DESIGN OF WATER LEVEL CONTROL TRAINING KIT

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Manufacturing Engineering (Robotic and automation)

by

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DECLARATION

I hereby declare that this report entitled **"**Design of Water Level Control Training Kit**"** is the result of my own research except as cited in the references.

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APPROVAL

This report is submitted to the Faculty of Manufacturing Engineering of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Manufacturing Engineering (Robotic and Automation). The members of the supervisory committee are as follow:

……

(Madam Nur Aidawaty Binti Rafan)

Main Supervisor

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ABSTRAK

Projek ini adalah mengenai penggunaan alat latihan kawalan paras air dengan menggunakan sesuatu pengaturcaraan. Ia adalah untuk menyediakan satu simulasi data bagi mendapatkan paras air. Penghasilan projek ini adalah untuk kegunaan pelajar bagi memudahkan untuk melakukan ekperimen yang berkaitan dengan mengukur paras air. Projek ini telah menggunakan gabungan antara komponen perkakasan dan perisian untuk menghasilkan satu paparan sistem data paras air yang di kesan melalui pegesan air. Umumnya, projek ini telah menggunakan pengesan air untuk mengesan paras air pada alat bantuan kawalan paras air yang telah dihasilkan. Bacaan paras air yang dikesan melalui pengesan air akan menghantar bacaan terus ke komputer melalui alat penghantar sesiri. Data bacaan paras air akan dipaparkan di skrin *LCD* dan komputer. Alat penghantar sesiri digunakan sebagai data penghubung antara pengesan air dan komputer. Visual Basic digunakan untuk memaparkan bacan suhu pada layar komputer dan mengawal operasi pum air mengikut aplikasi yang dikehendaki.

ABSTRACT

This project describes the development of water level control training kit using a programming. It provides a stimulation to get water level data. This project is suitable for the student's usage to make easier when doing the experiment that related water level. In this project combination between hardware component and software development is used to create a system of water level by using the water sensor. Generally, this project had been use the water sensor that functional to sense the level of water on the water level control. The data from the reading of water sensor is transmitted to the PC through the serial port communication. The data of water level will display at LCD screen and also in the user interface. The serial port communication is used as a connected between the data from water sensor to computer. Visual basic will serves as to display the level of water when the system is runs and also used as a controlling to the water pump functional by following the applications.

DEDICATION

I dedicate this PSM thesis to my beloved parents, my lovely brothers, friends and colleagues, not forgot UTeM's lecturers.

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Alhamdullilah, with the Bless from Allah the All Mighty, finally I have completed the final year project and thesis writing on time. Firstly I would like to express my appreciation to my supervisor Puan Nur Aidawaty Rafan for her guidance, advice and continuous encouragement in process of completing my project successfully. Besides that, a lot of cooperation to all staff and officer at fluid laboratory that help me give idea and guidance to finish this project. I also want to give this appreciation to Mr. Jiji that teach me a new knowledge and skill regarding develop the programming using Microsoft Visual Basic 6.0 to produce the interface simulation that I needed. I would also want to express my thankfulness to my beloved parents for never ending support, advice and encouragement since childhood until now. May your love and support will never be gone until the end of my life. For UTeM's lecturers who have taught me, thank you for giving me precious and valuable knowledge. For my friends and my classmates, thanks for your cooperation, support and help throughout these 3 years in UTeM. Thank you so much.

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LIST OF ABBREVIATIONS

VB	-	Visual Basic
PC	-	Personal Computer
LCD	-	Liquid Crystal Display

CHAPTER 1
INTRODUCTION

1.1 Introduction

Nowadays, the need to control system is a basic, integral requirement for most industrial process today. Process control allows manufacturers to obtain the higher level of quality control and to conform to stricter safety of workers and consumers. Manufacturers need to control the manufacturing environment in order to produce uniform product. Many chemical reactions are dependent on very specific reaction condition. For safety reasons, manufactured often needs to control physical variable of processes. These are all reason why control systems have become so widespread in the modern industry world.

