

ERGONOMICS DESIGN AND ANALYSIS OF BUS DRIVER SEAT

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I acknowledge that have read this work and in my view this work is adequate in terms of scope and quality for the award Bachelor of Mechanical Engineering (Design and Innovation)'

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This report is submitted in partial fulfillment of the requirements for the award

Bachelor of Mechanical Engineering (Design & Innovation)

Faculty of Mechanical Engineering
Universiti Teknikal Malaysia Melaka

APRIL 2010

“Hereby, I declared that this project report has written by me and is my own effort and that no part has been plagiarized without citation”

Signature :

Writer Name :

Date :

Dedications

For father and mother loved ones

ACKNOWLEDGMENT

Greatest thanks to ALLAH Almighty for blessings and giving me the ability to finish this project, which hopefully can contribute in further research.

I would like to express my gratitude to my supervisor, Mr. Shafizal Bin Mat who guides me through completing this project. He gave me lot of ideas, advises and encouragement that helps me for completing this research.

Lot of thanks to all my friends who help me a lot in generating ideas and information that very useful in this research.

Last but not least, I would like to express my gratitude and affection to my beloved parent, Ismail bin Ghazali and Katijah binti Hussain, and family for their unconditional support and smile during developing the original version of this style document.

Thanks.....

ABSTRACT

Seat is one of the important components of the vehicle and that are place for the professional driver spend most their time when operating their vehicle. This aim of this project is to improve the ergonomics design of the bus driver seat so that it will reduce bus operator injuries. The goal of ergonomics design is to create a seat that optimally adjusts to each user's physical dimensions and optimizes the operator in a time. In the case of driver seats, the aim is to preserve the driver's health and ability to perform a good job. The conceptual design that want to create and selected must based on the ergonomics design and analysis. This is because, when use method ergonomics analysis in the conceptual design can give the best result. The new concept is carried out based on the existing product that have now in the market. There are several concept designs have been design whether the concept can achieve the aim of the project. The best concepts that have fulfilled the requirements of bus driver seat are chosen to the final design of the project. From the analysis that has done by using RULA analysis that shown ergonomics analysis is a key factor can include how a person sits, stands or moves about in an area. This would also include the length of time for these activities. Range of motion and how humans normally move are also taken into consideration. Ergonomists try to discover what makes certain situations more stressful on the body and how they can relieve this stress. By improving the seat parameters according to those methods mentioned, the vehicle seats, such as buses' seats, could be developed in term of ride comfort for local purposes.

ABSTRAK

Kerusi adalah salah satu komponen penting bagi sesuatu kenderaan dan menempatkan seorang pemandu profesional serta menghabiskan banyak masa mereka di situ. Tujuan utama projek ini adalah untuk meningkatkan reka bentuk ergonomi bagi kerusi pemandu bas dan mengurangkan kecederaan yang berlaku kepada pemandu bas. Matlamat utama mereka bentuk mengikut ergonomi adalah untuk mewujudkan satu kerusi yang optimum serta disesuaikan kepada fizikal setiap pengguna dan boleh mengoptimumkan pengendalian itu dalam sesuatu masa. Dalam masalah yang berkaitan mengenai kerusi pemandu tersebut adalah bertujuan untuk mengekalkan kesihatan pemandu dan membolehkan keupayaan mereka melakukan tugas dengan baik. Rekabentuk konsep yang hendak dicipta dan dipilih hendaklah berdasarkan rekabentuk serta analisis ergonomi. Ini bertujuan untuk mendapat keputusan yang terbaik apabila menggunakan analisis tersebut dalam mereka bentuk konsep terbaru. Konsep baru yang dilaksanakan adalah berdasarkan produk yang telah sedia ada di pasaran. Terdapat beberapa konsep yang telah direka untuk mencapai matlamat projek ini. Konsep yang terbaik dan memenuhi syarat yang telah ditetapkan akan dipilih sebagai rekabentuk yang digunakan sepanjang projek ini. Dari analisis yang telah dilakukan dengan menggunakan analisis RULA menunjukkan bahawa analisis ergonomi yang dipaparkan merupakan faktor kunci yang dapat merangkumi bagaimana pergerakan seseorang seperti duduk, berdiri atau bergerak dalam sesuatu kawasan. Ini juga akan merangkumi tempoh masa aktiviti tersebut dilakukan. Rentang gerak dan bagaimana manusia bergerak biasanya juga dipertimbangkan. Pengkaji ergonomi cuba untuk mencari apa yang membuat situasi

tertentu menyebabkan lebih tekanan atau kesakitan pada tubuh dan bagaimana mereka boleh menghilangkan tekanan tersebut ini. Dengan memperbaiki parameter-parameter tempat duduk berdasarkan kaedah yang tersebut di atas, keselesaan tempat duduk untuk pemandu bas dapat ditingkatkan untuk kegunaan tempatan.

