AUTOMATIC REFILLING MACHINE

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This Report Is Submitted In Partial Fulfillment of Requirements for the Degree of Bachelor in Electrical Engineering (Power Electronic and Drive)

Faculty of Electrical Engineering
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APRIL 2009

"I hereby declared that this report is a result of my own work except for the excerpts that have been cited clearly in the references."

Signature: ……

Name: ……

Date: ……

DEDICATION

Specially dedicated to my beloved family especially my mother (Fatimah binti Hamat) and my late father (Allahyarham Salleh Bin Hussien); whose very concern, understanding, supporting and patient. Thanks for everything.
To All My Friends, thanks for everything. This work and success will never be achieved without all of you.

ACKNOWLEDGEMENTS

Alhamdulillah, the highest thanks to God because with His Willingness, I possible to complete the final year project in time.

I would like to express my gratitude to my dedicated supervisor, En Ahmad Idil Bin Abdul Rahman for guiding this project with clarity and that priceless gift of getting things done by sharing his value able ideas as well as his knowledge.

I also like to thank to all UTEM lecturers and who had helped directly or indirectly in what so ever manner thus making this project a reality. Not forgotten are my best colleagues for their openhandedly and kindly guided, assisted, supported and encouraged me to make this project successful.

My heart felt thanks to my dearest family which always support and pray on me throughout this project. Their blessing gave me the high-spirit and strength to face any problem occurred and to overcome them rightly.

Nevertheless, my great appreciation dedicated to my best friends Mohd Raimi, Abdul Majid, Nur Azam, Ehsan, Khairul Adlan, Mohd Fahmi and SEI member's batch 2008 and those whom involve directly or indirectly with this project. There is no such meaningful word than…..Thank You So Much.

ABSTRACT

Automatic refilling machine (ARM) wills a new innovation manufacturing industry especially sector filling. Automatic refilling machine is commercial refilling system that involves Programmable Logic Controller (PLC) and microcontroller. The system operates automatically in three stations, which are refilling, checking, and feedback. Filling system operated by automatic follow bottle height respectively. While system detector operated to detect deep table of contents stated bottle. In case happened error to table of contents stated bottle, bottle would be sent to system replenishment through the system feedback. For bottle also experience as many times surveillance process to three will be removed to place isolation. PLC operates to control DC motor as conveyer and pneumatic valve through signal forwarded by IR sensor. Microcontroller will obtain signal from IR sensor and data will be displayed on Liquid Crystal Display (LCD) .The LCD and Light Emitting Diode (LED) will be used to display amount of product produce, throw and system security

ABSTRAK

Automatic Refilling Machine (ARM) merupakan satu inovasi baru dalam sektor perbuatan terutamanya dalam sektor pengisian. Automatic refilling machine merupakan sistem pengisian komersil yang melibatkan "Programmable Logic Controller (PLC)" dan "microcontroller". Sistem ini beroperasi secara automatik yang melibatkan tiga stesen iaitu pengisian, pengesanan dan suap balik (feedback). Stesen pengisian beroperasi secara automatik mengikut ketinggian sesuatu botol. Manakala pengesan digunakan untuk mengesan isi kandungan cecair dalam botol. Sekiranya berlaku kesilapan pada isi kandungan botol tersebut, botol akan dihantar ke stesen pengisian semula untuk melakukan pengisian melalui stesen suap balik (feedback). Untuk pengisian yang mengalami kesilapan sebanyak 3 kali, botol tersebut akan dihantar ke stesen pengasingan. PLC beroperasi untuk mengawal DC motor sebagai penggerak dan juga "pneumatic valve" melalui isyarat yang hantarkan oleh "IR sensor"."Microcontroller" menerima isyarat dari "IR sensor" dan segala data dipaparkan kepada Liquid Crystal Display (LCD). LCD dan "Light Emitting Diode (LED)" digunakan untuk memapar keseluruhan operasi, produk dan sistem keselamatan.

