

WOOD FINISHING: FINISHES AND TECHNIQUES

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INTRODUCTION

Wood finishing refers to the process of refining, protecting or covering a wooden surface. Wooden surface, or also called as substrate, is normally coated with finishes such as paints, lacquers, drying oils, varnishes or stains. The process starts with surface preparation, that is covering the wood defects using wood filler and sanding works. Surface coating helps to protect the wood substrate from dirt, moisture, fungal attack, weather and scratches (Flexner 1996). In wood furniture manufacturing, surface coating is the final process where it is called “finishing”, while the coating material used is called “finish”. Finishing is regarded as one of the most important phases in furniture processing that will give value to the final product. Wood finishes are chosen based on factors such as types of wood, preparation time, cost, protection against weathering and the product’s final appearance. Essentially, another factor that need to be considered is the final role of the furniture, whether it is for indoor or outdoor usage. Therefore, the objective of this paper is to briefly discuss the common finishes and techniques used in furniture or wood finishing works.

WOOD FINISHES

Good level of protection and appearance of the final products can be achieved by using wood finishes. Currently there are varieties of wood finishes available on the market with affordable prices to choose from. There are few examples of wood finishes as listed in Table 1.

Table 1 Several types of commonly used wood finishes

Finish type	Notes
1. Stains	- Function as colour change to the wood - Wood grain can be either diminish or intensify
a) Dye stains	• Dyes are usually soluble salts • Particle size can be individual molecules • Easily get into spaces • No or lesser binder needed • Example: i. <i>Non-Grain Raising (NGR) stain</i> ▪ Methanol as solvent/carrier ▪ 15–30 min to dry ii. <i>Water stain</i> ▪ Causes the wood grain to raise ▪ Slow drying process
b) Pigment stains	• Pigments are typically small particle ground up coloured dirt • Bigger particle sizes compared to dyes • Difficult to get into spaces • Hydrocarbon-based solvents such as naphthalene and mineral spirit

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Finish type	Notes
2. Lacquers	- Natural or synthetic substances - Form a hard protective coating when dry
a) Polyurethane	• Isocyanates as curing agent • 40–60% solid content with less solvent • Viscosity: 55 sec using Ford Cup No. 4
b) Polyester	• Polymerisation occurs when peroxide is mixed as catalyst • 3-stage reaction • ~96% solid content • Superior chemical and mechanical resistant
c) Water-based acrylic	• Use water as non-toxic solvent • 20–30 min to touch dry
d) Ultra-violet (UV)	• A polyester lacquer without the presence of cobalt or peroxide as catalyst • UV light is used for curing • Can be cured in 30 sec
e) Nitrocellulose	• Thermoplastic coating • Solid content of between 12–35% • ~15 min to touch dry
f) Acid-catalysed	• Resin needs acid catalyst for curing • Scratch, chemical, water and heat resistant
g) Pre-catalysed	• Combination of melamine resin, alkyd and urea-formaldehyde resins • Drying time between 15–30 min
3. Washcoat	- To seal wood surface before staining - Prevent blotching - Typically made with shellac or vinyl sealer
4. Toners	- To alter the wood colour - Can make wood look brighter without bleaching - Washcoat layer may be sprayed to protect the toner

Different types of finishes give different characteristics to the final products. Nitrocellulose lacquers, acid catalyst and polyurethane are among the common types of finishes used in the furniture industry. Nitrocellulose lacquer is popular among carpenters and furniture makers due to its ability to dry off in short time and affordable in price. However, it has lower resistance to chemicals, water and moisture as compared to polyurethane and acid catalyst lacquers. The curing time for polyurethane and acid catalyst lacquers are normally longer than that of nitrocellulose lacquers.

WOOD FINISHING TECHNIQUES

Wood filler

Common wood fillers available in the market are typically readymade types and can be used directly on wood. It can be diluted with water or thinner if the wood cracks or gaps are fine and deep. Wood filler components consist of binders, solvents, wood dust and sometimes pigments. Prior to using wood filler, it is best to ensure that the affected area is clean from dirt and dust. The filler is applied into the cracks by using a putty knife (Figure 1). Finger press may be needed to get the filler more in-depth, and it is safe to do so since most wood fillers nowadays are non-toxic. The next step is to let the filler dry and cure for at least 20–30 minutes. Subsequently, the dried filler can be gently and properly sanded using medium grit sandpaper. Figure 2(a), Figure 2(b) and Figure 2(c) show before, during and after wood filler is applied, respectively, on the defected wooden surface.



