UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DESIGN AND DEVELOPMENT OF PORTABLE PINEAPPLE LEAF FIBRE MACHINE IN PINEAPPLE INDUSTRY

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Mechanical Engineering Technology (Maintenance Technology) with Honours.

by

MUHAMMAD SYAFIQ BIN MOHD TARMIZI

B071410836

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BORANG PENGESAHAN STATUS LAPORAN PROJEK SARJANA MUDA

TAJUK: **DESIGN AND DEVELOPMENT OF PORTABLE PINEAPPLE LEAF FIBRE MACHINE IN PINEAPPLE INDUSTRY**

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APPROVAL

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

……

(PUAN NURUL AMIRA BINTI ZAINAL)

ABSTRAK

Mesin peraut daun nanas yang direka khas untuk mengeluarkan daun nanas untuk mendapatkan hasil serat nanas dengan cepat dan menjimatkan masa. Mesin ini berfungsi semiautomatik, di mana mesin ini memerlukan tenaga manusia untuk bergerak di atas meja mesin. Dengan mesin ini, serat nenas boleh dikeluarkan dari daun nanas dengan cepat dan tidak memerlukan banyak tenaga manusia berbanding dengan kaedah tradisional yang menggunakan lebih banyak tenaga manusia untuk menghasilkan serat daun nenas. Mesin ini, boleh mengeluarkan tiga keping daun nanas dalam satu proses penggeluaran. Antara aspek keselamatan, mesin ini dipenuhi dengan ciri keselamatan untuk memastikan keselamatan pengguna apabila menggunakannya. Penggunaan dan kawalan mesin ini adalah perantaraan dan sesuai. Mesin ini dilengkapi dengan bekalan kuasa pada mesin untuk menghidupkan mesin. Sebelum menghidupkannya, daun nanas mesti diletakkan dan diikat untuk memastikan daunnya betul dan diletakkan dengan kemas di atas meja mesin. Kemudian, hidupkan mesin dan gerakkan meja mesin dengan memutar bilah memotong

ABSTRACT

A Pineapple leaf fiber machine is specially designed to extract fiber from the pineapple leaves in short time. This machine works in semiautomatic, where it still requires manpower to move the machine table. With this machine, pineapple fibers can be extracted from the pineapple leaves quickly and does not require much power as opposed to traditional methods. This machine could extract three pieces of pineapple leaf in one extracting process. Among safety aspects, this machine is filled with security features to ensure the safety of the users when operating it. This machine is equipped with a power supply to turn on the machine. Before turning it on, the leaves of the pineapple must be laid and tied to make sure the leaves are properly and neatly placed on the machine table. Then, turn on the machine and move the machine table by rotating the cutting blade. This project succeed to aim the objective of this study which to design and develop a pineapple leaf fiber machine.

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DEDICATION

To my beloved parents, Mr Mohd Tarmizi Bin Sahar and

Madam Rosidah Binti Zulkifly and siblings.

To my beloved wife; Norsafarina Binti Armat

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Alhamdulillah, all thanks should be praise to Allah as He help and ease me so much to complete this project successfully. This research project won't be complete without people surrounding me who give a lot support and help.

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Thank you.

TABLE OF CONTENT

LIST OF TABLE

LIST OF FIGURE

CHAPTER 1

INTRODUCTION

1.0 Background Of Project

Pineapple leaf fiber is a new popular commercial textile amongst fiber which is obtained from leaves of pineapple plant. Pineapple or namely as *Ananas Cosmosus* have a plant season (Doraiswarmy, 1993). The pineapple comes to Southern Asia by Spanish and Portuguese sailors around 1599 which comes from Brazil. In Malaysia, pineapple are grown in the state of Johor, Selangor, Kelantan and Penang and the most popular type of pineapple planted are Josapine (acronym for Johor-Sarawak-Pineapple) and Moris, which also known as Mauritius. From this two types of pineapple, it has a different characteristics. Moris have a small leaf and Josapine have long and more width of leaf. Josapine is more expensive than Moris and the fruit of Moris have a thorn on top of fruit. For the record, Malaysia is being part of 3.3% or 448,193 metric tonnes of the production and it has the capability to become better at producing more pineapple in the future (Hamid & Kassim, 2013). Pineapple grown from sprouting top of fruit, while it sapling are at the base of the stem or base of the tree fruit and its seeds are used as a tissue culture.

