EFFECT OF TREATMENT VARIABLESON THE SUPER- FAST DRYING METHOD ON THE PROPERTIES OF DRIED HIGH – DENSITY OIL PALM LUMBER (Elaeis guineensis)

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By

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ABSTRACT

Wood demand in industry has been increasing each year together with the increase in population and economic development of the country. Supplies of wood always decrease because of wood insufficient resources from the forest and oil palm wood can be used to solve the problem of raw material. As using it will produce value-added products will reduce the costs of production. However, the quality of OPW is inferior to and its MC is much higher (200-500%) than the common wood (<100%) and oil palm lumber need quality improvement, also it drying has been the most problem before it can be used. A “Super-fast drying method” has been recently developed by Bakar et al. (2016).and it is unique, consisted 2-step drying (contact drying and high temperature drying) with or without holing on the material. It was reported that the method capable to dry high and low-density oil palm lumber in just 3 hours without or minimum defect. As a new method, some drying parameters in this method are still need to be optimized. From the study, it has been proved that the super- fast drying method is able to improve the some properties of properties of outer part of oil palm lumber with MOE, MOR and thickness swelling test but not for the water absorption test. Unfortunately, the methods gives negatives feedback on the durability properties against white rot fungi for the outer part of lumber as the holing presence on the surface increase the presence of oxygen that allowing the growth of fungi more easily. But as a new method the anatomical and chemical test must be implement in order to know the reason behind it is happened.

ABSTRAK

Permintaan kayu dalam industri telah meningkat setiap tahun seiring dengan pertambahan penduduk dan pembangunan ekonomi negara. Bekalan kayu sentiasa berkurangan kerana sumber kayu yang tidak mencukupi daripada hutan dan kayu kelapa sawit boleh digunakan untuk menyelesaikan masalah bahan mentah kerana menggunakannya menghasilkan produk yang mempunyai nilai tambah akan mengurangkan kos pengeluaran. Walaubagaimanapun, kualiti kayu kelapa sawit adalah rendah dengan kandungan lembapan yang lebih tinggi (200-500%) daripada kayu biasa (<100%) dan memerlukan peningkatan kualiti, pengeringannya juga telah menjadi masalah sebelum ia digunakan. Satu "kaedah pengeringan Super-cepat" baru-baru ini telah diperkenalkan oleh Bakar et al. (2016) yang unik, terdiri daripada dua langkah pengeringan (pengeringan 'contact' dan pengeringan bersuhu tinggi) dengan atau tanpa holing kepada bahan. Dilaporkan bahawa kaedah ini mampu untuk mengeringkan kayu kelapa sawit berkepadatan tinggi dan rendah hanya dengan selama 3 jam tanpa atau dengan kecacatan minimum. Namun sebagai kaedah baru, beberapa parameter pengeringan dalam kaedah ini masih perlu dioptimumkan. Dari kajian ini, ia telah membuktikan bahawa kaedah pengeringan cepat super mampu meningkatkan beberapa sifat bahagian luar kayu kelapa sawit dengan MOE, MOR dan ujian ketebalan bengkak tetapi tidak untuk ujian penyerapan air. Malangnya juga kaedah ini memberikan maklum balas negatif kepada sifat-sifat ketahanan terhadap kulat 'white-rot' kehadiran holing di permukaan meningkatkan kehadiran oksigen yang membolehkan pertumbuhan kulat dengan lebih mudah. Tetapi sebagai kaedah yang baru kajian

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APPROVAL SHEETS

I certify that this research project report entitled "**Effect of Treatment Variables on the Super - Fast Drying Method on the Properties of Dried High- Density Oil Palm Lumber (*Elaeis Guineensis*)** by **Arini Madira Puteri Binti Daslizar** has been examined and approved as a partial fulfillment of the requirements of the degree of Bachelor Of Wood Science Technology in the Faculty Of Forestry, University Putra Malaysia.

