

The Development of Bamboo and Wood Composite Materials and Design Research

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Abstract

Through the bamboo and wood composite materials was introduced in detail the kinds, properties, composition structure and performance characteristics, discusses the production technology of bamboo and wood composite materials and the development process and its existing problems, and puts forward the measures and countermeasures to solve the problem, find a has the social benefit and economic benefit of bamboo and wood composite materials.

Keywords

Bamboo and wood composite materials, production technology, development process.

1. Introduction

Because of the great bamboo adaptation and its use, the planting area of our bamboo is huge, and it has the highest stock of the world, and it has a reputation as "the kingdom of bamboo". However, the development of bamboo in our country is constrained by its structure and its mechanical properties, and because of the sophistication and low utilization of the bamboo processing technology, the industrial development of bamboo is very slow. In recent years, the large number of forest areas in China has been greatly reduced, and the development of trees requires a lot of raw materials. In view of the practical constraints, many materials replacing trees or partially replaced trees appear in the market, bamboo and timber are characterized by structural and performance and mechanical properties, and it is easy to overcome the limitation of material itself in compounding and bonding. New generation of technology development and extensive research of Chinese and foreign experts provide guarantee for the efficient use of bamboo material and other tree materials. It discuss that types, property, structure and performance characteristics of the bamboo wood composite materials, discusses the production technology and development flow of the bamboo wood composite material and the problem of the development, seek the solution channel and measure, find out the regularity factors, and develop the standard to optimize the bamboo wood composite material, which provides reference and reference for the production and development of enterprises.

2. Bamboo and Wood Composite Materials

Bamboo and wood composite material is bamboo, bamboo sticks, bamboo broken material such as bamboo and wood for the same or different structure combination, through process development make artificial composite plate or timber. It has a very good physical and thermal insulation effect because of the compounded effects of its raw materials. Bamboo and wood are both natural organic materials, which have many communication points in the mechanical and performance properties, which are convenient to be combined into a composite material, due to the anisotropy of the anisotropy, the material after gluing is very suitable in terms of both the elastic coefficient and the surface roughness,

the soft and hard is moderate, the color is beautiful, and the thermal insulation is better, etc., the research and investment of the bamboo wood is very big in comparison with other materials, and the research on the bamboo wood is very large, and the research of the Chinese based on the reality is an important subject, the research range is extensive and the content is rich, which is rare in the world.

The bamboo and wood composite materials seen in the market are mainly bamboo and wood composite materials and functional bamboo and wood composites. They are a good building template material. According to the requirements of mechanics, it is different for different purposes. Constructional bamboo and wood composites are commonly used in architectural engineering components, and functional composites are generally used in decoration and furniture components. It is classified in that form of production, there are two kinds of bamboo mat and bamboo shades, which can be made into board material such as particleboard, hollow board, decorative board, etc., and other kinds of imitative wood materials can be produced.

Other Asian countries are also more research on bamboo wood composite materials, and the utilization of bamboo resources and bamboo is plentiful. The Japanese use the willow wood bamboo and the sugar cane to create a composite fiber board, and make it a standard system and a measurement system, and it's designed to make a different engineering artifact for its performance characteristics. Indonesia has also been deeply research on bamboo wood composite plywood and particleboard, which has increased the compression spring coefficient and surface roughness of bamboo fiber by increasing MOR and MOE of bamboo wood composite materials.

3. The Manufacturing Process and Development Process of Bamboo and Wood Composites

At present, the production of bamboo and wood composite materials in China is mostly the most advanced equipment imported from Germany and Italy. It adopts the latest machining tool system and the original surface technology, and follows the most stringent European quality standard production, and adopts the standardized production process and development process of the moulded circular arc corner. Through a series of anti-corrosion, anti-corrosion, anti-moisture, high pressure, high temperature, and adhesion, spinning and so on, the composite materials produced can be well received by the market.

3.1 Test Materials

The test material is bamboo, poplar core board, pine wood floor, adhesive and paint. Bamboo is the basic material, its specification is 2200mm * 200mm * 10mm, the density is 0.4-0.8g/m³, the moisture content is <10%. The raw material of the core board is the quick raw poplar or other soft material, the specification is 2200mm x 600mm x 10mm, the density is 0.3-0.6g/m³, the moisture content is 8%~9%. The adhesive is a water-soluble low molecular weight phenolic resin.

