



DESIGN AND DEVELOPMENT OF MOTORCYCLE ROTATED STAND



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Technology**



Nor Azureen Binti Saleh

Bachelor of Manufacturing Engineering Technology with Honours

2023

DESIGN AND DEVELOPMENT OF MOTORCYCLE ROTATED STAND

NOR AZUREEN BINTI SALEH

**A project report submitted
in fulfillment of the requirements for the degree of
Bachelor Manufacturing Engineering Technology with Honours**



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2023

DECLARATION

I declare that this thesis entitled “Design and Development of Motorcycle Rotated Stand ” is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature

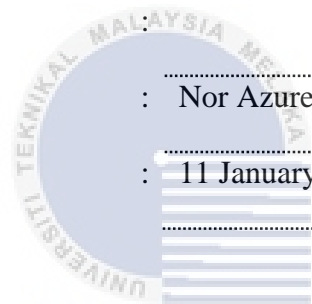


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APPROVAL

I hereby declare that I have checked this thesis and in my opinion, this thesis is adequate in terms of scope and quality for the award of the Bachelor of Manufacturing Engineering Technology with Honours.

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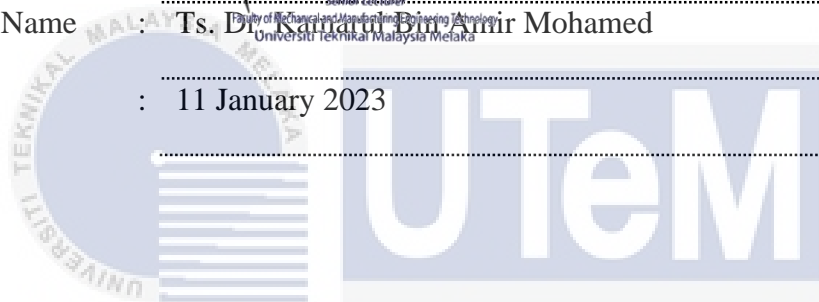
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DEDICATION

This report is dedicated to my parents in particular, for their endless love, support, and encouragement. And to my lecturer Ts. Dr. Kamarul Bin Amir Mohamed has guided me along the way to finish this project. Thank you for all your support, and give me strength until this project is finished.



ABSTRACT

This project describes a motorcycle stand to design a space-saving and multifunctional product based on basic service to maintenance the motorcycle for users. Every motorcycle has its own way to handle and how to stand if the user wants to place and park. However, there must be the exertion of force and energy when handling motorcycles, especially for types of motorcycles with mass of 300kg and above. Besides that, the characteristics of the motorcycle are very big and it is utilized more space to park in a certain place. Due to that, the main purpose of this thesis is to study the characteristics of motorcycle stands and maintenance for motorcycles. Then, the thesis is also about to analyze the level strength of the structure motorcycle stand using Solidworks software. In addition, to design a functional stand for lifting and rotating a motorcycle with a maximum weight of 300kg. In this study to produce a new motorcycle rotated stand, at least three phases must be completed in the development of this project. The three phases are the study, design, and development phases. This project was started with a questionnaire survey that involved 123 respondents. This questionnaire survey is carried out to figure out the customers' requirements. Furthermore, the data collected will be utilized to improve or develop a new motorcycle stand design that would meet the expectations of customers and a morphological chart has been used to complete this project. Thus, the motorcycle rotated stand will be created based on customer requirements and stability to use for lifting and rotating. Concept designs have been created and the most appropriate concept is chosen using the Pugh matrix, House of Quality (HOQ) and Solidworks software was used to design the 3D CAD drawing of the selected concept. The Design for the motorcycle rotated stand is sketching 4. It is because sketching 4 is more safety, efficiency, stability and it is easy to store. The rotated motorcycle stand must have these criteria according to the objective of this project. The material selection has been selected by analysis in Solidworks simulation to assess the motorcycle stand's safety, durability, and structural integrity, to optimize the satisfaction of users with their everyday usage, to determine the material behaviour and deformation in a few aspects. The main concerns in this project were the displacements, factor of safety, strains, and stresses of motorcycle stand designs subject to internal and external loads. A project feature was developed to perform weakness point of the product, in order to confirm that the designed product is stable enough to use. The results showed that the designed motorcycle stand is stable to use.

