PHOTOGRAPHS BY KURT HERTZOG

10 tips for drilling better holes

Kurt Hertzog gives his best advice on drilling better holes

As woodturners we are often cutting holes, but there are many occasions where drilling holes is the method needed. Whether it's a pass through for fasteners, locations for assembly dowels or one of the many other purposes, the ability to drill a proper hole is a skill. It might seem as mindless as chucking up the drill bit and having a go at it, but here are 10 tips to creating better quality drilled holes:

My drill sharpener accurately positions and presents the bit to the diamond wheel when it is running. Safety cover removed for visibility

Covering a wide range in drill sizes, orienting and sharpening the drill only takes moments

1 Sharpness is paramount

Like your turning tools that will cut well and cleanly when they are sharp and properly presented, it's the same with your drill bit. In this day of throwaway, few people outside of the trade have ever learned to sharpen a drill bit freehand. It's that sad fact that ensures the drill bit that's purchased in the bubble pack at the home centre will get dull quickly and continue to be used regardless of the quality of the hole it cuts. It will continue to be used until it becomes so woefully inadequate, but the turner rarely goes to purchase a new one to replace it. You will need a sharp drill bit to cut wood, plastic, metal or other materials whether they're new from the package or just re-sharpened. The calibre of the drill bits available, other than the industrial trades, are so poor that two things typically happen: firstly, they don't sharpen extremely well and even once it's done to their best, they don't hold a usable edge for long. In spite of that, don't be afraid to learn to sharpen or, as I did, buy an inexpensive drill sharpening machine.

The home hobbyist versions are very modestly priced and it won't take long before it has paid for itself. Now, a sharp drill is only a minute away. Like your tools, keeping an edge sharp is easier than sharpening so don't be afraid to touch up a drill after some use. It'll be fresh and keen for your next needs.

2 Give your drill a good start

It may seem unnecessary, but I can't recommend this more highly, create a starting location for your drilling. Are there times you might do okay without it? Sure, but like any process if you make it rote and do it as a matter of course, you'll find the seconds it takes is shorter than thinking whether it is necessary or not. I give every hole I drill a starting location by using either a centre drill, spring loaded centre punch, prick punch, hammer or even a nail and rock. That impression in the surface allows the nose of the drill to seat a bit below the surface of the wood and begin drilling without wandering or skating. Regardless of whether you use a pistol drill, a drillpress, your lathe or other mechanics to execute your drilling, precisely locating your centre point and giving your drill the opportunity to get a good start will give you a better quality drilling.

Whether a punch, centre drill or any implement to create a starting 'hole', give yourself the advantage of a starting location

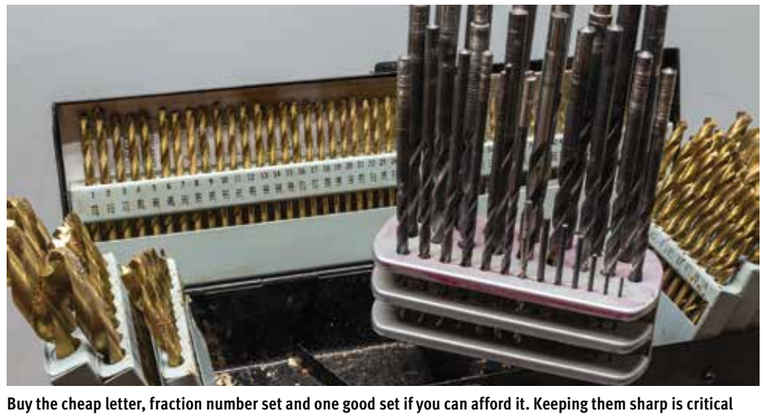
For speed and convenience, I keep a machinist's centre drill chucked up in an inexpensive chuck with its own taper

The advantage of a starting location can't be stressed enough. No wander, no drift, easy starting with a place to begin