3.2 Test Equipment and Instruments.

Universal material testing machine, static strain tester, water content meter, vernier caliper, plate vulcanizing machine, electric heating blower dryer, hot press, circular saw machine, press planing machine, roller mill, sander.

3.3 Production Process and Development Process of Three Stages

Substrate production: Bottom material production: bamboo, open, cutting, cutting (to the bamboo, Shiraia, outer segments, cooking, planing) group (bamboo or bamboo), and a rotary cutting coil, drying, finishing, dipping, drying, two pieces (horizontal wood drying, glue single plate, hot pressing, multi-directional) blank (Leng Tui), surface sanding, cutting edge and bottom material.

Core board production: wood to truncate, planing to glue and rubber, drying, rotary cutting, winding plate, drying, primary material, sawing edge, hot pressing, aging (low temperature drying), core plate.

Finished product combination: the bottom material and the core material mixed, the fixed thickness sand light, the grooves, the coating, the surface treatment, the pressure (hot pressure), the edge, the performance test and the evaluation, the packaging.

3.4 Test Method and Result Analysis of Measures.

Inspection standard refer to that test method for physical and chemical property of artificial board (GB/T 17657-1999) and the composite floor (GB/T 18103-2000) and the timber floor (YLT / 1573-2000) of the national standard, and the relevant requirements of the bamboo flooring (y/T 18103-2000) and the bamboo floor (YLT / 1573-2000) are taken at the national standard, and the corresponding material dimensions are taken to measure the water content, the leaching and peeling, the gluing strength, the static bending strength and the elastic modulus, and the test result is calculated as follows:

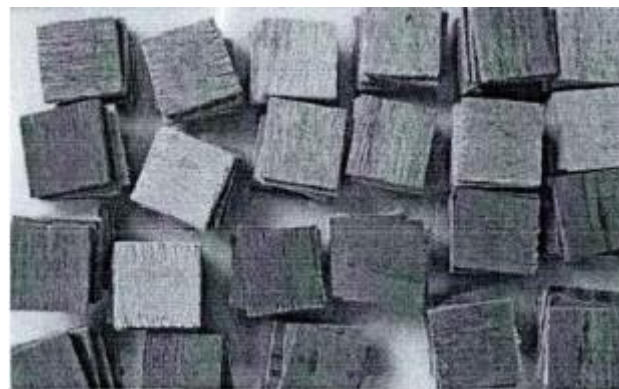


FIG. 1 shows a test specimen view of water content and leaching

moisture content: The moisture content test was carried out according to 4.3 in (GB/ T17657-1999) and the effect of water content on the cracking and deformation of the product was tested by sawing in accordance with the requirements of the performance test.

The moisture content of specimen is calculated according to the following formula, accurate to 0.1%.
 $H = (MU - MO) / MO * 100\%$.

Where: H -- the absolute moisture content of the specimen, %;

MU -- the quality of sample city, g;

MO - quality after drying, g.

Table 1. comparison table of water content of bamboo and wood composites.

Bamboo and wood combination	MF	UF	MF- Irradiation	UF- Irradiation	Mean Value	Standard Deviation	Coefficient of Variation
A1B1	8.5	8.6	6.2	7.5	7.70	0.97	0.13
A1B2	7.7	7.4	6.5	7.1	7.18	0.44	0.06
A1B3	9.3	9.5	6.6	7.5	8.23	1.22	0.15
A2B1	8.8	9.1	7.2	6.6	7.93	1.05	0.13
A2B2	8.3	7.4	7.2	7.1	7.50	0.47	0.06
A2B3	9.5	9.2	7.6	7.7	8.50	0.86	0.10
A3B1	8.6	7.6	6.4	7.1	7.43	0.80	0.11
A3B2	7.6	7.8	7.2	7.2	7.45	0.26	0.03
A3B3	9.2	8.5	7.2	7.2	8.03	0.86	0.11

Indicate: The A, B, C and D in A1B1C1D1 are respectively bamboo plate, wood board, adhesive, treatment, digit 1 is number of layers or number of times.

As shown in table 1, the moisture content of different bamboo and wood combinations is 6.7% to 9.4%, which is in line with the technical requirements of the wood-based panel process. The moisture content

of the sample of bamboo and wood laminated wood is compared with that of the untreated bamboo wood layer, with an average of 1.2 percentage points lower. Its standard deviation is 0.6351, variance, 0.4034. Irradiation of 60 Co- γ radiation change that molecular structure of cellulose, hemicellulose and lignin, so that the number of the stem in lignin is not only increased but also more stable, and the ability of adsorption of water molecules to decrease.

