Conestoga Works Vacuum Chambers

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Craftspeople have been using stabilized wood for several years. Knife makers have used it to create more durable and attractive handles. Turners have used it to utilize beautifully patterned spalted or punky woods that would otherwise be too damaged to turn. Additionally, they have used it to add stability to burls that are too crumbly to use in their natural state. More recently ornamental turners have used stabilization to add hardness to more readily available woods so the woods can take the detail necessary for ornamental turning. This has expanded the species of wood available for ornamental turning and reduced the need for some of the expensive and hard to obtain exotic woods that have been used in the past. Jewelry makers and other craftspeople have incorporated stabilized woods into their work because of its increased stability and durability. During the stabilization process dyes can be added to the wood creating attractive colors and patterns which do not exist in nature allowing all of these craftspeople to create items that could not be done without stabilization. Since these dyes penetrate through the wood and do not just sit on the surface there is no danger of losing the effect as the item is being created, and the piece does not require additional coloring time since the dying is done during stabilization.

There is extra cost to stabilized wood, but when a piece of stabilized wood has been completed it can be sanded to a high finish and then polished to a high shine without adding any additional finish. This saves the craftsperson time and expense which offsets at least some of the cost. Additionally should the item lose its level of initial finish with use, it can be restored by rebuffing the piece.

Stabilized wood is commercially available, but some woods and sizes of wood that the artist would like to use are not readily available. Until recently if the artist had a special piece of wood that he would like stabilized this has not been possible unless he knew a commercial stabilization service what accepted custom work. A good percentage of the cost of commercially available stabilized wood is the cost of the time and the overhead of the stabilization service. If the artist can stabilize his own wood, then these problems can be overcome and the artist has more control of the creative process. Initially, the directions for stabilizing wood may seem complicated so it can seem to be a daunting procedure. In truth this is not the case. Now with available equipment designed for the craftsperson, it is a simple procedure. Most of the process can be done unattended so that other work can be done while your wood is stabilizing.

For these reasons and being a turner who does both plain and ornamental woodturning, I have been interested in wood stabilization since the process became available to the home turner several years ago. I began studying the process and the available materials. This led me to realize that there are several requirements for a system that would work well for me. To stabilize wood you need the stabilizing resin, a vacuum source, a vacuum chamber, and with most resins an oven to cure the resin. In this article I want to focus on the vacuum chamber and why, after considering several possibilities, I choose the Conestoga Works vacuum chamber and explain why this chamber meets my requirements.

My first requirement was safety.

Vacuum is used to remove the air in the spaces between the wood fibers. When the vacuum is released the resin can flow into these spaces. During the heating step the resin polymerizes producing the stabilization. Thus, during the vacuum step you want to draw the maximum possible vacuum on the wood. For my elevation this is around 27psi. This means that the chamber must be able to withstand the pressures placed on it. Some turners use a homemade vacuum chamber of some type or even a pressure pot. However, chambers made for pressure are not always designed to withstand vacuum. Homemade chambers can work well, but I was not willing to be there when the chamber was tested and potentially failed.

At first thought, since we usually begin with wood that is either square or rectangular, it would seem that a rectangular chamber would be a more efficient use of space. While that is true, corners are stress points on the container so a round chamber is much better for containing a vacuum.

There are available metal chambers. These chambers may be entirely metal similar to a pressure pot, but most of the commercial metal chambers for stabilization have a clear plastic top. These chambers work well for maintaining the vacuum, but the metal prevents the user from observing what is happening in the chamber during the process. As shown in this photo when wood is placed in the chamber and vacuum is applied air bubbles are released and the surface of the resin initially foams. To control the foam and prevent it from being drawn through the vacuum tubing and possibly into the vacuum source, the chamber must have a relief valve that the user adjusts to control the foaming. At the start of the vacuum step the valve is left partially open and then as the air is removed and the foaming subsides the valve can be fully closed to achieve the full vacuum. This is very difficult to do if the chamber is not transparent. At the beginning of the vacuum step many large air bubbles are drawn into the resin. As the vacuum step continues the amount and size of the bubbles decreases until ultimately only very fine bubbles are being drawn into the resin. Ideally the vacuum step should continue until no additional bubbles are seen in the resin. In practice the vacuum step is usually continued until only a few very small bubbles are seen in the chamber. This endpoint is very difficult to determine if the only view inside the chamber is from the top of the chamber.

My second requirement was that the chamber be made from quality materials so that the chamber will not need to be replaced for a long period of time.

Metal is certainly a long lasting material, but as discussed in the previous section it has several drawbacks for a vacuum chamber for this use. Therefore, manufacturers have turned to various types of plastics to construct their chambers. Unfortunately, some plastics are reactive with the resins commonly used for stabilization. These reactions do not occur quickly, but over time, and are cumulative with exposure to the resins.

Conestoga Works' chambers are constructed from American made, laboratory grade, clear polyvinyl chloride (PVC). The top and bottom plates are CNC machined from 3/4 inch Type I PVC sheet. Laboratory grade PVC is very resistant to the type of resins used for stabilization so the chamber is not degraded by the resin. In fact, it is feasible to leave the resin in the chamber if you want to do back to back runs. It is recommended by the company that the resin be returned to a storage container when it is not in use. The top seal is custom cast for a vacuum seal around the entire cylinder surface.

When you first apply a vacuum to the chamber that you may feel the chamber is not sealing, because the vacuum gauge will not register any vacuum. This is because the air in the chamber above the resin must be drawn out of the chamber before a vacuum forms. After a few seconds of applying vacuum I usually gently press on the lid of the chamber to aid the sealing process.

