DEVELOPMENT ON EXTERIOR COMPOSITE PLYWOOD (COM-PLY) PRODUCT MADE OF MERANTI VENEER AND EKALIPTUS (Eucalyptus Deglupta Blume) THINNING VOLUME

(PENGEMBANGAN PRODUK KOMPOSIT PLYWOOD (COM-PLY) DARI VINIR MERANTI DAN KAYU EKALIPTUS (EUCALYPTUS DEGLUPTA BLUME) HASIL PENJARANGAN)

Arif Nuryawan¹ and Muh. Yusram Massijaya²

¹Major of Forest Product Technology, Dept. of Forestry, Fac.of Agriculture, The University of North Sumatra - Indonesia, Email: arifnury@yahoo.com
²Department of Forest Product, Faculty of Forestry, Bogor Agricultural University - Indonesia, Email: yusram@indo.net.id

Abstract

This research was concerning the development of properties of com-PLY to exterior use. The boards were bonded by Phenol Formaldehyde (PF) and Melamine Formaldehyde (MF) at 10% based on oven dry particle weight and pressed at 30 kgf/cm² and the temperature 170 °C. Type of wood particle to the core was wafer, made from Ekaliptus (Eucalyptus deglupta Blume) and the face and back layers were Meranti veneers which have 1.5 mm thickness. The results were follows: 1) Physics characteristic for density and MC were fulfill JIS A 5908 - 1994. The value 0.709 - 0.737 grams/cm³ below on target and 9.551 - 10.769 % met the target.2)Unfortunately, physics characteristics for thickness swelling didn't met JIS A 5908 - 1994 standard, because the value was upper from the standard. The value was 7.429 - 15.595 % 3) All of samples for investigation the mechanical properties (Internal Bond, MOE dry & MOR dry) were fulfill the standard, except for width direction

Key words: exterior use, Ekaliptus (Eucalyptus deglupta Blume), physics characteristics, mechanical properties.

INTRODUCTION

In recent years, demand on structural lumber products, such as sawn timber and plywood, for building materials has increased with the increasing of the world population and lifestyle standard (Nuryawan, 2001). Unfortunately, the quality and quantity of raw material to produce these products from natural forest have been decreasing. Consequently, development in
structural bio based composite boards as the substitution of lumber, is a must.

Com- ply is one of the panel products (Rowell, 1998; Hong, 1999), and sale on the market not only as panel product but also as lumber substitution (Maloney, 1977). Com- ply is a new composite to structural use with flake board as the core (Bodig and Jayne, 1982). Com- ply defined as three layers panel or five layer panels (Hong 1999), with special type of plywood with particleboard as the core and used to construction (Haygreen and Bowyer 1989).

Com- ply, one of structural wood composite products, is determined as one of the composite boards, which is made of veneer on the face/ back layers and particleboard on core layers (Nuryawan, 2001). Com- ply is a very good product because it can use low quality of wood, small diameter, even wood waste in the core layer and using thin veneer in the face and back layers. In this case, the utilization of high quality of wood will be minimized, while the appearance of the com- ply is the same as plywood (Massijaya and Nuryawan, 2000).

One of the large sources of bio based resources could come from small diameter trees (Rowell, 1998). In this research, small diameter wood, namely Ekaliptus (Eucalyptus deglupta Blume) was determined as raw material for core. The small diameter produced by thinning process in plantation forest or part of the stem or branch. From composite processing technology point of view, utilization of small diameter wood for composite products is feasible (Nuryawan, 2001).

Performance is one of research trends today in bio based composite (Rowell 1998). Another trends today that could help us look into the future of bio based composite is quality assurance and testing (Rowell 1998). This research will report physical and mechanical properties of com- ply. And the major research efforts in this area focused on physical and mechanical properties of com- ply as construction product and its improvement (Nuryawan, 2001; Hakim, 2002).

The main purposes of this research is to determine the fundamental properties (physical and mechanical) of com- ply made of small diameter Ekaliptus (Eucalyptus deglupta Blume) wood from thinning volume

**MATERIALS AND METHOD**

**Target**

In this research, the target of com- ply boards thickness will be 1.0 cm and the density will be 0.75 g/cm³. Totally there will be 20 boards will be produced. The boards will be vary in adhesive, PF and MF. Meranti veneer will be produced by peeling and using rotary lathe. The target of veneer thickness is 1.5 mm.

