



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

LOOSE COL - PICK EQUIPMENT

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

by

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I hereby, declared this report entitled “Loose Col – Pick Equipment” is the results of my own research except as cited in references.

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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 Manufacturing Engineering Technology (Product Design) with Honors. The member of the supervisory is as follow:

.....

(Umi Hayati Binti Ahmad)

ABSTRACT

Palm oil is one of the largest business in Malaysia and collecting the loose oil palm fruits is one of the most problem facing by entrepreneur which consume higher time in collecting them. The main goal of this study is to produce an equipment that will helps the user to reduce the time consumed and fatigue during collecting the loose oil palm fruits. The equipment that been built had been determined its machine element that will be used by using calculation and predict its shape based on questionnaire distributed to the user. As a result, the machine elements that used for this equipment to operate correctly is right but for further improvement, the machine elements need to be replaced for cutting the cost and the load applied for this equipment need for more study to extend the wear life of the equipment.

ABSTRAK

Minyak sawit merupakan salah satu perniagaan yang terbesar di Malaysia dan mengutip buah kelapa sawit relai adalah salah satu masalah yang kerap dihadapi oleh usahawan yang mana mengambil masa yang agak lama untuk mengumpul mereka. Matlamat utama kajian ini adalah untuk menghasilkan peralatan yang akan membantu pengguna untuk mengurangkan masa yang digunakan dan tahap kepenatan mereka semasa mengumpul buah kelapa sawit relai. Peralatan yang dibina ini telah dipilih unsur mesinnya yang akan digunakan dengan menggunakan pengiraan dan meramalkan bentuknya berdasarkan soal selidik yang diedarkan kepada pengguna. Kesimpulannya, pemilihan elemen-elemen mesin yang digunakan untuk peralatan ini untuk beroperasi dengan baik adalah betul tetapi ianya memerlukan penambahbaikan pada masa hadapan dimana elemen-elemen mesin ini perlu diganti bagi mengurangkan kos dan beban yang dikenakan pada elemen mesin ini perlu dikaji semula bagi melanjutkan jangka hayat haus peralatan.

DEDICATIONS

This report is dedicated to my beloved mother, my late father, my siblings and not forget my friends, who always support and encourage me during this final year project work. Last but not least, my team mates in TTLA OFFICIAL who were always there when I needed help during this final year project.

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CHAPTER 1

INTRODUCTION

1.0 BACKGROUND OF STUDY

Palm tree is historically brought over from Africa to Southeast Asia at the beginning of the 20th century. Today, Malaysia is known as one of the largest producers and exporters of palm oil in the world, accounting for 11% of the world's oil and fats production, and 27% of export trade of oil and fats (Malaysian Palm Oil Council; MPOC). Oil palm that extracted from palm fruits can give many use to the individual or company; consumer retail food and snack manufactures, personal care and cosmetics, bio fuel and energy, animal feed, pharmaceutical, industrial, food service, etc.

The profit of oil palm fruit is very large which is Malaysia's oil palm export on January till December 2014 recorded that around 875,213 tonnes, equal to 23.84% (MPOC Annual Report 2014). The regular price for oil palm per tan, it's about RM 1500 and this is not a fix price because the price will be changed according to the request and economy. To produce a tan of oil palm, at least five tons' bunch fresh oil palm needed. During harvesting process, every bunch of oil palm always caused at least 5% of oil palm fruits fall separated on the land. This is a big loss if the loose fruits not collect, because the loose fruit has a high oil contain.

The purpose of this project is to help the workers improve the collecting process which is reduce the time during collecting the loose oil palm fruits. Hence, Loose Oil Palm Fruit Col-Pick Equipment is the apparatus that will be built in order to solve this problem. This equipment is ergonomically and able to collect the loose palm fruits, and for the same time it's able to clean the rubbish and dirt present on

the fruits. This equipment will be included the gear system in order to drive it and make the purpose of this equipment succeed. In details, the study is mainly focus on collector part elements which hence attached it together with cleaning part, where the existing prototype of cleaning part will be taken as reference for redesign into a suitable and functional equipment.

Besides that, for making it ergonomic and portable which is not burden for workers, material selection is important and for this one, the equipment is planned will be fabricate using zinc plate steel where this material is light. If the equipment using the wrong material which is weight and difficult for workers to operate, its just will end with a failure prototype that has no value in market because not ergonomic. In order to simulate and analysis the machine elements that consists in the equipment, SolidWork software will be use because this software got feature in display the total analysis; rate of success and failure. The analysis using SolidWork software is focus on gear and belting system in order to see how they work and transfer the load and for the same time, drive the equipment.

