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Segmented Bowls using Dados and Splines (cut on a table saw)

Steve Reznek

Intermediate

Cutting dados and filling them with splines can make interesting “segmented” turnings. The shapes can be as simple as complex as you wish; or have patience for. In contrast to the n-sided ring approach where the interesting patterns usually are vertical, dados and splines are well suited to horizontal patterns. The patterns can be in the bottom of an ordinary bowl, as shown in most of the pictures. Alternatively they can be in the top of a closed pot or on a lid.

Like the n-sided ring approach, the dado/spline, or the inlay, approach has a few techniques to learn. I think they are a few in number and easy to do. I hope the pictures convince you to try them.

You start with a squared-up board which I will call the blank. The next step is to cut dados in your board with the saw. Most often I use a thin kerf blade, rather than an actual dado. Once you have the dados, you cut splines that are exactly the width of the dado. Obviously the next thing to do is glue the splines in the dados. Finally mount the blank for turning.

If you want to make several copies of the same design, you can start with a board that is several times as long as it is wide and cut it into squares after the splines are in. Also it is easier to make the splines wide enough to sit up proud of the blank. The design often requires mounting the blank spline side down. You flatten the blank to remove the top of the splines before mounting.

DESIGNS

Naturally the blank and the inlay should have contrasting colors. Some choices are red (bloodwood), yellow (palo amarillo, aka satine), purple (purple heart), orange (chakte viga), black (walnut, ebony and black wood) and white (maple and holly). And of course, a full range of browns.

The interesting and fun part of all this are the designs. Many of the ones in the pictures seem complicated. A question often heard is, "Do you know what the pattern will look like before you turn it?" My usual response is, "Do you know the first time, or the second?"

The design's complexity depends on the dados: their width, number, spacing, depth, orientation and angle. This sounds like a lot and, perhaps, it is. But you don't need to change very many of them to make interesting patterns.

From now on I will always assume the dado is the width of a thin kerf blade.

Number, Spacing, Depth



Photo 1



Photo 2

Start with something simple. The bloodwood bowl and the two lids for ceramic bowls have three maple inlays. The pattern lends itself to making multiple copies. The design is determined by two things. The first is the spacing between the inlays. And the second is how deep you cut the dados. The deeper you cut the dado, the longer the inlay will be in the bowl. In the bloodwood bowl and the lids, the center dado was deeper than the two on the sides and the inlay correspondingly longer. (See Photos 1 and 2.)

How do you judge how deep to make the dado? The easiest way is to draw the profile of your bowl. Add a line that marks the length of the center inlay. The distance from the bottom up to this line is the depth of the center dado. Finally, you will not need the drawing and can judge the depth by eye.

The designs with the inlay at the bottom of the bowl have the blank mounted with the splines at the head stock. The blank had to be flattened to remove the parts of the splines that stick up.

Orientation



Photo 3

The next degree of complexity is to have dados crossing each other. Two of the bowls have two sets of the inlays, right angles to each other.

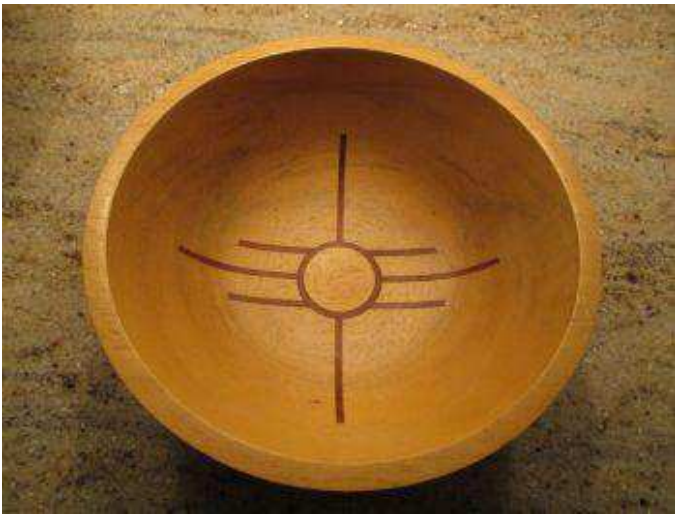


Photo 4

In Photo 3, there are three inlays in each direction and in photo 4 there are three in one direction and a single one perpendicular to them. The bowl in photo 4 has the center (where the inlays cross) removed, and replaced with a The pattern is a take-off on the New Mexico State symbol. I made the ring after the splines were glued in and flat drilling out the entire center and filling it with walnut. Then I drilled out the center walnut and filled that hole with same maple as the blank. Both times I did not drill all the way through the blank. In all cases where they cross, you must fill the first set of dados, gluing in the splines and flattening them before you cut the second set.

Angle



Photo 5

The final degree of complexity is to tilt the blade. All the designs thus far have cut the dados with the blade perpendicular to the saw table. The four remaining pictures, Photos 5, 6, 7 and 8, each show a bowl where the blade tilted at forty-five degrees. All four not only have the dados tilted, but they are positioned so they cross one another. The tilted blade allows the dados to cross each other even if they are cut in the same orientation with respect to the tables saw fence. You must cut one set of dados, glue in the splines and flatten the blank before you cut the next.