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CHAPTER 1

INTRODUCTION

1.1. Background

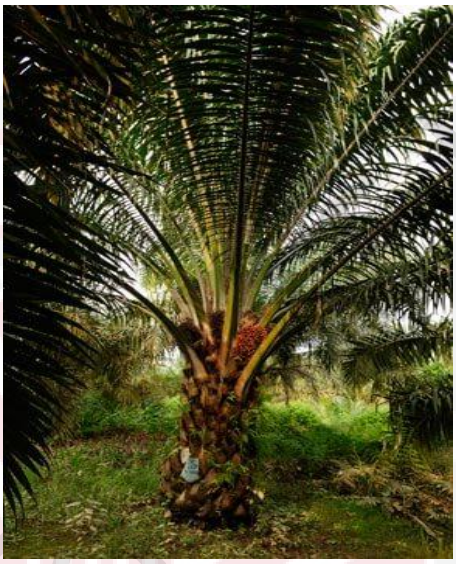

Figure 1: Oil palm tree

According to research, the history of consumption the oil palm (*Elaeis Guineensis*) was started in West Africa when they use it as a form of staple food cop. West Africa provide less than 50% of world supply (Havinden, 1970) .It also can be found the use of cask of palm oil at the Egyptian tombs of people that being buried from the five millennium years ago (Palm Oil production in the Peruvian amazon Basin A case study of current effects and emerging localized alternatives in Loreto district, 2015.

While palm oil was ubiquitous in West Africa, the use of palm oil in the international market expanded significantly as a result of the British Industrial Revolution and the expansion of overseas trade. From candle-making to industrial lubricants, palm oil was a driving force behind the expansion of industrial production, while nutrient rich red palm oil became a vital asset on long sea-faring voyages. And it was a result of this increased demand that Europeans began investing in palm oil production, first in West Africa and then expanding to Southeast Asia.

A combination of European settlers and entrepreneurs, seeing the opportunity for commercial palm oil production to produce soaps, lubricants and edible oils lead to a dramatic expansion of oil palm plantations throughout Sub-Saharan Africa and Southeast Asia. In Malaysia at the year of 1917, the first commercial scale plantation of oil palm plantation was founded and established in Tennamaran Estate in Selangor.

In general, the morphology of mature palms are mostly single-stemmed and it can grow until 20 m tall. The leaves are pinnate and reach between 3-5 m long. A young palm produces about 30 leaves a year. Established palms over 10 years produce about 20 leaves a year. The flowers are produced in dense clusters each individual flower is small, with three sepals and three petals.

Recently, an amount of mature palms of more than 20 million ha is estimated. The oil extracted from fruits and seeds is used for food and chemical and pharmaceutical products as well as for biodiesel. For the disposal of trunks in plantations, they are normally left to rot or are burnt in the field which causes environmental problems (Lim & Gan, 2005). The wood itself has some drawbacks in terms of poor dimensional stability, low strength, and bad machining characteristics (Bakar, Hao, Ashaari, & Choo Cheng Yong, 2013)

Oil palm wood has the characteristics with initially high moisture content in the trunk. It increases with the increasing amount of parenchymatous tissue from the periphery to the center of the stem and from the stem base to the top till 400% (Lim and Khoo, 1986). The high content of parenchyma cells in the trunks containing sugars and starch (Tomimura, 1992) and the initially high moisture content of oil palm would make it favor to be attacked by fungi (Erwinsyah, 2008). By using conventional drying method, it spent up to 4 to 5 weeks to dry. This created excessive drying defects like warping, twisting and honey comb. Such drying problem has limited the usage of Oil palm Timber.

In 2016, a drying method named “Super- Fast Drying” has introduced by Bakar et. al.. By using this method, we only need 3 hours to dry the Oil palm lumber with least drying defects. This method only require simple machine like hot pressing machine and kiln. By using this method, we could save energy, time and money. Because this is a new method, some parameters must be optimised. While, my research is focusing on the core of Oil palm timber.