1.1 PROBLEM STATEMENTS

In general, harvester always using traditional method to collect loose oil palm fruits. The traditional method still been practiced widely today which is the loose oil palm fruits will be collected using hand and will be put into bucket, plastic bag or gunny. Every worker who done these routine needs to bent down regularly and this is for sure add to fatigue and thus slow down the harvesting process for complete. Tired is the one of issue where workers non-stop bent down to collect the loose oil palm fruits and for sure they need to rest for several times after moving from tree to another tree.

Time to collect loose oil palm fruits usually took almost 30% from harvesting time (Mohd Zohadie, 1992). This is not included with the time consumed for cleaning process. There is another way of traditional method in collecting loose oil palm fruits which is by using rake, planks and scope. These methods also popular among workers of palm plantation but still, they're need for extra time which is

workers need to clean the fruits after collected. For cleaning the dirt, the bucket that fill with loose oil palm fruits around five kilograms will be sift around 15 minutes till the dirt perfectly loose from the oil palm fruits.

If happened that the dirt not removed clearly, its troubled the oil palm factory which they need to clean the oil palm fruit first before putting them into the machine for oil extraction process. The unclean oil palm fruits will slow down the process where as regular, the factory itself used the easiest way in cleaning process which is by using water. Well, this will take time for next process which is they need to dry the oil palm fruits by left them untouched for evaporate process.

1.2 OBJECTIVE

The objectives for this project is:

- i. To determine and analyze the machine elements of loose palm oil fruit collector part by using simulation method.
- ii. To analyze the machine elements of loose palm oil fruit cleaning part by using simulation method.

1.3 SCOPE

The scope for this project is:

- i. SolidWork software will be use to simulate and analyse the machine elements that consists in the machine.
 - SolidWork will be use to analyze the gear system that attached on the equipment. The simulation and analysis is focus on how the gear system works and fit into the equipment. The output of the analysis also will be highlighted in order to determine the rate of success and failure for the machine element.

- ii. Research is focus on collector part.
 - Research is only about the collecting method where the cleaning method will neglect since the prototype of it is ready for next reference.
 - The cleaning part will be taken from existing prototype and refabricate it in new design to make it available for assembling with collector part.

- iii. The prototype can uphold to five kilogram of loose palm fruits.
 - The prototype build with bucket of cleaning part that fit with maximum of five kilogram of oil palm fruits. The bucket itself can withstand the load of five kilogram and the equipment can operate the five kilogram of oil palm fruits at every session. The total value in kilogram was included rubbish and dirt that present on the loose oil palm fruits.

- iv. The prototype is not suitable for all palm plantation land structure.
 - The prototype will shape in not flexible one which mostly not suitable for uneven ground and for the same time not suitable to collect the loose oil palm fruit that fell in the water.

CHAPTER 2

LITERATURE REVIEW

2.0 INTRODUCTION

As indicated by history coconut palm got from African nation and suitable planted at warm atmosphere. Nation which delivers oil palm generally was in world north. Malaysia is either nation that biggest creation oil palm in the world. Malaysia has upper hand in palm oil industry in light of the fact that has claimed encounter more than century and lead market from profitability viewpoint. Each seed coconut palm is vital to national wage. Oil palm can be prepared and make different business material required by business sector. There is high request from neighborhood production lines which made business material; cleanser, wax, cooking oil, margarine, bread, and others.

Palm oil began from oil palm natural product. Oil palm organic product contain husk, shell and part. Palm oil is situated in husk zone and part. Palm oil which started from husk called as palm oil and oil which began from portion called part oil. Therefore, numerous new machines were made to encourage works whether in perspective empty or weaving. Most machine or instruments were made to release and cut bundle furthermore, oil palm fronds yet no machine to encourage process accumulation free natural product.

Each cluster of cutting will bring oil palm fruits fall isolated on the area where's implies lost pay. In the event that this loose oil palm fruits uncollected, business person oil palm grower would misfortune huge benefit other than pay expense of range upkeep. Beforehand, strategy used to gather the loose oil palm fruits with routine or conventional techniques. This implied gathers utilizing hand

and workers need to sit crouching, bow alternately curve their body to gather natural product on the area and need to move from one tree to another tree.



Figure 2.1: African oil palm (*Elais guineensis*)

2.1 TYPES OF OIL PALM FRUITS

They're several types of oil palm fruits existed in this world and the most common type that usually found is dura, tenera and pisifera.

