

Open Segmented Woodturning & 3D Printing

By Jared Bruckner

Even before my first segmented piece was finished, I decided to try doing a similar open segmented piece. The big advantage with doing open segmented work was you did not have to worry about getting the angles of the segments perfect, since there would be an open space on both sides of each segment.

I was not excited about trying to glue one segment at a time to the piece, but there is a way to glue a whole layer of segments at a time, using what are called Seg-Easy Plates. After seeing pictures of these plates, I realized that I could easily print some on my 3D printer.

Before long I had designed a parametric model for seg-easy plates. (A parametric model is a model that will produce a design based on parameters.) The parameters for my model were the number of segments in a layer, the size of the gap in degrees, and the diameter of the plate. Since I was interested in small turned pieces, I made seg-easy plates only 6 inches in diameter, but I printed 7 different colored plates. For each plate I printed a like color wedgie, for my table saw sled, with the angle needed for cutting segments to fit that plate. The plates and wedgies are shown in picture #1.

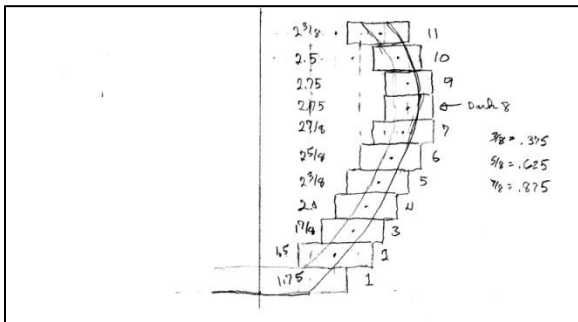


Picture #1. Seg-easy plates and wedgies

The blue plate is for 8 segment layers with an 11 degree gap, the black plate is for a 12 segment layer with a 8 degree gap, the yellow plate is for a 16 segment layer with a 6 degree gap, the brown plate is for 18 segment layers with a 4 degree gap, the red plate is for 24 segment layers with a 4 degree gap, the green plate is for 36 segment layers with a 3 degree gap, and the orange plate is for 48 segment layers with a 2 degree gap. The white plate is a 12 segment with a 0 degree gap plate which is used to make 12 segment solid rings. (First 6 rings are glued,

and after the glue dries, the other 6 segments are glued between the first 6.)

I decided to use the same design for my open segmented piece as I had used for the closed segmented piece. See picture #2. But, I needed new columns in my spreadsheet to deal with the new formulas needed for the open segmented piece. When making these additions to the spreadsheet I made a mistake in the last two rows, which are shown in green in picture #3. The mistake presented me with a problem when it came to gluing the rings together.



Picture #2 5 Full size drawing. (Graph paper did not show on picture.)

Ring#	Radius	Diameter	Width	LENGTH	STOP	MaxRadius	Circ. Dia.	Stock length	Length
1									
2	1.5	3	1.25	0.80	0.78	2.25	14.1	4.5	12.9
3	1.875	3.75	1.25	1.00	0.97	2.5	15.7	5.0	14.0
4	2	4	1.25	1.07	1.04	2.75	17.3	5.5	15.2
5	2.375	4.75	1.25	1.27	1.23	3	18.8	6.0	16.3
6	2.675	5.35	1.25	1.43	1.38	3.25	20.4	6.5	17.5
7	2.875	5.75	1.25	1.54	1.49	3.5	22.0	7.0	18.6
8	2.75	5.5	1	1.47	1.42	3.5	22.0	7.0	18.6
9	2.75	5.5	1	1.47	1.42	3.5	22.0	7.0	18.6
10	2.5	5	1	1.34	1.29	3.25	20.4	6.5	17.5
11	2.375	4.75	1.25	1.27	1.23	3	18.8	6.0	23.8
			11.75						173.0

Picture #3 Spreadsheet for calculations.

As I did in the closed segmented piece, I decided to glue up the rings in two parts – one part with rings 0 to 8 and the other with rings 11, 10, and 9. I discovered the problem which I made in the spreadsheet as I was gluing ring 9 onto ring 10 and 11 which were already glued to a glue block. Ring 9 was much too large. It would fit onto ring 10, but was not the size that I had planned for. But with the glue already on ring #9, I went ahead and glued it to ring 10.

I realized that I would need to redo rings, 9, 10, and 11, but I figured that I could make a small open segmented bowl out of what I had already glued up. I removed the three rings from the glue block, turned a piece of cherry wood for the base, glued the three rings to the cherry, added a closed ring to the top and turned the bowl shown in picture #4.



Picture #4. The completed bowl. 2¼ tall by 6¼ wide

Picture #5, #6, and #7 were taken after the top and bottom pieces were glued up, the inside of both parts turned, sanded and finished, and the outside partially turned. They only show how the seg-easy plate is used to glue on the next layer. In picture #5, the seg-easy plate is already mounted on a revolving center, the segments placed on the plate and held in place with a rubber band. The brush seen in picture #5 was used to apply the glue to the edges of the segments after which the seg-easy plate with the revolving center were placed in the tailstock (See picture #6) and brought up against the piece the layer would be glued to (See picture #7).



Picture #5.



Picture #6.



Picture #7.

Pictures #8 and #9 show the top part being glued to the bottom part. It may have been better to separate the top from its glue block before gluing the two parts together, but I was able to separate the top from its glue block and complete the turning of the outside without a problem. The completed piece is shown in picture #10.



Picture #8.



Picture #9.



Picture #10. The completed piece. 5" tall and 6.5" wide