

METHODS OF WOOD DRYING

By Daniel Yourdon

Over the past year I have been gathering information on various methods of wood drying. This article is an attempt to consolidate that information. Specifically it will cover three methods: Boiling, Freezing, and Microwaving.

BOILING

Drying time reduced an average of 50% over air-drying

A large portion of this information was taken from Comments written by Steven D. Russell. He has done extensive studies of wood boiling methods and results. These methods have been used by hundreds of turners around the world with consistent results.

It is important to remember that the protocol for wood boiling is a formula, as apposed to a recipe. If any part of the formula is changed the result will be different than what is described here.

Steve's comments where originally made to Bowl turners where concerns of warping are greater than it would be for penturners. Cracking is a greater concern to us as penturners, and this is reduced to 1-4% depending on the wood species.

He had boiled more than 4,200 bowls or platters, representing 46 different species of wood, with a success rate of 96%-98.5% or better. Solid pieces of lumber (4"X4"X18") have also been processed in this manner, indicating that this is not just a method for Bowl Turners.

The basics of the boiling protocol are:

1. 1 hour (60 minutes) of active boiling (not simmering) for every 1 inch of wood thickness.
2. If a batch of blanks are boiled together. The time must be calculated for the thickest piece in the batch. A bucket full of ½ inch blanks with just one 1 inch blank in it will still need to be boiled for 1 hour.
3. Boiling longer than the protocol requires will not hurt. It will not help either. Steve has boiled 1-inch thick pieces for 8 hours with no problems. Not boiling long enough is the problem.

4. When adding wood to the boiling water you must wait for the water to return to boiling before you start the timing cycle. It is critical that the boil be an active boil for the required time. Really, really hot doesn't count if the water is not bubbling. On a personal note I would recommend adding the wood before the water boils to avoid burns from splashing hot water.
5. The wood must be fully submerged. Considering that wood floats, this presents a problem. A simple solution is to use a piece of wire mesh, or grate placed over the blanks. Place a weight on this wire that is sufficient to keep the blanks submerged. If the wood floats the procedure will not work.
6. Do not allow green blanks to dry in the open air while they wait to be boiled. Boiling will not repair pre-existing cracks. Keep blanks in plastic bags until you have enough to boil. You may even be rewarded with a bit of spalting if they stay there long enough.
7. When the blanks are removed from the boiling water. They must be protected from rapid drying of the surface fibers. Piling them together and covering them with a tarp or old bath towels will accomplish this. Do not cover them with plastic; the water vapor needs to escape. The idea is to slow down the escaping vapors so that the inside and the outside of the blanks dry equally. This step also removes any excess water remaining from the boiling process so that the blanks can be stored in a traditional manner for complete drying.

Blanks CANNOT be left in the open air! And they cannot be covered with anything that does not allow the water vapor to escape. Do not use tarps or towels with holes in them unless you want to become very proficient at inlay techniques!

8. Allow the blanks to air dry for three days under the fabric cover, with an inverting cycle every day (restack them with the bottom blanks on top and the top blanks on the bottom). At the end of three days, the blanks are removed from underneath the fabric cover and are placed into paper grocery bags. The boiled pieces remain in the paper bags until they reach equilibrium moisture content. Paper bagging is the best environment for drying the post-boiled pieces for most people.

Steve has done some experiments with Tyvek as an alternative to paper bags. Initial results were good but I was unable to find further comments about this. (Tyvek is a specialty film developed by Dupont that only allows moisture vapor transmission in one direction, and is used extensively as a house wrap prior to adding brick or siding.)

Boiling will decrease drying time an average of up to 50%. For example, a non-boiled piece may take 6 months to air dry. A boiled piece of the same timber will typically reach EMC (equilibrium moisture content) in three months or less. EMC is defined as the point at which the moisture content in the timber is at equilibrium with the ambient atmosphere.

In some cases the wood will need to be dried to a level that is below EMC. This can be accomplished by moving the pieces into an area that is heated and/or air-conditioned. This will reduce the moisture content even further. You can find the average moisture content for your area on the Forest Products Laboratory website, at;

<http://www.fpl.fs.fed.us/>

Actual drying time for a particular wood cannot be given as the properties of wood vary from species to species. On average 1" thick pieces dry in two to three months.

A different source claimed that he finished turned bowls within one day to one week of boiling the wood. No mention of success or failure was mentioned with this time frame. For Pen blanks I would not recommend it due to the need for extremely dry wood.