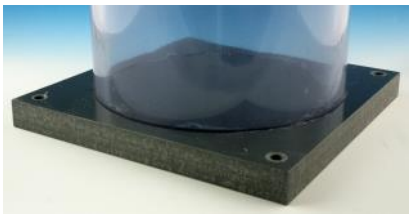
My third requirement was a ready-to-go chamber without having to source any additional parts myself.

The chamber is supplied fully assembled with the needed vacuum hose, vacuum gauge, valve, and vacuum fitting. The purchaser does not have to source additional parts or do any assembly. All the vacuum fittings are solid brass, and the relief valve is a full port, brass ball valve with a sintered bronze filter to control the vacuum level. The sintered bronze filter prevents contaminates being drawn back into the system and a brass ball valve operates easier and is longer lasting than other, cheaper types of valves. The supplied gauge is a 2-1/2", liquid filled, stainless steel and brass vacuum gauge. 6 feet of 1/4" I.D., reinforced vinyl hose are supplied with each chamber. The hose

is fitted with a Milton M Style Quick coupling. Quick couplings are often not recommended for vacuum applications since they can be a source of leaks. However, Conestoga Works has found that these quality Milton couplings do not have that problem; and since most users will not keep their system permanently attached to their vacuum source, it certainly makes setup much quicker and easier. Conestoga Works tests each unit to hold a high static vacuum level when each chamber is manufactured.

Since most woods will float in the resin keeping air from being removed from the wood, chambers are usually supplied with some type of weight or plate to keep the wood submerged in the stabilizing resin. However, these plates do not aid in placing or removing the wood from the chamber. Instead Conestoga Works supplies a custom designed carrier, shown here in close up with a piece of wood in place, which allows the user to place and remove the wood without coming into contact with the resin and also keeps the wood submerged in the resin. It consists of an unfinished steel base disk just smaller than the diameter of the chamber. A steel rod is welded to this disk and as you can see in the first photo in this review the top of the rod is shaped to form a handle. Another adjustable steel disk of the same diameter is also attached to the rod. The upper disk can be easily adjusted along the length of the rod to suit the length of wood being stabilized while keeping the wood submerged beneath the resin. Both disks are perforated to allow the resin to easily flow around them as they are placed into and removed from the chamber. The perforations also prevent air bubbles from being trapped in the disks during the vacuum step. The carrier is purposely unfinished to prevent any interaction between a finish and the resin.

My fourth requirement was ease of use.



The base on the chamber makes it very stable in use. The vacuum seal for these chambers, shown in the upper photo, is built into the lid rather than the base or a separate seal. This makes it much easier to pour the resin into or out of the chamber. The base of the chamber, shown in the lower photo, is large and heavy enough to prevent tipping yet the base is not so large that it makes the chamber cumbersome. In use it has proved very simple to pour the remaining resin from the chamber into a storage bottle using a funnel lined with a disposable filter available from paint stores. The chamber is heavy and sturdy without being difficult to maneuver. After a run if you plan to do another run within a few days the chamber and carrier can simply be wiped with a towel to remove any remaining resin on the PVC. For longer term storage the chamber and carrier can be rinsed with mild soap and room temperature water and allowed to dry. Since the carrier is unfinished it should be treated with a rust preventive spray. Conestoga Works recommends using CRC 3-36 for this purpose. It dries and protects the metal. When the carrier is needed again it just needs to be wiped with a clean dry cloth. After I allow the CRC 3-36 spray to dry I wrap my carrier in Kraft type paper and place it in the chamber. I line the chamber's original shipping box with the same paper and store the chamber in its box to protect it from shop dust.

My fifth requirement was a reasonable price for a chamber that met all my other requirements.

Conestoga Works offers three sizes of chambers. The small chamber is 4 inch diameter x 17-1/2 inches high. Its interior area is 220 cubic inches giving it a 3.8 quart maximum capacity. It is priced at $189.00. The medium chamber is 6 Inch diameter x 17-1/2 inches high. Its interior area is 495 cubic inches with a 8.6 quart maximum capacity. It is priced at $266.00. The large chamber is 8 inch diameter by 17-1/2 inches high. Its interior area is 867 cubic inches with 15 quart maximum capacity size. It is priced at $387.00. In addition to the stated capacities these chambers have additional height to allow the required headspace for resin foaming during the vacuum step. This additional space is needed to prevent drawing resin into the vacuum source which in the case of a vacuum pump may cause damage to the pump. One of these sizes should cover the

needs of most woodworkers. When choosing a chamber capacity, remember that you need additional depth in the chamber so the level of the resin can be a few inches above the level of the wood. After the vacuum step the wood is allowed to set in the chamber while the resin is drawn into the wood. If the resin level drops below the surface of the wood, then the wood will not be fully impregnated with the resin requiring additional resin and the repeating of the vacuum step.

If none of these sizes will work for your needs Conestoga can make a custom sized chamber. You can contact them through their website, http://conestogaworks.com/index.html, for further details and pricing on this option.

Here are a couple of pieces made from woods stabilized using Cactus Juice and the Conestoga Works vacuum chambers.

Urn made from stabilized Blackjack Oak by Dick Webber, owner of the Flute Master spiraling jig.

Pocket Tape Measure approximately 2" in diameter made from stabilized walnut and holly by the author. There is no finish on the piece. The wood was sanded and buffed.

Stabilized wood offers design and use opportunities that are not available with the same wood which has not been stabilized. I feel that Conestoga Works offers a vacuum chamber that best fits my needs. You can find information on their vacuum chambers and other products at http://conestogaworks.com/.

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