Exfoliation rate of impregnation: The immersion test is conducted according to 4.17 of GB/T17657-1999 test methods for physical and chemical properties of man-made boards and decorative boards. It is mainly through impregnating and drying of the specimens, so that the wet swelling and dry shrinkage are applied to the rubber layer to stress, and the rubber layer can meet the stripping level of the adhesive property.

Table 2. the record of strip size

Serial number	Bamboo and wood combination	Test piece 1 strip size (mm)	Test piece 2 strip size (mm)	Test piece 3 strip size (mm)
I-1	A1B1C1D1	15	16	16
I-2	A1B1C1D2	20	24	28
I-3	A1B1C2D1	0	0	0
I-4	A1B1C2D2	0	2	4
I-5	A1B2C1D1	0	0	0
I-6	A1B2C1D2	200	200	200
I-7	A1B2C2D1	0	0	0
I-8	A1B2C2D2	0	8	10
I-9	A1B3C1D1	0	8	9
I-10	A1B3C1D2	0	0	5
I-11	A1B3C2D1	0	0	0
I-12	A1B3C2D2	0	0	0
I-13	A2B1C1D1	14	17	22
I-14	A2B1C1D2	16	25	28
I-15	A2B1C2D1	0	0	0
I-16	A2B1C2D2	30	35	36
I-17	A2B2C1D1	8	12	16
I-18	A2B2C1D2	200	200	200
I-19	A2B2C2D1	0	0	0
I-20	A2B2C2D2	7	11	15
I-21	A2B3C1D1	0	10	15
I-22	A2B3C1D2	18	21	28
I-23	A2B3C2D1	0	0	14
I-24	A2B3C2D2	15	18	27
I-25	A3B1C1D1	0	0	0
I-26	A3B1C1D2	0	0	0
I-27	A3B1C2D1	0	0	0
I-28	A3B1C2D2	0	7	10
I-29	A3B2C1D1	10	24	28
I-30	A3B2C1D2	200	200	200
I-31	A3B2C2D1	12	18	35
I-32	A3B2C2D2	10	8	15

I-33	A3B3C1D1	12	15	25
I-34	A3B3C1D2	0	0	22
I-35	A3B3C2D1	0	10	15
I-36	A3B3C2D2	5	9	10

From table 2 analysis, it can be seen that, except for the serious deviation of a few material dip stripping, most of the adhesion properties can meet the standard. The most part of the lamination is in the bamboo and bamboo and the bamboo -wood interface, which is probably not enough, and the surface roughness of the bamboo curtain has too much effect on the adhesion strength.

Bonding strength: The adhesive strength shall be saw and glued strength test pieces according to 4.15 of GB/t 17657-1999 test methods for physical and chemical properties of man-made boards and facing boards. According to the formula, the adhesive strength of the time was calculated:

$$P = F / (A * B)$$

Where: P - the adhesive strength of the specimen, MPa;

F - maximum damage load, N;

A -- the length of the shear section of the specimen, mm;

B - the width of the cutting section of the specimen, mm.

