AUTOMATIC WATER LEVEL CONTROL

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DEDICATION

My parents Abd Rahman bin Ismail, Salmah Binti Lateh and my brothers and sisters (aya, ain, atah, amira, amin & aqim) who has encouraged, guided and inspired me throughout my journey of education.

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ABSTRACT

Automatic Water Level Control is a project that has been purpose to maintain the water at the certain level. The project has two actuator to control the water, which are pump and valve. The pump draws water to the tank and the valve can enable or disable the outflow from the tank. When the water is higher from the actual level, the valve will automatically on and the water will decrease to the actual level. But when the water is less than the actual level, the valve will off and the pump will draws the water until reach the level. This project uses the PLC as the controller to control the water in and water out. The CX-programmer software in PLC is used to draw the ladder diagram. The instruction such as jump, counter, timer, compare will be used in this system to function the water level control hardware. The Flash Software will be used to display the anime of water flow in the tank controlled by motor and valve.

ABSTRAK

*"Automatic Water Level Contro*l" adalah satu projek yang diusulkan untuk menseimbangkan air pada satu tahap tertentu. Projek ini menggunakan dua penggerak iaitu pam dan injap. Pam berfungsi memasukkan air dalam tangki dan injap berfungsi untuk mengawal keluar masuk air. Apabila air tinggi daripada tahap yang ditetapkan, maka injap akan berfungsi untuk mengeluarkan air sehingga tahap yang ditetapkan dan apabila air rendah daripada tahap yang ditetapkan, maka injap akan tertutup dan pam akan berfungsi untuk memasukkan air kedalam tangki sehingga mencapai tahap yang ditetapkan. Projek ini menggunakan PLC (P*rogrammable Logic Controller*) untuk mengawal air keluar masuk dan bila sepatutnya pam berfungsi. Perisian CX-programmer digunakan untuk membuat *ladder diagram*. Macromedia Flash 8 juga turut dibuat untuk menghasilkan animasi projek ini.

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CHAPTER I

INTRODUCTION

Water is very important to human being. The management of water is very important to avoid it wasted. The *Automatic Water Level Control* is introduced to help the human being to manage the water in their life.

1.1 Project Overview

Automatic Water Level Control was used for on/off signal. The system is very useful to the house and the factory. The purpose of this project is to keep the water at the certain level. The water is set at three level which is high level, medium level and low level. The purpose of this project actually to keep the water stable at the medium level

But if there are any disturbances occurred, such as the water at the high level the water will decrease and stop at the medium level. Then when the water at low level, the pump will on and pump the water until it reaches the medium level. Then the pump will off. In this operation, when the manual valve is on, the pump will on until it the medium sensor is on. The seven segments will display low when the

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pump is on. When the high level sensor on, the seven segment will display high but the seven segment will display

medium when the level of the water is higher than the low sensor and below the high sensor.

In this project, the types of system involve components such as process water holding tanks, actuators as valves and pumps and measured values as level, flow and composition. The flow of water into the tank is controlled by a valve. The control input signal to the valve is a current signal in mA which is converted into a pressure signal.

This pressure is applied to a valve and changes the valve stem position in mm. the valve position dictates the amount of flow passing through the valve into the tank. The height of water in the tank is measured by a transducer (gauge pressure) which produces an output in mA.

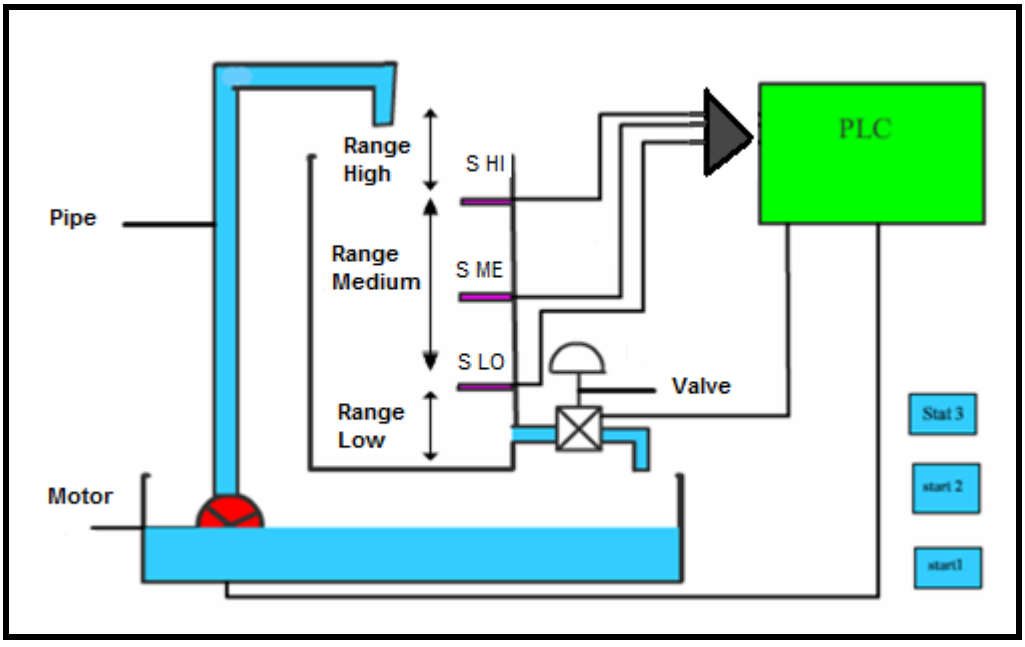

Figure 1.1 The Automatic Water Level Control

1.2 Objective

In order for the project to success and to be implemented, the following objectives have to be achieved:-

1) To design and develop an automatic water level control using PLC
2) To learn about the Macromedia Flash Software this can display the anime of the increasing or decreasing of the water in the tank.
3) To learn more about the characteristic of the sensor and others devices such as valve and motor

1.3 Scopes Of work

The scopes of works in this project are:

1) In this project the control system should be study to control the outflow of the water. The specification of the float sensor also must be study to use as a sensor.
2) In order to make this project successful, ladder diagram must be built using CX programmer.
3) After the theoretical, the development of PLC and the hardware will continue and be tested
4) Besides, the component such as valve and motor need to study.

