Overview of Segmented Turning

by Delbert Dowdy

Why Segmented Turning

Can make any shape: Wood segments can be glued to make any shape you wish whereas normally shapes are dictated by the shape of wooden blank you have.

Can make any size: You are not limited to the size of the solid blank. Form any size you wish.

Use different colors of woods: Mix and match colors of wood to create interesting designs and contrasts.

Use different woods for designs: Designs made by gluing pieces of differing shapes are only limited by your imagination.

Can use dimensional lumber: You can use lumber that is available in many locations and in many types of wood.

Can use dry wood: By using dry dimensional lumber, you do not have the problems associated with drying wet wood.

Can use scrap wood: Scraps of wood that have little use otherwise can be cut into strips and used.

Designs

Look in Books: Some books are specifically about designs such as ***Turned-Bowl Design*** by Richard Raffan and ***Shapes for Woodturners*** by David Weldon. Most woodturning books will show many shapes to give ideas.

Look at pottery and glassware: Whenever you are around pottery and glassware, observe the shapes. By now most basic shapes have been made in pottery and glass. Look at the book ***Southwestern Pottery*** by Allan Hayes and John Blom. There are hundreds of shapes beautifully shown.

Sketch shapes: Take some opportunities to sketch basic shapes on paper. You may find some that really appeal to you. I keep a folder full of my sketches.

More is not necessarily better: A bowl of a thousand different woods does not necessarily look better than a bowl made with only a few woods. Use colors and designs to add to the appeal of your piece. Be aware that some pieces might become too 'busy'.

Thickness of segments: The thickness of a ring of segments can change the look of a piece. Look at pieces that have 3/4" thick rings and pieces that have rings that are thinner. Although thinner rings will increase the number of rings and the work involved, the look of thinner rings might be worth the effort. Larger pieces may look fine with thicker rings, but smaller pieces could look out of proportion. Bud Latvin has settled on rings that are 3/8" thick. After many years in segmenting, he thinks this thickness looks best.

Number of segments in a ring: There is no golden rule as to the number of segments that should be in a ring. For looks you should keep the number of segments per ring consistent throughout the piece. Larger pieces would probably look better with a larger number of segments in a ring. Most people will use between 12 and 32 segments for their pieces. Much of my work is made with 12 or 16 pieces per ring. Numbers that are divisible by 4 can make things easier when you are making test cuts to fit your segments within a 90° angle.

Make a full scale drawing: Many people will make a full scale drawing of their final piece before construction. Especially if you are a beginning segmenter, you could benefit from a drawing.

Pros: It allows you to check your basic shape and any special designs in the wood. You can measure on paper the diameter of each ring and the width of the wood in that ring. It helps you to see if your shape is true to the original design.

Cons: The drawing limits any changes in the design you might want to make as you are constructing your piece. You must remember to make your rings match the thickness on the design and so they must start thicker than what is in your design so they can be sanded to final thickness. You should only abandon the use of the drawings if you are an experienced turner.

Preparing Stock

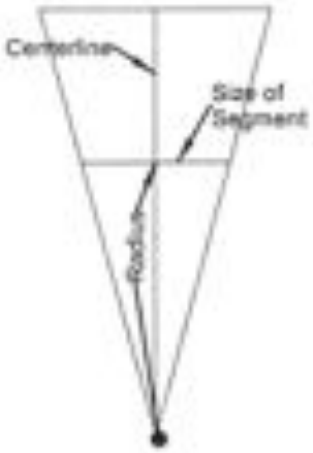
Thicker than final: Your segments will not fit perfectly flush on the top and bottom of a ring. The ring will have to be sanded/turned to final thickness for your design. Your stock should be thicker than your final ring by up to a $\frac{1}{4}$ inch.

Width determines slope: The width of your stock determines the width of the ring. The smaller the width the less change in slope can occur from one ring to another. A larger width ring will allow the slope from one ring to another to vary.

Parallel and straight: The wood stock should be surfaced on all four sides and be parallel to the opposite side. The stock should not be warped as this will change the angles as they are cut.