Pineapple leaves are left unused after harvesting of fruits causing wastage of natural wealth which needs to be explored. The pineapple leaves is actually contain a long fiber, which is valuable for in industrial application especially for agriculture industrial. Depending on the species or type of plant, pineapple leaf length is between 55 cm to 75 cm by 3.1 cm to 5.3 cm wide and 0.18cm thick leaves of up to 0.27cm (Hidayat, 2008). A pineapple leaf has produced strong, white, fine and skilly fiber. The pineapple leaf fiber is produce between the age of 1 to 1.5 years. A young pineapple that derived from leaves is not long and strong. Fiber from old pineapple is short,

coarse, and brittle if it is exposed to sunlight without protection. The selection of pineapple leaves should be done carefully to obtain a strong, soft and smooth fiber with protection of sun (Pandey, 2005). The pineapple fiber can be made as clothing, paper, handicrafts and many more. It potential is likely to have a business and need to be developed in order to acquire the right technology to be used in agricultural industry.

The extraction process of the plant fibers is of great importance to the quality as well as the yield of the fibers. The extraction of the fiber from pineapple leaf can be done by two ways. First, by using conventional method where the pineapple was extracted manually using man power. The most common used in manual extraction is by immersion. In this process, a micro-organism will play a role to remove or separate gummy substance from leaves to make a fiber easier separated each other. Usually leaves will soaking into water in period of time such as a week. The second method is by using mechanical extraction machine which will be studied in this project. Pineapple leaf has a gummy substance surround it, so it is easy to separate the fiber from the leaf (Hidayat, 2008) .In 1990, a fiber machine extraction has been found and made by different types of inventors to produce a machine (Gardner F, 1939). The inventors were fight each other to produce a best fiber extraction machine. Until now, the development of fiber extraction machine is continuously studied.

1.1 Problem Statement

Pineapple leaf fiber is related in handicraft sector. But, it is less commercialized because the process of pineapple fiber extraction is inconvenient. Malaysia is a world producer of the pineapple industry, therefore the pineapple fiber must be fully utilized because of residue when processing activities that called agro-waste. Agro-waste will create environmental issue at the disposal stage. To obtain the pineapple leaf fiber, process that needs to be done before obtaining it is takes time while the process is quite complicated and requires high skills (Kazi, 2015). Because of lack of commercial in pineapple leaf fiber, the extraction method is still outdated. Manual extraction is process laborious. This is because the pineapple leaf need to be scrapped by using

ceramic plate or coconut shell in order to obtain the fiber (Kazi, 2015). After that, the fiber is washed and dried in an open air. This process will reduce its quality because the exposure of the fiber to the sunlight. When extracting the fiber, time is the essence as the chemical in the plant leaves, change continuously progressing after the stalk has been removed, making it harder to fully extract the fibers (John E., 1960). On the other hand, the second method is by using a mechanical extraction machine. It is convenient and practical, however this method is costly and need skill to operate it (Kazi, 2015). A design of mechanical extraction machine is important to make a fiber is fully extract from pineapple leaves. Besides that, the extraction should be continuously scrapping the leaves and the feeding angle of extraction must be right way.

1.2 Objective

The objectives of this study are:

i. To design a pineapple leaf fibre machine
ii. To develop a pineapple leaf fibre machine

1.3 Work Scope

In order to achieve the objectives of this project, the project work scopes are prepared as shown below:

i. This machine is limited to extract fibre from pineapple leaf only
ii. The machine can extract at least three leave at a time
iii. The machine is portable and easy to use

1.4 Result Expectation

i. Finalize the design of pineapple leaf fiber machine
ii. Develop a pineapple leaf fiber machine based on the choosen design after considering the advantage and disadvantages of the pineapple leaf fiber machine

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This chapter covered the study about a fiber, design and extraction method. This chapter also reviewed previous study from research or paper and article that related with fiber and its extraction process.

2.1 Classification of fiber

There are several classification of fiber that has been identified such as natural fiber, seed fiber, bast fiber, leaf fiber, animal and synthetic fiber.

2.1.1 Natural fiber

Natural fibres with their long history of serving mankind are very important in a wide range of applications. Their history is long because they have been produced for millions of years and used by man for thousands of years. Their history is proud because they have served man's textile needs unchallenged for thousands of years. In spite of 20th century competition from man-made fibers and plastics, facilitated by temporarily inexpensive petroleum, the natural fibers still have a strong position in the world fiber market. They have a classification of natural fibers and have advantage from their excellent permeability and healthy properties. Natural fibers conduct heat,

can be properly dyed, resist mildew, have natural antibacterial properties, block UV radiation and can be easily made flame retardant (Ryszard et.al, 2012). The textile industry currently conduct a research about alternative green fibers with provide healthy, comfortable clothing which is can be recyclable. Most natural fibers can be taken from lignocellulosic fibrous plant such as flax, jute, hemp, kenaf, sisal, ramie, abaca, pineapple and bamboo.

