UNIVERSITI TEKNIKAL MALAYSIA MELAKA

COMPUTER INTEGRATED MANUFACTURING (CIM) – DEVELOPMENT OF MONITORING SYSTEM

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Manufacturing Engineering (Robotic and Automation) with Honors.

by

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FACULTY OF MANUFACTURING ENGINEERING

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DECLARATION

I hereby, declared this report entitled "Computer Integrated Manufacturing (CIM) – Development of Monitoring System" is the results of my own research except as cited in references.

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APPROVAL

This report is submitted to the Faculty of Manufacturing Engineering of UTeM as a partial fulfillment of the degree of Bachelor of Manufacturing Engineering (Automation and Robotics) with Honours. The member of the supervisory committee is as follow:

……

(Supervisor)

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ABSTRAK

Projek ini mengenai pembangunan sistem pengawasan, yang akan memberitahu berkenaan status mengenai prestasi CIM. Sistem ini akan dibangunkan dengan menggunakan Visual Basic dan isyarat akan dirakam menggunakan sensor yang sedia ada pada CIM. Sistem ini akan memaparkan lokasi produk pada tempat yang berbeza, pengeluaran dari segi lulus atau ditolak dan tanda-tanda penyelenggaraan dan pemaparan ini akan dipaparkan pada masa yang sama dengan pergerakan CIM. Projek ini difokuskan dalam merancang sistem pengawasan yang dapat memaparkan status CIM di makmal CIM di Fakulti Pembuatan di Universiti Teknikal Malaysia Melaka. Visual Basic 6 akan digunakan untuk pembangunan sistem pemantauan ini yang akan berkomunikasi antara Siemens PLC. Pengetahuan dalam pengaturcaraan sangat penting untuk menyelesaikan projek ini

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ABSTRACT

This project presents the development of monitoring system, which is to provide the current status in term of CIM's performance. The system will be developed using Visual Basic and the signals will be tapped using existing sensors on the CIM. As the result the system will display the location of the product on the different locations, outputs (pass and reject) and maintenance alerts, all on the real time basis. This project is focused in designing a monitoring system that can observed the current status of the current CIM in CIM Laboratory at Faculty of Manufacturing in University Teknikal Malaysia Melaka. Visual Basic 6 had been use to for the development of the monitoring system which will communicate between Siemens PLC. Knowledge in programming is vital in order to complete this project.

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DEDICATION

This report is dedicated for my parents, Abdullah bin Hamzah and Rohelah binti Omar, for all my siblings and friends, my beloved supervisor and for every kind of help and support.

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LIST OF ABBREVIATIONS

UTeM	-	Universiti Teknikal Malaysia Melaka
CIM	-	Computer Integrated Manufacturing
GUI	-	Graphical User Interface
CASA	-	Computer and Automated System Association
SME	-	Society of Manufacturing Engineering
FKP	-	Fakulti Kejuruteraan Pembuatan
PLC	-	Programmable Logic Controller
CAD	-	Computer Aided Design
CAM	-	Computer Aided Manufacturing
SM	-	System Monitor
VB	-	Visual Basic
PIC	-	Programmable Integrated Circuit
UART	-	Universal asynchronous receiver/transmitter

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CHAPTER 1
INTRDUCTION

1.1 Background

Computer Integrated Manufacturing or also known as CIM is commonly used in many industries. It is an approach of using computers integrated with automation industrial plant which is the entire process functioning is under digital control and digital information tying them together. This integration allows that the processes exchange information with each other and they are able to initiate actions. Through this integration, we are able to create an automation manufacturing system which is faster and less-error. Typically CIM relies on closed-loop control processes, based on real-time input from sensors. It is also known as flexible design and manufacturing [1].

The history of CIM begun in the last part of 1980‘s when industries want to improve the manufacturing process by introducing more computerizing systems in the manufacturing field. This idea of ―digital manufacturing‘ was promoted by machine tool manufacturers, Computer and Automated System Association (CASA) and Society of Manufacturing Engineers (SME). The innovation of CIM has been used widely in many manufacturing sectors such as automotive industries, electronic component industries and many more which is very useful to increase the productivity and reduce labor [1].

A typical manufacturing plant may have many software systems. But the heart of CIM is computer-aided design (CAD) and computer aided manufacturing (CAM). This system is essential to reducing cycle times in the organization. CAD and CAM is a high technology integrating tool between design and manufacturing which provide

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design/drafting, planning and scheduling and fabrication capabilities. CAD techniques make use of group technology to create similar geometries for quick retrieval. CAD provides electronic part images and CAM provides the facility for toolpath cutters to take on the raw piece. With the combination of CAD and CAM thus CIM was created [2].

