UPGRADE FMS200: STATION 4 MONITORING SYSTEM

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PROJEK SARJANA MUDA II

Tajuk Projek : UPGRADE FMS200: STATION 4 MONITORING SYSTEM

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Dedicated to my family especially my parents, brothers and to my entire friend.

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ABSTRACT

For FMS-200 system, each of the workstations is comprised of a structure based on aluminum profiles where the elements to carry out the corresponding process are located. The front part includes the control unit which consists of the control panel and the PLC selected by the user. The conventional FMS200 system is controlled by using push button control panel which is inconvenient in term of controllability and appearance which lack of description about the operation of the system, high of cost maintenance, and having a lot of wiring. This particular project is to upgrade the FMS200 with notification/alert message which appear at the touch screen control panel. The upgrade plc programming code with pop-up notification message function is developed with CX-programmer software. While the Human machine interface is create by using CX-Designer. This front panel provides user interface, which is used to operate the system with multiple options such as start or stop operation, auto or manual operation, reset operation, and material selection option. In order to conduct interfacing between the PLC controller and the Touch screen control panel, an interface card is required to be installed to the system.

ABSTRAK

Untuk sistem FMS-200, setiap stesen kerja melaksanakan bahagian yang tertentu dimana setiap hasil pemasangan daripada stesen yang tertentu akan dihantar ke stesen yang seterusnya untuk kerja pemasangan yang tertentu. Secara asalnya, sistem ini dikawal melalui suis tekan tutup pada papan pengawalannya. Akan tetapi, jenis pengawalan secara ini adalah kurang cekap dari segi pengawalan serta dalam segi kecantikan dimana kurang penerangan tentang operasi dalam sistem, kos penyelenggaran yang tinggi dan pemasangan litar yang banyak. Dalam projek ini, sistem ini akan di naik taraf dengan teknologi terkini iaitu dengan menunjukkan notis/waspada mesej pada produk "touchscreen" panel. Selain daripada ini, dalam projek ini aturcara untuk membolehkan pengguna dapat tahu masalah-masalah yang berlaku dalam sistem melalui notis/waspada mesej juga telah dituliskan dengan menggunakan CX- Programmer. Manakala sistem pengawalan untuk "touch screen" akan dicipta dengan menggunakan aturcara "CX-Designer". Bukan begitu sahaja, sistem pengawalan ini membolehkan pengguna mengawalkan sistem dengan pilihan seperti operasi start atau stop, operasi auto atau manual, operasi reset, dan jenis shaft pemilihan. Demi tujuan perantaraan antara Pengawal PLC dan "Touch Screen Control Panel" satu kard perantaraan dipasangkan pada mesin.

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FMS	-	Flexible Manufacturing System
PLC	-	Programmable Logic Controller
LCD	-	Liquid Crystal Display
PID	-	Proportional-Integral-Derivative
AC	-	Alternating Current
CNC	-	Computer Numerical Control
RAM	-	Random Access Memory
PIC	-	Peripheral Interface Controller
I/O	-	Input/output
SAC	-	Single Acting Cylinder
DAC	-	Double Acting Cylinder
RAC	-	Rotary Air Cylinder
SMS	-	Short Message Service
GSM	-	Global System for Mobile Communication
SCADA	-	Supervisor Control and Data Acquisition

CHAPTER I

INTRODUCTION

This chapter will discuss the introduction of FMS-200 and describing the technique used to upgrade the touch screen panel that will popping with notification/alert message by using the CX-One software. The block diagram gave the general ideas on this project. In addition, objectives, problem statement of the project and the report structure are included as well.

