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)

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Abstrak

Penelitian ini menitikberatkan pada pengembangan sifat-sifat dari papan com-ply untuk penggunaan eksterior/ di luar ruangan. Papan direkat dengan perekat PF dan MF berdasarkan 10% berat partikel kering oven dan dikempa pada tekanan 30 kgf/ cm^3 dan suhu 170 ^{o} C. Jenis partikel kayu yang digunakan untuk *core*/ bahan pengisi adalah wafer yang berasal dari Ekaliptus *(Eucalyptus deglupta* Blume*)* dan bahan pelapis muka dan belakangnya adalah vinir Meranti dengan ketebalan 1.5 mm. Hasilnya adalah sebagai berikut: 1) Karakteristik fisik untuk kerapatan dan kadar air memenuhi standar JIS A 5908-1994, dengan nilai 0.709 - 0.737 gram/ cm^3 di bawah target dan 9.551 - 10.769 % sesuai target. 2) Karakteristik fisik untuk pengembangan tebal tidak memenuhi standar JIS A 5908-1994 karena nilainya di atas standar, berkisar 7.429 - 15.595 % 3). Seluruh contoh uji untuk penyelidikan sifat-sifat mekanik memenuhi standar, yang meliputi kuat teguh rekat, kuat teguh lentur, dan kuat teguh patah kecuali pada arah sejajar serat.

Kata kunci: penggunaan eksterior, Ekaliptus *(Eucalyptus deglupta Blume)*, karakteristik fisik, sifat-sifat mekanis.

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/cm^3 and the temperature 170 ^{o}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/cm^3 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/ cm^3. 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 Baldwinn Universal Testing Machine.

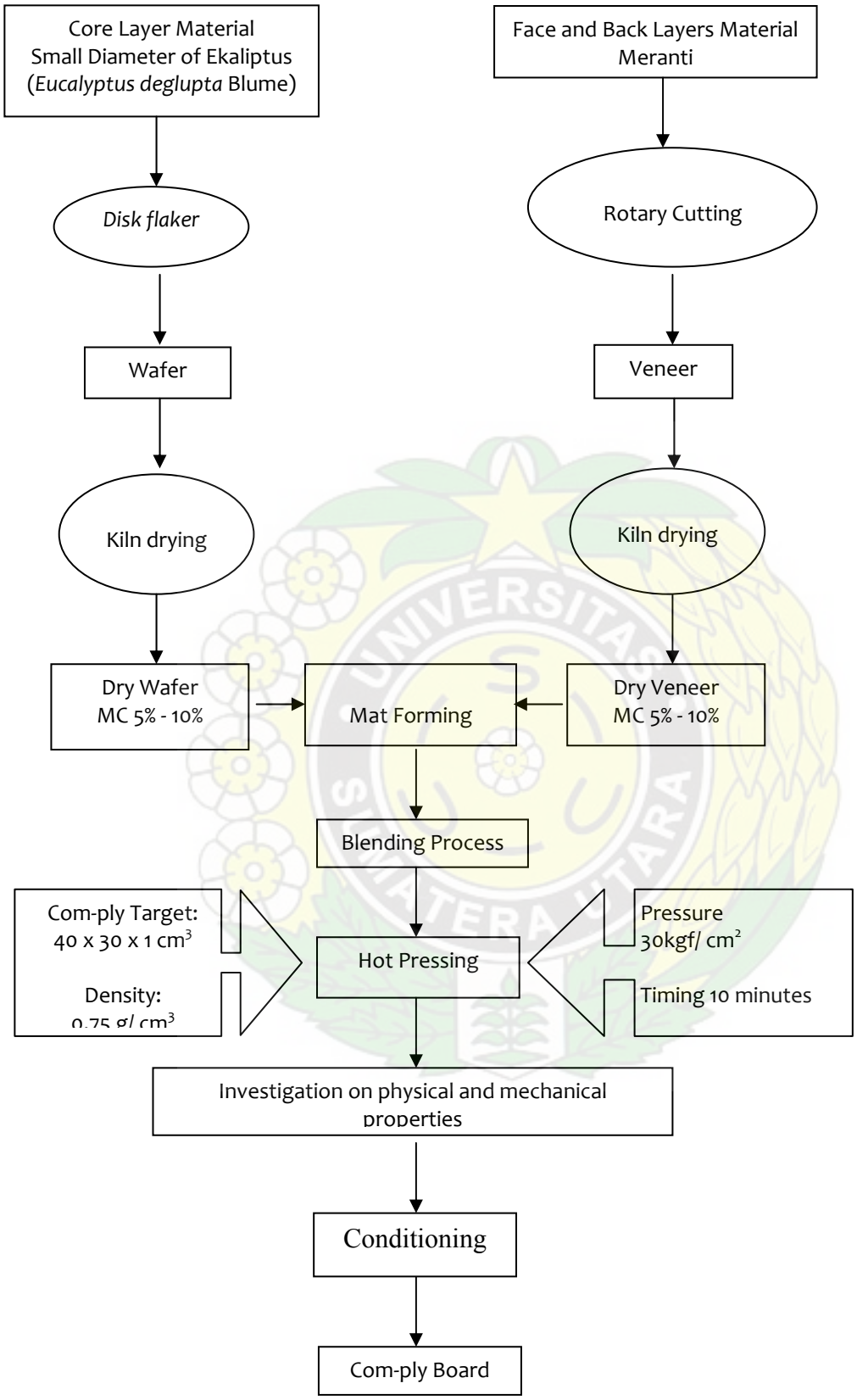

Figure 1. Diagrams of Com-ply Production

RESULT AND DISCUSSION

Physical Properties

The density met JIS A 5908-1994, unfortunately it's below on target, 0.750 grams/ cm^3 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 com-ply 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 deglupta* 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/ cm^2 for MOR and 21867 - 68311 kgfs/ cm^2 for MOE.

Table 1. Physical Properties of Com-ply

Condition	Density (grams/ cm^3)	Moisture Content (%)	Water Absorption (%)	Thickness Swelling (%)
PF	0.737	9.551	41.224	15.595
MF	0.709	10.769	30.072	7.429
Standard of JIS A 5908 - 1994	0.400 - 0.900	5 - 13	N/A	max 12

Table 2. Mechanical Properties of Com-ply

Condition	Internal Bond (kgfs/ cm^2)	Dry MOR for length (kgfs/ cm^2)	Dry MOR for width (kgfs/ cm^2)	Dry MOE for length (kgfs/ cm^2)	Dry MOE for width (kgfs/ cm^2)
PF	6.232	507.083	140.014	515341.7	68311.7
MF	7.941	645.399	123.543	631160.9	21867.5
Standard of JIS A 5908-1994	min 3.1	min 306	min 153	min 45900	min 28600

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