NEW DEPARTMENT

ADVANCED POWER TOOL TECHNIQUES

Diving Deeper into a Drill Press

By A.J. Hamler

Your drill press is ideal for cutting circles or wheels, mortising and boring angled holes with great precision if you set it up properly and use the right bits.

Hand drills are essential tools for every woodshop. They can create just about any kind of hole, but they do have their limits. Drilling at exact angles, even at a simple 90 degrees, can be difficult, for example. They can only handle bits up to a certain size safely, and there are some bits — like the circle cutters you'll see in a moment — that they simply should never be used with.

That's where the drill press comes in as the perfect complement to your handheld hole-maker. Perfect right-angle everyday drilling, large bits, repeatability for identical holes — you name it. That's where a drill press excels.

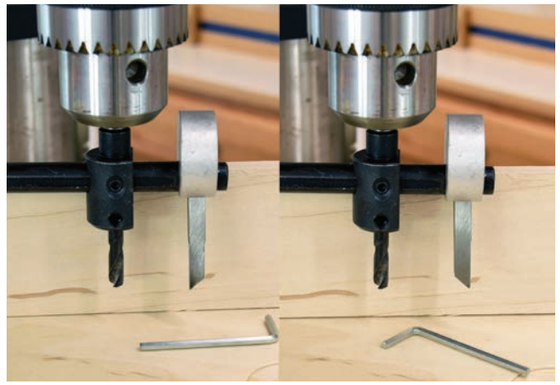
And combined with a few next-level techniques for those with a basic working knowledge of the machine, it's easy to see just how valuable and useful a drill press can be.

Adjustable Circle Cutters

Some drill bits get pretty big, but when you need even bigger holes it's time to call in some help. And that's where adjustable circle cutters — commonly called "fly cutters" — really shine. Even better, they not only cut holes but also can produce perfect wheels for toys and other projects.

Fly cutters consist of a central pilot bit mounted into a heavy shaft that mounts in the drill press chuck. An extendable cutter arm goes through a hole in the shaft, with a vertically oriented cutter on the end. Backing off a set screw releases the arm so it slides in and out for cutting circles from 1" to 6" in diameter, measured by setting the circle's radius.

Adjustable circle cutters are set by positioning the tip of the cutter to the radius of the desired hole or disc. Here, a setting of 1¼" will produce a 2½" disc.



Reversing the cutter changes the type of hole that's created. With the cutting tip on the inside (left), you'll produce a disc or wheel with a smooth edge. Oriented outward (right) produces a clean-edged hole.

The cutter has an angled business end that determines if it cuts an inside or outside circle. If you want to cut a clean hole, set the cutter so the tip is on the outside and measure your radius from there. For wheels or discs with clean outer edges, reverse the cutter to the inside and set the radius.

Let's make a wheel to show the process. With the cutter set for an inside cut, adjust to the desired radius. In the top left photo, I've set it at 1¼" for a 2½" wheel and mounted it in my drill press, followed by clamping the workpiece to the table atop a piece of sacrificial scrap.

It's essential to emphasize three safety issues. The first is that clamping the workpiece, often optional for ordinary drilling, is absolutely mandatory here. A fly cutter, by its nature, spins metal in a very big circle that's virtually invisible when moving. You **do not** want your hands anywhere near it.

Second, that big spinning cutter can grab and throw a workpiece in the blink of an eye, so securing it in place is a must.

Finally, back off the speed. Because of their asymmetrical nature and the large diameter of the cut, fly cutters should be run slowly. Never run a fly cutter higher than 500 rpm, with 300 to 400 rpm being a much better range.

It also goes without saying (but I'll say it anyway) that a fly cutter should only be used in a drill press, *never* in a handheld drill.

With everything set, turn on the drill press and lower the cutter slowly into the workpiece. Don't force it into the wood or you'll get overheating and burning. Let the cutter do its job.

Steadily move the cutter through the stock until the circle center comes loose and spins with the cutter. Shut off the machine and allow

Utmost caution is essential when using fly cutters — you can barely even see it when it's in motion, but there's a lot of spinning metal there. Use clamps and keeps your hands well away!

This sample 2½" wheel came out perfect. Reset the workpiece and clamps before cutting additional pieces.

