


"I admit that I have read this report and I found that it is suffice from the aspect of scope and quality to pass Bachelor Degree of Mechanical Engineering
(Design and Innovation)

Signature : 

Supervisor Name : Mr. Mohd Ruzi bin Haji Harun

Date : 8 May 2007

**DESIGN FOR MANUFACTURING AND ASSEMBLY OF AIR FRESHENER
DISPENSER**

MOHD AZIZI BIN JALI

I hereby declare that this thesis entitled "Design for Manufacturing and Assembly of Air Freshener Dispenser" is the result of my own research except as cited in the references.

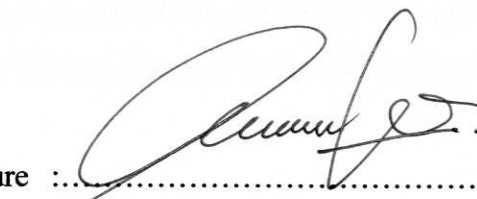
This thesis is fulfillment of the requirement for the award of the degree of Bachelor
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Faculty of Mechanical Engineering
Universiti Teknikal Malaysia Melaka

MAY 2007

i

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Signature : 

Author : Mohd Azizi bin Jali

Date : 8 May 2007

ACKNOWLEDGEMENTS

DEDICATION

In this opportunity, I would like to express my highest gratitude to my supervisor, En. Mohd Ruzi bin Hj. Harun for his full guidance and considerate for all the time being that leads me to finally finish doing this Projek Sarana Muda (PSM) report.

To my beloved parents, family, friends and lecturers who are never give up on me and keep on supporting during the long hours of doing and writing the PSM.

Not to forget, I also want to say thanks to all PSM committee member that have worked hard in order to enable us, the final year student of Faculty of Mechanical Engineering (FKM) to get through this semester without having any problem.

Last but not least, I would like to say thank you to my fellow friends who have been helping me and giving tips on how I can work through this semester task and for supporting me in all time through.

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ABSTRACT

This project paper is about a study on the Design for Manufacturing and Assembly. This study is carried out to exposed student to the concept and methodology of Design of Manufacturing and Assembly (DFMA).It is also figure out the analysis on how the assembly and handling process to finishing the assembly process. Base to the product of existing, there was a criticism on the weakness of the product such as the number of component and the mechanical fastening used in the existing product. This study is important to student to give improvement to the existing product as to develop a new process in out local industry to compete to the foreign country's industry. At the end, the study will be developed in order to show the simplest assembly and manufacturing the product.

ABSTRAK

Projek ini adalah tentang pengkajian terhadap Reka Bentuk Pembuatan dan Pemasangan. Projek ini dibuat adalah bertujuan untuk mendedahkan para pelajar mengenai konsep dan metodologi Reka Bentuk Pembuatan dan Pemasangan (DFMA). Projek ini juga mengemukakan tentang analisis pemasangan dan pembuatan dalam pembuatan sesuatu produk. Berdasarkan pengkajian terhadap produk sedia ada, terdapat komen mengenai kelemahan sesuatu komponen yang terdapat di dalam produk kajian. Di akhir projek ini, kajian ini akan dibangunkan bagi menunjukkan pemasangan dan pembuatan termudah bagi produk kajian.

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This project is actually an learn on DFMA (Design for Manufacturing and Assembly) approaches. The system of DFMA is the most popular system ever use in the industry nowadays therefore, the study of DFMA in this project, will give a huge impact of the student especially for the future engineer to learn their mind and thinking on how to create a product for a specific component.

This is important for a business industry as they had to compete with the competitor to manufacture the best performance of product and even though to be in the lower cost as well. This project can also help quality in the product analysis in giving the best quality and reduce error when it occur product. Later in the future, the industry which implement this approach will gain a high profit margin for the company.

The DFMA (Design for manufacturing and assembly) is also a setup of production line which designing for the process of manufacturing in the industry. The better performance of manufacturing process, the shorter line in every department, the safest cost reduction and safety time estimation resulted by the company. Soon, the product will probably manufacture faster than the existing product if the improvement after implementing the DFMA approach.

CHAPTER 1

INTRODUCTION

1.1 Background of project

This project is actually to learn on DFMA (*Design for Manufacturing and Assembly*) approaches. The system of DFMA is the most popular system ever use in the industry nowadays Therefore, the study of DFMA in this project, will give a huge impact of the student especially for the future engineer to setup their mind and thinking on how to create a product for a simple component.

This is important for a nowadays industry as they had to compete with the competitor to manufacture the best performance of product and even manufacture in the lower cost as well. This project is actually a justifier to the product analysis in giving the best quality and simple component in every product. Later, in the future, the industry which implements this approach will gain a high profit margin for the company.

The DFMA (*Design for manufacturing and assembly*) is also a setup of production line which designing for the process of manufacturing in the industry. The better performance of manufacturing process, the shorter line in every department, the safest cost reduction and safest time estimation resulted for the company. Soon, the product will probably manufacture faster than the existing product as the improvement after implementing the DFMA approaches.

