ERGONOMIC IMPROVEMENTS ON SHOCK MITIGATING BOAT SEATS FOR YACHT CABIN

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

by

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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 (Design) (Hons.). The members of the supervisory committee are as follow:

……

(Principal Supervisor)

……

(Co-Supervisor)

ABSTRAK

Projek tahun akhir yang bertajuk "Peningkatan Ergonomik Design Tempat Duduk Shock Mengurangkan Bot untuk Yacht Cabin". Ini Tujuan projek ini adalah untuk meningkatkan reka bentuk ergonomik yang tempat duduk bot kejutan pengurangan supaya ia akan mengurangkan kecederaan kapten. Selepas selesai untuk mereka bentuk oleh SOLIDWOKS, langkah seterusnya adalah membuat analisis postur untuk menguji reka bentuk ergonomik atau tidak untuk postur manusia menggunakan dengan CATIA. Analisis dengan menggunakan analisis Rula terlibat kerusi jarak dengan stereng, dimensi dan jarak tempat duduk kerusi depan dengan tempat duduk belakang. Kaedah ini adalah penyelesaian berkomputer menggunakan CATIA dan analisis yang berdasarkan penarafan warna. Selepas selesai menganalisis reka bentuk, skor Rula yang dikumpul dari hasil analisis menunjukkan bahawa reka bentuk yang sedia ada kejutan kerusi bot kawalan yang masih kekurangan aspek ergonomik untuk empat postur. Reka bentuk baru untuk postur pertama adalah lebih baik ergonomik kerana larges ruang tempat duduk memberikan manusia yang lebih selesa. Analisis Rula kerusi untuk postur kedua berdasarkan kedudukan pemandu. Reka bentuk baru untuk postur kedua adalah tangan manusia tidak boleh mencapai stereng dengan selesa kerana apabila telah jarak dikekalkan di antara badan manusia, ia akan mempunyai kerusi panjang maksimum kepada pemandu. Bagi reka bentuk baru untuk postur ketiga mempunyai bentuk di kapten tulang belakang untuk menyokong batang dan leher. Reka bentuk baru bagi konsep postur terakhir kapten boleh mengawal stereng dengan satu tangan dan tangan lain untuk menyokong pada bahagian genggaman tangan.

ABSTRACT

This final year project entitled "Ergonomic Improvement Design of Shock Mitigating Boat Seat for Yacht Cabin". The aim of this project is to improve the ergonomics design of the shock mitigating boat seat so that it will reduce captain injuries. After finished to design by SOLIDWORKS, the next step is made the posture analysis to test the design is ergonomic or not for the human posture using by CATIA. Analysis by using RULA analysis involved distance seat with steering, seat dimensions and distance front seat with rear seat. The method is computerized solution using CATIA and the analysis based on colour rating. After finishes analyze the design, the RULA score that collected from the analysis results shows that the existing design of shock mitigating boat seat still lacks of ergonomics aspects for four posture. The new design for first posture is more good ergonomic because the space larges of the seats give the human more comfortable. RULA analysis seat for second posture based on the driver position. The new design for second posture is hand of human cannot reach the steering with comfortable when have the distance maintained between human bodies, it will has a maximum length seat to steering. For the new design for third posture has a shape at captain spine for support the trunk and neck. The new design for the last posture concept a captain can control the steering by one hand and other hand to support on hand grip part.

DEDICATION

This report is dedicated to my parents, brothers and sisters for their endless love, support and encouragement. I also dedicate this work to my supervisor and friends who have supported me throughout the process. I will always appreciate all they have done. Thank you.

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First of all, I would like to express my thankfulness to Allah S.W.T the Almighty because I manage to finish this Final Year Project on time. With full of His merciful, now I am writing this report of this project.

I also like to state my gratitude to my supervisor, En. Hazman Bin Hasib and co supervisor En. Saifudin Hafiz Bin Yahaya for his assistance and guidance in producing this report and giving me his constructive comments, guidance, patience and encouragement until the completion of this report. Besides that, I would like to express my thankfulness to my parents and friends for their continuous supports and advices in complete the report.

My special acknowledgement, I would like to pay high regard to my family for their since support and inspiration throughout my research work. I owe everything to them. Besides this, several people have knowingly and unknowingly helped me in the successful completion on this project.

I hope that this project report will fulfill the conditions as requested in Final Year Project in UTeM.

Thank You.

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LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

BOM	-	Bill of Material
CAD	-	Computer Aided Design
FEA	-	Finite Element Analysis
FEM	-	Finite Element Modeling
FOS	-	Factor of Safety
FYP	-	Final Year Project
HSC	-	High Speed Craft
ISO	-	International Organization for Standardization
PSM 1	-	Projek Sarjana Muda 1
PSM 2	-	Projek Sarjana Muda 2
RULA	-	Rapid Upper Limb Assessment

CHAPTER 1
INTRODUCTION

This chapter is discuss to background of the project. This project focus about on the Ergonomic Improvements on Shock Mitigating Boat Seats for Yacht Cabin. The background of the project included covered development and current achievement of Shock Mitigating Boat Seats. Moreover, this chapter provides the problem statements pursue the objectives and scope of the project. The planning of this project also is discussed in this chapter.

