UNIVERSITI TEKNIKAL MALAYSIA MELAKA

The Design of The Agriculture Smart Mover Bodywork Structure using Total Design Technique

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor's Degree in Mechanical Engineering Technology (Automotive Technology) with Honours

by

MUHAMAD RIDHWAN BIN MOHAMAD SALEH
B071410415
950407-07-5987

FACULTY OF ENGINEERING TECHNOLOGY

2018

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: **The Design of The Agriculture Smart Mover Bodywork Structure using Total Design Technique**

SESI PENGAJIAN: **2017/18 Semester 1**

Saya **MUHAMAD RIDHWAN BIN MOHAMAD SALEH**
mengaku membenarkan Laporan PSM ini disimpan di Perpustakaan Universiti Teknikal Malaysia Melaka (UTeM) dengan syarat-syarat kegunaan seperti berikut:

1. Laporan PSM adalah hak milik Universiti Teknikal Malaysia Melaka dan penulis.
2. Perpustakaan Universiti Teknikal Malaysia Melaka dibenarkan membuat salinan untuk tujuan pengajian sahaja dengan izin penulis.
3. Perpustakaan dibenarkan membuat salinan laporan PSM ini sebagai bahan pertukaran antara institusi pengajian tinggi.
4. **Sila tandakan (✓)

☐ SULIT   (Mengandungi maklumat yang berdarjah keselamatan atau kepentingan Malaysia sebagaimana yang termaktub dalam AKTA RAHSIA RASMI 1972)

☐ TERHAD   (Mengandungi maklumat TERHAD yang telah ditentukan oleh organisasi/badan di mana penyelidikan dijalankan)

☐ TIDAK TERHAD

Disahkan oleh:

_____   _____

Alamat Tetap: Cop Rasmi:

No. 1, Jalan Damai 11, Taman Damai 3,
34200 Parit Buntar,
Perak.

Tarikh: _____   Tarikh: _____

** Jika Laporan PSM ini SULIT atau TERHAD, sila lampirkan surat daripada pihak berkuasa/organisasi berkenaan dengan menyatakan sekali sebab dan tempoh laporan PSM ini perlu dikelaskan sebagai SULIT atau TERHAD.

DECLARATION

I hereby, declared this report entitled "The Design of The Agriculture Smart Mover Bodywork Structure using Total Design Technique" is the results of my own research except as cited in references.

Signature   : ....

Author's Name   : ....

Date   : ....

APPROVAL

This report is submitted to the Faculty of Engineering Technology of UTeM as a partial fulfillment of the requirements for the degree of Bachelor of Mechanical Engineering Technology (Automotive Technology) with Honours. The member of the supervisory is as follow:

…………………………

(Project Supervisor)

ABSTRAK

Kajian ini membincangkan tentang reka bentuk dan analisis rangka 'Agriculture Smart Mover'. Secara ringkas, tujuan produk ini ialah untuk memudahkan kerja-kerja pengangkutan barang-barang dari ladang untuk jemput trak. Matlamat dan objektif projek ini adalah untuk mereka bentuk dan menganalisis struktur Bodyworks 'Agriculture Smart Mover'. Reka bentuk ini dihasilkan menggunakan perisian CAD CATIA V5 dan menganalisis menggunakan perisian CAE SolidThinking. Bahan yang digunakan dalam analisis ini adalah keluli lembut sebagai bahan utama untuk badan. Akhir sekali, struktur casis kemudiannya dianalisis untuk menentukan struktur yang dihasilkan kuat dan tahan lama.

i

ABSTRACT

This study discusses about the design and analysis for the body of the 'Agriculture Smart Mover'. Briefly, the product purpose is to ease the works of transportation of the goods from plantation to pick-up truck. The goals and objectives of this project is to design and analyse the bodyworks structure of Agriculture Smart Mover. This design is produced using CAD software CATIA V5 and analyse using CAE software SolidThinking. The material that is used in this analysis are Steel 1018 as the main material for the body. Finally, the chassis structure is then analysed to determine the structure that produced a strong and durable.

DEDICATION

This thesis is dedicated to my treasured father Mr. Mohamad Saleh bin Ramli, my beloved mother Mrs. Norma binti Mohamad and my beloved supervisor Mr. Ahmad Zainal Taufik bin Zainal Ariffin

.

ACKNOWLEDGEMENT

Bismillahirrahmanirrahim. In the name of Allah the Beneficent, the Merciful.

