UNIVERSITI TEKNIKAL MALAYSIA MELAKA

A FEASIBILITY STUDY ON DESIGN FOR ENVIRONMENT AND DESIGN FOR SUSTAINABILITY APPLICATION IN BOAT INDUSTRIES

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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Date : 10 May 2009
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). The member of the supervisory committee is as follow:

En.Tajul Ariffin bin Abdullah
(Official Stamp)
ABSTRACT

Engineers are in an essential position to affect the environmental aspects of the product they design. Role of a design engineer has become increasingly vital not only to produce product to meet customers needs of quality and cost but also to produce products with as low environmental impact as possible and good in sustainable. This report is about the collection data in development of an innovative environment by applying the design for environment (DFE) and design for Sustainability (DFS) approach to improve human living environment. In recent years, DFE has become an important approach since the world is facing problems of limited resources and serious environmental effects. DFE and DFS are approach implemented at product design and development stage to avoid or minimize significant environmental impacts and increase resource efficiency at all phase of a product life cycle ranging from extraction of its material, manufacturing, transportation, product usage and finally to recycling or deposition of the used product. The methodology used in this report is by comparing the way that used by others manufacturing industries than choose the right or good method to solve the environment impact in boat industries and improve the sustainability of product developing. From the research, the data that have collected from the survey are following with the literature review that have done, than that data must be analysis to get the result. Finally that data should be discussed to get the solution about DFE and DFS in boat industries.
ABSTRAK

Tanggungjawab seorang jurutera rekabentuk menjadi semakin penting bukan sahaja untuk merekabentuk produk untuk memenuhi kehendak pengguna dari segi kualiti dan harga tetapi juga merekabentuk produk yang mempunyai kesan negatif serendah yang mungkin terhadap persekitaran dan mempunyai ketahanan yang baik. Laporan adalah tentang pengumpulan maklumat perkembangan sesuatu persekitaran yang inovatif dengan menggunakan konsep rekabentuk untuk persekitaran dan rekabentuk ketahanan bagi membaiki persekitaran hidup manusia. Sejak kebelakangan ini, konsep ini menjadi semakin penting kerana dunia kini menghadapi masalah sumber terhad dan kesan persekitaran yang serius. Pendekatan rekabentuk untuk persekitaran diapplikasi pada peringkat rekabentuk dan mengembangkan sesuatu produk untuk mengelakkan atau mengurangkan kesan negatif terhadap persekitaran yang ketara dan meningkatkan kecekapan sumber pada setiap peringkat jangka hayat produk bermula dengan pemilihan bahan, pembuatan, pengangkutan, pengunaan produk dan akhir sekali kitar semula atau penghapusan produk tersebut. Kaedah yang digunakan dalam laporan ini adalah dengan membandingkan cara yang digunakan oleh industri-industri pembuatan lain dan memilih kaedah yang sesuai untuk industri-industri boat dalam mengurangkan kesan negative terhadap alam sekitar dan meningkatkan ketahanan dalam penghasilan produk. Daripada penyelidikan, data yang telah dipungut hasil dari tinjauan yang telah dibuat menikut ulasan karya, daripada data itu mesti analisis untuk mendapat hasil atau keputusan. Akhirnya data itu harus dibincangkan untuk mendapat penyelesaian tentang DFE dan DFS dalam industri-industri bot.
DEDICATION

Special dedicated to; my beloved Mother, Rohani binti Awang and my family who are very concern, understanding, patient and supporting. Thanks for everything. To My Respectful Supervisor; Mr. Tajul Ariffin bin Abdullah for his construction guidance, encouragement and patience in fulfilling our aspiration in completing this project. The Work and Success will never be achieved without all of you.
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<td>CSM</td>
<td>Chopper Strand Mat</td>
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<td>DFE</td>
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<td>DK</td>
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<td>EMS</td>
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<td>EMAS</td>
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<td>MSET</td>
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<td>MIPS</td>
<td>Material Input Per units Services</td>
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<td>PSM</td>
<td>Projek Sarjana Muda</td>
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<td>PU</td>
<td>Polyurethane</td>
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<tr>
<td>PVC</td>
<td>Poly vinyl chloride</td>
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<tr>
<td>RHIB</td>
<td>Rigid Hull Inflatable Boat</td>
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<tr>
<td>SOLAS</td>
<td>Safety of Life at Sea</td>
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<tr>
<td>UTeM</td>
<td>Universiti Teknikal Malaysia Melaka</td>
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<td>IB</td>
<td>Inflatable Boat</td>
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CHAPTER 1
INTRODUCTION

1.1 Background

In the global manufacturing world, industries compete each other to be winner in their business. In any organization and the industries sustainability of the product and good environmental are the main factors contributes to get better performance in their business. Design for Sustainability (DFS) and Design for Environment (DFE) are the two design tools can be used to create product that are sustainable and environment fricity.

DFS and DFE are combination of terms which have evolved from the recognition of the important design, manufacturing, material choice, product type, use and final disposal have on the environment. (MacKenzie, 1991). The recognition of a single global environment in which all activities are interrelated from one situation to others situation. Its means if some of product or work that have done, it can effect environmental. Affect each other is bringing researchers to an in depth recognition of the importance DFE and DFS in the manufacturing industries.

The goal of DFE and DFS method becomes particularly relevant in the context of manufacturing industries in Malaysia. These manufacturing industries are fundamental as they provide one of the employment opportunities for local people. However, in many areas these manufacturing involve in environmental affect. So all industries should take care the environmental performance from danger of pollution.