TABLE OF CONTENTS

CHAPTER	TITLE	PAGES
	DECLARATION	iii
	ACKNOWLEDGEMENT	v
	ABSTRACT	vi
	ABSTRAK	vii
	TABLE OF CONTENT	ix
	LIST OF TABLE	xiv
	LIST OF FIGURE	xv
	LIST OF APPENDIX	xvii
CHAPTER 1	INTRODUCTION	
	1.1 Introduction	1
	1.2 Objectives	2
	1.3 Scopes	3
	1.4 Problem Statements	3
CHAPTER 2	LITERATURE REVIEW	
	2.1 History of Busses	5
	2.2 Buses	6
	2.2.1 Type of Buses	7
	2.1.1.1 Single-deckers Buses	7
	2.1.1.2 Double-deckers Buses	7
	2.2.1.3 Articulated Buses	8
	2.2.1.4 Bi-articulated Buses	8

CHAPTER	TITLE	PAGES
	2.2.1.5 Low-floor Buses	9
	2.2.1.6 Open top Buses	9
	2.2.1.7 Coaches Buses	10
	2.2.1.8 Trolleybuses	10
2.3	Seat	11
	2.3.1 Sitting and Seating	12
2.4	Defining Comfort in Automotive Seating	12
2.5	Bus Driver	13
2.6	Bus Driver Seat	14
	2.6.1 Specification of Seat	14
2.7	Ergonomics	16
	2.7.1 Characteristic of Ergonomics	17
	2.7.2 Cognitive Ergonomics	17
	2.7.3 Physical Ergonomics	17
2.8	Ergonomics Posture Sitting	18
2.9	Ergonomics Driving Posture	20
2.10	Ergonomics Seat	21
	2.10.1 Seat Based On Ergonomics	24
2.11	Computer-Aided Design (CAD)	26
	2.11.1 CATIA V5	28
	2.11.2 Rapid Upper Limb Assessment (RULA) Analysis	28
	2.11.2.1 Human Builder	29
	2.11.2.2 Human Activity Analysis	29
	2.11.2.3 Human Posture Analysis	30
 CHAPTER 3	 METHODOLOGY	
3.1	Introduction	31

CHAPTER	TITLE	PAGES
	3.2 Flow Chart	32
	3.3 Literature Review	33
	3.4 Concept Design	33
	3.5 Selection of the Design	34
	3.6 Detail Design	34
	3.7 Ergonomics Analysis	35
	3.8 Comparison	35
CHAPTER 4	CONCEPTUAL DESIGN AND SELECTION DESIGN	
	4.1 Introduction	36
	4.2 Conceptual Design	37
	4.2.1 Concept Development	37
	4.2.2 Concept Ideation	38
	4.2.3 Concept Generation	38
	4.3 Ergonomics Recommendations	39
	4.4 Existing Product	39
	4.5 Concept Designs	41
	4.5.1 Concept One	41
	4.5.2 Concept Two	42
	4.5.3 Concept Three	43
	4.5.4 Concept Four	44
	4.6 Selection Design	45
	4.6.1 Concept Evaluation	46
	4.6.2 Concept Screening	47
	4.6.3 Concept Scoring	48
CHAPTER 5	DETAIL DESIGN	
	5.1 Introduction	50

CHAPTER	TITLE	PAGES
5.2	Drawing	52
5.2.1	Existing Design	52
5.2.1.1	Drawing Existing Design	53
5.2.2	New Design	54
5.2.2.1	Drawing New Design	55
CHAPTER 6	RESULTS AND ANALYSIS	
6.1	Introduction	56
6.2	Analysis of the Existing Bus Driver Seat	59
6.2.1	First Posture Using Existing Bus Driver Seat	59
6.2.2	Second Posture Using Existing Bus Driver Seat	60
6.2.3	Third Posture Using Existing Bus Driver Seat	61
6.3	Analysis of the New Bus Driver Seat	62
6.3.1	First Posture Using Redesign Bus Driver Seat	62
6.3.2	Second Posture Using Redesign Bus Driver Seat	63
6.3.3	Third Posture Using Redesign Bus Driver Seat	64
6.4	Comparison between Existing and Redesign	65
6.4.1	First Posture of Bus Driver Seat	65
6.4.2	Second Posture Of Bus Driver Seat	65
6.4.3	Third Posture of Bus Driver Seat	66
6.5	Discussion for the Existing and Redesign Posture	66
6.6	Analysis of Material Selection	67
6.6.1	Brown Leather	68
6.6.2	Sponge	69
6.6.3	Blue Jeans	70
6.7	Comparison of the Material Selection	71

