

A Preliminary Study of the Low Density Particle  
Boards Quality using Rice Husks and Oil Palm  
Empty Fruit Bunch with Plastic Waste Adhesive

# Background

- Oil palm empty fruit bunch (OPEFB) produced from palm oil industry. The accumulation of OPEFB and rice husk (RH) every year is one of the fertility soil problem that should be addressed due to it does not decompose at a fast rate.
- Plastic waste is the undegradable material in the soil. It will prevent the production of nutrients in the soil, so that the fertility of the soil is reduced and influences the agriculture sector.
  - The waste can be used to make a particle boards to reduce the environmental problem. In this research, the utilization of RH and OPEFB with PW as adhesive for making the low density particle boards is proposed based on the SNI 03-2105-2006. This is certainly very suitable in saving those materials and produce more products, It can be used for the allotment of products that do not require high density.

This research was conducted by comparing the quality of the particle boards produced from RH and EPFB using PW as adhesive obtained from plastic cups waste (polypropylene). The particle boards were produced in two different treatments with 3 replications for each treatment and the weight of each specimen was 162 g. Design of mixes are as follows: 50% of RH : 50% of PW and 50% of EPFB : 50% of PW (by weight of total mixes).



Rice Husks (RH)



Plastic cups waste (PW)



Oil Palm Empty Fruit Bunch (OPEFB)



Mold



RH and PW mixed



Hot Press Machine

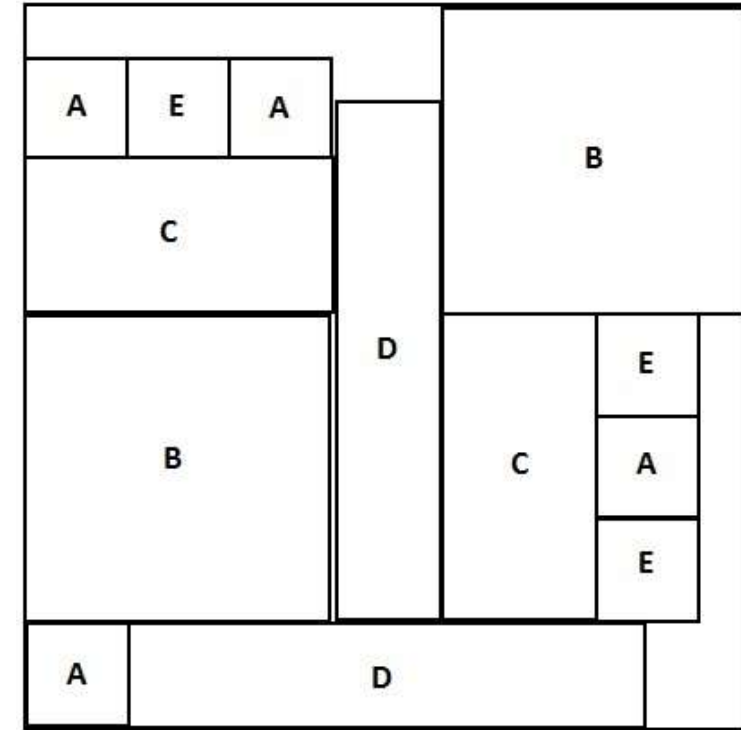


Hot Pressing

The hot pressing was carried out in a hydraulic press, at a temperature of 175°C and pressure of 30 kg/cm<sup>2</sup> for a period of 7 minutes of total hot pressing. All particle boards were cooled and conditioned under the room condition for 4 days after hot pressing.