For cutting mortises, use a Forstner bit matching the workpiece thickness to set and lock the fence. Then, swap the Forstner bit for your drill bit, and the mortise you drill will be perfectly centered.

The most important details of laying out a mortise for drill press cutting is a center line and stop lines on the workpiece. Drill only inside the lines.

Establish the length of your mortise with a hole at each end inside your stop lines, then remove the remaining waste along the middle with a series of sequential holes.

everything to spin down completely before removing the disc.

Mortising

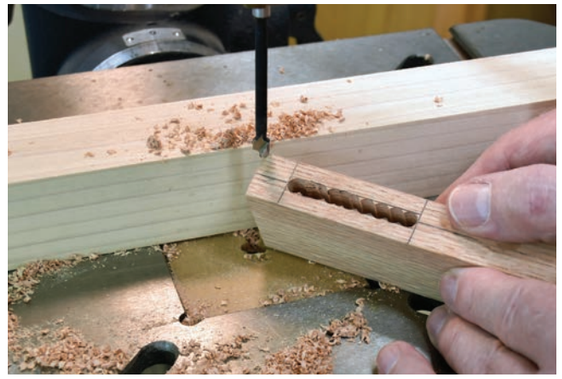
Nothing beats a dedicated hollow-chisel mortiser for cutting mortises quickly and perfectly. But lacking one, a drill press (upon which mortisers are based) gives them a run for their money. Mortisers work by connecting a series of square holes to create the mortise. A drill press can do that same thing but with round holes instead.

Since mortises are aligned with a workpiece, and almost always centered, a fence is necessary – either one designed for the machine or simply clamped to the table. The first step is setting that fence, an easy task with a quick trick.

Grab a bit matching the thickness of your workpiece – a Forstner bit with its smooth sides is ideal – and chuck it up. In the top left photo, I've used a 3/4" Forstner bit to match my 3/4" workpiece.

Now, simply slide your fence till it touches the bit, and lock or clamp it in place. That's it. Whatever bit you use to drill the holes for your mortise, it will be automatically centered on the workpiece.

Setting up the mortise is just a matter of marking out the width and length along a center line on the workpiece. Here, the sample mortise is 1/4" x 2", and I'll use a 1/4" Forstner bit to do the drilling. Forstner bits cut extremely clean holes you can overlap, and they're perfect for mortises. As an alternative, a second-best choice is a brad point bit.



Drilling holes that touch or slightly overlap quickly removes most of the waste from the mortise. With the fence and depth stop now set, you can churn out mortises one after the other without changing anything.

To complete the mortise, use chisels to remove the remaining waste left over from the drilling process, and square up the mortise ends if desired.

Set the stop to the desired mortise depth, and begin by drilling at each end of your markings to establish the mortise length, taking care not to go past the stop lines. With the ends of the mortise established, slide the workpiece along the fence and drill a steady line of holes that touch or slightly overlap until all waste is removed.

Use your favorite chisels and hone the mortise to remove what little waste remains and to smooth the mortise walls. If you plan to use square-ended tenons, square up the mortise ends as well. For round tenons, the drill holes on the ends of the mortise are all you need.

Drilling Angled Holes

Drilling angled holes, especially a series of holes that must all match, is difficult by hand. But with a drill press's ability to tilt the table, all it takes is to set the correct angle once and you're good to go.

An accessory every drill press should have is a straight metal calibration rod. This can be either aluminum or steel, from 1/4" to 1/2" in diameter and at least a foot long. In a pinch, a perfectly straight dowel will also work, but you'll have better reliable straightness with metal.

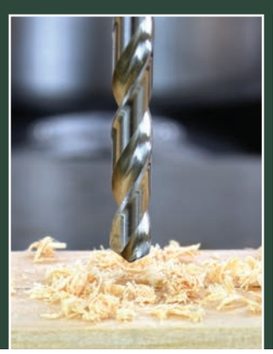
Use this rod to set table angles, ncluding verifying and tweaking your drill press for perfect 90-degree everyday drilling, as shown in the photo at right. Sure, every drill press has a setting gauge built right into the table, but do you really trust it? Nah, me either.

To demonstrate, I'll

A good accessory to keep with your drill press is a metal calibration rod. Chucked up into the machine, you can use it to check and set precise drilling angles.

