UNIVERSITI TEKNOLOGI MARA

THE FEASIBILITY OF USING OIL PALM VENEERS IN LVL WITH RESPECT TO ITS WETTABILITY, ADHESIVES PENETRATION AND BENDING STRENGTH

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ABSTRACT

The depletion of our tropical timber has encouraged the Malaysian wood based industry to seek alternative lignocellulosic materials for board production. Oil palm (*Elaeis guinensis*) from agricultural residues is a potential alternative. Oil palm trunk (OPT) appears to have great potential use after rubberwood, as a source of value-added products such as plywood, laminated veneer lumber (LVL) and parallel strand lumber (PSL). Due to the potential of using OPT as raw a material for panel product, it is necessary to investigate its properties. Therefore, the main objective of this study is to determine the general properties of OPT veneer and its interaction with adhesives. The properties investigated were moisture content, relative density, pH, buffer capacity, wettability, surface tension, adhesive penetration and bending strength and stiffness. The moisture content of dry veneer was approximately 8%. The results of relative density of OPT veneer increased significantly from the bottom portion to the top portion and declined significantly inward from the outer part to the inner part. The average mean pH value and buffer capacity of OPT veneer were 4.52 and 0.12 me., respectively. Contact angle of the surface using deionised distilled water was 49.78°. Surface tension parameter of OPT veneer for Lifshitz van der Waals' (γ_S^{LW}) component was 39.40 mJ/m², acid or electron accepting (γ_S^+) was 1.65 mJ/m², base or electron donating (γ_S^-) was 38.37 mJ/m² and total surface tension (γ_S^{total}) was 55.20 mJ/m². In general, the adhesive penetration properties when using PF and UF resins were significantly different between parts and temperatures, but only slightly significant at different portions. Bending strength properties of laminated OPT veneer when using PF and UF resins mostly gave a higher significance value for comparison at different temperatures, portions and parts. A Pearson correlation coefficient was computed between bending strength and adhesive penetration properties of laminated OPT veneer using PF and UF resins. Generally a weak, positive correlation was established and found to be significant.

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CHAPTER I

INTRODUCTION

1.1 Introduction

The oil palm tree (*Elaeis guineensis*) is one of the most important commercial crops supplying palm oil for household and commercial consumption. The oil palm industry in Malaysia started 80 years ago in a modest way. It has positioned Malaysia as the leading nation in oil palm production, being the largest producer and exporter of palm oil in the world with a market share of between 50 and 58 percent, respectively. The huge production of palm oil consists of only about 10 percent of the total biomass of the tree and the remainder consists of a large amount of lignocellulosic materials in form of empty fruit bunches (EFB), oil palm fronds (OPF) and oil palm trunk (OPT) (Mohd Nasir, 2003).

Therefore, to achieve a zero-waste strategy in the Malaysia palm oil industry, research and development activities are also focused on the utilization of oil palm biomass. The oil palm biomass has great potential to be converted into high value-added and useful income-generating products. This strategy will also introduce to the market a new alternative or supplementary lignocellulosic source in addition to rubberwood.

1.2 Problem Definition and Research Justification

Currently, many wood-based industries depend solely on rubberwood as their source of material to the extent of seriously depleting the resources. The depletion of tropical timber has encouraged Malaysian wood-based industry to seek other alternative lignocellulosic raw materials production. The potential alternative is agricultural residues from sources such as rubberwood, oil palm, coconut, paddy, pineapple and banana. In the cultivation of oil palm and the production of palm oil, the industry generates a number of by-products and residues, which are either recycled or converted to value-added products. According to Gurmit Singh (1995),