UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DESIGN IMPROVEMENT ON AN MPOC USING DFMA

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Manufacturing Engineering (Manufacturing Design) with Honours.

by

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2009

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

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SESI PENGAJIAN : **2008/2009 Semester 2**

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I hereby, declared this report entitled "Design Improvement on an MPOC" is the results of my own research except as cited in reference.

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APPROVAL

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 (Manufacturing Design) with Honours. The member of the supervisory committee is as follow:

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ABSTRACT

The project is based on an industrial product which will be used to apply Design for Manufacture and Assembly (DFMA) for improvement. There are some significant problems faced by the company such as resources in analysis and development of the existing design products and assembly process. The objectives of this project are mainly to propose an improvement on the design of the Multi Purpose Outdoor Cabinet (MPOC) by optimizing the usage of manufacturing processes and minimize the number of components in an assembly or on the parts. A discussion is also included on the differences between traditional manufacturing development and DFMA approach which is more helpful in the product design development. The background and explanation of the basic concept and method of Boothroyd Dewhurst DFA, Lucas DFA method and the Hitachi Assembly Evaluation Method (AEM) were compared and discussed in this report. Lucas DFA methodology is chosen in this research and will be use to look up for an efficiency in assembly flow of the product. The analysis was done using DFA TeamSET to improve efficiency and effectiveness of assembly process. In addition, the Time Study method has been used in order to identify the total estimated reduction of cycle time for the product in Assembly Department. Based on the improvement design report, graph chart is plotted and shows the reduction in percentage.

ABSTRAK

Kajian ini berdasarkan produk industri dimana aplikasi ‘Design for Manufacture and Assembly (DFMA)’ digunakan untuk tujuan penambahbaikan. Objektif atau tujuan utama kajian ini adalah untuk mencadangkan pembaikan rekebentuk pada bahagian komponen produk yang sedia ada bagi mengoptimumkan penggunaan sistem dalam industri pembuatan dan juga mengurangkan bilangan komponen produk dalam pemasangan. Terdapat beberapa masalah yang dihadapi oleh syarikat seperti sumber dalam menganalisis serta penambahbaikan rekabentuk produk dan proses pemasangan yang sedia ada. Perbincangan juga menyentuh perbezaan penambah baikan antara pembuatan tradisional dan kaedah ‘DFMA’ dimana ‘DFMA’ sangat membantu dalam penambahbaikan rekabentuk produk. Latarbelakang dan penerangan mengenai konsep asas dan kaedah dalam ‘Boothroyd Dewhurst DFA’, ‘Lucas DFA’ dan ‘Hitachi Assembly evaluation Method (AEM)’ dibincangkan dalam laporan ini. Panduan perbandingan telah dilakukan dengan menggunakan kaedah ‘Boothroyd Dewhurst DFA ‘dan ‘Lucas DFA’. Kaedah ‘Lucas DFA’ telah dipilih untuk analisis kajian ini dalam konteks meningkatkan keberkesanan dalam pemasangan produk. Analisis menggunakan DFA TeamSET telah diaplikasikan bagi meningkatkan kecekapan dan keberkesanan di dalam proses pemasangan. Tambahan lagi, kaedah ‘Time Study’ telah digunakan bagi menentukan kitaran masa dalam pemasangan produk di bahagian pemasangan. Berdasarkan pada laporan pembaikan rekabentuk produk, graf carta telah diplot dan menunjukkan pengurangan dalam peratusan.

DEDICATION

To God for His blessings,

To my beloved parents for their support,

To my family for standing beside me always,

To my supervisor Mr. Hassan Attan for his guidance,

To all my friends for their encouragement and help,

To Taiace Engineering Sdn. Bhd for helping,

And to everyone who had helped.

ACKNOWLEDGEMENT

Alhamdulillah and Thank to Allah S.W.T. with all His Gracious and His Merciful forgiving me strength and ability to accomplish this project research successfully. I would like to offer thanks and deepest gratitude from the bottom of my heart for all the support, encouragement and inspirations I obtained throughout the duration of this project.

The first person I would like to take the utmost opportunity to express my sincere and gratitude to my supervisor, Mr. Hassan Bin Attan who is always giving me supports and guidance throughout the year in completing this Final Year Project I & II until up to this stage in victory. Besides that, his constant urge for me to complete my project helps me to complete this project in time. I also would like to convey my biggest appreciation to all the staff in Taiace Engineering Sdn. Bhd (TESB) especially Mr. Jailani and Mr. Ibrahim Mat Noor as Designer and QC Inspector for supporting and guiding in accomplishes my Final Year Project without hesitation. All knowledge and experience I gained would not be forgotten.