Figure 1 Putty knife

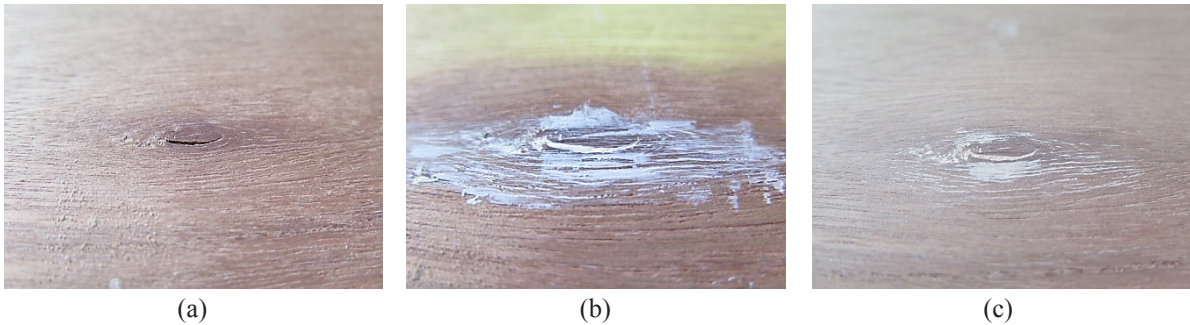


Figure 2 (a) Wood surface defect, (b) Wood filler is applied and left to dry and (c) Result after sanding with sandpaper

Sanding

There are four common reasons for wood sanding. Firstly, is to remove cutting marks or defect on wood caused by milling or handling processes; secondly, is to smoothen the wood; thirdly, is to level the wood surface for side jointed panels; fourthly, is to prepare a good surface for an effective bonding between the substrate and the coating material. The usual way of sanding is to start with coarse grit sandpaper, followed by a fine grit, then with a finer grit (Taylor et al. 1999). The grit, or sometimes called grade of sandpaper, is determined by a number, representing the amount of sand grain in a square inch of paper. The higher the number, the smoother the sandpaper as shown in Table 2. For natural wood, it is better to start sanding with grit P60 and progressively with P80, P100, P120, and P150/P180. Grit P220 is more advisable to be used when working with plywood or veneer. Sanding for finishing should be done along the wood grain and not against it. Figure 3 shows several examples of different grit sandpapers.

Table 2 Sandpaper grits

Grit	Fineness level	Uses
P30-P60	Coarse	Sanding for rough wood surface for rapid removal of material
P80-P120	Medium	Give a smoother surface as preparation for finishing
P150-P180	Fine	Use during the final stage of sanding work before finish is applied.
P220-P240	Very fine	Scuffing between finish coats
P320-P600	Super fine	For wood polishing

Source: (Mell, 2010)

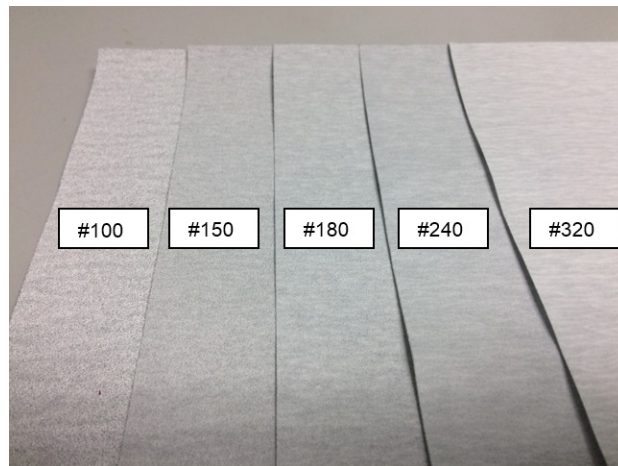


Figure 3 Different grits of sandpapers

Sanding can be done manually either by hand or with the help of machines such as wide belt sander, vibrator or random-orbital sander. When hand-sanding a flat surface, a wooden or sanding block is used to hold the sandpaper rather than holding it directly with a hand as shown in Figure 4(a). This is to prevent an undulant wooden surface at the end of the sanding process.