Unwanted guests in the wood, i.e. worms, bugs and other critters with a face only a mother could love, are usually taken care of by boiling.

COLOR LOSS IN BOILED PIECES

There is some leaching of the surface color (about 1/16" of an inch), but below that the color is normal.

WARNING! Use extreme care when removing blanks from the boiling water! Reports of severe burns have been made due to splashing and even exploding water when lifting the lid to the boiling container. If the wire mesh holding the blanks down fails, the wood will surface in a dramatic fashion.

MICROWAVING

Drying time reported is overnight. My experience is more like one month, but I tend to play it safe.

First let me recommend that you make sure that there is a comfortable location in your shop before you attempt this method. You may need it after you are kicked out of the house for blowing up, setting fire to, or stinking up the microwave so that edible items can no longer be cooked in it.

Microwave drying has several disadvantages:

1. Blanks can catch on fire if allowed to heat for too long. This can happen in the center of the wood where it is not obvious.
2. The smell can get pretty noxious.
3. I have had blanks split in half, with a fair amount of violence.
4. The fast drying is accompanied with a high risk that the wood may crack.

To its advantage, microwave drying is a quick way to dry a piece of wood that just can't wait for some of the better methods.

Accepting that this method is an extended process goes a long way to aiding in its success. Don't try to dry a blank in just one or two cycles. Time must be allowed for the moisture to migrate from the core of the blank and this requires several cycles.

The blank or blanks are placed on a paper plate in the microwave oven. Heat the blanks on LOW power for 20 to 30 seconds. Some recommendations are as low as 15 seconds max, but no mention of using low power was made with them. Do not heat blanks on full power, as I have found that they will crack while still cool to the touch on the outer surface. The more blanks you heat at one time the more time you need to heat them. This is a determination you will need to learn to make by trial and error. I have placed as many as 25 blanks in my microwave at one time and heated them for up to 5 minutes. But this was pushing it, and some of the blanks came out darkened at the corners.

Remove blanks from microwave and place them in a paper bag to cool. I have seen everything from 2 minutes and up for the cooling time. I allow my blanks to cool to room temperature. I usually place them

outside, both to keep the odor down, and I found that the heat will dissipate faster in the cooler air that we have here at night. Usually 30 minutes will be enough.

Once the blanks are cooled off, weigh them. Accurate weighing is important in this process, so a postal scale or other sensitive measuring device is handy. Note the weight, and then place the blanks back in the microwave. This is considered one cycle.

Repeat these steps until the weight of the blanks do not make a significant change between cycles. The blanks are then considered dry. I usually get my blanks dry in 3 to 5 cycles.

On cool evenings I have used the steaming of the blanks as an indicator of how dry they are. As they dry there is less steam rising from them when I place them outside, but this is just a method I have found works for me.

I have had varied success with this method of drying, without being able to identify any consistent reason for the failures. I recommend that you keep heating times on the conservative side. The time required for an extra cycle or two can mean the difference between having a pen blank to turn or a chunk of wood that wouldn't yield a decent toothpick.

FREEZING

Drying time uncertain, but approximately three months.

I ran across this information while reading about boiling wood. It is not very detailed, but then this is a pretty general process. Drying wood by freezing accomplishes the same thing as boiling in that it ruptures the cells in the wood that are holding the moisture.

The method is to wrap the wood in plastic film (I'm not sure if this is to protect the wood or the other food in the freezer), and then freeze it for 24 hours. The wood is then removed from the freezer, unwrapped, and placed in the refrigerator to dry. A refrigerator is a very dry environment.

I would suspect that the wood could be dried in a more traditional manner such as being placed in a paper bag and stored in the shop. Since the primary purpose for freezing is to rupture the moisture

holding cells of the wood, once these cells are broken the moisture in them should be able to dissipate from the wood faster. Keep in mind that this method recommends that you keep the wood in the refrigerator for the entire drying period (three months). Unless you have a forgiving spouse or a fridge in the shop, this may not be practical.

OTHER METHODS

I have seen information on several other methods of drying wood while learning the methods described above. In case you want to explore them for yourself I have listed some of them below.

- Solar Drying chambers
- Chemical drying with glycol or Pentacryl
- Kiln Drying
- Air Drying (too many variations to even think about)

I wish you all the best of luck in your turning endeavors, and I look forward to seeing the results.