This document assumes the person attempting to make and use a vacuum chuck has a working knowledge of various power tools, hand tools, and wood lathes. There are *NO safety warnings contained within.* If you are unsure of how to perform a procedure safely, please STOP and research how to perform the procedure in a safe manner. Do not proceed until you are comfortable with the operation and all procedures.

Vacuum Chucks-

What is a vacuum chuck?
A vacuum chuck is a container that has negative air pressure in it. We can utilize that negative air pressure to hold work pieces on the open end of that container to remove the tenon or recess from the bottom of our bowls and platters.

How does it hold our bowls and platters to itself?
The earth's atmosphere pushes 14.7 pounds per square inch of air pressure on us all day long. That pressure will vary depending on the current weather conditions and altitude above sea level. We are at sea level in this area.

By removing the atmosphere inside our container (creating negative pressure) the atmosphere outside our container will push the bowl or platter against the open end of the chuck. How hard it pushes depend upon how much atmosphere we remove from our container. The more atmosphere we remove, the harder it pushes on the end of our container.

We can also increase the amount it pushes by increasing the diameter of our container. More diameter = more square inches increasing the atmosphere square inches pushing against the open end of our container.

How is vacuum measured?
Vacuum is measured in inches of mercury. Our atmosphere will support a column of mercury 30 inches tall.

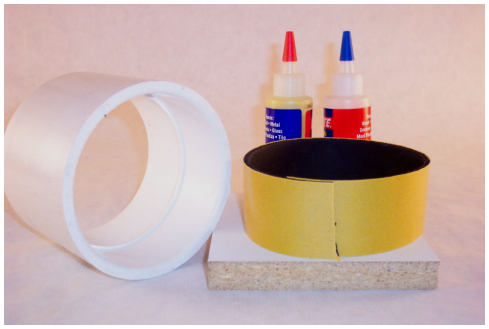
Why inches of mercury?
If we used water instead of mercury the column of water would be about 34 feet tall. The density of mercury makes a 30 inch tall column much easier to work with.
As we remove atmosphere from that column the mercury level will decrease. (In reality it should be measured as negative inches of mercury; however, it is not.)

The chart on the last page will tell you how much pressure is pushing on the work-piece based on the chucks diameter and how many inches of mercury are being removed from it.

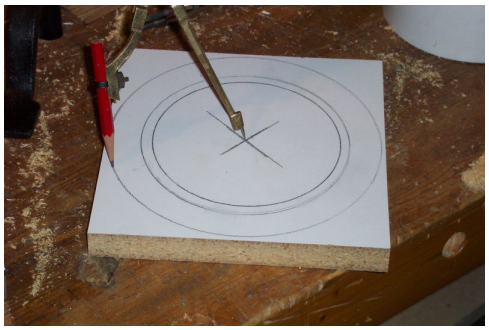
How do we create this negative pressure?
By using a sealed container and a pump to remove the atmosphere from the container, we will create a negative pressure.

How to make a vacuum chuck for use on a wood turning lathe.

Materials needed:

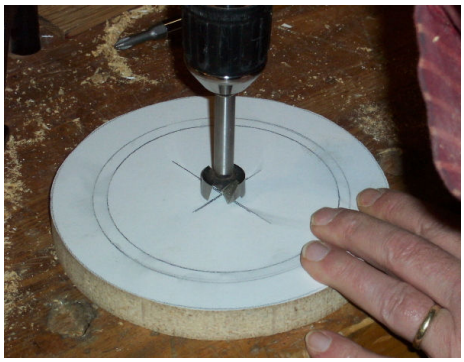


1-PVC coupling- Size is your choice. 3-4 inches is a good place to start.
1-pc. of melamine about 1 ½ inches larger than the outside dimension of your PVC coupling.
2-part epoxy about 2- ½ dollar sized puddles of each part.
1- 3 inch face-plate.
4- #8 or 10 steel faceplate screws (not shown)
Foam tape- enough to wrap around the circumference of your coupling



Lay out the center, inside and outside diameter of the PVC coupling and approximately ¾" outside the OD of the coupling

Cut melamine round. Cut just outside of the line



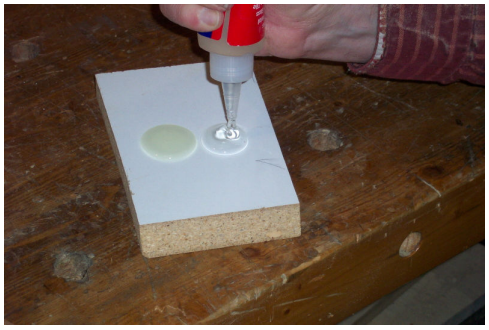
Drill a hole through the melamine approximately the size of the nose piece of the EZ vacuum adapter.