Water level is one several variable that are commonly monitored and operated in the modern industry environment. Many industrial processes utilize tanks filled with the various liquids such as milk tanks in dairies, coolant water in a nuclear reactor.

1.2 Problem Statement

For this project, visual basic will be used at the water level control training kit. Visual basic is a one software very easily and simple to conduct. Visual basic can to reduce the hardware to running the water level training kit. The significant of this project is to develop and provide user friendly water level control training kit based on analyzed that will be done. The purpose of this is to design water level control training kit. In the end of the project, the performance for water level training kit will be done with experiment, discussion and result that produced in project.

1.3 Objective

1. To design and develop controller for water level control training kit.
2. To analyze performed water level control training kit.
3. To provide user friendly training kit.

1.4 Scope Of Project

This project will focus primarily on the design controller of water level control training kit, which focuses on development of water level control training kit by using visual basic 6. This performed project will be analyzed by suitable experiments.

1.5 Project Planning

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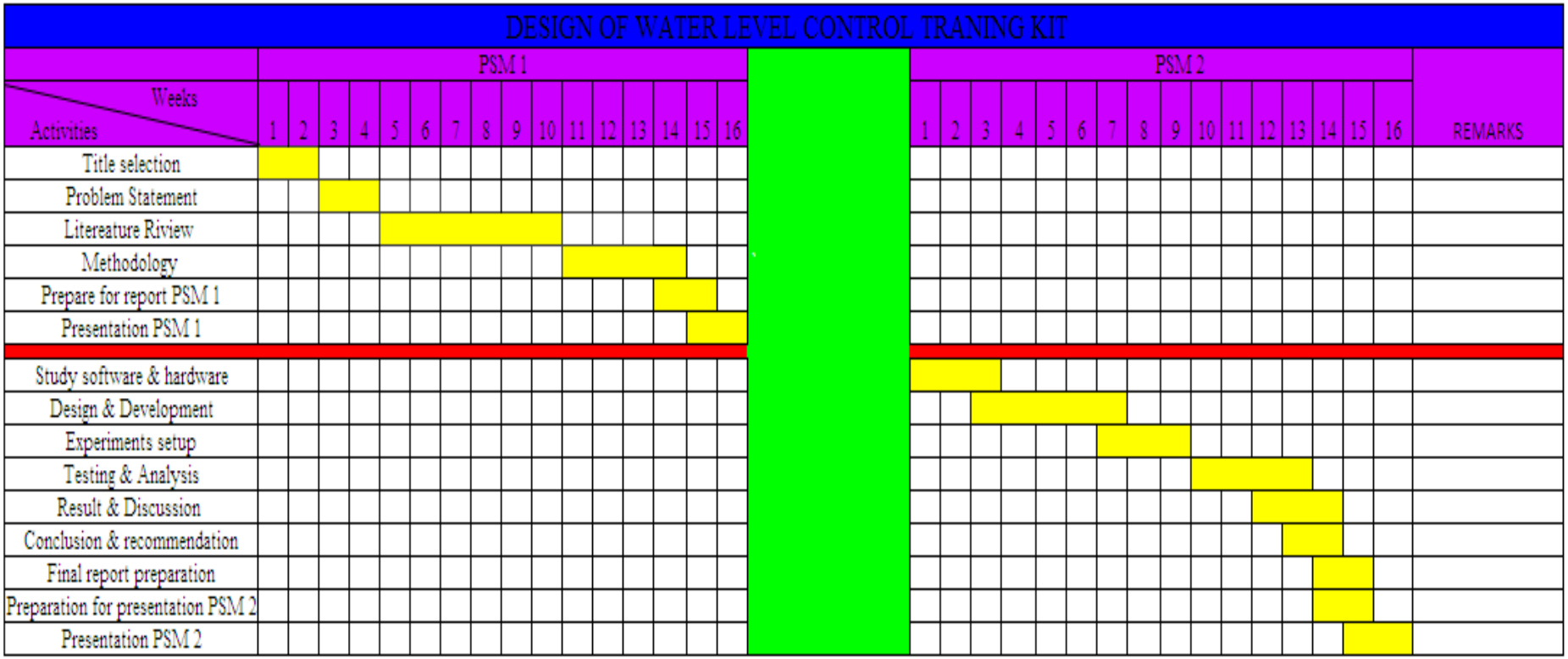