The United Nations set up the World Commission on Environment and Development (Bruntland Commission) in 1983. In 1987 it published on “Our Common Future”,...
which defined sustainable development as ‘meeting the need of present without compromising the ability of future generations to meet their own needs was carry out by MacKenzie, (1991).

In this study DFS and DFE is the important that should be used in all industries especially in boat industries. DFS and DFE are offer benefit in boat industries to produce good productivity and performance.

1.2 Problem Statement

There is growing worldwide interest in environmental aspect of DFE and DFS. DFE and DFS are the new systematic approach to take into account environmental impact and human health at product design stage. The responsibility to reduces environmental damage and improve the quality life. Following the principle or factor has to look in Malaysia boat industries. It is to look usage DFS and DFE in boat industries as the list below:

1. To improve design for disassembly
2. To improve design for remanufacture
3. To minimize hazardous chemicals.
4. To consider the light sustainability of material is used.
5. The amount of waste generated in the product life cycle, ie attempt to prevent and minimize waste in boat design process.

Theoretically, to design a product with hundred percent environmental performances is nearly impossible to be achieved but it can be improved to perform better environmentally. This can be done by implementing the DFE at design and development stage of a product which aims to reduce the overall environmental impact of products through use of a life cycle prospective was carry out by Fran K and Patrick E. (2007).
1.3 Objectives

This study is carry out based Design for Sustainability (DFS) and Design for Environment (DFE) in the industries. However this study is focus at boat industries by using DFE and DFS method. Data collection from the questionnaire survey and findings journal or article are used to relate boat industries concept. Develop information or data base on related to Design for Sustainability and Design for Environment.

For this project, the objective want to achieve are as follows as:-
1. To indentify concepts, principles and usage DFS and DFE.
2. To find out information current application in boat industries in general.
3. To obtain related information on DFS and DFE to be used in boat industry.
4. To propose DFS and DFE model to be used in boat industries.

1.4 Scope

Scope of assumption for this project is Design for Sustainability and Design for Environment in boat industries. It is finding the relation DFS and DFE that have used in all industries. From that finding, the data that have collected are use to relate in boat industries in Malaysia. The boat design and development is based on the DFE and DFS guidelines. The product that has been produced is provided by previously done researches, and its environmental performance is evaluated with life cycle assessment (LCA). The key assumption is a product can be redesigned to improve a product’s energy consumption, material usage, recycle-ability or toxicity compared to its originally designed performance level by implementing the DFE and DFS method.
1.5 Importance of the Project

This project can generate an improvement to the product and environmental performance of boat industries which develop drastically in Malaysia. In that industries have some effect from the environment and performance that should be solve to get better industries performance. This study of DFS and DFE can solve many problems aspect in manufacturing of boat industries. Some of aspect can be solving by DFS and DFE are reducing the in using material, energy and safe environmental performance.

1.6 Organization of the report

1. Chapter 1 : Introduction
   This chapter consists of background of Problem, problem statement, objectives, scope, and importance of the project and definition of terms.

2. Chapter 2 : Literature Review on DFE
   This chapter includes the literature review of definitions of DFE, product life cycle, Improvement of environment, DFE focus and others.

3. Chapter 3 : Literature Review on DFS
   This chapter includes the literature review of definition of DFS, guidelines of DFS the opportunities for changes, a new design focus and others.

4. Chapter 4 : Methodology
   The chapter consist of DFS and DFE method flow chart, Gantt chart, source of this thesis, indentify the scope for research, literature review, classification systems, and questionnaire or interview for this thesis.

5. Chapter 5 : Result and Analysis
   This chapter contains the observation, results, comments and findings from the questionnaire or interview at boat industries.
6. Chapter 6 : Discussion
   This chapter contains interpretation of the observations and relates them to problem stated in chapter 1 in context of literature.

7. Chapter 7 : Conclusion
   This chapter contains summary of main findings and brief recommendation for further study.

1.7 Summary

The design and development of an innovative product according to DFE and DFS method is a step taken up to minimize environmental impact of a product and to improve sustainability of the product. Hopefully this effort will encourage many more products to be redesigned according to DFS and DFE. The information obtained can use as guideline in designing boat inform of DFS and DFE principles and concept requirements and principle therefore it is more sustainable and environmental friendly.
CHAPTER 2
LITERATURE REVIEW ON DFE

2.1 Introduction

Nowadays, issue of design for environment is an important matter in manufacturing industry to reduce pollution rate and minimize material uses. Business today faces a variety of challenges, so DFE is used to increase the income of business. The Design for Environment (DFE) can be maintaining the high quality product and service at the low cost (Anonymous, 2008a). Many companies also stay the competitive in a global market place and they should have some of meeting consumer prefer for more environmentally products.

In the business design or redesign products, processes and management systems, DFE can offer solution in product design process. In DFE, cost effective, safer for workers and public. DFE usually involve in manufacturing industry world sectors to compare the human health and environmental risk, performance and cost (Anonymous, 2008a).

2.2 DFE History

The first Century, in actual consideration of technical aspects in design action directed at reducing the environmental impact of product appeared in the first half of the 1980 (Overby, 1979, Lund, 1984). In early 1990s, these first experiences were followed by a phase of greater understanding of new needs to safeguard resources, which the new ideas and experience developed with the clear objective of, integrating environmental demand in traditional design procedures was carry out by