

**UNIVERSITI TEKNOLOGI MARA**

**MECHANICAL AND PHYSICAL  
PROPERTIES OF RECONSTITUTED  
PANEL FROM OIL PALM FROND AT  
DIFFERENT AGE GROUPS**

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Thesis submitted in fulfillment of the requirements  
for the degree of  
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## AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This topic has not been submitted to any academic institution or non-academic institution for any degree or qualification.

I hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research

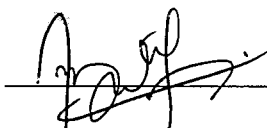
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## ABSTRACT

The reconstituted panels from oil palm frond (OPF) were manufactured from different age groups (8 and 11 years old), with different density levels ( $550 \text{ kg/m}^3$  and  $650 \text{ kg/m}^3$ ) and at three resin contents (8%, 10% and 12%) with the synthetic resin Urea Formaldehyde (UF) was used as the binder. The panels then were tested to determine their mechanical (MOE, MOR and IB) and physical (TS and WA) properties. In this study, chemical analysis was performed in determining the chemical compositions contain in the OPF. The chemical analysis that had been performed including hot water (HW) soluble, alkali (1% NaOH) soluble, alcohol-toluene soluble, ash content, lignin content, holocellulose content and alpha-cellulose content. While, the fiber morphology was performed to characterize the characteristics of fibers in term of fiber length (FL), fiber diameter (FD), lumen width (LW) and cell wall thickness (CWT). In manufacturing the reconstituted panel from the OPF, the fundamental study of the bulk density and particle analysis were conducted in comparing the amount of raw material that are going to be used and in determining the thickness and length distribution of particles used. Based on the testing that had been carried out, the results showed that age, board density and resin content were significantly affected the mechanical and physical properties of the panels made of the OPF. In this study, the panels made from 8 years old OPF had possessed better mechanical properties compared to 11 years old OPF. In the contrary, there were insignificantly effected on the panel properties contributed by both of age groups in the physical properties, thickness swelling (TS) and water adsorption (WA). Otherwise, increase in board density did improve the mechanical and physical properties of panels for both of age groups. In the meanwhile, resin content also had contributed same outcome where increase in resin content did improve the mechanical and physical properties of the panels for both age groups. The panels made of 8 years old OPF with density of  $550 \text{ kg/m}^3$  at 10% of resin content were able to meet the minimum requirement of European Standard (EN 312-3) for their mechanical properties of interior applications including furniture. However, physical properties of OPF panels did not meet the satisfactory of the standard. From the outcome of this study, OPF can be considered as alternative raw material for composites industries in manufacturing the composites panels such as particleboard.

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