The Basics of Stave Segmented Turning

Notes by
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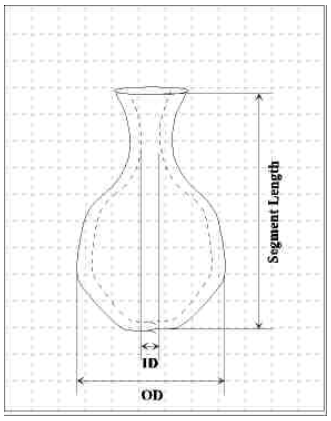
Requirements

1. Basic equipment requirements
    a. Graph paper
    b. Band Saw or Table saw
    c. Sanding center
2. Tools
    a. Roughing gouge
    b. Spindle gouge
    c. Bedan or large parting tool
    d. Hollow vessel tools
    e. Four-jaw chuck
3. Supplies
    a. Band clamps
    b. Glue, PVA or PE
    c. Vernier calipers
    d. Thickness calipers
    e. Painter's tape
    f. Accurate angle measuring gauge
4. Helpful accessories
    a. Segmented planning software
    b. Compression chuck (Judy Jig)
    c. Steady rest
    d. Stabilized hollowing system

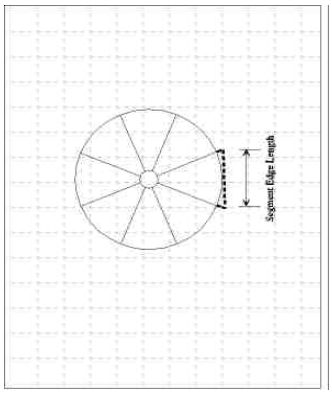
Preparation

1. Design the vessel
    a. Create a full scale drawing
    b. Make full scale drawing on graph paper
    c. Draw both inside and outside profile
    d. Draw in the number of segment required

2. Measurements
    a. Determine stave segment length
        i. Measure and record vessel height
        ii. Add one inch for required tendons
        iii. This is the segment length



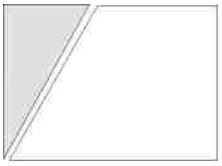
    b. Determine Segment thickness
        i. Divide circles into correct number of segments
        ii. Draw maximum OD and minimum ID of the vessel
        iii. In the ID circle draw a line between two adjacent segment lines
        iv. The difference between ID line and OD is the thickness of each segment



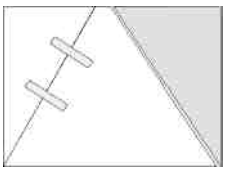
    c. Determine segment edge length
        i. Construct a cord between two segment lines tangent to the OD circle
        ii. Measure length of the cord on the OD circle. This is the required segment edge length

Making the Blank

1. Prepare billets of desired wood
    a. Crosscut the determined length
    b. Rip to segment edge length plus
    c. Rip to segment thickness
    d. True and square stock

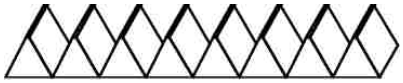


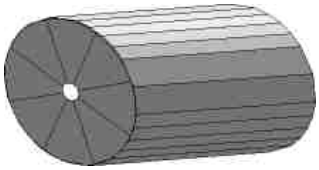
2. Cut segments
    a. Set bandsaw table accurately to correct angle for the number of segments (see table in appendix)
    b. Cut segments
        i. Cut one side of each stave
        ii. Tape cutoff back in place
        iii. Cut second side
        iv. Set aside cutoffs for later use



c. Fit cylinder together
    i. Sand or joint cut edges
    ii. Assemble segments and clamp
    iii. Check for correctness of fit
    iv. Resend or joint until all segments fit without visible gaps
d. Prepare veneers as required for design
    i. Cut veneers to size
    ii. If multiple pieces of veneer are used, prepare veneer packs

3. Assemble the segments & veneers into a cylinder
    i. Place blue painter's tape face up on glue surface
    ii. Layout segments and veneers on tape – edges tight
    iii. Press down to adhere the tape
    iv. Glue all surfaces
    v. Roll up package and add band clamps
    vi. Adjust all pieces and veneers
    vii. Tighten band clamps
    viii. Set aside to dry

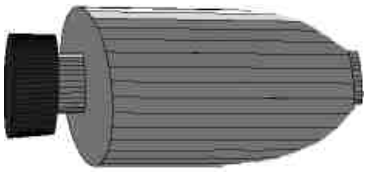




Turning the Vessel

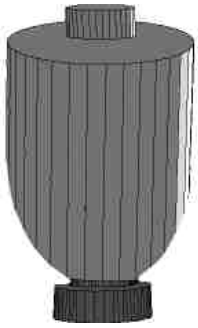
1. Phase I turning - Preparing the cylinder
    a. Action
        i. Place glued up package between centers
        ii. Rough turn into a cylinder
        iii. Add a tendon to each end to fit chuck