**Board Production**

The procedures of boards production are as follows: First, face and back layers preparation. Second, core layer from particle wafer of Ekaliptus (Eucalyptus deglupta Blume) preparation. Third, blending process. Forth, mat forming and hot pressing. And fifth, conditioning.

**Board Testing**

After conditioning for two weeks in a conditioning room, the boards will be cut into specimens, and tested for physical (dimensional) properties and mechanical strength according to JIS A 5908 - 1994 for particleboard with ten replications for each condition. The bending test used center loading by Baldwin Universal Testing Machine.
Development on Exterior Composite Plywood (Com-Ply) Product Made of Meranti...

Core Layer Material
Small Diameter of Ekaliptus
(Eucalyptus deglupta Blume)

Face and Back Layers Material
Meranti

Disk flaker

Rotary Cutting

Wafer

Veneer

Kiln drying

Kiln drying

Dry Wafer
MC 5% - 10%

Dry Veneer
MC 5% - 10%

Mat Forming

Blending Process

Hot Pressing

Com-ply Target:
40 x 30 x 1 cm³

Density:
0.75 g/cm³

Pressure
30 kgf/cm²

Timing 10 minutes

Investigation on physical and mechanical properties

Conditioning

Com-ply Board

Figure 1. Diagrams of Com-ply Production
RESULT AND DISCUSSION

Physical Properties
The density met JIS A 5908-1994, unfortunately it's below on target, 0.750 grams/cm³ because the compression ratio was below 1.3. It was important matched with Maloney (1997) that the best ratio of compression ratio was 1.3. The MC in this research was com- ply on air dry condition. All the values fulfill JIS A 5908-1994 (Table 1). JIS Standard didn't require for water absorption. Unfortunately, thickness swelling on PF condition didn't fulfill the standard. It was assumed that PF has higher properties of water repellent than MF.

Mechanical Properties
The investigation of mechanical properties of compl-y consist of internal bond (IB), Modulus of Rupture (MOR) and Modulus of Elasticity (MOE) in air dry condition. IB, MOR, and MOE for length direction fulfill JIS Standard, unfortunately MOR and MOE for width didn't require the value of standard.

CONCLUSION
The physical properties of com- ply exterior made of Ekaliptus (Eucalyptus deugupta Blume) and meranti veneer fulfill the JIS A 5908 - 1994 standard. Unfortunately, for mechanical properties just IB, MOE for length and MOR for length fulfill the standard, for width direction just 123 - 140 kgfs/cm² for MOR and 21867 - 68311 kgfs/cm² for MOE.

Table 1. Physical Properties of Com- ply

<table>
<thead>
<tr>
<th>Condition</th>
<th>Density (grams/cm³)</th>
<th>Moisture Content (%)</th>
<th>Water Absorption (%)</th>
<th>Thickness Swelling (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PF</td>
<td>0.737</td>
<td>9.551</td>
<td>41.224</td>
<td>15.595</td>
</tr>
<tr>
<td>MF</td>
<td>0.709</td>
<td>10.769</td>
<td>30.072</td>
<td>7.429</td>
</tr>
<tr>
<td>Standard of JIS A 5908 - 1994</td>
<td>0.400 - 0.900</td>
<td>5 - 13</td>
<td>N/A</td>
<td>max 12</td>
</tr>
</tbody>
</table>

Table 2. Mechanical Properties of Com- ply

<table>
<thead>
<tr>
<th>Condition</th>
<th>Internal Bond (kgfs/cm²)</th>
<th>Dry MOR for length (kgfs/cm²)</th>
<th>Dry MOR for width (kgfs/cm²)</th>
<th>Dry MOE for length (kgfs/cm²)</th>
<th>Dry MOE for width (kgfs/cm²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>PF</td>
<td>6.232</td>
<td>507.083</td>
<td>140.014</td>
<td>515341.7</td>
<td>68311.7</td>
</tr>
<tr>
<td>MF</td>
<td>7.941</td>
<td>645.399</td>
<td>123.543</td>
<td>631160.9</td>
<td>21867.5</td>
</tr>
<tr>
<td>Standard of JIS A 5908-1994</td>
<td>min 3.1</td>
<td>min 306</td>
<td>min 153</td>
<td>min 45900</td>
<td>min 28600</td>
</tr>
</tbody>
</table>
REFERENCES