Table 3. statistics of bonding strength

Serial number	Bamboo and wood combination	Bonding strength(Mpa)						Mean Value	Standard Deviation
I-1	A1B1C1D1	0.82	0.89	0.81	0.88	0.86	0.89	0.86	0.04
I-2	A1B1C1D2	0.94	0.86	1.12	1.1	0.88	0.96	0.98	0.11
I-3	A1B1C2D1	0.75	0.77	0.81	0.76	0.82	0.72	0.77	0.04
I-4	A1B1C2D2	1.38	1.32	1.41	1.42	1.39	1.43	1.39	0.04
I-5	A1B2C1D1	1.55	1.62	1.61	1.51	1.62	1.61	1.59	0.05
I-6	A1B2C1D2	1.02	1.11	1.12	0.98	1.05	1.03	1.05	0.05
I-7	A1B2C2D1	2.55	2.44	2.63	2.61	2.45	2.68	2.56	0.10
I-8	A1B2C2D2	1.55	1.47	1.63	1.53	1.62	1.48	1.55	0.07
I-9	A1B3C1D1	1.26	1.22	1.33	1.22	1.35	1.26	1.27	0.06
I-10	A1B3C1D2	1.25	1.26	1.23	1.31	1.27	1.22	1.26	0.03
I-11	A1B3C2D1	1.76	1.76	1.72	1.81	1.76	1.78	1.77	0.03
I-12	A1B3C2D2	1.12	1.03	1.02	1.22	1.23	1.08	1.12	0.09
I-13	A2B1C1D1	1.65	1.51	1.66	1.63	1.67	1.65	1.63	0.06
I-14	A2B1C1D2	1.95	1.92	1.96	1.98	1.96	1.97	1.96	0.02
I-15	A2B1C2D1	1.12	1.02	1.16	1.05	1.19	1.21	1.13	0.08
I-16	A2B1C2D2	1.52	1.62	1.51	1.53	1.47	1.48	1.52	0.05
I-17	A2B2C1D1	1.45	1.46	1.44	1.53	1.48	1.45	1.47	0.03
I-18	A2B2C1D2	1.02	1.06	1.1	1.12	1.01	0.99	1.05	0.05
I-19	A2B2C2D1	1.71	1.62	1.65	1.67	1.82	1.66	1.69	0.07
I-20	A2B2C2D2	1.75	1.76	1.72	1.81	1.85	1.69	1.76	0.06
I-21	A2B3C1D1	0.63	0.66	0.61	0.69	0.72	0.63	0.66	0.04
I-22	A2B3C1D2	0.61	0.55	0.58	0.59	0.56	0.73	0.60	0.07
I-23	A2B3C2D1	1.36	1.37	1.39	1.34	1.49	1.38	1.39	0.05
I-24	A2B3C2D2	1.42	1.44	1.45	1.36	1.38	1.49	1.42	0.05
I-25	A3B1C1D1	1.18	1.25	1.26	1.13	1.12	1.03	1.16	0.09
I-26	A3B1C1D2	1.44	1.45	1.47	1.42	1.47	1.52	1.46	0.03
I-27	A3B1C2D1	1.17	1.22	1.21	1.13	1.11	1.15	1.17	0.04

I-28	A3B1C2D2	1.47	1.55	1.51	1.51	1.38	1.43	1.48	0.06
I-29	A3B2C1D1	1.42	1.43	1.55	1.73	1.38	1.46	1.50	0.13
I-30	A3B2C1D2	1.61	1.55	1.57	1.71	1.62	1.41	1.58	0.10
I-31	A3B2C2D1	1.61	1.63	1.65	1.59	1.58	1.57	1.61	0.03
I-32	A3B2C2D2	1.63	1.54	1.62	1.65	1.67	1.61	1.62	0.04
I-33	A3B3C1D1	0.81	0.81	0.76	0.82	0.72	0.92	0.81	0.07
I-34	A3B3C1D2	0.52	0.56	0.49	0.66	0.51	0.43	0.53	0.08
I-35	A3B3C2D1	0.88	0.82	0.83	0.85	0.77	0.99	0.86	0.07
I-36	A3B3C2D2	0.56	0.55	0.61	0.59	0.62	0.63	0.59	0.03

From table 3, it can be seen that different combinations of the bamboo-wood type test pieces have a significant impact on the strength of the bond. It is easy to crack phenomenon with veneer adhesion test pieces, and it can solve this problem well. The quality of bamboo has a great influence on the gluing strength of the sandwich board. The adhesive property of glue also plays an important role in the bonding strength of bamboo and wood materials.

Elastic modulus and static bending strength: The test was conducted according to 4.9 requirements of GB/T17657-1999 in the physical and chemical performance test of artificial board and decorative panel.

The calculating formula of elastic modulus:

$$E_b = (13/4 bh^3) * \Delta f / \Delta s$$

Where: E_b - the elastic modulus of the specimen, Mp.

l - distance between two supports, mm.

B - specimen width, mm.

H - specimen thickness, mm.

Δf - Increase in the straight line segment in the loading deformation diagram, N.

Δs - reasonable $f_2 - f_1$ interval specimen deformation, mm

The calculating formula of static music intensity,

$$\sigma_b = 3 * l * P_{max} / 2 bh^2$$

Type: σ_b - specimens of static music intensity, HPa

P_{max} - maximum load when the specimen is damaged, N;

l -- distance between two supports, mm;

B - specimen width, mm.

