

## INTRODUCTION

**M**POB initiated a research project on the manufacture of Agrolumber from oil palm fibres, which focuses on outlets of special applications commanding a higher price. The so-called Agrolumber is a semi-structural composite product of lumber scantling, in which a thermosetting polymer resin is combined with reinforcing fibre preforms from oil palm fibres using the resin infusion processes.

## MANUFACTURING PROCESS

The basic ingredients for the manufacture of Agrolumber are oil palm fibres and a polymer resin. The oil palm biomass, regardless of its form, is processed through a Maier chipper, model D-33649 Bielefeld. Oil palm chips are

sieved for the required particle size and are defibrated in a Andritz pressurized refiner, model 1CP-HS. Defibration occurs as the chips pass between the rotating and stationary plates of the refiner. A Sprout Waldron refiner plates (D2A-505 type) were used for the refining process.

After refining, the fibre suspension of a known consistency is moulded into an oriented fibre preform of lumber scantlings with a dimension of 0.92 m (length), 0.22 m (width) and 0.22 m (thickness) using the wet-process forming. The resulting fibre preforms are then dried to a lower moisture content.

Dry fibre preforms are individually placed in a plastic bag. A vacuum is then applied and a polymer resin is fed into the plastic bag. The vacuum draws the resin through the fibre matrix until saturation occurs. The lumber scantling is then pressed and cured under a specific pressure. *Figure 1* illustrates the process flow on the manufacture of Agrolumber from oil palm biomass.

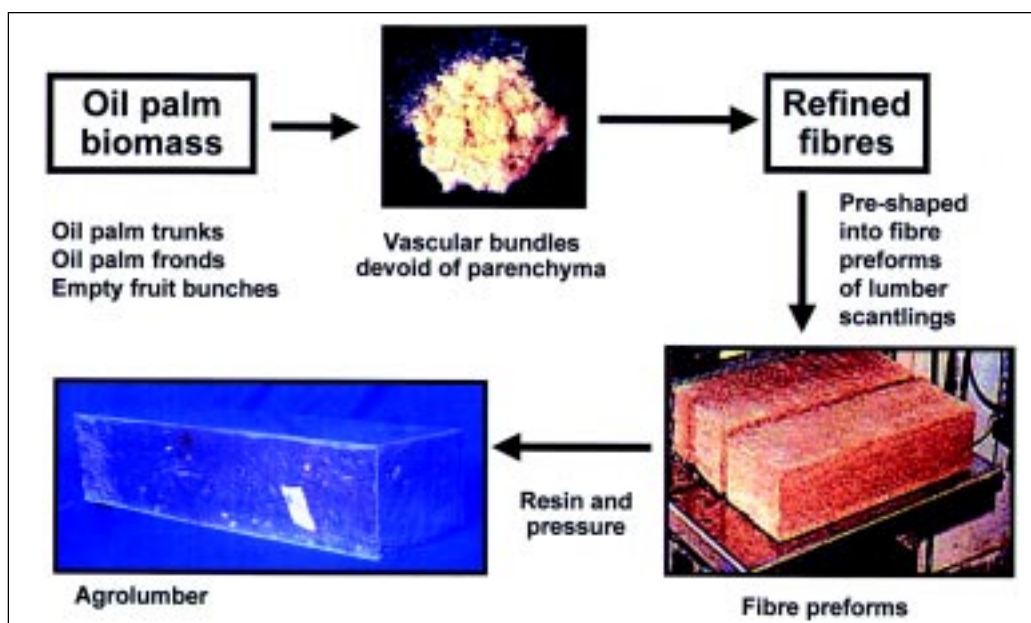


Figure 1. Process flow of Agrolumber from oil palm biomass.

## PROPERTIES

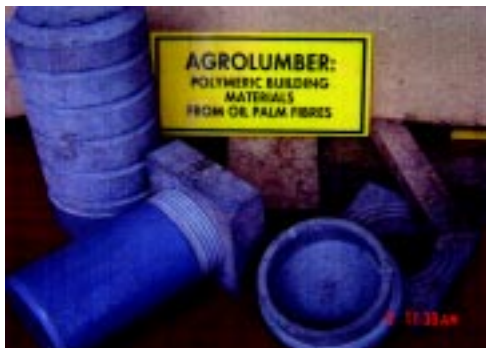
The physical and mechanical properties of Agrolumber from oil palm fibres shown in *Table 1*.

**TABLE 1. PROPERTIES OF AGROLUMBER**

Properties	Unit	Value	Test method I.C Used
Density	kg m <sup>-3</sup>	0.98 to 1.11	ASTM D792
Water absorption			
(a) After 3 hr soaking	%	0.26	ASTM D570
(b) After 18 hr soaking	%	1.31	ASTM D570
Bending strength	MPa	29.67	ASTM D3039
Tensile strength	MPa	16.44	ASTM D790
Impact resistance	J m <sup>-2</sup>	27.84	ASTM D4812

### ADVANTAGES OF AGROLUMBER

- Works much like wood with ordinary tools;
- Flexible, can be shaped into various cutting profiles (*Figure 2*);
- Dimensionally stable;
- Resistant to swelling and insect infestation;
- Good machining properties (sawing, boring, nailing and sanding);
- Splinter free, does not crack; and
- paint able.



*Figure 2. Mouldings with different cutting profiles from Agrolumber.*

### ECONOMICS OF PRODUCTION

Production costs are estimated at RM 830 m<sup>-3</sup> of Agrolumber. Of the total production costs, variable costs accounted for 63.06% and the remaining 11.93% is the fixed costs (excluding interest and depreciation). Costs for interest and debt service are estimated at 11.87% while depreciation, a non-cash cost, is estimated at 13.14%.

### POTENTIAL END USES

- Building industry (exterior and interior claddings, wall panels, doors, window sills, window frames and handrails);
- Furniture industry (leg frames for indoor and outdoor furniture, table-top, frame for upholstered furniture and kitchen cabinets);
- Electronic industry (cabinets for television sets and loud speaker fronts); and
- Packaging industry (pallets, containers, fruit cases and crates for fish and vegetables).

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