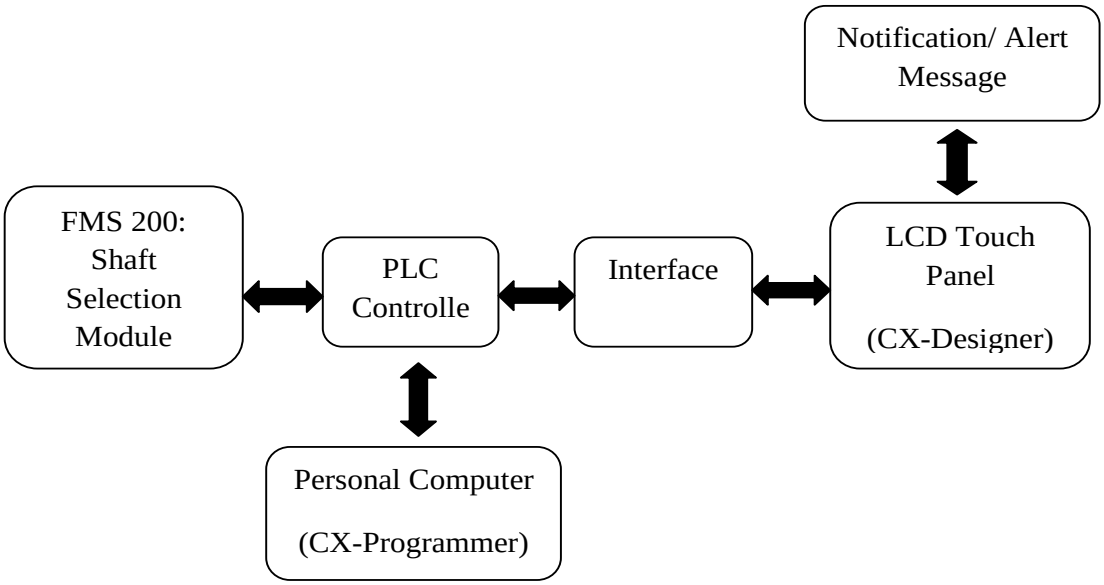

Figure 1.0: Block Diagram of the project

1.1 Introduction to FMS 200 system

A flexible manufacturing system (FMS) is a manufacturing in which there is some amount of flexibility that allows the system to react in the case of changes, either 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 ability to be changed to produce new product types, and ability to change the order of operations executed in a part. The second category is called routing flexibility, consisting of the ability to use multiple machines to perform the same operation in a part, as well as the system's ability to absorb large-scale changes, such as in volume, capacity, or capability. There are 8 stations involve in FMS-200. These 8 stations are stated below.

i. Body Feed-Positioning (Body supply)
ii. Pick and Place Bearing (Bearing supply)
iii. Press Bearing in Hydraulically (Hydraulic press)
iv. Pick and Place Shaft and verify (Shaft selection/supply)
v. Pick and Place Cover (Cover selection supply)
vi. Fit Screws (Screw supply)
vii. Robot Screw Driving (Robotized screwing)
viii. Unloading, storage and palletization of final assembly.

1.2 Project Objectives

There are several objectives that need to be achieved at the end of final year project. The lists of objectives are as below:

i. To upgrade the system with notification and alert message in the touch screen panel which will increases performance and efficiency of the system.

ii. To enhance the system with ability to conduct reprogramming without consideration in hardware input.
iii. To develop a system that able to provide information when system error occurred.
iv. To reduce the cost of maintenance of conventional push button control panel.
v. To reduce the time taken for troubleshooting of the machine.

1.3 Problem Statement

In this fourth workstation, there are mounted with a lot of sensor and actuator material in the machine. When there are any error occurs in the system, it is hard to know which part of the system is goes wrong. So that, it is need to take time in troubleshooting and maintenance. This is mainly due to the conventional control program lack of function to provide the information in the system.

The existing control panel consists of a start push button, stop push button, a reset push button, a selective switch to choose either continuous cycle or single cycle, and a push button meant for emergency stop. This control panel is lack of description about the operation of the system, and consist a lot of wiring.

1.4 Scope of Work

The scope of work in this project is started as given:

1. Familiarization on the FMS-200 operation.
2. The PLC Programming Code is required to be modified in order to enable detect the error occur so that it can be show out in the touch screen panel.
3. NS-5 has been chosen as the LCD Touch screen to replace the conventional push button control panel and added with the features of display mode notification/alert message.

4. CX-Designer from CX-One software is used to create the human machine interface.
5. Interface Card from Omron Manufacturer is used to communicate between the PLC and the LCD Touch screen.

1.5 Report Structure

The thesis consists of five chapters and each chapter is described as below:

Chapter 1, the introduction of FMS-200 and describing the technique used to upgrade the touch screen panel with notification/alert message by using the CX-One software. The block diagram gave the general ideas on this project. In addition, objectives, problem statement of the project and the report structure is included as well.

Chapter 2, the background study of the project along with the literature review is performed and document about the theoretical concept applied in completing the project. Background studies on the PLC and operation method are stated throughout this project.

Chapter 3 is the introduction of the methodology for the project, design flow and construction of the project. Brief description is given about each procedure in the completion of the project.

Chapter 4 shows overall result and discussion of the result on current project. The developed of the draft of touch screen panel, the created selective mode in the touch screen panel about the project are shown in order to strengthen the result.

Chapter 5 is the final part of the thesis which concludes the Final Year Project. This chapter includes the application of the project and the recommendation that can be implemented for future references.

CHAPTER II

LITERATURE REVIEW

In this chapter, discusses regarding the background study of the project along with the literature review is performed and documented about the theoretical concept applied in completing the project. Background studies on the PID controller and AC motor operation method are stated in this chapter.

2.1 Introduction of Literature Review

A flexible manufacturing system (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.

Most FMS systems comprise of three main systems. The work machines which are often automated CNC machine are connected by a material handling system to optimize parts flow and the central control computer which controls material movements and machine flow.

The main advantages of an FMS are its high flexibility in managing manufacturing resources like time and effort in order to manufacture a new product. The best application of an FMS is found in the production of small sets of products like those from a mass production.

Advantages of this system are:

i. Productivity increment due to automation.
ii. Preparation time for new products is shorter due to flexibility.
iii. Saved labour cost, due to automation.
iv. Improved production quality, due to automation.
v. However, it is not always necessary that on increasing flexibility productivity also increases.

