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FINGER JOINT FROM DENSIFIED RECYCLE OIL PALM TRUNK

INTRODUCTION

Oil palm is one of the largest agricultural plantations sector in Malaysia. Increasing land area of oil palm plantation has been leaving large amount of residue in harvesting sites. It is estimated that overall oil palm industry generates at least 30 million tonnes of lignocellulosic biomass per year in the form of trunks, fronds, empty fruit bunches, and leaves [Rokiah Hashim, 3 April 2010]. All of these oil palm residue are disposed to the environment. The current research on oil palm residue are used to make a useful produts such as, particle board, wood cement board, plywood, and others.

One of the main oil palm residue is the trunk. The trunks are soft, low density and has insignificant mechanical value as it is. Hence, the trunk is densified to enhance its mechanical properties and make it useful in the form of finger joint. The finger joint will then assembled to be useful medium density product such as indoor furniture.

OBJECTIVES

- To fabricate finger joints from oil palm trunk
- To study mechanical properties of oil palm trunk
- To produce product from finger joints

METHODOLOGY

Wood block
(20 cm x 20 cm)

RESULTS & DISCUSSION

The density of densified oil palm trunks changes with temperature ranges between 100-200°C is shown in Figure 1. It was found that there is improvement of oil palm trunk density before and after pressed. The highest density changes recorded was 45.6% at temperature 200°C. The dramatic changes in term of density maybe because of the lignin in the sample melt and fill the void; hence it closes the gap and become packed structure. The sample pressing under 100°C only experienced a small increase in the density of 5% and this is maybe due the possibility of moisture absorption from surrounding.

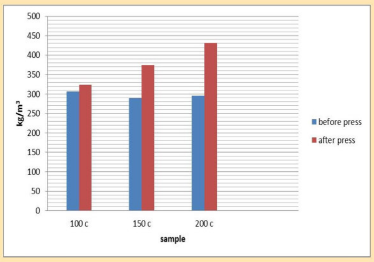

Figure 1: Density of oil palm trunk varies with pressing temperature

The mechanical properties of the densified oil palm trunk at three different pressing temperatures is given in Figure 2. The highest mechanical property obtained is the modulus of elasticity (MOE) which shows an increment up to 37.4%. Hence the strength of the oil palm sample is significantly increases. This also shows that finger joint of high thermodensified sample can support high pressure applied and can act as cushion to single lamella profile of the sample.

On the other hand, modulus of rupture (MOR) shows that the sample tends to rupture at higher pressure compared to lower thermodensified and kiln dry sample. With high thermodensified, the bonding of the joint is increased thus finger joint sample required high pressure to break.

The trend od tensile strength (TS) is similar to MOR and MOE. They increses with increasing pressing temperature. This could be related with the internal structure of the sample where the increase in tensile strength is could be due to increase of compactness of wood substance for a given volume (Jackson and K.Dhir, 1996). TS properties of wood begin to increase significantly as lower moisture content in the wood since that the strength and stiffness process of the cell wall take places (Nadhir, 2011). This was proven when, high thermodensified sample had higher value of TS compared to lower and kiln dry sample.

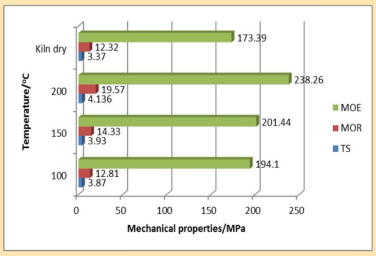

Figure 2: Mechanical properties of oil palm trunk varies with pressing temperature

CONCLUSIONS

The objective of this experiment was achieved. This research is mainly to determine the finger joint performance when thermodensified oil palm is done. By measuring with different temperature of oil palm wood and control sample that put in kiln dry, the performance of high temperature has higher strength among others. The limit temperature of oil palm trunk is 200°C because at this temperature few sample become brittle state, maybe at higher temperature the fibre content in the samples were destroyed. All tests such as modulus of elasticity, modulus of rupture, and tensile strength, shows that 200°c was the highest among lower and controlled sample but not very significant. This research also shown that by increasing the density of oil palm trunk the strength also will be increased.

RECOMMENDATIONS

Based on this study several recommendations had been provided for future study. First for future studies, actual scale is tested not small sample scale to measure the true behaviour of finger joint from densified oil palm trunk compared to other wood. Second for future research other segment of oil palm wood such as peripheral segment of oil palm must put to the test. This is because in theory peripheral segment of oil palm trunk is denser and more woody compared to core segment of oil palm trunk. Third in future study, different type of adhesive could increase the performance of joint. Different finger joint profile also could have an effect to the strength of joint.

REFERENCES

- Nurjannah Salim ,Rokiah Hashim, Othman Sulaiman, Mazlan Ibrahim, Masatoshi Sato, Salim Hiziroglu (2011). Optimum manufacturing parameters for compressed lumber from oil palm (Elaeisguineensis) trunks: Respond surface approach. UniversitiSains Malaysia
- Nadhir , (2011) Effect of moisture content on tensile strength of yellow meranti timber. Universiti Teknologi Malaysia, Skudai Johor.
- Jackson, N. and Ravindra K. Dhir.,(1996). Civil Engineering Materials(5th edition). London, MacMillan Press. Ltd

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