Wood Finishing

Questions and Answers (version 4 September 2005)

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Safety Note:

Always read the product label and instructions before using any finishing product, paying careful attention to the section describing safety precautions. Reduce exposure to yourself by wearing safety glasses and gloves and by working in a well ventilated area. Wear a dusk mask when sanding wood for more than brief periods of time. The use of some finishing materials may require a respirator, which should only be used if in good working condition and always with appropriate and fresh organic vapour filtering cartridges.

Practical Notes:

- If the instructions say to stir the finish before using, then stir the finish before using.
- Don't skimp on sanding. You will never get an excellent finish on wood that has not been sanded well.
- Use the best quality materials and tools. You get what you pay for in finishes and in brushes. A cheap brush will give cheap results.
- Be meticulous with cleanliness. Dust and debris in your finish will be noticed immediately.

- Treat all surfaces equally. Don't skimp on the underside, especially with a small hand-held object. I always turn them over to look underneath - most people do.
- Test finishes and stains on extra pieces of wood that are the same as your final work, and that have been prepared in exactly the same way as your final work.

What is Wood Finishing?

Wood Finishing is a process in which the surface of the wood is adjusted, treated or conditioned in order to better serve its intended function and / or appearance. It usually includes some preparation that involves sanding followed by one or more coats of a finish and could include a stain. These finishes and stains can have many different formulations. Ingredients and methods of application vary quite a bit. The most common finishes we will use in this shop are wax, oil, paint, and urethane. These are usually rubbed on with a paper towel or applied with a brush.

What is Wood Stain?

A wood that has been stained is a wood that has had its surface colour changed by the addition of pigment or through a chemical reaction. Unlike paint, which coats the wood with an opaque coloured surface, stain allows the grain of the wood to show through the finish.

Doesn't Stain And Finish Mean The Same Thing?

Not to me. Many people use the terms "stain" and "finish" interchangeably, but I feel this is not a good practice. I use the term "finish" to mean the protective coat applied to the wood, and I use the term "stain" to mean the pigment or chemical that I treat the wood with in order to change the colour. The difference between the two terms (stain and finish) can be confusing because the almost clear coat of a protective finish will change the colour of the wood a little bit, just as wetting the wood with water will, but this is not a stain. Another source of confusion may come from the way that some finishing products combine a protective coating with a colouring agent or pigment. These products make the finishing and staining process easier and simpler but allow far less control than if the stain and the finish are applied separately.

Why Finish Wood?

The main reasons for finishing wood are:

- to protect the wood from marking, staining, abrasion, and decay
- to enhance or change the appearance of the wood, and
- to make the wood surface easier to clean.

Do I Have To Finish Wood That Will Be Used Outside?

No. A protective finish is not usually required to prevent decay if the wood is kept dry, such as being kept up off the ground in well ventilated conditions outside. Wood that is left outside in dry conditions will undergo **weathering** which usually involves changing colour to dark gray (like old tree bark) and the surface will crack and split. Weathering does not usually affect strength. Rot or decay occurs when the wood gets wet and stays wet. A protective finish may help prevent the wood from getting wet, but only for so long. Such a protective finish must be constantly maintained if it is to keep a water seal on the wood. If the seal is not maintained then when the

water does leak under the surface, the protective coating acts to keep the moisture in the wood, which actually promotes decay. For exterior wood work, consider using a wood that is naturally rot resistant, such as cedar.

Why Sand Wood Before Finishing?

If a smooth surface and clear visibility of the wood grain is desired, then a thorough and fine sanding of the work is required before finishing. (Sanding is usually not necessary or appropriate in whittling or carving where the surface is created carefully with very sharp tools.)

How do I Sand Wood?