1.2. Problem Statement

Several humans activity like logging, mining and construction has been done in order to render a develop country. This has causing in the decrease in the quantity of wood consume because of most the forest is cleared as to change to development place.

Oil Palm Wood (OPW) is among the suitable material to replace the sawn timber wood due to its viability and as it can grow very fast compared to the other wood species. Oil palm trunk could be an appropriate choice for an alternative source of compressed wood (Sulaiman et al., 2012)

However, though using OPW as an alternative source to substitute the use of sawn timber is a brilliant, there are some aspect from it that should be alter. For example, the quality of OPW is inferior and its moisture content is much higher (200-500%) than the common wood (<100%). A freshly fell oil palm trunk has 100%-500% moisture content (Anis, Kamarudin, Astimar, & Mohd Basri, 2008).In the other hand, not only Oil Palm Lumber need quality improvement, also it drying has been the most problem before it can be used.

The integrated treatment method using Low Molecular weight- Phenol Formaldehyde (Lmw-PF) resin has been developed by Bakar et al. (2014) resulting high performance “compreg” OPL. The drying, however, is still a problem for Oil Palm Wood, since any kind of Oil Palm Lumber use, with or without treatment, will need drying. In addition, the drying of Oil Palm Lumber takes very long time (4-5 weeks as compared to <1 week of common wood) and creates excessive drying defect like warp, twist and honey comb. Such drying problem has limited the usage of Oil Palm Lumber.

A “Super-fast drying method” has been recently developed by Bakar et al. (2016). The new method is unique, consisted 2-step drying (contact drying and high temperature drying) with or without holing on the material. It was reported that the method capable to dry medium- and low-density OPL in just 3 hours without or minimum defect. As a new method, some drying parameters in this method are still need to be optimized.

1.3. Objectives

The general objectives of this study were to determine the effect of Super – Fast drying method on the

i. Mechanical properties on holing diameter and holing distance of High Density Oil Palm Lumber.
ii. Physical properties on holing diameter and holing distance of High Density Oil Palm Lumber.
iii. Durability properties on holing diameter and holing distance of High Density Oil Palm Lumber.

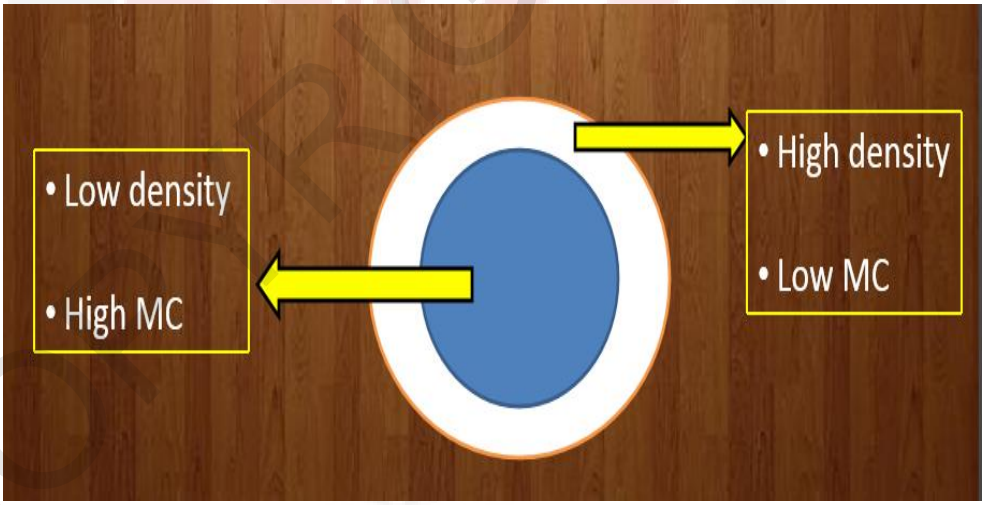

Figure 2: Oil Palm Trunk Cross section view

The specific objectives of this study was to figure out drying parameters of super-fast drying method for High – density of OPL that has been implemented.

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