

FINISHING PROPERTIES OF A PARTICLEBOARD

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Abstract

High level of demand occurred to high quality furniture in Malaysia. The quality of furniture produced is depending on the material and manufacturing process. Finishing quality of the furniture also plays their role in classifying the quality level of a product. This study is conducted to determine the effect of hardener, different particle sizes and finishing systems application on a particleboard from *Gliricidia sepium*. The particleboards been produced with hardener and without hardener and the particle sizes been used in these studies are 1mm and 0.5 mm. Two different finishing system applications were then applied by using acid catalyst (AC) lacquer. Different finishing testing was conducted in determining the finishing properties of the particleboard, which is physical (surface roughness, pencil hardness and tape adhesion) and mechanical (household test using vinegar, detergent and sauce) testing. From this study, it was found that there is highly significant different on the surface roughness testing when the hardener, different particle sizes and finishing system applications been applied. Pencil hardness testing showed the same pattern but there is no significant different when using different particle sizes. For tape adhesion testing, all variables showed no significant different except for different finishing system application. Meanwhile, for household test, only different particle sizes showed that there is significant different on the finishing properties of particleboard. Indirectly, this study also wants to introduce *Gliricidia sepium*, as an alternative material for particleboard.

Keywords: Particleboard, finishing properties, *Gliricidia sepium*, finishing testing, acid catalyst

INTRODUCTION

Recently, timber furniture industry is one of the most developed industries in Malaysia. High level of demand occurred to high quality furniture. Basically, the quality of furniture produced is depending on the material and design used. Moreover, the finishing's quality of the furniture also plays their role in classifying the quality level of a product.

Wood finishing can be defined as a process of embellishing or protecting the surface of a wooden material. It's also one of the most difficult woodworking tasks for beginners in timber's furniture production. The advantages of wood finishing are such as to improve the furniture's appearance, to preserve the appearance, protection of the wood and appearance and also to provide an easy to clean surface. Top coating is one type of finishing's process. It can be transparent or semi-transparent. It may give the furniture's surface a protection and appearance desired. This step is often generically referred as varnishing. The choice of topcoat material should be determined by some factors. The factor is compatibility with products previously applied, final appearance desired, stability of the final appearance, longevity of the top coating, types of exposure to light and wear, frequency of cleaning and reparability.

Besides using solid wood as main material, a wood composite's product known as particleboard also widely used in furniture's construction. The advantages of particleboard are it is cheaper, denser and more uniform than solid wood and plywood and is substituted for them when appearance and strength are less important than cost. *Gliricidia sepium* is one of

the species that suitable for particleboard making. It has long been cultivated and is naturalized in tropical Mexico, Central America and northern South America.

MATERIAL AND METHODOLOGY

The raw materials has been used to produce the particleboard are *Gliricidia sepium*, urea formaldehyde (UF) adhesive, hardener and acid catalyst (AC) lacquer.

Particleboard making process

Particleboard making process begin from raw material particleboard preparation; tree *sepium Gliricidia* litter will be used in this study. After preparation is complete, the next process is debarking. Debarking is a process of removing the bark. After the bark is removing, it will then be separated through the process then the process of chipping and flaking. To obtain the desired particle size, it must pass through the screening process. After make some calculations on the total particle, resin, Hardener and water must be added, that can do the next step of blending. Upon completion of the blending process, mat forming process is done so that a uniform particle arrangement during the next process is to do pre-press and hot press. After that, it will be a conditioning process to lower the temperature of the particleboard. Once the board is cold then it can pass through the trimming and cutting process.

Finishing process applications on particleboard

Finishing application process begins by determining the moisture content in particleboard. After that, it continues with surface preparation process. Make sure the surface of the particle that would like to put finishing clean and no dirt. After that, apply finishing systems on the board surface. In this study two types of finishing application used in the system A (the coating) and system B (two coating) and finally, finishing sample. There are testing was conducted on four testing which are surface roughness, pencil hardness, tape adhesion and household test.