Drill pilot holes and screw face plate to melamine. Center faceplate over hole drilled through center of melamine.

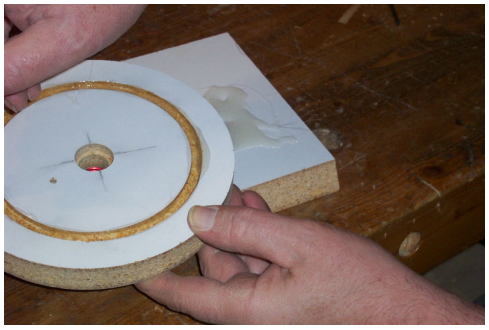
Cut a groove on the face of the melamine using lines traced from coupling.

The coupling should fit snugly into this groove.

True up the edge of the melamine until it spins true.



Squeeze out and mix two half dollar sized puddles of part A and B of epoxy



Apply mixed epoxy in groove cut for PVC coupling

After applying mixed epoxy in groove, mount assembly on lathe's spindle, insert coupling in groove, and bring up tailstock against a piece of scrap. Apply pressure with tailstock.

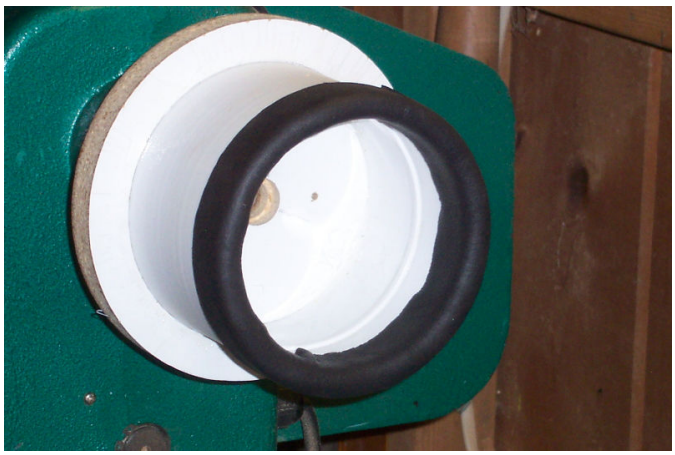
Spin assembly at low speed to evenly distribute epoxy.
This will evenly distribute the epoxy and keep chuck balanced.

The PVC couplings I used have an alignment bump on them that needs to be removed.

Turn away the alignment bump and true outside of coupling

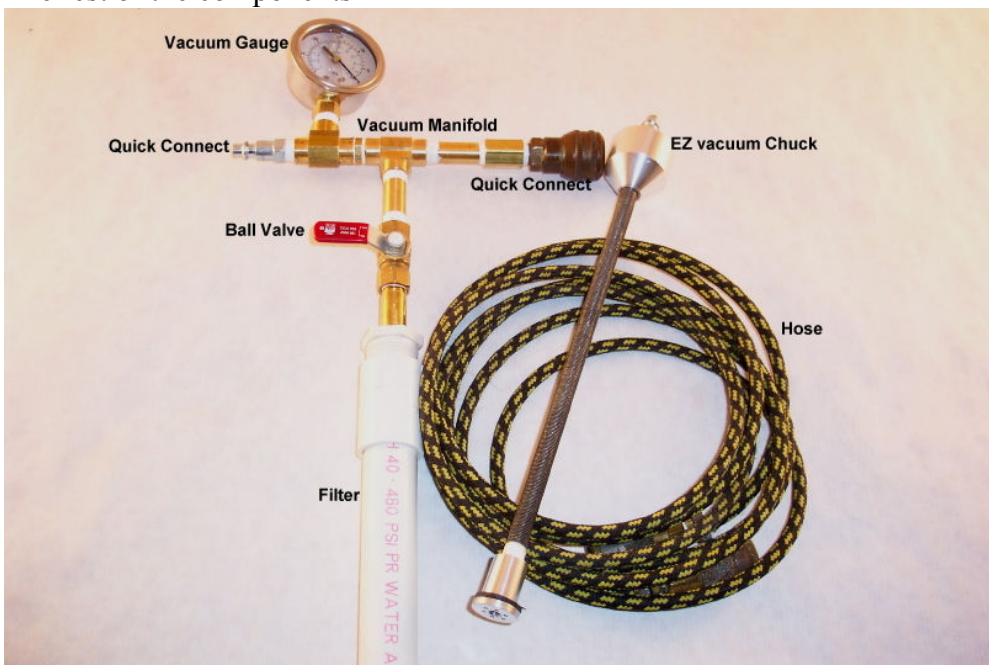
Cut a piece of gasket material and apply to the coupling. Overlap the last inch or so and cut through both pieces. Remove the excess from the top piece and the excess from the bottom piece. The two ends should meet together creating an airtight gasket.

