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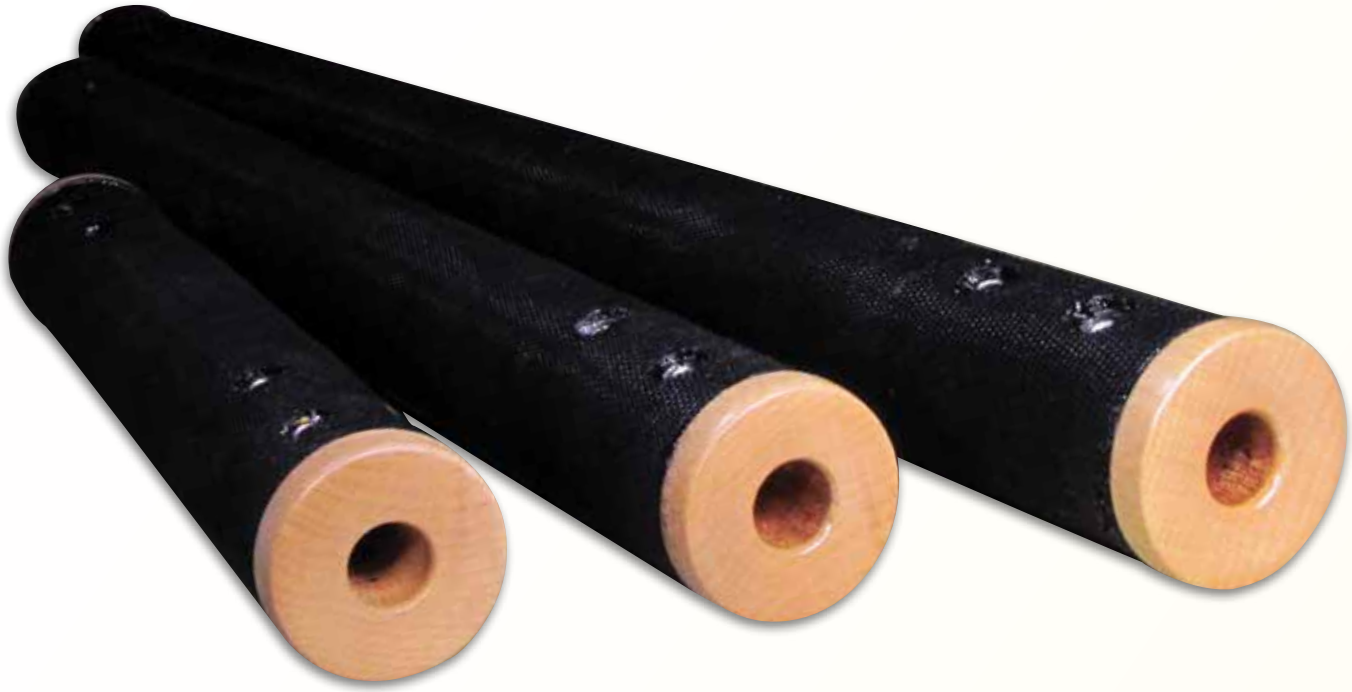


- CUSTOM - TOOL HANDLES

Carl Ford

I have found most commercially available tool handles uncomfortable to use for a variety of reasons. So I found a way to make adjustable handles that are just the right diameter for my grip, the right level of softness, and the right weight and length for my tastes. You can make customized tool handles at a fraction of the cost out of PVC pipe, craft foam, heat-shrinkable cloth, and a few other easily attainable supplies (*Photo 1*).

Solving design challenges

When I first thought of making my own handles, I had to solve a couple of design challenges. First, I wanted a soft-grip material, but I knew I could not simply slip something like a rubber hose over a long piece of pipe and end up with a snug fit. I hit upon the idea that I could heat shrink a soft material onto the pipe for a perfect fit. But the cost of 2"- (51mm-) diameter heat-shrink tubing was too high. Then I found a heat-shrinkable, polyester woven fabric (*see Sources sidebar*). It creates the perfect outer handle surface—not too slick and not uncomfortably rough.

The next challenge was how to mount a ⅝"- (16mm-) diameter tool shaft in a 1¼" (32mm) PVC pipe. Commercially available adapters and inserts for making your own handles are designed to fit into a ¾" (19mm) hole, much smaller than my base material. I thought ▸

about making an adapter out of wood but decided a short piece of wood would be too prone to splitting when stressed. The breakthrough came when I realized I could insert the hardwood adapter farther into the PVC pipe, making the pipe act as a ferrule that prevents the wood from splitting. I could hold the tool in the long wooden insert using set screws reinforced by steel threaded inserts (*Photo 2*).