First and foremost, special thanks to my benevolent parents Mr.Mohamad Saleh bin Ramli and Mrs. Norma binti Mohamad for their love and support throughout my life. My small humble family have granted me strength, passion, and sprits to perform at my best and pursuit my visions and goals.

I would like to acknowledge my supervisor, Mr. Ahmad Zainal Taufik bin Zainal Ariffin, for trust and confidence granted to me for conducting this plus his comprehensive guidance and support throughout this study. I would also like to thank my co. supervisor, Profesor Madya Dr. Muhammad Zahir bin Hassan. His comments and lessons were very beneficial in order for me to complete this thesis and conduct this study. I learned from his insight a lot. I was grateful for the discussion and clarification made with him.

Last but not least, I would like to thank Universiti Teknikal Malaysia Melaka (UTeM) for giving me the opportunity to give a course for degree. To all my friends, thank you for your understanding and encouragement. Our friendship makes our life wonderful. Although your name are not mentioned here, but you are always on my heart.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

1.1   Background

From the earliest starting point, agriculture is largely from human society because of the reality that humans and agriculture are directly related to each other. This fact leads to the development and improvement of the usual, inappropriate and time-consuming methodology used for agriculture. The fast-paced world, new patterns and innovative developments have changed the way individuals live. The growing new innovation is an important part of the routine. Intelligent and grid smart home, smart city (Abbai Belai, Daniel Boakye, John Vrakas, Hashim Wasswa, 2011) are part of the latest technology, information and communication technology that helps people save time and get faster and precise results .

Many innovations such as elaborate computing, isolated systems, RFID labels, after experiencing advances in various areas of life, due to remarkable efficiency, are also imposing agricultural industries (Yusof Basiron, 2002). In addition, the upcoming IT era will replace the traditional methodology with smart, efficient and controlled agriculture administration (BACP, 2008).

This project focuses on the initial design of the intelligent farm drive body structure by using the entire design process. Design stage process involves in this project from stract with the aim that the design can be arranged with soft steel. This involves the use of computer help software namely CATIA and SOLIDWorks to prove that the design meets the safety and strength criteria. This allows the design to be submitted for commercialization purposes.

1

1.2   Problem Statement

Palm oil is one of the most important vegetable oils in the world and annually one million tons of palm oil has been traded worldwide for one million people worldwide (Abbai Belai, Daniel Boakye, John Vrakas, Hashim Wasswa, 2011). It is also a major export commodity in our country. It has become one of the largest tax revenue contributing to the Malaysian budget (Yusof Basiron, 2002). The key role of the industry in the Malaysian economy is not only because Malaysia relies heavily on oil palm for its foreign exchange earnings, but also because palm oil is used as a means of development in the last three decades of poverty reduction programs (BACP, 2008). However, there are several types of problems that can not be separated by the development of the palm oil industry with many labor uses to produce palm oil. Workers' wages also increase their labor force. The time taken by the workers to collect the fruit is also longer. There are many steps taken by farmers and entrepreneurs to implement strategic plans to work better and transport oil.

Nowadays, demand for oil has increased dramatically (Cheng Hai Teoh, 2002). Developments in the palm oil industry should address this problem to improve quality and quantity to meet customer needs. Starting at the base, usually in their palm oil plantations they use ordinary wheelbarrows to collect palm fruits that have been extracted from coconut trees. This method has been practiced for a decade. This method will increase the number of employees and it will lead to increased costs. Based on the structure of the stroller, it does not last long due to the maximum weight of palm oil. It also can not withstand high loads. Therefore, there is a need to come out with a solution that has a clever palm fruit that will facilitate the transport of goods from farm to pick-up truck.

Vehicle body design is one of the key aspects of the performance of any vehicle. When vehicles cross the medium with high speed, the medium will act on the resistance vehicle body (McBeath, S. and Rouke, Brian, 2000). Large smart drive designs should be able to work on the rough surface of oil palm estates

In addition, body designs should have the appeal to those who see every detail of the design in terms of creativity and aesthetic value. Therefore, there is a need to meet market criteria for wheelchairs.