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ARM	- Automatic Refilling Machine
PLC	- Programmable Logic Controller
LCD	- Liquid Crystal Display
LED	- Light Emitting Diode
DC	- Direct Current
RAM	- Random Access Memory
ROM	- Read-Only Memory
PROM	- Programmable Read-Only Memory
EPROM	- Erasable Programmable Read-Only Memory
I/O	- Input/Output
IC	- Integrated Circuit
Vb	- Visual Basic

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CHAPTER I

INTRODUCTION

1.1 Background of Project

Filling system is among the system in manufacturing sector for in Malaysia. The system can faster for the produce product in factory. In the industries, the filling used because the system to operated with automatic. All the operation in factory will be control through this system. But this system still need human for to look this operation system. This system must be to need human for to control system because the machine non-perfect.

Automatic refilling machine (ARM) wills a new innovation manufacturing industry especially sector filling. This system is commercial refilling system that involves Programmable Logic Controller (PLC) and microcontroller. The system operates automatically in three stations, which are refilling, checking, and feedback. PLC and microcontroller to using for control all process in this system.

The Liquid Crystal Display (LCD) and Light Emitting Diode (LED) will be used to display amount of product produce, throw and system security.

1.2 Problem Statement

In small industries, their refilling system usually operates in manual even though for other industries, they used automatic refilling system. By using manual processing method, it need take along time to produce a product. Caused use manually limited to singles only time.

In refilling sector, the process must done fast to ensure the efficient of the machine. It is a fact that when using refilling process manually needs many workers. This is because every section needs workers to make sure all the product that developed is working smoothly and to prevent any problems that may occur during the refilling process.

As a solution Automatic Refilling Machine will be made. It will solve the problems that small industries face today. With this system that operates automatically, every process can be smooth and the process of refilling can reduce workers cost and operation time. The system operates by the program that designed to do the operation

1.3 Objective of Project

There are four objective of this project:

- To design a system that operates automatically using PLC.
- To use a Microcontroller PIC16F877A to display the information about the process of refilling machine.
- To integrate the PLC and PIC system to operated the complete Automatic Refilling Machine.
- Make one system can do filling by quick, accurate and effective in Automatic Refilling Machine.