As method of manufacturing, three components distinguish CIM from other manufacturing methodologies:

1. Means for data storage, retrieval, manipulation and presentation
2. Mechanism for sensing state and modifying process
3. Algorithms for uniting the data processing component with the sensor/modification component.

CIM implies that there are at least two computers exchanging information, for example the controller of an arm robot and the micro-controller of a CNC machine. Some factors involved when considering a CIM implementation are the production volume, the experience of the company or personnel to make the integration, the level of the integration into the product itself and the integration of the production processes. CIM is most useful where a high level of ICT is used in the company or facility [3].

Thus in a simple words, computer-integrated manufacturing system (CIM) is formed by many manufacturing functions and then those functions are linked through an integrated computer network. These manufacturing functions consist of production planning and control, shop floor control, quality control, computer-aided manufacturing, computer-aided design, purchasing, marketing, and other functions. The purpose of a computer integrated manufacturing system is to enable changes to be made in the product design, so that this can reduce the cost of correction and to optimize the production requirements [3].

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Figure 1.1: Example of CIM, Manufacturing Cell of the CIM Pilot Plant [4]

In the CIM Laboratory of Faculty of Manufacturing Engineering (FKP) of Universiti Teknikal Malaysia Melaka (UTeM), there is a CIM system for educational purpose. The CIM uses the Siemens PLC system which is connected to several actuators such as motors and pneumatic valve. The CIM also equipped with conveyor belts, several sensors and linked to the PLC. From previous project, the pick and place system has been developed as additional function on this CIM. The CIM can perform several task depends on how it programmed. The CIM is very useful for student as exposure before entering in working environment as an engineer.

Figure 1.2: UTeM Educational base CIM

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Figure 1.3: Pick and Place System 1

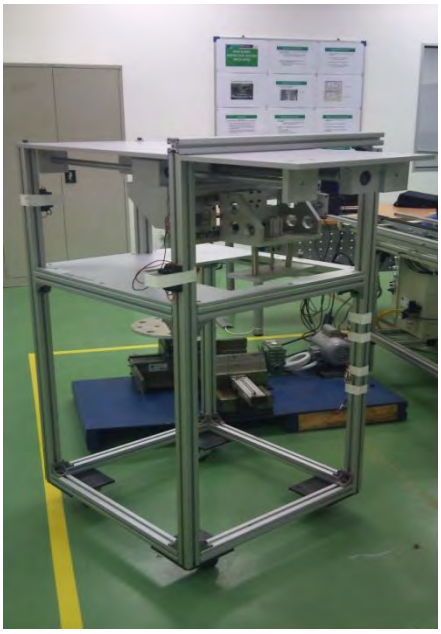

Figure 1.4: Pick and Place System 2

1.2 Problems Statements

From my observation, there are several improvements can be done with this CIM. Firstly the current pick and place system is not fully functional. This is because the PLC system is not fully integrated with the current CIM and the pneumatic cylinder cannot lift up because the weight of the load itself. Other than that the purpose of the current pick and place system is to use as educational exposure for the student after UTeM has invested some amount of money to prepare this system. Lastly as the additional improvement for the current CIM system, I have been instructed to develop a monitoring system for the CIM which can provide the current status of the CIM as my final year project (PSM).

This CIM monitoring system will monitor the inspection system that will inspect the circuit board using the existing CIM and pick and place system. The CIM will perform the continuity test on the self made circuit board that have been placed on a special jig that is fixed to the CIM‘s carriers base. The probing station will check the continuity between two points on the board and any board that failed the test will be removed at the reject station. This monitoring system will display the location of the products on the different locations, number of outputs (pass or reject) and maintenance alerts.

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1.3 Scope

My project will only focus on the development of monitoring system, which is to provide the current status in term of CIM‘s performance. The system will be developed using Visual Basic and the signals will be tapped using existing sensors on the CIM. As the result the system will display the location of the product on the different locations, outputs (pass and reject) and maintenance alerts, all on the real time basis. Apart from that the working system which is CIM responsible to do the inspection test will not be discussed in this report.

1.4 Objective

The objectives of this project are:

1. To study the CIM‘s working principle.
2. To design a monitoring system by using Visual Basic.
3. To integrate the monitoring system and CIM.
4. To analyze the performance of the monitoring system.

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