MULTIAXIS DISK VASE

Dennis Belcher

Photos by Jeffrey King.

When I began turning, I rushed through numerous projects, jumping from spindle work to bowls, boxes, and hollow forms. I was always in a hurry to try my hand at a new form or technique that I had just seen in a demo or an article. Having acquired an array of skills and techniques, I now prefer the more measured path of selecting a form, mastering it, and using that form as a canvas for artistic expression.

My canvas of choice easily could have been a bowl, platter, vase, or hollow form, but the more unusual vertical disk, turned on two axes, appeals to me most. I live on the coast of North Carolina, which is awash with flowers. A common practice here is to bring these blooms, and their color, into the home. A turned form with the functionality of a flower vase (with inserted glass tube to contain the water) and broad surfaces that serve as a canvas for embellishment was just the thing.

Design and layout

Certain design elements need to be determined before you begin. These include the finished disk diameter, the width (thickness) at the center, and the diameter and length of the glass tube. It is also good to know up front whether you intend to texture the vase and the type of base it will have. *Figure 1* shows a typical design I like to use.

Another consideration is the holding method that will be used when forming the disk faces. The full thickness of the wood is needed for the curves on each face. If you begin turning the disk between centers, allow for the loss of thickness when the drive and tailcenter pin marks are removed.

Once these elements are set, lay out your design at full size on graph paper. A disk diameter of about 6" (15cm) is stable on the lathe when the disk is later held on edge in a screw chuck. A size greater than this diameter will cause excess vibration.

I have settled on using 8/4 (2", or 5cm) timber. This thickness allows the disk to stand without a base. If you use thinner stock, a base will be required for stability.

For this size disk vase, I use a glass tube with a diameter of ⅞" (22mm) and a length of 3⅝" (9cm). The depth of the cutout at the top of the disk, the length of the test tube, and the length of the screw chuck used all have to fit within the overall diameter of the disk *(Figure 1)*.

Wood preparation

Start with a block of wood at least 6¾" (17cm) square and 2" (5cm) thick. Opposing edges should be parallel to each other and square to adjacent edges. If the block is not true, problems will arise in the final phases of the project.

The next step is to add a temporary wasteblock to the bottom edge using a paper glue joint (*Photo 1*). After initial turning, this wasteblock will be removed, exposing a flat that can be used to hold the disk on a screw chuck. The wasteblock is typically ½" (13mm) thick and the same length and depth as your block. It can be thicker, but needn't be, as you'll have to drill through it to begin drilling into the vase blank itself. I use water-soluble white glue and the brown paper from a grocery sack. Spread glue on the bottom of the disk blank and on the waste piece, place the paper between the two, and clamp. After the glue has cured, remove the clamps and clean up the joint of glue and paper.

Pre-turning steps

A photocopy of your layout drawing will act as a useful template when glued to the wood blank. Carefully align the bottom line of the template, ▸