2. Phase II turning - Turning the base portion
    a. Turn base exterior
        i. Chuck one tendon supporting the opposite end with live center
        ii. Readjust balance if required
        iii. Using drawing, determine location of maximum final diameter - mark
        iv. Turn exterior of *base* section from maximum diameter toward tail stock
        v. Remove tail stock
        vi. Add steady rest if required



    b. Turn base interior
        i. Drill out maximum amount of material to location of maximum diameter
        ii. Hollow out interior
            1. Sand and finish interior of base section
            2. Shorten tendon to ½ inch and assure it is smooth
            3. Remove vessel from chuck
    c. Adding the Foot

i. Prepare base material



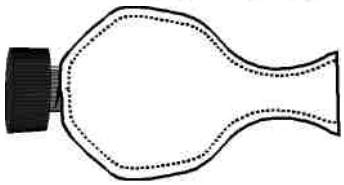
1. Chuck a disk of material to be used for vessel base
2. Measure exact dimension of base tendon
3. Hollow out disk of base material to exactly fit vessel base tendon
4. Check fit carefully

ii. Mount vessel to base

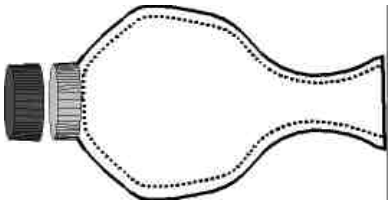
1. Remove vessel from chuck and glue to chucked base
2. Do not remove assembly from chuck as this is the new hold for completing the turning

3. Phase III Turning - Turning the top portion
   a. Turn top exterior

      a. Mount base assembly, supporting with tail stock
      b. Readjust balance as required
      c. Turn exterior of top portion from maximum diameter
      d. Remove tail stock
      e. Add steady rest if required



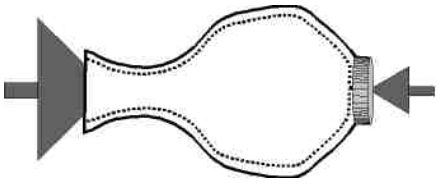
   b. Turn top interior
      a. Drill out maximum amount of material to location of maximum diameter (smaller drill)
      b. Hollow out interior
      c. Sand and finish interior of top section
   c. Finish neck



      a. Remove neck tendon
      b. Add top design ring is desired similar to the process for adding a foot.
      c. Turn neck to final shape
      d. Sand and finish
   d. Part off foot from chuck

Completing the Foot

1. Prepare a soft-wood cone to fit curvature of vessel neck
   a. Chuck soft-wood cone and true
   b. Place vessel between soft-wood cone and live center; use anti-abrasion material to protect the vessel



2. Complete base shape
   a. Reduce and undercut bottom leaving a small live center support
   b. *(A compression chuck or vacuum chuck may be used as an alternate to the above step)*
   c. Complete base

i. Remove vessel from the lathe
ii. Part off small protrusion on base
iii. Sand

Finishing

1. Resand vessel with the grain to 400
2. Apply appropriate finish – let dry
3. Resand and refinish to your satisfaction
4. Buff and wax

Sources for supplies and equipment

- Craft Supplies USA, 800-551-8876, www.woodturnerscatalog.com
  - Most complete suppliers to wood turners in the USA
- Direct Safety, 800-528-7405, www.directsafety.com
  - Safety supplies, dust masks, etc.
- Hastings Saws, 707-584-8541, www.hastingssaws.com
  - Thin kerf band saw blades with no set to the teeth
- Klingspor's Woodworking Shop, 800-228-0000, www.woodworkingshop.com
  - Sanding and finishing product, importer of German sandpapers
- OneWay Manufacturing, 800-565-7288, www.oneway.ca
  - Manufacturers of lathes and lathe accessories
- Packard Woodworks, 800-683-8876, www.packardwoodworks.com
  - Woodturning supplies tools, equipment, supplies
- Rockler Woodworking, 925-521-1800, www.rockler.com
  - General woodturning supplies, lumber, tools, equipment
- The Cutting Edge, 800-790-7980,www.cuttingedgetools.com
  - Turning and Carving tools
- Tool Crib (Amazon), 800-635-5140, www.amazon.com
  - Tools, equipment mail order
- Treeline, 800-598-2743, www.treelineusa.com
  - Carving tools
- Woodcraft of Dublin, 925-875-9988, www.woodcraft.com
  - General woodturning supplies, lumber, tools, equipment

