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American Association of Woodturners

Turn your own from UHMW polyethylene

Custom Centering Cones

By Carl Ford

Aluminum cones packaged with the Oneway revolving (live) centers are valuable for many turning projects. But two or three shapes aren't versatile enough to fit all projects.

Fortunately, you can easily make your own cones because the threads on the Oneway rotating cup center are standard ¾"×10 tpi. Jet now markets a similar device.

I like to turn my own cones from ultra-high molecular weight (UHMW) polyethylene rather than hardwood blanks.

In my shop, I've found plenty of uses for custom cones: Cones with steep angles. Cones with low angles. Round-end cones that fit inside of goblets. Concave cones that match the rounded end of tool handles for re-turning. A bullnose cone with a small inside triangle for small work. A cone that is similar to a Oneway live center adapter without threads.

The properties of UHMW are ideal for these projects. UHMW is dimensionally stable, will not split, is a little slippery, not too hard, and not too soft. It turns easily with a bowl gouge.

Photos: Joe Larese

Another benefit is you can tap threads using a standard NC (National Course, relates to coarseness of threads) tap available from local hardware or automotive stores. Threads cut in UHMW are more accurate and more durable than those cut in hardwood. And when accidentally damaged by a slip or catch, you can easily re-turn the UHMW cones.

Glue does not stick to UHMW. Thus, you must purchase solid UHMW blanks that are large enough from the start. UHMW rods, in diameters from ¼" to 10", are available by the foot from industrial suppliers such as McMaster-Carr (mcmaster.com). A 2½"-diameter rod (#8701K53) is a good starting point for centering cones. A 1'-long rod (about $10) will yield four or five cones.

Get started

As mentioned earlier, you'll need a standard ¾"×10 NC hand tap with bottom chamfer to match the threads on a Oneway live center. A tap should cost about $10 from your local hardware store. Or you can order McMaster-Carr part #26035A164 online.

You won't need a taper chamfer tap to start the hole because UHMW is softer than steel and easy to thread. If a bottom tap is not available, a plug chamfer tap is fine. The threads don't need to go all the way to the bottom of the hole because the space is taken up by the cup and point on the Oneway live center. At the lathe, you'll need a ½" or ⅝" bowl gouge and a 4-jaw scroll chuck.

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To avoid a catch at the bandsaw, support the UHMW cylinders with a miter gauge.

True up the UHMW blank with a bowl gouge and create a recess to start the drill.

Tap ¾"×10 thread. For more details, see "Hand-Threading on the Lathe" *opposite.*

Prepare the blank

Cut UHMW with ordinary tools. Use a handsaw or bandsaw to rough-cut a 2½"-long piece of UHMW from a 2½"-diameter rod. To avoid a nasty catch, use a sliding miter gauge to support the 2½"-diameter rod while cutting it with a bandsaw (**Photo 1**). V-blocks also work well in this application.

Mount the blank in a 4-jaw scroll chuck and true up the end with a bowl gouge. Then create a recess in the middle to start a drill (**Photo 2**).

Run the lathe at medium speed and ride the bevel. The shavings should peel off in long, continuous streams. However, this can be frustrating (but not dangerous) when the ribbons accidently wrap themselves around the headstock. With practice, you can shoot the shavings off to the side and out of the way.

Thread the cone

All drilling and tapping should be completed on the lathe so your homemade cone has straight threads that fit snugly and run true (**Photo 3**). For details about hand-threading, see "Hand-Threading on the Lathe" *opposite*.

Test-fit the Oneway live center after tapping threads. The face on the center should seat square and tight against the face of the cone blank (**Photo 4**).

Test the new threads. The blank should seat square and tight against the live center.

Mount a partially threaded 5"-long bolt (head removed) in a 4-jaw scroll chuck.

Turn the cone shape

You'll get the most accurate cone if you turn it while mounted to the live center. That presents a challenge: How do you turn a cone while mounted to a live center spinning on the headstock?

Here's the solution. Purchase a ¾" coupling nut and a 4"-long bolt with ¾"×10 thread from a hardware store or McMaster-Carr parts #90264A241 and #91257A851.

