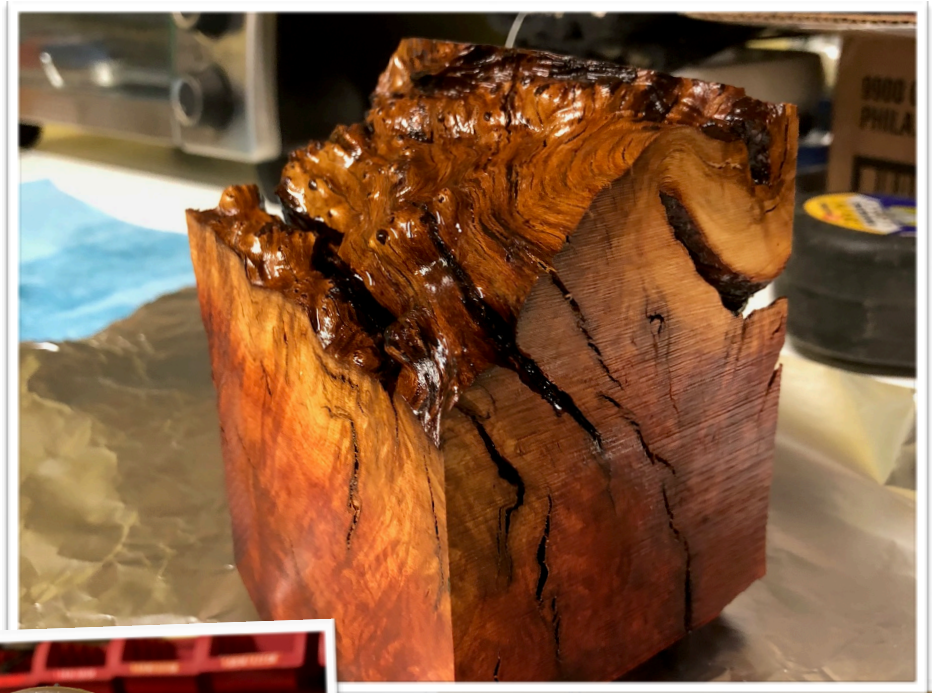
Corridor Wood Turners
Cedar Rapids, IA

Tim Wehr
November 6, 2017

Wood Stabilization

Putting the Brakes on Wood Movement



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One thing you can always count on: "*Wood is going to move*"; usually in a way that you do not want it to. But if you could build a scaffolding around the individual wood fibers, you could literally hold those fibers in place, preventing, or greatly reducing the amount of movement possible; you would be stabilizing the wood's movement.

Stabilization is the process we use to build that scaffolding. It works by replacing the air in the wood fibers with a liquid resin that, once cured, is strong enough the resist the wood's natural tendency to move - thus the term "Stabilization".

Equipment Needed:

- Vacuum Source
- Vacuum Tank
- Vessel for wood and resin
- Weight to keep wood submerged
- Curing Box

Let's take a look at each piece and discuss what is required and what is optionally nice to have.

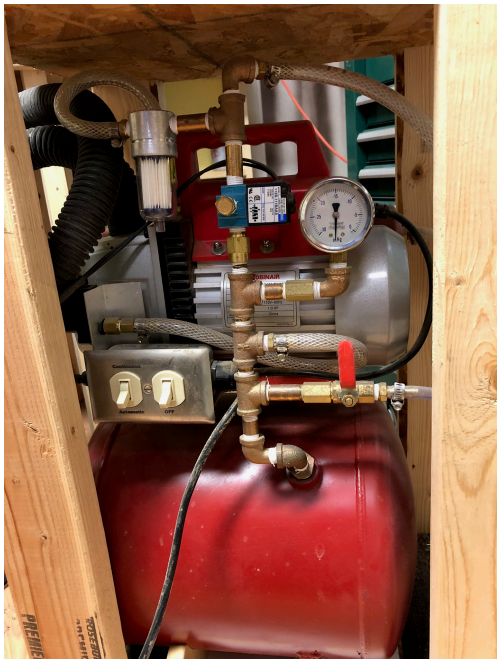
Vacuum Source

Any vacuum source capable of drawing down 27+ inches of Hg (Mercury) is sufficient. The speed with which it gets to that point is not critical, since we are working with a limited amount of air that needs to be extracted; limited by the size of the vacuum tank used. If you already have a vacuum source for a vacuum chuck, chances are it will work.

I use a Robinair (15500) VacuMaster Economy Vacuum Pump, designed for extracting refrigerant from an automotive air conditioning system. It is strong, relatively quiet, and easily pulls a vacuum of 27.5 inches of Hg in my system. The cost of this pump is about $187 - Amazon.