3 Select the correct drill type

To say 'drill bit' really doesn't narrow it down very much. There are more types of drill bits than most of us are aware of. Like most of the tools, there is a reason for any particular style and type. Their design, size, shape, material, sharpening characteristics, length and more are all for a purpose. Most of us will be using the standard jobber length-type twist drill in either 118° or 135° nose angle. These in either angle will work quite nicely for our typical needs. For most holes of a quality nature, you'll need to use a twist drill or Forstner bit. Spade bits are inexpensive in the larger sizes, but they cut a brutal hole. More information on these types, uses and sharpening is in *Woodturning* 278. Carbide tipped drills aren't needed for wood and will not take as keen an edge. Besides, sharpening carbides requires a special wheel. Titanium Nitriding (TiN) is a wear resistant coating applied to cutters in industrial applications to extend life between changes, which is a 'not needed' capability in our type of applications unless it comes for free. Bradpoint bits are nice for cutting into face grain, but have little benefit in drilling the end grain. Most bradpoints I've seen are so poorly ground that the centre point isn't even equidistant between the wing cutters. Not a good recipe for straight tracking of the drill. If you buy and use bradpoint drills, be certain the centre spike is truly dead centre and accept the fact that you probably won't be able to sharpen the drill. None of the drill sharpening units I'm aware of will deal with them. Getting good quality, high-speed steel twist drills will serve you well unless you have very specialised needs.

While bradpoint bits can offer some advantage in face grain cuts, I find most are too poorly made to be of good advantage

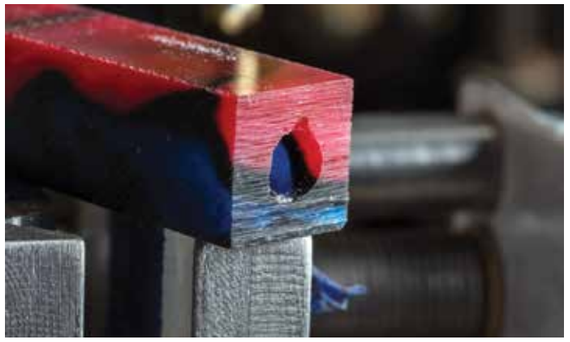


Buy the cheap letter, fraction number set and one good set if you can afford it. Keeping them sharp is critical

4 Use appropriate speeds and feeds

You've certainly heard the term 'speeds and feeds' from me before. It is the catch-all term that says, how fast are you turning? And how hard are you pushing? It applies to nearly any kind of cutting, and drilling is a perfect place to use it. The rpm you select to drill is based on two key items: what is the material being drilled? And what size is the hole being drilled? Obviously, popular drills are much differently than blackwood requiring the use of a different drill rpm. Denser woods require a slower speed and less dense woods can be drilled at a higher rpm. The size hole also has a huge impact on your rpm choice. A 3mm hole can be drilled at a fast speed, while a 25mm hole needs to be slowed down. It is simply surface feet per minute at the outer edge of the drill bit. The SFPM of the 25mm drill is far higher than that of the 3mm drill running at the same rpm. Good technique for drilling involves getting the hole centre established using a start point advancing the drill to just touch that location and get properly located. Apply some drilling force, drilling slowly enough to avoid chatter and breaking the chip. Breaking the chip involves relaxing the drill forward force a bit to let the chip break and exhaust out of the flutes. This process is repeated until near the breakthrough point. At that point, relaxing the forward force will provide a better quality hole at breakout. If the exit hole size, shape and quality are key, they provide a sacrificial backing material to support the material being drilled as you break through, even with your relaxed pressure. Some other helpful ideas for minimising destruction of the entry or exit surfaces are using packing or painters tape over the wood. These can help minimise damage when combined with a backing material.

Proper speeds and feeds will drill efficiently, without overheating, and will eject debris effectively



Plastics are especially susceptible to blowout. A sacrificial backer and/or relaxing the force as you approach breakthrough helps

