Sliced Hollow Forms

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This project is relatively involved. Start with a hollow form (or a bowl or other form), remove a slice from it on the bandsaw, and reassemble the slices with pewa (butterfly patches) or similar. There are a number of steps and a special bandsaw jig is required to safely make cuts with a bandsaw.

A lot of this project involves aesthetic choices. The basic form and shape and thickness of the piece. The location and size and shape (straight, curved, etc) of the slice. Shape and wood species for the pewa. I describe some of my opinions, but the final choices are all yours.

Turn a Hollow Form

The first step is to create a hollow form (or a bowl). Shape the outside and hollow out the inside, but leave the piece on the chuck. I won't go into detail about how to do this, as you should already know - this is not a good project with which to learn hollowing or bowl turning.

I completely hollow out the inside. After we slice the piece, the only thing holding it together are the pewa, which might not have enough strength for hollowing. Also, cutting through two walls is much easier than cutting through a solid piece.

The shape you choose should lend itself to being "sliced". That is, there should be some area where a cutout section would "look right". For me, the best shapes have a gentle curve at their widest point, and that's where I usually will slice them.

Form is also important. Make the piece as if you were not slicing it. A poor form is not going to be improved by cutting it up.

Think also about the wall thickness of your piece. You will be adding pewa - the ones I use are about 0.2" thick, and I want their recesses to have a "bottom" (for more glue surface, also I don't have to try to sand the inside smooth). If my wall thickness is ¼" or so, that should work out. If it's thinner, I need to remember to not route out the recesses too far. The wall thickness can be clearly seen at the slice (assuming your slice is wide enough), so it needs to be even. And the thickness should be in harmony with the width of the slice you will cut.

I go ahead and sand the piece at this point. Maybe not completely to my final grit (which is usually 400), but at least get started and get rid of any tool marks and tear out. It helps to have a good surface for layout lines. Also, now is the time to ensure this piece is worth the extra work, and some initial sanding will let you make that decision.

Now that your form is turned, it's time to think about the slice.

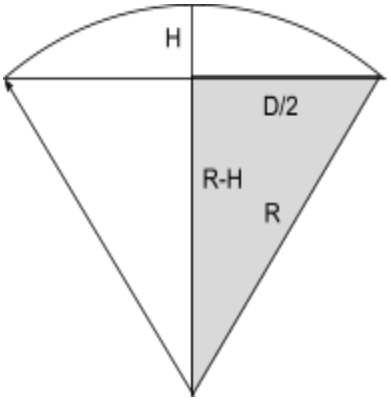
Setting Up the Slice

My current favorite shape for a slice is an arc. But straight, and maybe angled, lines might go better with your piece. Now is the time to decide. It is also time to decide on the extent of the slice.

For an arc, we need to know the high and low points, and where around the piece they fall. There may be figure or grain patterns that define a place you want to slice (or avoid).

I use a jig on my bandsaw to safely cut an arc (radius) in the piece (more about that jig later).

For an arc, I will now mark the desired high and low points of the curve. That is, the place closest to the foot and closest to the top. This defines both the position of the arc and its height. The high and low spots are often balanced around the widest point of the piece.



Next, we need to know the radius of the arc to cut. We can approximate this by assuming that we are cutting a cylinder. In that case, we have a Pythagorean theorem for a triangle: $R^2 = (R-H)^2 + (D/2)^2$, where R is the radius we want to cut, H is the height of the arc (distance between the top and bottom locations of our arc), and D is the diameter of our hollow form or bowl. Solving that for the radius R, we get:

$$R = H/2 + D^2/8H$$

For example, if we have a 6" diameter bowl (D=6) and decided on a 1" arc height (H), we'd need an arc radius (R) of 1/2 + 36/8 = 5".

If you aren't sure what you want the arc to be, a good starting point is to make R equal to D.

That formula gets us pretty close, but I prefer to check the cut locations on the bandsaw.

The Bandsaw Jig

The jig I use is modeled after one by John Beaver (https://johnbeaver.net/). He sells plans - your best bet is to use his plans. But I'll do my best to describe the jig I use…

The jig is in 3 "layers". The base piece is just plywood with a strip to slide in the saw's mitre slot. There's also several holes drilled to set the radius. It is important that these holes are all in a line perpendicular to the mitre slot. And that line needs to be marked so the jig can be aligned with the blade.

