DEVELOPMENT OF AUTOMATIC WATER LEVEL CONTROL AND IT'S MONITORING SYSTEM

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A report submitted in partial fulfillment of the requirements for the Bachelor of Electrical Engineering (Control, Instrumentation and Automation)

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"I hereby declared that I have read through this report entitled "Automatic Water Level Control and Its Monitoring System" and found that it has comply the partial fulfillment for awarding the degree of Bachelor of Electrical Engineering (Control, Instrumentation, and Automation)"

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Date : 22 APRIL 2009

I hereby declared that this report entitle “Automatic Water Level Control and Its Monitoring System” is the result of my own research except for the excerpts that have been cited clearly in the references. The report has not been accepted for any degree and it is not concurrently submitted in candidature of any other degree.

Signature : ……

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Date : 22 APRIL 2009

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ABSTRACT

Nowadays robotic and automation system has been introduced to facilitate humankind from doing everyday chores to the high scale manufacturing. A control and automation system is very important for country to generate economy throughput optimization and better product. Therefore, it needs the modern and exceptional automation system. Based on that requirement, an *"Automation Water Level Control and Its Monitoring System"* have been developed. The water levels in tank automatically control by the pump. It also can monitor the system on the personal computer PC with the interfacing system. Visual Basic software is used as software tool to produce a graphic user interface (GUI). An electronic sensor circuit was detecting the water level and give signal to the Programmable Logic Controller PLC. The PLC control the pumping system to allow the amount of water that will be flow into the tank. The whole processed will be connected by parallel port to the personal computer and monitor the water level using Visual Basic 6 software programming.

ABSTRAK

Hampir kesemua pekerjaan dalam kehidupan manusia seharian masakini telah di permudahkan oleh penggunaan robot dan sistem automasi. Ia meliputi kerja harian biasa sehinggalah kepada penghasilan produk yang banyak dan berkualiti. Memandangkan sektor kawalan dan automasi adalah amat penting untuk menjana ekonomi negara melalui produk yang lebih optimum dan berkualiti tinggi, maka satu sistem kawalan yang moden dan cekap adalah perlu. Berdasarkan keperluan ini, projek " *Sistem Automasi Kawalan Paras Air serta Pengawasan* " dibangunkan. Projek ini mengawal takat air di dalam tangki simpanan secara automatik menggunakan pam. Ia juga dipantau oleh sistem kawalan melalui paparan pada komputer. Perisian Visual Basic digunakan bagi membina pengantaramuka grafik pengguna. Pengesan jarak mengesan takat air dan menghantar isyarat yang diterima kepada Pengawal Logik Aturcara (*Programmable Logic Controller-PLC*). PLC mengawal sistem pengepam air bagi membolehkan sejumlah air masuk ke dalam tangki simpanan. Isyarat yang dikawal dari PLC akan dihantar ke komputer melalui pengkalan selari dan dipaparkan menggunakan perisian Visual Basic 6.0.

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PLC	-	Programmable Logic Controller
VB	-	Visual Basic
PC	-	Personal Computer
RAM	-	Random Access Memory
I/O	-	Input/Output
AC	-	Alternate Current
DC	-	Direct Current
IC	-	Integrated Circuit
LED	-	Light Emitting Diode
GUI	-	Graphical User Interface
USB	-	Universal Circuit Bus

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CHAPTER 1

INTRODUCTION

1.1 Overview

Control engineering is among the most theoretical and difficult to understand. The utilizing of control and automation systems is very important in optimization production, quality and productivity furthermore reduces cost. In industries, application of water level control system is widely use especially in chemical industries. This project is about design and develops of an automatic water level control system and its monitoring system. In this project, the system uses an electronic sensor circuit to detect the water level in a tank. It will be use a Programmable Logic Controller (PLC) to control the pump for automatic incoming and outgoing of water. The monitoring system using Visual Basic software programming will be interface by parallel port between hardware and Personal Computer (PC).

1.2 Objective of Project

The main objectives for this project are to develop the automatic water level control and its monitoring system where the water level automatically detects by the electronic sensor circuit. There are also to program the automatic control pumping system using the Programmable Logic Controller (PLC). Beside that, a Personal Computer (PC) monitoring system will be developed using Visual Basic software to monitor the water level.

1.3 Scope of Project

The scope of this project is to develop user friendly integrated system for water level control purpose. The automatic water level control and its monitoring system will help to overview the overall process of water level control. It has a sensor that will be detect the water level, and it will generate a signal to control by the PLC. The PLC will be control the motor pump to allow the amount of water that will be flow into the tank. When the water is reaches at a high level the sensor will be sent a signal to PLC to stop the pump. The overall system will be monitor from the personal computer PC using Visual Basic software programming. Then the interfacing system using the parallel port will display the water level on the tank.

1.4 Problem Statement

Various types of water level system that use in industries nowadays, but to keep the quality of the product, there are an automatic pumping system which is needs to control the automation of water level. Otherwise, water level detector also requirements in control the level of water in a tank such as float switch, ultrasonic and radar sensor. The water level detector needs to be successfully incorporated in all appliances where water levels are critical, such as chillers, boilers, and radiators. For those industries that must constantly monitor solvents and mixtures for their levels, the high quality of water level detector such as ultrasonic and radar sensor can replace monitoring personnel. In addition the system also has a Personal Computer, PC to monitor level of the water. The PC monitoring system will control the incoming and outgoing water and also help user to monitor the water level system.

CHAPTER 2

LITERATURE REVIEW AND PROJECT BACKGROUND

2.1 Overview

This chapter will be stressed on the literature review and project background of water level control system. The main purpose of this chapter is to analyze, identify and make conclusion based on the research. A literature review means a collecting related data, analyzed business process, identify underlying patterns and create the conclusion (Strauss & Corbin 1990). Another description of the project background is a systematic, explicit and reproducible method to identifying, evaluating and synthesizing the existing body of completed and recorded work produced by researcher, scholars and practitioners (Fink, 2005).