5 Eject the chips

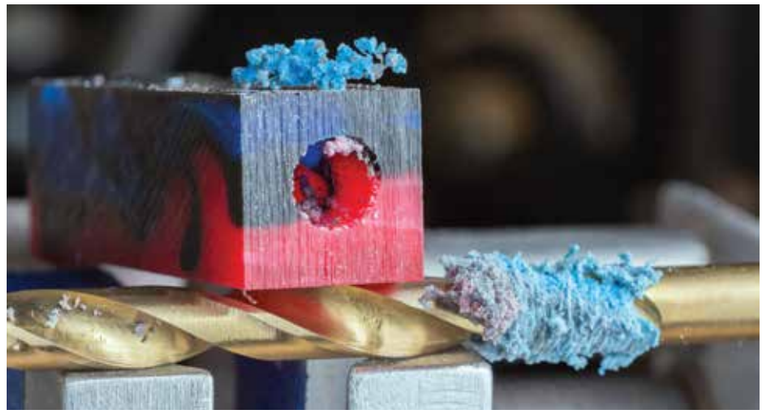
The only spot that really does any cutting work is the two edges at the nose of the drill. All else involved is solely as a support mechanism. Those sharp cut edges that twist up alongside the flutes aren't there except as part of the process of making the drill flutes. The flutes, their design and their functionality are exclusively known for getting the already cut debris clear of the cutting edges so they can continue to cut. Depending on the species, drill size and technique, you may have a nice, continuous exhaust of cut material from the flutes. This is especially true with proper breaking of the chip. If you don't have debris being thrown from the drill flutes as you drill, retract the drill, turn it off and clean the flutes. Many times, the flutes will become clogged with material and not continue to self feed upwards and out. If you continue to drill with the flutes plugged, you'll negatively impact the quality of the drilling. Not only will things overheat and probably smoke, but you will have debris preventing the cutting edges from working correctly. It only takes a moment to stop and clear the chips. There are some species where it needs to be done repeatedly. Take the time to do it to drill the best holes possible.

The already cut debris exiting quickly and continuously lets the cutters have a clean area to work

Breaking the chip, easier in a drill press, is good practice to keep the chip strings short and safe

6 Keep things cool

Smoke is never a good thing when drilling wood. You can drill quickly and efficiently without creating a lot of smoke. On occasion, you may get some, particularly from those species that like to burn such as cherry (*Prunus* spp.) but it should be rarely and only a little bit. If you've got smoke erupting from your drilling, regardless of your drilling method you've got other problems. Chances are it is one or more of these: when a drill is dull, rather than sharpen it we often just push harder and speed up the rpm. Smoke can often be caused by far too aggressive speeds and feeds. Slow things down and let the tool do the work. Plugged flutes will also impact the drilling location and just continue to pack things in with no relief for heat or debris. Smoke is a good indicator that shows it is time to check the flutes. Lastly, even without smoke, many turners overheat their drilling. This is often true with plastics, they wonder why the holes aren't round and can have recast plastic on the inner diameter. The short answer is speeds and feeds are too high.



No smoke, but things did get too hot. The hole is egg shaped, there is recast in the hole and the melt is fused to the shank

The longer answer involves the thermal conductivity of plastics and how being a thermal insulator traps the heat inside rather than shedding it. For plastics, it is all about being slow and easy. Once you've screwed it up it really is scrap at that point. Besides, removing a too hot to hold drill bit from the drill chuck is no joy. When things get hot, stop and take a rest. Let things cool and then continue.

7 Step up sizes

Even in a machine tool shop with specialty equipment of massive sizes they rarely go from zero to big in one step. If you have a larger sized hole to drill, begin with a pilot hole. You'll drill that pilot hole using your starter location and all of the good practices for drilling. Once that has been accomplished, step up to a somewhat larger size and drill another hole using the smaller hole as the guide. Once that has been accomplished, do it again. Depending on the material being used, the drilling equipment and the final size needed, you might need to only drill a pilot hole and then the final size. You might need several intermediate drillings. Don't believe that if you go slow enough and think things are rigid enough that you can put a quality 25mm drilled hole with a twist drill into a turning on one go. It is possible with a Forstner bit, but not with a twist drill in my experience. By stepping up through intermediate sizes, you'll be able to let things centre on the previously drilled hole and work far less since the current drilling is opening the hole.

