UNIVERSITI TEKNIKAL MALAYSIA MELAKA

AN AUTOMATIC BOTTLING PROCESS SYSTEM FOR MONITORING AND CONTROL

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Engineering Technology (Industrial Power) (Hons.)

by

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UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: **AUTOMATIC BOTTLING PROCESS SYSTEM FOR MONITORING AND CONTROL**

SESI PENGAJIAN: **2015/16 Semester 2**

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I hereby, declared this report entitled "Automatic Bottling Process System for Monitoring

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APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Engineering Technology (Electrical Technology Department) (Hons.). The member of the supervisory is as follow:

…………………………….
(Project Supervisor)

ABSTRACT

Nowadays, a lot of automation project had been carried out. So, automatic system with monitoring system is created to allow the control it. This project is designed to fill the bottle with water using an automation system with monitoring and control system. The title of the project "An automatic bottling process system for monitoring and control" is a system that PLC as heart. The main purpose of the project is to create a system which uses PLC that can communicate with Visual basic. PLC is the medium which the automation system can be monitored from long distance. It is used to reduce time and saving the cost. The CX-Programmer was used to create a ladder diagram.

ABSTRAK

Pada masa kini, banyak projek automasi telah dijalankan. Oleh itu, sistem automatik dengan sistem pemantauan diwujudkan untuk membolehkan kawalan itu. Projek-projek ini direka untuk mengisi air ke dalam btol dengan menggunakan sistem secara automatik dengan kawalan dan pemantauan. Tajuk projek "Proses pengisian air ke dalam botol secara automatik dengan sistem kawalan dan pemntauan" adalah satu sistem yang menggunakan PLC sebagai alat yang paling utama. Tujuan utama projek ini adalah untuk mewujudkan satu sistem yang boleh berkomunikasi dengan asas Visual. PLC adalah medium yang mana sistem automasi boleh bergerak menggunakan enjin dari jarak jauh. Ia digunakan untuk mengurangkan masa dan menjimatkan kos. Perisian CX-Programmer digunakan untuk menghasilkan gambarajah tangga.

DEDICATIONS

Special dedication to my beloved father and mother and also kindhearted supervisor Mr.

Shahrudin Bin Zakaria. Do not forget also to my friends who I love. Love you all.

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First of all, I would like to thank for ALLAH for the strength and blessing until I get to here. In this project I had the opportunity to learn new skills and enhance their knowledge. I would like to congratulate Mr. Shahrudin Bin Zakaria for giving guidance and advice will never fail to make a success of this project. His guidance gives a huge role to fulfill this project.

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LIST OF SYMBOLS AND ABBREVIATIONS

PLC	=	Programmable Logic Controller
VB6	=	Visual Basic 6
PC	=	Personal Computer
GUI	=	Graphical User Interface
I/O	=	Input or Output
LD	=	Ladder Diagram

CHAPTER 1

INTRODUCTION

1.0   Introduction

Industrial bottling process with automation become more useful and famous among industrial world reduces the need human work. Automation plays important role closed loop system. Increasingly on world economy automation plays an important role. Automation is suitable to all type of beverage. The production will cover all complete filling and packaging process.

1.1   Background

In new era of industrial, automation is important to build fast machines by human needs. Seeing from industrial phenomena is increase like competition among Industries Company. Automation is likely can be used in many sector to develop. A prototype about bottle filling system is controlled using programmable Logic Circuit (PLC) and the process is monitored while also controlled using Visual Basic (VB).

This project focused on filling the bottle with water. In addition to this project also included monitoring system and control system to monitor also control the filling water in Visual Basic (VB) while conveyor system uses for carries the bottle at filling station.

1.2   Problem Statement

i.   Most of the filling machine in the market is not fully automatic. This machine requires human assists to operate properly.

ii.   No proper monitoring when a predicted condition happens.

iii. Some workers not know with ladder diagram so cannot monitored properly

iv.   If something happen during process the need to go and shut down the operation at the machine

1.3   Objective Study

The objectives of this project are:

i.   To develop a user friendly system by using Visual Basic as the monitor and control on computer

ii.   To design a filling bottle system controlled by PLC

iii. To design a system that can fill the bottle with liquid where the specified quantity.