Fold the remaining gasket material inside, making sure you have no wrinkles or projections on the rim of your chuck.



The completed vacuum chuck.

The rest of the components-

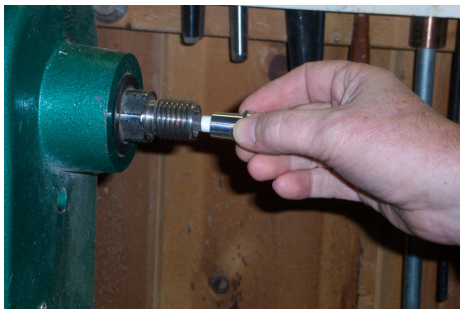


The Vacuum Adaptor- Shown is the the EZ Vacuum Chuck from Oneway. This allows the spindle of the lathe to become the inlet of the vacuum source. The Vacuum chuck will screw onto the spindle with the nose piece of the vacuum adapter inside the faceplate.
The other end of the vacuum adaptor connects to the vacuum pump. It has a bearing that allows the hose to pivot.

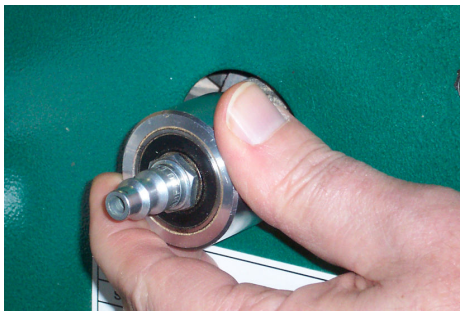
The Vacuum Manifold-
The vacuum manifold is a very handy piece of the vacuum system. It allows you to:
Monitor your vacuum levels by way of the gauge.
You can Also adjust the amount of vacuum going to the chuck by way of a filtered bleed off valve.
The manifold mounts between the vacuum adaptor and the hose from the vacuum pump.

The filter- It is a piece of ¾ inch x 8 inch PVC pipe with a cap. The cap has a 3/8 NPT thread cut into by the pipe nipple attached to it. The PVC pipe is filed with steel wool. This filters any dust or chips from entering through the bleed off valve.

To use all of these components-



Insert the nose piece with threaded tube attached through the spindle of the lathe.



Attach the bearing end of the vacuum adapter to the other end of the threaded tube and tighten hand tight.

Attach the vacuum chuck to the drive spindle

Attach the manifold to the bearing end of the vacuum adapter; attach the hose to the manifold and to the vacuum pump.

Using the Vacuum chuck-

Place the inside of your bowl against the vacuum chucks gasket, bring the tailstock up to the center point of the tenon and run the lathe at low speed to get the bowl centered. Increase the vacuum until the bowl is securely fastened to the chuck.

Caution- be careful here, too much vacuum could cause your bowl to implode!!!

You can turn off the lathe but not the pump. The tailstock can be left in place until the last minute if needed. Use sharp tools and a light touch. A catch or too heavy a cut can pull the bowl off center or off the chuck all together.

I understand there are many ways to make and use a vacuum chuck. I think this is one of the easier and most economical ways to go about it. It works for me.

Respectfully, Wayne Kuhn

More info than ever want to know about vacuum, chucks and pumps can be found here

http://www.wbnoble.com/WN_articles/vacuum_chuck/vac_chuck_briefing.pdf