UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DEVELOPMENT OF CONTROLLER FOR BACK COVER ASSEMBLY STATION FOR FLEXIBLE MANUFACTURING SYSTEM USING PROGRAMMABLE LOGIC CONTROLLER (PLC)

Thesis submitted in accordance with the partial requirements of the Universiti Teknikal Malaysia Melaka for the Bachelor of Manufacturing Engineering (Robotic and Automation) with Honours

By

AMINUDDIN BIN ABDUL WAHAB

Faculty of Manufacturing Engineering

March 2008

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS LAPORAN PSM

JUDUL:

DEVELOPMENT OF CONTROLLER FOR BACK COVER ASSEMBLY STATION FOR FLEXIBLE MANUFACTURING SYSTEM USING PLC.

SESI PENGAJIAN:
SEMESTER 2 2007/2008

Saya AMINUDDIN BIN ABDUL WAHAB
mengaku membenarkan laporan PSM / tesis (Sarjana/Doktor Falsafah) ini disimpan di Perpustakaan Universiti Teknikal Malaysia Melaka (UTeM) dengan syarat-syarat kegunaan seperti berikut:

1. Laporan PSM / tesis adalah hak milik Universiti Teknikal Malaysia Melaka dan penulis.
2. Perpustakaan Universiti Teknikal Malaysia Melaka dibenarkan membuat salinan untuk tujuan pengajian sahaja dengan izin penulis.
3. Perpustakaan dibenarkan membuat salinan laporan PSM / tesis ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. *Sila tandakan (√)

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

_____
(TANDATANGAN PENULIS)
Alamat Tetap:
79, Kampung Barokhas, Mukim
Belimbing Kanan, 06300 Kuala Nerang,
Kedah Darulaman

Tarikh: _____

_____
(TANDATANGAN PENYELIA)

Cop Rasmi:

Tarikh: _____

* Jika laporan PSM ini SULIT atau TERHAD, sila lampirkan surat daripada pihak organisasi berkenaan dengan menyatakan sekali sebab dan tempoh tesis ini perlu dikelaskan sebagai SULIT atau TERHAD.

UNIVERSITI TEKNIKAL MALAYSIA MELAKA
Karung Berkunci 1200, Ayer Keroh, 75450 Melaka
Tel : 06-233 2421, Faks : 06 233 2414
Email : fkp@kutkm.edu.my

FAKULTI KEJURUTERAAN PEMBUATAN

Rujukan Kami (Our Ref) :
Rujukan Tuan (Your Ref):

9 MEI 2008

Pustakawan
Perpustakaan Universiti Teknikal Malaysia Melaka (UTeM)

Taman Tasik Utama, Hang Tuah Jaya,
Ayer Keroh, 75450, Melaka

Saudara,

PENGKELASAN LAPORAN PSM SEBAGAI SULIT/TERHAD
- LAPORAN PSM SARJANA MUDA KEJURUTERAAN PEMBUATAN (ROBOTIK DAN AUTOMASI): AMINUDDIN BIN ABDUL WAHAB
TAJUK: DEVELOPMENT OF CONTROLLER FOR BACK COVER ASSEMBLY STATION FOR FLEXIBLE MANUFACTURING SYSTEM USING PLC

Sukacita dimaklumkan bahawa tesis yang tersebut di atas bertajuk ***"DEVELOPMENT OF CONTROLLER FOR BACK COVER ASSEMBLY STATION FOR FLEXIBLE MANUFACTURING SYSTEM USING PLC"*** mohon dikelaskan sebagai terhad untuk tempoh lima (5) tahun dari tarikh surat ini memandangkan ia mempunyai nilai dan potensi untuk dikomersialkan di masa hadapan.

Sekian dimaklumkan. Terima kasih.

"BERKHIDMAT UNTUK NEGARA KERANA ALLAH"

Yang benar,

……..