Electric sanding machines like in Figure 4(b) are power tools that make sanding easier and faster. However, extra precaution must be taken not to burn or over sanding the surface. When sanding into corners, a detail sander may be helpful.

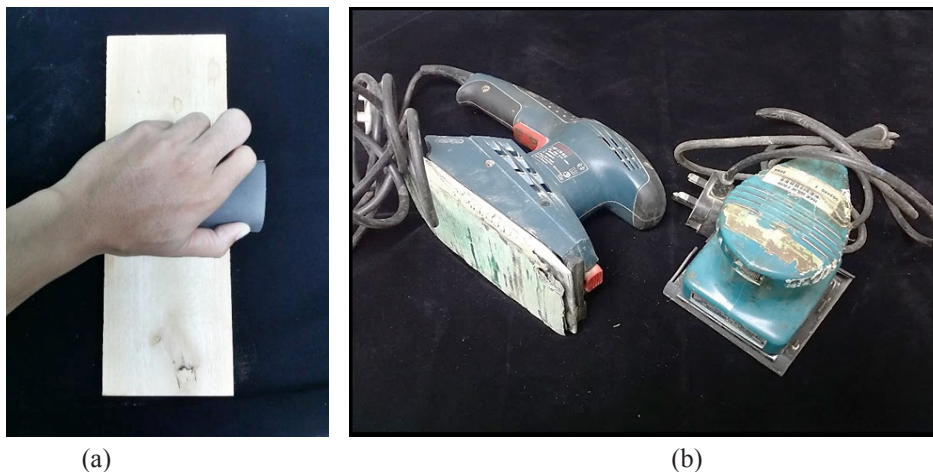


Figure 4 (a) Hand-sanding and (b) Power tool sanders

Brushing and paint roller

Brushing is a traditional technique to apply paint or other wood finishes. It is the easiest way and suitable for small scale finishing works such as for antique or small size furniture. This method requires patience because it is time consuming. For a good result, it is advisable to use a good quality brush and high quality finish. Oil based finishes would not work well with latex brushes. Similarly, water based finishes will not work well with oil brushes.

The use of roller to apply finishes is easier, fast and economical. Paint roller can cover much larger flat surface area efficiently as compared to brushes. Its simple design consists of a roller cover and a roller frame. Foam and fabric type rollers are commonly found in the market. The roller frame can be reused or replaced depending on the need. Paint is transferred to the roller by rolling it in a flat paint container and then rolled onto the surface to be painted with medium and uniform pressure. However, paint roller is only suitable for flat surface. Figure 5 shows common brushes and paint roller used for wood finishing.



Figure 5 Brushing, brushes and paint roller

Dipping

Dipping technique is best suited for finishing product with complex parts and designs. Dipping is quicker and will evenly cover every corner of the item. Waterborne finishes like stain and primer can be applied using this technique. The item is carefully dipped until all parts are immersed and then taken out and let to drip four to five seconds before hanging prior to drying process.

Distressing

Distressing is a process to add the effects of age or beautifully worn look to furniture that brings a rustic feel to a space (Figure 6). This method can help transform pristine pieces to look like a treasured heirloom rather than a cheap reproduction. Another advantage is to hide physical defects such as dent and scratches. The well-worn look can be achieved by using variety grits of sandpapers or a planer by mixing up the strikes, pressure and strokes. In order to give a more realistic look, some parts of the finish can be removed or trimmed using utility knife or chisel. Grinding the furniture surface in a random pattern with gravel can bring distinct marks. Blunt objects like hammer, wood stick, screwdriver or similar tool may be used for gouging. Further worn-look or antique impression can be done with paint or stain. Distressing has no fixed rules. It solely relies on one's creativity.



Figure 6 Furniture distressing in progress

Spray finishing

Spray finishing is a widely used technique in the furniture industry. Although it adds up to the cost due to maintenance and spare parts, spray finishing has many advantages. This technique is able to give smooth and uniform layer of finish on the final product. It is way quicker than brushing and can save time, finishes and labour.