In order to develop a successful project, the current systems are identified. The system of conventional water level control system and its connection have been analyzed. Studies of these systems are significant to develop a valid, reliable and efficient upgrade project. The literature review and project background part acts as a mean to discover which methodology should be chosen in developing this system.

2.2 Literature Review

2.2.1 Water Level Control System

The Level Master of water level control system had been designed by Milwaukee, WI in January 2006 for fire tube boiler and water tube boiler which is constructed with enhanced safety diagnostic capabilities.

Figure 2.1: LEVEL MASTER Water Level Control System

The Level Master water level control system as shown in figure 2.1 was designed to be a low water cutoff controller with enhanced safety features. The Level Master's capabilities ensure the boiler's water level remains at safe operating level. While monitoring the boiler's water level, the self-checking features verify the control is operating as designed. The system can also verify the operation of the auxiliary low water cutoff control. The Cleaver-Brooks Level Master was built with security as a major objective. The operating parameters are password protect-ed to eliminate the chances of tampering with preset levels. The Level Master offers easy accessibility to its time stamped alarm and blow down history. As a final touch to promote peace of mind, the Level Master includes multiple alarms and a visual water level indicator. [4]

Figure 2.2: Monitoring System of Water Level

The water column chambers have been engineered to easily replace limited, single purpose controls with state-of-the-art electronic level sensing and monitoring. Figure 2.2 shows the monitoring system which is display the percentages for output value of water level and display user configurable for on-off or modulating water level control. The design also makes the system adaptable to both new and existing boilers. The specially engineered design of the Level Master was built to accommodate your boiler room specifications. Depending on your boiler application, the control's sensitivity may be selected in the field.

Figure 2.3: Type of Sensor

In figure 2.3, this type of sensor employs the magnetostrictive principle, a non-contact, non-wearing, long-life technology. Designed specifically for boiler applications, it will withstand working temperatures to 400°F at 250 PSIG. It includes a 2” diameter titanium float with a captive magnet. The sensor electronics enclosure meets NEMA 4 standards with a working environment of 130°F.

2.2.2 Liquid Level Monitoring and Automatic Control Systems.

Active Control Systems have become very popular with consultants, designing Water Supply and Disposal Schemes in Industry. The main reason is that unlike normal conductivity types, these are unaffected by water corrosion. This has helped reduce the constant manual checking, and bring about extremely high Functional Reliability. Most of the clients are from professional maintenance/ project engineers and consultants. For the example, Oberoi Group of Hotels is consistently using the systems, both in Projects and Maintenance. So is the case with Le Meridien, Delhi, Mother Dairy, CDIL etc. This company is specializing in Liquid Level Monitoring and Automatic Control Systems which are based on Magnetic Level sensing.

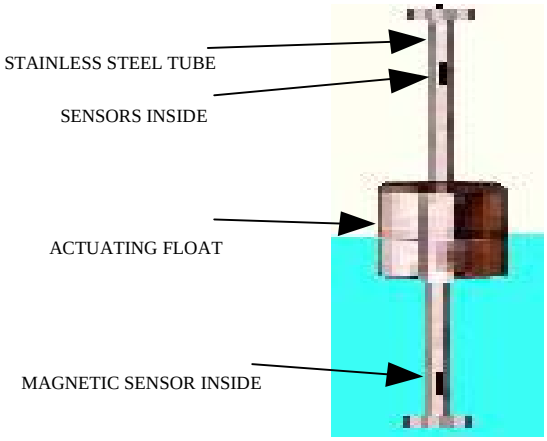

Figure 2.4: Water Level Sensor

The level sensing is done by means of a probe unit as shown in figure 2.4. It is made of stainless Steel. A number of sensors suitably spaced, depending of functional requirements are enclosed inside the Probe Unit. An Actuating Float, made from Stainless Steel or PP is used to actuate these sensors.

This Float has a Ring Magnet of specific polarity for correct operation of the Control System. The control unit will receives signal from sensors as liquid reaches their level. This signal then operates the Controller or Indicator System. The Control Systems are designed as 'stand alone' units and are specific to the capacity and system of operation of Pumps.

Otherwise, type of Pumps or Valves which is can be used is any type or capacity for the example single phase mono-block pumps, jet pumps, single or three phase submersible pumps, or other heavy capacity pumps or pumps related to chemical or process or dozing etc.

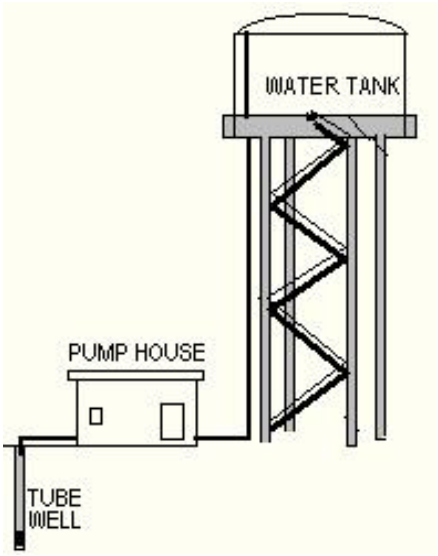

Figure 2.5: Typical Water Supply System

Figure 2.5 shows the typical of water supply system. This is a standard arrangement where water is drawn from a tube well (submersible pump) and pumped directly to the overhead tank. A variation to this is a sump tank where water is received from a tube well or municipal water supply and then pumped to the overhead tank. The automation system for this