Considerations

PVC pipe of 1¼" diameter is just the right size for my hands, but you can customize the feel by using a different diameter and length of PVC. Schedule 40 1¼" PVC pipe is actually 1.66" (42mm) outside diameter and 1.36" (35mm) inside diameter. You may be thinking PVC is too flexible to make a good handle, and that is true if the PVC pipe is less than 1" (26mm) diameter. A 1¼" pipe is quite rigid.

You can also use schedule 40 aluminum or steel pipe, but they are more expensive and I do not like heavy handles. I try to adjust my turning technique to eliminate vibration problems rather than adding weight to my tool handles. But if you want to add weight, you can fill an old sock with lead shot or aquarium stone and insert it into the PVC handle.

Sources

Three of the items needed for these tool handles may be hard to find, so I have provided my preferred materials, along with a reliable source and model numbers. I get all of the following items from McMaster-Carr (mcmaster.com):

- Heat-Shrinkable Woven Fabric Tubing: McMaster-Carr item #2587K16
- Steel Threaded Insert for Set Screws: McMaster-Carr item #90248A027
- Cup Point Set Screw, McMaster-Carr item #92311A578

I insert a scrap of metal rod in the wooden insert at the tail end of the PVC handle to counterbalance the weight of the cutting tool. Adjust the length of this rod to attain just the right balance.

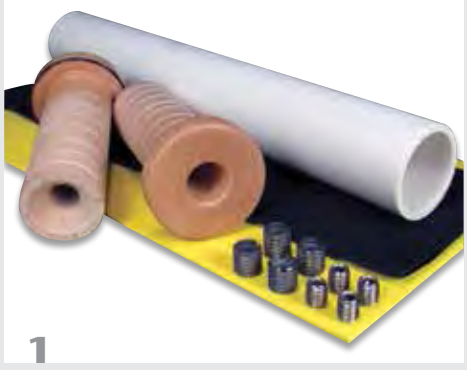
Making the handle

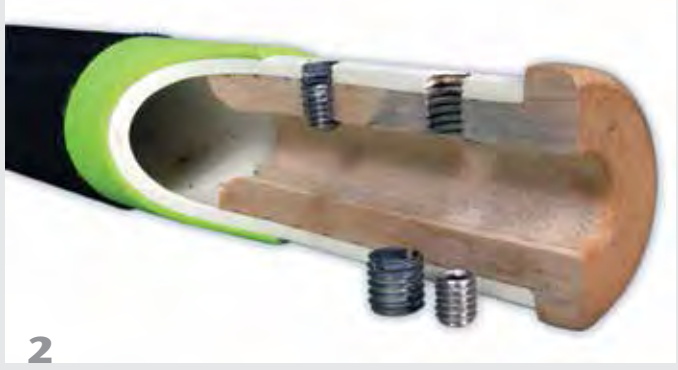
Prepare the PVC

1. Start by cutting your PVC pipe to length. A hacksaw works well for this. I generally like handles that are 16" (41cm), 22" (56cm), or 30" (76cm) long.
2. Cutting PVC often creates a burr on the inside that you need to remove before you attempt to turn a snug-fitting wooden insert. Remove the burr with a deburring tool or sandpaper wrapped around a dowel. I also cut and debur a 6" (15cm) length of the same diameter PVC pipe, which comes in handy later, while turning the wooden insert: it is easier to test fit the tenon size with a shorter length of PVC, as you can just slide the tailstock out of the way and test the fit.

Turn wooden handle inserts

1. For a 1¼" PVC handle, start with a 2¼" (57mm) × 2¼" (57mm) × 5" (13cm) blank of hardwood. After turning it round and making a tenon, mount the blank in a scroll chuck. True up the end and create a small dimple in the center to help start a drill bit. I like to drill a ½"- (13mm-) deep starter hole with a ½" drill point countersink (often used in metalworking). These countersinks are short and stout and therefore drill a starter hole dead on center (*Photo 3*).
2. If you are going to mount a ⅝"-shank cutting tool in your handle, drill





(1) The author's ingredients for a customizable, durable, and inexpensive tool handle.

