EFFECT OF THICKNESS ON DEFECTS OF AIR FORCED DRIED OIL PALM LUMBER (OPL)

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FH 2018 50

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FACULTY OF FORESTRY

UNIVERSITI PUTRA MALAYSIA

2018

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EFFECT OF THICKNESS ON DEFECTS OF AIR FORCED DRIED OIL PALM LUMBER (OPL)

By

CHANG YING YING

A Project Report Submitted in Partial Fulfilment of the Requirement for the Degree of Bachelor of Wood Science and Technology in the Faculty of Forestry

Universiti Putra Malaysia

2018

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DEDICATION

Special dedicate to my parents,

Chang Wen Bing and Pang Bee Yen.

My sisters, Chang Hui Ying and Chang Li Ying.

All my beloved course mates and friends.

Thank you all for your support.

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ABSTRACT

Air forced drying is a method to dry oil palm lumber (OPL) by forcing the air circulation towards the OPL by setting a range for air velocity. This method takes shorter time compared to the conventional air drying method. OPL has high initial moisture content and is prone to drying defects like warping, checks and collapse. Conventional air drying method for OPL results in high number of defects. In this study, air forced drying method is used to determine the effect of thickness of OPL on the drying defects. The two thicknesses of OPL in this study are 3cm and 5cm. The samples were cut according to their size and stacked properly to undergo air forced drying. After the duration of one month, the defects found on the samples were evaluated based on 3 categories of defects and percentage of defects in each thickness group was calculated. The rate of drying of the samples were determined by measuring the weight of samples each day and calculated with formula. From the data, the thickness of OPL has significant effect on the level of defects. The 3cm thick OPL is more prone to drying defects than the 5cm thick OPL by air forced drying method.

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ABSTRAK

"Air Forced Drying" merupakan satu kaedah pengeringan kayu kelapa sawit dengan menentukan pengedaran angin terhadap kayu kelapa sawit dan menetapkan satu rangka untuk halaju udara. Kaedah ini mengambil masa yang lebih singkat berbanding dengan kaedah pengeringan konvensional. Kayu kelapa sawit mempunyai kandungan lembapan awal yang tinggi dan senang mengakibatkan kecacatan pengeringan seperti terpiuh, meleding dan kempis. Kaedah pengeringan konvensional mengakibatkan bilangan kecacatan yang tinggi dalam kayu kelapa sawit. Dalam kajian ini, kaedah "Air Forced Drying" digunakan untuk menentukan kesan ketebalan kayu kelapa sawit terhadap kecacatan pengeringan. 2 ketebalan digunakan dalam kajian ini iaitu 3cm dan 5cm. Sampel dipotong mengikut saiz yang ditentukan dan disusun dengan betul bagi menjaminkan pengedaran angin yang rata. Selepas sebulan, kecacatan pada sampel kayu dinilai berdasarkan 3 kategori kecacatan dan peratusan kecacatan dalam setiap kumpulan dihitung. Kadar pengeringan sampel ditentukan dengan mengukur keberatan sampel setiap hari dan dikira dengan formula. Berdasarkan data, ketebalan kayu kelapa sawit mempunyaikan kesan yang singifikan terhadap tahap kecacatan pengeringan. Kayu kelapa sawit ketebalan 3cm mendapat kecacatan pengeringan yang lebih banyak berbandingkan kayu kelapa sawit 5cm.

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ACKNOWLEDGEMENT

I would like to express my sincere gratitude and appreciation to my supervisor, Assoc. Prof. Dr. Edi Suhaimi Bakar, from Faculty of Forestry, Universiti Putra Malaysia (UPM), Selangor, Malaysia for his guidance, motivation and financial support throughout this project. I would also like to sincerely thank my co-supervisor, Dr. Mojtaba Soltani for his advice and guidance to me in this project. I have gained a lot of knowledge and skills from both my supervisors.

My appreciation also extends to my examiners, Dr. Rasmina Halis and Prof. Dr. Zaidon Ashaari, for their evaluations and feedback for my presentation and this final year project. Also to Dr. Roslan bin Mohamad Kasim for his advices in statistical analysis.

Furthermore, I would like to thank my teammates, Lim Jia Yuan, Chia Zi Bin and Wong Mui Leng for their encouragement and support; and master's students, Mohd Rafsan bin Rais, Muhammad Nadzim bin Mohd Nazip and Hannafi bin Muktah for their patience in giving me advices and suggestions.