AZRUL AZWAN BIN ABDUL RAHMAN
Pensyarah,
Fakulti Kejuruteraan Pembuatan

DECLARATION

I hereby, declare this thesis entitled "Development of Controller for Back Cover Assembly Station for Flexible Manufacturing System Using Programmable Logic Controller (PLC)" is the result of my own research except as cited in the references.

Signature :…….

Author's Name :…….

Date : …….

APPROVAL

This thesis submitted to the senate of UTeM and has been accepted as partial fulfillment of the requirements for the degree of Bachelor of Manufacturing Engineering (Robotic and Automation) with Honours. The members of the supervisory committee are as follow:

……

(En. Azrul Azwan bin Abd. Rahman)

Supervisor

(Official Stamp & Date)

DEDICATION

For My beloved parents and family

ACKNOWLEDGEMENTS

Alhamdulillah, I'm grateful that by the power of Allah, Most Gracious, Most Merciful, I managed to complete this project. I also want to thank my parents, who taught me the value of hard work by their own example. Both of them are my source of inspiration that lead me to working hard in gaining knowledge. I also would like to share this moment of happiness with all my friends that had help me in completing this project in one way or another.

I also would like to thanks my supervisor, En. Azrul Azwan b. Abd. Rahman from Manufacturing Engineering Faculty, UTeM for all his guidance and help throughout the entire time of this project being carried out. Without this guidance this project might not go as well as it is. The encouragement and motivation that was given to me to carry out my project work are greatly appreciated.

Finally, I would also like to thanks all my housemates and whose directly and indirectly helped me and gave their help and support towards my project. Without their supports this project might not be as well as it is upon it's completion.

ABSTRACT

Flexible Manufacturing System (FMS) is manufacturing technology. The problem in the world of manufacturer is to achieve "agility". An agile manufacturer is one who is the fastest to the market, operates with the lowest total cost and has the greatest ability to "delight" its customers. FMS is simply one way that manufacturers are able to achieve this agility. Beside that, the problem in this project is to develop the controller for FMS system. In this project, there are two objective needs to be achieved which are to automate assembly station and to develop and install the programming of Programmable Logic Controller (PLC) to control the FMS system for LCD assembly. Methodology have been used in this project is start with the planning, followed by literature review, continued with analyzing, design and modification, and implementation phase. The controller have been programmed to operate as required in order to automate the assembly station.

ABSTRAK

Sistem Pembuatan Fleksibel (FMS) adalah teknologi pembuatan. Masalah di dunia pengeluar adalah untuk mencapai "ketangkasan". Pengeluar yang tangkas adalah merupakan pengeluar yang lebih laju dalam pasaran, beroperasi dengan kos terendah dan mempunyai keupayaan yang besar untuk "menggembirakan" pelanggan-pelanggannya. FMS adalah satu cara yang mudah untuk para pengeluar mencapai tahap ketangkasan ini. Disamping itu, masalah dalam projek ini adalah untuk membangunkan sistem kawalan untuk stesen FMS. Dalam projek ini, terdapat dua keperluan objektif untuk dicapai dimana untuk mengautomasikan stesen pemasangan dan juga untuk membangunkan dan melakukan pengaturcaraan Programmable Logic Controller (PLC) untuk mengawal sistem FMS bagi pemasangan LCD. Kaedah yang telah digunakan dalam projek ini adalah bermula dengan perancangan, disambung dengan ulasan karya, berterusan dengan penganalisaan, rekaan dan pengubahsuaian, dan tahap pelaksanaan. Alat kawalan yang diprogram bagi mengautomasikan stesen pemasangan tersebut telah beroperasi seperti yang dikehendaki.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLE

CHAPTER 1

INTRODUCTION

Lately developers contesting to make the business or undertaking design automatically move. Either from the way that timber used is with implementation of Flexible Manufacturing System (FMS).