1.4   Scopes of Study

This project is primarily concerned with every phase to develop an automatic liquid filling machine. For the first phase, it starts with collecting information about the project in terms of problem statement, objective and scope. Scope should explain the objective in more detail and in accordance to the concept.

Scopes of this project are:

i.   Using Visual Basic coding which is easy to use as monitor and to control the operation of the bottling process.

ii.   The GUI is use to monitored the process and control the operation.

iii. Design and development ladder diagram using Omron CX-Programmer software

iv.   Interface PLC CP1E with visual basic 6 to make simple GUI system with low cost.

v.   Build system that can fill water into bottle automatically.

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CHAPTER 2
LITERATURE REVIEW

2.0 Introduction

This chapter discussed about the literature discourse and review of structural analysis and some components used in these projects. Research and reference is use from various source such as journals, internet and previous projects. These items are use as the key for the whole project.

2.1 Synopsis of Journal

In this part, it involve in finding information from journal, websites and textbooks.

Table 2-1: Synopsis of Journal

No	Journal title	author
1	Automatic Filling Management System for Industries	Ahuja et al.(2014).
2	PLC Based Automatic Bottle Filling and Capping System User Defined Volume Selection	T.Kalaiselvi et al.
3	Implementation of Sensor Network for Automation of Bottle-Capping Assembly Station Using IEEE 802.15.4	Kunal Utekar et al.(2011)
4	Application of PLC for Arranging Bottle in Beer Filling Production Line	ZHANG Tianxia et al.(2014)
5	Temperature Controlling Design Based on VB and PLC	Yaning sun and Junyu fu, (2010)
6	Automatic Multivariate Liquid Filling System & Conveyor Control Using PLC & SCADA	Dheeraj Pongallu and Prof.S.R.Suralkar(2014)

7	Conveyor control and sorting module controlled by programmable logic controller	G. Sujatha and V. Perasiriyan (2014).
8	The Principle of Programmable Logic Controller and its role in Automation.	Avaru Ravi Kiran et al(2013)
9	GUI Based Remote ON/OFF Control and Monitoring Single Phase Lamp Using Microcontroller	Mohd Suhaimi B.Sulaiman et. Al.(2003).
10	Development of Monitoring System by Serial Port Based on VB Software and electronic Communication	Yu Tu,Chao Wang, and Peng Du.(2011).

2.1.1 Automatic Filling Management System for Industries

Ahuja *et al*. (2014). This paper presents Automatic Filling Management System for industries how to control the process. A sample of bottling process control using programmable logic controller (PLC) and the process is monitored using supervisory control and data acquisition (SCADA). It will tell if there have fault occur.

2.1.2 PLC Based Automatic Bottle Filling and Capping System User Defined Volume Selection

T.Kalaiselvi *et al*. (2012) according to this journal, it elaborates and explains about how the flow of bottle filling involved placing bottle on the conveyor while the first bottle filling the water at the same time using old version technique . The task will involve any liquid products water even or cold drink. This task will take time and a little bit quite costly.

This project aims how to shorten the time and make it in kind with the cost to become more flexible. Their operation will involve filling water into the bottle and capping it at the same time and also user can also pouring the water with different volume into the bottle using volume selection menu. This project becomes multi-tasking.

This type of machine will be monitored by SCADA (Supervisory Control and Data Acquisition) and being control using PLC (Programmable Logic Controllers) which is more flexible, low complexity, low cost and effective, and reduce space taken.

2.1.3 Implementation of Sensor Network for Automation of Bottle-Capping Assembly Station Using IEEE 802.15.4

Kunal Utekar *et al.* (2011) on his journal represented the implemented smart sensor network to improve the bottling process. The installation period had been reduced and network capacity is increase. PLC is used as a controller and microcontroller as DSDC to protect smart sensor network and available to controlling the data. Interlock Logic use to make sure all mechanical part not easily get damaged while the fault sensor is implementing from the wire break sensing concept.