Finally, I am using this opportunity to express my gratitude to everyone who has supported me throughout this project.

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APPROVAL SHEET

I certify that this research project report entitled “**Effect of Thickness on Defects of Air Forced Dried Oil Palm Lumber (OPL)**” by **Chang Ying Ying** 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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Date: Jan 2018

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TABLE CONTENT

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LIST OF TABLES

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LIST OF FIGURES

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LIST OF ABBREVIATION

MC	Moisture Content
MPOB	Malaysia Palm Oil Board
OPL	Oil Palm Lumber
OPT	Oil Palm Trunk
OPW	Oil Palm Wood

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CHAPTER 1

INTRODUCTION

1.1 Background

Oil palm, also known as *Elaeis guineensis*, is a species of palm which is also called African oil palm. In the early 1870's, oil palm was brought into Malaysia by the British as decorations. It was planted commercially in Tennamaran Estate in Selangor in 1917, initiating the oil palm industry for Malaysia (Basiron, 2007).

In South East Asia region, Malaysia and Indonesia are two of the largest oil palm production countries among all others. In 2006, Malaysia was overtaken by Indonesia and was placed as the second largest country of oil palm production (U.S. Department of Agriculture, 2007). Malaysia has a suitable climate for the growth of oil palm trees, with the temperature varies between 24°C to 34°C, relative humidity between 54% to 96%, and average rainfall of 2500 millimetres per year (Lau et al., 2016). Oil palm developers are attracted to South East Asia countries due to the favourable climate, low labour costs, low land lease and government plans in developing the oil palm industry by enforcing appealing legal scheme, cheap loans and fiscal incentives (Colchester et al., 2006).

The main harvest from oil palm plantation is the palm oil. Over the years, the demand for palm oil has increased due to its multipurpose application. Palm

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oil can be used in food products, lubricants, cosmetics and biofuel (Tan et al., 2009). The oil palm industry has risen over the years as the demand for palm oil increases. In year 2007, palm oil export from Malaysia was 16.5 million tonnes which is a huge increase compared to the previous years. In 2008, Malaysia's oil palm plantation area was increased by 4.3% (Mekhilef et al., 2011).

According to Table 1.1, 5.64 million hectares were used for oil palm plantation in all states, where the highest plantation percentage was in Sabah and Sarawak. (Malaysia Palm Oil Board Economics and Industry Development Division, 2015)

Table 1.1: Oil Palm Planted Area by State as at December 2015 (Hectares)

STATE	MATURE	%	IMMATURE	%	TOTAL	%
JOHORE	665,795	90.0	73,788	10.0	739,583	13.1
KEDAH	81,905	93.9	5,339	6.1	87,244	1.5
KELANTAN	106,314	70.0	45,659	30.0	151,973	2.7
MALACCA	50,272	92.1	4,331	7.9	54,603	1.0
NEGERI SEMBILAN	152,021	85.5	25,720	14.5	177,741	3.1
PAHANG	627,210	86.5	98,029	13.5	725,239	12.9
PERAK	350,073	87.9	48,241	12.1	398,314	7.1
PERLIS	287	97.6	7	2.4	294	0.0
PENANG	13,657	94.5	790	5.5	14,447	0.3
SELANGOR	126,318	92.0	11,018	8.0	137,336	2.4
TERENGGANU	141,409	81.9	31,178	18.1	172,587	3.1

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PENINSULAR MALAYSIA	2,315,261	87.1	344,100	12.9	2,659,361	47.1
SABAH	1,375,229	89.1	168,994	10.9	1,544,223	27.4
SARAWAK	1,168,907	81.2	270,452	18.8	1,439,359	25.5
SABAH & SARAWAK	2,544,136	85.3	439,446	14.7	2,983,582	52.9
MALAYSIA	4,859,397	86.1	783,546	13.9	5,642,943	100.0

(Source: Malaysian Palm Oil Board Statistical Report, 2015)

Looking at Table 1.2, 19.67 million tonnes and 19.96 million tonnes of crude palm oil were produced in 2014 and 2015 respectively (MPOB, 2015).