Make use of grain patterns: Some woods have a much more attractive grain pattern on the top of the wood than on the side. The side of the wood is what usually shows in segments. Turning the wood so that the top of the wood is on the side can improve the looks of the wood but may limit the width of the wood as the normal thickness has now become the width (usually $\frac{3}{4}$" up to 1")

Sizes of Segments



Calculations: There are many formulas available to place in a calculator or computer to determine the size of segments.

Tables: Tables of sizes of segments for different sizes of rings are available.

Slice of Pie: A simple straight forward method of measuring the size of segments needed can be determined from a piece of wood cut to the same angles as your segments. Measure the diameter of the ring needed. Take half of that number to get the radius. Measure this distance along the center of your slice starting at the point. Now measure across the piece at 90° to the centerline at the proper radius to get your width of piece that is needed to make the ring.

How Precise to be: Some people will measure out to a thousandth of an inch but this may be a lot more accuracy than most people need. I like to work in millimeters because it is in decimals already and millimeter scales are available on almost all rulers now. If I am within a fraction of a millimeter, I do not have peoblems with ring sizes.

Plain vs Design Rings

Sand design rings: Segments with a design made of smaller pieces of wood glued together will have to be sanded to final size after cutting. These design pieces are made of pieces of wood glued together to make individual segments or in a length that is cut into individual segments. The individual segments will be rectangular in shape after being cut and must be sanded because they are too small to be held and cut safely on a saw.

Cutting

Miter Saw: With the miter saw you may be able to accurately set the angle although making slight changes in the angle with my miter saw is very difficult. A stop can be clamped to the say to cut various sizes of segments. The problems are the buildup of sawdust that has to be cleared regularly and small pieces tend to thrown off the saw by the blade. Small pieces on my saw are often mangled as they are thrown from the saw.

Band Saw: The band saw is great for cutting small pieces but leaves a rough edge and is not very accurate. It is required that you sand the pieces after you cut them. Hands can get too close to the blade for my comfort.

Table Saw: Using a miter gauge on the table saw can produce varied results. A lot depends upon the type and accuracy of the miter gauge. Very few of the best gauges have the ability to make changes less than

1/2 degree and the gauges are expensive. The miter gauge that I use still has more movement than I would like. There is the problem of adjusting length of segments which is best done with a stop block attached to the tablesaw fence. Small segments can get lost in the saw if you do not have a zero clearance throat plate. The cut segments are sitting next to the blade which is dangerous and if they are not removed one by one, the next segment may knock the first segment into the blade and you are off on an Easter egg hunt on the floor for the first piece.

Cutting Sled

Get wiggle out: For any cutting sled to work accurately, there must be minimal side to side movement in the miter slot. I say minimal because to eliminate all side movement requires the slider to fit so tightly that the sled has trouble moving forward. Pay special attention to making the slider fit well in the miter slot. I have been able to reduce the side movement to a level that allows for accurate cutting.

Length setup: The sled has a movable stop that allows for fast changes in the size of segments that easily repeodaces from piece to piece.

No holddowns: There are no holddowns for the segments. I first built the sled with holddowns but found that the wood was not grabbed by the blade and did not move during a cut.

Pieces not flying: Also no holddown was needed because the cut pieces are not thrown away from the blade. Very small pieces are moved a few inches by the air from the blade

Pieces not by blade: The cut pieces sit on the sled. The sled is pulled back after each cut and the piece is safely removed.

Hands away from blade: Your hands stay clear of the blade. One hand is used to hold the stock being cut against a fence about a foot from the blade. Only as the stock gets shorter does the hand get closer. I never let the hand holding the stock get closer than 6 inches from the blade. The other hand is at the back of the sled on the back holder and does not get closer than a foot from the blade. Pulling the sled back after each cut allows the cut piece to be removed at a safe distance from the blade.

Safety equipment: In using the sled many hours, I have never had a piece of wood grabbed by the blade or a cut piece thrown by the blade but I take no changes. I wear eye, hearing, and breathing protection while cutting segments.