# Testing

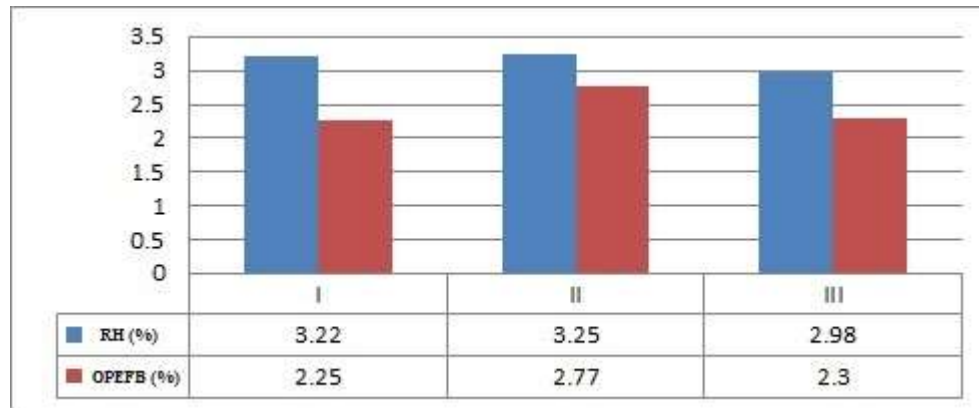
- The testing included several parameters such as water content, water absorption, thickness swelling, density, modulus of elasticity (MOE), and modulus of rupture (MOR) based on SNI 03-2105-2006 and the tension perpendicular to the surface based on Food and Agricultural Organization (FAO) 1996 standard. After curing, the cutting of particle boards was conducted for physical and mechanical tests.
- A is the specimen for water content and density tests (5 cm × 5 cm), B is the specimen for water absorption and thickness swelling tests (15 cm × 15 cm), C is the specimen for MOE and MOR (15.2 cm × 7.6 cm) tests, D is the specimen for the tension of parallel to surface test (25.4 cm × 5.1 cm), and E is the specimen for the tension of perpendicular to surface test (5 cm × 5 cm). The thickness of the whole specimens is approximately 0.6 cm.



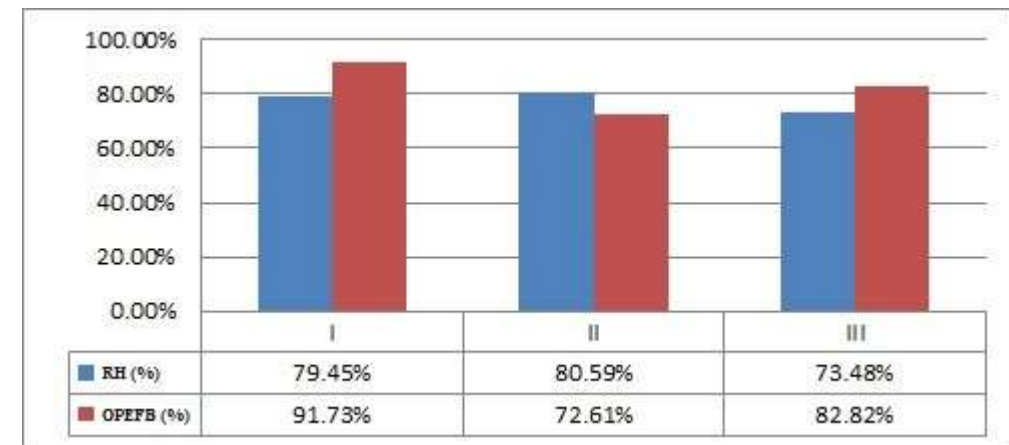
The cutting pattern of specimens for physical and mechanical tests

# Standardization of Particle Boards

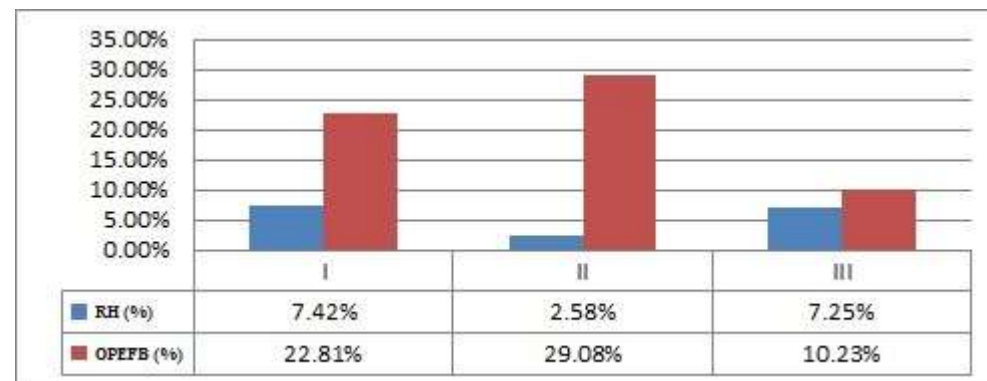
	Unit	SNI 03-2105-2006	JIS A 5908-2003	FAO (1996)
Density	(g/cm <sup>3</sup> )	0.4 - 0.9	0.4 - 0.9	0.42 - 0.80
Water content	(%)	≤ 14	5 - 13	-
Water absorption	(%)	-	-	6 - 40
Thickness swelling	(%)	≤ 12	≤ 12	-
Modulus of rupture (MOR)	(kg/cm <sup>2</sup> )	≥ 82	≥ 82	108 - 280
Modulus of elasticity (MOE)	(kg/cm <sup>2</sup> )	≥ 20400	≥ 20400	1.000 - 49.000
Internal bonding	(kg/cm <sup>2</sup> )	≥ 1.5	≥ 1.5	-
Tension perpendicular to surface	(kg/cm <sup>2</sup> )	-	-	85 - 210