2

1.3   Objective

The objectives of this project is:

1.   To design a suitable bodywork structure of the agriculture smart mover using Total Design Method.
2.   To conduct feasibility study of the agriculture smart mover to meet the safety and strength demand criteria

1.4   Scope

The scope of this project are as follow:

i.   To facilitate a transportation oil palm fruits on the plantation site.
ii.   Cost effectiveness as the design is required to be affordable by the market.
iii.   To create 3D design of agriculture smart mover bodywork chassis using CATIA.
iv.   To analyse the chassis structure using SolidThinking.

3

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

Literature review purpose for this study is to review other research related to the study conducted in order to get the right idea and concept. Literature review also use in this study to obtain problem statement and to obtained best and suitable methodology.

This project is about the development of bodywork of Agriculture Smart Mover by using composite material which is mild-steel. The developments that have been planned in the bodywork are the refreshing new design which more focuses on analysis to the bodywork. Furthermore, there is some analysis in order to find the right type of material to use in agriculture smart mover.

By using finite element analysis SOLIDWorks, we can satisfy the requiring of automotive design, and develop the level of design radically. In addition, shortcut the development period and reduce the cost (Jin yi-min, 2006).

2.2   Historical Background

2.2.1   The Wheelbarrow

A wheelbarrow is a bearer like small vehicle that usually having only single wheel and comprising of a tray bolted to two handles and two legs. While referred to generally as a device for conveying small loads for the household gardener, a wheelbarrow is regularly likewise utilized as a part of development and industry for conveying bigger loads.

As early as 100 B.C, the origination of the present day wheelbarrow was China. The early form consists of a large single wheel on or near the front of the stage. The load will be set behind the wheel and the administrator will lift the weight end and push the load. Small baskets will be used to convey the load and to the outside chance that the load is large, the second administrator can pull from the front. Another type, most likely created by Chuko Liang at 300 A.D., has a conveying surface which is basically a large wheel housing that packs half the top of the wheel. Levels that are projected from both sides at the pivot level can deliver a lot of loads, individuals and items in the pannier plan while administrators guide them. The load is higher than the land delivered on the car today. China's stroller is like a rickshaw because its purpose is to ship a lot of heavy separation. Tseng Min-Hsung in 1200 A.D. boasting that "detours like sheep will not destroy them."

In Europe, first use of the stroller may be in agriculture. Then, it spread to the development, transport of goods, mining, and brick making. Some wheelchairs have wooden bodies like boxes with legs. Others have slatted or wicker structures with legs. In addition, French, Flemish, and Dutch tanks usually have shelves for many containers or containers. The Swiss Wheelbarrows have strong wheels, while English has four legs and wheels. Bohemia at the time also used a distinctive wheel, but foot was not used to help reduce the load. For help when moving the load, the European wheelbarrow around 1200 A.D. has a leather band that hurts around its handle. The administrator will release the ropes around his neck.

The wheelbarrow's points of interest were that loads could be lifted and conveyed near the ground, instead of two-man handbarrows that required conveying to be done at waist level. A wheelbarrow that delivers a basket of goods can be quickly expelled and returned to activity, despite the fact that it is too complicated on this date, so it is unlikely to be released essentially tilting and rolling it. An individual using a stroller will reduce the cost of labor in half, and it is easier than two individuals to organize their progress as they convey the burden. The wheelbarrows quickly move towards being a carpenter made for sale to construction workers. In 1222, the record for England's masterpiece showed that eight wheelbarrows were bought from the city of Canterbury for development in Dover.

Today's strollers can have one, two or four wheels. This wheel can be in front of or under load. Other amenities include storage space or side clip to deliver the instrument. Sledges are seen as a requirement for backyard and even industry, as they are seen as direct, unauthorized, but successful pathways for an individual to deliver heavy loads.
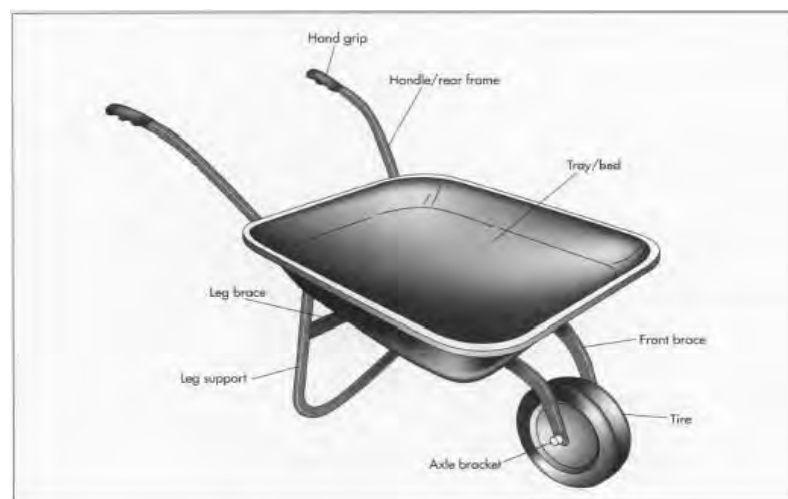

