

What you need to know about hollowing

Kurt Hertzog explores the vast subject of hollowing, its specialist tools and offers a wide array of tips

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Hollowing in woodturning is a very expansive term. It is the removal of the material when creating a bowl, goblet, other turning with an inside surface exposed for use, or simply for viewing. Hollowing can be as simple as the creation of the inside of a lidded box. Both top and bottom can be excavated or hollowed. Depending on the aspect ratio, it can make certain tools more advantageous for use than others. Other hollowing needs employ the use of special hollowing tools or hollowing bars when creating deeper vessels, such as vases and the like. For the extremes in hollowing, deep vessels can be a foot to many feet in depth. In between the extremes can be traditional hollow forms, ornament bodies and more.

Whether the hollowing process is done in the wide open or through a small hole, it is so critical to the creation of many different woodturning projects that I'd like to offer a primer here. For the sake of space, we'll leave the bowl excavations for another time. While certainly requiring skill to perform well, their depth to width aspect ratios are usually quite low, making them pretty straightforward using traditional tools. This month, we'll launch into the deeper hollowing techniques. Rather than be the purist and use only the 'real turner's mentality', I'd like to broaden the scope to include any way of safely getting to the hollowed end point. If you are stuck in the real woodturner mentality, perhaps you should skip the drilling sections.



Safe hollowing demands support up close with sufficient toolrest strength along with tool shaft and handle appropriately sized

Safety

The keys to safe turning are the use of the proper PPE as appropriate and using tools within your and their limitations. There are many tools available to perform the hollowing process, both commercially available and homebuilt. There are some that I won't include in this article because, in my opinion, they are functional and will do the job yet present greater potential for incident than others. With many ways to get to the same end point, why not use the most efficient and safest method possible? If you don't see your favourite tool or brand included, you can assume that I've opted to illustrate some alternate that will also do the job – no offence intended to any specific tool or manufacturer. One of the most common problem situations is trying to perform work too far over the toolrest; this can be done both by hand and using a hollowing bar. By hand, the strength of the tool, the depth it is embedded in the handle, toolrest design and position, the leverage ratio between the cut position and the turner's control position on the handle, the material being worked on along with speeds and feeds all interact to make the situation safe or potentially unsafe. The same is true for hollowing bar equipment. Toolrest design and position, bar diameter and mass, length hanging over toolrest, demands of the cut being made, along with the material and speed issues

make for a pleasant or nerve-wracking experience. Rather than quote numbers, I will try to explain situations that I recommend against or should be used with added caution.

TIPS ON SAFETY

1. Don't extend your tool any further over the toolrest than necessary
2. With hooked tools or tools with flats, keep the tool on the rest correctly
3. Speciality toolrests are available for hollowing applications
4. Light touch and sharp tools are essential for hollowing safely
5. Always have an acceptable ratio of overhang to control point
6. For hollowing bars, always use their bar 'anti-slip out' safety system



Both tool and tool handle length and mass have a dramatic impact on the length over the rest you can work safely. Select both carefully



When you are going to perform operations deep in a turning, be certain that your tools are sufficiently built for the task

Using drills or Forstner bits

Some will turn up their nose at using a drill or Forstner bits in their hollowing process. Using only turning tools to hollow is what 'real' turners would do. They would perform their initial depth drilling using their spindle gouge. That certainly works nicely but might not be the most appropriate method for all turners. Depending on your skill level, using turning tools will get you there but why not use whatever will work the fastest and safest, regardless of what it is? Using a Forstner bit to hollow a lidded box and then cleaning up the side walls and bottom as needed works nicely. It might be faster and safer since you can easily remove evidence of drilling in the corners and bottom. Can it be done from scratch with a gouge or scraper? Certainly it can but there might be less stress on the workholding and results that are acceptable by using a drill or Forstner bit with some touch up. Is your end goal to create your turning quickly and safely to provide it to your customer or do you feel the need to impress your turning buddies? If it is faster for you to use your spindle or bowl gouge, then by all means do so. If not, don't lose sight of the fact that once the material is gone and you've cleaned up the hollowing, nobody will know how you got there. Forster bits also lend themselves well to hollowing pepper mill bodies and prepping for any other hollowing by creating a work area and depth indication. Whether a standard twist drill or Forstner bit, don't be afraid to use them if they lend value to your process. The benefit of a drilling in any hollowing, whether by drill or spindle gouge, is that the hole not only creates a good hollowing start point but also indicates the desired bottom depth. Measuring and marking the drill and then drilling a hole to the depth where you intend the bottom, is very helpful in speeding



Drilling to set depth and hollowing can be done with standard gouges. Use the method you find safest and most reliable

the hollowing process. Not only will you have a hole to work with as you hollow, but you'll already know where you'd like the bottom to be as you work.

