3D Printing for Woodturners

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For years I resisted getting a 3D printer. I was not sure what I would do with it. Then a friend lent me one and it has been coming in very handy. This Tutorial illustrates some of the uses.

Part of

The SegMaster Series

The SegMaster Series is a set of short articles provided for woodworkers interested in Segmented Wood Turning. They are short, concise, and filled with tips and techniques that readers may or may not have thought of themselves. They maximize photos and illustrations and can be skimmed quickly or read slowly and studied. They can be printed, taken to the shop, and used as tutorials. Please enjoy them and let me know how they can be improved.

Written By

The SegMaster

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3D Printing for Woodturners

For years I resisted getting a 3D printer. I could not think of what I would do with it. Then a friend lent me one and it has been coming in very handy. I am constantly amazed at the number of uses I have found – especially around wood turning.

This document shows you some of what I have done with the 3D printer to support my woodturning habit. I am not going to try to give you a tutorial on the tools for designing in 3D. I will provide the designs as downloadable files which you can hand over to friends who have 3D printers.

The Software and the File Types

I use three software tools for designing and printing my 3D objects.

The first one is Fusion360 from Autodesk. They make one of their most sophisticated and expensive tools available for free use by students and hobbyists. This is an amazing piece of software, but there is a bit of a learning curve to use it. I will provide Fusion360 compatible files for you in case you want to make minor changes to them. As far as learning to use the program, I suggest doing so if you have the time and are interested in such things. There is lots of help available online, but I will not be going into it.

In Fusion360, you have an account with Autodesk that you use to both use and store your designs. You can also export the files to F3D format as well as some other file formats. I assume that you can also import the same, and possibly other, file formats.

Fusion360 designs are made up of *bodies*. You can save these bodies as STL files. STL files are collections of all the surfaces in the body. There is no intelligence as to what the surface is part of. It could be part of a sphere or cylinder or a cone or anything else. STL files are read by a program that converts them into a *slicer* program.

A slicer breaks the STL files into slices. Each slice is one layer that will be laid down by your 3D printer. The slicer figures out the x and y movements to deposit the slice on the layer below it. It can take minutes to hours or longer to print a body depending on size and density. I use a slicer called *FlashPrint* that came with the printer. It creates files with an X3G extension. I believe these are particular to my printer: *CreatorPro.* I will not provide any X3G files.

My slicer program allows me to rotate, move and scale the designs in any combination of x, y and z dimensions. I can also cut the design into two or more pieces which I never have done.

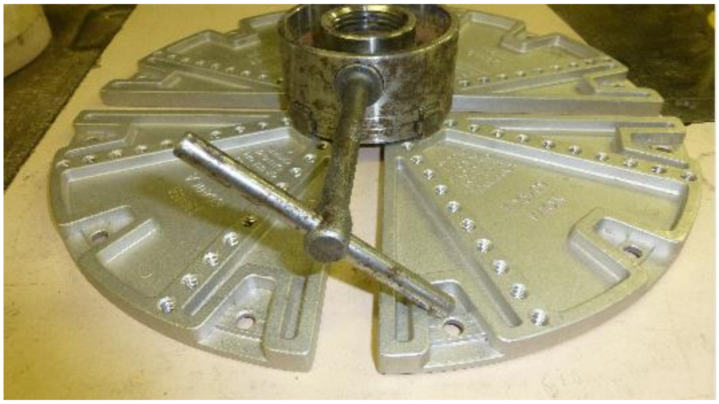
You can download many of my files from my website at http://www.TheSegMaster.com.

The other program I used a bit when I was first getting started is called *TinkerCAD.* This too is from Autodesk, but it is simplified and much easier to use. It is also much less flexible. This program is used online rather than being downloaded to our computer. I found that this generated some of the shapes I wanted.

So now, on to the designs themselves.

Nova Chuck Tightening Tools

I have a series of Cole Jaws that are considerably larger than the standard ones that one usually purchases. They get in the way of the wrench one uses for tightening the chuck. You can use it, but you must move and re-insert the tool many times to go around only once and if you have a lot of tightening to do, it is very tedious. Notice in the photo that one can turn the tool only slightly before it hits the Cole Jaws:



I designed and printed an extended tool. I used a piece of brass for the shaft but designed a compatible end and a knob for it as shown below.

Here it the tool at work:

This handle extends beyond even the largest Cole Jaws with the extension. I do not do the final tightening with this. I assume that the plastic would break before it gets tight enough. However, I do get it close and I use the shorter, all metal wrench for the last bit of tightening.