The middle layer also has holes so that a dowel can connect it to the base and it can swivel around to make the arc. It also has a mitre slot (dado) cut perpendicular to the saw's slot.

On top is a cradle with a strip to slide in the middle dado, and wing nuts to secure it in place. That dado and slot allow the top piece to be adjusted closer and farther from the blade. The cradle has vertical piece with a bolt to accept a chuck. I used a 1"-8 bolt with a spindle adapter to 1¼"-8. This cradle holds the chuck (and work piece) horizontally.

Like I said, you are probably best served by getting John Beaver's plans rather than trying to figure it out from my description.

Some important things about the jig:

- A workpiece in a chuck can be mounted securely and horizontally.
- It slides in the saw's mitre slot - this helps with alignment of the arc height and also lets the jig be used for cutting straight lines.
- Various radii can be cut by moving a dowel to different holes.
- The location of the cut can be adjusted by sliding the cradle in the middle layer's dado.
- The jig can be aligned with the saw blade (front of the teeth) and clamped in place (needs accurately marked locations of the dowel holes etc).

It is also important to have a good, fine-tooth blade on your saw. I use a ¼" wide, variable pitch 14/18 TPI blade, but any good quality fine tooth blade should work. The better the blade, the better the cut on the slice surface. The saw also needs to be tuned properly and guides adjusted. The blade should be perpendicular to the table (both side-to-side as well as front-to-back). I always check everything before each cut, just to be sure.

Finalizing the Arc Location

So we decided where we wanted our slice, and marked that on the piece. We also used some math to approximate the radius we want to cut. That math usually gets pretty close, but I like to double-check that and tweak it on the bandsaw.

Take the hollow form (in the chuck) to the bandsaw jig. Set the radius to whatever the math said. Set the jig so the radius holes (with the dowel) line up with the front of the bandsaw blade.

Now, rotate the piece till it just touches the blade, and adjust the slide (between the top two pieces) to hit your low point of the desired arc. You might have to rotate the piece in the chuck so you can see the mark near the blade.

Now, slide the jig in the saw's mitre slot and rotate the jig until the chuck is perpendicular to the saw. Where the blade hits now should be the top of the arc. If you're satisfied with that, mark it. Or tweak the radius dowel and offsets until you have the arc you want (and mark where the blade hits those positions).

Cut Four Pewa

Mount the piece back in the lathe and transfer the final marks (from the bandsaw blade) all the way around the piece. You may want to erase some of the previous marks if things get confusing.

Using your lathe's indexing holes (or indexing pins on your chuck, or whatever you have), mark 4 lines - two horizontal and two vertical where you want the pewa to be. Use your tool rest at center-height and keep your pencil level when marking the lines. I usually like the curve of the arc to line up (somehow) with the grain or figure of the hollow form.

You now have 4 places - two low and two high. The next step is to cut the outlines (recesses) for the inserts.

If you've never done this, I suggest you take a look at Mark Stebbins products and information (https://bigislandengraving.com) . He sells precision cut templates for a trim router, and inserts of various shapes and sizes that perfectly match the templates. He also has instructions and videos of the process.

The easiest inserts to use are just straight strips. Next are butterfly shapes with rounded corners. The best looking (in my opinion) are butterflies with square corners, but these require hand-cutting the corners.

Considerations now are:

- How wide will your slice be?
- What size and shape of insert will look best?
- What wood - matching or contrasting - for the insert?

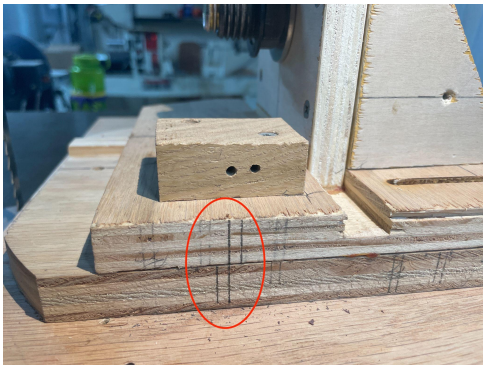
I attach the template with hot glue so they are aligned along the axis of the piece and centered on the high or low point of the arc. Add wedges around the template (usually 4) to secure it in place. I use painter's tape on the wood, template, and wedges to make the hot glue come off easier.