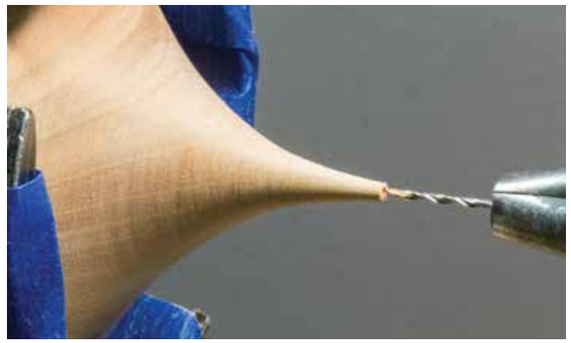
Start small and work your way up to the final size. The quality of the final hole will benefit from the process

8 Check your sizes

If you need a specific hole size, you need to do a couple of things to ensure that you get it. First, you need to check the actual twist drill you intend to use. Whatever the manufacturer marked is usually close, but on smaller drills you can't even read it. Obviously, the slop in sizes in the index stand is no guarantee of the correct size. When you measure the drill you're going to use, measure it across the flutes, that is where the work occurs. Even when you have that across the flutes measurement, you still don't know what your final hole size will be. For the most part, we aren't working in thousandths of an inch, but sometimes we are. When I drill my custom nibs for the inkfill, my minor diameter is selected to be 1.98mm. Because my inkfill dimension is 1.90mm, I really can't live with a no clearance fit at 1.90mm or a sloppy fit at 2.08mm. You may not care a hoot about the real dimension, but only if a mating part fits properly. Again, too small and you get press fits with no glue gap. Too big and the precision is gone, and the adhesive needs to fill the slot.

If size is important, measure! You measure a drill diameter across the edges that do the cutting

Machinists starter drills come in all sizes from very big to very little as do chucks and drills



Do you think there would have been any way to start a No.62 drill in the point of this cherry roof without a start hole?

9 Different materials yield different size holes

If you drilled the same hole in a variety of species of woods and in different grain orientations, I think you'd be surprised and the variation in hole sizes that resulted by doing this. The end grain will drill differently than the face grain in the same species with slightly different results. Now throw in the various species and any cross grain drillings you might be doing. Plastics and metals are obviously going to have a different response. Though not often that critical, when I need a special size or a special fit, I will test drill my hole(s). I will use the drill I intend to use and a scrap of the exact same piece of wood in the intended orientation. It lets me work out any special workholding if needed and zero in the best speeds and feeds. Once I've completed the practice hole(s), I can measure or test fit things to be certain they meet my needs. If there is a problem, I can easily regroup and change drill sizes, parameters or anything else that might impact my results.

Every species and every orientation is liable to give you a slightly different final result. If needed, drill a test piece to find out

Upon successful completion, all is well and I can proceed with confidence. How long does this take? Usually a minute or two at most. Is it worth it? For me it is when the size is key.

10 Practice

I'm certain none of us looks forward to telling our turning mates you can't go off with them since you are going to the 'shop to practise drilling holes. I don't treasure it either. Like any skill, reading about drilling doesn't perfect it. Understanding it doesn't perfect it. Only doing it repeatedly and learning from the mistakes will you build the skills to make drilling holes a rote skill. Of course, you can continue on as you were if you are content with your current results. I would liken this to any of the skills you have or will get in the woodshop. You didn't master the skew chisel by reading about it or understanding it. You mastered it, if you have, by spending sessions at the lathe practicing each of the cuts until you got comfortable with them. Gradually, your quality of cuts improved and the frequency of catches decreased and one day you were comfortable reaching for the tool. Don't worry about setting aside specific times to practice drilling holes. When you need to drill, spend a few minutes ahead of time practising. Make that your mode of operations and soon you'll see the improvement. The great news is that mastering drilling will take a small fraction of the effort that mastering the skew did.

Don't be afraid to practise. Take scraps and drill holes. Try long lengths with thin walls and then check for uniformity

Conclusions

I view everything in this series and the predecessors as building blocks. Individually, they might seem inconsequential. Collectively, you'll be surprised if you look back to see how far you might have come. Just knowing the 'shop equipment, workholding, processes, tools, sharpeners, techniques, good and bad practices, shortcuts and the other items should be helpful. I try to share things that will improve your skills and make your shop time more productive. Is drilling a hole that big of a deal? You'll need to be the judge next one you do poorly.