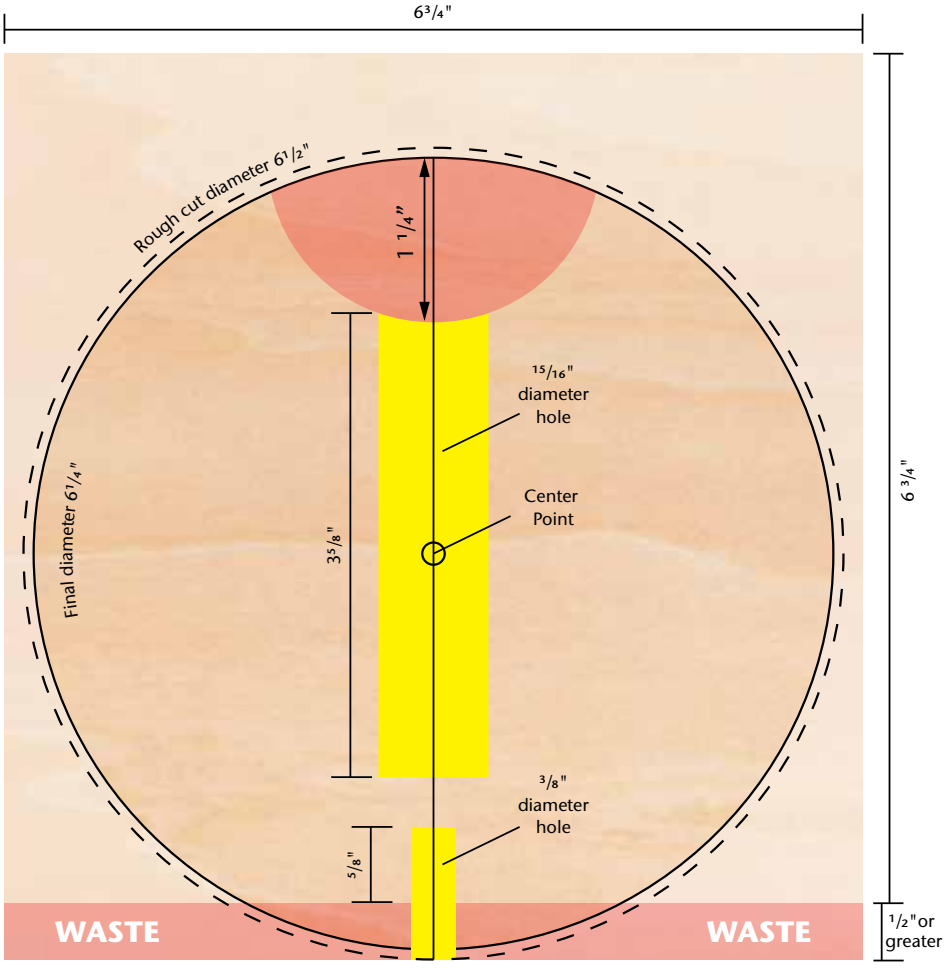
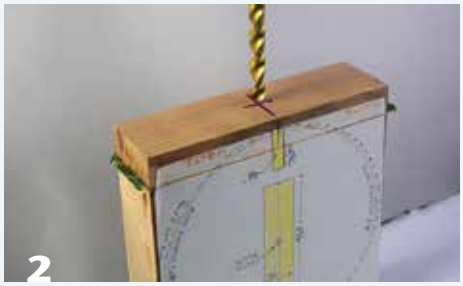


Figure 1. It is helpful to create a full-sized drawing of key shapes and dimensions.

Prepare and mount blank

1 Glue a temporary wasteblock onto the vase blank using a paper glue joint.



2 Mount the full-sized drawing onto the blank and drill through the wasteblock for later mounting on a screw chuck.

3 After bandsawing the blank round, center it using the point of the tailstock live center for alignment.

Turn one face

Layout lines on the blank's outer edge aid in the symmetrical shaping of the two faces.

A hardboard template used on both faces ensures similar opposing curves.

excluding the wasteblock area, with the glue joint on the blank, as shown in *Photo 2*. Using rubber cement for this step allows for adjustment of the template.

Next is to lay out the hole for the screw chuck *(Photo 2)*. Locate the center of the blank on the waste-block side and extend the centerline from the front face until the two lines cross. At this point, drill through the wasteblock and into the disk blank to the depth indicated on your layout. Remember to measure this depth from the edge of the disk blank, not from the beginning of the wasteblock, which will be removed later. Size your drill bit to your specific screw chuck for a solid hold.

Cut the blank round on the bandsaw close to the layout lines.

Turn one disk face

Now it is time to mount the disk on the lathe to turn it round and shape the front and back faces. My preferred holding method for this step is to use a vacuum chuck, which is illustrated in this article. If you don't have a vacuum chuck, there are a number of other ways to mount the blank. *(See Alternate Holding Methods sidebar.)*

Mount the blank with a low level of vacuum so it can be adjusted. Bring up the tailstock with a live center that has a center point. *Do not press the center point into the wood,* but use the point and the center mark on your paper template to align the blank *(Photo 3)*. It is critical that the blank be at the center point established in the layout.

With the blank centered, increase the vacuum for sufficient holding. Put a small piece of scrap wood on the live center to keep the point from entering the wood and bring up the tailstock.

Before shaping the convex surface of the first disk face, true the blank's edge. Then establish three layout lines to aid in turning matching faces on the disk. Use the screw chuck hole established earlier to locate the center of the edge. Draw pencil lines across the waste block at the outer edges of the screw hole and at the center of the hole *(Photo 4)*.

Remount and turn second face

(6) Find the center point on the second face.

(7) Reverse-mount the blank for turning the second face. Here, a vacuum chuck is used and the blank is adjusted with gentle taps from a mallet. With the lathe off and the toolrest loose in the banjo, use the toolrest edge to judge centeredness of the disk.

Turn the first face using a bowl gouge, gradually creating a flowing curve from the center of the disk to the nearest pencil line on the edge. A challenge of this form is to shape both faces in matching, mirrored curves when one face is always hidden from view. My solution is to shape the first face and capture the curve with a contour gauge. Once the curve is captured, it can be transferred to a template and used as a guide when forming the curve on the second face *(Photo 5)*.