Figure 1.1: Gantt chart PSM 1

CHAPTER 2
LITERATURE REVIEW

2.1 Introduction

In this chapter, research and studies about this project will be implementation. Firstly, the basic explanation about water level is described. List of the equipment used in is described in the general way. Apart from that, the equipment that will be used is a flow sensor. Flow sensor is used for the project to detect the flow water at water level control training kit.

These chapters also include the control and the programming involved in the project. Program language such Visual Basic either one of type discovered at the chapter. In the end this chapter, design for water level training kit will be done with guide from the information.

2.2 Water Level Control

Water level control is a basic application of process control and is commonly used in river or dam to measure the level of water. Other than that, water level control is use in several industries like iron and steel, chemicals and other industry that work with liquid. It is also has been use as one of the learning activity in do any experiment that involve with water. Today, water level control can be proceeding using many type of programming software. The functional of each water level is same but the differences between it just a type of programming software either difficult to handle and understand

or more friendly user and easy to control. The equipment that used in this project such as:

2.2.1 Water Level Measurement

Water level measurement is used to measure level of water. Many type water level measurements can used to develop this project, such as:

2.2.1.1 Flow Sensor

A flow sensor is a device that responds to fluid flow by providing an output indicative of the fluid flow rate. Flow sensors are utilized in a variety of fluid-sensing applications for detecting the quality of fluids, including gas and liquid. Normally a flow sensor is the sensing element used in a flow meter, or a flow data logging device. The flow sensor can normally measure velocity or flow rate. Flow sensors are sometimes related to sensors called velocity meters for measure speed of fluids that flowing. A flow sensor can work by direct measurement or inferential measurement. The flow sensor technology can be based on such things as light, heat, electromagnetic properties, ultrasonic and many other technologies in a wide spectrum.

2.2.1.2 Flow Switch

A flow Switch is used to sense the flow of a fluid passing through its valve body and to send an electrical control signal to control the switching unit. In many applications, it is essential to be able to determine whether fluid is flowing in a pipeline or other duct. For example, flow responsive devices for producing a control signal which is used to de-energize a pump when the flow rate falls below a preselected minimum are commonly employed in systems for transferring fluid between reservoirs.

Fluid Flow switch sensing devices have been developed for monitoring fluid flow in pipelines or other ducts. A flow switch produces an electrical signal which is suitable with a preselected rate of flow of a fluid in a pipe. Various flow switches have been developed to be responsive to the flow rate of a fluid within a flow line. Usually the flow switch is connected into the flow line so that the flow path of the fluid passes through the flow switch. (www.omega.com)

Figure 2.1: flow switch

2.2.1.3 Flow Meter

Measuring flow rate is an important requirement in many experimental and industrial applications. Flow meters are used for a variety of applications where it is desired to measure the flow rate or volume of a given fluid or gaseous material. The flow meter is an instrument used to measured linear, nonlinear, mass or volumetric flow rate of water. Determine the required meter range by identifying minimum and maximum flows that will be measured. After that, the required flow measurement accuracy is determined. Typically accuracy is specified in percentage of actual reading (AR), in percentage of calibrated span (CS), or in percentage of full scale (FS) units.

The accuracy requirements should be separately stated at minimum, normal, and maximum flow rate. When a flow meter's accuracy is stated in % CS or % FS units, its absolute error will rise as the measured flow rate drops. If meter error is stated in % AR, the error in absolute terms stays the same at high or low flows. Because full scale (FS) is

always a larger quantity than the calibrated span (CS), a sensor with a % FS performance will always have a larger error than one with the same % CS specification.