2.1.4 Application of PLC for Arranging Bottle in Beer Filling Production Line

ZHANG Tianxia *et al.*(2014) according to his article, to an automatic and efficient production line, the subsection that being control must be optimize. During the first subsection of production lines it will arrange bottle and its need control function to make the flow of the operation smooth. PLC (Programmable Logic Controller) is installing to overcome this automatic problem control in control procedures and system architecture. Monitoring system is create to collect operation status and the design of the program, meanwhile system fault is trace and some control treatment create which to make the automatic and smooth operation of bottling arrangement. Seeing from other state the use of solenoid valve and motor are key to part as design.

2.1.5 Temperature Controlling Design Based on VB and PLC

Yaning sun and Junyu fu, (2010) for monitoring the temperature of automatic oven and heating –furnace host personal computer (PC) and send command to PLC through monitoring interface while controlling the temperature process, PLC will state data of the

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temperature and upload the temperature when sensor sense. The actual temperature can be real-time display on monitor. The whole process is controlling using visual basic the programming real-time control the temperature monitoring system.

Conveniently entitles send and receive data via serial ports. MSComm is design approach to process communications event communications these process. Timely response and high reliability.

2.1.6 Automatic Multivariate Liquid Filling System & Conveyor Control Using PLC & SCADA

Dheeraj Pongallu and Prof.S.R.Suralkar(2014)Bottling plants control volume of the filling operation. In industry many PLC & SCADA system that been implemented. PLC & SCADA software interface PC to processing plants and control and monitoring between computer and hardware. Process prototype had been make using sensor, motor, relays, serial communication and PLC device. The work consists tree section, first section filling process, second conveyor process and last capping section.
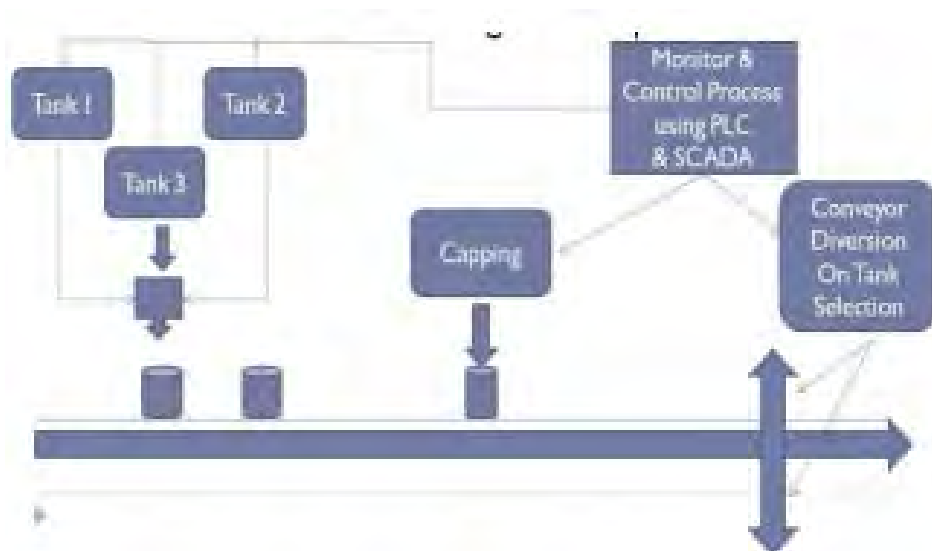

Figure 2.1: Block Diagram of the Process

(Source: www.ijetae.com)

2.1.7 Conveyor control and sorting module controlled by programmable logic controller

This paper was developed by G. Sujatha and V. Perasiriyan (2014). It used PLC to investigate a conveyor sorting module controlled. In industrial conveyor plant the conveyor sorting plant module is necessary. The conveyor belt are mounted so that the object mounted on first conveyor will fall on second conveyor. It can be applied to sort the objects in depends to the size and the conveyor will stop if the sequence is wrong.