CHAPTER	TITLE	PAGES
CHAPTER 7	CONCLUSION AND RECOMMENDATIONS	
7.1	Conclusion	72
7.2	Recommendations	73
	REFERENCES	75
	BIBLIOGRAPHY	77
	APPENDIX A	78
	APPENDIX B	81

LIST OF TABLES

BIL	TITLE	PAGES
1	The concept screening matrix	47
2	The concept scoring matrix	48
3	RULA scoring and indications	58
4	First Posture of Bus Driver Sea	66
5	Second Posture of Bus Driver Seat	66
6	Third Posture of Bus Driver seat	67
7	Comparison of the Material Selection	72

LIST OF FIGURES

BIL	TITLE	PAGES
1	Double-deckers buses (Source: www.oxford-chiltern-buspage.co.uk/171206.htm)	7
2	Articulated buses (Source: www.skyscrapercity.com/showthread.php?t=368316)	8
3	Low-floor buses (Source: www.edmonton.low-floor-buses.aspx)	9
4	Open top buses (Source: opentopsightseeing.wordpress.com/)	9
5	Coach Buses (Source: www.ecvv.com/company/zonda/index.html)	10
6	Trolleybuses (Source: homepage.ntlworld.com/bruce.lake/index.html)	10
7	Free posturing (Source: Dr. Tim Springer, 2009) Driving posture (Source: http://www.motiontrends.com/2006/2006csm/m05/ebaymotors/driving_postures.jpg)	12
8	The typical postures adopted during service route driving (Source: Olanrewaju O. Okunribido et al., 2006)	19
9	Driving posture (Source: www.Recaro.com)	19
10	Flow chart for PSM 1 and PSM 2	21
11	The existing bus driver seat	32
12	Concept one	40
13	Concept two	41
14	Concept three	42
15	Concept four	43
16	The final selection concept	44
17	Existing Seat of Nissan GP bus that use in UTeM	49
18	Isometric, Front and Side View of the existing bus driver seat	52
19		53

20	The Selection Concept	54
21	Isometric, Front and Side View of the new bus driver seat	55
22	First Posture Using Existing Bus Driver Seat	59
23	Second Posture Using Existing Bus Driver Seat	60
24	Third Posture Using Existing Bus Driver Seat	61
25	First Posture Using Redesign Bus Driver Seat	62
26	Second Posture Using Redesign Bus Driver Seat	63
27	Third Posture Using Redesign Bus Driver Seat	64
28	Brown leather	68
29	Sponge	69
30	Blue jeans	70

LIST OF APPENDIXS

BIL	TITLE	PAGES
1	Gantt chart PSM 1	78
2	Gantt chart PSM 2	79
3	Concept 1	80
4	Concept 2	81
5	Concept 3	82
6	Concept 4	83
7	Final concept	84
8	Isometric existing design	85
9	2D existing design with dimension	86
10	Isometric redesign design	87
11	2D redesign design with dimension	88

CHAPTER 1

INTRODUCTION

1.1 Background

Nowadays, the public transportation has become one priority to consumers. Public transport forms the major use of buses and coaches, designed for the transport of the general public as a public service, rather than the private hire or use of buses for transport or other purposes. A bus is a road vehicle designed to carry passengers. Buses are the most widely used form of public transportation because many companies are provided that services and make the consumers easy and comfortable to move anyplace. Around the world many public transports were provided such as taxi, bus and train. Buses are either which became priority to users to be use in many places.

Bus drivers provide transportation for millions of people, from commuters to school children to vacationers. There are two major kinds of bus drivers. Transit and intercity bus drivers transport people within or across states, along routes run within a metropolitan area or county. For company which carried out that service must give priorities to security aspect on consumer such as check better and perfect bus. The company should think about the consumers comfortable and safety when use the services.

Nowadays, comfortable seating in a vehicle is no longer considered a luxury, but as a requirement. A seat that is comfortable in a showroom may have poor dynamic characteristics that make it uncomfortable whilst on road. Considered comfortable by a user also depends very much on the way a seat is used and how long it has been used. The optimum seat for one vehicle may not be the optimum seat for another vehicle. It is therefore important to consider both static and dynamic comfort when considering the quality of the in-vehicle experience.

Until now, there is still no local study on seat comfort for vehicles in Malaysia. Most of the automotive seats, especially bus driver seats, were designed not accordingly to the average size of Malaysian. For a long journey ride, the seat is important because it will affect the comfort feeling of the driver. These are the reasons that the seat comfort need to be studied in detail.

Either aspect which need emphasized is driver, this is because driver necessary in current comfortable position driving. The design of seat for driver must suitability for the driver and must be ergonomics, latest and suitable. The several existing design that have now in the market is not suitable to be used. This is because the designs of the seat are not follow the requirements for Malaysian people. It makes the driver become pain if seating for a long time when operate the bus. The certain design seat at the market is not follow the bus driver needed. Beside that the design has not follow the specification driver bus need.