FMS is a manufacturing system in which there is some amount of flexibility that allows the system to react in the case of changes, whether predicted or unpredicted. This flexibility is generally considered to fall into two categories, which both contain numerous subcategories.

The first category, machine flexibility, covers the system's ability to be changed to produce new product types, and ability to change the order of operations executed on a part. The second category is called routing flexibility, which consists of the ability to use multiple machines to perform the same operation on a part, as well as the system's ability to absorb large-scale changes, such as in volume, capacity, or capability. The whole FMS is commonly controlled by a central computer.

The main advantages of a FMS are its high flexibility in managing manufacturing resources like time and effort in order to manufacture a new product. The best application of a FMS is found in the production of small sets of products like those from a mass production. Another advantages is productivity increment, preparation time for new products is shorter due to flexibility, saved labor cost, improved production quality, it is not always necessary that on increasing flexibility it also increases productivity. To fulfill this advantage, all the system of FMS must be automate.

The word of automation means the machines or equipment we require to automated are used the control system such as computer or other controller to control the machines and processes to replacing the human operator in industrial. The automation sometimes used to assist the human with the physical of work, it's been greatly reduces the human sensory requirement. However, no device were created can match human eye in accuracy and precision in many task.

Currently, for manufacturing companies, the purpose of automation has changing from increasing productivity and reducing costs, to better range issues, such as increasing quality and flexibility in the manufacturing process.

In every automated machine we need the controller to control each process according our requirement. Specialized hardened computers, referred to as PLC, are frequently used to synchronize the flow of inputs from (physical) sensors and events with the flow of outputs to actuators and events. This leads to precisely controlled actions that permit a tight control of almost any industrial process.

Human-machine interfaces (HMI) or computer human interfaces (CHI), formerly known as man-machine interfaces, are usually employed to communicate with PLCs and other computers, such as entering and monitoring temperatures or pressures for further automated control or emergency response. Service personnel who monitor and control these interfaces are often referred to as stationary engineers.

Another major changing in automation is the increased emphasis on flexibility and convertibility in the manufacturing process. Manufacturers are increasingly demanding the ability to easily switch from manufacturing Product A to manufacturing Product B without having to completely rebuild the production lines.

1.1 Problem Statement

A recent trend in manufacturing industries is to make all process in manufacturing system is automated. All manufactures race to make their product high quality, to increase the productivity, to enhance the quantity, and to make their process flexible. Majority problem that face by product manufacturer is in assembly process product using operator assembler as which often foment in the quality. Problem that often face when using operator to assemble product is the quality produce did not keep customer needs. This may be due operator not very often is in deep comfortable position doing assembly process which job make over cause operator fatigue and could cause backache or more popularly known as musculoskeletal disorders (MSDs). In overcome this problem, most manufacture begins to look other alternative such as adaptation automation into each deep process in their product manufacturing. Additionally by using automation in the process their product can reduce especially cost of the labor. For adaptation deep automation their product's manufacturing process variety element should be considered like equipment use for automation stated process. Among the equipment often used currently is PLC, PLC is one device used to control process model which does neatly. Unlike general-purpose computers**,** PLC is designed with contains many input and output to be used to control many process without extended temperature ranges, immunity to electrical noise, and resistance to vibration and impact. The problem is to control the FMS system which needs deep expertise in installation programming of the PLC.

1.2 Objectives

a) To automate the assembly station of the FMS system for LCD assembly.
b) To install and develop the programming for PLC to control the movement of FMS system.

1.3 Scope of Project

The aim of this project is to generate a controller device for FMS system. It consist of develop the programming for PLC that used to control the whole of FMS system which is assembly of back cover computer monitor. For this aim we should know of whole system stated FMS including of that FMS system, assembly of back cover monitor computer, PLC, pneumatic system, and the type of PLC we used. Below shown the element of the scope:

1.3.1 Assembly of Back Cover

a) Learn the sequence of the assembly process
b) Identify the component used for this station
c) Identify input and output used and their address to communicate with PLC

1.3.2 PLC and Siemens PLC

a) Analyze the features and identify the components on PLC program.
b) Study ladder diagram that being used in Siemens PLC
c) Learn the function of block diagram and learn how to program that being used as network program between PLC and the system.
d) Investigate and describe the function of each component or device in PLC such as timer, counter and relay.