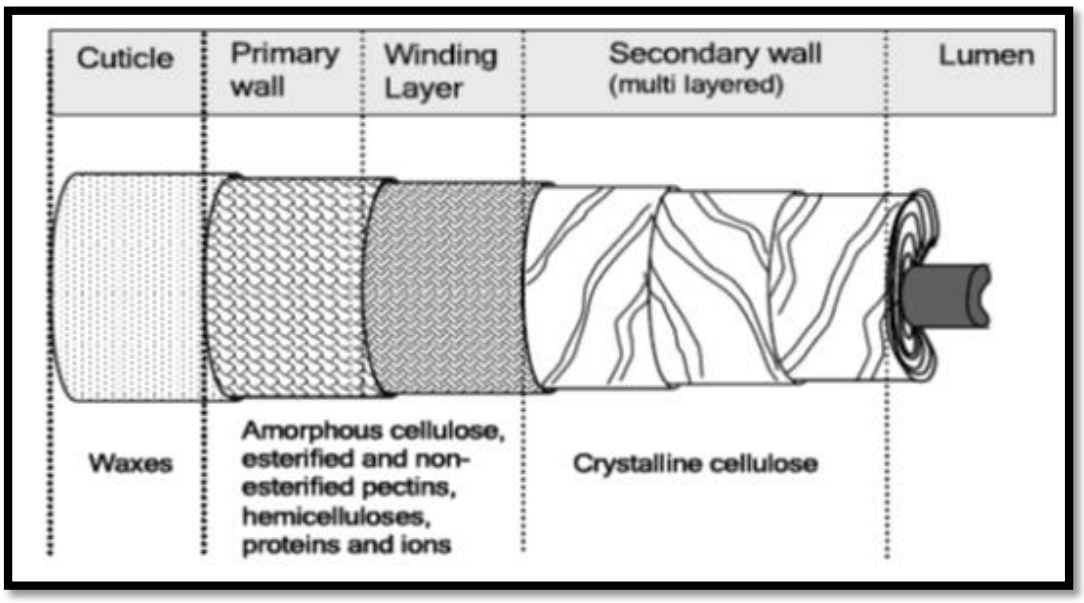
2.1.1.1 Seed fiber (Cotton fibers)

Cotton, the seed hair of plant of genus *Gossypium,* and the purest form of cellulose available in nature, is the dominant natural fibre. For textile application, cotton has many desirable fiber properties making it a major fiber. It start learn cotton fiber more than 5000 years BC in India and the Middle East. Cotton is most important textile fiber in twentieth century. It is still the most widely used natural textile fiber with over 25.2 million tons produced annually (Dochia et.al, 2012). For cotton type, the colour of fiber is usually creamy white or yellowish. Cotton fiber is mostly composed of cellulose.

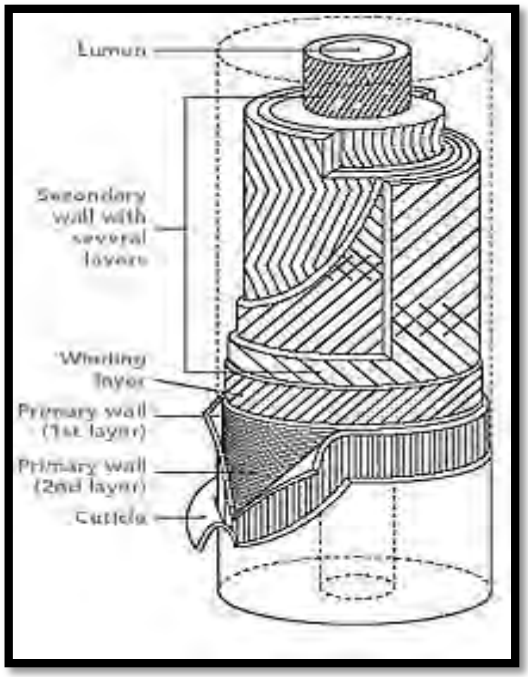
Table 2.1 Chemical Composition of Cotton Fiber

	Per cent (Dry Basis)		
Constitents	**Typical**	**Low**	**High**
Cellulose	94.0	88.0	96.0
Protein	1.3	1.1	1.9
Pectic substance	0.9	0.7	1.2
Ash	1.2	0.7	1.6
Wax	0.6	0.4	1.0
Malic, citric and other organic acids	0.8	0	0
Total sugars	0.3	0	0
Pigments	Trace	0	0
Other	0.9	0	0

Environmental influences plant growth and development of cotton fiber physics features recognized good for textile industry. Affects the dyeing behavior of fibers in textile products is important in cell wall development (James et.al, 2015). Cotton fiber have a multilayers structure. The major influence on fiber properties is the structure of primary cell wall and of cotton fiber, and particularly the outer surface layer. Primary wall, a secondary wall and a lumen are a fibrillar structure on cotton fibers.



a.



b.

Figure 2.1 a and b is A Schematic Representation of Mature Cotton Fiber Showing its Various Layers