All six dados in Photo 5 are cut with the blade at 45 degrees. All six are ripped with the grain parallel to the fence. Three of the splines tilt to the left and three tilt to the right. (You can change the left/right orientation by changing blank end-for-end, not by flipping it.)



Photo 6

The twelve splines in Photo 6 are similar to those of figure 5, except that six of them are parallel to the grain and six are perpendicular. You start cutting the twelve dados by first cutting three. You fill these and flatten the splines. You then rotate end-for-end, cut the next three, fill and flatten. You then do the first three cross grain and finally the last three cross grain.



Photo 7

In Photos 7 and 8, there are eight dados and splines. Four dados are cut parallel to the grain and an additional four perpendicular. The four in the same direction do not cross each other. The only crossing occurs between the parallel and perpendicular cuts.



Photo 8

The most interesting patterns seem to come from a tilted blade. Start with an easy pattern and go on from there. Good luck. But be careful. You might get hooked!

APPENDICIES

Safety

Use the table saw safely. Cutting square blanks is dangerous, particularly if they are small. Unless you are very experienced, the easiest thing to do is to use waste wood to turn your square blank into a board. The waste wood should be the same thickness and width as the blank. You can glue waste pieces on to both ends of the blank. Alternatively use double-sided carpet tape on the ends to hold the three pieces together. The double-sided tape on the ends, by itself, is **not strong** enough. I cut a thinner piece of wood that is a little narrower than the blank and a little shorter than “three piece board”. This is a cap. I use the tape to hold this thinner piece to the tops of the three pieces. I find this works well. The end pieces also assure that the blank goes straight through the blade and there is no sideways movement at the end of the cut.

Making the longer piece allows you to use a feather board. All the cuts for the bowls I have shown are made against the fence. The feather board not only helps make the cuts safely, it helps assure that the dado and spline are straight and of consistent width.

Remember you cannot have a splitter that is higher than the blade when you are cutting a dado.

Tips

How can you assure that three or more dados are spaced evenly? I do this by cutting positioners of equal thickness that go between the fence and the blank. The positioners must be long enough to assure the blank rides on them as it moves through and beyond the blade. You can also tape the positioners either to the blank or to the fence to assure they will be in place as the blank goes through and beyond the blade. You need one less positioner than the number of dados. For the three inlay bowl, start with one positioner in place. Set the fence so that the blade is in the middle of the blank and cut the center dado. Then lower the blade and cut each of the two side dados. One is cut with the two positioners and the other with none, i.e. against the fence.

How can you assure that the splines exactly fit the dados? I use the table saw with a spacer. The spacer must be exactly two kerfs wide. Once you have made a spacer, you can use it over and over again.

You make a first cut of a board against the fence. Then you make the second cut with the spacer between the board and the fence. The splines are thin and I don't particularly like cutting thin slats against the fence. Also, if you do this you have to find the correct position for the fence every time you want to cut splines. Making fine adjustment to the fence is a pain even if you have marked the position on your table.

Cutting the spacer that is exactly two kerfs wide is, perhaps, the most difficult part of the inlay approach. I use inexpensive wood for three things. First I cut a dado that I will use to see if the splines fit. I use inexpensive wood for cutting both the trial pieces for the spacer and the resulting spline from each trial. Cut the first trial spacer. Having done that, I don't like cutting thin slabs against the fence, I do so for the trial spacers. Use the spacer to cut a spline. Try the spline in the dado. Adjust the fence and repeat for a second trial spacer. Once you get the spacer about right, change to something stable like MDF for the next trial. Very fine adjustments of the fence are difficult. When you get to the point where the trial spline is just a very little too thin, you can use duct tape to thicken the trial spacer. When you think you are there, cut a spline from the wood you actually want to use. I find that there is no difference between the dado and the spline thicknesses with the cheap wood and the actual wood.

Hang on to that spacer. It works and it is stable.

Finally one more piece of bad news. If you have tilted the blade, the dado can easily be deeper than the thickness board you are using for the splines. Only if the board is thick enough, can you use the same spacer and cut the splines 90 degrees. If the board you are using to make the splines is not thick enough, you can cut the splines with the blade tilted as well. However, now the spacer will be too thin and you have to make a new spacer for each tilt angle.

How do you glue the splines in the dados? I use Tightbond glue. Cyano glues are too weak. Once you have put on a spline, it swells and can be very difficult to fit into the dado; particularly if the dado is deep. I open up the dado with a tough board and a narrow piece of wood. The narrow piece can be a strip of half round molding. I tape the narrow piece to the bottom of the blank just below the dado. I then put the blank on the tough board and use clamps on the sides to bend it just enough to open the dado a little bit. (Be careful not to bend the blank so much that it cracks.) I apply the glue on the sides of the spline and insert it into the open dado. If the glue is in the dado, you may not be able to push the spline all the way in. Release the blank and use clamps on the sides to squeeze the dado closed.