Gluing Segments

Types of glue: The two most popular glues used today are yellow glue such as Titebond and polyurethane such as Gorilla Glue. Some of the

biggest names in turning use yellow glue without problems. Although most people seem to be using Titebond II, I still prefer the original Titebond because it dries faster. The instructions on the bottle gives a shorter clamping time for Titebond I. Polyurethane glue is much more expensive but some say it causes less movement in the wood called creep.

End grain: The way most segments are cut, you are gluing endgrain to endgrain. Endgrain is harder to glue because of the glues tendency to soak into the pores of the wood. Some woods such as oak can soak up a lot of glue whereas more dense, oily woods may soak up very little glue. Know your woods and make sure you put on enough glue for a good joint.

Spreading glue: People spread glue on the segments in many different ways. Some like to use their fingers to spread the glue and some will use a brush. Others like to rub two segments together to spread the glue on both sides. Still others like myself will place a bead of glue between two pieces and use the pressure as they are clamped to spread the glue.

Gluing surface: Some people take great pains to spread some material such as wax paper on the surface where they will be gluing so they will not get glue on things. This has some definite advantages. One should start with a flat surface. I use a piece of hard plastic without a covering. When glue drips on it, I use a scraper to remove the glue so I have a flat surface again. It is quick and easy.

Joining Segments

Sand fuzz: Some woods tend to leave small strands of wood where the blade has cut the segment. These are called fuzz. Some people like to lightly sand the fuzz off before gluing. My experience is that leaving the fuzz on the pieces does not affect how well the joint goes together because the fuzz is below the surfaces to be joined.

Noah method: I call this the Noah method because the pieces are joined two by two. This is the best method when you have a design on two segments such that the design must match on the two pieces. Glue is placed between the two pieces and they are rubbed together. After a tight joint has been achieved between the two pieces, they are set aside to dry sufficiently before joining other pieces to make larger groups. Most people will make half a circle and let it dry enough to sand a flat surface on the ends. The two circles can now be joined. I have not had great luck with this method. When I join the pieces by twos, the completed ring has different spacing than when I join them all at once. Rings that leave no gaps when joined all at once, leave gaps when joined by twos. You must have a light touch with a sander on the two halves or you will get an oval with four small segments.

This has too often occured to me.

Clamping: Many people including Ray Allen prefer to use clamps. These work best when all the segments are glued at one time. The segments can be dry fitted inside the clamp. When the clamp is tightened, you can hold the ring up to a light. This is a good test when your eye can not detect any gaps otherwise. Light will come through any gaps that exist. When you are ready to glue, apply glue in your usual manner to the segments and place all the segments together in a ring. Partially tighten the ring and move the segments so that the outside points are pushed out to touch the ring. The outside points are where two segments meet at the clamp. Now make sure the segments have their top and bottom surfaces flush with each other and not above or below the others. Placing the segments on a flat surface and lightly hitting the segments with a hammer will usually straighten the segments. Now tighten the clamp. Some people do not like clamping because they say that clamps compress the wood that will try to move back later. It is true that the glue adds moisture to the wood but this should make the wood swell. I have not seen any direct evidence of this compression and swelling at the clamping pressures that I use. How long you leave the wood in the clamp is a matter of patience. Some will leave the wood for a full 24 hours which gives full glue strength. Others like myself are more impatient. The Titebond bottle says to clamp between 10 and 30 minutes. The manufacturer has a good reason for overestimating the clamping time so that their glue will hold. I find that 15 minutes clamping is enough where I live in East Texas. Clamps should be the quick release variety that can be purchased in sizes up to 22 inch diameter for less than $3 from MSC Industrial Supply.