1.3.3 Pneumatic System

a) Analyze the component of pneumatic in this system.
b) Investigate the features each pneumatic component to be used as input and output with PLC.
c) Learn how to communicate pneumatic component with PLC.

CHAPTER 2

LITERATURE REVIEW

This chapter will describes several literature reviews about the theory of FMS, its development, controller for FMS, theory of PLC, PLC component, PLC Siemens, and Liquid Crystal Display (LCD) monitor.

2.1 FMS

FMS is an integrated production system composed by a set of independent machining centers (MCs). An automatic part handling system (PHS) interconnects the MCs to a group of part-storage locations such as loading/unloading positions and input/output buffers. An automatic tool handling system (THS) interconnects the MCs to a group of tool-storage locations as tool magazines, tool rooms, exchangers and spindles. Either the PHS and THS mechanisms consist of one or more automated guided vehicles (AGVs) or transporters. A central supervisor (the FMS control software) monitors and manages the whole system. Three different kinds of object flows may be identified: the material flows (physical objects as parts, tools, pallets and fixtures), the information flows (abstract objects that describe the system status), and the decision flows (A. Anglani, 2002)

FMS have provided solutions to a myriad of problems afflicting small to medium job shop type manufacturing firms. There is a substantial and still growing body of literature on a variety of FMS related issues including the complex FMS set-up problem. The set-up problem constitutes a set of sub-problems that include the part mix selection (Choobineh, 1988; Kumar & Shankar, 2000)

FMS is a configuration of computer-managed numerical work stations where materials are automatically handled and machine loaded. The flexible manufacturing system is principally used in mid-volume (200 to 30,000 parts per year) mid-variety (5 to 155 part types) production. (Flexible Manufacturing, 2007]

2.1.1 FMS Components

Inside FMS system there were important components need to be known before we implement this system. Among component consist in FMS system is two or more computer-managed numerical work stations that perform a series of operations, an integrated material transport system and a computer that controls the flow of materials, tools, and information (e.g. machining data and machine malfunctions) throughout the system, and auxiliary work stations for loading and unloading, cleaning, inspection, etc. Figure 2.1 show the example of FMS and figure 2.2 show the real FMS machining process. (SNK Flexible Manufacturing System,2007)

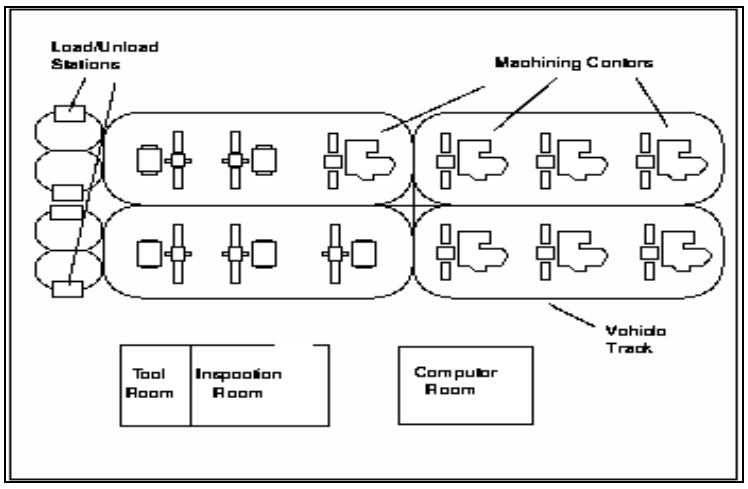

Figure 2.1: A Flexible Manufacturing System