1.4 Scope Of Project

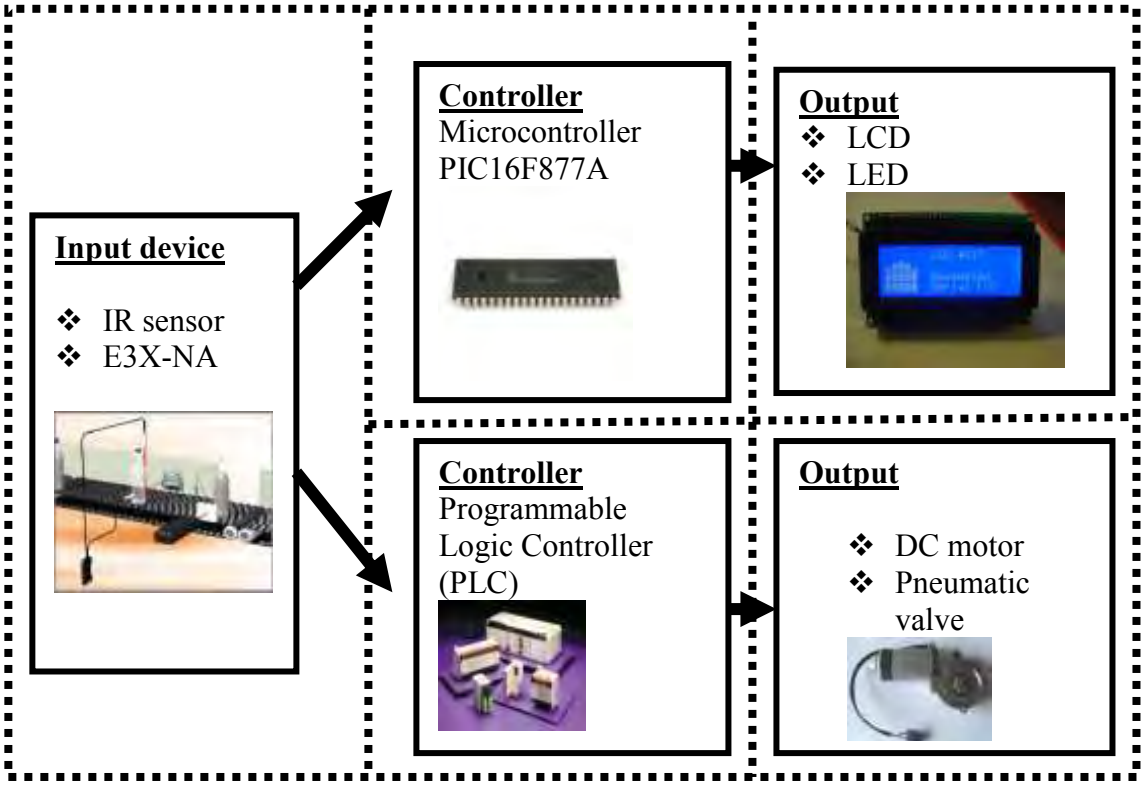

Figure 1.1: Scope of project

In system this, there were 3 part to control all Automatic Refilling Machine's whole operation. Among this parts are input device, controller and output device. This part important to system because can be control all operation with perfect. For this input device part, IR sensor and E3X-NA used to give signal for controller to operate this system. PIC16F877A and PLC used as controller for this system when accepted signal from input device. Microcontroller PIC16F877A used to control output through signal forwarded by sensor. The signal stated will be translated in language micro C to be sent to Liquid Crystal Display (LCD) for the all display process. For the PLC, signal from sensor will be translated in language from cx-programmer and sent to DC motor and pneumatic valve.

1.5 Outline Of Thesis

In this project, I would like to design the machine filling. In this report, I will discuss it in detail in five sections. There are introduction, literature review, methodology, results and discussions, and conclusion

In chapter one (introduction), I discussed about the major characteristics to be Automatic Refilling Machine. The problem statement, project objectives, scope and thesis outline are also included in this chapter.

In chapter two (literature review), the comparison is made by discussing the operation for automatic system and application of filling system. Later, each part of the Automatic Refilling Machine is discussed in detail.

In chapter three (methodology), I discussed about the techniques and consideration that I applied during I carried out my PSM1 and PSM2. Infrared sensor is an important part for the Automatic Refilling Machine to operate with successfully. In simulation part, Proteus software is used to simulate the design circuit before I proceed to the hardware part.

In chapter four (results and discussions), the results are obtained using the methodology discussed in previous chapter. Then, Proteus 7.2 SP6 simulation is done to the design circuit to ensure it functions probably. This is determined by looking at the data obtained during simulation. Finally, I proceed to the hardware part. Here all the obtained results are gathered. Finally, analysis is done according to the results.

In chapter five (conclusion), a brief summary and recommendation of this project are provided. Besides that, I also include my personal experiences during the Automatic Refilling Machine. Finally, I have finished all the parts in my project planning according to the objectives and scopes.

CHAPTER II

LITERATURE REVIEW & THEORY

2.1 Introduction

This chapter includes the study of different types of a reliable automatic liquid nitrogen filling system, real-time implementation of a fuzzy logic controller for switch-mode power-stage dc–dc converters and pneumatic valve. It also brief discuss about microcontroller, DC motor, proximity sensor and filling system.

2.2 Literature review

2.2.1 A Reliable Automatic Liquid Nitrogen Filling System

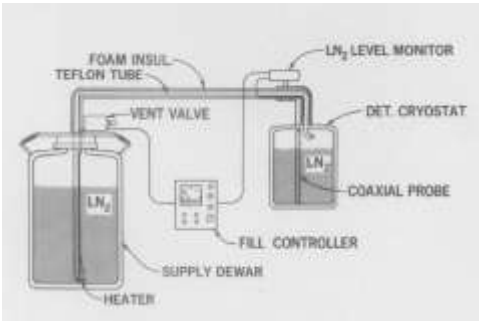

Figure 2.1: Drawing of automatic liquid nitrogen filling system

Figure 2.1 show the drawing of the automatic liquid nitrogen filling system. The system operational by automatic which all operation it control by detector cryostat. The level monitor supplies a continuous reading of the liquid nitrogen level in the detector cryostat to the fill controller. When the liquid nitrogen in the detector cryostat drops below a preset level as determined normally by the monitoring

computer, the fill controller activates the fill cycle. This closes the normally open vent valve on the supply Dewar and turns on the internal heater. The pressure build-up forces the liquid nitrogen through the foam insulated Teflon tube to the detector cryostat. When the liquid nitrogen in the detector cryostat reaches the preset stop fill level, the controller turns off the heater and opens the vent valve [1]. Figure 2.2 show the view of cross section of cap for supply Dewar.