Types of Bits

Note on sizes: Common size range is listed, but larger and smaller specialty bits are available in each category.



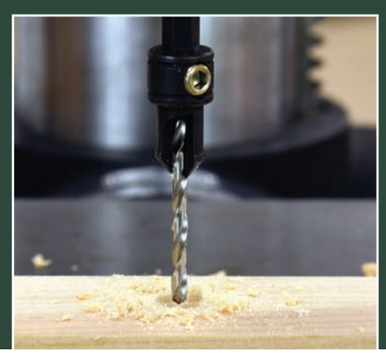
Standard Twist Bit
"Classic" all-purpose drill bit; spiral flutes clear waste. Best choice for metal.
Sizes: Sets with 1/16" to 1/2" bits are typical.

Brad Point (or Spur Point)
Self-centering; wider spiral flutes clear waste easily. Produces ultra-clean holes in wood.
Sizes: 5/64" to 1"; 1/8" to 1/2" most common.

Spade Bit
Self-centering, for large holes. Does not clear waste. Often makes ragged holes, so best used where hole is unseen.
Sizes: 1/4" to 1½", and extra-long bits are common.

Forstner Bit
Cuts large, very smooth and clean holes; excellent for cutting mortises and dowel joinery.
Sizes 1/4" to 3½".

Hole Saw
Multi-material use; excellent for larger holes in sheet stock or drywall. Central pilot bit keeps saw cutting around a single axis. Does not produce the cleanest holes.
Sizes: 5/8" to 6".



Countersink Bit
Variations with or without pilot bit, creates countersink or counter bore to lower screwheads below the material surface.
Sizes: Typically correspond to common screw/bolt heads.

Plug Cutter
A hole cutter that excels at creating face-grain plugs; used in tandem with countersunk screws. Both tapered and straight versions are available.
Sizes: 1/4" to 1/2".

Once zeroed to the table, a digital angle gauge gives an exact reading as the table is rotated into position for angled drilling. One of these handy gauges will earn its keep with all sorts of tool setups.

A bevel gauge, like this digital model, helps set table angle in combination with a calibration rod. Originally set at 90 degrees, the bevel now indicates 100 degrees, just right for a 10-degree hole.

create the seat for a small three-legged stool with legs angled at 10 degrees. First, I verified that the table is currently at 90 degrees, then I zeroed a digital angle gauge on the table surface.

Next, I loosened the table bolt and removed the 90-degree alignment pin (these are under the table at the pivot point). With the angle gauge zeroed, I just tilted the table 10 degrees and then locked it down again. Done!

You can also set the angle with a digital bevel gauge in a similar way. First, with the table still at 90 degrees, register and set the gauge to match using your calibration rod. Loosen and tilt the table, adjusting the bevel gauge until it reads 100 degrees against the rod. A non-digital bevel gauge also works fine in concert with a protractor to get the angle, but nothing beats the ease and accuracy of digital measuring tools.

With the table set and locked, install your drill bit (for clean holes I'm using a Forstner bit here), set the depth stop and clamp the workpiece into place according to the layout/drilling marks. Now just drill, unclamp, rotate, re-clamp and drill again.

Any variation of angles is possible. You could even turn the table completely vertical and in line with the calibration rod for, say, drilling holes in the ends of table legs. Just clamp the workpiece to the table surface, check for verticality front-to-back, and drill away.

When done, return the table to level, replace the alignment pin and fine-tune the table for 90-degree drilling once again.

If you need lots of holes of the same angle repeatedly for multiple projects, it's better not to tilt the drill press table at all. Instead, make a drilling jig with the angle built in. For a series of bar stools I enjoy making, I made the jig shown in the bottom left photo that takes out every bit of measuring and guessing.

For the bar stool's leg rungs, I needed holes drilled at 5 degrees, so I made a jig with a flat bed angled that amount. A fence at the back of the jig makes aligning the legs simple, while an extended base at the back makes it easy to clamp the jig down. Open areas at the bottom of the jig offered room for hold-down clamps to keep the leg workpiece steady.

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With workpiece drilling locations marked, clamp the stock in place and set the depth stop. Then just drill, rotate, reclamp and repeat.

If you build numerous projects needing the same angled holes, making a jig for the task eliminates the need for tilting the table – it always stays at its original 90 degrees.