DRYING PERFORMANCE AND PHYSICAL PROPERTIES OF AIR DRIED OIL PALM WOOD

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DRYING PERFORMANCE AND PHYSICAL PROPERTIES OF AIR DRIED OIL PALM WOOD

By

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DEDICATION

Every challenging work need self-effort as well as guidance of elders especially those who are very close to our heart. My humble effort, I dedicated to my sweet and loving

Mother, Zainab Ibrahim

Sisters, Faizatul Akma & Akmarina

Whose prays days and night and encouraged me to do well. Thank you and I love you all!

ABSTRACT

Air Drying is the method used to dry Oil Palm Wood (OPW) at open air area until achieved the Equilibrium Moisture Content (EMC). This conventional air drying method takes longer time compared to advanced drying method such as Air Forced Drying where the drying of OPW is done by forcing the air circulation towards the OPW by setting the range of air velocity. Air Drying Method for OPW affect the quality of the lumber where results in high number of defects due to the high moisture content, long drying periods and nature of OPW. In this study, Air Drying Method was used to evaluate the drying rate and drying defect of air dried OPW based on different thickness and portion. The thickness used were 3cm and 5cm thick for both outer and inner portion of trunk which were differentiate based on initial moisture content. The samples were cut into desired dimensions and undergo air drying for some duration of months. The drying rate of OPW then was calculated with formula based on the daily weighed of sample. Thus, these findings showed inner portion of OPW with 3cm and 5cm thick gave most drying defect and highest in drying rate than outer portion.

ABSTRAK

Pengeringan Udara merupakan kaedah digunakan untuk mengeringkan kayu kelapa sawit di kawasan terbuka sehingga mencapai Kandungan Kelembapan Keseimbangan. Kaedah Pengeringan Udara yang konvensional ini mengambil masa yang lama berbanding Kaedah Pengeringan Udara yang kohensif seperti kaedah 'Air Forced Drying' dimana merupakan satu kaedah pengeringan kayu kelapa sawit dengan melakukan peredaran angin terhadap kayu kelapa sawit dengan menetapkan julat kelajuan udara. Kaedah Pengeringan Udara untuk kayu kelapa sawit memberi kesan kepada kualiti kayu dimana mengakibatkan kecacatan kayu yang banyak disebabkan kandungan kelembapan yang tinggi, jangkamasa penferingan yang lama dan sifat semulajadi kayu kelapa sawit. Dalam kajian ini, kaedah pengeringan udara yang digunakan adalah untuk menilai kadar pengeringan dan kecacatan kayu kelapa sawit berdasarkan ketebalan dan bahagian yang berbeza. Ketebalan yang digunakan adalah 3sm dan 5sm untuk kedua-dua bahagian luar dan dalam kayu kelapa sawit dimana dibezakan melalui kandungan kelembapan awal. Sampel telah dipotong mengikut saiz yang dikehendaki dan menjalani kaedah pengeringan udara untuk jangkamasa yang ditetapkan. Kadar pengeringan kayu kelapa sawit kemudian telah dikira menggunakan formula bersarkan penimbangan berat sampel setiap hari. Oleh itu, kajian ini menunjukkan bahagian dalam kayu kelapa sawit dengan 3sm dan 5sm tebal member banyak kecacatan pengeringan dan kadar pengeringan yang tinggi berbanding bahagian luar kayu kelapa sawit.

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APPROVAL SHEET

I certify that this research project entitled “Drying Performance and Physical Properties of Air Dried Oil Palm Wood” by Farizatul Shahira binti Zainun has been examined and approved as a partial fulfilment for the degree of Bachelor of Wood Science and Technology in the Faculty of Forestry, Universiti Putra Malaysia.

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MPOC	Malaysian Palm Oil Council
MPOB	Malaysian Palm Oil Board
OPTL	Oil Palm Trunk Lumber
CPO	Crude Palm Oil
OPW	Oil Palm Wood
OPT	Oil Palm Trunk
MC	Moisture Content
AFD	Air Forced Drying
F	Fiber
V	Vessel
Px	Protoxylem
Pp	Protophloe

CHAPTER 1

INTRODUCTION

1.1 Background

Oil palm or also known as *Elaeis guineensis* in scientific name were introduced to Malaysia by the British in early of 1870's as an ornamental plant. The first commercial planting were at Tennamaran Estate, Selangor in 1917 where initiating the oil palm industry for Malaysia (Basiron, 2007).

Malaysia currently accounts for 39 % of world palm oil production and 44% of world exports. If taken into account of other oils & fats produced in the country, Malaysia accounts for 12% and 27% of the world's total production and exports of oils and fats. Being one of the biggest producers and exporters of palm oil and palm oil products, Malaysia has an important role to play in fulfilling the growing global need for oils and fats sustainably. Malaysia is the second largest oil palm production in the world after Indonesia, with total 5.74mil ha planted areas (MPOC, 2018).

In Malaysia, the oil palm trees planted mainly in the tenure variety where have yields about 4 to 5 tonnes of crude palm oil (CPO) per hectare per year and about 1 tonne of palm kernels. The oil palm is the most efficient oil-bearing crop in the world, requiring only 0.26 hectares of land to produce one tonne of oil while soybean, sunflower and rapeseed require 2.22, 2 and 1.52 hectares, respectively in order to produce the same. As in Figure 1.1, the total production in 2017 had achieved 2000000 tonnes while in 2018 are slightly decreasing in first month of February and now achieve 1500000 tonnes (MPOB, 2018).