Cut the insert using the trim router with the proper bit and collar (to match the template and inserts you are using).

Back to the Saw

Once the recesses for the inserts are cut, take the piece back to the bandsaw jig. Rotate the piece in the chuck to get the insert recesses perfectly horizontal and vertical. Use the reference lines drawn on the piece to help with this. Double check that the radius and offset are still correct.

Clamp the base of the jig so the radius dowel hole is aligned with the saw blade.



Next, I mark two lines along the side of the jig (top two sliding layers). They should be half the distance apart as your desired slice width. If I want a ¼" wide slice, then I mark two lines at ⅛" apart. When both lines line up, the offset is at the center of the slice. Offset the slider so one line aligns with the other, and you are set up for the top or bottom of the slice.

Set the offset to make the first cut - the one farthest from the chuck. Cut carefully, slowly, and support the top of the hollow form (or bowl) as you remove it. Don't just stick your fingers in the top of the hollow form to grab it - there's a blade in there!

Reset the offset to the other pair of lines (cutting nearer the chuck) and make another cut.

You've now removed a slice from your piece. And you cut your hollow form in half. So if you want to sand and/or apply finish inside, now's the time!

Reassemble

The top and bottom pieces can now be reassembled by inserting the pewa into the recesses you cut. Since the recesses were cut when the piece was whole, adding the inserts will preserve grain and figure across the slice. Cool.

I usually dry-fit all 4 pewa (masking tape helps here), then remove one at a time to glue it in. I prefer wood glue (PVA) like Titebond. Take care that there's enough glue but watch out for squeeze-out in the slice - it's hard to remove (I scrape it out with dental tools). Depending on how things fit together, you might choose to clamp the piece in the lathe (for alignment) and/or wrap the slice and inserts with tape.

After the glue is set, you might consider if more pewa are desired. It is now fairly straightforward to align the template with the slice for more pewa patches.

Sand off the excess height of the inserts, matching the curvature of your hollow form across the slice. Use a stiff sanding block to avoid over-sanding around the edges (it's just too easy to power-sand a big flat spot). Then give the whole piece a final sanding.

The Bottom

No piece is complete without giving the bottom some care. Reverse-chuck the piece as you normally would and turn a foot (or whatever) on the bottom. You can use a friction-drive chuck - a cup of scrap wood in the headstock padded with foam, with the piece held between centers.

I've even used a vacuum chuck with these pieces. I wrap the slice with painter's tape, then wrap the whole thing in plastic wrap. Keep the tail stock engaged as long as you can.

Tool and Equipment List

The following are some of the tools that I use for this project. Other tools are certainly useful - my tool choices are often based on what I happen to have. Most tools are available from several sources; links are provided for your convenience.

John Beaver's Jig Plans - http://johnbeaver.net/resources
Click the "Wave Bowl Jig Plans" link there.

Big Island Engraving - https://bigislandengraving.com/butterfly-inlay-repair-system/
Templates and Inserts in various sizes and woods. Also see the Resources links for instructions and videos.

Excel X-Acto knife blade #19 - https://www.amazon.com/gp/product/B001LVZ746

Lenox Diemaster 2 Bimetal Bandsaw Blade (0.25" width, 0.025" thick, 14/18 TPI) - https://bladeserpent.com/lenox-diemaster-2-bimetal.html - https://www.bandsawbladesdirect.com/lenox-diemaster-2-bi-metal-band-saw-blades

DeWalt Rapid Heat Hot Glue Gun - https://www.amazon.com/gp/product/B00FI6QWBM

Porter Cable Trim Router - https://www.amazon.com/gp/product/B00JTV1A0K

Router Inlay Kit (MLCS #9177 with insert and bit - MLCS is now HValleyTools) - https://www.hvalleytools.com/product/v9177-mlcs-router-inlay-sets/router-inlay-templates - https://www.amazon.com/gp/product/B000VJKA6Y