UPGRADE FMS200: SHAFT SUPPLY MODULE THOUGH HUMAN MACHINE INTERFACE

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BORANG PENGESAHAN STATUS LAPORAN

PROJEK SARJANA MUDA II

Tajuk Projek : UPGRADE FMS200: SHAFT SUPPLY MODULE WITH HUMAN MACHINE INTERFACE

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Dedicated to my family especially my parents, brothers and to all of my 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. Besides that, the system is also lack of options for material shaft selection and will insert two kinds of the shafts into the assembly which contributes to the limitation of the performance of the system. This particular project is to upgrade the FMS200 with the touch screen control panel and enhance the system with ability to carry out material selection for the shaft. The upgrade plc programming code with material selection 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. Selain daripada ini, secara asalnya, Sistem ini juga kekurangan pilihan untuk memilih jenis "shaft" iaitu sama ada jenis aluminium ataupun jenis nylon. Dimana ia akan memasuki kedua-dua jenis shaft ke dalam assembly. Dalam projek ini, sistem ini akan di naik taraf dengan produk teknologi terkini iaitu dengan "Touch screen control panel". Selain daripada ini, dalam projek ini aturcara untuk membolehkan pengguna membuat pilihan untuk jenis "shaft" yang dimasukan dalam sistem juga telah dituliskan dengan menggunakan CX- Programmer. Manakala sistem pengawalan untuk "touch screen" akan dicipta dengan menggunakan aturcara "CX-Designer". 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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INTRODUCTION

In this chapter, discusses regarding the introduction of FMS200 and describing the technique used to upgrade the shaft selection option by using CX-Programmer. 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.

1.1 Introduction to FMS 200 system

The purposes for this project are to upgrading the FMS200 with the touch screen control panel and enhance the system with ability to carry out material selection for the shaft. The conventional FMS200 system is controlled by using push button control panel which is inconvenient, lack of description about the operation of the system, high of cost maintenance, and having a lot of wiring. Besides that, the system is also lack of options for material shaft selection and will insert two kinds of the shafts into the assembly which contributes to the limitation of the performance of the system.

First of all, the CX-programmer software is used to create a plc programming code. The function of this new programming code is to enable the user to select either one type of the shaft to be inserted to the assembly while evacuate the other. In addition

to that, the CX- Designer software is also used to construct a front panel of virtual instrument. 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. Thus by upgrading the systems to a LCD touch screen control panel, it is now able eliminate the limitation for the conventional control panel and enhances the performance of the system.

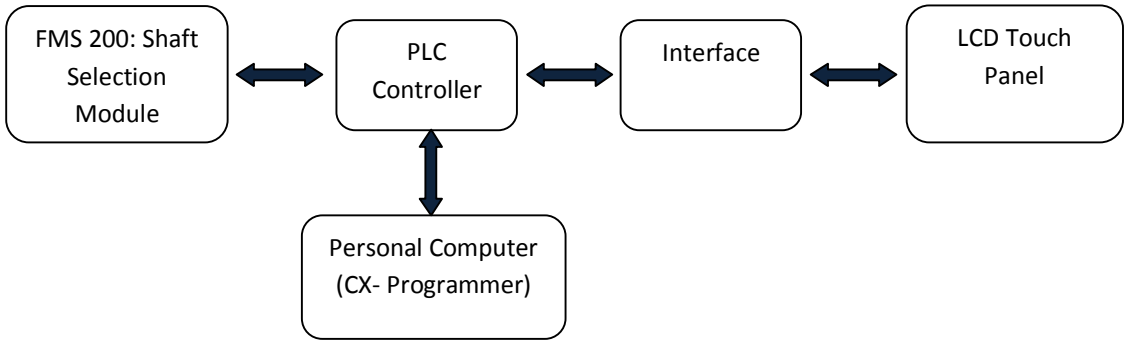

Figure 1 : Block Diagram

1.2 Project Objectives

There are several objectives that need to be achieved at the end of PSM. The objectives are listed as below:

i. To upgrade the system with LCD Touch Screen control panel which will increases flexibility of the system, reduces the wiring as well as the space requirement for the control panel.

