DESIGN AND BUILD A NEW COLD PRESS MINI MACHINE CONTROL BY PLC (PROGRAMMABLE LOGIC CONTROL)

NOORIZRAQ BIN MOHD YASIN

This Report Is Submitted In Partial Fulfillment Of Requirements For The Bachelor Degree of Electronic Engineering (Industrial Electronic)

Fakulti Kejuruteraan Elektronik dan Kejuruteraan Komputer
Universiti Teknikal Malaysia Melaka

May 2007

UNIVERSTI TEKNIKAL MALAYSIA MELAKA
FAKULTI KEJURUTERAAN ELEKTRONIK DAN KEJURUTERAAN KOMPUTER

BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II

Tajuk Projek : Design and build a new cold press machine control by PLC

Sesi Pengajian : .... 2006/2007 .....

Saya NOORIZRAO BIN MOHD YASIN
(HURUF BESAR)

mengaku membenarkan Laporan Projek Sarjana Muda ini disimpan di Perpustakaan dengan syarat-syarat kegunaan seperti berikut:

1. Laporan adalah hakmilik Universiti Teknikal Malaysia Melaka.
2. Perpustakaan dibenarkan membuat salinan untuk tujuan pengajian sahaja.
3. Perpustakaan dibenarkan membuat salinan laporan ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. Sila tandakan (√) :

☐	**SULIT***	(Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia seperti yang termaktub di dalam AKTA RAHSIA RASMI 1972)
☐	**TERHAD***	(Mengandungi maklumat terhad yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan)
☑	**TIDAK TERHAD**	

Disahkan oleh:

(TANDATANGAN PENULIS)

(COP DAN TANDATANGAN PENYELIA)

Alamat Tetap: .....
LOT 436. JLN HJ KASTARI

81800 ULU TIRAM, JOHOR BHARU

Tarikh: 27/04/07

Tarikh: 27/04/07

"I hereby declare that the report is the result of my own, as clearly stated in the sources of references and sources is explained and stated."

Signature: .....

Name: Noorizraq Bin Mohd Yasin

Date: 27 April 2007

SUPERVISOR APPROVEMENT

"I/ we have approve that I've read the Final Year Project report with my opinion this report is fulfill the scope and the quality to be honored with the Ijazah Sarjana Muda Kejuruteraan Elektronik (Elektronik Industri)."

Signature: .....

Supervisors Name: En Zulhairi Bin Othman

Date: 27/04/07

ZULHAIRI B OTHMAN
Ketua Jabatan (Elektronik Industri)
Fakulti Kej Elektronik dan Kej Komputer (FKEKK),
Universiti Teknikal Malaysia Melaka (UTeM),
Karung Berkunci 1200,
Ayer Keroh, 75450 Melaka

I dedicate this to both of my parents, my family,
friends and electronic engineering education.

ACKNOWLEDGEMENT

Firstly, I would like to thankful to Almighty for giving me strength to complete this report. More than that, I would like to thankful to En Zulhairi Bin Othman as my supervisor as long as I have pretend to finish this Final Year Project. He has helped me in many ways such as give an opinion, help to find out the solution and discussion to finish this project.

Moreover, also to the individual named En. Hj Mohammad Bin Abdullah, this lecturer in Giat MARA Institute, which gives the permission and cooperation to use their workshop and mechanical equipment along the development of this project. His cooperation and help is a lot and I'm thanks for that. Furthermore, to Mrs Bulan Binti Abdullah, lecturer from UiTM Shah Alam for giving us to use and borrow the pneumatic equipment likes valve and cylinder.

Not forget to my parent that has gives a supported to make sure this project would be finish smoothly. Also to my project partner Mohd Firdaus bin Hashim for his cooperation and helps along this project. Further, to all my friends have supported me and together estimated the problems in this project. Consequently, I would like to thanks all that have make sure this project is excellent. Hope God bless you are for your kindness. Amen…

Thank you…

ABSTRACT

Mini cold press machine is a project to improve previous press machine which have weakness in safety while operating it. This matter creates a lot of problem and at the same time the operators and technician have the higher risk to have an accident in industries.