Finally, to all my fellow friends who involves direct or indirectly that always stand strong beside me in giving opinions, supports also criticism throughout our relationship, I really thankful and appreciate it. All yours are the most valuable things for the rest of my life. And last but not least, I would like to express my deepest gratitude to all those whom has lend me a helping hand to complete this project. With their help, I dare say that this project is a success.

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LIST OF ABBREVIATIONS

AEM	-	Assembly Evaluation Method
ASF	-	Assembly Sequence Flowchart
BD	-	Boothroyd Dewhurst
BOM	-	Bill of Materials
CAD	-	Computer-Aided Design
CR	-	Chromium
DFA	-	Design for Assembly
DFM	-	Design for Manufacture
DFMA	-	Design for Manufacture and Assembly
DIA	-	Diameter
EG	-	Electro Galvanized
PCS	-	Pieces
PDS	-	Product Design Specification
QTY	-	Quantity
R & D	-	Research and Development
SS	-	Stainless Steel
TM	-	Telekom Malaysia
WIP	-	Work Instruction Procedure

CHAPTER 1

INTRODUCTION

1.1 Introduction

Outdoor Telecommunication Cabinets also known as TM Multi Purpose Outdoor Cabinet (MPOC) in production line is to house the telephone equipment, such as the channel banks that are used to carry out analog-to-digital and digital-to-analog conversion between subscriber lines and telephone company lines. Importantly, outdoor telecommunication cabinets are often used to protect sensitive electronic equipment from tempering, vandalism and adverse environmental conditions. Some organizations and company that involved in making this product have in past used different methods for establishing the critical issues in a product design and as a results, focused their efforts for improving the productions. In manufacturing industrial sector, a company must take into account the many factors that affect the choice of assembly method when considering the manufacture of a product to improve the productivity. The problem in designing the product is how to maximize the use of manufacturing processes in production line and how to minimize the number of components of products in assembly processes, so that the total cost of manufacture and assembly is minimal.

Figure 1.1 : TM Multi Purpose Outdoor Cabinet (MPOC)

Each process involves material set up and subsequent change by a person or a machine and is called a manufacturing operation. Each manufacturing operation takes time and has an associated cost. Assembly is an important part of the overall manufacturing process. Assembling a product means that a person or a machine must retrieve finished components from storage, handle the components to orient them relative to each other, and mate them. Each act of retrieving, handling, and mating a component is called an assembly operation. Each assembly operation takes time and has an associated cost. The assembly of components can form a significant part of the manufacturing cost of a product, especially when large quantities of components are involved.

Through this, there are many ways or method for analysis design that can be used for improving an existing products. In addition, the method nowadays has developed with a computerized version which allowed its implementation in a broad range of companies. There are many manufacturing company of significant savings obtained through the application of software which provide more reliable, easy to use, and high efficiency. In conjunction with the application, designers can make use of DFMA guidelines to help manage and reduce the large amount of information involved. The use of these guidelines have not only brought significant cost savings and improvements in quality and reliability to the manufacture of many products, they have also helped to shorten their time-to-market (Boothroyd, 1994).

1.2 Project Background

This project strives to make an improvement of design for assembly processes for TM Multi Purpose Outdoor Cabinet (MPOC) in TAIACE Engineering Sdn. Bhd. (TESB). Basically, this project is conducted accordingly to the process flow chart as shows in Figure 1.2. The initial step is the confirmation of the project title which is improvement in assembly process of TM Multi Purpose Outdoor Cabinet (MPOC) using DFMA and DFA analysis. Second step is to identify a company (TESB) to carried out the case study. After that, a few visits to the company in order to gain the overall idea on the assembly operation and management system in production line.

Objectives and scopes of the projects need to be identified to concentrate and limit the study areas. Then, relevant data and information related with product, DFMA and DFA are collected simultaneously from the company and other resources such as internet, library, book, and etc. Search the journal and articles that related with DFMA and DFA concept and methodology as the references. Next, determined DFA methodology to be use for analysis the ease of assembly of the products or subassemblies it designs with consideration of project needs to state the objective and scope. Both of Boothroyd Dewhurst DFA methodology and Lucas DFA methodology will be testing principles

with same product (multi ink mechanical pen) to make sure which method provide quick results, effectives and easy to use. This step done to determines which methodology will be used in the analysis process. After that, analyzed the assembly current parts design product based on the DFA terminology. The tools that used is Lucas DFA software (TeamSET V3.1) as the design for assembly analysis method and Autodesk Inventor 2009 software for designing the development new product.

Next step is to compare the design efficiency of current assembly parts product with the new improvement assembly parts product due to ease assembly with minimal time. If the result achieved the objective of the analysis which is reduce the number of parts and assembly time, so all the data will analyzed in term of assembly process to proposed the new development parts design of the product. In fact, if the result did not achieve the aim of analysis which is reduced cost and in shorter time, reanalysis the product due to the same method. **Appendix A** represents the Gantt Chart of this project.