H - specimen thickness, mm.

Table 4. statistics of Modulus of elasticity.

Serial number	Bamboo and wood combination	Modulus of elasticity				Mean Value	Standard Deviation
I-1	A1B1C1D1	12.9	12.7	12.45	12.7	12.69	0.18
I-2	A1B1C1D2	12.85	12.89	12.45	12.7	12.72	0.20
I-3	A1B1C2D1	12.87	12.95	12.88	12.9	12.91	0.04
I-4	A1B1C2D2	13.05	13.15	13.54	13.2	13.24	0.21
I-5	A1B2C1D1	13.6	13.25	13.87	13.6	13.59	0.25
I-6	A1B2C1D2	13.89	13.72	13.94	13.9	13.85	0.09
I-7	A1B2C2D1	14.93	14.87	14.15	14.5	14.62	0.36
I-8	A1B2C2D2	13.58	14.02	14.12	13.5	13.81	0.31
I-9	A1B3C1D1	13.89	13.89	13.87	13.9	13.89	0.02
I-10	A1B3C1D2	14.45	14.02	13.98	14.2	14.16	0.21

I-11	A1B3C2D1	15.05	15.42	15.21	15.2	15.23	0.15
I-12	A1B3C2D2	15.22	15.12	15.32	15.2	15.22	0.08
I-13	A2B1C1D1	15.33	15.42	15.5	15.4	15.42	0.07
I-14	A2B1C1D2	15.54	15.42	15.5	15.5	15.49	0.05
I-15	A2B1C2D1	15.55	15.42	15.48	15.5	15.49	0.05
I-16	A2B1C2D2	15.52	15.55	15.58	15.6	15.57	0.04
I-17	A2B2C1D1	15.58	15.55	15.52	15.5	15.54	0.04
I-18	A2B2C1D2	15.58	15.6	15.52	15.3	15.51	0.13
I-19	A2B2C2D1	15.58	15.63	15.65	15.5	15.58	0.09
I-20	A2B2C2D2	15.65	15.62	15.71	15.7	15.67	0.05
I-21	A2B3C1D1	15.6	15.8	15.8	15	15.55	0.38
I-22	A2B3C1D2	15.5	16.02	15.7	15.7	15.74	0.21
I-23	A2B3C2D1	15.7	16.02	15.8	15.9	15.85	0.13
I-24	A2B3C2D2	15.6	16.02	15.9	15.8	15.83	0.18
I-25	A3B1C1D1	15.7	16.02	16.2	16.9	16.21	0.51
I-26	A3B1C1D2	15.7	16.2	16.1	16.6	16.15	0.36
I-27	A3B1C2D1	15.6	16.2	16.2	15.9	15.98	0.29
I-28	A3B1C2D2	15.7	16.3	16.4	16.2	16.16	0.31
I-29	A3B2C1D1	15.8	16.4	16.32	16.2	16.18	0.27
I-30	A3B2C1D2	15.7	16.5	16.33	16.3	16.20	0.35
I-31	A3B2C2D1	15.82	16.42	16.43	16.2	16.23	0.29
I-32	A3B2C2D2	15.8	16.51	16.61	16.4	16.33	0.36
I-33	A3B3C1D1	16.15	16.51	16.61	16.3	16.39	0.21
I-34	A3B3C1D2	16.15	16.72	16.7	16.5	16.52	0.26
I-35	A3B3C2D1	16.25	16.82	16.8	16.2	16.52	0.34
I-36	A3B3C2D2	14.05	17.21	17.45	17.2	16.49	1.63

As can be seen from table 4, the elastic modulus of bamboo and wood composite materials is all set in the standard. Bamboo timber, veneer, adhesives, irradiation treatment have significant effect on elastic modulus, bamboo veneer, bamboo one adhesive, radiation processing, bamboo veneer veneer a adhesives adhesives and factor combination has also have a significant effect on the modulus of elasticity.

Table 5. statistics of MOE.

