PRODUCT DESIGN IMPROVEMENT USING DESIGN FOR MANUFACTURE AND ASSEMBLY (DFMA) METHODOLOGY

MUHAMMAD NAZRUL BIN MOHD YUSOFF

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

MUHAMMAD NAZRUL B MOHD YUSOFF BACH. DEG. OF MECHANICAL ENG. (DESIGN & INNOVATION) 2015 UTeM

SUPERVISOR DECLARATION

"I hereby declare that I have read this thesis and in my opinion this report is suffiecient in term of scope and quality for the award of the degree of Bachelor of Mechanical Engineering (Design and Innovation)."

Signature : _____

Name of Supervisor : _____

Date : _____

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MUHAMMAD NAZRUL BIN MOHD YUSOFF

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Faculty of Mechanical Engineering

Universiti Teknikal Malaysia Melaka

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DECLARATION

"I hereby declare that the work in this report is my own research except for summaries and quotations which have been duly acknowledged."

Signature : _____

Author : _____

Date : _____

DEDICATION

To my beloved parents

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ABSTRACT

This paper shows a detailed study to investigate the Design for Manufacturing and Assembly (DFMA) method to improve the product design process. Through the applied DFMA, the production cost of manufacturing and assembly can be reduced as well as improving the efficiency of the product. Amongst the methods that widely been used in the industry for the product design improvement, the most efficient and reliable way must be identified. A product with many part count numbers will effect the product designing process. This problem commonly occurs in assembly line as the rises of number of tasks, task times as well as cycle times which then affects the production cost. Due to that, the product takes more steps before entering the market. The main objective of this project is to reduce part count number in the existing product design by using DFMA method. This project will compare the product design by using DFMA techniques namely Boothroyd Dewhurst (BD. The approach is by using the software of Boothroyd Dewhurts. Other than that, CAD software has been used for the proposed new design. The CAD drafting tool used is CATIA as it represents the visual of part design in solid view as well as the material applying and mechanical properties of each part drawn. The result of this project can be used and applied in industry in order to improve their design effectiveness.

ABSTRAK

Kertas ini menunjukkan kajian terperinci untuk menyiasat kaedah ***Design for Manufactring and Assembly*** (DFMA) untuk memperbaiki proses reka bentuk produk. Melalui penggunaan DFMA, kos pengeluaran pembuatan dan pemasangan boleh dikurangkan di samping meningkatkan kecekapan produk. Antara kaedah yang meluas digunakan dalam industri untuk penambahbaikan reka bentuk produk, cara yang paling berkesan dan boleh dipercayai mesti dikenal pasti. Produk dengan banyak kiraan bahagian akan mempengaruhi proses mereka bentuk produk. Masalah ini biasanya berlaku di bahagian pemasangan dengan kenaikan kadar tugas, masa tugasan serta masa kitaran yang kemudiannya memberi kesan kepada kos pengeluaran. Oleh itu, produk akan mengambil masa lebih lama sebelum dapat memasuki pasaran. Objektif utama projek ini adalah untuk mengurangkan jumlah kiraan bahagian dalam reka bentuk produk yang sedia ada dengan menggunakan kaedah DFMA. Projek ini akan membandingkan reka bentuk produk dengan menggunakan teknik DFMA iaitu ***Boothroyd Dewhurst*** (BD. Langkah pendekatannya adalah dengan menggunakan perisian ***Boothroyd***. Selain itu, perisian CAD telah digunakan untuk reka bentuk baru yang dicadangkan. Perisian CAD yang digunakan adalah CATIA kerana ia menunjukkan visual reka bentuk bahagian dalam bentuk pepejal serta bahan yang digunakan di samping sifat-sifat mekanikal setiap bahagian turut disediakan. Hasilnya kajian ini boleh digunakan dan diaplikasikan dalam industri untuk meningkatkan keberkesanan reka bentuk produk mereka .

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF SYMBOLS AND ABBREVIATIONS

BD	=	Boothroyd Dewhurst
CAD	=	Computer Aided Drawing
DFA	=	Design for Assembly
DFM	=	Design for Manufacturing
DFMA	=	Design for Manufacturing and Assembly
EFA	=	Effort Flow Analysis
E_{ma}	=	Design Efficiency
g	=	grams
h	=	hours
kg	=	Kilogrames
LH	=	Lucas Hull
mm	=	milimetres
N_{min}	=	Theoritical Minimum Part
RM	=	Ringgit Malaysia
s	=	seconds

T_a	=	Theoritical Lowest Assembly Time
T_{ma}	=	Estimated Assembly Time

LIST OF APPENDIX

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

In this chapter, the project background is being explained. This is followed by the identification of problem statement. The problem statement will be solved by which then comes up with the objectives to be achieved and also the scope of project which act like a guidance for the project line. The significance of the project will be explained too.

1.2 BACKGROUND OF THE PROJECT

In this era of rapid industrial, designing field is really crucial as every basic released product involve with designing process. Designing is a set of decision making processes and activities to determine the form of an object which given the customer's desired function. It is also the improvement of the product's aesthetics, ergonomics, functions, marketability as well as the production line itself. A designer needs to identify the problem and overcome with any possible execution of solutions in order to redesign or getting a better improvement.

Normally, design engineers use Design for Manufacturing and Assembly (DFMA) as the method to improve their products. DFMA is used in engineering by providing guidance to the engineers to simplify the design structure and proces. Through the applied DFMA, the production cost of manufacturing and assembly can be studied to be reduced as well as improving the efficiency of the product. The DFMA can be divided into two separations which the first is Design for Assembly (DFA) and the second is Design for Manufacturing (DFM). The separation makes the engineering studied for both field can be done efficiently and in more detail. The DFA is the process of redesign part of product and also improving the assembly line. Meanwhile, the DFM is the process to facilitate the manufacturing process in order to reduce the cost and also improve the materials usage of the product.

There are several ways or methods in DFMA that has been used in industry. The common method that widely applied in product improvement is Boothroyd-Dewhurst (BD) throughout the software. Another methods that been used are Lucas Hull (LH), Effort Flow Analysis (EFA), Hitachi Assembleability and others.

Amongst the methods that widely been used in the industry for the product design improvement, the most efficient and reliable ways must be identified. Due to that, the methods need to be compared as the result after applying different methods may be varied to each other. It is best to determine the most applicable methodology as it affects the product design process.

1.3 PROBLEM STATEMENT

A product with many part count numbers will effect the product designing process. This problem commonly occurs in assembly line as the rises of number of tasks, task times as well as cycle times which then affects the production cost. Due to that, the product takes more steps before entering the market. Therefore, by applying the DFMA method on design process will help to improve the product design and the most important is they can reduce the cost affect in product assembly and manufacturing.

1.4 OBJECTIVES

There is a purpose of carrying this study on the methodology of DFMA. The objective of the study is to reduce part count number in the existing product design by using DFMA method. Plus, it is essential to carry CAD drawing for the new proposed design.