FMS200 OUTPUT COUNT DISPLAY

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FAKULTI KEJURUTERAAN ELEKTRONIK DAN KEJURUTERAAN KOMPUTER

BORANG PENGESAHAN STATUS LAPORAN
PROJEK SARJANA MUDA II

Tajuk Projek : FMS200 OUTPUT COUNT DISPLAY

Sesi Pengajian : 2006/2007

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

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ABSTRACT

The Flexible Manufacturing System, FMS200 consists of 8 stations, where each station has its own electrical panel and the wiring system is fully visible for study. New elements may be fitted to the panel if desired. Station 8 of FMS200 which is the storage station can only holds up to 20 pallets or finished products. Unfortunately it didn't have any display or counter to show user that the maximum storage capacity has been reached. This may cause problem as user must be there at all time to manage the station. The idea of building a *FMS200 Output Count Display* for station 8 of FMS200 is generated due to this weakness. Other additional features to be add to help smoothen this station's process is by providing a buzzer to alert user when the maximum value is reached. Overall, this project is divided into two parts which are software and hardware. The software is about programming a PIC to control the counter, a display and also buzzer while the hardware is an electronic circuit that is constructed to detect each output by using a sensor. For user's convenience a dot matrix type display is used instead of the conventional 7 segment display as it can give clearer view of the numbers. When the sensor detects the presence of product, it will send signal to the PIC and the quantity of the product will be displayed on the dot matrix display. By sending a signal to the PIC, the quantity of the product that went across the sensor will be displayed.

ABSTRAK

Flexible Manufacturing System, FMS200 terdiri daripada 8 stesen, di mana setiap stesen mempunyai panel elektrik yg tersendiri dan sistem pendawaian dan automasi boleh dilihat sepenuhnya untuk tujuan pembelajaran. Kelebihan FMS200 ini ialah fleksibiliti sistemnya yang membolehkan sebarang elemen-elemen baru ditambah mengikut keperluan. Mengikut spesifikasi, Stesen 8 FMS200 hanya mampu menyimpan sehingga 20 palet atau produk sahaja. Stesen ini juga tidak mempunyai sebarang paparan atau pengira untuk menunjukkan pada pengguna bilangan produk yang disimpan di Stesen 8 sudah mencapai nilai maksimum. Ini akan menimbulkan masalah kerana pengguna terpaksa berada berdekatan dan berjaga-jaga sepanjang masa untuk menguruskan stesen tersebut. Idea untuk menghasilkan *FMS200 Output Count Display* ini adalah disebabakan kelemahan ini. Elemen lain yang turut ditambah ialah *buzzer* yang akan berbunyi apabila jumlah produk di stesen 8 sudah mencapai nilai maksimum. Projek ini terbahagi kepada 2 bahagian iaitu pengaturcaraan dan perkakasan. Pengaturcaraan melibatkan PIC untuk mengawal keseluruhan litar termasuk pengira, paparan dan juga *buzzer* sementara perkakasan pula melibatkan merekabentuk dan menghasilkan satu litar elektronik yang mempunyai satu pengesan untuk mengesan kehadiran produk. Untuk kemudahan pengguna paparan jenis *dot matrix* digunakan kerana paparan nombor yang dihasilkan lebih jelas untuk dilihat berbanding paparan menggunakan jenis *7 segment*. Secara ringkasnya, sistem ini mula beroperasi apabila pengesan mengesan kehadiran produk dan menghantar isyarat kepada PIC yang seterusnya akan menghidupkan paparan pada *dot matrix* mengikut pengaturcaraan yang telah dibuat.

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FMS	-	Flexible Manufacturing System
POV	-	Persistence Of Vision
PIC	-	Programmable Integrated Circuit
CC	-	Common Cathode
CA	-	Common Anode
LED	-	Light Emitting Diode
PLC	-	Programmable Logic Circuit
EMI	-	Electromagnetic Incompatibility
RA	-	Port A for PIC16F84A
RB	-	Port B for PIC16F84A
GND	-	Ground
DTR	-	Data terminal ready
CTS	-	Clear to send
DTE	-	Data Terminal Equipment
DCE	-	Data Communications Equipment
GUI	-	Graphic User Interface

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CHAPTER I

INTRODUCTION

1.1 PROJECT INTRODUCTION

The Flexible Integrated Assembling System (FMS 200) is a comprehensive training system developed by SMC International Training. It is manufactured entirely from industrial grade materials of maximum strength and quality and complies with European safety directives in respect of both low voltage and machine safety. The machine includes a 4 meter line transfer system which integrates to 8 stations. Familiarizing students with FMS 200 will enable the development of various skills associated with pneumatic, electro pneumatic, electrical, robotic and handling automatisms, programming and PLC technologies, industrial communications, supervisions, quality control and fault diagnosis and repair. It also allows the study of wide range of sensor types. The process stations or layouts function either independently of the transport system, or integrated to it. Each station has its own electrical panel, where the wiring system and automaton are fully visible for study, while new elements or upgrade may be fitted to the panel if desired. Students may design and build their own controls with different automatons and subsequently integrate them in the station, thereby developing a further series of skills.