Serial number	Bamboo and wood combination	Static bending strength				Mean Value	Standard Deviation
I-1	A1B1C1D1	97.77	97.84	99.35	94.86	97.46	1.88
I-2	A1B1C1D2	100.22	100.67	102.34	99.78	100.75	1.12
I-3	A1B1C2D1	90.45	90.65	91.84	89.67	90.65	0.90
I-4	A1B1C2D2	120.75	122.16	120.11	120.7	120.93	0.87
I-5	A1B2C1D1	135.34	136.22	136.17	135.24	135.74	0.52
I-6	A1B2C1D2	103.75	105.88	102.27	102.57	103.62	1.64
I-7	A1B2C2D1	151.25	150.45	151.58	151.63	151.23	0.55
I-8	A1B2C2D2	132.76	132.55	131.81	132.95	132.52	0.50
I-9	A1B3C1D1	118.42	118.52	120.26	118.17	118.84	0.96
I-10	A1B3C1D2	117.12	116.32	119.54	117.34	117.58	1.38
I-11	A1B3C2D1	146.45	146.44	147.15	147.07	146.78	0.39
I-12	A1B3C2D2	108.16	108.35	108.78	108.46	108.44	0.26
I-13	A2B1C1D1	141.17	140.65	141.81	141.54	141.29	0.50

I-14	A2B1C1D2	147.22	147.56	148.24	147.11	147.53	0.51
I-15	A2B1C2D1	110.56	110.51	110.64	110.27	110.50	0.16
I-16	A2B1C2D2	130.42	130.75	129.83	129.54	130.14	0.55
I-17	A2B2C1D1	125.67	126.22	125.43	126.12	125.86	0.37
I-18	A2B2C1D2	105.48	105.21	105.12	105.24	105.26	0.15
I-19	A2B2C2D1	143.69	143.59	143.10	143.80	143.55	0.31
I-20	A2B2C2D2	145.42	145.12	146.23	145.88	145.66	0.49
I-21	A2B3C1D1	89.15	91.75	89.11	88.49	89.63	1.45
I-22	A2B3C1D2	87.55	87.22	89.48	86.20	87.61	1.37
I-23	A2B3C2D1	119.48	119.45	119.57	120.96	119.87	0.73
I-24	A2B3C2D2	122.12	123.23	121.16	121.26	121.94	0.96
I-25	A3B1C1D1	112.15	112.25	112.64	112.43	112.37	0.22
I-26	A3B1C1D2	126.82	126.51	125.42	126.85	126.40	0.67
I-27	A3B1C2D1	114.32	116.55	116.21	114.35	115.36	1.19
I-28	A3B1C2D2	128.86	127.22	128.58	128.47	128.28	0.73
I-29	A3B2C1D1	123.55	124.26	122.45	122.51	123.19	0.87
I-30	A3B2C1D2	139.42	139.76	141.34	139.30	139.96	0.94
I-31	A3B2C2D1	138.11	138.66	139.53	138.27	138.64	0.64
I-32	A3B2C2D2	142.44	142.12	143.47	142.63	142.67	0.58
I-33	A3B3C1D1	93.12	95.14	92.18	92.46	93.23	1.34
I-34	A3B3C1D2	85.61	86.34	83.18	86.57	85.43	1.55
I-35	A3B3C2D1	95.88	92.44	96.68	97.36	95.59	2.19
I-36	A3B3C2D2	86.43	85.88	86.37	87.25	86.48	0.57

As shown in table 5, the static bending strength of bamboo and wood composite sandwich panels is between 85.41-151.24MPa, and the average static curve intensity is 118.94MPa, which is 79.8% higher than the MOR peak specified in the JAS standard. There is a significant influence on the static bending strength of bamboo and wood composite materials by using bamboo raw materials, single board raw materials, adhesive grafting and irradiation treatment, and the combination of different factors has significant influence on the static bending strength.

Under the condition of optimum preparation process, the adhesive effect of bamboo and wood combination method is intact, and the process of bamboo wood material is feasible. The moisture content of bamboo and wood composite material reaches the technical requirement of man-made board process. The factors such as bamboo and wood, pretreatment of materials and adhesives have significant influence on the adhesion strength. Bamboo, veneer, adhesive, irradiation treatment have significant influence on the elastic modulus and static bending strength of bamboo and wood materials.

4. Product Performance and Problems

Bamboo and wood composite floor is a combination of bamboo and wood products. Its panels are made of good bamboo, with wood, wood, wood, camphor and wood. The two or more than two independent of the physical properties of raw material, in the performance of the product on the physical and mechanical anisotropy, structure character of discontinuity, the material characteristics of the difference of physical properties, the modulus of elasticity, static music intensity, and absorbing water thickness expansion rate is not the same. Through sophisticated production technology and the development process, the two materials with real wood plank after compound in woodiness feeling and natural texture, or architectural aesthetics and material design aesthetics has a different effect, at the same time the quality of the materials and the use of consistent results.

