PRODUCTION OF SANDWICH PANELBOARD FROM OIL PALM TRUNK

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MPOB INFORMATION SERIES • ISSN 1511-7871 • JULY 2017 MPOB TT No. 617

The physical properties such as moisture content and density of oil palm trunk (OPT) vary in radial direction with tree height (Lim and Gan, 2005). This must be considered in the processing and manufacturing of composite panel board from oil palm trunk (OPT). If these disadvantages could be addressed, the OPT could complement the use of timber for products that are traditionally made from wood.

In line with the zero-waste strategy, Malaysian Palm Oil Board (MPOB) has developed a technology for the production of palm based sandwich panelboard (SP). The product is made from oil palm particles and sandwiched between flat sheets of oil palm veneer of specified grain orientation. The product is ideal for various end uses such as packaging, building materials and furniture parts.

PROCESS DESCRIPTION

For sample preparation, OPT is sawn into billets and labelled with codes into two zones. Zone 1 is the area of circumscribed circle at 120 mm radius from the centre of the OPT diameter whereas Zone 2 is the peripheral zone of the billet.

For veneer production, the billet is peeled until its diameter reaches the Zone 1 section. After peeling, wet veneer is dried to 8%-10% moisture content in a conventional dryer. The remaining OPT billet (Zone 1) is removed from the peeler lathe and reduced into chips using a drum chipper. After drying, the chips are blended with a known quantity of resin/wax mixture in a drum-type glue blender and to be used for the production of particleboard. The particleboard mat is manually formed in a box, hot pressed at temperature 165°C and cured to specified dimensions.

Dry veneers are then assembled or laid-up onto the particleboard surfaces with a known quantity of adhesive. The semi-finished product is then finally compressed using cold and hot press (temperature 165°C for 5 min) and cured to specified thickness and densities. *Figure 1* illustrates the process flow for the production of SP.

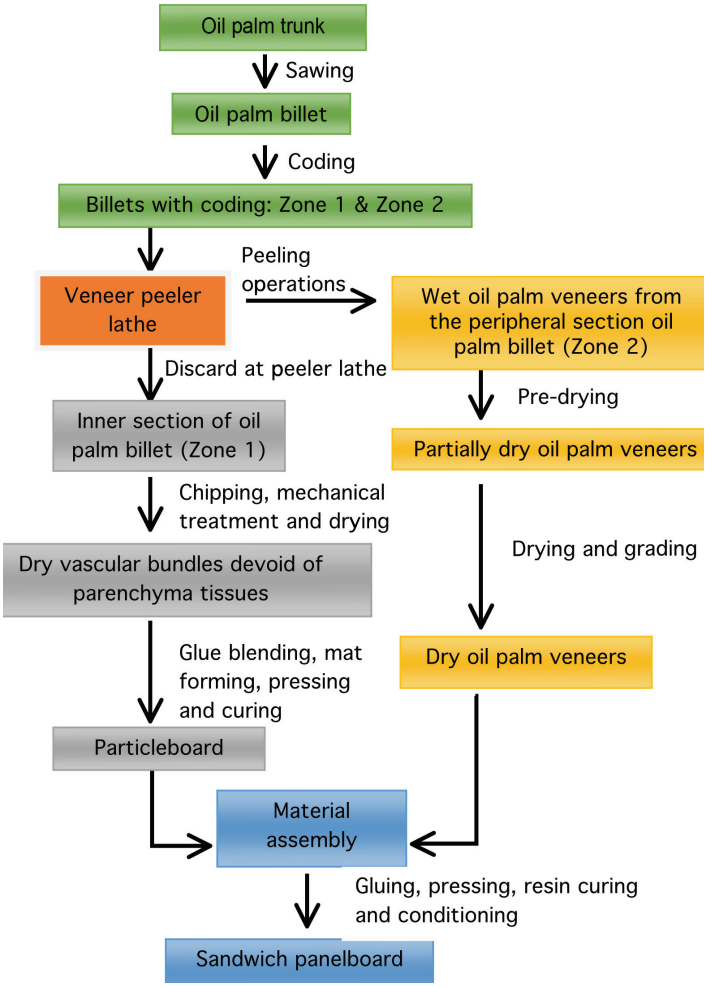

Figure 1. Process flow for the production of sandwich panelboard (SP) from oil palm trunk.

NOVELTY OF THE PRODUCTS/ TECHNOLOGY

The novelty of this product, is in (i) the veneer peeling operation, and (ii) material assembly for the construction of SP. The properties of SP versus other board types from oil palm trunk are shown in *Table 1*.

ISSN 1511-7871
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TABLE 1. COMPARISON OF MECHANICAL PROPERTIES FOR VARIOUS PRODUCT TYPES FROM OIL PALM TRUNK

Product types	Mechanical properties			
	Modulus of Rupture (N mm^{-2})	Modulus of Elasticity (N mm^{-2})	Internal Bond (N mm^{-2})	Thickness Swelling (%)
Sandwich panelboard	28.5 ~ 31.9	2555 ~ 3055	0.4 ~ 0.6	14.3 ~ 15.2
Oil palm plywood	28.8 ~ 29.2	2240 ~ 2740	2.1~ 3.2	16.8 ~ 17.2
Oil palm Particleboard	26.8 ~ 27.4	2843 ~ 3343	1.5 ~ 2.8	14.2 ~ 16.2
EN 312-4	>17	>2300	>0.4	<16

Note: Board density = 650 ~ 700 kg m^{-3}; Board thickness = 12 mm

ADVANTAGES

- Extend the use of OPT to new composite products.
- Total use of this low cost raw material results in cost-saving.
- May be used for various applications such as packaging, building materials and furniture parts.

ECONOMIC ANALYSIS

For the manufacturing of SP, the internal rate of return (IRR) is estimated at 30%, payback period three years and net present value (NPV) RM 662 793. *Table 2* shows the costs of production of sandwich panelboard and palm plywood.

TABLE 2. COST OF PRODUCTION OF SP VERSUS STANDARD PALM PLYWOOD

	Cost (RM per m^3)	
	Standard palm plywood	Sandwich panelboard
Oil palm peeler logs	270	270
Tropical wood veneer (for face and back)	153	0
Resin and chemicals	162	208
Salary and wages	216	233
Electricity and utilities	45	66
Repair and maintenance	27	33
Depreciation	27	25
Production costs	**900**	**835**
Selling price (ex-factory price)	**920 ~ 960**	**900 ~ 940**

CONCLUSION

For the manufacturing of SP, it is important to segregate OPT with known physical properties for veneer peeling and chipping operations. Although this may involve some additional expenses, there are major savings which can be gained by investors through better yield, lower primary and secondary processing costs, and improvement in the product quality. SP would be an option for existing plywood factories to venture into.

REFERENCES

BS EN 312 (2003). Particle board specification. Requirements for general purpose boards for use in dry conditions.

LIM, S C and GAN, K S (2005). Characteristics and Utilization of Oil Palm Stem. TIMBER Technology Bulletin, FRIM. No. 35.

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