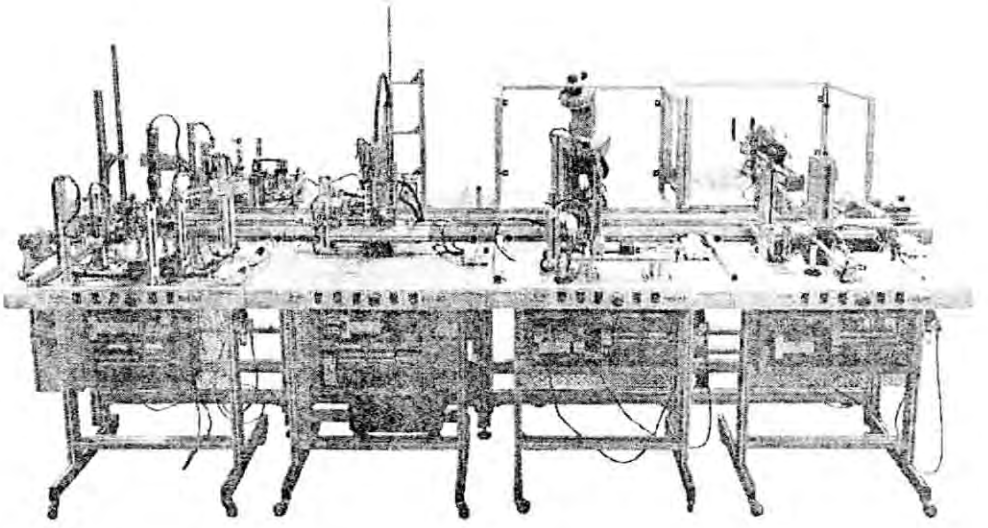

Figure 1.1: The FMS200 workstation

While new elements may be fitted to the panel if desired. Parts are transported between the different stations or layout by an automated 4-metre transfer line with corresponding stoppers and precision lifters-positioners. This is where the idea of building a FMS200 COUNT OUTPUT DISPLAY is generate.

This FMS200 COUNT OUTPUT DISPLAY is use to develop a new upgrading FMS200. The project involves a software and hardware. The software is about programming of PIC is used to setup the counter and displayer depending on the output of the FMS. The hardware is an electronic circuit that will be created to detect each output by using a sensor. By sending a signal to the displayer, the quantity of the product that go through the sensor will be displayed.

1.2 OBJECTIVES

The objective of this FMS200 COUNT OUTPUT DISPLAY is to identify the quantity of the product from the FMS200 machine. The identification of the product can

be detected by using a sensor that will sense the presence of the product that went across the sensor.

Other objectives should be achieve is to display the quantity of the product on the LED displayer so that people can monitor the output product per hours. This will help people to know the current quantity of the complete product. A buzzer to alert user that current count of assembled product has equaled the user preset count and a counter reset button should also be added in the FMS200 machine new features.

All these new features will be controlled by PIC. PIC is another technology in the electronic industry, which is a simple chip with memory to control some process. PIC will work based on the programming that is burned into it by the programmer. When the PIC is activated, it will start running the program by sending a bit that will produce voltage to activate the driver circuit.

The last objective is to construct the driver circuit to deliver the signal from the PIC to the LED display. By constructing the electronic circuit, all the theory of electronic can be implemented directly. The skill of troubleshooting the circuit also can be mastered.

1.3 SCOPE OF WORKS

The FMS200 COUNT OUTPUT DISPLAY involve a lot of procedure that focusing on how to identify each output product and displaying the quantity of each output product that comes out from the FMS200 machine. This project involves 100% PIC programming where all the new features added will be installed at station 8 of FMS 200, the storage area.

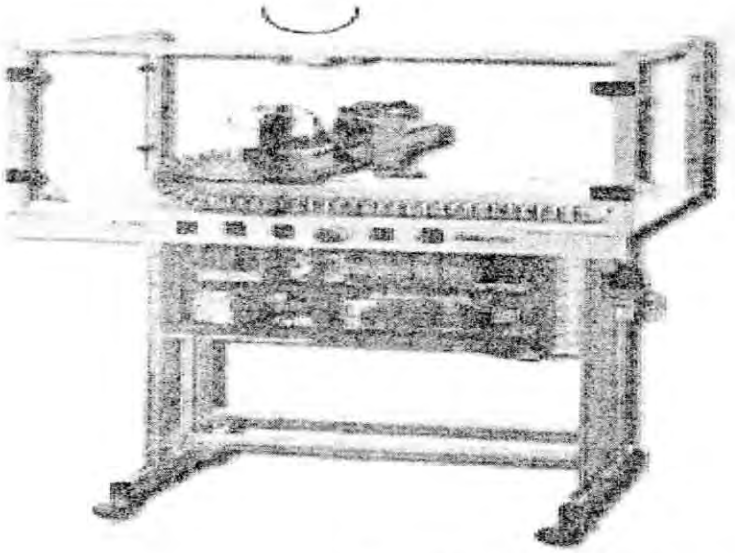

Figure 1.2 Station 8 of FMS 200

The storage system of FMS 200 consists of two position controlled axes which distribute the assemblies along the surface of the table.

