

Finishing Properties of Coffee Table by Using Kelempayan (*Neolamarckia cadamba*)

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Abstract

Finishing is the most important part of manufacturing furniture process. The benefits of finishing are to give protection and attractive appearance on product itself. Finishing has two stages that are pre-finish and fully finish. Pre-finish is a preparation of surface product where it is must keep the product surface clean from dust, dirt, or any unwanted particle before applying the coating material. At this stage, sandpaper was also used to give smoothness to the product surface. Fully finish is a process of applying coating on the product. In this study, two types of system applying coating are used to compare the effect of finishing properties of a coffee table from Kelempayan. For system A, the process of sanding and sealer was repeated four times. Meanwhile, for system B, the process of sanding and sealer was repeated six times. The coating material use in this study is acid catalyst lacquer. The tests that have done are heat resistance test, household chemical resistant test, tape adhesion test and surface roughness test. Based on the results, its shows that the six layers of sanding sealer process give better results than four layers. But four layers are enough and more recommended because of saving cost and more economical.

Keywords: Finishing, Coffee Table

1. INTRODUCTION

Nowadays, the furniture industries commonly use the natural source of raw material to produce furniture but the industry has lack dependency on commercially species like Nyatoh, Chengal and others mostly. Thus, as an alternative, the research used lesser known species Kelempayan wood which is a kind of fast-growing tree species in making a coffee table.

Based on the demands of the furniture industry, customers want furniture that looks attractive and to remain the way for a long times, but at the same time, it must be sold at a cheaper price. Unfortunately, the price of a coffee table is too far out of reach because maybe the price for finishes used is too expensive or depends on the grade of wood quality.

The objective of finishing properties of a coffee table by using Ac lacquer is to determine the suitable system for finishing in term of save cost but more resistance. Furthermore, the properties of Ac lacquer are relatively cheap, fast drying and have high water resistance, but their usage on commercially producing furniture is quite limited.

Hence, the finishing of a coffee table by using the Ac lacquer it might be reducing cost for the materials used. Moreover, the research has assisted add-on the data for application finishing technique that might be improving a better quality of finish while producing the furniture.

2. METHODOLOGY

2.1 Raw Materials and Preparation

The wood species used in the research is Kelempayan. It was obtained from the UiTM Pahang forest reserve. Then, the log had cut into the sizes which were three feet 40 inches by using chainsaw and brought back to Wood Industry workshop in UiTM, Pahang.

Then, it was cut into rough size before place it in the kiln dry. Wood was dried in kiln drying to reaches specified moisture content. The humidity, temperature and air circulation of kiln dry was controlled in order to changes of moisture content (MC) in wood. The wood has been dried around three weeks to reaches constant reading of 12% of MC. The moisture content of the wood is a main consideration in finishing pressure- treated lumber. Williams, (1993) stated that before the finishing, wood has higher moisture must be allowed to dry less than 20% of MC (Axelsson, 2007).

Then, the sample was cut into required size by using radial arm saw machine. Meanwhile, the require thickness was produced by using the thicknesser machine with the measurement of 200mm×100mm×20mm. The samples had been cut into 40 replicates.

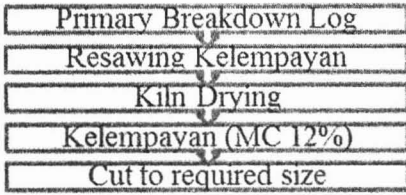


Figure 1: Preparation of raw materials.

2.2 Finishing Process

After all the sample preparation is completely done, the preparation for applied the coating is begun. First, wood surface must be smooth, clean and free from blemishes before applied a surface finish. Then, by using filler, press into the blemish if any with small flexible blade, such as an artist's palette knife. When the filler has set hard, the process of sanding is begun.

The sandpaper grit with grade 120 types of aluminium oxide was used to smooth the entire samples surface. Sanding direction is along the grain to get a smooth and uniform finish. Then, clean all dust by using air spray gun, cloth, or dry brush. After that, the first layer of sealer was applied on the surface by using spray gun. Sealer also can be applied by using a brush, gun, or pad, but that does not always give the best result. The first layer of sealer was applied to the surface to close the cavities. After that, the sample will be dried.

Then, after the sealer layer is completely dried, the process of sanding and sealing was repeated again according to the system used before applied the top coat which is Ac lacquer.