Spraying may be easier than brushing, however special knowledge is necessary before doing it. Most importantly is knowing the right tools and equipment to protect the wooden surface. Spraying requires some practice before getting a satisfying result. Factors that need to be considered are such as the

distance of the spray gun's nozzle from the substrate, nozzle position, spraying angle, the movement of the spraying tool, shape of the item or surface, right air pressure, correct handling and time interval between layers. The nozzle position can be set accordingly as shown in Figure 7(a) and Figure 7(b). Some spraying tips are shown in Figure 8.

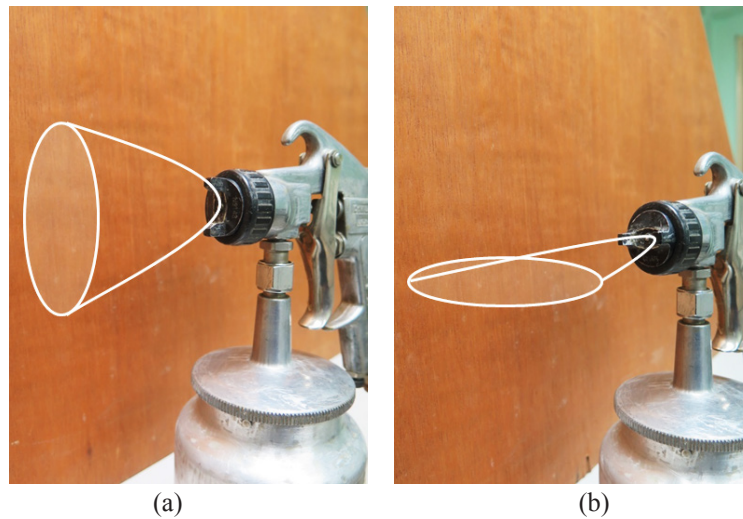


Figure 7 Nozzle position: (a) Left-right spraying and (b) Up-down spraying

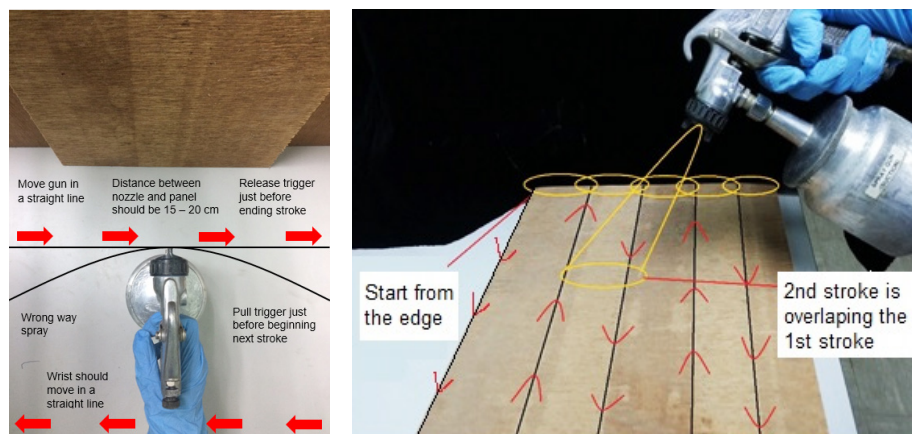


Figure 8 Spraying tips

Spray Gun Nomenclature

When buying and using a spray gun, basic knowledge of its features can be helpful in order to operate it properly. It is therefore imperative to learn the components and its terminology so that the spray gun can be used efficiently. The spray gun nomenclature is shown in Figure 9.