Flow meter is suitable to get a performance from both a full flow meter and a point sensor. Because point sensors do not look at the full flow, they read accurately only if they are inserting to a depth where the flow velocity is the average of the velocity profile across the pipe. Even if this point is carefully determined at the time of calibration, it is not likely to remain unmoved, since velocity profiles change with flow rate, viscosity, temperature, and other factors. (www.omega.com)

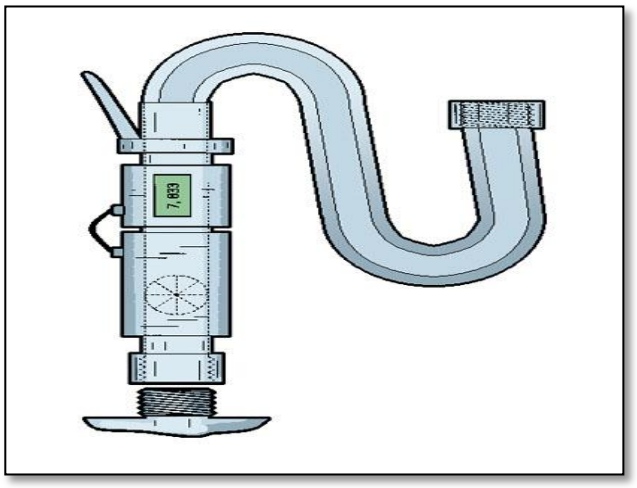

Figure 2.2: flow meter

2.2.1.4 Ultrasonic flow

Based on J. C. Drury (2004), ultrasonic flow measures the velocity of any liquid or gas through a pipe using ultrasonic transducers. The results get slightly affected by temperature, density or viscosity of the flowing medium. Maintenance is inexpensive because there are no moving parts. Some may be able to measure liquid level as well. With the level measurement and pipe size, flow rate and total discharge can be calculated.

Ultrasonic flow uses to transfer time principle, where opposite sending and receiving transducers are used to transmit signal through the flow. The signal travel would be moving smoothly when according to correct flow. The difference time between the sending and receiving used to calculate the flow rate.

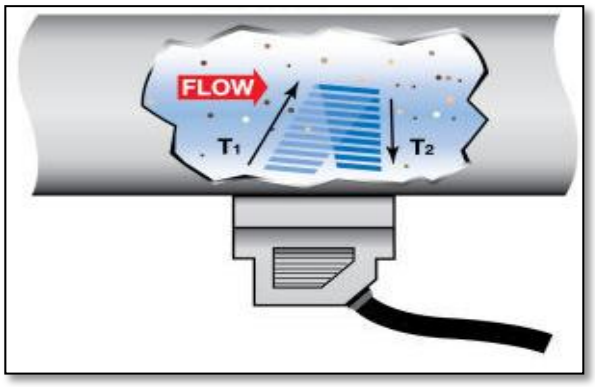

Figure 2.3: ultrasonic flow

2.2.2 Valve

Based on Deborah Anderson (2002), valves used to control the flow of water in a system, can be mechanical, hydraulic and electric. In order for a valve to work, there has to be a drop in pressure between the water source and the outlet, such as a sprinkler. The pressure drop enables the valve to close itself and an increase in pressure allows the valve to open. A problem can come up if there is a low flow of water, which does not create enough drops in pressure, so the drop in pressure has to be increased. This is accomplished by leaving the valve in question partially closed. Valves are used in a variety of contexts, including industrial, military, commercial, residential, and transport. The industries in which the majority of valves are used are oil and gas, power generation, mining, water reticulation, sewerage and chemical manufacturing.

Valves manually, operate by a hand wheel, lever or pedal. Automatic valves, control by factor pressure, temperature, or flow change. These changes may act upon a diaphragm