1.2 Problem statements

The project is focusing on the Design of Manufacturing and Assembly (DFMA) of the product that had been choose to be investigate on the process of manufacturing and assembly.

In this project, the problem statement is focusing on how to design the simplest structure of the product that will be investigate as to refine the way on procedure to manufacturing and assembly of the product. This is regarding to the operation of the industry to reduce on the budget of the manufacturing and assembly cost. But, referring to our local industry, there is no improvement to the operation tally to the suitable method and even in certain industry, there is no method usage and practice to their daily operational in producing a product. But in foreign country, the implementation of the method to the industry were taking a main role to give encourage and benefit to their profit of the product sales.

Regarding to the project, we will going to solve a problem base to the existing product that we had choose to investigate and redesign the product as to reduce the number of component besides to suit the procedure of manufacturing and assembly method that will be learn soon. Besides that, we will going to do a reverse engineering which is to re-assemble the unit of the product and will be redraw the structure of the component following the true dimension by using CAD-CAM software. This step were planning to be taken soon as to investigate on how to reduce the number of part of the component and to resize the unit until become the finest and simplest unit ever.

Base to the product that we had choose, *Air Freshener Dispenser*, there was a lot of mechanical structure such as gear usage that communicate with electronic device such as sensor to working as self-dispense of air freshener. In this project, the product had to reassemble part by part in purposes to investigate on the level of important or usage which then will be reduce until the lowest level of function. This is to achieve the better

assemble procedure. This become to difficult to the user as they had to use another tools to operate the system.

Beside that, in detail issues, the purpose of the project is refine the methodology of our local industry's operation as to reduce the cost of manufacturing and assembly in the industry that normally practice by foreign industry. This is important as to compete to the biggest and influential company in quality and finest operation in manufacturing the product. As the concept is, the fastest operation in producing the product, the more profit that the company will gain. This happened to our local industry where such a big company that practicing the proper method in manufacturing and assembly, had gain the profit and even monopolize in market. By this case, it had to redesign the system and procedure in manufacturing and assemble of each product to reduce on the cost of manufacturing and assemble the product. This is came from the design of the product itself, where it had to reduce on the using of tools aid as reduce, to minimize the margin of the cost of manufacturing and assembly in industry.

1.4 Scope of the project

As the methodology of the manufacturing and assembly will be studying soon, the method by well-known gurus such as Dr. Deming, Dr. Taguchi, and Boothroyd and Dewhurst, will be apply in the project. This is important as to give improvement of the module and format of the manufacturing and assembly in our local industry as to gain the demand and profit margin in their business. Later, by the end of the project, with hope the goal of the will be apply in our local industry as to compete to the foreign country by the quality of manufacturing and assembly.

1.3 Objectives of project

This project was actually focusing on the implementation of DFMA through the development of a new product. In this project also, there is certain objective that must be achieve as to develop the quality and effective product following the criteria of DFMA methodology. The objectives of the project are:

1. To investigate on the purpose of the DFMA in industry's management
2. To let the people know about the important of DFMA in industry
3. To search for another method that will be apply in our local industry
4. To create the creative design following the methodology of DFMA
5. To define the impact of DFMA to the product development

1.4 Scope of the project

In this project there is the main scope of the project had been given while proceed to running in the project. Thus, the following scope project must be follow as to achieve the objective of the project for the whole project line. The project scopes are:

1. To study the other DFMA methodology
2. To present the study of existing and new design
3. To apply conceptual design to detail design
4. To apply the FEA on the new design
5. To fabricate prototype for the new design

1.5 Project outline

In the next page, there is shown in the *Figure 1.1*, the methodology of the project for the whole project line. The project methodology is actually following the scope of the project that had been state in above.