TIPS ON USING DRILLS

1. A standard twist drill can be measured and marked with tape to drill a centre hole to the desired bottom point
2. Use the tailstock with a drill chuck observing good practices and hold the chuck on removal
3. Good drilling practices, sharp drill, proper speeds and feeds and breaking the chip are recommended
4. A Forstner bit, run at proper speed, can not only set bottom but remove much of the stock required



If your turning is well executed, will anyone know whether you drilled and hollowed the form?

Speciality toolrests

There are a variety of toolrests available that can aid in your hollowing endeavours: some are factory offerings and others are aftermarket offerings. Their goal is to provide support for the tool at the closest point to the cutting position. Like the lever example in your physics class, the closer the fulcrum is to the point of work, the more mechanical advantage and resolution you'll have at the control point. Sometimes it is possible to get these special rests into a useable position, sometimes not. Use them wherever possible. They will stress the tools less and give you far finer resolution and control. Don't lose sight of the fact that you or your local workshop can create special toolrests for your specific application. This can be a great time saver not to mention safer for those who produce many of the items needing a special rest. Be aware of the strength needs and be certain your fabricated rests are built appropriately.

TIPS ON SPECIALITY TOOLRESTS

1. While designed to provide support, the tool overhang concerns still apply
2. Use speciality rests to provide up close support, not to overwork the cutting process
3. Be cautious of homebuilt speciality toolrests until proven. Designs, materials, and welds need to be sound and always used within their safe limits
4. Speciality toolrests are an aid in the process, not license to violate safe turning practices



Forces on a toolrest when hollowing demand sturdily built equipment. Be certain your toolrests are up to the task

Hollowing tools

Nearly any tool in your kit can be used for hollowing. Depending on the material, orientation, depth needed and your proficiency, some tools lend themselves more than others. As noted above, cleaning up the sides of a drilled hollowing is far less demanding on the workholding than doing the hollowing from scratch. That said, there are many 'purpose-built' hollowing tools available. Nearly all of them follow the same design and function principles so the choice of manufacturer is yours. With the advent of carbide cutter tools, the entire world of hollowing tools changes. Most hollowing used to be performed by scraping operations using a machine tool-style cutter. Scraping, regardless of the type of cutter, was the norm and still is used. With the advent of the shaded cutter designs and now the carbide cutter designs, true cutting does occur. The design and execution of hollowing tools is essentially the steel shape and strength to present the scraper or shrouded cutter to the work. Most tools are designed to fit through an opening to create hollow forms. As such, the need for straight, partially curved and more curved tools makes up most families. With the newer designs using the carbide cutters, the needs for an extremely beefy tool shaft is reduced. Because the operation becomes a cutting rather than scraping operation, the strength demands are reduced somewhat. This has created a whole new genre of hollowing tool in the short to mid-depth designs. The advantages of the carbide cutter designs are rotating the cutter to provide a fresh edge rather than sharpening

TIPS ON HOLLOWING TOOLS

1. Select your hollowing tools based on your typical depth and type of hollowing
2. The traditional had the mechanics for various scrapers and cutters to be mounted
3. Carbide cutter designs usually only accept the manufacturer's cutter
4. Tool and cutter selection needs to be based on wood, orientation and distance over rest
5. Hollowing bar systems, by design, allow for work further over rest but you still need to heed the tool overhang limitations
6. Clearing debris from the hollowing area regularly will improve the hollowing process immensely



Originally, hollowing tools were just bent steel or tool steel usually bought unhandled. My early Chris Stott hollowing tools circa 2001



Depending on your hollowing needs, you may consider special heavy-duty rests designed and built for the task



Speciality toolrests for support up close. Adjustable for reach or a platform for boxes. Beware of excessive demands placed on toolrests



Just a few of the available carbide cutter hollowing tools for hand held use. All feature replaceable cutters when the existing has been rotated until spent



Most modern carbide cutter tools support the cutter as completely as possible. The cutter is exposed only in the areas of potential use

◀ Inside surface finish

When hollowing a bowl, goblet, lidded box and the like, the inside surface finish you achieve is important. It will be seen and touched by people and therefore it needs to be cut cleanly, sanded and finished in the same league as the outer surfaces of your turned vessels. For deep hollowings, the rules are a bit different. If you are hollowing through a small hole, no one will likely be able to see inside much less feel the surface. If they can, it will be for a very limited depth. That relieves the creator from needing a great surface finish. It needs to be clean and sanded only as far as the customers reach. This is not to be a freedom to do shoddy work but only to put some bounds on where the critical surfaces are. You certainly are welcome to sand to the bottom of a hollow form with a 25mm opening but perhaps the time is better spent elsewhere. Grain orientation is your choice but most turners will do end grain hollowing for their deep hollowed turnings. Not only end grain orientation but also green wood if possible. While it is dependent on species, nearly all green wood blanks will cut like soap in comparison to that of dry wood. The reason for end grain hollowing