(2) Cutaway showing the tool handle's components and design. A cutting tool is held in the hardwood insert and held firmly by set screws.

a ⅝" hole all the way through the insert blank (*Photo 4*). The hole size should match the diameter of the shaft of your cutting tool. I like to use drill bits with a Morse taper shank that fit directly into the tailstock of my lathe. They are ideal for drilling deep holes on center because they are long, stout, and fully supported by the matching Morse taper in the tailstock. Each handle has two wooden inserts, one on each end. I often make handles with different sized holes on each end to accommodate different cutting tools—½" and ⅝" holes on short handles; ⅝" and ¾" holes on longer handles.

3. With a pencil, lay out the tenon and shoulder (*Photo 5*). Mark the total length of the insert at 4" (10cm) with a ⅜"- (10mm-) wide shoulder on the headstock side. The tenon has to be on the tailstock side so you can test fit it into PVC pipe. With a narrow parting tool, make a ¼"- (6mm-) deep slot a little below the shoulder to remind yourself not to go any farther than this while rough turning the tenon.
4. Turn a tenon that will fit snugly into your PVC pipe. Vernier calipers are useful here, as they have both inside and outside jaws that move in sync. When you set the inside jaws to the inside diameter of the pipe, the outside jaws will automatically be set to the tenon size you need (*Photo 6*). Use your calipers and a parting tool to cut a tenon on the first ¼" ▸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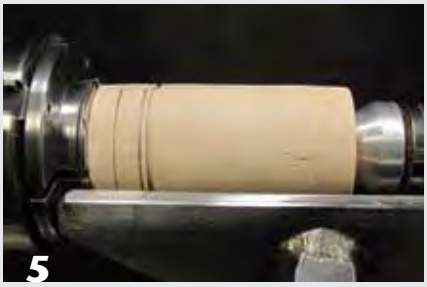
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of your blank (*Photo 7*). Test fit this section to your PVC pipe before roughing out the rest of the tenon with a spindle roughing gouge.

5. Turn the tenon incrementally to its final diameter, and test fit the PVC as you go. Use a pencil to keep track of how far the PVC pipe fits on the tenon (*Photo 8*). Switch to a parting tool to turn the area under the shoulder to final diameter and a detail gouge to cleanly cut the endgrain under the shoulder (*Photos 9, 10*).
6. With a pencil, lay out the finished diameter of the shoulder (*Photo 11*). I like to use the no math method. Slip your PVC pipe up to the shoulder and use a scrap of ⅛"- (3mm-) thick craft foam held on top of the pipe to mark the shoulder diameter. Using the foam as a spacer accounts for the thickness of the foam layer, which will be added later. The width of the pencil line will account for the thickness of the fabric that will go over the foam. Turn the shoulder to final diameter with a detail gouge, being sure to leave the pencil line (*Photo 12*).
7. Using a point tool or parting tool, cut shallow grooves every ½" on the tenon to improve the holding power of the epoxy (*Photo 13*). Do not sand the tenon, as a rough finish will further improve adhesion.
8. Part off the insert and remount in a chuck or between centers to clean up the parted-off end with a detail gouge. Then sand the shoulder and exposed end, rounding over any sharp corners with abrasives (*Photos 14, 15*). I like to apply a coat of shellac and then mask off the shoulder area and exposed end to protect them from glue during the next step.
9. Repeat this process to turn a second insert for the other end of the tool handle.
10. Glue the handle inserts into PVC pipe with a generous amount of epoxy (*Photo 16*).


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Drill and tap holes for the threaded set screw inserts

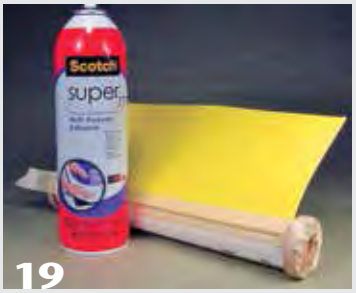
In use, your cutting tool is secured in the wooden insert of the handle with set screws. This allows you to easily remove and replace interchangeable cutters. I like to install set screws in holes that have been lined with threaded steel inserts, which add a layer of reinforcement to the hardwood and will stand up to lots of abuse. I use inserts that have ½"-13 threads on the outside and 5/16"-18 threads on the inside. These inserts accept any length 5/16"-18 stainless steel set screws (*See Sources sidebar*).

1. Start by drilling a ⅜"-deep starter hole using a ½" drill point countersink. The small point on the countersink really helps get the hole started where you want it, which can be tricky on a curved surface (*Photo 17*). Clamp the handle in a wooden hand screw or clamp it to a block of wood so it does not roll around while drilling. To drill straight holes, use a drill press if you have one. Otherwise, use a hand drill with a square held nearby for vertical reference.
2. Drill a 27/64" (11mm) hole through one wall of the PVC and wooden insert.
3. Tap threads in the hole with a 1½"-13 SAE taper or plug tap, available at most hardware stores (*Photo 18*).

