UNIVERSITI TEKNIKAL MALAYSIA MELAKA

AUTOMATED PLATFORM FOR COMPONENT SELECTION FOR DESIGNING MANUFACTURING SYSTEM FACILITY

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

by

MOHD ZAIDI BIN AHMAD SOFIAN
B051010041
870920035185

FACULTY OF MANUFACTURING ENGINEERING
2013
TAJUK: Automated Platform For Component Selection For Designing Manufacturing System Facility

SESUJI PENGAYAAN: 2012/13 Semester 2

Saya MOHD ZAIDI BIN AHMAD SOFIAN

Mengaku membenarkan Laporan PSM ini disimpan di Perpustakaan Universiti Teknikal Malaysia Melaka (UTeM) dengan syarat-syarat kegunaan seperti berikut:

1. Laporan PSM 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 ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. **Sila tandakan (✓)

☐ SULIT (Mengandungi maklumat yang berdasarkan keselamatan atau kepentingan Malaysia sebahagian yang termaktub dalam AKTA RAHSIA RASMI 1972)

☐ TERHAD (Mengandungi maklumat TERHAD yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan)

☐ TIDAK TERHAD

Disahkan oleh:__________________________________________

Alamat Tetap:__________________________________________

546 – C Bkg. Sek. Keb. Sri Bemban,
Jalan Abdul Kadir Adabi
15400 Kota Bharu, Kelantan.

Cop Rasmi:__________________________________________

**Jika Laporan PSM ini SULIT atau TERHAD, sila lampirkan surat dari pada pihak berkuasa/organisasi berkenaan dengan menyatakan sebab sebab dan tempoh laporan PSM ini perlu dikelaskan sebagai SULIT atau TERHAD.
DECLARATION

I hereby, declared this report entitled “PSM Title” is the results of my own research except as cited in references.

Signature : .................................
Author’s Name : MOHD ZAIDI BIN AHMAD SOFIAN
Date : 18 JUN 2013
This report is submitted to the Faculty of Manufacturing Engineering of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Manufacturing Engineering (Type your department’s name here) (Hons.). The member of the supervisory is as follow:

…………………………
(Mr. Muhamad Arfauz Bin A Rahman)
ABSTRAK

ABSTRACT

The purpose of this study is to develop an automated platform for component selection in designing manufacturing system facility. In designing manufacturing system facilities, time taken in design a production line is generally very long. One of the reasons is due to the high and complex requirement for identification and selection of components for a system. Each manufacturing system usually experience several phases. During the planning phase, consideration must be provided to critical factors like the market potential for the product, the design, the process used, facilities, equipment and materials required to produce. In the implementation phase, the resources available and put into place so that production can begin. The implementation phase goes with the controlling phase, in that the system must be controlled or managed both at the time of its implementation and during production. The system must devise, execute and control, generally by well-trained and efficient manufacturing and personnel management. In this project automated platform will be created by using CATIA for component library and designing system layout and Visual Basic software for graphical user interface (GUI) and programming. The platform created with a lot of component and system layout can cut the time of the design of production line, it is also easy to choose layout needed.
DEDICATION

To my beloved parents, Ahmad Sofian Bin Mohd Salleh and Masitrah Binti Taib. To my supervisor, Mr. Muhamad Arfauz Bin A Rahman, lecturers and friend for their help, support and friendship.
ACKNOWLEDGEMENT

In the name of Allah, the Most Merciful and the Most Beneficent. It is with the deepest senses gratitude of the almighty that gives strength and ability to complete this report. First and foremost, I would like to take the opportunity to thank Mr. Muhamad Arfauz Bin A Rahman, the lecturer and supervisor for my Final Year Project for his support and guidance. Thanks to my family who always support me in term of money, advice and motivate me to complete this project. And also not forgetting for entire friends and any other respondents, who have been involved directly for all their helpful cooperation, comments and their support in accomplished successfully in this project. Thank You
TABLE OF CONTENT

Abstrak i
Abstract ii
Dedication iii
Acknowledgement iv
Table of Content v
List of Tables x
List of Figures xii