2.1.8 The Principle of Programmable Logic Controller and its role in Automation.

Avaru Ravi Kiran *et al*(2013).Purpose of PLC is requiring "on/off" control. There are used in many industries and device. The designation consist several input with output arrangement, PLC input and output recognize in "high" and "low" logical state. PLC read in analogue input or digital input. Then it the output generate in analogue and digital to automation system. PLC can connected in many ways to personal computer such as RS232, RS-485 or RS-422.
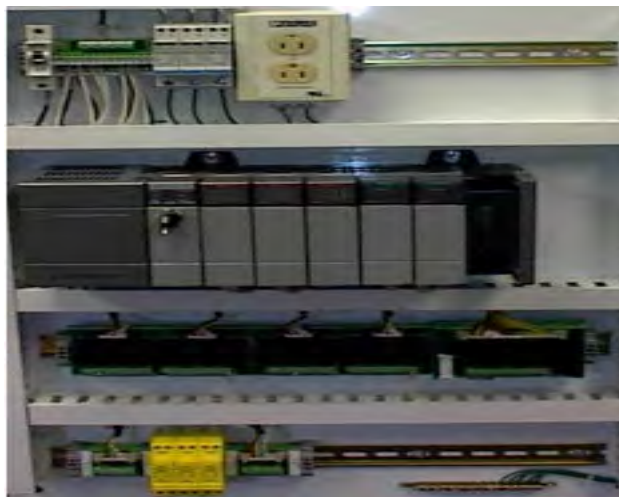

Figure 2.2: Control Panel with PLC(grey element in the centre).

(Source: http://www.internationaljournalssrg.org)

2.1.9 GUI Based Remote ON/OFF Control and Monitoring Single Phase Lamp Using Microcontroller

Mohd Suhaimi B.Sulaiman *et. Al.*(2003). Controller and monitoring now is an important field these days. From the electric power to the distribution grid based on automation, data acquisition and control equipment. Microcontroller is used because low cost to control hardware. Automation like control system and monitoring introduce to help people from hazardous working phenomena. This technology is efficient and more flexible.
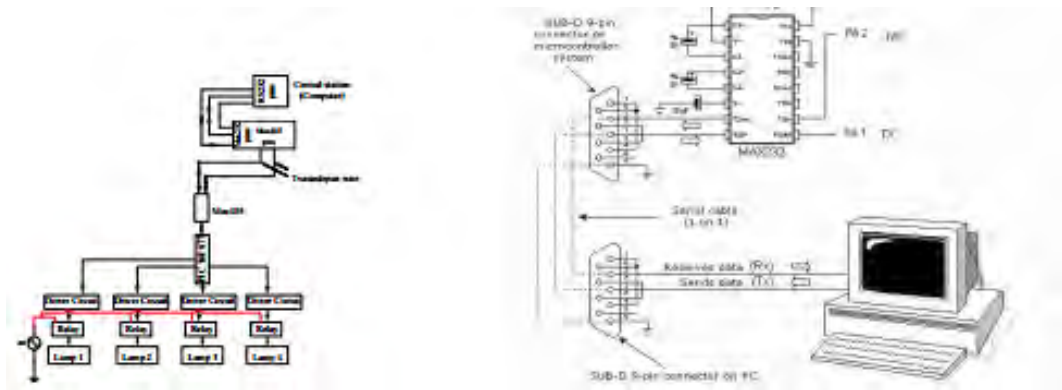

Figure 2.3: Hardware development GUI and Connection with Max232 with computer

(Source: http://www.enggjournals.com)

2.1.10 Development of Monitoring System by Serial Port Based on VB Software and electronic Communication

According to Yu Tu,Chao Wang, and Peng Du.(2011). Monitoring system function as automatic, manual, stop and reset system. The device is connected with RS232 serial port connected to serial port on PC. CPU 226CN and EM223 receive the sensor signal. Main unit connected to serial port PC receive some command signal to control the output via monitoring system. Input signal for the main event toward OnComm.

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CHAPTER 3
METHODOLOGY

3.0   Introduction

This chapter will discuss how the methodology works. Some aspect should be used while develop this process. This aspect will divide into several parts and important to overcome the project objective. Furthermore, the parts that consist are materials use, hardware and software relate.

3.1   Project Flow

To make something new, project flow is important to stabilize the project smoothly run. That why, hardware part and software is using to create this project. The purpose is to make this system low cost with biggest function.

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