ABSTRAK

Projek ini adalah mengenai pendirian motosikal yang direka bentuk untuk produk yang menjimatkan ruang dan pelbagai fungsi berdasarkan perkhidmatan asas untuk penyelenggaraan motosikal kepada pengguna. Setiap motosikal mempunyai keistimewaan tersendiri untuk dikendalikan dan cara berdiri sekiranya pengguna ingin meletakkan kenderaan. Namun, pengguna mesti menggunakan tenaga yang banyak untuk mengendalikan motosikal terutamanya bagi motosikal yang berjisim sebanyak 300kg dan ke atas. Selain itu, ciri-ciri motosikal tersebut sangat besar dan menggunakan lebih banyak ruang untuk disimpan. Oleh itu, tujuan utama tesis ini adalah untuk mengkaji ciri-ciri pendirian motosikal dan penyelenggaraan motosikal. Di samping itu, tesis ini juga menganalisis tahap kekuatan struktur pada pendirian motosikal dengan menggunakan Solidworks. Selain itu, tujuan thesis ini untuk mereka bentuk pendirian berfungsi untuk mengangkat dan mengalihkan motosikal yang mempunyai berat maksimumnya 300kg. Pelaksanaan pendirian motosikal dalam kajian ini, mempunyai tiga fasa yang perlu dilaksanakan. Tiga fasa tersebut ialah fasa kajian, reka bentuk dan pembangunan. Projek ini dimulakan dengan tinjauan soal selidik yang melibatkan 123 orang responden. Tinjauan soal selidik ini dijalankan untuk mengetahui keperluan pengguna yang menggunakan motorsikal. Justera, data yang dikumpulkan akan digunakan untuk menambahbaik dan mereka bentuk "Motorcycle Rotated Stand" yang akan memenuhi jangkaan pelanggan dan carta morfologi dalam projek ini. Oleh itu, "Motorcycle Rotated Stand" akan dibuat berdasarkan keperluan pelanggan dan kestabilan untuk digunakan untuk mengangkat dan dialihkan. Reka bentuk konsep telah dibuat dan konsep yang paling sesuai dipilih dengan menggunakan "Pugh matrix", "House of Quality (HOQ)" dan Solidworks yang digunakan untuk mereka bentuk lukisan CAD 3D bagi konsep yang dipilih. Reka bentuk yang telah dipilih untuk "Motorcycle Rotated Stand" ini ialah lakaran 4. Dalam kajian "House of Quality (HOQ)", lakaran 4 lebih selamat, cekap, stabil dan mudah disimpan. "Motorcycle Rotated Stand" mestilah mempunyai kriteria ini untuk memenuhi objektif projek ini. Pemilihan bahan telah dipilih melalui analisis dalam simulasi Solidworks untuk menilai keselamatan, ketahanan, dan integriti struktur pendirian motosikal, untuk mengoptimumkan kepuasan pengguna dengan penggunaan harian mereka. Kebimbangan utama dalam projek ini ialah sesaran, faktor keselamatan, strain, dan tegasan reka bentuk pendirian motosikal tertakluk kepada beban dalaman dan luaran. Projek yang telah dibangunkan untuk melaksanakan titik kelemahan produk, untuk mengesahkan bahawa produk yang direka bentuk adalah stabil untuk digunakan. Hasil kajian menunjukkan bahawa pendirian motosikal yang direka adalah stabil untuk digunakan.

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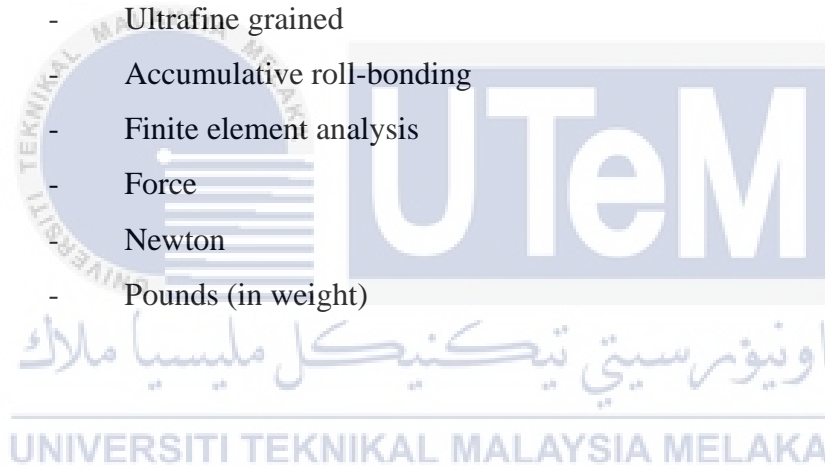
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LIST OF SYMBOLS AND ABBREVIATIONS

D,d	-	Diameter
Etc	-	Editable text configurations
CC	-	Cubid Capacity
ACU	-	Auto-Cycle Union
Kg	-	Kilogram
HP	-	Horsepower
KTM	-	Kronreif, Trunkenpolz, Mattighofen
HSS	-	High strength steel
UFG	-	Ultrafine grained
ARB	-	Accumulative roll-bonding
FEA	-	Finite element analysis
F	-	Force
N	-	Newton
Lb	-	Pounds (in weight)



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CHAPTER 1

INTRODUCTION

1.1 Background Research

Motorcycles are the fastest-growing segment of the global automobile industry, representing the majority of fleets in many low and middle nations and motorcycles are the fastest-growing trends in the global automobile industry, accounting for the majority of fleets in many low- and middle-income nations (Dimitrios, 2017). There are many different sorts of motorcycles, depending on how they are used, the designer's purpose, or a mix of the two. Cruiser, sport, touring, standard, dual-purpose, and dirt bikes are the six primary categories. Sport touring motorcycles are often classified as a seventh category.