is multi fold. My article in *Woodturning* issue 255 has an in depth discussion on 'thinking grain', which will provide additional information on the subject. The short answers here are uniform cutting resistance and less stress relaxation and drying deformation. These alone are well worth making your selection of end grain hollowing a primary consideration. With this orientation, your surface finish in green wood is not ideal but usually is immaterial. If you need to sand inside a piece, use caution and the appropriate tools for safety. My article in *Woodturning* issue 265 has some additional information on hand-sanding safely.

TIPS ON INSIDE SURFACE FINISH

1. Sanding on the inside is only as needed for reach and sometimes sight
2. End grain orientation usually provides an acceptable surface finish as turned
3. When sanding inside of a hollow turning, use caution rotating slowing using necessary aids for safety
4. Inside surfaces are rarely finished so preparation for finish is unnecessary

Learning hollowing techniques

Depending on your end goal, your tools and techniques for hollowing will vary. I'll try to illustrate a few different methods here that I use as examples. I'll include the very simple scraper types through to the largest hollowing bar I own. Please accept them as examples to get you thinking about the process. Once you understand the concept of hollowing, the size of the work and the depth is mainly a matter of scaling. With the constraints on space, an in-depth coverage is not possible so additional information is recommended. There are many sources of additional information available to you, from books to videos. Be cautious of the

videos on hollow turning available on YouTube. Some are by the hollowing tool or hollowing bar manufacturers; some are by very expert woodturners focusing on hollowing as their speciality. These videos are usually excellent along with their freely available writings on the subject. However, there are other videos by folks who have limited knowledge and experience. Their content ranges from very bogus to extremely unsafe. Be certain to vet the video creator to ensure they have the credentials to be believed. There is sufficient content available by true experts to keep you sufficiently engaged.



Do a bit of outside shaping to help with your hollowing but leave plenty of strength for the workholding until later. It is easily cut away after hollowing



If you can't see the surface or even reach a pinky inside to feel it, then surface is obviously pretty spectacular isn't it?

TIPS ON LEARNING HOLLOWING TECHNIQUES

1. If you are just beginning, practice on inexpensive stock for throwaway
2. There are many experts with books and videos available to learn from
3. Be cautious of the various self-proclaimed experts on YouTube. Vet them carefully before you take their advice
4. While you don't need to specialise, be aware that equipment varies based on type and depth of hollowing



Don't start your deep hollowing learning process working through small openings. Begin practising in the wide open to learn tool control



Hollowing lidded boxes is great practice. Notice the desired finished wall surface to work towards

Sequence of hollowing

Like with any turning, the stress on the workholding method and the material needs to be considered. Hollowing, especially deep hollowing, can make large demands on both. As such, be certain you've planned your mounting and turning process to support your cutting demands. Smaller turnings can be mounted using a mounting tenon and chuck. Larger turnings or more stressful hollowing based on material or design do better with a faceplate mounting. By using the appropriate screws and good faceplate mounting techniques, you'll have a secure mounting that can accommodate the larger stresses caused by your hollowing process. Depending on whose advice you take, there are several hollowing sequences available. I'll share mine. I favour a rough shaping of the outside to provide the form. However, I don't shape the base too small; I leave extra material there for support until the hollowing has been completed. I'll finish the shaping later since the cutting to finish the shape is a very low stress operation. From

the inside, I usually do a drilling to the full depth of the finished hollowing. This lets me hollow from that hole to the desired inside finished wall. It sets the bottom for me so I can avoid excessive measurements on that dimension. Much like turning a thin wall bowl, if you do your cutting full depth as you proceed to the wall, you'll remove needed strength from below the cut. By processing in stepped depths, you can cut to the finished wall having material below supporting the material. This provides not only mass but also strength to minimise flex and vibration in your area of cut. By finishing at that depth and then processing the next increment of depth, you'll take advantage of the material below supporting your cut. I step and repeat until I get to the bottom. At every level, I make a faring cut to blend each step together. It is a methodical process that allows me to hollow to a thin wall with minimal flex and vibration chatter. There are others that are proponents of other methods. I only share that this method works well for me. You are



Cut to your finished wall allowing the material underneath to support your cuts working in shallow depth incremental steps. Step and repeat



When turning green wood, deep hollowing or not, keeping it sealed and wet is important when leaving even for the briefest time



Regardless of your cutting sequence, the debris needs to be cleared from the turning to allow the cutter to effectively reach the surface