For system A, the process of sanding and sealing was repeated four times. Meanwhile, for system B, the process of sanding and sealer was repeated six times.

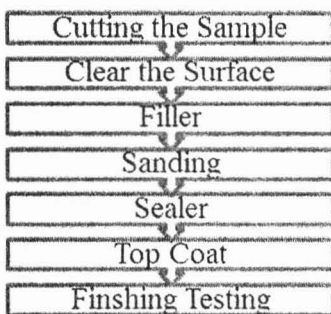


Figure 2: A flowchart of general finishing process

2.3 Experimental Design

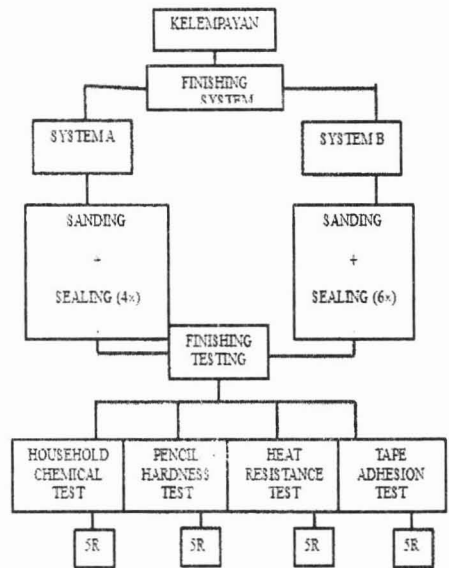
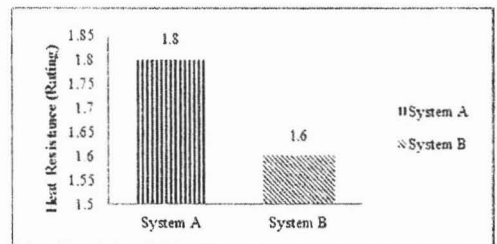


Figure 3: Experimental design of finishing testing samples

3. RESULTS

3.1 Effect of Different Finishing System on the Finishing Properties of a Coffee Table from Kelempayan



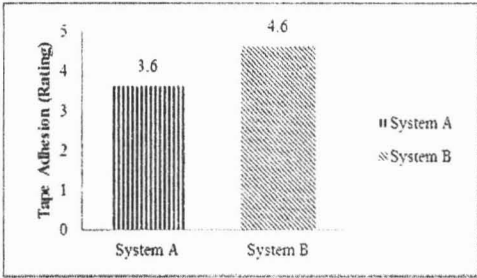
Note: rating (3- Burnt, 2- Stain easily removed, 1- No changes)

Figure 4: Heat Resistance Test

Figure 4 shows that system A has higher mean value more than system B. For this test, the higher value of means obtained the lower effect when the cigarettes put on the surface coating. Its shows that system A which has 4 layers of sanding sealer gives the result stain easily removed and give a very small effect of burnt on the surface coating. Meanwhile, system B which has 6 layers of sanding sealer gives the result stain easily removed and left no changes occur on the coating surface. This is shows that system B which has 6 layers of sanding sealer gives more resistance to heat compare to system A which has 4 layers only.

According to Dresdner (1999), he stated that Ac sealer already has properties of heat resistant [3]. Based on heat

resistance on test samples of 4 layers, only 1 sample left the results of small burnt and the others are stain easily removes. Probably, during the finishing process, maybe the human skill factor such as sanding was quite hard and accidentally remove sealer layer, and this will affect the result of cigarette test.

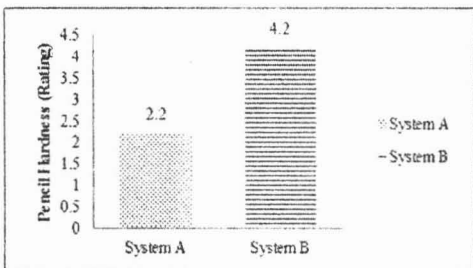


Note: rating (5 - smooth surface, 4 - <5% effect, 3 - 5% to 15% effect, 2 - 15% to 35% effect, 1 - 35% to 65% effect, 0 - >65% effect)

Figure 5: Tape Adhesion Tape

The numbering of rating was 0, 1, 2, 3, 4 and 5 where 5 were being the best and 0 is the poorest. Figure 5 showed there is no significant result. The system B with 6 layers of sanding, sealing give the best result with rating 5 which is almost zero percent of area removed by tape. Meanwhile, for system A the area affected was less than 5% of the lattice when pull off the tape. This is because system A just applied 4 layers of sanding, sealing and give the rating 4 which is (small flakes of the coating were detached at intersections; less than 5% of the area was affected).