Every motorcycle has its own special to handle and how to stand if the user wants to place and park. Every motorcycle must have one stand. The one stand is always used as a temporary park. The side-stand on superbikes positions the bike in a slanting position, limiting users' capability to do maintenance. The kickstand should be retracted by kicking it up with the left foot and allowing it to tuck behind the motorcycle's underbody. Besides, the motorcycle also has a double stand or known as a center stand. Besides that, double-stand which is common on considerably lighter lower CC motorcycles is rarely encountered on superbikes with a dry weight of moreover 100 kg. This double-stand serves as a temporary stand that elevates the motorcycle to a vertical standing position, allowing for easy maintenance work on a regular or ad-hoc basis (Rashid et al., 2012).

Motorcycle studies have recently sparked a lot of interest in the scientific community (Syahmi et al., 2022). A paddock stand is used on superbike motorbikes to support the motorcycle in an upright and stable posture, which can be used for a variety of tasks such as washing, tire change, and general maintenance (Pratik Patole, 2015). So, the paddock stand serves an important purpose and can be found in most garages. It's not difficult to use a paddock stand. All that is required is to align the paddock stand's holding mounts with the extension bolts on the rear wheel and support the wheel on it. Then simply push the handle frame lower, wedging the bike upwards until the frame contacts the ground and supports it. It's a lock mode in which the bike will be supported on the stand and will not move till you pull the frame upwards again. As a result, they are extremely safe to use.

While using a paddock for a superbikes motorcycle, the motorcycle will be stable and can use to maintain the motorcycle. It also provides solid stability to the motorcycle. However, if the user motorcycle does not use the paddock stand, it has limitations that can occur motorcycle damage and fall. Moreover, the paddock stand has a lot of space to store. It can occupy space for the user to store such as in the garage. Next, one stand motorcycle can also easy to fall upside down the motorcycle which is parking for a long period. This is because, factors of environment, maintenance, and the placement of motorcycles are affected the stability of the motorcycles.

1.2 Problem Statement

People nowadays prefers riding a motorcycle to driving a car. This is because motorcycles also have lower operational costs and fuel consumption than passenger cars, contribute less to traffic congestion and provide the personal freedom that public transportation does not (Cox & Mutel, 2018). However, users must use a lot of force and energy for handling motorcycles, especially for types of motorcycles with 100 kg and above. Besides that, the characteristics of the motorcycle are very big and it is use more space to store. If the motorcycle has to park and handle, the space also should be big and have a lot of space to use. Besides that, motorcycles like 100kg and above do not have a double stand. So, it is difficult to park and maintenance. So, paddock stands are commonly used by superbike owners to temporarily hold their motorcycle in an upright posture, allowing them to do either daily or ad-hoc maintenance (Syahmi et al., 2022). Unfortunately, usage of the paddock in the current market is not effective and the rear wheel of the motorcycle and front are not orderly. In addition, the paddock can lifting at rear wheel of the motorcycle only.

1.3 Research Objective

The main aim of this research is to propose a systematic and effective methodology to design and develop a motorcycle rotated stand with reasonable accuracy. Specifically, the objectives are as follows:

- i) To study the characteristics of the motorcycle stands and services to maintenance for motorcycles.
- ii) To analyze the level strength of the motorcycle stand using Solidworks software.
- iii) To design a functional stand for lifting and rotating a motorcycle with a maximum weight of 300kg.

1.4 Scope of Research

The scope of this research are as follows:

- i) This project focuses on the motorcycle which does not have a double stand and type of service the motorcycle.
- ii) The main focus of this project is to design and create functional tools for lifting and can rotate the motorcycle.
- iii) Handling motorcycle which is weight of moreover 100 kg to 400 kg in the small space.

1.5 Report Outline

This study proposal has been divided into 5 main chapters. Each chapter consists of the project background, literature review, methodology, result, and project summary. Chapter 1 introduces the project background, problem statement, research objective, research scope, report outline, and summary. This chapter is very important to tell the background and direction of this project.

Chapter 2 cover the literature study on about type of motorcycle, the history of the motorcycle, the space that the motorcycle use, and the service or maintenance for the motorcycle. This chapter describes the history, and analysis of the structure of the material, basics, principles, and existing products that have to handle the motorcycle.

Chapter 3 explain the flow chart of a detailed project implementation process that is carried out for the whole process of the methodology and project scheme (Gantt Chart). This chapter describes from the beginning until the end. There has three-phase for this project which are Phase I (Study), Phase II (Design of Product), and Phase III (Development and Fabrication).

Chapter 4 presents the results and analysis of the development of the motorcycle rotated stand, along with the results step by step. The data the result collected from the survey by questionnaire and analyzed in Solidwork.

Chapter 5 concludes the improvement of the final result collected from the survey. The improvement is based on the customer requirement. This chapter also will conclude with the study objective and suggestions for the future studies.