1.1 Introduction

Based on the title "Ergonomic Improvements on Shock Mitigating Boat Seats for Yacht Cabin", the chapter will discuss the background of the project, the problem statement, its objective and the scope of the project. The project will focus on the study ergonomic improvements on shock mitigating boat seats for yacht cabin. The background of the project included covered the current design of the Shock Mitigating Boat Seats.

The ergonomics is a science absorbed on the learning of human filth, and discomfort and decreased fatigue over product design. Ergonomics method can be manufacture, use and integral part of design. Most products of shock mitigating boat seat on the market can be improved in some way or another by good industrial design. A part of the importance of industrial design to particular products is to describe the importance onward two dimensions that are aesthetic and ergonomics. In the ergonomics aspect needs in industrial products can qualitatively assess by answering a series of question

along the dimension of an ergonomics. Ergonomics is planning in produce design and product when a job to suitable the worker so the work is harmless and more productive. Ergonomic can resolve the solutions can sort employees extra growth productivity and comfortable. Ergonomics posture is very important because after who to complete the activity their body is stressed by an awkward posture, higher temperature or repetitive effort the musculoskeletal system impressed. ("Ergonomics Handbook")

According to Chris Adams (2008) state ergonomics is the about higher discipline disturbed with the accepting of connections between the other elements of a system, scientific and the specialty that put on data, theory, principles and methods to design and manufacture in to optimize human comfort and overall system is perform. The ergonomics aspect is working to achieve the two goals of productivity and health. For to produce the shock mitigating boat seats ergonomic in designed is important. Ergonomics feature in a product could give a satisfaction and comfortable to the user. Ergonomic in design also could be achieved through enhance a performance of the product, increase safety of the product and increase user satisfaction of the product.

Shock mitigating boat seat design directly relates to captain performance measures such a comfort, risk of injury, efficiency, and vehicle safety. A soft control is a comfortable. Comfort is more than about a soft handle. Comfortable is one of item the highest features of a design's actual. Comfort in the human mental features and the machine line of the service and product is a primary ergonomic design concern. As a seat is one of the main interfaces between the boat and the body, comfort cannot be forgotten during seat design. Human posture analysis by CATIA software one of the method use to analyse the design seat comfort with an occupant or not.

There are many ships that are produced by the shipping company around the world. To ensure the comfortable and safety to the people those are involved while sailing, the type of seat for the people who is in charge while sailing is an important. Today, boats are big, high powered and designed very well. Many type of the seat for a boat such as Helm seats, Suspension seats and Shock Mitigating seats. Each the type of seat for a captain must comfortable by the type of boat. Furthermore, the seat of boat must know the size and the specification of boat. The seat also must meet the specification of their posture while working. The yacht cabin boat a few types of seat are Shock-

Mitigating Boat Seats that their produced. The types of seats are Shock-Mitigating Pedestal Seat, Advanced Shock-Mitigating Seat and Advanced Shock-Mitigating Seat and Advanced Shock-Mitigating Bolster. Their type suitable for yacht cabin will focus on advanced Shock-Mitigating Seats. (www.Stidd System, Inc. Assessed on October 2013)

Shocks mitigating boat seats now in use tool an inactive suspension system to absorb the shock transmitted done the hull. A submissive suspension system can only be adjusted for a specific condition because of it non-adjustable nature. A high speed craft could arise through changed environmental situations on the same varying from calm seas at harbour to violent rough waves away from shore. Roughly passive systems have the capability to be physically adjusted before use but are difficult to adjust while on-going during high motion. Other than that, the human of the boat seat is not constantly import that humans of different weight and size may activate the seat at different times. Many operating situations kinds it tough to design the perfect suspension system to be applied on shock mitigating boat seats. Based on result nautical personnel regularly wish standing to sitting although working their vessels. They working can could use their legs from a standing site to absorb effects. (Peter, 2010)

Today, there are multiple shocks mitigating seats design currently used by military and civilian boats. These seats implement a variety of shock mitigating design. Shock mitigating seats come in a variety of styles that can be broadly. (See **Figure 1.1**)

Figure 1.1: Types of shock mitigating seats

Boats operating in the sea are subject to large shock and vibration forces. Effect to such forces can lead to spinal injuries, discomfort, and performance degradation, especially to expose to forces in the vertical axis. A person is to sitting posture in standard ISO 2631-5:2004 addresses human exposure to mechanical multiple shocks stately at the seat cushion. So, this project is to improve the existing design to be more ergonomics of shock mitigating boat seats for yacht cabin. (ISO the International Organization for Standardization, Geneva, 1997)

1.2 Problem Statement

In the current market of boat industries, the ergonomics aspect of shock mitigating boat seats for yacht cabin is poor design. Ergonomics improvement for shock mitigating boat seats is one of the objectives in this study. Besides, the current design for boat seats is less concerned on the ergonomic design. The main problem of this project is to design the shock mitigating boats seats for yacht cabin with improvement on the ergonomic especially for captain's seat. This seats should have the ergonomic features, comfort and also safe for the users.

1.3 Objectives

The main objective of this project is to improve the ergonomic design of the shock mitigating boat seats for yacht cabin. Specific objective as follows:

a) To study the ergonomic design, and working posture of the Shock Mitigating Boat Seats.
b) To redesign of Shock Mitigating Boat Seats.
c) To analyse the redesign of Shock Mitigating Boat Seats produce using RULA analysis for improve ergonomic features, comfortable and safety especially for captain.