1.4 Problem Statement

The traditional water tank had many disadvantages such as:

1) Traditional water level must draw the water manually to the tank when there is no water in the tank.
2) The problem of manual control is sometimes people forget to turn off or turn on the valve.
3) For the automatic water level control, if the manual float broken or damage, all the system can't function properly.
4) To avoid the overfilling of the open container in industrial

1.5 Methodology

There are a few methods that must be following to complete this project. The method is as below:

1) The project had started with study the literature of the project. It's including the operation of the project and the purpose of the project.
2) Then, it will continue to research about the calculation of the water flow including the water level, volume, velocity and the time its take to fill in the tanks and drain the tanks. The calculation should be including the area of the pipe and nozzle and the it should be affected by the gravity.
3) If the formula related enough, then can proceed to the animation. To create the animation, the Macromedia flash 8 had to study first. Then can create the water draws in the tank and the water decreasing when there are some disturbances. But if the formula does not enough, then the literature reviews need to be study again.
4) Then study about the Programmable logic controller and create the ladder diagrams. At the same time studies about the component such as valve and motor. Next, try to construct the hardware.

5) Test the functionality of the ladder diagrams and the hardware. Then integrate the hardware and the software. If it can't function, then try to construct the ladder diagram and the hardware again.

6) Then if the hardware and software is successfully done, then prepare for the final report and submit to the supervisor.

1.6 Thesis Outline

This thesis will be divided into 5 chapters to provide the understanding of the whole project.

Chapter 1 is introduction to the overview of this project and its objectives. It also explains the scopes of the project.

Chapter 2 describe about the literature review that has been studied to get information to complete the project. This study is focused especially on automatic level control.

Chapter3 covers up all the project methodology and a process this project implementation to achieve goal. Also hardware and software technical details are explained in this part.

Chapter 4 explains the results and discussions of the project and what had been done in the whole semester.

Chapter 5 certain conclusion of the project.

CHAPTER II

LITERATURE REVIEW

For complete this report, a few reference had been made. There are a few theses that had been referred as a literature review. The past year thesis that related with this title is the past year theses from the Faculty of Electric Engineering.

2.1 Background Study

The Automatic Water Level Control had a few most important actuators as the main of the process. The actuator will control the process of water level which is pump and valve. The pump draws water to the tank and the valve can enable or disable the outflow from the tank. When the water is higher from the actual level, the valve will automatically on and the water will decrease to the actual level. But when the valve is open, the water will decrease to the low level then the pump will keep running, until the valve is off. Then, the pump will automatically off when it reaches the manual level. This project uses the PLC as the controller to control the water in and water out. The CX-programmer software in PLC are used to draw the ladder diagram .The instruction such as jump, counter, timer, compare will be used in this system to function the water level control hardware. This project will also used the seven segment display to show the level of the water, so that the user will know the level of the water without check it.

Table 2.1 The Reference Thesis from the previous year.

Writer	Theses Title	Description
Mohd Firdaus Abd Ghani	Water Level Controller	Use the PLC to controls the water level tank. The user key in the value of the water they want such as low, medium or high and the pump will on. The user key in will appeared then the user will switch on the controller by pressing the touch screen. After the desired level is reached the pump will off.

2.2 Control Theory

Control theory is an interdisciplinary branch of engineering and mathematics, that deals with the behavior of dynamical systems. The desired output of a system is called the *reference*. When one or more output variables of a system need to follow a certain reference over time, a controller manipulates the inputs to a system to obtain the desired effect on the output of the system. [11]

In a closed-loop control system, a sensor monitors the output (the vehicle's speed) and feeds the data to a computer which continuously adjusts the control input (the throttle) as necessary to keep the control error to a minimum (to maintain the desired speed). Feedback on how the system is actually performing allows the controller (vehicle's on board computer) to dynamically compensate for disturbances to the system, such as changes in slope of the ground or wind speed. An ideal

Feedback control system cancels out all errors, effectively mitigating the effects of any forces that may or may not arise during operation and producing a response in the system that perfectly matches the user's wishes.

Interconnections of components forming system configurations which will provide a desired system response as time progresses. The steering of an automobile is a familiar example. The driver observes the position of the car relative to the desired location and makes corrections by turning the steering wheel. The car responds by changing direction and the driver attempts to decrease the error between the desired and actual course of travel. In this case, the controlled output is the automobile's direction of travel, and the control system includes the driver, the automobile, and the road surface.

The control engineer attempts to design a steering control mechanism which will provide a desired response for the automobile's direction control. Different steering

designs and automobile designs result in rapid responses, as in the case of sports cars, or relatively slow and comfortable responses, as in the case of large autos with power steering.

2.2.1 Open Loop and Closed Loop Control Systems

The basis for analysis of a control system is the foundation provided by linear system theory, which assumes a cause-effect relationship for the components of a system. A component or process to be controlled can be represented by a block. Each block possesses an input (cause) and output (effect). The input-output relation represents the cause-and-effect relationship of the process, which in turn represents a processing of the input signal to provide an output signal variable, often with power amplification. An open-loop control system utilizes a controller or control actuator in order to obtain the desired response in figure 2.1.