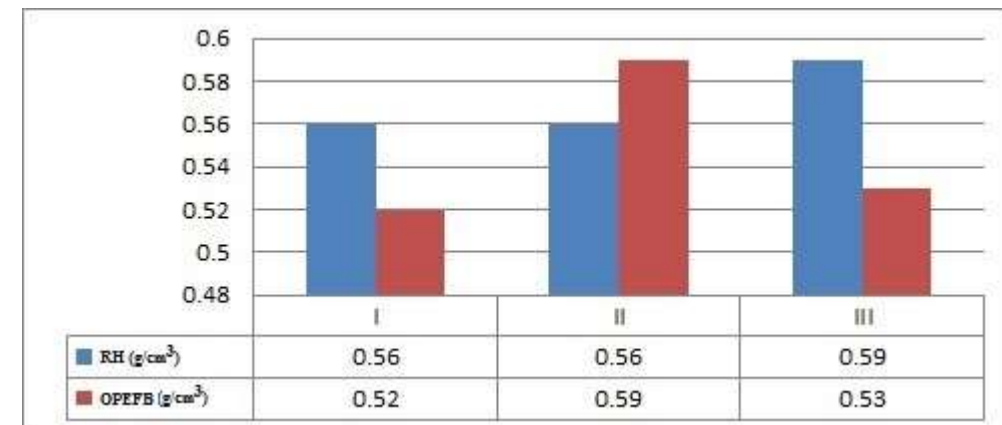
Comparison of water content



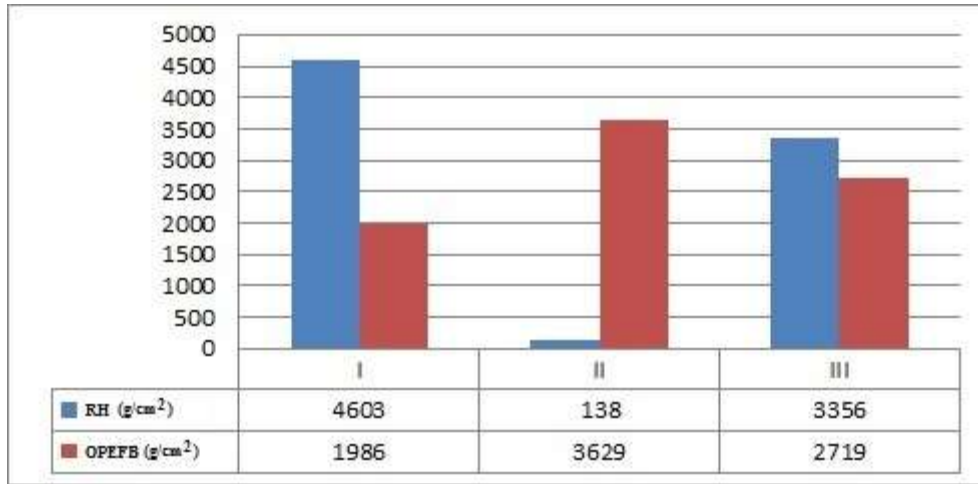
Comparison of water absorption



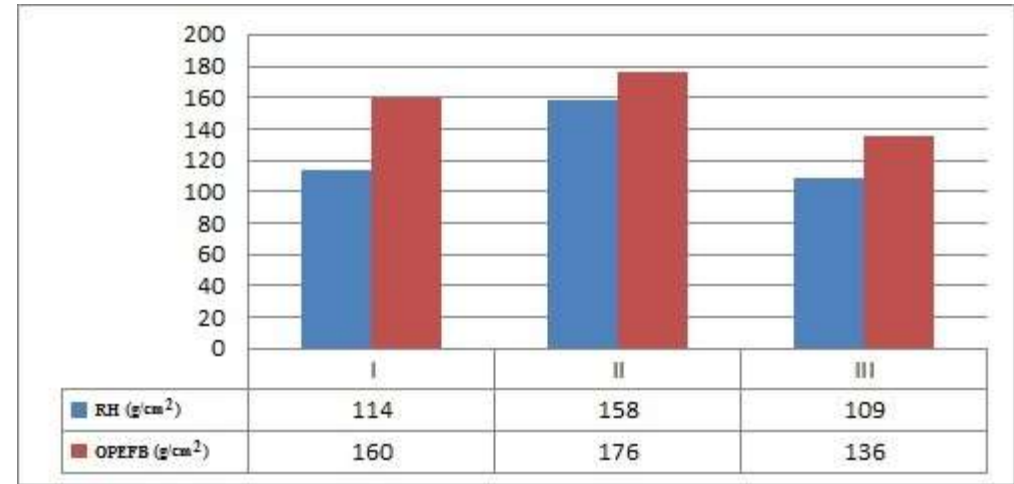
Comparison of thickness swelling



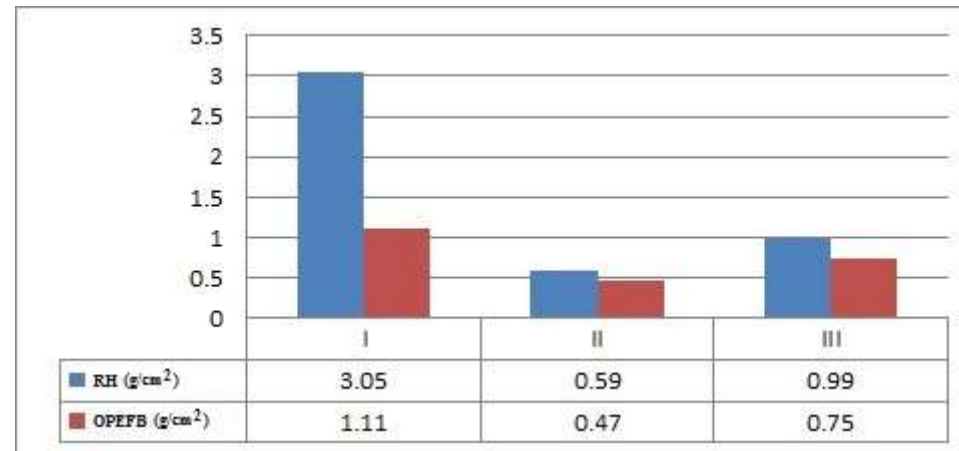
Comparison of density



Comparison of Modulus of Elasticity



Comparison of Modulus of Rupture



Comparison of the tension perpendicular to the surface



# Conclusion

- The results revealed that the quality of the low density particle boards based on water content, density, and modulus of rupture (MOR) meet the requirement of SNI 03-2105-2006 and FAO 1996, whereas the modulus of elasticity (MOE), thickness swelling, water absorption, and the tension perpendicular to the surface do not comply to the requirement.
- This preliminary study revealed that the quality of particle boards using EPFB is better than using RH for building materials. The results of this research are expected to be used for ceiling based on MOR values, but further analysis need to be performed to study the appropriate standard for ceilings.
- This research is a preliminary study, therefore, further analysis is needed to be conducted by varying dosage of RH and EPFB with many replications. A comparative study among the quality of particle boards produced from baggase, RH, and EPFB with PW as adhesive will be the next research topic to be analyzed.

**THANK YOU FOR YOUR ATTENTION**