2.1.1 Flexible Manufacturing System 200

FMS is a flexible automation cell that allows the introduction of variations in the posts of which it is comprised towards adapting to the different requirements of companies and training centres. The system itself has eight stations involving a whole series of feeding, handling, verification and loading operation worked out using components from different technologies for smooth operations.

In fact, there are two alternative forms of transferring the final product being assemble in the different station by using a meter ling bidirectional conveyor belt that able to attach 8 workstations or using modular conveyor belts.

Basically, the station can be easily extracted from the cell so that work can be done autonomously. Apart from that, each of the station carries out one part of the assembly process by using various technologies used in automated industry.

Figure 2.1: FMS-200 System

2.1.2 Shaft Supply Module

In this fourth workstation, the shaft is assembled on the product in process coming from the previous station. There are two types of shafts depending on the material of which they are manufactured: aluminum and nylon. This increases the number of possible finished products which are assembled, while also increasing the didactic capacities of the FMS-200.

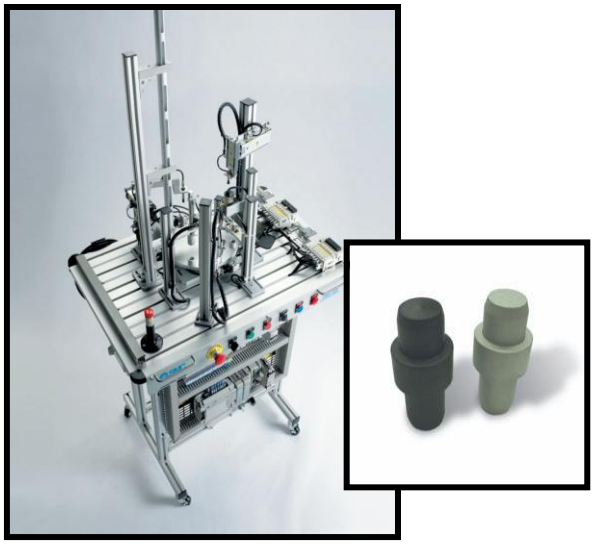

Figure 2.2: Station 4 of the FMS-200 and the Types of Shafts

In this fourth workstation, the shaft is assembled on the product in process coming from the previous station. There are two types of shafts depending on the material of which they are manufactured: aluminum and nylon. This increases the number of possible finished products which are assembled, while also increasing the didactic capacities of the FMS-200.There are number of sub-module on this station which have specific task to complete in order to fulfill the main purpose of the system which to supply the shaft. The sub-modules are:

- Index plate
- Feeding of shaft
- Measuring the shaft height
- Positioning the shaft in the correct position
- Material detection system
- Evacuation manipulator
- Insertion manipulator

Index plate:

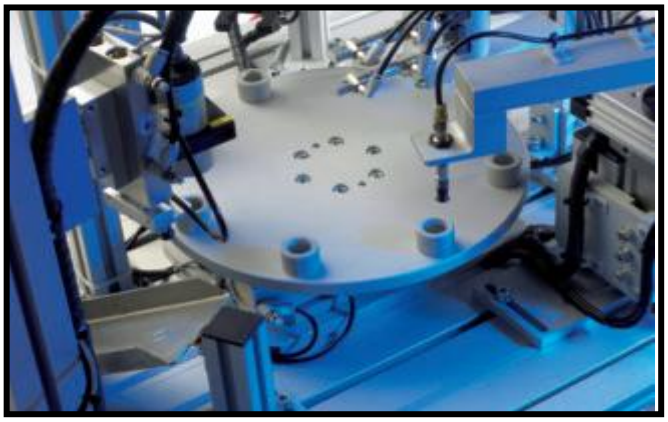

Figure 2.3: The Index Plate

The different operations undertaken in this station are distributed around an index plate. This plate uses an oscillating pusher cylinder and two stopper cylinders which work alternatively, to rotate a specific number of degrees between each of the operation which are carried out in relation to it.

Feeding of shaft:

The shafts remain stored in a gravity feeder. By using a stepper feeding system (formed by two pneumatic cylinders) they are extracted and left in the first position of the revolving plate.

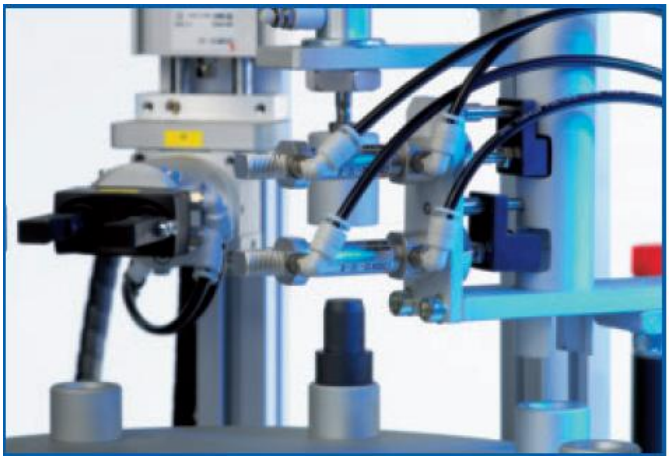

Figure 2.4: The stepper feeding system