Cutters

There are a host of cutters that can be used for hollowing. The original hollowing cutters were metal machining tool bits ground for use essentially as a scraper. By using a small area of engagement, they worked well removing material in a relatively low stress manner, depending on presentation and the operator. Flat stock that is shaped can also be brought to bear. This scraping action usually has more drag and the area of engagement needs to be carefully controlled lest you cause a catch. This is less of a problem in end grain hollowing as compared to face grain hollowing, but it is a concern in both. The face grain issues are not only based on the area of engagement but also the constantly changing grain orientation to the cutter. This continuing change in forces can cause problems unless you are careful. The shaded cutter introduces the true cutting action with the aggressiveness being tamed by



The mainstays of the hollowing tools for both the hand-held and the hollowing bar systems



Superb at hollowing end grain green wood, the Martel hook tools are not for newcomers

the position of the hood. With the popular expansion of the carbide cutter, there are many companies offering cutters and tools to do hollowing both freehand and with a hollowing bar. All of the cutters available can be used freehand and with the aid of a hollowing bar or system although some are difficult to control freehand. The selection

of a cutter is a personal choice. Some turners are capable of producing wonderful work with the simple machinist's tool bit, whereas others are proponents of the shrouded cutter designs. Of course, selection is often driven by the material, orientation, depth of hollowing and more. Cost ranges from virtually pennies to £170 or more.



A shrouded/shielded cutter's aggressiveness is controlled by how much of the cutter is exposed from beneath the hood



Carbide cutting tools are now available designed and manufactured for turning in forward and reverse. Remember to lock the grub screws

TIPS ON CUTTERS

1. Simple steel cutters do work with proper grinding and presentation
2. Orientation of the wood plays a big part in selection of cutters
3. Green wood and dry wood will usually demand a different cutter for effectiveness
4. Clearing of cutting debris is critical for any cutter to work effectively
5. Safe operation requires attention to speeds and feeds. All good turning practices apply to hollowing

Lasers

Nearly all of the hollowing systems available to turners offer a laser attachment option. Because you are working blind for the most part with very limited or no view of the cutter area, a method to know the cutter location is very helpful. With the hollowing bars, the laser attaches to the bar and projects the laser beam down from the top. The user can set the laser prior to the cutting to indicate the cutting edge position or a distance away to mark the desired wall thickness. The laser does need to be periodically reset based on the orientation of the cutter to the work. This is particularly important when hollowing under the lip and when working on the corner near the bottom of a piece. The most common setting for the laser is a distance from the cutter measured for the finished wall thickness. The cutting operations are performed with the laser shining on the top of the work. When the laser image falls off the edge of the work, the cutter has arrived at the proper thickness. The measurements of wall thickness can always be achieved using a pair of callipers or even a bent coat hanger. This requires frequently stopping the lathe and removing the cutter but it works well and has been done since the very beginning of woodturning. I have seen laser arrangements rigged to freehand tools but it is not as common as the systems available from the hollowing bar manufacturers.

TIPS ON LASERS

1. Be cautious of the laser beam itself: it is not a toy and should never be pointed carelessly. It has the potential to cause vision problems temporarily or even permanently
2. Focusing the beam to a sharp point at the distance being used is most effective
3. Don't be lazy! Readjust the laser as needed as you progress in your hollowing
4. The beam location needed to be dimensioned perpendicularly to the cutting action



Depending on preference, you can adjust the laser to show cutting tool edge or set for a dimension away from the edge



Adjusted for desired wall thickness, once the laser beam falls off the turning that dimension has been achieved



Using a quality, properly adjusted steady rest to minimise vibration and flexing maximises a laser's value on a hollowing system



Turning a deep hollowing to a wall thickness of 1mm is achievable with use of a steady rest, a laser and care in turning

Modern electronics

There are systems on the market now that let you 'see inside'. These systems will project the shape of the turning and the cutter's position within that turning. These systems can be used both inside and outside. Nothing prevents you from using them as pattern systems for repetitive turnings. I am aware of two being offered commercially but have no personal experience with either. I include them to make you aware of their presence. There are also many home-grown efforts underway to make similar systems using phone cameras, home computers and other support software. More on these efforts as they become more mature.

Conclusion

If you've turned a bowl, you've done hollowing. If you've turned a lidded box, you've done hollowing. With this primer, I hope I've given you incentive to begin exploring. It need not be expensive. I still have my Chris Stott style hollowing tools that are modestly priced or easily made by the shop handy turner. Of course, the sky is the limit should you want the full blown hollowing rig with the electronic systems being offered now. Whether you use a Forstner bit and clean up the evidence or make hollow forms through a 10mm hole at the top, give hollowing a try. Not only is it fun but can open a whole new genre of turnings to your woodturning repertoire. ●