RESULTS AND DISCUSSIONS

From the data has been gathered from 96 sample of particleboard from *Gliricidia Sepium*, can be shown by the table has been given. The tables are including surface roughness test, pencil hardness test, tape adhesion test and household test were carried out accordance to standard D3363-05, D3359-09, and D1308-02

Table 1: Finishing test data for the particleboard from different particle size, hardener and system

SOV	df	SR	Pencil hardness	Tape adhesion	Household test		
					vinegar	detergent	sauce
Hardener	1	13.409**	784.000**	4.000ns	4.000ns	—	—
Size	1	10.139**	4.000ns	4.000ns	16.000*	—	—
System	1	4.512**	64.000**	100.000**	4.000ns	—	—
Hardener* Size	1	.000ns	16.000**	4.000ns	4.000ns	—	—
Hardener* System	1	1.768ns	196.000**	4.000ns	16.000**	—	—
Size*System	1	1.390ns	64.000**	4.000ns	4.000ns	—	—
Hardener* Siza*System	1	.998ns	4.000ns	4.000ns	16.000* *	—	—

Note: $p < 0.01 = **$ Highly significant, $p < 0.05 = *$ Significant, $p > 0.05 = ns$ (Not significant)

Table 1 shows, the impact of testing on Hardener finishing mostly highly significant. Only tape test adhesion and household not just significant. For the size of the reading was more not significant result, only the surface roughness has given a reading test highly significant. While reading for the finishing system, the more highly significant than not reading significant. Only for household test using vinegar with a reading not significant.

Effect of particle sizes on finishing testing

Based on figure 1, the reading of the mean value for surface roughness testing showed the highest compared with the mean reading for other testing. In overall, 0.5mm Particle size showed better reading than particle size of 1mm

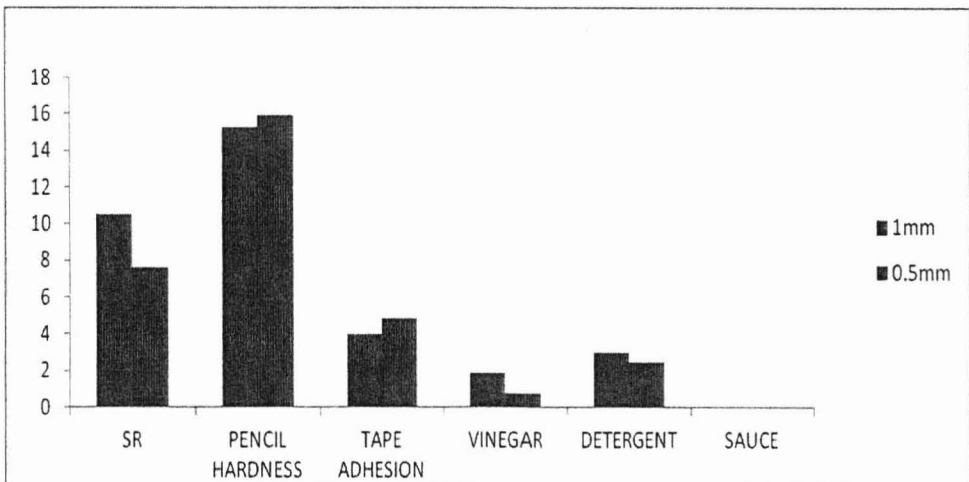


Figure 1: Finishing testing data on different particle size

Effect of Hardener on finishing testing

Graph 2 shows the mean reading for the surface roughness test and tape adhesion test is higher than the mean reading of the other test. In overall, particleboard with hardener has better result testing compared to particleboard without hardener.

