishes, although the methodology and understanding of aquarium filtration has varied considerably. The first known formal study of fish was conducted by the Greek philosopher Aristotle (384-322 B.C.). Studying their structure and other characteristics, he carefully recorded accurate information on 115 species of fish then living in the Aegean Sea. Today, scientists have classified more than 20,000 species of fish around the world.

Based on the works of Chemist Priestley and Zoologist Johnson, who realized the plant oxygen relation, Robert Warrington builds the first aquarium. His theory was, by building a glass structure filled with sand on the bottom, snails, and plants that can provide oxygen, fish can live forever. The plants would provide oxygen to the fish, snails eat decaying plants and lay eggs, and the fish feed off of the snail eggs. The perfect contained cycle. From there on, the hobby flourished. Fueled by shorter transportation (air traffic was in its infant years), more and more breeders and the enthusiasts helped make the hobby more popular. The inventions and the

understanding of water chemistry and fish within the past 30 years has enabled just about anyone to enjoy fish-keeping with little to no problem.

According to book Common Fish Diseases by Lance Jepson and The Tropical Aquarium by Gina Sandford, both of these books discussed about the Aquarium environment. The contents include the aspects in aquarium environment, the importance of water quality and the effects of bad water quality to the fish. Temperature or Heat is important to drive fish metabolic process. If the temperature is too high enzymes will stop working and if too low the enzymes will damage. On average, most tropical aquariums do best with temperatures ranging from 26ºC to 29ºC.Aquarium not only consist fish but it also consists plant. Light is essential to promote healthy plant growth and allow you to see your fish. Fish inhale oxygen and exhale carbon dioxide.

Water level also one of the important aspect. Fish inside the aquarium needs wide space to swim. If the space is too small space and many fish inside the aquarium, this situation can make the fishes stress and frightened at last the fish will die.

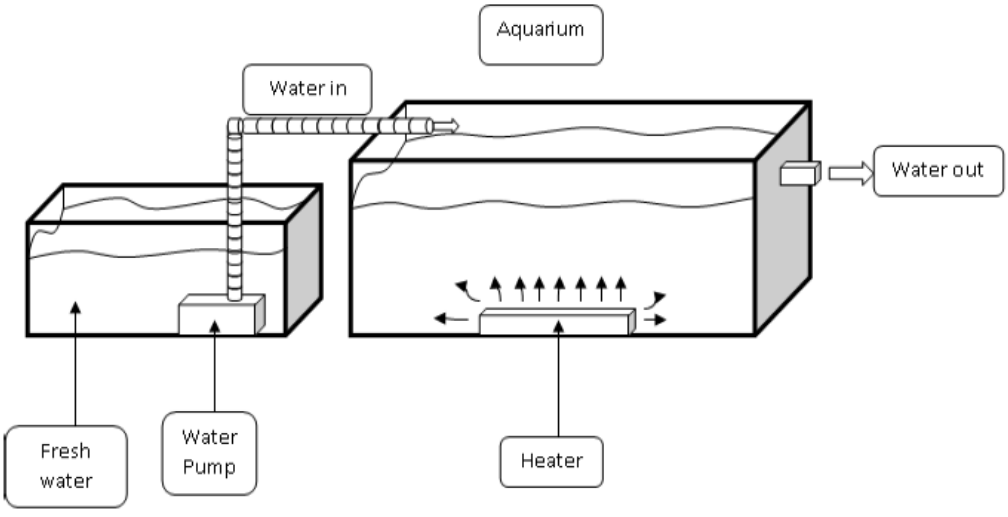

Figure 2.1: The project design of Robert Warrington who builds the first aquarium