The solution for this problem is a development of a new program of machine which running same operation but the machine is more safety and easy to setup when machine pressing the radio panel using external timer.

ABSTRAK

Project *mini cold press machine* ini adalah suatu usaha untuk menaik tarafkan mesin tekan yang sedia ada dimana pada mesin yang sedia ada, bahagian ciri-ciri keselamatan kurang dititik beratkan. Jadi ia akan mengundang kepada risiko berlakunya kemalangan ditempat kerja oleh operator dan juruteknik.

Penyelesaian untuk masalah ini ialah membuat program yang baru pada mesin dimana mesin berfunsi seperti sedia ada tetapi ia lebih selamat dan senang untuk menukar masa mesin tersebut tekan panel radio dengan penambahan pemasa luar.

TABLE OF CONTENTS

CHAPTER 2 : LITERATURE REVIEW

CHAPTER 3 : PROGRAM DEVELOPMENT

CHAPTER 4 : INTERFACING AND TROUBLESHOOTING

CHAPTER 5 : RESULT

CHAPTER 6 : DISCUSSION AND CONCLUSION

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

1.1 PROJECT OVERVIEW

This machine is use to attach stickers and place button to the radio panel. It is controlled by PLC. It consist of 5 pneumatic cylinder, where each cylinder have their own function which are to press the radio panel, carry the finished radio panel to the pickup and place section and there the cylinder is used to grip and pick up the radio panel.

This project is conducted to overcome the problem exist, emergency button not function if user used machine in manual mode. In automatic mode, user can use just one hand to handle the machine although have two switch at the machine and time machine press the panel radio difficult to change at the current machine by enhancing the machine, modify the program and added external timer. This is to produce a mini machine which is safer to use.

1.1.1 PROGRAMMABLE LOGIC CONTROL (PLC)

Automation of many different processes, such as controlling machines or factory assembly lines, is done through the use of small computers called a programmable logic controller (PLC). This is actually a control device that consists of a programmable microprocessor, and is programmed using a specialized computer language. Before, a programmable logic controller would have been programmed in ladder logic, which is similar to a schematic of relay logic. A modern programmable logic controller is usually programmed in any one of several languages, ranging from ladder logic to Basic or C. Typically, the program is written in a development environment on a personal computer (PC), and then is downloaded onto the programmable logic controller directly through a cable connection. The program is stored in the programmable logic controller in non-volatile memory.

Programmable logic controllers contain a variable number of Input/Output (I/O) ports, and are typically Reduced Instruction Set Computer (RISC) based. They are designed for real-time use, and often must withstand harsh environments on the shop floor. The programmable logic controller circuitry monitors the status of multiple sensor inputs, which control output actuators, which may be things like motor starters, solenoids, lights and displays, or valves.

The programmable logic controller has made a significant contribution to factory automation. Earlier automation systems had to use thousands of individual relays and cam timers, but all of the relays and timers within a factory system can often be replaced with a single programmable logic controller. Today, programmable logic controllers deliver a wide range of functionality, including basic relay control, motion control, process control, and complex networking, as well as being used in Distributed Control Systems.

Digital signals yield an on or off signal, which the programmable logic controller sees as Boolean values. Analog signals may also be used, from devices such as volume

controls, and these analog signals are seen by the programmable logic controller as floating point values.

There are several different types of interfaces that are used when people need to interact with the programmable logic controller to configure it or work with it. This may take the form of simple lights or switches or text displays, or for more complex systems, a computer of Web interface on a computer running a Supervisory Control and Data Acquisition (SCADA) system. [1]

Programmable logic control or PLC is the most commonly used industrial automation technique in the world. It is universally applied for factory automation, process control and manufacturing systems.

Programmable logic control originated from the creation of computerized versions of relay control systems used to control manufacturing and chemical process systems. The programming is done using a special technique called ladder logic, which allows sequences of logical actions to be set up, inter-linked and timed. A standard task in logic control is batch control and sequencing in a process system.