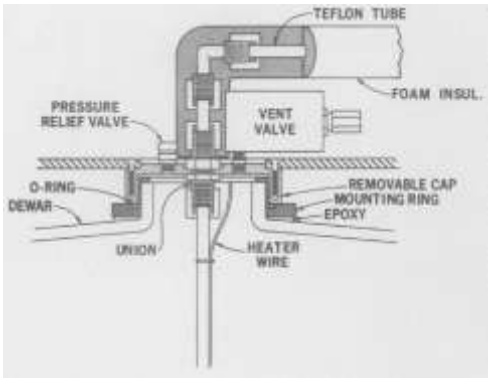

Figure 2.2: View of cross section of cap for supply Dewar

The advantages of this system are:

a) The liquid nitrogen level monitor provides a continuous output of the level
b) The probe does not require heating as resistor or thermister types do. This conserves liquid nitrogen in the cryostat.
c) The fill and stop levels are set electrically in the controller and do not require mechanical.
d) No valve is used in the liquid nitrogen line (The plague of most automatic liquid nitrogen filling systems).
e) The fill tube made of Teflon is insulated with foam insulation and is more reliable than other plastic fill tubes. The fact that the thermal capacity is much lower than metal fill tubes means that much less liquid nitrogen is used to cool it down [1].

2.2.2 Real-Time Implementation of a Fuzzy Logic Controller for Switch-Mode Power-Stage DC–DC Converters

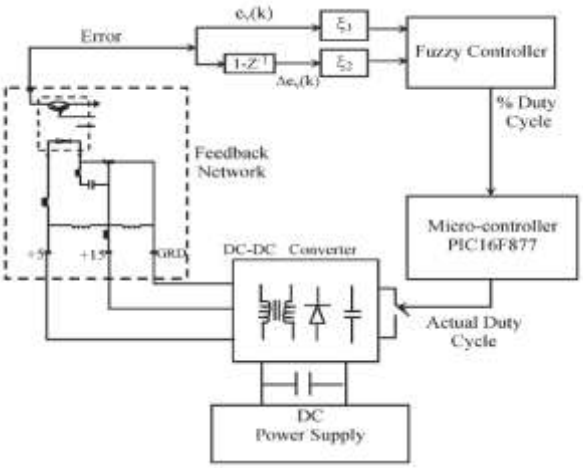

Figure 2.3: Fuzzy controller-based converter topology

Figure 2.3 show the fuzzy controller-based converter topology for this system. The structure built up here is a two-input single-output controller. The inputs are the variable voltage error e(k) and the change in voltage error Δe(k). Consequently, the input to the dc–dc converter would be the duty cycle, which is actually the output of the fuzzy controller. Fuzzification translates a numeric value for the error e(k) or change in error Δe(k) into a linguistic value such as big or small with a membership grade. Defuzzification takes the fuzzy output of the rules and generates a numeric value used as the control input to the dc–dc converter. The controller qualitatively captures the dynamics of the dc–dc converter and executes this qualitative idea in a real-time situation [2]. The dc–dc converter is equipped with a feedback network that provides the error value at the output [3].

This output voltage is then compared internally to the reference of the precision voltage reference, and any error difference detected is amplified and fed back. The controller provides a percentage duty-cycle signal for a peripheral interface microcontroller PIC16F877, which generates the converter actual duty cycle [3].

2.2.3 Overflow filling systems

This type of filler is perhaps the most widely used machine in small bottle filling operations because it handles a wide range of thin, free flowing liquids as well