I created the part that goes into the chuck using *TinkerCAD.* I created the Knob using Fusion360.

I also built a ring with knurls on it that exactly fits into the base of the Nova Chuck. I figured that this would allow me to make rapid adjustments by twisting the base directly. You will see that I printed only part of the tool in plastic. It turns out that I had a used waste block with a waste ring on it that was close to the right size. I glued the plastic to that.

I had designed this assuming that I would grab it in one hand, hold it against the bottom of the Nova Chuck and then twist to make rapid changes in the Nova Chuck. What I ended up doing was leaving it on the bench and resting the Nova Chuck on and in it. The Nova Chuck was much more stable making it easier to change Jaws. I can spin the Nova Chuck to tighten of loosen it. It works wonderfully.

Salt and Pepper Shaker Plugs

I recently decided to make a few salt and pepper shakers. The question was how to leave an opening in the bottom for refilling.

I have taps for both 1” x 8tpi and 1.25” x 8tpi holes. I use these for making self-mounting waste blocks that do not require face plates. I describe their use elsewhere. But I decided they would work well for saltshakers. See the Tutorial on *Using a Spindle Tap.*

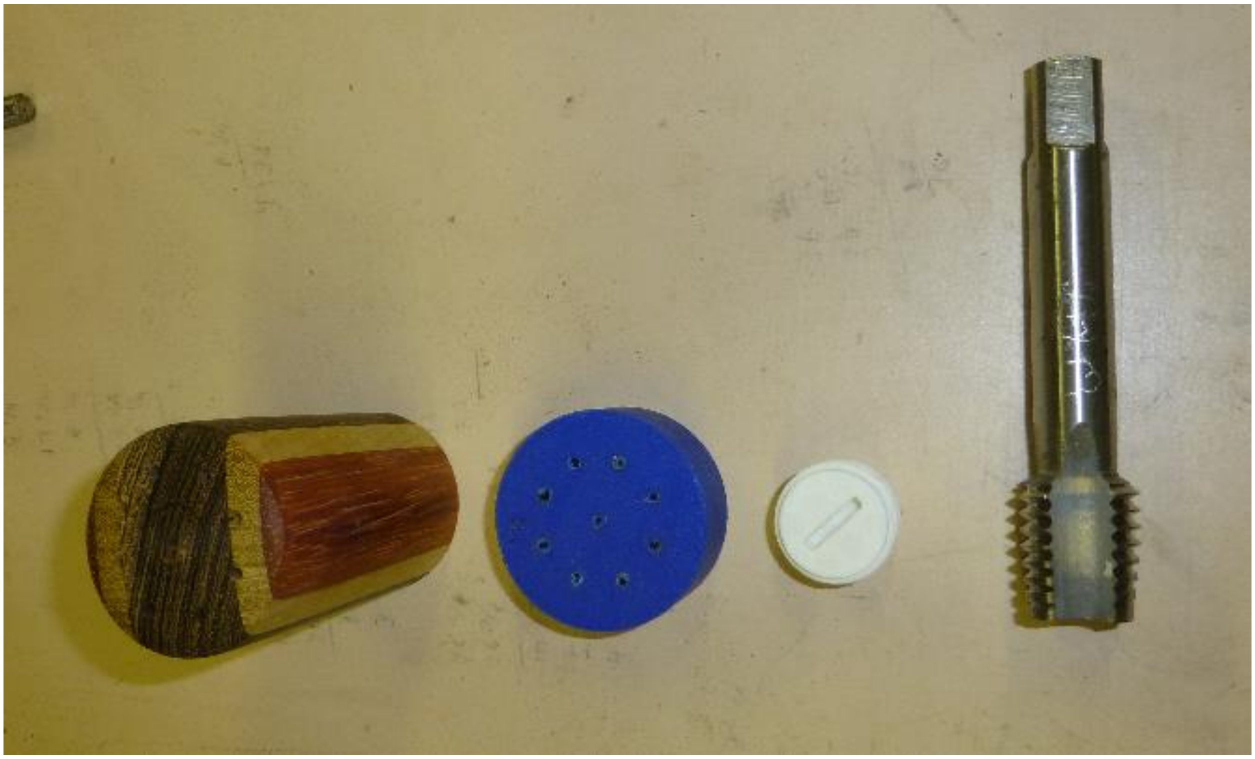
I designed these using Fusion360. They turned out to be difficult because my printer did not print them as designed. They put an extra upward slope on the upper edge of the threads. I designed droopy ones that when printed would be the correct shape. This turned out to be much more difficult in Fusion360 than the even ones.