Sand the first disk face. Sanding with a 4" (10cm) rotary sander helps in creating a continuous, flowing curve.

Turn the second face

The reverse face is turned in the same manner as the first. The key is to re-center the workpiece accurately. Establish the center point on the unturned surface by drawing multiple lines across it with a center-finding tool (*Photo 6*). Once the center point is marked, remount and center the blank using the tailstock for alignment. With the vacuum on low, gently tap the blank to fine-tune its position (*Photo 7*).

Turn the second face using the template as a gauge in creating a curve similar to the first. Sand the second face and remove the workpiece from the lathe.

Turn the top cove

To position the workpiece so you can turn a scoop at the top and drill a hole for the glass tube, remount it on a screw chuck on a new turning axis. Prior to mounting the vase in this orientation, use a chisel to knock off the wasteblock at the glue line *(Photo 8)*. The remaining flat is the key to holding the disk on the screw chuck safely, so it is important to maintain its integrity. Moisten the glue and paper remaining on the flat and get it as clean as you can. A dampened woven abrasive pad is useful for this step. A cabinet scraper also helps to remove the glue and paper without rounding over the flat's edges.

I use a ¼"- (6mm-) thick spacer of wood or metal to increase the holding power of the screw chuck (*Photo 9*). This spacer provides a greater surface area on which to register the disk blank and increases the stability of the hold. Screw the disk blank onto the screw chuck and seat it firmly against the spacer. The screw action will cause the wood around the drilled hole to swell up, and this can result in poor contact and a compromised hold. I have modified my spacers to allow room for this swelling.

Before proceeding with the turning, confirm that the disk is centered properly. Bring up the toolrest, turn on the lathe at a slow speed, and mark the center of the disk edge with a pencil (*Photo 10*). If this mark is ▸

Remount on screw chuck

Use a chisel to remove the wasteblock, exposing a flat, which is critical to safe mounting on a screw chuck.

Mount the disk on the screw chuck, establishing a new axis for turning. Note the metal stabilizer/spacer, which provides a flat surface on which the disk can seat.

Turn cove, drill for glass tube

(10) Before turning, do an alignment check. The pencil circle should be in the center of the disk at the base of the mouth.

(11) Use a small bowl gouge to form the mouth of the vase.

(12) Drill a hole to accept the glass tube.

off-center, the glass tube will not be centered when mounted in its hole. The flange of the glass tube could extend past one face—not a desirable occurrence this close to the completion of the project. If you find that your pencil mark is off-center, you can adjust the position by partially unscrewing the disk and adding a shim to one side. A thin piece of sandpaper works well for this, and the amount of shift can be controlled by trying different grits.

Once you have confirmed the alignment of the workpiece, mark a pencil line 1¼" (32mm) down on the disk where the cove at the top of the disk should stop. Form the cove with a bowl gouge (*Photo 11*). When you start the cove, you will be cutting wood throughout the cut. As the cove deepens, you will be cutting wood more and more intermittently. At this point, it is helpful to "find the wood" by gently presenting the back of the gouge, or bevel, to the wood. Registering the tool to the wood in this way helps you know where to begin the next sweeping cut. A freshly sharpened, smaller gouge used with a light touch works better than a larger tool in this case. Also, listen to the sound of the cut. If you start to hear or feel vibrations as you cut, stop the lathe and tighten the disk on the screw chuck. Start again with a freshly sharped gouge and a lighter cut.

Drill for the glass tube

The hole for the glass tube should be sized to accept the tube's diameter. However, the fit should be loose, as the wood will move with changes in humidity and the movement can break the glass. I have found that a ¾" hole for a glass tube of the same diameter does not allow for wood movement. It is better to drill a hole 1/16" (2mm) oversize. If your glass tube flares out at the top, adjust your hole to accommodate this flange.

Mount the appropriate-sized drill bit into a drill chuck mounted in your tailstock and drill to the required depth specified on your paper template (*Photo 12*).

Drilling holes on a lathe can be dangerous. When drilling with the tailstock, it is possible for the

Finish the bottom

(13) Clean up the bottom around the screw chuck hole.

(14) Fill the screw chuck hole with a metal rod to add weight for stability.

JOURNAL ARCHIVE CONNECTION

For more information on drilling with the tailstock and maintaining clean Morse taper fittings, see John Lucas's sidebar in the April 2014 issue of the journal, "Safety Note: Jacobs Chuck in the Tailstock Quill" (vol 29, no 2, page 31) and Leon Olson's August 2014 article, "Maintain Your Morse Tapers" (vol 29, no 4, page 12). AAW members can access all past journal articles online at woodturner.org.

drill chuck to come loose from its Morse taper mounting while withdrawing the bit to clear the chips. Clearing the hole of shavings frequently and inserting a drawbar through the tailstock into the back of the Morse taper minimizes this problem.