Vertical axis:

The system of holding the finished assemblies incorporates four suction cups which use an ejector produced vacuum to hold the assembly until it is positioned at its storage point. This axis takes the form of a parallel rod cylinder on which the suction cups are fitted. As all the stations which make use of vacuum components, a pressure sensing element consisting of a vacuum switch is fitted. This supplies a digital signal indicating that the ejector has produced the level of vacuum needed to hold the assembly firm enough.

Positioning Axes:

The first task in storing the finished assemblies is to situate the vertical axis mentioned above over a fixed pick up point over the place where the pallet is retained facing the station. The finished assembly is the n picked and lifted by the pneumatic cylinder forming the vertical axis. The assemblies to be stored must now be positioned at various points over the surface of the station table before being unloaded at these points. From the mechanical point of view, these components incorporate a precision lead screw with a recirculating ball system, together with two lateral linear guides of high rigidity and precision, able to withstand the forces arising out of the loads acting on the carriage. These components allow the study of electric motors used in application which call for position control, increasing further the number of technologies associated with automation which are dealt with by this flexible cell.

There will be a LED display (also known as dot matrix) need to be use in this project. It will show up the number in range from 0 to 99. However we expected that the LED displayer could display at least from 0 to 20. Each number that is displayed is fully controlled by the PIC. The PIC that will be use in this project is PIC16F877.

The programming of this PIC is more specific to the signal receiving by the sensor each time it detect the object. And the signal will be send to the PIC, and the program in the PIC will display the number of the output product at the LED displayer. The processes are continuously each time the sensor detect the object. The designing of the electronic circuit will include the sensor which will determine each object that comes out from the FMS200 machine.

The sensor that will be use is the limit switch type. The electronic circuit will be designed free from noise. Resistors on the board limit the current to the LEDs to prevent damage to the microcontroller as each output of the chip can deliver a maximum of 25 miliamps.

To finish this project, focus should be more on Programmable Integrated Circuit (PIC); learning the programming language, choosing the suitable microcontroller and

other related components. There are numerous types of programming language to be chosen such as

I. C or C++ programming
II. Visual Basic
III. Assembly Language

Revision and research must be done on all the programming language to determine which one is the most appropriate for this project. Research about type of display proposed for this project, the 7x5 or 8x8 type LED dot matrix display and type of microcontroller suitable to be used. Research on using transducer as buzzer based on their frequency and suitability. Besides that the designed circuit and hardware must be suitable to be placed on station 8 of FMS 200.

1.4 PROBLEM STATEMENT

The FMS200 machine is located at the Automation Lab, FKEKK. This machine didn't have the features to set and count the output product. This is where the difficulty arise; to identify how many outputs has been produced. In industrial, each output need to be counted so that we know the performance of the machine, whether it is in good condition or not. Low output means that the machine has some problem and it need to be troubleshot and mended to achieve optimum performance.

Besides that the more defect products mean the poorer operation of the machine. So the counter is needed to minimize the waste and to increase the productivity. It is important to achieve the production plan, so each output product need to be recorded and the production requirement can be fulfill.

1.4.1 Problem Solving

Using the electronic counter is the smartest choice to solve the problem. There are several types of electronic counter in the market such as:

a- *The traditional counter*: A patented basic design to achieve high performance over a wide temperature range with low power consumption. Low cost, large quantity discounts, patented high performance mechanism, rugged plastic package and long life.

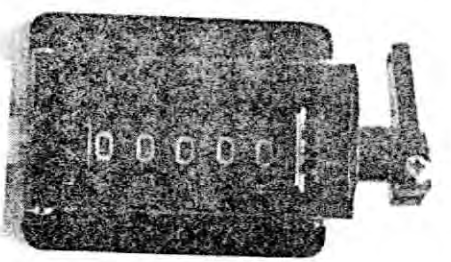

Figure 1.3 The traditional counter

b- *The LED-7-segment*: Suitable for portable devices, vending and gaming machines, printers and copiers. Can be used for simple counting, length and distance measurement. Non-volatile memory (no battery). Wide temperature range and wide voltage supply range. Very high reliability. Small size and low cost.