I also have dies for these thread pitches. I ordered these when I thought I could make plugs from wood. (silly me). I sometimes run the plastic inserts into these dies to trim them. The trimmed dies go into the S&P shakers more easily. If you do not have dies (and I do not recommend purchasing them), you might try forcing them into a faceplate or other female threads of this pitch. I put the metal piece in a bench vise and crank the plastic part into it using a wrench. If it is still too tight, try using your slicer to scale the design to 99% in the X and Y dimensions.

I soon realized that the other problem with the S&P shakers were the holes on top. I find it impossible to drill holes like this evenly. So, I designed a hole drilling template. It fits snugly over the shaker and I drill the holes using a drill press. This worked perfectly.

TBD Photo of Hole Template

The photo below shows a shaker with a template, a plug and the tool I use for tapping the inside of the shaker:



Tools for my Grizzly 0766 Lathe

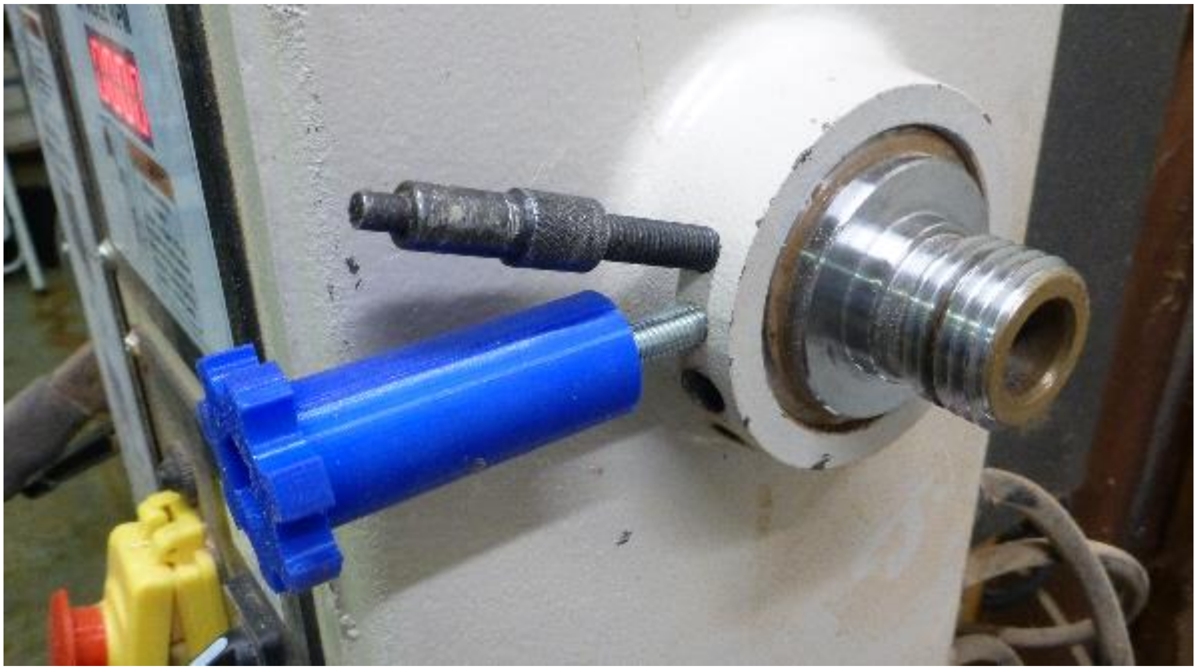
Spindle Lock Tool

Grizzly thoughtfully provides a tool for locking the spindle on the 0766 lathe. While it does work, I found it difficult to use. First it is too skinny to grip well. Second it is so small that I am sure I will eventually drop it into some wood chips where it will be absorbed and disappear forever.

I purchased a bolt with compatible threads. I put the bolt into a chuck of some sort (I don't recall whether it was on the lathe or a drill press). I got it to spinning and used a file to properly shape the end that goes into the shaft.

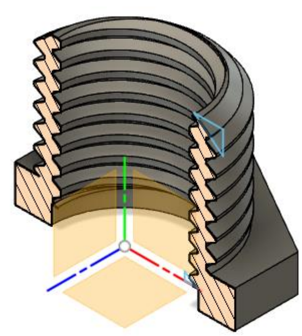
Next, I used Fusion360 to design a knobbed extension for this that will be more difficult to lose.