- Begin with coarse sand paper and work through various grades in small and even increments until you reach the finest paper. I usually start with either 80 or 100 grit and then use 150 grit and end with 220 grit.
- The grit number of sandpaper refers to the thread count of the screen the abrasive particles are sifted through. Eighty grit paper uses abrasive particles that are sifted through a screen 80 threads by 80 threads.
- To sand flat surfaces I usually wrap a quarter sheet of sandpaper around a cork block for hand sanding. A quarter sheet of sandpaper measures about 4" x 5" and a cork block measures around 5/8" x 2 1/2" x 3 3/4". The cork block holds the paper flat but has some flexibility. Use a block of soft wood (like pine) if you don't have a cork block. (In the shop we have some wood blocks that have a thin layer of cork on one face.)
- To sand irregular shapes I usually fold a quarter sheet of sandpaper into thirds and hold that in my hand to sand. The fold into thirds helps to keep the paper from shifting in your hand. Unfold the paper and refold it occasionally in order to use up the whole sheet.
- Applying water or water based finishes to finely sanded wood will leave a raised grain when it dries. This will appear fuzzy. Some people like to get rid of this fuzz before applying a stain or finish by **raising the grain** with a water treatment first and then re-sanding very lightly with fine sandpaper to cut the raised grain. This involves wiping the wood with a well rung-out wet cloth and then letting the wood surface dry. Then lightly sand.

What Is The Difference Between Wax, Oil, Paint, And Urethane?

The differences between these finishes can be described in many ways including: the chemical makeup, the method of application and the qualities of finish provided.

- **Wax** is a fast and easy finish to apply but is least durable and provides the least protection. It can be used on its own but is also often used to enhance the surface of other finishes. The idea of waxing the furniture before the company arrives is something many of us have heard before. The effect of wax is significant but not long lasting. Application is usually by cloth. Most waxes are clear (or nearly clear) and will not greatly affect the colour of your finished work.
- **Oil** is a penetrating form of finish that builds in the surface of the wood. It is an easy finish to apply but it takes several days to build up sufficient coats to provide a decent finish. The finish is moderately durable and very lustrous - never glossy, and may require a rejuvenating coat of oil every year or so to maintain the sheen. Application is usually by cloth or brush and

includes some sanding and wiping at several stages. Two advantages of an oil finish are that your method of application need not be all that neat, and a dusty environment will have no negative effect on the final finish. Oils have a yellow tint which will affect the final colour of your work.

- **Paint** is a finish that has a heavier body than oil, such that it hardens as a coat on top of the wood. It provides a durable protective barrier between you and the wood, which usually also carries a colour. Neatness counts in painted work, whether the method of application is by brush, roller or spray. The wet surface of the finish must be applied evenly and must remain undisturbed until dry. A dusty environment is very problematic when painting.
- **Urethane** (or varnish) is very much like transparent paint, although the oil based urethanes do have a yellow tint that will affect the final colour of your work. The water based urethanes do not have any tint and are quite clear. See paint above for other characteristics.

Are All Finishes Safe To Use On Food Utensils And Children's Toys?

No. Always read the labels of finishes before you use them, especially before using them on wooden ware for food or on children's wooden toys. Some finishes are specially made and sold for this purpose and can be safely used. Not applying any finish can be a very safe alternative to the application of a commercial finish. Some of my students have had good results using food colouring to colour children's toys.

What Is The Best Finish To Use?

It depends.

- If you have little time, then consider using wax.
- If you have some time, and are neat and have a dust free and well ventilated area to work and let the finish dry, then consider using urethane or paint.
- If you have the time, and dust and neatness is a problem, then consider using oil.
- For durability use urethane.
- For a finish that seems like the wood is glowing with richness and colour, use oil (but this kind of lustre will take some time to build).
- For a glossy finish use urethane.
- To avoid noxious vapors, use wax or water based paint or water based urethane.
- To avoid the yellow tint of some finishes, use clear paste wax or water based urethane.

What Is The Easiest Finish To Use?

- Wax, but it is not very durable.
- The next easiest finish is oil, but it takes several days to build a decent surface.
- Urethane and paints are easy if you are careful and neat with a brush, have a place to work that is well ventilated and dust free, and that your work can be left there undisturbed until dry.

What Is The Fastest Finish To Use?

- Wax, but it is not very durable.
- Urethanes and paints can be quite fast because two coats may be all you need and some of these finishes dry in only a few hours (read the label for times). These finishes require that you are careful and neat with a brush, have a place to work that is well ventilated and dust free, and that your work can be left there undisturbed until dry.

What Is The Most Durable Finish To Use?

- Paints and urethanes.
- Oils are moderately durable
- The durability of waxes is poor

What Is The Safest (Most Non-Toxic And Environmentally Friendly) Finish To Use?

