

AUTOMATIC TEMPERATURE CONTROL

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Dedicated to:

My beloved parents and friends for giving me unconditional love and care.....

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ABSTRAK

Projek ini adalah untuk membina sebuah system pengawalan pemanasan secara automatik. Tujuan projek ini dijalankan adalah untuk menghasilkan dan membangunkan satu sistem untuk mengawal pemanasan air dalam tanki dengan suhu yang ditetapkan. Di samping itu, projek ini dapat bertindakbalas dengan gangguan yang diterima dan mengawal gangguan-gangguan tersebut. Proses pemanasan air dan mengawal suhu dalam air dihasilkan dengan menggunakan '*Programmable Logic Controller (PLC)*'. Perisian ini berkomunikasi dengan perkakasan yang disambungkan kepadanya, contohnya sensor suhu, elemen pemanasan, pump air dan lain-lain. Sensor digunakan sebagai komponen utama untuk menerima dan menghantar isyarat kepada PLC untuk mengawal keseluruhan projek ini. Perisian FLASH digunakan untuk menunjukkan projek ini dalam animasi. Untuk merealisasikan projek ini suatu kenyataan, kajian yang mendalam dilakukan mengenai sensor-sensor, PLC dan perisian. Kajian yang asas dan utama yang digunakan dalam projek ini termasuk kajian latar belakang, pembangunan sistem, ujian lapangan dan penghasilan program.

ABSTRACT

This project is to build an automatic temperature controller system. The purpose of this project is to create and develop a system that automatically monitor and control the temperature of the water. Besides that, this project can maintain the temperature in the water even disturbances is given to the system. In this project 'Programmable Logic Controller (PLC)' was used as the main device to control and maintain the temperature of the water. PLC will be interfacing with the sensing and controlling device such as sensors, and heater element. Sensor was used to receive and send the signals to the PLC to control this system. ADOBE FLASH used as software to develop an animation of this project. In order to realize this project, extensive background studies have been done on sensors, PLC and Adobe Flash. The basic and important methodologies that have been used in this project are literature review, system development, field testing and build up software. This project can be implemented at the places that require maintained water temperature.

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LIST OF ABBREVIATIONS

CPU	-	Central Processing Unit
C	-	Specific heat capacity
COM	-	Common
I	-	Current
m	-	Mass
NTC	-	Negative Temperature Coefficient
NC	-	Normally Closed
NO	-	Normally Open
P	-	Power
PLC	-	Programmable Logic Controller
Q	-	Energy
RTD	-	Resistance Temperature Detector
T	-	Time
V	-	Voltage

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CHAPTER I

INTRODUCTION

Chapter 1 starts with the introduction and background of the project. It is followed by objectives, scope of the project and problem statements. Research methodologies and organization of the thesis are presented in the last of the part.

1.1 Introduction

Automatic temperature control system is a system that controls the temperature of materials, fluids, environment and other objects. Temperature control system used to control and maintain the desired temperature set point in the tank. Water temperature controller system is a process that heats the water and maintained in the range as set. Heating process can be conducted by using heater elements, boiler system or with other process. Heating process with heater elements is a standard process used at industrial side. Programmable Logic Controller (PLC) is a famous controller system used in

controlling process. PLC control the devices by receiving the input signals, then processing it's and generating the desired output signals.

This project is to develop a control system that will keep the water in certain temperature in a tank. Temperature of water will be set to a range of fixed value and will follow the setting point temperature. The main aim of this project is to provide a temperature in the range by controlling it through PLC.

1.2 Background of Project

This project is to develop a control system that will keep the water in certain temperature in a tank. Temperature of water will be set to a range of fixed value and will follow the setting point temp. Electrical heater is used to heat the water in the tank. Temperature sensors are used to detect the range of the temperature required for the water. Signal from the temperature sensors will be send to the PLC. Closed loop system will use PLC as PID controller.

PLC act as a main part in this project as it triggers and controls the whole circuit. The temperature heating and controlling process will be controlling by PLC. This system is design to keep the range of temperature fixed in the tank although disturbance is given to increase or decrease the temperature. Cold water is supplied to the tank when temperature increases from fixed value. PLC also controls the process of supplying cold water and level of the water in the tank. This project was done through by a number of studies in literature review, design, build and test. The animation of this system is developed by using software. This project is applicable in industries and agriculture side that require the usage of stabilized water temperature.

1.3 Objectives of Project

Following are the objectives set in this project:

- To design a circuit that controls the temperature in the tank within the range as set.
- To maintain the range of the temperature in the tank even disturbances are given.
- To develop the model of the control system based on the Programmable Logic Controller (PLC).
- To design animation for temperature controller system.

1.4 Problem Statement

Water temperature that not stabilized or uncontrolled brings lot of problem to the industries. Weather factor and other disturbance can easily change the actual temperature that is required. It will cause disturbance in the quality of the output product. In industries side, gas or oil boiler is used to provide heated water to the production. Designing gas or oil boiler system can bring a high cost and inconvenience to the industries.

When we discuss about temperature controlling system, there are many disadvantages in manual temperature controlling. Manual controlling system needs a manual system or process to activate and deactivate the heater system. Besides that, manual controlling system needs a person or systems to observe the water temperature for 24 hours.

1.5 Scopes of Work

The system is designed to detect and control the temperature in the tank within the set range. The temperature sensors will detect the temperature in the tank. Electrical heater used to heat the water in the tank. The range of the temperature can be changed manually as required. This project involves the research on the temperature controller with PLC. PLC will be the main part of the project as it controls the heating process and maintains the temperature and level in the tank. FLASH software also will be used to develop the animation for the temperature controller system.