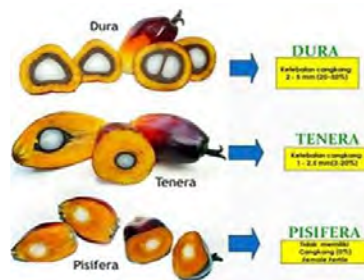


Figure 2.2: Types of oil palm fruits

These sorts of oil palm organic products having an alternate fit as a fiddle and just about their structure are not in closeness. The points of interest present request of these sorts were expressed in perspective of yield and basic (Verheye, W., 2010):

- i. **Dura:** shell 2-8mm thick, comprising 25-55% of weight of fruit, medium mesocarp content of 35-55% by weight, but up to 65% in Deli palms; less productive but hardy variety, well adapted to village gardens.

- ii. **Tenera**: shell 0.5-3mm thick; comprising 1-32% of weight of fruit: medium to high mesocarp content of 60-95% but occasionally as low as 55%: this variety is the result of hybridization of *Dura* and *Pisifera*, and has a high commercial value.
- iii. **Pisifera**: shell-less, with small pea-like kernels in fertile fruits: of little commercial value, because of its high abortion ratio, but important for cross-breeding commercial palms.

In Malaysia, the oil palm trees planted are chiefly the tenera assortment, a cross breed between the dura and pisifera. The tenera assortment yields around 4 to 5 tons of unrefined palm oil (CPO) per hectare every year and around 1 ton of palm bits. The oil palm is the most effective oil-bearing yield on the planet, requiring just 0.26 hectares of area to create one ton of oil while soybean, sunflower and rapeseed require 2.22, 2 and 1.52 hectares, individually, to deliver the same. Thus, altogether the oil palms might satisfy 200 years, yet their business yield quickly diminishes following 30 years' old.



Figure 2.3: 12 years old oil palm plantation. Stipe is secured by old bases of leaves which were cut during collecting and upkeep pruning (Courtesy D. Cornet)

2.2 CUTTING BUNCH OIL PALM FRUIT

Most of the palm plantation, they plant a high tree that requirement for collector utilizing apparatuses like sickle that appended to a solid wooden shaft to cut and gather the loose oil palm fruits. Each pack of cutting will bring about no less than 5% of oil palm natural products fall isolated on the land.



Figure 2.4: A harvesting sickle

2.3 LOOSE FRUITS

Loose fruits mean lost pay for the business visionary oil palm grower which is they need to pay for each and every of procedure including upkeep yet the loose fruits that got a higher oil not gathered. This is a major misfortune and need to maintain a strategic distance by applying a couple of techniques with a specific end goal to gather all the loose oil palm fruits.



Figure 2.5: Loose fruits

2.4 METHODS

There're a couple of methods connected these days in gathering the loose oil palm fruits. For the most part, every one of these strategies required for expansion labor to stay aware of the reaping advance and make it complete prior immediately. The present techniques are spotlight on conventional one which is every one of the

loose fruits gathered physically and the cleaning procedure will be handle if certain methods required for it.

2.4.1 Using Hand

For the certain area, the routine strategies still used to gather the loose oil palm fruits. They are utilizing hand to gather the free natural product on the land. The loose oil palm fruits will be collect manually and insert it into net or other alike equipment.



Figure 2.6: Using hand in order to collect the loose oil palm fruits.

The advantages of collecting the loose palm fruits using hands are no rubbish is collected, injury fruit is low and easy to apply. This is because when collecting using hands, the workers will pick the fruits one by one and instantly remove the dirt attached on fruits while picking them. While for the disadvantages, its need more time to collect fruits, workers always faced waist pain and workers need sat squatting or bow.

2.4.2 Using Nail Rake, Hand Basket and Net

Some location using tools like nail rake, hand basket and net collector to collect the loose oil palm fruits on the land. This applied method can collect the loose fruits in large amount which is can save the time for workers to travel from spot to another spot.

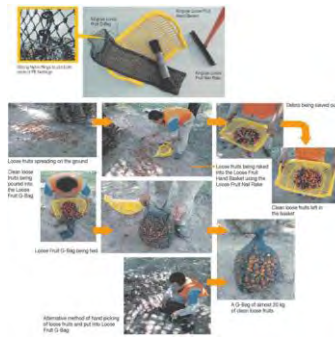


Figure 2.7: Using Nail Rake, Hand Basket and Net.

The advantages of collecting the loose palm fruits using nail rake, hand basket and net are can collect the large amount of fruits, injury fruit is low and easy to apply. This method can collect the large amount of fruits because when using that equipment, the fruits can be scrapping into one place. While for the disadvantages are rubbish presence, workers always faced waist pain and workers need to bend their body to collect the loose fruits.

2.4.3 Using Scoop and Hoe

At certain place, assigned workers as yet utilizing scoop and scraper to gather the loose oil palm fruits. These tools will conduct using hand to collect the loose fruits in large amount. Using this tools also need for workers to bend down regularly.



Figure 2.8: Scoop



Figure 2.9: Hoe