Cut off the bolt head and mount it in a 4-jaw scroll chuck the same way you mount the screw center that comes with most chucks. Temporarily install a ¾" coupling nut between the bolt and live center to align parts (**Photo 5**). Use a partially threaded bolt for this step rather than a chunk of fully threaded rod. The smooth part below the bolt head allows it to be accurately and securely gripped by a 4-jaw scroll chuck.

Use two ¾" plywood spacers to clear the jaws of the chuck.

Remove the ¾" coupling nut and slip two ¾" plywood spacers into the bolt (**Photo 6**). Then screw the cone blank into the bolt and bring up the tailstock for safety. The spacers create a solid surface for the cone blank to tighten against (**Photo 7**).

To keep things running true, keep the tailstock in place as long as possible.

Ride the bevel while turning the cone shape with a bowl gouge.

The custom cone, mounted on a Oneway live center, is ready for your next project.

You are now ready to turn the cone shape. Use a bowl gouge in bevel-rubbing mode to create a smooth surface on the cone (**Photo 8**). After you are done turning, test the new cone (**Photo 9**).

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Hand-Threading on the Lathe

Use the lathe to drill and tap straight holes with crisp threads in UHMW. Hand-tap the threads by rotating the tap with the lathe off.

Make the handle

You need a sturdy handle to get enough leverage to hand-rotate the tap. You can easily make your own handle from maple or similar dense hardwood. For a ¾"×10 tap, you need a handle with a 7/16"-square hole to match the 7/16"-square end on a ¾×10 tap.

Start with a 1¼×1¾×12" piece of maple. Drill a 7/16" hole 1" deep in the center of the 1¾" face. With a ¼" drill, finish drilling the hole through the maple. Complete all of the drilling from the same side so the 7/16" and ¼" holes are in alignment.

Square up the 7/16" hole with a chisel until it accepts the 7/16"-square end of your tap (**Photo A**).

Drill the hole

Mount the UHMW rod in a 4-jaw scroll chuck. To create snug threads when tapping UHMW, the drilled hole size should be 1/32" less than the hole size marked on tap or ⅛" less than the thread size if the tap is not marked. (The undersize tap hole is acceptable because UHMW is softer than steel. I intentionally undersize the hole to create deep, snug threads.) Thus, a ⅝" bit is the correct size in this application for a ¾"×10 tap.

UHMW drills easily with a flat bit. The hole left by the point of the flat bit will allow you to mount the cone on the live center without having to remove the centerpoint.

Drill a 1"-deep hole using a ⅝" spade bit and a Jacobs chuck mounted in the lathe tailstock (**Photo B**). Run the lathe at low speed.

Tap threads

Insert a ¼×1¾" bolt into the tap handle through the 7/16"-square hole. You want the head of the bolt buried inside the square hole and the threads sticking out (**Photo C**). Mount the tap handle in the tailstock by grabbing the threaded end of the bolt with a Jacobs chuck. Insert the tap into the square hole in the handle and tighten the tailstock until the tap engages the hole in the piece to be tapped.

Lock the headstock and then tap threads by rotating the tap handle by hand while slowly advancing the tailstock (**Photo D**). To clear chips, back out the tap a few rotations every ½".

Make a homemade tap handle from 1¼×1¾×12" hardwood with a 7/16"-square hole and ¼×1¾" bolt.