Table 1.2:
Annual and Forecast of Crude Palm Oil Production (tonnes) 2014 & 2015

Months	2014			2015		
	Forecast	Actual	Difference %	Forecast	Actual	Difference %
JANUARY	1,423,000	1,508,980	6.04	1,400,000	1,160,687	17.09
FEBRUARY	1,309,000	1,275,812	-2.54	1,350,000	1,121,628	16.92
MARCH	1,391,000	1,497,142	7.63	1,456,000	1,495,151	2.69
APRIL	1,420,000	1,555,777	9.56	1,570,000	1,693,425	7.86
MAY	1,580,000	1,656,957	4.87	1,670,000	1,810,530	8.41
JUNE	1,579,000	1,569,684	-0.59	1,750,000	1,763,667	0.78
JULY	1,655,000	1,665,661	0.64	1,840,000	1,815,634	1.32
AUGUST	1,858,000	2,031,677	9.35	1,920,000	2,051,000	6.82
SEPTEMBER	1,995,000	1,896,901	-4.92	1,950,000	1,959,064	0.46
OCTOBER	1,904,000	1,892,994	-0.58	1,840,000	2,037,466	10.73
NOVEMBER	1,800,000	1,750,567	-2.75	1,730,000	1,653,946	4.4

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DECEMBER	1,606,000	1,364,864	-15.01	1,530,000	1,399,383	8.54
TOTAL (JAN-DEC)	19,520,000	19,667,016	0.75	20,006,000		
TOTAL (JAN-DEC)	19,520,000	19,667,016	0.75	20,006,000	19,961,581	-0.22

(Source: Malaysian Palm Oil Board Annual and Forecast of Crude Palm Oil Production, 2012)

The economic lifespan of an oil palm tree is usually around 25 years. The oil palm trees are usually burnt down or left to rot after the productive age because of their lessening produce and difficulties in the harvesting work due to their tall height (Ashaari, 2017). The oil palm trees could be replaced through replantation, however, replantation resulted in about 2.29 million cubic meter of oil palm stem waste (Nadhari et al., 2014). Oil palm stems are susceptible to attacks by fungal or insects, this is due to its high starch and sugar percentage in the tree. It is also difficult to dry the lumber because it results in drying defects such as warping and raised grain (Ashaari, 2017). The oil palm tree has high variation in terms of their density, particularly between the inner layer and outer layer of the trunk. The difference in density between the layers causes problem during their application (Sulaiman et al., 2012). Furthermore, fresh oil palm trunks are found to contain moisture content of up to 500%, hence drying oil palm lumber also requires high cost and longer duration (Bakar et al., 2008). Thus, many factories in this wood industry prefer to use other wood than oil palm wood.

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To reduce pollution to the environment we should reuse the oil palm waste such as the trunks, there are many potential applications from the oil palm trunks, for examples particleboard, plywood, fibreboard, laminated board and furniture (Sulaiman et al., 2012). Recent research has been working on methods to turn oil palm lumber into a value added product. Experiments were conducted to try out different drying methods for oil palm lumber to increase their quality to be used as solid wood.

Due to the high moisture content properties of oil palm wood, the conventional air drying of oil palm wood takes a very long duration up to months. This method is very weather-dependent and affects the moisture content in the wood during the drying process. The long drying duration causes drying defects on the lumber such as warping, checks and collapse. Furthermore, the long duration of exposing the wood to external environment will cause the wood to be attacked by biological agents.

Air forced drying is a method to dry wood by forcing the air circulation towards the wood by setting a constant air velocity. This method takes shorter time compared to the conventional air drying method. The rate of drying of the wood will be more consistent as it will not be affected by the external factors such as weathering. It is a very economical method as the only equipment needed is industrial fans. Air forced drying method can reduce the drying time, schedule drying time within predetermined periods of time, and minimizes defects (Gaby, 1961).

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1.2 Problem Statement

Due to the high moisture content of oil palm lumber, drying duration is longer and possibly results in drying defects such as warping and raised grain. Through air forced drying, the parameters have yet to be determined to produce oil palm lumber with the least defects at the desired moisture content percentage.

1.3 Justification

Due to the high moisture content of oil palm, the oil palm lumber is very prone to drying defects such as warping, checks and collapse. So in this research, Air Forced Drying method will be used to reduce the moisture content of oil palm lumbers. Rate of drying and evaluation of defects will be determined to compare different thickness of oil palm lumbers.

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1.4 Objective

1.4.1 General Objective

The general objective of this research is to determine the variables of oil palm lumber for high quality product through air forced drying method

1.4.2 Specific Objective

- To determine the effect of thickness of oil palm lumber on the defects through air forced drying method
- To determine the portion (outer or inner) of oil palm lumber with the least defects through air forced drying method
- To evaluate the defects of oil palm lumber dried with air forced drying method

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