Final steps

The screw chuck will cause a rim of wood to swell around the mounting hole. Removing this rim will ensure the completed disk will sit stably on a flat surface. I use a small knife to remove this wood and then a little sanding as the final cleanup (*Photo 13*).

If the vase is intended to sit on its flat, without an added base, you may want to fill the bottom mounting hole. I insert a short piece of stainless steel rod in the hole (*Photo 14*). This gives the base a completed look and adds weight at the bottom to improve the disk's stability.

Apply the finish of your choice. Or use the broad vase surfaces as a canvas for embellishment. Since the glass tube will be filled with water, your finish should to be able to stand up to the occasional spill. Lastly, putting a few flowers in the vase before you take it out of the shop will ensure it has a place in your home. ■

Dennis Belcher retired from a long career in the investment world to his lifelong passion of working with wood. He rediscovered turning in 2004 and wood curls have been in his blood ever since. He is an active member of the Wilmington Area Woodturners Association and a past member of the Central Illinois Woodturners.

Alternate Holding Methods

If you don't have a vacuum chuck for holding the vase blank, here are two alternatives you can consider.

Option 1: Between Centers

If you intend to carve or texture your vase form, the disk can be mounted between centers since the indentations from the drive and live centers can be removed during embellishment. Start with a blank that has parallel front and back faces, and use the same layout process as described in the main article. When mounting the blank, use a combination square to ensure its faces are ninety degrees to the bed ways *(Photo a)*.

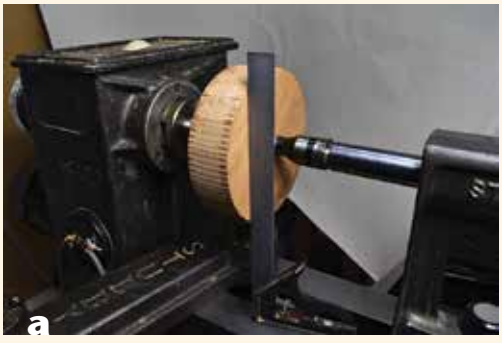
The spring-loaded center point in a Steb center allows for small adjustments. Plus, Steb drive and live centers penetrate the wood less and leave a pattern on the wood that is more likely to blend into your carving than other types of centers.

Option 2: Jumbo Jaws with Wooden Extensions

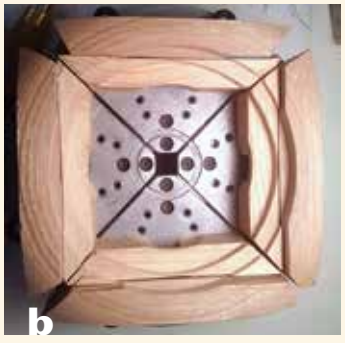
If you intend to emphasize the natural beauty of the wood, any marks left by a holding method should be avoided. This can be accomplished with jumbo, or flat, chuck jaws outfitted with shopmade wooden extensions *(Photo b)*.

Screw a wasteblock to each individual jaw in such a way that the jaws can still expand and contract. With the wasteblocks screwed to the jaws, close the jaws until they are tight, removing any play prior to turning your custom recess. Turn a recess, or step, in the wooden extension jaws about ¾" deep and slightly smaller in diameter than the diameter of your vase blank. This way, you'll be able to open the jaws and then grip the blank firmly within the turned recess.

It may be necessary to use shims to position the workpiece so the center point on the exposed face is aligned with the tailstock live center (*Photo c*). With the blank centered, true up as much of its outside edge as you can, given you will only have access to the section protruding from the turned recess. Remove the blank and flip it in the jaws, registering the trued edge in the step in the wasteblock. The blank is now mounted and true and you can mark the layout lines on its edge and turn each face, as described in the article.



With the tailstock live center registered on the center point of one face, square the blank to the bed ways to locate the center point on the back (headstock) side.



Jumbo, flat, or Cole chuck jaws outfitted with custom-turned extension blocks can hold the disk blank. These accessory jaws are screwed in from the back of the chuck jaws but could also be screwed from the front with countersunk holes.

Shims are used to adjust the position while centering the blank. The jaw's buttons visible here were used only as an aid in setting up each of the four wasteblocks, providing a reference point until the blocks were mounted with screws. The buttons are not involved in holding the wooden extensions in place. Note the protective scrap wood between the live center and the blank. The tailstock can be removed to allow access for light, final shaping cuts.