- Using no finish is the safest method
- Waxes can be quite safe - read the product label
- Water based finishes can also be quite safe - read the product label

What About Stains?

Stains will change the colour of your wood and are grouped as follows:

- **Stains as pigments used to colour the wood and are applied separately from the protective finish**. Just about anything that will colour the wood can be considered a stain - everything from spilled red wine to commercially purchased stain in a can. The variety is immense.
- **Stains as pigments used to colour the wood that are mixed together with the protective finish**. Many finishes combine these two processes (adding colour and a protective surface) in one step. The mix makes the application easier but there is less control of the final result. Many finishes come with stain already mixed in. Ordinary paint is often used as a combined stain/finish by reducing the consistency and wiping on - then wiping off (several applications may be required). Shoe polish can also be used - this is primarily wax mixed with pigment.
- **Reactive stains which are not pigment based but use chemical reaction to change the colour of the wood**. These are typically applied separately from the protective finish. There are many. A few examples are:

    - **Weathering** - the natural gray colour of wood left outside is actually due to chemical reactions that result from being exposed to the elements.
    - **Ferrous Sulfate** (iron water) can be used on wood to provide a dark gray or black colour. The iron reacts strongly with the tannic acids found in some woods, oak for example, turning the wood black. (Never raise the grain of oak with water if steel wool has been used on your project or you will be cursed with tiny black dots.)
    - **Tannic Acid.** Woods that are low in tannic acid can be treated with a solution of tannic acid (strong tea) prior to the iron treatment.

- **Sodium Hydroxide.** "Easy Off", a commercial oven cleaner, can also be used to change the colour of wood. The active ingredient, sodium hydroxide, serves to accelerate the oxidation process turning woods darker in colour. Easy Off is particularly effective with cherry wood providing the look of aged cherry in minutes. If using Easy Off, always read and follow instructions on the product label because it can be dangerous.

How Do I Apply Wax?

Two methods of using wax are common - using hard stick wax for lathe turning, and paste wax for other applications. As always, your results will depend on how well you have sanded the surface BEFORE applying the 1st coat.

- Stick wax or turning wax is applied by holding the stick against the revolving work to charge the wood with wax. A tightly rolled wad of cloth is then pressed against the revolving and charged surface to melt the wax and polish the surface. Push hard - the wax should wet the wood surface and darken its colour noticeably. Reapply as necessary. (Note: Always exercise extreme caution when using loose cloths near revolving machine parts. Be sure to keep the cloth wrapped into a tight wad or pad.)
- Paste wax is applied with a cloth and then rubbed hard with a dry cloth to remove excess wax and to polish.

How Do I Apply Oil?

There are a few different methods. One method is to follow the directions on the can. Or you might try a variation that I always use (see below). As always, your results will depend on how well you have sanded the surface BEFORE applying the 1st coat.

- 1st coat. Apply a light coat of oil using a cloth, brush or sponge. Wear gloves and work in a well ventilated area. Be careful not to flick the oil onto other surrounding surfaces or you may spoil somebody else's work. Let the 1st coat dry overnight or for at least 10 or 12 hours.
- 2nd coat. Apply a second coat as above. Keep the coats light. While the oil is wet, sand the surface very lightly with 220 sand paper. The idea is to cut the slight roughness of the surface mixing the resulting dust with the oil to create a paste that fills the pores of the wood. The excess paste MUST be wiped off immediately and not be left to dry on the surface. When wiping, the longer and the harder you rub the better. This process is called **porelimeration** and it builds the oil coat a very small amount. Over large surfaces you may want to work one small section at a time. Let the 2nd coat dry overnight or for at least 10 or 12 hours.
- 3rd coat. This is exactly like the 2nd coat and is the minimum number of coats for a decent finish. More than 3 coats are recommended. The more coats the better. Each subsequent coat is applied like the 2nd coat. Leave each coat to dry overnight or for at least 10 or 12 hours (once in the morning and once at night is OK). The surface will not build without waiting sufficient time between coats.

How Do I Apply Oil For A Lathe Turning?

Take advantage of the lathe to do the rubbing and polishing that helps an oil finish look so wonderful. As always, your results will depend on how well you have sanded the surface BEFORE applying the 1st coat.