Because our country has not been booked solid bamboo flooring standards, in the production of bamboo and wood composite materials to production process conditions and the development process, product quality control is very difficult to grasp, to produce a lot of problems in the production process. Its mainly include bamboo warping, cracking of bamboo, bamboo glue joint rickety table board, board face color difference is too big, strewn at random, unreasonable grain degree of impurities, equipped with uneven density, non-standard products production standard at the same time, lead to imbalance of the hot pressing pressure, machining accuracy is not enough, a lot of waste of raw materials and other problems, serious impact on the level of product and limit the development of bamboo and wood composite materials as well as market development and demand.

5. The Channels to Solve the Problem

According to the theory of composite material mechanics, bamboo and wood composite materials in the production of mainly by sheet elastic modulus, static music intensity, and greatly influenced by the absorbing water thickness expansion rate, plus some process problems and plank wood physical properties, the differences between the type of glue or glue quantity, method of sizing, grain polishing technique, the reason of thermal stress and mechanical power equipment, some problems for bamboo and wood composite materials production process. Based on these problems and experiences, production standards and database are established to avoid problems in the production process.

5.1 Improve Production Technology Parameters and Standard System.

In the process of production, by controlling the hot pressing parameters, the plate of the modulus of elasticity, static music intensity, and absorbing water thickness expansion rate control in the reasonable scope, the contact area between the slab material compression properties of the slab rubber thickness and material between the rules of the board of transmission capacity to mechanical strength and size.

5.2 Glue Type, Sizing and Sizing Method Choice.

Glue is the medium of composite cohesion, the market generally use urea-formaldehyde resin adhesive, composite material as a result of the mole ratio and glue bond strength and formaldehyde release a quantity to different selection should be based on the function demand of the bamboo and wood composite materials; The mechanical properties of the plates are different. When choosing, they should choose the type of glue according to the amount of formaldehyde release. On the choice of sizing, the formaldehyde emission standard should be selected strictly according to the influence of the elastic modulus, the static bending strength and the expansion rate of the suction thickness.

According to the current production technology of bamboo and wood composites, sizing methods mainly include pipeline and mixing pneumatic spray adhesive, for sizing methods directly influence the environmental performance and quality of the products.

5.3 Choose Good Makings, Procedure of Manufacturing Processes and Standards

The physical properties of wood and the expansion rate of the water absorption thickness of the board are different, and the base material selection of wood produces different effects. Due to the structural characteristics of the plate, the plate core selection is different, the strength and mechanical properties are different. So choose good base material, make good building material. Standards process and production process, effectively solve the production of bamboo and wood composite caused by overlap problem brought by the uneven, deal with the thickness of the composite lines, brown spots, impurities and density as well as the thick sanding stage, effectively control and adjust the thickness of the plank of tolerance.

5.4 The Introduction of the Latest Equipment

The current production of wood composite materials processing equipment, low degree of mechanization. Generally appeared in the production of bamboo glue, bamboo glue in the

manufacturing process of bamboo and wood, bamboo, molding, processing machinery can't completely adapt to the requirement of production, the bamboo processing and the intensity of labor is big, the machining accuracy is poor, the production efficiency is low, resulting in wasted a lot of raw materials.

6. Conclusion

My country is rich in bamboo resources, bamboo high hardness, high mechanical strength, but are in a small diameter grade, the low rate, low machining efficiency shortcomings. With the development of materials science, new materials with excellent performance are constantly appearing and widely used in various fields. However, the progress of science and technology and the development of society also put forward higher requirements on the performance of materials, such as reducing weight, increasing strength and reducing cost. So with bamboo plantation wood composite with a certain form, through the reasonable structure design, give full play to the plantation wood material is qualitative light, short growth cycle, bamboo advantage such as high strength, hardness, realize the two kinds of material utilization, overcome the shortcomings.

In addition, the development of bamboo and wood composite materials is very beneficial to promote the processing and utilization of China's artificial rapid growth forest. As long as we insist on the principle of combining production, study and research, continuously improve the composite process and the development process and standard system, to overcome the equipment technology, production technology and the development process, lack of many aspects, such as bamboo raw material, production management, must be able to use the commercialization of the plantation tree species opened up a new field.

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