Tape and clamp: One day when I was wanting to experiment, I reread an article by Ray Allen. In the article, Ray used a piece of tape to join the segments before clamping. I had ignored this part because I thought it would be just some extra time wasted. When I gave the tape a try, I discovered that the tape had some great advantages over just using a clamp. The segments are aligned on a piece of masking take. One edge of the segment is aligned along one edge of the tape. The next segment is placed with its edge next to the last segment. When the last segment is placed on the tape, remove any excess tape from the two ends. The segments can be placed in a clamp for a dry fit. If you are happy with the fit, remove the clamp and set the taped pieces on a flat surface with the small ends up. I place a large drop of glue on the top center of one side of each segment. Place enough glue so that the glue will run down to the bottom of the segment. Roll the segments up and place them in a clamp. The tape makes applying the glue easier and faster. In the clamp, the tape helps to align the points and helps to keep the segment surfaces flush. Only a small amount of adjustment may be needed. Using the tape actually takes less time overall with the sav-

ings in glue application time and adjustment time. Because the segments are aligned vertically to each other better, I have had to sand less to create a flat surface on the rings.

Sanding Rings

Sand one side: There are several methods of sanding the segment rings one side at a time.

Disk on lathe: A MDF disk can be attached to a faceplate with sandpaper applied. The ring is pushed against the rotating disk. Rotate the ring to give even pressure all the way around the ring.

Belt sander: An easier way to sand is to place the ring on a 6 inch belt sander. You must be careful to hold the ring so your fingers do not slip off. The ring should be rotated constantly back and forth. Rotate your holding position on the ring every few seconds until the ring is flat. Most people recommend 80 or 100 grit sanding belts. I use a 60 grit and have been happy with the results in terms of sanding speed and the fit of the rings. If your try to sand both sides of the ring, you may get a ring where the top and bottom surfaces are not parallel to each other. Gluing several of the uneven rings together can magnify the problem and the offset can be very noticable in the final result.

Thickness (drum) sander: If you want to have rings that have parallel surfaces and are uniform in thickness, use a thickness sander. This is a must if you are gluing all of your rings together before turning your piece. For the best results possible, have all of your rings ready at one time. Pass each through the sander. Since no sander produces absolute parallel surfaces, turn all your pieces a fraction of a turn before making the next pass. This will help to even out any irregularities.

Planer: I have not had much luck with using a planer. All of my rings have either torn to pieces or have created badly torn grain.

Gluing Rings

Two by two: If you wish to glue all your rings together before starting to turn the piece, the best method may be to glue the rings together in pairs. You are able to get the best clamp pressure when gluing only two rings. These pairs are then glued to other pairs until the whole piece is glued.

All at once: Some like to glue all of the rings together at one time. I have had a problem in creating enough clamp pressure especially when there is a lot of offset from one ring to another.

Glue one and turn: No matter which method your choose, be sure to offset the joints from one ring to the next. Joints that are on top of each other are structurally weak and are not as pleasing visually. The method

I like to use is the same method that Ray Allen used. A waste block is attached with screws to a faceplate. Another waste block is glued to the first waste block. The waste block is trued on the lathe. The first layer is sanded on one side and glued to the waste block. The faceplate with its blocks and the first ring are pressed together using a press made for this purpose or you can use a drill press. The Jacobs chuck fits in the center of the faceplate threaded end. The table of drill press cranks up and creates enough pressure to produce a nice fit. Once dry, the piece is mounted on the lathe and the ring is trued. I check the trueness using a metal ruler or the edge of a turning tool. This gives an opportunity to turn away some of the wood to begin to get your shape. Do not turn to final thickness at this point. The process is repeated for each ring until the piece is all glued together.

Turning

Creep: One of the problems that arises in segmented pieces is the swelling and shrinking of pieces that can produce an uneven surface at joints. These can be felt. Bud Latvin will allow his pieces to dry for three days before the final turning. He has only had one piece that had problems and that piece underwent a tremendous humidity change. Remember that the glue joints will have more moisture from the glue than the rest of the wood.

Bowl Gouges: After sufficient drying the piece is ready to be turned. The bowl gouge works very well on segmented pieces. It is especially good on rough turning.

Scrapers: Because of the way segments are cut, most of the surface of the final piece has the grain running parallel to the direction the piece is turning. This allows scrapers to work very well. I use scrapers for most of my segmented turning both inside and out.

Finishing

Anyway goes: The sanding and finishing goes like any other piece. Sand and finish the piece according to your own desire.