How do you cut the dados if you want them to go all the way through the blank? The easiest way to make such the complex bowls is, in fact, to cut the dado all the way through the blank. However, if you merely cut the blank into two pieces, you may have a problem assuring good alignment in the glue up.

A simple trick works well. Glue a piece of reasonably thick plywood on top of the blank. Cut the dados a little into the plywood, but be sure to leave enough for strength. Even if you do not want the dados to go all the way through the blank, reinforcing the face that won't be cut with plywood will help assure that you can bend the dados open without cracking the blank.

How to deal with Alternative Top Bevel (ATB) blades if you don't own a dado blade? The first is just forget about it. Yes, the ends of the dados have little "arrow tails" but you live with it, particularly if the color of your glue more or less matches the color of one of your woods. Tightbond III matches walnut pretty well. If, after turning, the glue has filled "arrows", I use sawdust and glue as a filler.

Second, use a cross cut blade. The ATB is usually a lot less, but still exists. Ripping with a cross cut blade works more or less okay, but be sure your blade is sharp.

Third you can try to find an actual dado blade. The top will be flat. However, I have not found an actual dado blade with a thin kerf.

Fourth, you can have your local saw sharpener grind a blade so the tops are flat.

Fifth, if you carefully look at the information on the blades that are available, you will see that some of them emphasize and some downplay the ATB. Again the ATB does not go away, but it is reduced.

In fact for the most part I just forget about the problem and fill any gaps that remain with saw dust and glue. Sometimes I use a sharp cross cut blade.

One important point is that if you are going to make the cut all the way through the block, the ATP problem doesn't exist. Remember you glue a piece of waste wood on top. I usually use plywood. You cut the dado into the blank but not through the plywood. When you take off the plywood, you also remove the end of the dado and the top of the spline. Most of the really neat designs are made this way. (But the simpler ones are not.)

How do you mount your blank with the splines in place on your lathe? In almost every bowl I have made, I have used face plates. I mount a waste block on the face plate and make sure its face is flat. To flatten, I first use a gouge then a strip of sand paper backed by a board. Keeping the board squared up is easier if you stand it on the tool rest.

How do you flatten the blank to remove the tips of the splines sticking up above the blank? Often you want to mount the blank with the top of the dado down. The easiest way to remove the parts of the splines proud of the blank is with a drum sander. But not everyone has one. One way is to use a face plate with a large flat board attached. You clamp your blank to the board and flatten the splines. Now you attach the flattened face to the bowl's foot and remove the

original waste. An alternative is to use double-sided tape and a large face plate. Stick the blank to the face plate and then carefully flatten it. If you don't have a large enough face plate, use a flat piece of board attached to a small face plate.

Be careful. The double sided tape will only take so much and **it is very easy to have it let go and the piece fly off.** Tape may be OK for small pieces, but I wouldn't try it with large ones. If at all possible, use a drum sander to make things easier **and safer.**

Should you use two extra pieces, one for the foot and another for the rim? I often find that I want to use the entire depth of the blank in the design. Adding the extra pieces can improve the designs considerably.

How can you minimize the effects of movement with winter and summer humidity? You must cut the splines the grains in the same orientation as the grain in the blank. That is, if the dados are along the grain, so must the splines. If the dados are across the grain, the splines must be cut across as well. It also helps if the orientation of the splines perpendicular to grains, i.e. across and parallel to the growth rings, are the same.

Isn't this project really for beginners? Yes and no. A beginning turner should be able to turn this type of bowl without much problem. However, if you're new to woodworking, making the square blanks and cutting dados into them may take a bit of practice. Woodworkers that are experienced with table saws will better understand the safety issues and will be better prepared to construct these blanks with their dados. Also flattening the faces where the tips of the splines are proud of the blank takes a little care. It is easy enough with a planer or a drum sander. However, if you want to flatten the face on the lathe be very careful that the blank is attached securely enough to a flat waste piece that is either on a faceplate or in a chuck. If you use double sided tape, be particularly careful. Finally cutting the spacer that is two kerfs wide and therefore allows you to cut the spline that is exactly one kerf wide does not take special skill. However it does take enough patience to repeat the trials enough times to get it right.

DRAWBACKS

In the interest of full disclosure: the inlay approach has two disadvantages compared with the n-sided rings. Neither is particularly devastating. The first is that the horizontal orientation tends to use more wood to make the same size bowl. The second is that you will have to finish end grain. Just as with turning an ordinary bowl from a half log, you can't escape having at least a part of the cut "up-hill" as well as some of the surface end grain. However, I find I am more entranced by the possible patterns and designs than I am put off by the extra effort needed for "up-hill" turning and grain finishing.

Maybe there is a third drawback. There are many, many designs out there for the n-sided ring approach. And there are few to none for the dado-spline approach. But here is your chance to get in at the beginning and be one of the field's original innovators!