Additionally, I have build a complete vacuum system that can be set for continuous running, switched on and off automatically at a set vacuum level. It also has a reserve vacuum tank to prevent rapid cycling if the system is leak-prone and a small reserve air source to assist in releasing vacuum. The former is handy when when attached to my vacuum hold down on the CNC router or a vacuum chuck on a lathe, and the later is handy when attached to a well sealed system like the stabilizing tank. The

investment in this upgrade was about $400 as I recall, and took some effort to design, gather parts, and assemble.



Vacuum Tank

The vacuum tank is where you place your wood and the stabilizing resin. It is important that it has a see-through lid, as you will see in the demonstration.

Safety Note: Be sure you purchase a tank that is specifically stated as suitable for wood stabilization. Some tanks are not safe for this process, as their lids are see-through but the materials are either not satisfactorily strong enough to sustain the near-complete vacuum for a period of time or the material is known to interact with some resins.

I use the GlassVac 3 Gallon Aluminum Chamber. Cost is $117 at Amazon.

The size of the tank you need is based on the size of the wood you plan to stabilize. Unless you are stabilizing pithy logs or stumps, 3 gallon is probably a reasonable size for most of us.

Vessel for Wood and Resin

Since the wood must be completely submerged in the resin, just placing your wood and resin in the vacuum chamber is probably not ideal. The resin is somewhat expensive and for small pieces, you simply don't need a chamber that large. So it is good to have something smaller in which you can place the wood and resin and then place that vessel inside the chamber.

I use just about any vessel I can find that is adequate. Remember, though, the wood must be (and remain) completely submerged, even after the vacuum is removed and the air into wood has been replaced with resin.

Weight to Keep Wood Submerged

Wood floats (guess maybe you already knew that). If the wood is the hull of your boat, that is a good thing. If it is a pithy blank you want to stabilize for wood turning, not so much. The wood MUST remain submerged. Find something to hold it down.

Cure Box

The liquid resin must be cured. The resin most of us (those doing stabilization) use, requires heat to cure. Fortunately, it does not take a lot of heat - only 190-200 degrees F. Therefore, a simple toaster over ($10 at Good Will or $25-$40 at Walmart) is sufficient. There are three factors that determine whether any specific toaster over is going to work on not.

1) Is it big enough to hold your stabilization project?

2) Can you set and maintain a temp of 190-200 degrees F?

3) Can you set the timer to continuous (unending) as you will to have it run for a couple of hours or so.

Items 1 and 3 are easy enough and pretty obvious just by looking at the box and its controls. Item 2, on the other hand, is a bit more complicated.

The resin that most stabilizers use is Cactus Juice (see consumables section) . It is a heat-curing resin that needs to be maintained at 190 degrees F for a minimum of 1 hour. The problem is holding it at that temperature. Toaster ovens are notoriously bad at either setting an accurate temperature or holding it steady.

The answer for me was to add a digital temperature controller that has two circuits - one for heat and one for cool. I plug the heat (the toaster oven) into the heat circuit. That way, when the temperature probe senses it needs more heat, it switches power on to the oven. When it reaches the target temperature, it switches the oven off. But that may not be good enough. The temperature keeps on raising for a bit after the power is removed. In fact, mine would clime to about 230 degree. And that is not good.

The heat needs to be pretty stable at about 190 degrees. Less than that and it doesn't cure. Over 200 and a lot of the resin will "bleed" out of the wood. So, without a commercial oven, what are you to do?

That is where the cool cycle comes in. I cut a hole in the back of the oven and installed a 4" muffin fan (from a computer). It is tied to the cool cycle on the temperature controller. When the temperature rises to 3 degrees above our target, it kicks on the fan and extracts some of the heat.

There is a bit of lag time between turning the heat or cooling fan on and the time the ambient air inside the oven reacts. In my system, the temperature has a steady swing between 186 degree and 195 degrees. With this, I get pretty consistent results.

The cost of the fan and temperature controller were less than $30 combined. So that brings the cure box total cost to about $70, for my setup.

For my complete setup, I have invested about $800. The fully regulated vacuum source accounts for about $600 of that. And you can certainly do it for less. For me there is a difference between being conservative and skimping on cost. It all comes down to how you value you time and the quality of the results. At this point in my life, I tend to spend $ instead of time. (I will run out of both at some point, but I prefer to work WITH my tools rather that ON them.)

Consumables

- Resin
- Dyes (optional)
- Aluminum Foil (optional but HIGHLY recommended)
- Wood to be stabilized

Resin

Most of the stabilizing community use a product named Cactus Juice. Its only connection to actual cactus is that the developer originally used it to stabilize some cactus products.