A PLC or Programmable Logic Controller is a user friendly, microprocessor specialized computer that carries out control functions of many types and levels of complexity. Its purpose is to monitor crucial process parameters and adjust process operations accordingly. It can be programmed, controlled and operated by a person unskilled in operating computers. Essentially, a PLC's operator draws the lines and devices of ladder diagrams with a keyboard onto a display screen. The resulting drawing is converted into computer machine language and run as a user program.

PLC will operate any system that has output devices that go on and off (Discrete, or Digital, outputs). It can also operate any system with variable (analog) outputs. The Programmable Logic Control can be operated on the input side by ON/OFF devices or by variable (analog) input devices.[2]

1.1.2 HISTORY OF PROGRAMMABLE LOGIC CONTROL (PLC)

The programmable logic controller may be the best example ever of taking an existing technology and applying it to meet a need. In the 1960s and 1970s, industry was beginning to see the need for automation. Industry saw the need to improve quality and increase productivity. Flexibility had also become a major concern. Industry needed to be able to change processes quickly to meet the needs of the consumer.

Programmable logic controllers were first created to serve the automobile industry, and the first programmable logic controller project was developed in 1968 for General Motors to replace hard-wired relay systems with an electronic controller.

1.1.3 THE OLD WAY

Imagine an automated manufacturing line in the 1960s and 1970s. There was always a huge wiring panel to control the system. The wiring panel could cover an entire wall. Inside the panel were masses of electromechanical relays. These relays were all hardwired together to make the system work. Hardwiring means that an electrician had to install wires between the connections of the relays. An engineer would design the logic of the system and the electricians would be given a blueprint of the logic and would have to wire the components together. There were hundreds of electromechanical relays in a system before programmable logic controllers were developed.

The drawing that the electrician was given was called a ladder diagram. They were called ladders because they resemble a ladder in appearance. The ladder showed all the switches, sensors, motor, valve, relays, etc, that would be in the system. It was the electrician's job to wire them all together.

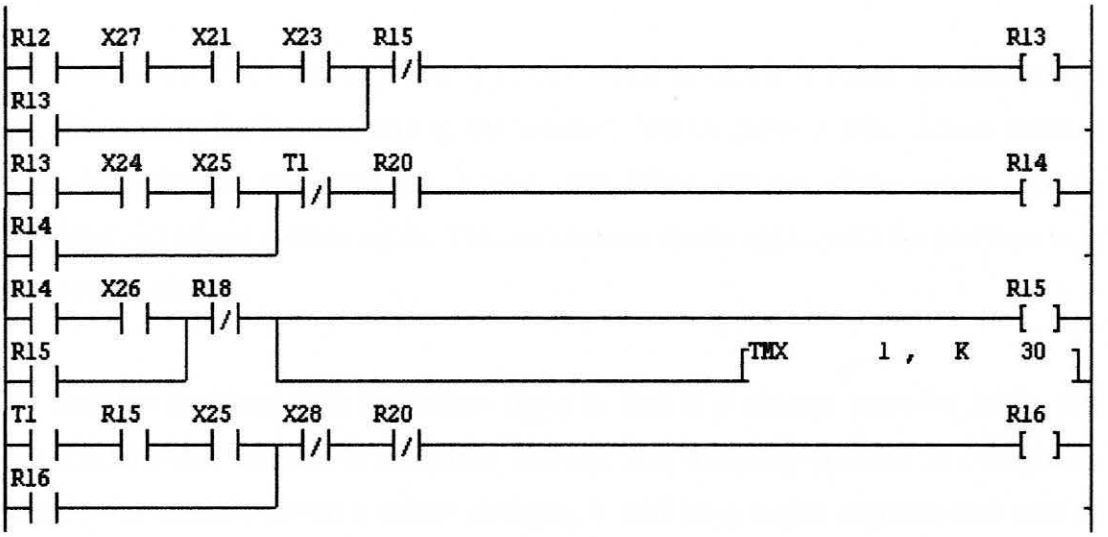

Figure 1.1: Example of PLC ladder diagram.

Note the similarity in appearance to a ladder. There are three rung in this example. Power is represented by the left and right upright. There are five inputs and two outputs in the example. Inputs are on the left, output at the right of each rung.