1.2 Objectives

The main objectives of this project are to design and perform the ergonomics analysis for the bus driver seat.

1.3 Scopes

The basic scopes that want to achieve for the project to make successful and fulfill the objective are:

1. Literature review of the existing ergonomics of bus driver seat.
2. Carry out the conceptual designs of bus driver seat.
3. Re-design of the bus driver seat.
4. Perform the ergonomics analysis with the new concept.
5. Comparison between the existing and the new design based on the ergonomics analysis.

1.4 Problem Statements

Driving a bus through heavy traffic or long journey while dealing with passengers is more stressful and make the driver became pain. Many drivers enjoy the opportunity to do work without any problem with other or uninterrupted from anyone, with full responsibility for their bus and passengers. To improve working conditions and retain drivers, many bus lines or bus express provide ergonomically designed seats and controls for drivers.

The general objective of the seat project is to develop a bus operator's seat that would accommodate the extremes of the bus driver population with minimal mechanical adjustment, and durable enough to withstand daily and prolonged use. Because a particular bus may be driven by different drivers within a single day or certain time, the great variation in driver size within the driver population demands the various adjustments have a best range of adjustment to accommodate the wide differences in driver size and shape.

Because of the limited amount of time allocated for the preparation and start of transit service, the actions to adjust the seat must be easy, intuitive, understandable, and quick. It is not uncommon for many bus drivers to start their shift away from the bus yard and on the road, relieving drivers from buses already in service.

Finally, the seats must fit into the wide variation of urban transit bus workstations available. This lack of uniformity exists not only between bus manufacturers, but also among the bus models themselves.

CHAPTER 2

LITERATURE REVIEW

2.1 History of Busses

The History of Bus dates back to the early 19th Century. In the early 1830's Sir Goldworthy Gruney from the UK had designed some kind of a Hugh stagecoach, which was powered by steam engine. This was probably the first kind of bus developed by mankind. However, the concept of buses has drastically changed in today's world (<http://www.automobileindia.com/commercial-vehicles/bus-jeep-tractor-history.html>).

Today, anything which is used to carry passengers and is self engineered is termed as a bus. It is normally used for fixed distances and routes. Any vehicle that carries more than 10 people is called a bus.

However, after the first breakthrough in 1830, the development of buses took a new stage in 1895. It was during this time, that the first passenger bus with four to six horse power single cylinder engines was made in Germany. The modern term bus had come from the Latin word "Omnibus", meaning "for all". And, by the 1915, bus service had started throughout the world. And slowly the Horse-Drawn Carriage and the Electric Trolley cars were replaced by Buses (<http://www.automobileindia.com/commercial-vehicles/bus-jeep-tractor-history.html>).

Initially, the structures of Buses were not very different from trucks. They used to share the same kind of chassis with a different body. However, in 1922, an American Firm for the first time had developed a chassis especially for bus service. It's a little

different from the truck chassis, which is a foot higher than that of the bus chassis. It also had a front mounted engine, a wide tread and an extra long wheelbase. However, later an integral frame was developed for better performance. Soon after that, the gasoline electric buses were introduced and a few years later the diesel powered Buses came into being. Later in the 1950's air suspension was first implemented in the passenger buses. Compared with the buses of the yesteryears today's buses consume more fuel, but at the same time are also more powerful than the buses of the past (<http://www.automobileindia.com/commercial-vehicles/bus-jeep-tractor-history.html>).

2.2 Buses

Bus is a derivation of Omnibus Vehicle meaning "vehicle for all", where Omnibus means "for all" in Latin (omnes meaning "all"), reflecting its early use for public transport. When motorized transport replaced horse-drawn transport starting 1905, a motorized omnibus was called an autobus, a term still used until now (<http://www.lingeriebrasandthongs.com>).

Nowadays technology had modified design a bus and technology has influenced design bus. The traditional configuration of a bus was an engine in the front and an entrance at the rear. After that with the transition to one-man operation, buses in the developed world have taken the form of mid or rear-engine designs, with a single door at the front, or multiple doors. Front-engine buses still persist for niche markets such as school buses, some minibuses, and buses in less developed countries, which may be derived from truck chassis, rather than purpose-built bus designs.

A motor vehicle for mass transit, built in various capacities and sizes, designed for carrying from 10 to 60 passengers or more on school, local, intercity, or interstate routes. A commercial bus usually operates on a regular schedule and travels a fixed route, and each passenger pays a fare. In general, a bus has a long body with the passengers sitting on benches or seats. A double-deck bus has two separate passenger compartments, one above the other. The articulated bus has two connected passenger compartments that bend at their connecting point as the bus turns.