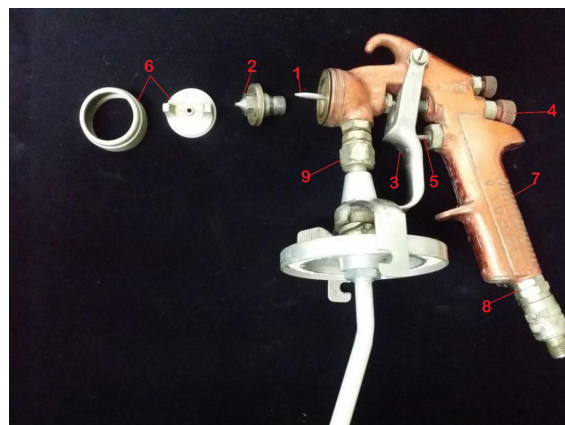


Figure 9 Basic components and parts of a spray gun

	Terminology	Function
1.	Air needle	To streamline air and coating material
2.	Fluid tip	To control the amount of coating material to the nozzle
3.	Trigger	To control the amount of air passing through the nozzle
4.	Fluid adjustment screw	To provide mechanical force to close the valve when trigger is released
5.	Air valve	To open/close valve for air movement
6.	Air cap	To define the spraying pattern
7.	Handle	To grip the spray gun comfortably
8.	Air Inlet	To supply compressed air into the spray gun
9.	Fluid Inlet	To supply coating materials into the spray gun

Two common types of spray guns

Suction feed spray gun and gravity feed spray gun are the two commonly used spray guns to apply finishes, as can be seen in Figure 10. Suction feed spray guns work by bringing the pressurized air over the finish and draw it out through the nozzle. It is suitable for a large scale finishing works. The finish is placed below the trigger in a fairly big container and that helps for a comfortable and stable handling.

Gravity feed spray guns are suitable for smaller batches of finishing works. The material container is located on top of the spray gun that allows the finish to flow down into the nozzle by gravity force. The air only serves to carry the finish to the substrate, therefore lesser air pressure is needed.

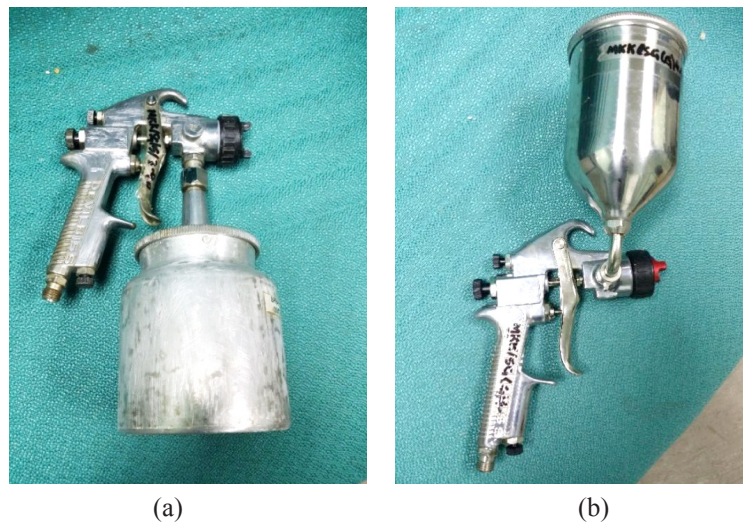


Figure 10 (a) Suction feed spray gun and (b) Gravity feed spray gun

SUMMARY

In general, selection of the right equipment for wood finishing is very important for satisfactory results. The finishing technique will depend on the types of finishes, substrate and desired final look. Other than what has been discussed in this paper, there are some other wood finishing techniques used in wood industry such as the use of UV curing machine, curtain coating, roller coating and smudges. Wood Finishing Lab (WFL) at FRIM, Kepong provides some tests to determine the property and evaluate the quality of finished wood.

REFERENCES

- FLEXNER B (1996). *Understanding wood finishing*: Rodale Press.
- MELL B (2010). Sandpaper roughness measurement using 3d profilometry. *Nanovea Technical Report*.
- TAYLOR JB, CARRANO AL, & LEMASTER RL (1999). Quantification of process parameters in a wood sanding operation. *Forest Products Journal*, 49(5), 41.

Finishing is an important process in wood product manufacturing. A good finishing work can increase the value and price of a product. There are varieties of wood finishes like stains, lacquers, washcoats and toners. Those finishes are available in the form of water or oil based products. In order to have a good bonding between substrate and finish, surface preparation is a crucial aspect that need to be taken care of. Sanding with a right technique using the right sanding tools and sandpaper grits is a key for a perfect wood surface. Once the surface is ready, wood finishes can be applied through various methods like brushing, dipping, distressing, spraying or using roller, depending on types of finishes, substrate and desired final look.

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