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Workholding aids & chucking – part 3

In the next part of this new series on workholding, **Kurt Hertzog** explores the subject of mandrels and looks at the wide range available to the woodturner

Mandrels have been used to grip materials to be machined dating back to the Egyptians. Today's modern woodturner can use this ancient and versatile method for a host of workholding needs ranging from pens to hollow forms.

A mandrel can be defined as anything that you can mount your work over that can position and hold the work as well as provide drive engagement. Whether passing through or dead ended, the tailstock can certainly assist with all or part of the engagement and processing.

An effective mandrel can precisely orientate the turning material and helps to drive it while you are performing your work be it turning, sanding, finishing, or decorating. I include pin chucks, expansion drives, and some of the forms of jam chucks in the mandrel category.

The commercial mandrels are varied and helpful but I find that the most valuable mandrels are made to order in the workshop. Workshop built mandrels are often born of necessity based on the awkwardness of the external features of the turning preventing gripping or its fragility.

The ability to create a workholding device on the spot that will allow you to make those few touch ups without marring the already buffed out finish is a skill you'll want to develop.

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KEYS TO AN EFFECTIVE MANDREL

The keys are to: run true; position, secure and drive the work; and if needed be accurately repositionable – both the mandrel and the work. It is easy to turn a mandrel from an already mounted piece of stock. Whether mounted to a faceplate or a chuck, being turned true based on the current mounting and a trial and error fit works wonderfully. If you are in a 'production' environment whether commercially or by avocation, pens, bottle stoppers, bud vases, lidded boxes, and more lend themselves to mandrel mounting and drive. Even for one-offs, a mandrel is often just the ticket for solving that hard to hold turned item.

Fragile walls or finished parts needing a bit of attention are often candidates for a mandrel. Padding such as tape, foam, or tissue can not only protect the turning but also fine-tune the fit of a mandrel.

ABOVE: With the inside drillings of pepper mills stepped and identical within the family, they lend themselves to a mandrel's benefits

ABOVE: Support well up inside allows for turning, sanding, and finishing both with and later without the tailstock in play

ABOVE: Using a stub mandrel to join top and bottom allows both to be turned together, if desired

ABOVE: The stub mandrel does double duty allowing for support for turning just the lower portion without stressing the hole dimension

ABOVE: The stub mandrel also allows for the top to be turned alone, if that is desired

THROUGH AND CLOSED END MANDRELS

When turners think of mandrels, usually the first thing to mind is a pen mandrel. The kit pen with its internal brass tubes lends itself to having a mandrel slide through the inside of the turnings and be compressed on the other end by a nut. The tailcentre holds up the far end of the mandrel for stability while turning. Various inner diameter dimensions are dealt with by the use of bushings to match things up. The system works well and deals with the through hole style pen kits but what about the closed end pens? Enter the pin chucks, expansion mandrels, or old-fashioned friction mandrels. The mandrel depth of reach inside the closed hole will dictate how sturdy the mounting is to side loading. As always, it is good practice to keep the tailcentre engaged until it must be removed out of necessity. The beauty of pen mandrels is that the hole, whether through or closed end, is there out of necessity so it comes for free. Other turnings may require a hole for in-process use only.

RIGHT: Scraps from the cut-off bin make great one-time use as well as reusable mandrels

MAIN: Turned in place, the best fitting mandrel is a trial and error fit that is turned to be a light press fit

MAIN: There is no rule that says you can't make tapered mandrels to assist with the tailstock end of things

PIN CHUCKS

Rarely called a mandrel, I put commercial pin chucks into the closed end mandrel category. A device that fits into a hole, created for in process or by final design need, that doesn't usually rely on a friction fit but rather a roller that tightens the grip to the work during rotation. The most common pin chuck I've seen marketed is for bottle stoppers. It is a piece of soft steel with a machined flat that has room for a roller in the flat. As the work is spinning, the roller helps engage the work from the inside of the hole providing friction for the turning process. The concept works well and can be adapted to nearly any turning you can drill a hole in. Workshop made versions can be made from soft steel with a flat filed on the shaft or even a piece of wood.

Depth of engagement and mandrel diameter will determine the amount of work that can be done. Tailstock engagement provides for a safe, secure driving method for pin chucks whenever possible. When the final parting or end treatment is required, slower speeds, sharp tools, and light touch are in order. The pin chuck is usually mounted into a collet, chuck with spigot jaws, or a Morse taper equipped drill chuck. These accurately positioned devices will share that accuracy imparting it to the mandrel and ultimately to the piece being worked on.

FITTING YOUR MANDREL

Other than the expansion mandrels, the hole to mandrel fit needs to be closely controlled. Since the friction fit usually provides the positional accuracy and the drive, a snug yet removable fit is desirable. Too snug only requires turning a bit more off the mandrel. Too loose requires a remake or perhaps a bit of 'fudging'. Often a bit of tape or tissue will snug things up enough to allow use. Moistening the mandrel or the hole, or both, will cause the wood to swell and tighten the fit. Work can be done with this temporary tight fit. Once dry, the loose fit returns allowing easy removal.

ABOVE: Closed end mandrels can be made in any size and shape to suit the needs of the part. The tailcentre can be used for additional strength, if needed

ABOVE: A light duty closed end mandrel is made and used only to re-sand and finish a closed end pen cap that experienced an ink leak

ACCURACY OF THE MANDREL

A mandrel owing its alignment to the headstock taper or threading will be very accurate and repeatable when reused. Like all mountings, the further you are away from the headstock, the more the run out error begins to creep in. Long-term accuracy can be dependant on the mounting method and the material. One time use, turned in place mandrels are inherently accurate. Reusable mandrels need to be planned and constructed for accurate repositioning. Don't forget the wood moves! What fit well and ran true today may need a touch up next time you use it. If you have repetitive tasks, make a mandrel that you can easily mount to the lathe that repeats accurately. Threaded and butting right to the spindle shoulder face, permanently fixed to a faceplate, or positioned via the Morse taper are the most accurate on reuse. If it is a one-time need, mount your mandrel securely, turn to fit, use it, and pitch it.

BELOW: Accuracy of any reusable mandrel, regardless of the duty, is very repeatable and accurate with a threaded attachment

BELOW: Using the Morse taper, or a mandrel holding device that locates on the taper provides an accurate and repeatable mandrel location for re-use

LEFT:These mandrels, a homemade and a more industrial homemade, use the taper and bottoming in the turning along with the tailcentre for effective use

MAIN: Custom mandrels, wood and steel, have a variety of special applications especially for the pen maker

CONCLUSION

The possibilities of mandrel creation and use are limited by your own imagination. You'll find a use for all of those scrap pieces that you can't bear to throw away but keep growing in the bucket. Don't overlook the uses of a mandrel without the lathe running. Sanding, painting, carving, buffing, and more will benefit from this method of mounting. There is no rule that says there has to be power on to reap a mandrel's benefits. Either way, I believe you'll enjoy the benefits of using a mandrel. ●