CHAPTER 1: INTRODUCTION 1
1.1  Background 1
1.2  Problem Statements 3
1.3  Objective 4
1.4  Scope 4

CHAPTER 2: LITERATURE REVIEW 5
2.1  Manufacturing System Facility 5
2.2  Design of Manufacturing System Facility 6
   2.2.1 Fixed-position manufacturing system facility layout 7
   2.2.2 Functional manufacturing system facility layout 8
   2.2.3 Cell manufacturing system facility layout 8
   2.2.4 Product manufacturing system facility layout 9
2.2.5 Additional manufacturing system facility layouts

2.2.6 Advantages and Disadvantages of Basic Layouts

2.3 Component in Manufacturing System Facility

2.3.1 Sensors

2.3.1.1 Type of Sensors

2.3.1.2 Criteria to choose a Sensors

2.3.2 Actuators

2.3.2.1 Type of Actuators

2.3.2.2 Conveyor

2.3.2.3 Cylinders

2.3.3 Industrial Control System

2.3.3.1 Type of Industrial Control System

2.3.4 Standalone Equipment

2.3.4.1 Robot

2.3.4.2 Type of Robot

2.4 Component Selection in Manufacturing System Facility

2.5 Automatic Component Selection in Manufacturing System Facility

2.6 Platform for Component Selection

2.6.1 ACS

2.7 Software

2.7.1 Software for Programming and Interfacing

2.7.1.1 Visual Basic

2.7.1.2 Matlab

2.7.2 Software for Drawing and Designing
CHAPTER 3: METHODOLOGY

3.1 Introduction

3.2 Methodology Concept
   3.2.1 Phase 1
   3.2.2 Phase 2
   3.2.3 Phase 3
   3.2.4 Phase 4

3.3 Automatic Component Selection Procedure

3.4 Gantt Chart

3.5 Summary

CHAPTER 4: DESIGN AND DEVELOPMENT OF THE THEORETICAL STRUCTURE

4.1 Introduction

4.2 Library of Component
   4.2.1 Actuator
      4.2.1.1 Conveyor
      4.2.1.1 Cylinder
   4.2.2 Sensor

4.2.3 Standalone Equipment
LIST OF FIGURES

2.1 Manufacturing System Design Levels 6
2.2 Chute Conveyor 15
2.3 Wheel Conveyor 16
2.4 Chain Conveyor 16
2.5 Slat Conveyor 17
2.6 Flat Belt Conveyor 18
2.7 Hydraulic Actuators 19
2.8 Pneumatic Actuators 19
2.9 Electric Actuators 19
2.10 SCADA 22
2.11 PLC in Industrial Automation 22
2.12 KUKA Wash-Down Robot 23
2.13 Palletizer Robot 24
2.14 Occubot 24
2.15 Robotic Sprayer 25

3.1 Project Methodology 36
3.2 Automatic Component Selection Procedure 38
3.3 Gantt Chart 39

4.1 Conveyor 42
4.2 Cylinder
4.3 Sensor
4.4 Workstation
4.5 Robot Arm
4.6 Office Chair I
4.7 Office Chair I Parts
4.8 Office Chair I Layout A
4.9 Office Chair I Layout B
4.10 Office Chair II
4.11 Office Chair II Parts
4.12 Office Chair II Layout A
4.13 Office Chair II Layout B
4.14 Office Chair III
4.15 Office Chair III Parts
4.16 Office Chair III Layout A
4.17 Office Chair III Layout B
4.18 Office Chair IV
4.19 Office Chair IV Parts
4.20 Office Chair IV Layout A
4.21 Office Chair IV Layout B
4.22 Chair with Table
4.23 Chair with Table Parts
4.24 Chair with Table Layout A
4.25 Chair with Table Layout B
5.4  Office Chair IV Layout A  
5.5  Chair with Table Layout A
LIST OF TABLES