ii. To enhance the system with ability to conduct reprogramming without consideration in hardware input.

iii. To upgrade the system with ability option to carry out material selection for shaft supply.

iv. To reduce the cost of maintenance of conventional push button control panel.

v. To provide a medium for the user to collect the information data regarding the performance of the system such as total output, total reject and etc.

vi. To enable the user to understanding the operation of the system with more easily way though manual selection.

vii. To provide a platform for user to verify the input signal and output signal and also as a platform for training purpose.

1.3 Problem Statement

The FMS-204, which is the fourth station from the SMC-FMS-200 Training module, is mounted with the inductive and capacitive detector to detect the material of the shaft. However, it is unable to evacuate the undesired material from the rotation plate and hence, it will insert two different types of material shafts into the assembly. This is mainly due to the conventional control program lack of function to carry out a selection of shafts.

The conventional 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 FMS200 operation.
2. The PLC Programming Code is required to be modified in order to enable selection of material of shafts using CX-Programmer from CX-One Software.
3. NS-5 has been chosen as the LCD Touch screen to replace the conventional push button control panel.
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

This thesis is a document report of the ideas generated, the theories and concepts applied, the activities performed and the final product of this project produced. The thesis consists of five chapters and each chapter is described as below:

Chapter 1, the introduction of FMS200 and describing the technique used to upgrade the shaft selection option by using CX- Programmer. 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 material selection of shaft on FMS200 shaft supply module, the created electric diagram block diagrams 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 throughout this project.

2.1 Introduction

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.

An advantage of this system is:

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. These 8 stations are stated below.

i. Body Feed-Positioning
ii. Pick and Place Bearing
iii. Press Bearing in Hydraulically
iv. Pick and Place Shaft and verify
v. Pick and Place Cover
vi. Fit Screws
vii. Robot Screw Driving
viii. Unloading, storage and palletization of final assembly.

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: FMS200 System

2.1.2 Shaft Supply Module

In the fourth workstation, the shaft is assembled on the product in process coming from the previous station. The two types of material of which they are manufactured which is aluminium and nylon increase the number of possible finished products that are assembled as well as increasing the didactic capacities of the FMS200.

The distribution around an index plate from the different operation uses an oscillating pusher cylinder and two stopper cylinders which work alternatively.

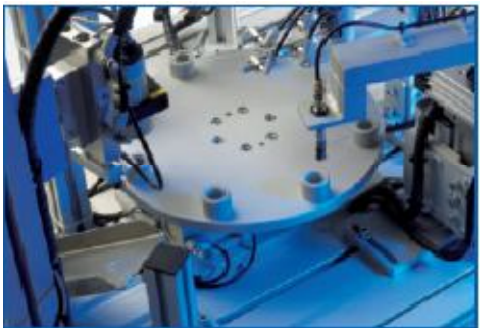

Figure 2.2: Index Plate

Figure 2.3: Feeding Module

As the shafts remain stored in a gravity feeder, they are extracted and left in the first position of the revolving plate by using a steeper feeding system. Since the shaft is not symmetrical, it must therefore be positioned over the assembly in a specific position. In order to do so, the height is measured by a pneumatic cylinder together with a magnetic detector.

If the shaft is detected to be incorrectly positioned by the previous module a handling device has to correct it by rotating it with 180˚ rotary actuator which then places it back in the correct position.

Figure 2.4: Shaft Verification Module

Figure 2.5: Evacuation Module

The following two station modules select the type of shafts which is either nylon or aluminium to be assembled on the product in process and rejects shafts that are manufactured of undesired materials. This function is done by a handling device with two shafts with a vacuum pad at the end and each shaft is composed of a dual rod cylinder which handles the shaft lifting movements and brings it to the evacuation ramp.

When it comes to the last phase of the process, a rotor handling device which has an arm with vacuum pad then collects, moves and positions the shaft in the assembly by suction.