The photo below shows both the original tool and the tool I made. Notice that my custom tool extends beyond the control box on the lathe making it easier to grip and turn.



1 inch to 1 ¼ inch adapter

I started my wood turning with a conventional midi-lathe. This had a 1" x 8tpi drive spindle on it. I purchased many tools for this lathe before upgrading to a larger lathe with a 1 ¼ x 8tpi drive spindle. I purchased inserts for my Nova Chucks that replace the 1" inserts that came with the Chucks. I have a bunch of waste block assemblies that are tapped for a 1" drive. For these I purchased a 1¼" to 1" metal adapter. That solved most of the problems.



But I also have a Live Tailstock Spindle adapter that has a 1" x 8tpi end on it. I use this all the time and I could not find an adapter for purchase. So, I designed one for the 3D printer. It works great.

Note that I do not worry about using plastic for this tool. There is very little force on it when used in the tailstock. I have had no reason to try it on the headstock and even if I did, it would be surrounded on both sides by metal. The thing I would not do is try to replace the 1¼" to 1" metal adapter with a plastic one.

Tailstock Adapter

I frequently use my Nova Chuck on the tailstock to exactly position additional rings for gluing onto a bowl. The problem is that one needs an adapter from the #2 Morse Taper in the tailstock to the 1” or 1¼” threads on the Nova Chuck. As I have mentioned previously, I usually prefer using my Live Spindle Adapter, but I think I might get a better fit with the Nova 71093 available from Amazon at ever increasing prices.

This seems to be available only in the 1 ¼” size and I also wanted one with a 1” adapter. I designed one of each using Fusion360.

Unfortunately, 3D printers will not print overhead flat surfaces; the print nozzles need to print on top of something and if there is nothing underneath, then there is nothing to print to. My solution was to design the part in two pieces and then glue them together in the shop.

Because I am not sure of the plastic strength, I left a ½” hole in the center of all the parts. You might have to ream out this center hole with a ½” drill before inserting a section of ½” steel rod into it.

Here is a photo of the two adapters that I printed and assembled.

Thread Insert

I had been wanting to create threaded lids for some of my turned boxes. I spend hours trying to figure out an easy way to do this with wood. I finally decided to do this using the 3D printer. I turned a set of inner and outer threads and glued them into box as shown in the photo:

Project Stand

Last Easter I made some very pretty Easter Eggs. They looked great in a basket but I wanted to be able to display the best on a little stand. No problem. I designed and printed one on the 3D printer. The stand also worked well with some Christmas Ornaments I made.

TBD Photo of egg in stand

Spacers and Washers

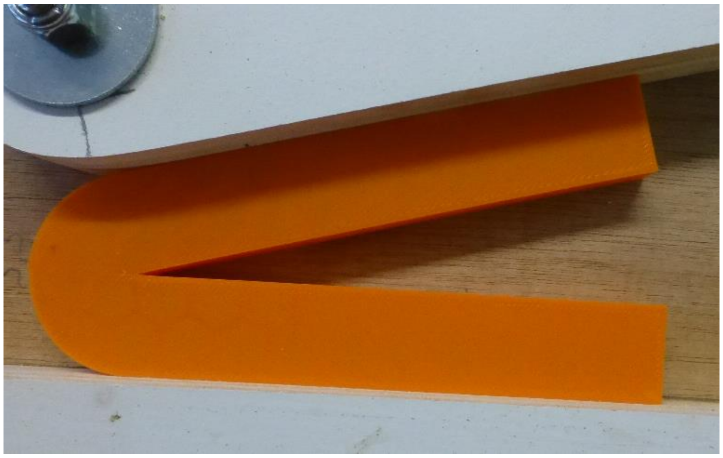
Sometimes, I need a spacer of a certain dimension that does not have to be metal. It is generally easy to design and print these on the 3D printer. It is quick and easy to make a washer with any inside and outside dimension of any thickness.

A few weeks ago, I was frustrated that I had cut the tip on my epoxy bottles so short that the cap would not stay on. No problem. I designed and printed new ones.

Last week, I moved a smoke detector. This left an ugly hole in the ceiling. I had white filament in the printer. I designed and printed a cover plate for it.

TBD photos of washers

Angle Gauge



One of the challenges for Segmented Wood Turners is setting precise angles for their sleds and other jigs. The 3D printer does this perfectly. I made one that is 15 ° and found that it exactly matches the angles set by using meter sticks and geometry.