Figure 2.1: A typical wheelbarrow

6

2.2.2 Existing Wheelbarrow Design

The wheelbarrow is a very old design that has produced many different iterations. One of the example for a typical wheelbarrow is the Jackson medium duty wheelbarrow, pictured in Figure 2.2.

Figure 2.2: Jackson Wheelbarrow

Wheelbarrow's simple task Jackson uses the most widely acclaimed one wheel with two support foot designs. This is an extraordinary jewelry for any kind of worker, regardless of whether he or she owns a homeowner or a construction laborer. Strong steel and frame containers are designed to last for years. However, this design still requires a lot of energy to be deployed by the operator when moving and removing the material. With no mechanical parts, the operator is the single information required to drive the load that the wheelbarrow is capable of transporting. An alternative way to handle a stroller configuration can be seen in heavy-duty Gorilla Cart trolleys, illustrated in Figure 2.3.

Figure 2.3: Gorilla Carts Heavy Duty Dump Cart

The Gorilla trolley uses four wheels, a train design. This design adapts more to homeowners who may use this car to transport mulchs and flowers around their pages. In addition, with four wheels, it does not look like the flexibility of Jackson's design, but it has a discharge door that facilitates the uploader. However, a single holder is not suitable to attract heavy loads and plastic containers can exhibit brittle under continuous strokes with spade spades.

Created around the design of two-wheeled cars, Lifetime thrust carts are meant for smaller jobs. Examples are gardening, and are illustrated in Figure 2.4.

Figure 2.4: Lifetime Wheelbarrow

The two wheel design of the Lifetime wheelbarrow takes into account extraordinary mobility and its pivot point allows for easy dumping of the load. owever, its plastic containers can break under the recurring hit from the spade and the back support bar will make it difficult to raise the hill because the bar will be dug into the ground. It is an excellent alternative to small jobs such as transporting

8

flowers and light loads, but is not expected for heavier loads or applications such as concrete.

The Lifetime also makes two more wheelchairs, but one takes more carts. The two-way wheelbarrow The Elevator Concentration, seen in Figure 2.5, is the stage of the Lifetime thrust cart.

Figure 2.5: Lifetime 2-Way Dumping Wheelbarrow

The 2-way dumping wheelbarrow also uses a two wheel cart design, however it has two angled holders instead of straight. Furthermore, the holder can descend and expose the delay barrier to pull the stroller with the tractor. The 2-way route also allows the container to dump the garbage making it easier for operators to move the load. However, this method is designed with two wheels and an old container makes the harder speed in a tight spot. Also the holder is closer to the ordinary wheel of the wheel which can make it harder to push or pull heavy loads with a nearby holder.

Subsequently, the final product to be examined is Narrow Barrow's stroller, illustrated in Figure 2.6.

Figure 2.6: Narrow Barrow Wheelbarrow

The Narrow Barrow stroller does not demand it to carry higher loads or working with material such as concrete, but it is best suited for gardening. Its main feature is its former fabric that allows it to be folded for storage. It persists as before as a standard stroller where the user supplies all the power to move and dump, but it separates itself by taking almost no space when stored.

2.3   Work Principle

2.3.1   Finite Element Analysis

FEA utilizes a mind boggling arrangement of focuses called nodes which make a framework called a mesh. This mesh is customized to contain the material and auxiliary properties which characterize how the structure will respond to certain stacking conditions. Nodes are alloted at a sure thickness all through the material relying upon the expected anxiety levels of a specific region. Areas which will get a lot of anxiety as a rule have a higher node density than those which encounter next to zero anxiety. Point of interest may comprise of: fracture point of beforehand tried material, fillets, corners, complex subtle element, and high push territories. The lattice demonstrations like a bug catching network in that from every node, there extends a mesh component to each of the contiguous nodes. This web of vectors is the thing that conveys the material properties to the article, making numerous