- To use the lathe for an oil finish you need to retain the capability for mounting your work on the lathe. For a faceplate turning this will mean leaving the plywood backing plate fixed to your work. The metal faceplate can be removed, but leave the plywood on. You will just have to put the metal faceplate on and take it off for each coat. For spindle turning, you must not cut off the ends where the centres fit to your work.
- 1st coat. Apply a light coat of oil using a cloth, brush or sponge. This 1st coat can be done without the lathe. Wear gloves and work in a well ventilated area. Be careful not to flick the oil onto other surrounding surfaces or you may spoil somebody else's work. Let the 1st coat dry overnight or for at least 10 or 12 hours.
- 2nd coat. Set the lathe to low speed before mounting the work. Remove the tool rest. Mount the work on the lathe but do not turn the lathe on. Apply the oil with the lathe off. Apply the oil very lightly because you will soon turn the lathe on and it will spray all over if there is too much oil. At low speed, turn the lathe on. Sand lightly with 220 sand paper (see "porelimeration" above). Use a tightly rolled wad of cloth to wipe off all excess oil and to polish the surface. Turn off lathe. Clean any oil that sprayed on the lathe. Remove work from lathe. Let the 2nd coat dry overnight or for at least 10 or 12 hours.
- 3rd coat. This is exactly like the 2nd coat and is the minimum number of coats for a decent finish. More than 3 coats are recommended. The more coats the better. Each coat is applied like the 2nd coat. Leave each coat to dry overnight or for at least 10 or 12 hours (once in the morning and once at night is OK). The surface will not build without waiting sufficient time between coats.

How Do I Apply Paint Or Urethane?

To me, paint and urethane are exactly the same except that one has pigment (providing an opaque finish, which you can't see through) and the other has no pigment (providing a transparent finish). As always, your results will depend on how well you have sanded the surface BEFORE applying the 1st coat.

- 1st coat. The product you are using may specify the need for a special **primer coat**, which is a fancy name for 1st coat. This is often nothing more than a coat that has been reduced by about 10%. Use the appropriate reducer (water for water based products, mineral spirits for oil based - check the label) and apply. Use a clean good quality brush or roller for paint – avoid the roller for urethanes. Apply light even coats brushing or rolling in a regular pattern. A coat that is too heavy may drip or sag. Water based products dry fast so work quickly and leave an area alone once it is brushed/rolled out. Allow to dry undisturbed in a dust-free, warm, well ventilated area for the length of time indicated on the product label.
- 2nd coat. The product label may recommend a light sanding with fine sandpaper between coats. This will help create a smooth surface. Use product full strength for the 2nd coat, and follow the same procedure as for the 1st coat.

- 3rd coat and all subsequent coats. If more than two coats are desired/required - follow procedure for 2nd coat.

How Do I Apply Stain?

A complete description of all possible methods is beyond the scope of this document. When using a commercial stain, follow the directions on the product label. When using non-conventional methods and experimental recipes it is wise to test all the steps in the procedure on extra pieces of wood. These pieces of wood must be the same wood as your project and must be prepared in exactly the same way - otherwise your test results will not be consistent with the results on your final piece. When working experimentally use common sense and product labels as guides for safety precautions.

What Is Spontaneous Combustion, And Why Do I Need To Know About It?

Spontaneous combustion is when materials such as oil soaked rags burst into flames due to the rapid build up of heat caused when oxidizing materials are bundled into a confined space. Lindseed oil is particularly problematic in this way. Bunched up oily rags should not be placed into the regular garbage can. Instead, do one of the following:

- If rags are holding wet finishing materials, spread the rags out to completely dry before throwing away, or
- Completely wet the rags with water and seal them in an air-tight container such as a glass jar with a tight fitting lid, or
- Dispose of rags in a closed metal container especially designed and designated for the disposal of oily rags.

Does the College have a Spray Booth?

A spray booth at the college is available for spraying solvent-based products. It is located in room 132 in basement level of 100 McCaul Street.

Is it Important to Read Product Labels?

YES! If it says flammable it means it is flammable. And the vapours of flammable solvents are several times heavier than air and will settle. So ensure that there are no sources of ignition in the area where you are applying a finish – including furnace pilot lights.