Books

Segmented Turning, A Complete Guide, Ron Hampton, Guild of Master Craftsmen, 2003
Segmented Turning, A Good Start, Bill Kandler, Verified Software, 2004
Segmented Turning, William Smith, Schiffer Publishing Ltd., 2002
The Art of Segmented Wood Turning, Malcolm Tibbetts, Linden Publishing, 2005
Woodturning with Ray Allen, Ray Allen & Dale Nish, Fox Chapel Publishing, 2004
Laminated Designs in Wood, Clarence Rannefeld, Lark Books, 1998
Southwest Pottery – Anasazi to Zuni, Allen Hayes & John Blom, Northland Publishing, 1996
Fine Woodworking on Faceplate Turning, Taunton Press, 1987

Videos

Introduction to Segmented Turning, Curt Theobald, 307-245-3310, www.curttheobald.com
Segmented patterns, Curt Theobald, 307-245-3310, www.curttheobald.com

Software suppliers

Stave calculations	http://stavecalc.logiztix.net/
Simple segment calculations and lots of help on the processes	http://turnedwood.com/
Calculations for open segment work	http://texasgadgets.com/
The most complete program & difficult to manipulate	http://verifiedsoftware.com/goodturns/
This is the one I use, mates with 3d design ware	http://woodturnerpro.com/
General woodworking software including layout	http://www.woodbin.com/

Veneer Sources

Wood cost comparisons	http://www.verifiedsoftware.com/goodturns/woodcosts.htm
Constantine's	http://www.constantines.com/
Certainly Wood	www.certainlywood.com
Hearn Hardwoods	http://www.hearnehardwoods.com/
Woodworkers Resource	http://www.woodworkerssource.net/index.html

Untested sites

World panels	www.worldpanel.com/WoodVeneers.htm
Dodge Veneers	http://www.doogeveneers.com/
Exotic Wood *	http://www.exotic-wood-online.com/
Form Wood Industries	http://www.formwood.com/index.htm
West Penn Hardwoods	http://www.westpennhardwoods.com/
Source for inlays	http://www.inlays.com/
Saurers & Company	http://www.sveneers.com/

Segment Edge Length Estimation Table

	Number of segments				
	6	8	12	16	24
Ring Diameter	**Segment Edge Length**				
1	9/16	7/16	¼	3/16	1/8
1.5	7/8	5/8	3/8	5/16	3/16
2	1 1/8	13/16	5/16	3/8	¼
2.5	1 7/16	1 1/16	11/16	½	5/16
3	1 ¾	1 ¼	13/16	5/8	3/8
3.5	2	1 7/16	15/16	11/16	7/16
4	2 5/16	1 11/16	1 1/16	13/16	½
4.5	2 5/8	1 7/8	1 3/16	7/8	9/16
5	2 7/8	2 1/16	1 5/16	1	11/16
5.5	3 316	2 ¼	1 ½	1 1/8	¾
6	3 7/16	2 ½	1 5/8	1 3/16	13/16
6.5	3 ¾	2 11/16	1 ¾	1 5/16	7/8
7	4 1/16	2 7/8	1 7/8	1 3/8	15/16
7.5	4 5/16	3 1/8	2	1 ½	1
8	4 5/8	3 5/16	2 1/8	1 9/16	1 1/16
8.5	4 15/16	3 ½	2 ¼	1 11/16	1 1/8
9	5 3/16	3 ¾	2 7/16	1 13/16	1 3/16
9.5	5 ½	3 15/16	2 9/16	1 7/8	1 ¼
10	5 ¾	4 1/8	2 11/16	2	1 5/16
10.5	6 1/16	4 3/8	2 13/16	2 1/16	1 3/8
11	6 3/8	4 9/16	2 15/16	2 3/16	1 7/16
11.5	6 5/8	4 ¾	3 1/16	2 5/16	1 ½
12	6 15/16	5	3 3/16	2 3/8	1 9/16
12.5	7 3/16	5 3/16	3 3/8	2 ½	1 5/8
13	7 ½	5 3/8	3 ½	2 9/16	1 11/16
13.5	7 13/16	5 9/16	3 5/8	2 11/16	1 ¾
14	8 1/16	5 13/16	3 ¾	2 13/16	1 13/16
14.5	8 3/8	6	3 7/8	2 7/8	1 15/16
15	8 11/16	6 3/16	4	3	2
15.5	8 15/16	8 7/16	4 1/8	3 1/16	2 1/16
16	9 ¼	6 5/8	4 5/16	3 3/16	2 1/8
16.5	9 ½	6 13/16	4 7/16	3 5/16	2 3/16
17	9 13/16	7 1/16	4 9/16	3 3/8	2 ¼
17.5	10 1/8	7 ¼	4 11/16	3 ½	2 5/16
18	10 3/8	7 7/16	4 13/16	3 9/16	2 3/8
18.5	10 11/16	7 11/16	4 15/16	3 11/16	2 7/16
19	11	7 7/8	5 1/16	3 ¾	2 ½
19.5	11 ¼	8 1/16	5 ¼	3 7/8	2 9/16
20	11 9/16	8 5/16	5 3/8	4	2 5/8