1.6 Research Methodologies

The automatic temperature control system is built by using PLC. PLC is used to control the entire system in this project. PLC receives the signals from temperature and level sensors, and then sends the output signals to maintain the desired output. Thus, this system enables the temperature of the water to be controlled and maintained. The procedures and methods used to achieve the project objectives are;

- 1) Literature review and background of study
 - Temperature Sensor
 - Programmable Logic Controller (PLC)
 - Heater Element
 - FLASH Software
- 2) Study and develop animation of the project by using software.
 - FLASH Software was used to develop the animation

- 3) Build temperature sensor circuit in order to send the temperature signals to the PLC.
 - Temperature sensor circuit build
- 4) Study and utilize the PLC to control entire project
 - Studying PLC controller system.
 - Studying and develop PLC program.
- 5) Synchronize the hardware components with PLC system
- 6) Field Testing
- 7) Thesis Writing
- 8) Come out with complete final project and report

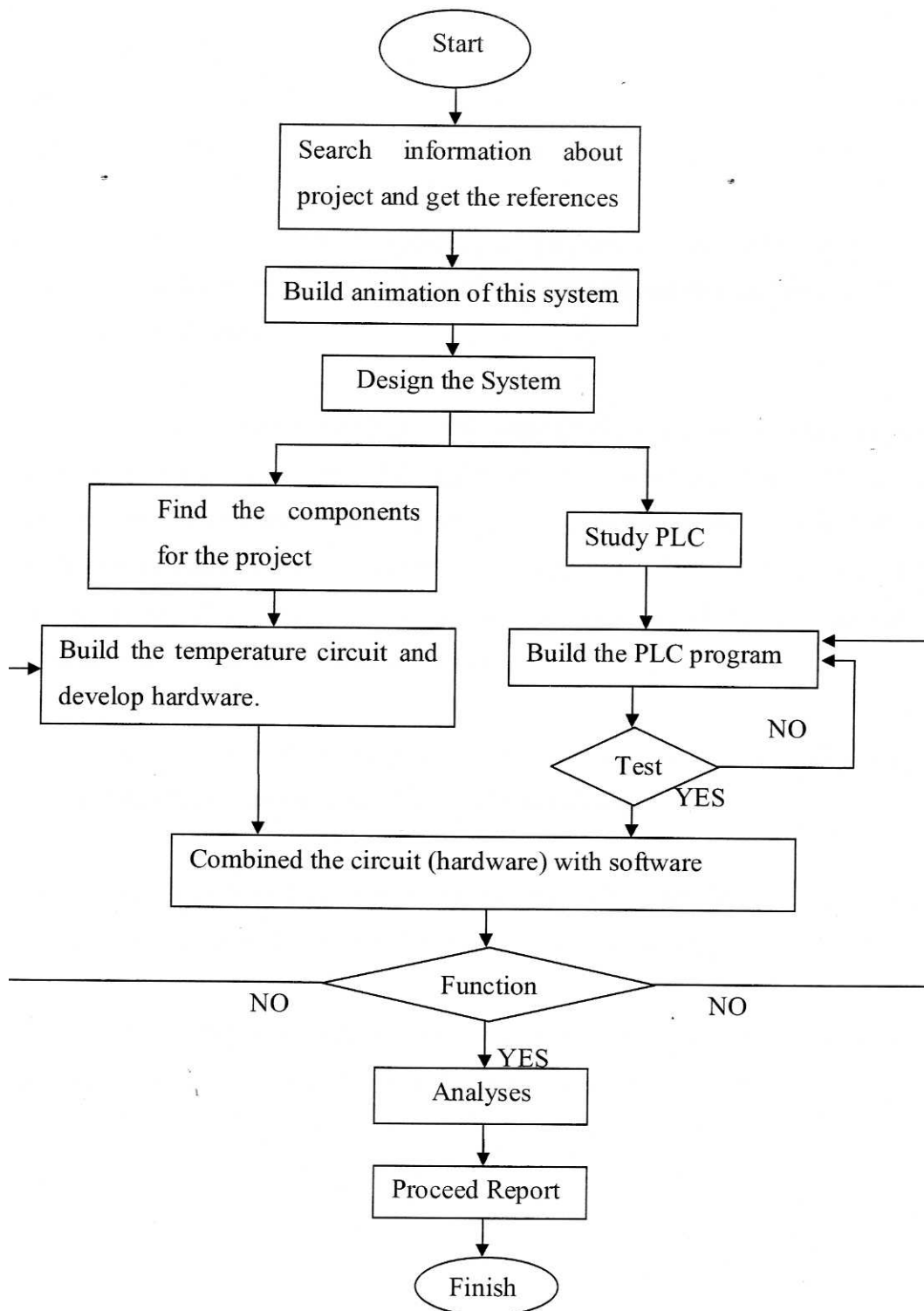


Figure 1.1 Flow Chart of Methodology

1.7 Organization of Thesis

Each chapter begins with identifiable objectives and brief overview. This report is divided into several chapters which are Introduction, Background and Literature Review, Calculation, Project Methodology, Result and Analysis and Conclusion.

Chapter 1 is the brief introduction of the project. It consists of objectives, scope of works, problem statements and research methodologies that clearly describe what is the project is all about.

Chapter 2 and Chapter 3 contains about theory and concept of the entire project. Literature review based on technologies and information has been done in order to create a specific research about this project. Several researches have been highlighted such as temperature sensors, Programmable Logic Controller and the used of FLASH as an animation of the project. Besides that, the basic calculation for the temperature measurement is also included in third chapter.

Chapter 4 explained the methodology used in this project. In this chapter, the methods and the project flow has been explained clearly.

In chapter 5, it describes the results and analysis obtained on this project. This chapter has indicated the development and analysis on the project

Finally chapter 6 contains the discussion, and conclusion of the thesis. Some suggestions have been given to make this project much better in future