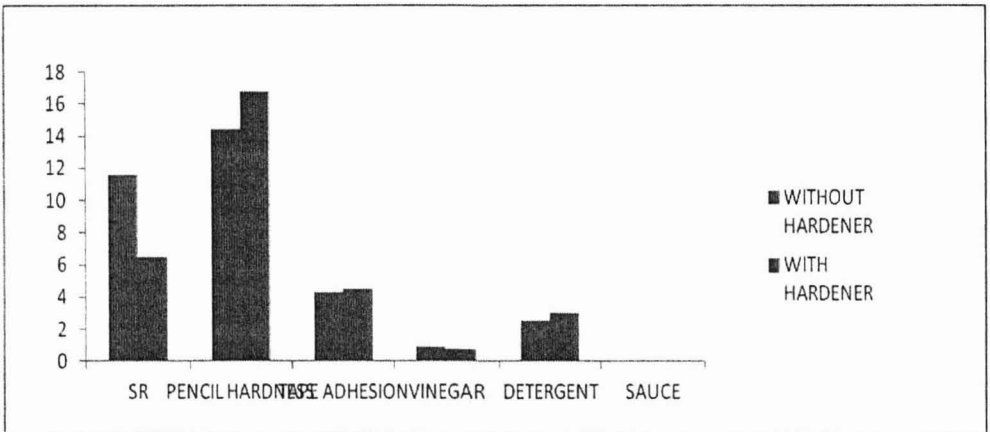


Figure 2: Graph of finishing testing data on particleboard with hardener and particleboard without hardener

Effect of finishing system on finishing testing

Based on graph 3, the mean reading for testing surface roughness are higher than the reading of other testing. Overall, finishing system type B is better than finishing system type A. This is because; with two coating finishes can make the surface of particleboard smoother.

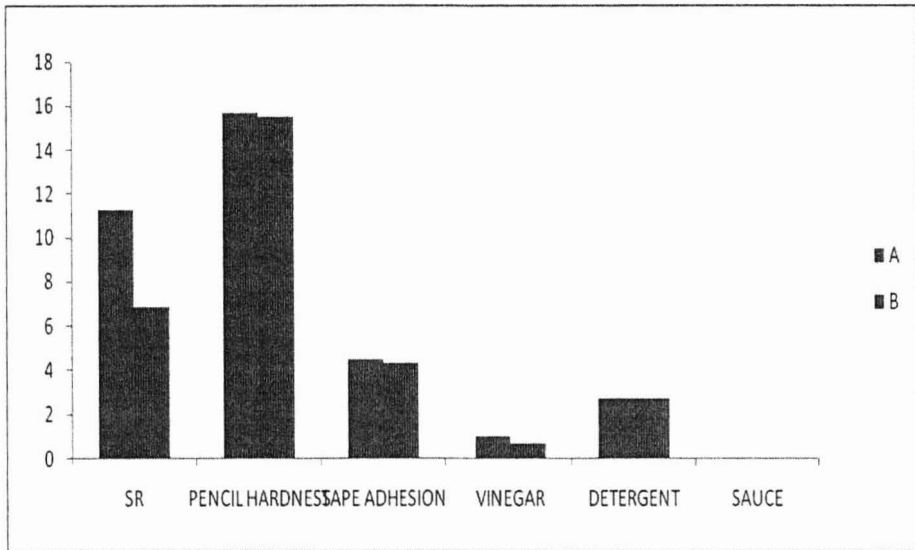


Figure3: Graph of finishing testing test on different system of finishing application

CONCLUSIONS

Finishing is very important in furniture making in order to enhance the appearance and quality of the furniture. The reason for wood finishes is because various products are applied to wood for enhancement of appearance, preservation of the appearance, protection of the wood and appearance and lastly to provide an easy to clean surface.

Based on the study, it can be concluded that, particleboard with particle size 0.5mm has a good result for the finishing test compared to particleboard with particle size 1mm. For the finishing system, system B shows the good performance for the finishing test than system A. While the particleboard with hardener also shows the good performance for the finishing testing compared to particleboard without hardener.

For a recommendation, finishing process needs a skilled person in order to get the better finishing appearance. Then, it also needs a specified place to do the finishing process to make sure the finishing solvent only focuses on the subject (use spray booth) and no dirt or dust flying around that place.

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