It was developed and is sold by Curtis Seebeck at TurnTex.com. Curtis is a great guy, running a small family-operated business. Best of all, he is one of the most helpful and knowledgeable people I know. There is a wealth of information on his site. And if you have a question that has not already been answered, it will undoubtedly get the answer for you.

The resin comes in a 1 gallon jug with a small bottle of activator. Don't worry about measuring, etc.

Just dump the small bottom into the gallon of CJ, and shake it up. You don't have worry about it going bad once the activator is added, either. It is not like a two-part resin that starts curing right away. (Remember the need for 190 degrees for an hour or more?) Once activated, the shelf life is about 6 months. I have gone longer than that without a problem. If, however, you find it isn't working the way it should, just contact Curtis. He will send you some more activator and you are back in business.

You can get it in smaller quantities than a gallon. There are pints, quarts, and half gallons available. I just always buy the gallon size.

Cactus Juice is reusable. Any juice that is left after a run can safely be keep for future use on another run. Two words of caution, though.

1) Don't put the left over juice back in the original container. It may be contaminated or discolored from the previous run. The coloration (if not dyed) does not bother me, as it usually adds a bit of darkening to light colored woods and looks quite nice.

2) Don't put it in a tightly sealed glass jar. Curtis recommends a plastic jug (milk jug?) as it will breath.

Resin Dyes

One of the more fun things to do is to add dye to your Cactus Juice. That will dye the wood throughout the piece. You can be some really nice effects that way. I have used it to dye both blue and red on some of my lighter color burls (Maple, Buckeye, etc). The dyes are the same ones we use for coloring Alumilite resin for casting.

Aluminum Foil

It is best to wrap your pieces of wood individually just before your place them in the curing oven. It will help protect the inside of your oven and will keep the pieces from sticking together. For this, I use the non-stick aluminum foil. Regular foil will end up stuck to the surface of the wood. It can be easily sanded off, but is a bit of a pain to do so.

Wood to Stabilize

Not all wood needs to be (or even can be) stabilized.

Stabilization works by replacing the air in the wood with resin and then curing that resin in place. Therefore, wood that is loose grained or very punky do the best. A tight grained wood has very little air, so there is very little to air to replace. And, tightly grained wood probably will show no real workability improvement anyway, so why bother?

I do mostly burls, as they often want to blow up on you when turning. Stabilizing really helps with this.

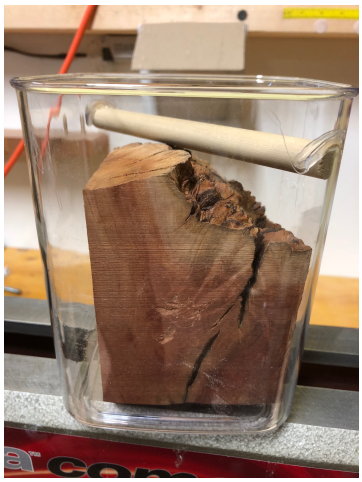
The Process

The following steps are taken directly from TurnTex.com. For each step I am adding some general comments and a few process photos. Curtis has a lot more detail available on his site.

Quick Start Basics for Use

1 Prepare blanks

MOISTURE IS YOUR ENEMY!!! Make sure your moisture content is below 10%.



2 Place blanks in vacuum chamber and weigh down.

I sometimes use a dowel hot-glued in place to hold the piece down.

3 Add Cactus Juice to completely cover blanks
Cover with sufficient juice to keep it covered every after the resin has penetrated the wood. Exposing any part of the wood to air, you let air back into the wood. It must remain submerged until ALL the air voids have been filled with just (set step 5).

4 Apply full vacuum to chamber and keep your vacuum pump running until bubbles stop
This can take anywhere from 15 minutes to 1hour.

5 Release vacuum and soak blanks for at least twice as long as you had them under vacuum.
If it took 15 minutes to stop bubbling, then it takes 30 AFTER it stops bubbling. 1 hour of bubbling = 2 hours AFTER bubbling stops.

6 Remove blanks

7 Wrap in foil

Not required but should be - messy if you don't.

8 Cure at 190-200° F (87-93° C) until Cactus Juice has solidified

Keep max temp UNDER 200 degrees.

9 Remove foil

10 Allow to cool to room temperature

11 Store your excess Juice for the next use (DO NOT STORE IN AN AIR TIGHT GLASS JAR!)

When done, you will likely have some cured Cactus Juice on the outside of the blank you stabilized. I go after it on the belt sander to quickly remove it.

What's Next?

Well, you can turn it and enjoy turning really stable wood with all the character you want from an otherwise punky or unstable piece of wood. OR you can cast it with Alumilite, to fill all voids, bark inclusions, and cracks first. But THAT is a different presentation.