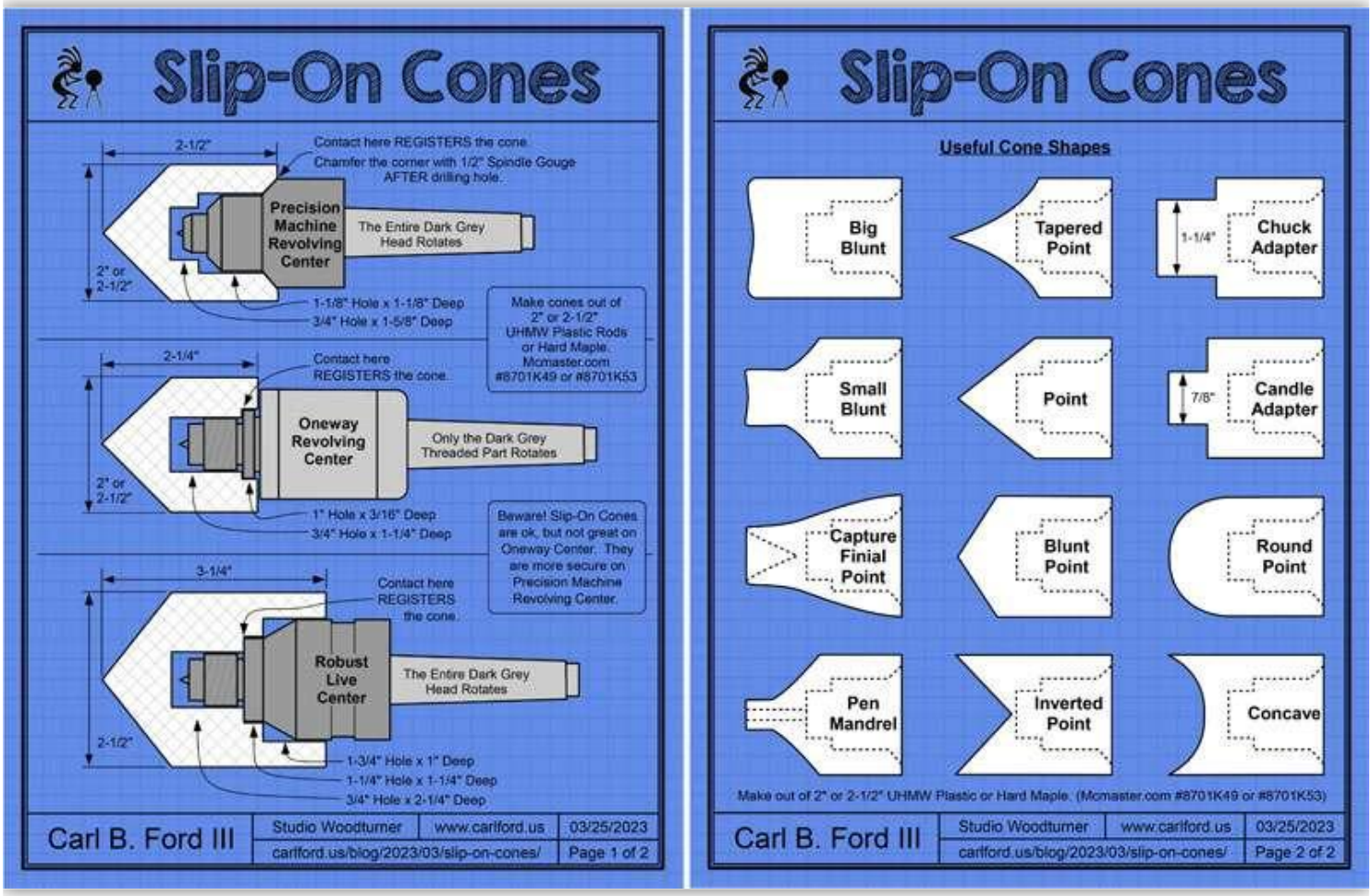
Run the lathe slowly while advancing the ⅝" spade bit into the UHMW stock.

Insert a ¼×1¾" bolt through the 7/16"-square hole in the tap handle.

Rotate the tap handle by hand while slowly advancing the tailstock.

Carl’s Slip On Custom Centering Cones

https://carlford.us/blog/2023/04/slip-on-cones/



I now use my "slip on" custom UHMW cones rather than the "threaded" custom cones featured in my 2007 AAW Journal "Custom Centering Cones" article.

Some times you look backwards and realize you had "blinders" on. In 2007 I was replacing the Oneway thread on aluminum cones with my own cones made out of UHMW plastic. Oneway threaded on there aluminum cones thus I thought I needed to thread on my cones. It took years, but I have seen light.

Slip on cones are better! They are easier to make and they are easier to use. Why? Because, they just slip on! When you press them up against something with tail stock pressure they will stay in place on there own. You don't need to waste time threading them on.

I like to turn my own cones from ultra-high molecular weight (UHMW) polyethylene rather than hardwood blanks. Each cone costs me less than $5 each.