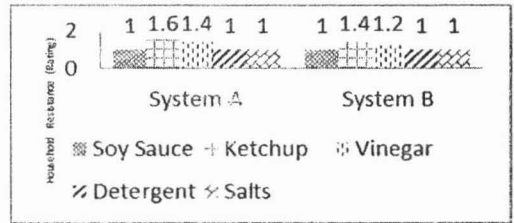
According to Dresdner (1999), stated that the more layer of sanding sealer, the thicker of sealer seals the wood and gives the better results of adhesion finish. This is because coating material function as holding the wood surface that will prevent it from tear off. Each layer coating gives different strength of coating to hold on wood surface [4,5]. Therefore, from the results, 4 layers of coating sealer gives the results less than 5% of area removed when the tapes pull off and it is enough to protect and enhance the properties of coffee table.



Note: rating (higher rating, higher performance)

Figure 6: Pencil Hardness Test

From figure 6 shows that the mean value of system A is lower than system B. It was showed that there are highly significant different between both of system in pencil hardness. For system A, it was shows that the ranking of pencil hardness test on the samples was scratched at grading 2H but for system B, the test samples had started to scratch at grading 4H. It means that the surface coating of 6 layers is more durable than 4 layers of sanding sealer. According to Dresdner (1999), stated that the Ac lacquer has an excellent chemical that would act as a barrier to prevent scratch and stain. Therefore, system B which has 6 layer of sanding sealer gives more resistance to scratch.



Note: rating (3 - Swelling, 2 - Colour changes, 1 - No changes)

Figure 7: Household Resistance Test

Figure 7 shows the means results of household test which using 5 different types of household solution such as soy sauce, ketchup, vinegar, detergent and salts. It shows that the soy sauce, salt and detergent solution in both systems has lower means result which it is from neutral and alkaline grouping. It is do not give any effect on surface coating because of the solution do not contain any chemical substance that will react with coating material. Meanwhile, for vinegar which is from acid grouping give discolouration effect for system A. This is because an acid property is corrosive, that can reacts and change colour of coating. While ketchup only gives very small stain left on the surface coating of system A because it is from acid grouping and probably contain weak chemical that can change colour of coating. Probably, the human skill factor during the process of sealing by using spray, which is not applying consistently, gives the effect on result surface coating. According to Soudki (2011), he state that penetrating sealers must be applied at the optimum rate to ensure good penetration into a prepared substrate so that they can considerably reduce the ingress of harmful chemicals.

Therefore system B which is has 6 layers of sanding sealer gives the better result in household chemical test. This is because, the sealers are typically classified as either penetrants or surface sealers that do not change the appearance of wood surface at any significant degree (Soudki, 2011).

4. CONCLUSIONS AND RECOMMENDATIONS

Overall, from the test results obtained shows that 6 layer of sanding sealing gives the better results compared to 4 layers only. This is because 6 layer of sanding sealing gives thicker of layer coating that would enhance the resistance of finishes. Even though, the result of system B shows the 6 layers is better than 4 layers, it does not means that system A which is 4 layers of sanding sealer have lower resistant. In fact, Ac sealer has properties particularly of heat resistant, scratch resistance, water resistance, moisture resistance and others (Flexener, 1999). Therefore, 4 layers of sanding sealer are enough to protect a coffee table made from Kelempayan.

In addition, coffee table is indoor furniture and do not exposed too much on weather, oxidation, and sun's ultraviolet rays that will totally change wood's appearance. Meanwhile, 6 layers of sanding sealer are more suitable to apply on outdoor furniture such as garden chair, and garden table which can stand on open area and weather. As a conclusion, 4 layers are used to apply on coffee table because it is more economical in long term. Furthermore, it will reduce cost for purchasing strong finishing types like Poly urethane lacquer. Even though, the six layers of coating sealer give the excellent result, but it can be more expensive in term of cost because it might be need more sanding sealer used for the finishing process.

For the next study, it is recommended that to add some variable such as an application of different grit sandpaper (sanding process) during finishing process, rather than using different finishing system only. It may give more accurate result and gives better finishing properties and more quality of product appearance.

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