It is not hard to imagine that the engineer made a few small errors in his/her design. It is also conceivable that the electrician may have made a few errors in wiring the system. It is also not hard to imagine a few bad components. The only way to see if everything was correct was to run the system. Systems are normally not perfect on the first attempt.

Troubleshooting was done by running the actual system. This was a very consuming process. The system had to be disabled for wiring changes. This means that all of the production personnel associated with that production line was without work until the system was repaired. After the electrician had completed the troubleshooting and repair, the system was ready for production.

1.1.4 DISADVANTAGES OF THE CONVENTIONAL WAY

One of the problems with this type of control is that it is based on mechanical relays. Mechanical devices are usually the weakest link in systems. Mechanical devices have moving part that can wear out. If one relay failed, the electrician might have to troubleshoot the whole system again. The system was down again until the problem was found and corrected.

Another problem with hardwired logic is that if a change must be made, the system must be shut down and the panel rewired. If a company decided to change the sequence of operations (even a minor change), it will be a major expense and loss of productions time while the system do not produce parts.

1.1.5 THE FIRST PROGRAMMABLE CONTROLLERS

General Motor saw the need for a replacement for hardwired control panels. Increased competition forced the automakers to improve manufacturing performance in both quality and productivity. Flexibility, rapid changeover and reduced downtime became very important.

GM realized that a computer could be used for logic instead of hardwired relays. The computer could take the place of the huge, costly, inflexible, hardwired control panels. If changes in the system logic or sequence of operation were needed, the program in the computer could be changed instead of rewiring. Then, eliminating all the downtime associated with wiring changes. Now, system can be completely changed by simply changing the software in a computer.

1.2 OBJECTIVES

The objective of this project is to identify the all of function the cold press machine and the input/output equipment like sensor, switch, external timer and solenoid valve.

Another objective is to study the component of Flexible Manufacturing System (FMS) to conform to the model to be developed. The component of Flexible Manufacturing System is pneumatic equipment (solenoid valve and pneumatic cylinder) and control equipment (Programmable Logic Control). PLC is the most commonly used industrial automation technique in the world. It is universally applied for factory automation, process control and manufacturing systems.

To build a new Flexible Manufacturing System (FMS) model that will be cost, time and quantity effectiveness is other objectives should be done. Machine need one worker only to handling machine and send the set, not two workers like other machine. In this case, we can cut cost for pay one worker. The last objective is for build low cost machine and the function better from other machine and safety in manual or auto mode.

1.2 SCOPE OF WORKS

The scopes of the project are:

1. Identify function of the electronics component like sensor and switch for control/handle pneumatic system.

2. Identify how to use console Programmable Logic Control for key in program from ladder diagram to PLC (Programmable Logic Control).

3. Identify detail function of machine and how PLC (Programmable Logic Control) control machine.

1.3 PROBLEM STATEMENT

1. Machine not safe to used, in manual mode and also in automatic mode. In manual mode, worker not safe to use the machine because machine can't stop immediately while doing maintenance job. In automatic mode, user can use just one hand to handle the machine although have two switches at the machine. The programming will be change to make sure machine are safe to use in manual mode or automatic mode.

2. Need two workers in this part, one for handle machine and other one for take panel radio after machine pressed the panel radio. Need to design and build a new mini machine, which machine just need one worker only to handle the machine and send the panel radio, not two workers like other machine. In this case, we can cut cost for pay one worker.

3. Time for machine to press the panel radio is difficult to change and need a long time to check and modify the program. So that's why we need the external timer. If timer of press the panel radio wants to change, we just adjust at the external timer. In this case, machine is easy to use and if maintenance wants to change time of machine press the panel radio, it is not a waste the time..