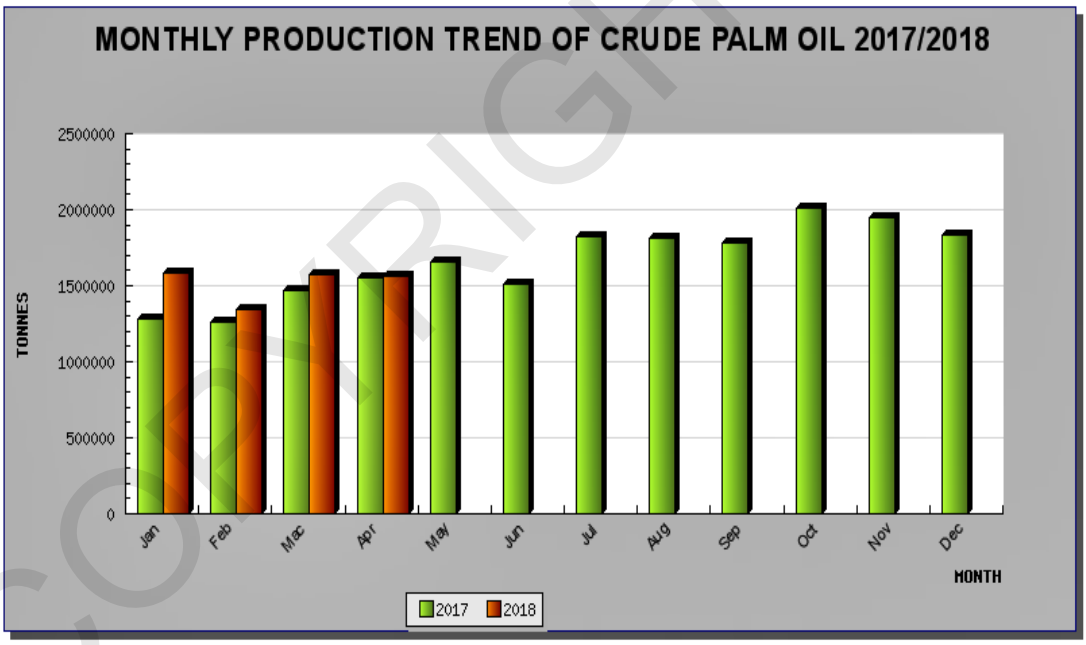

Figure 1.1: Monthly Production Trend of CPO in 2017/2018

Based on Table 1, the monthly productions of Oil Palm Products are increasing from 2017 to 2018 of April.

Table 1: Monthly Production of Oil Palm Products Summary for the Month of April 2018 (Tonnes)

Months	Crude palm oil		Palm kernel		Crude palm kernel oil		Palm kernel cake	
	2017	2018	2017	2018	2017	2018	2017	2018
January	1,276,849	1,586,653	310,182	418,424	144,621	206,597	159,884	230,641
February	1,258,539	1,342,805	316,069	340,708	147,844	161,124	165,011	181,118
March	1,464,021	1,573,957	374,530	404,924	170,401	195,294	188,447	219,538
April	1,548,026	1,558,337	387,306	393,014	170,042	188,701	188,259	208,806
Total	**5,547,435**	**6,061,752**	**1,388,087**	**1,557,070**	**632,908**	**751,716**	**701,601**	**840,103**

Source: Economic and Industry Development Division of Malaysian Palm Oil Board, 2018

According to Bakar et al. (2008) the oil palm tree need replanting after 25-year old with estimated annual replanting rate at about 2.5% of the total planted area. This will produce huge amount of biomass, especially from the trunk that can be used as wood alternative.

Each year, the oil palm industry produces more than 15 million cubic metres of oil palm trunks (OPT) during replanting. Despite their possible use as wood, the material is largely wasted. Some of the problems are a low recovery of sawn timber after seasoning, and the poor inherent physical and mechanical characteristics of the wood.

As wood alternative material, oil palm wood (OPW) has many problems. The oil palm wood has several inherent flaws as lumber which are inconsistent weight, moisture content, size and density and high parenchyma tissue. OPW also have low quality where low dimensional stability, low strength, low durability and low machining properties with their unique wood structure (Bakar et al., 2008). These increase its cost of processing and manufacturing.

However, some of the flaws can be ameliorated with proper drying and conditioning. Due to high moisture content characteristics of OPW, the drying of OPW by air dried method takes longer duration up to months. This method is needed in order to support the studies of Air Forced Drying (AFD) of Oil Palm where AFD method can reduce the drying time and minimize the defects (Gaby, 1961).

1.2 Problem Statement and Justification

Drying duration for oil palm trunk is very long due to its high moisture content that will cause some defects such as bowing, twisting, cupping, cell wall collapsed and fungi attack. Also, the parameter in producing high quality oil palm wood (OPW) has not yet been determined. So, for this research air drying method will be highlighted in reducing the moisture content of OPW. Based on different thickness of OPW, the drying performance and physical properties of air dried oil palm wood can be rated and evaluated.

1.3 Objective

1.3.1 General Objective

The general objective of this research is to analyse and evaluate the drying performance and physical properties of oil palm wood (OPW) dried with Air drying (AD) method.

1.3.2 Specific Objective

- To determine the drying rate of different portions OPW
- To determine extent and type of drying defects of different portion air dried OPW
- To evaluate the initial occurrence of drying defects from sections of OPW

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