Cut and install the foam and fabric

A layer of ⅛" craft foam (available at most craft stores) between the PVC and the outer fabric creates a handle that feels good and does not require a death grip. I glue the foam to the PVC pipe with spray adhesive. The heat shrinkable fabric is made in a tube shape and shrinks in diameter but not in length when you heat it with a heat gun. I recommend rehearsing the foam and fabric installation with scraps before you attempt it on a real handle. Spray adhesive is unforgiving, and the heat shrink fabric is not cheap, so a little practice will be very helpful. I normally use black foam to match the color of the outer fabric and help hide any installation problems, but I have used yellow foam here to better illustrate the process.

1. Cut the craft foam to the same length as the PVC pipe and wide enough to wrap all the way around the pipe with a little overlap (about 5¾", or 15cm wide for 1¼" PVC). The foam I purchase only comes in 12" or 18" lengths, so I have to use multiple pieces on longer handles.
2. Cut the heat-shrinkable fabric to length with scissors. Make it at least 1" longer than the total length of the handle because it is hard to control how the fabric distorts when it shrinks.
3. Draw a straight reference line from end to end on the handle. Then test fit the foam. Cut ¾" wide masking tape 1" longer than the handle and keep it handy. In a separate work area, put down some newspaper to catch any overspray and spray a coat of adhesive onto the back of the foam. Attach half the width of the masking tape to the long edge of the foam and the other half to the



handle with the edge of the foam on your reference line (*Photo 19*).

4. Avoid sticking the foam to the handle until after you have the masking tape all lined up. Wrap the foam all the way around the handle with no air pockets or wrinkles. The foam should overlap, but the masking tape will keep it from sticking to itself.
5. With a sharp knife, cut through the overlapped layers of foam at a 45-degree angle to create a tight seam (*Photo 20*). Peel the foam back a little and remove all of the masking tape. Then close up the newly cut seam.
6. Cut holes in the foam to allow the set screw inserts and set screws to be inserted later. If you are not using black foam, paint around the holes and ends of the foam on the handle with black acrylic paint to hide any fabric installation problems.
7. Fold back both ends of the fabric about 2", then slip it onto the handle. Center the handle in the fabric (*Photo 21*), but make sure the fabric does not cover the set screw insert holes.
8. Glue down only the ends of the fabric with spray adhesive to keep it from shifting around on the handle. To do this, mask off the fabric with paper and apply the spray adhesive to just the foam ends of the handle. Remove the masking paper and unfold the fabric onto the glue. The fabric should extend ½" beyond each end of the handle.
9. Shrink the fabric onto the handle with a heat gun as soon as possible after bringing the ends of the fabric into contact with the spray adhesive. You want to shrink the fabric before the spray adhesive dries. You have to heat the fabric to 212° F (100° C) to shrink it. So you will need at least a 1200-watt heat gun (available at hardware stores, often used for stripping paint). Start in the middle of the handle on the fabric's seam. Work from the center out to the ends and from side to side until the fabric is tight enough so it does not move. Be careful not to overheat the seam, as it will split if you apply too much heat when the fabric is almost tight.
10. Use a knife to trim the fabric to length and cut out the set screw insert holes. I use a long skew tip in my wood burner as a hot knife (*Photo 22*), which cuts the fabric easily. The cut ends of the fabric do not unravel easily after shrinking, but I like to ensure they stay put by applying a thin coat of epoxy to a ¼"-wide area at the cut ends and around the screw holes.

Install the set screws

1. Put a little epoxy on the outside threads of the steel insert and screw the insert into the handle (*Photo 23*). The epoxy permanently locks the thread inserts in place. After the epoxy is cured, you can clean up any excess epoxy that may have leaked onto the inside threads using a 5/16"-18 tap.
2. Install the set screws with a thread-locking fluid (*Photo 24*). Let the thread lock dry overnight, then break the set screws free using a hex wrench. This process makes the set screws fit snugly so they will not rattle loose.

Now all that is left to do is mount your favorite turning tool into your new custom handle and make some wood shavings. ■

Carl Ford, an accomplished woodturner, loves teaching people how to turn and is looking forward to starting a second career teaching woodturning at Purchase College in New York in spring 2015. His website is carlford.us.