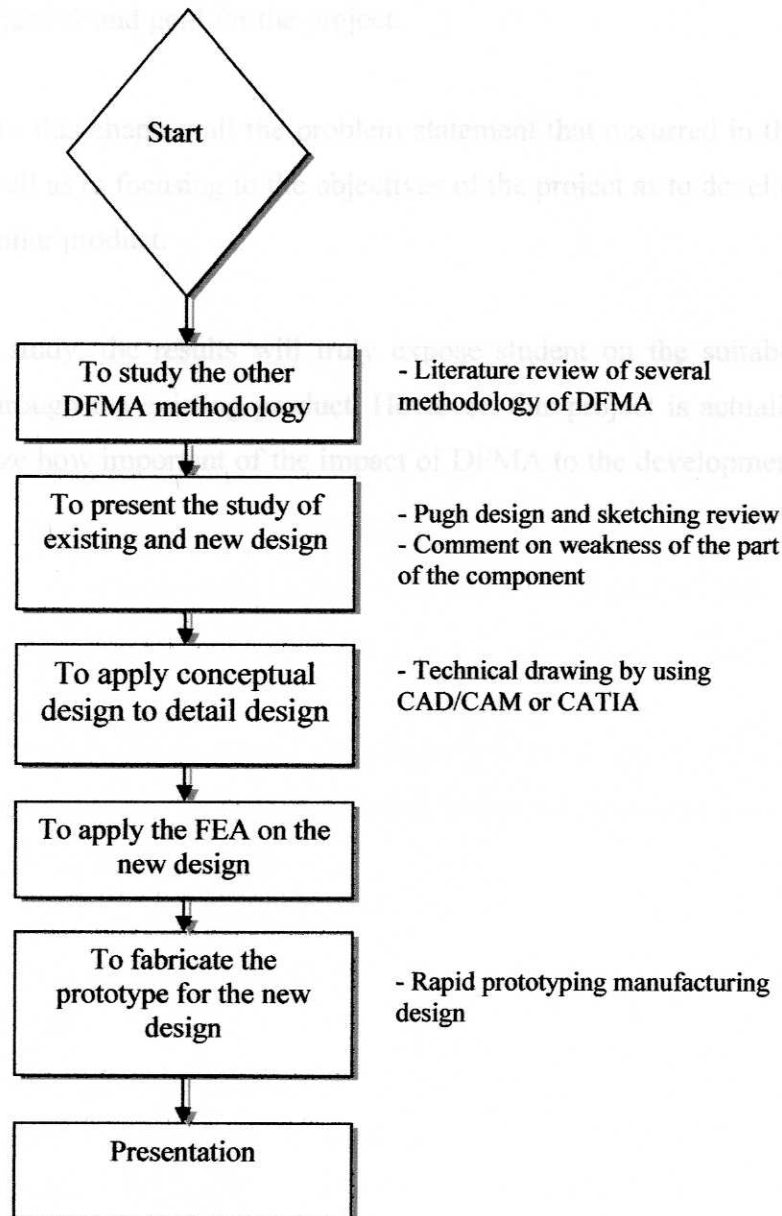


Figure 1.1: The methodology of the project

1.6 Summary

From the chapter, the estimation of the basic outline of the project had been state out before proceed to the nest step, that is to analyze the existing product case study. The project scope is actually had been given from the early session as to let the student know and understand on their objective and goal for the project.

Besides that, base to this chapter, all the problem statement that occurred in the study had been define as well as to focusing to the objectives of the project as to develop the better edition of the similar product.

At the end of the study, the results will truly expose student on the suitable methodology of DFMA through the existing product. However, this project is actually wanted the student to realize how important of the impact of DFMA to the development of new product.

This chapter, it'll be the lesson of the *Design for Manufacturing and Assembly (DFMA)*. This method is to show to us how to deal with the existing product before analyze the product to propose a new conceptual design.

This approach was exactly the best method to manage a good and effectively manufacturing process in the industry. The implementation to the whole system of the industry will give a big impact to the elements:

1. Increasing of profit margin for the company
2. Maximizing the employees
3. Reducing the time for the whole project
4. Reducing the quality factor of the product
5. Reducing the cost for manufacturing the product.

Thus, the usage of this software in the processing of manufacturing will give better performance for the whole industry.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter, it'll be the lessons of the *Design for Manufacturing and Assembly (DFMA)*. This method is to show us on how to deal with the existing product before analyze the product to propose a new conceptual design.

This approach was exactly the best method to manage a good and effectively manufacturing process in the industry. The implementation to the whole system of the industry will give a big impact to those elements:

1. Increasing of profit margin for the company
2. Minimizing the employees
3. Reducing the time for the whole project
4. Reducing the cost of production of the product
5. Reducing the time to manufacture the product.

Thus, the usage of this method into the processing of manufacturing will give better performance for the whole production line.

2.2 Assembly Capability

When considering assembly processes, many problems are due to relatively minor design details. It must be remembered that a product is often an assembly of sheet metals, pipes, wires and a variety of other components held together by nuts, bolts and rivets. The attention to detail cannot be overemphasized at this stage of product design (Jones, 1978) . [4].

Assembly variation (along with manufacturing variation) is a major contributor to poor quality and increased costs. For example, when the assembly of a poorly designed and poorly made product is attempted, faults such accumulated tolerance error, incompatible dimensions and difficult part installation become apparent. At the same time, the costs of recovering of this problem during the late phase of production are high (Kroll, 1993). Industry has recognized the need to reduce assembly variations (Craig, 1992). The three main sources of variation in mechanical assemblies are (Chase et al. 1997):

- Dimensional variations (lengths, angles)
- Form and features (flatness, roundness, angularity)
- Kinematics variations (small adjustments between mating parts).

The above are all closely linked to manufacturing variability depending on the characteristics associated with the product. Manufacturing is an important aspect of assembly too. The design of the product for assembly requires careful consideration of many factors that influence the functionality and manufacturability. For example, while stability and relative precision of part positions are often essential for the functional performance of assemblies, these same requirements may make the product difficult to manufacture. At the same time, dimensional clearance among the parts is essential to create paths for assembly operations (Sanderson, 1997). In general, close (or numerical small) tolerances must be maintained on parts that are to be assembled with the other parts, and the closer the tolerances, the greater the ease of assembly (Kutz, 1986).[4].