1.4 PROJECT METHODOLOGY

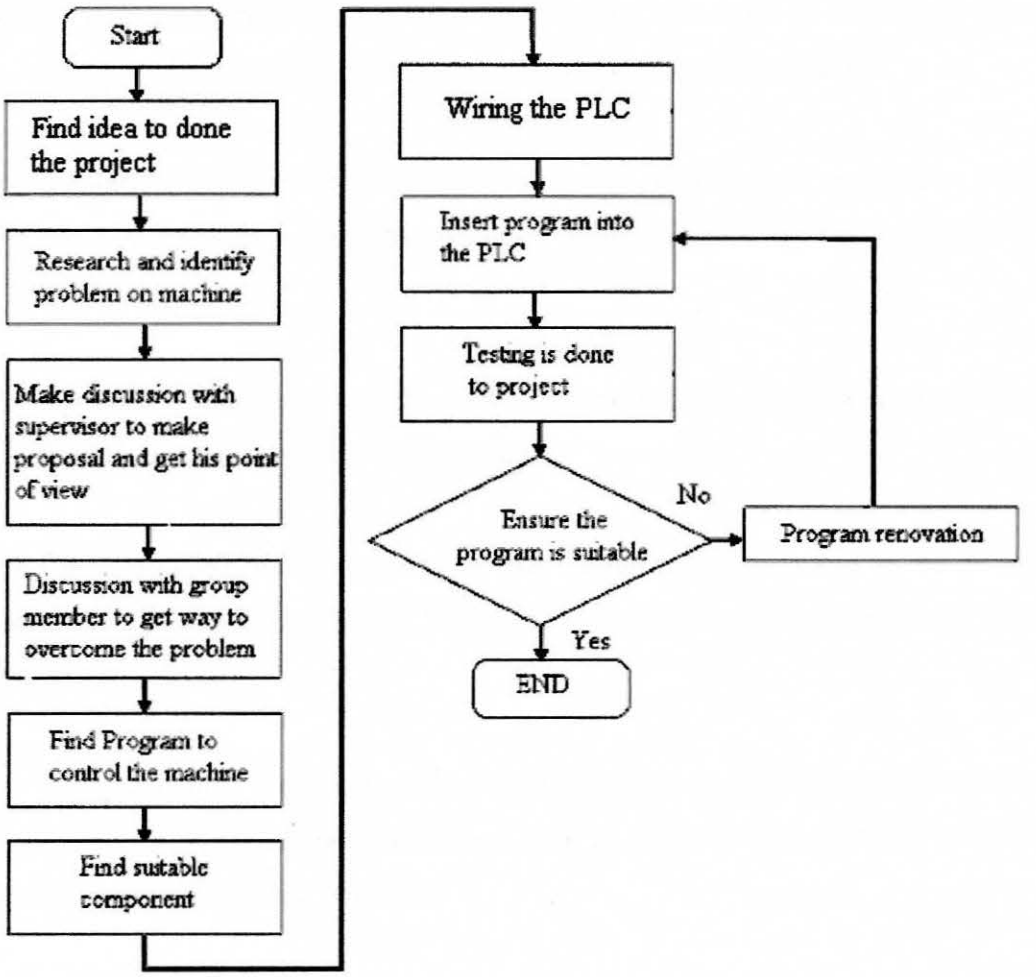

Figure 1.2: A System Approach to Programmable Controller Design

This project was carried out in two main phases, which were the fabrication of model and interfacing the model with Programmable Logic Controller. The idea to proposed and done this project comes from the experiences that have got during industrial training program. While working as technician at production engineer department there are many problem had occurred at the assembly line.

Some of the problem that can be seen is at the press machine, puncture test machine, and AM/FM machine. Press machine had been chosen because it not uses external equipment that exists on the puncture test machine and AM/FM machine. In addition it didn't need high voltage like puncture test that need 11 KV so that product can be test There are several problems that can be found at the machine:-

1. Machine can't stop immediately in auto mode, in automatic mode; user can only use one hand to operate the machine although there are two switches at the machine

2. Time for machine to press the panel radio is difficult to change and need a long time to check and modify the program.

Discussion is making with supervisor about title that going to be proposed, problem at the machine, equipment that going to be used and make proposal from its point of view.

Discussion also been made with group member to overcome the problem; discuss how added function of machine because I have to program the controller of the cold press machine to achieve the objective.

Find suitable program to control the machine is finds and PLC had been chosen to control the machine. The main factor of using PLC because of the experience that been getting during industrial training. Nais had been choose because this PLC that been familiarized while doing troubleshooting at the factory.