2.1 The advantages and disadvantages of the basic layout types 12

2.2 Example of subcategory of the three types of process technologies 26

4.1 Conveyor Symbol 42

4.2 Type of Conveyor 42

4.3 Cylinder Symbol 43

4.4 Type of Cylinder 43

4.5 Sensor Symbol 44

4.6 Type of Sensor 44

4.7 Workstations 45

4.8 Type of Workstations 45

4.9 Robot Arm Symbol 46

4.10 Type of Robot Arm 46

4.11 Office Chair I Parts 48

4.12 Office Chair II Parts 50

4.13 Office Chair III Parts 54

4.14 Office Chair IV Parts 56
4.15 Chair with Table Parts 60
4.16 Outdoor Chair Parts 63
4.17 Study Table Parts 64
4.18 Computer Table Parts 66
4.19 Room Table Parts 68
4.20 Glass Cabinet Parts 69
4.21 Locker Cabinet Parts 70
4.22 Wardrobe Parts 73
CHAPTER 1
INTRODUCTION

1.1 Background

Automated manufacturing is the manufacturing method relies on the use of computerized control system to simplify the layout of equipment in which the product is produced. Development of a fully automated production system dates to the second half of the 20th century, and manufacturing techniques used in the scale of various facilities around the world.

Historically, manufacturing has been committed entirely by hand. This requires a large amount of labor, driving up the cost of the final product, and also expose workers to hazards. During the Industrial Revolution, manufacturing machinery introduced. In the manufacture of machinery, workers operate equipment that is not labor, instead work directly. This reduces costs, better consistency, and contribute to the development of workplace safety. Automated manufacturing is the next step in the process of refining and modernizing manufacturing. In a fully automated facility, no man on the floor. Automated equipment to do the job, as ordered by the control system. The system uses complex software that can schedule manufacturing tasks and run diagnostics on equipment that appears to malfunction.

Automated equipment can fabricate, install, and packaged products. Some systems even if the product package for full delivery of invoices and mailing labels, send the products directly from the line and into the truck for delivery. Levels of automation
depending on the product and the company's budget, such as auto manufacturing is expensive to implement even if it saves costs in the long term. Consulting firms can help companies to order, install, and customize the automated systems for manufacturing applications.

From a safety perspective, auto manufacturing is a significant improvement. If people only on the assembly line when it closed for work on equipment, the risk of workplace injuries decreased dramatically. Managing automated systems also need more training and skills and translate into higher wages for workers involved in the maintenance and management of the system. Automated manufacturing also eliminates jobs, however. This has been criticized in areas where employment rates are low and people will prefer dangerous manufacturing jobs unemployment.

When planning, execution and control phase has been safely and successfully implemented, it is necessary that staff follow up with continuous improvement, to meet emerging demands, and also to ensure that the company will stay in business for a long time. It is at this stage that many technical managers, as graduates of Manufacturing Systems, using their initiative to review and improve different areas of their manufacturing systems for continuous productivity and better. Right now using of automatic component selection are really needed to speed up the design of the manufacturing system facility. This paper addressing why it is necessary to improve manufacturing systems, and how different improvements can be achieved in different areas of the field.
1.2 Problem Statements

In designing manufacturing system facilities, time taken to design a production line is generally very long. One of the reasons is due to the higher concentration identification and selection of components for a system. This system will help manufacturers shorten the time required to complete the layout, the manufacturer can also find the components needed for a layout.

Each manufacturing system usually experience several phases. The system must devise, executed and controlled, generally by well-trained and efficient manufacturing and personnel management. During the planning phase, consideration must be provided to critical factors like the market potential for the product, the design, the process used, facilities, equipment and materials required to produce. In the implementation phase, the resources available and put into place so that production can begin. The implementation phase goes with the controlling phase, in that the system must be controlled or managed both at the time of its implementation and during production.
1.3 Objective

The aim of this project is to develop an automated platform for component selection for designing manufacturing system facility. In order to achieve the aim the following objective need to be fulfilled:

i. To develop a component library for designing manufacturing system facility.

ii. To develop the interface and software for automated component selection.

iii. To provide the automation solution for system layout.

1.4 Scope

The project will only focus on furniture manufacturing system facility, which is to automate furniture manufacturing system facility layout selection. The system will be developed using Visual Basic and design of manufacturing system facility using Catia. As the result the system will show some of layout that already created and saved in this system.