Introduction

Story

I’ve been spending a whole lot of time lately writing a book on Woodturning Accessories for All American Crafts, the publishers of Woodturning Design. I discovered while working on an expansion of an earlier article on Wooden Faceplates (http://www.davidreedsmith.com/Articles/WoodenFaceplate/WoodenFaceplates.htm) that I could use 2 mm Craft Foam and spray adhesive to build up a form and then use coarse abrasive to shape it however I liked. As the Guinevere pneumatic cushion ball sander had come out recently, shaping the foam into a ball was a pretty obvious step. All I had to do was figure out a way to cover the ball with abrasive.

Some “All’s” are harder than others. I’ve lost track of how many different ways I tried. All of them worked, but I think the first version took about 5 minutes to change abrasive. I took several versions in for an extended show and tell at a Baltimore Area Turners meeting. When I was done, one of the guys asked me which version I liked best—and I couldn’t say. There seems to be an unavoidable trade-off between convenience and durability. Which approach is best depends on the application.

Why

I really think the Foam Ball Sander has many advantages:

- Disc sanders are inherently unstable, as a slight change in contact area leads to a big change in the direction of the force you have to counteract. The Foam Ball Sander is much more forgiving. I can easily control it with one hand. It’s more pleasant to use.
- You can sand a bowl off the lathe. I’ve done a few bowls finished turned while green, let them dry and then power sanded the inside with the Foam Ball Sanders.
- The Foam Ball Sander more easily adapts to the concave surface of the inside of a bowl.
- The Foam Ball Sander can be manipulated so that the abrasive pattern is consistent and similar to hand sanding—no swirls [see a comparison in Fig01 & Fig 02].
- Because of the above a Foam Ball Sander can be used to “spot sand” a defect, or an area hard to sand with the lathe running, such as the top of a natural edge bowl, with much less obvious results [see a comparison in Fig03 & Fig 04].
- When sanding off the lathe you can easily avoid those telltale concentric circles at the bottom of a bowl that only appear when you apply finish—and that everybody looks for at show and tell. There are compensating defects I imagine, but people aren’t looking for them yet.
- When sanding on the lathe you can stop the lathe after each grit and easily power sand with the grain at the bottom of the bowl to get rid of concentric circles.
- You can make it whatever size you like, whereas the Guinevere is to my taste too small for bowls and too large for vessel interiors.
- It will remove a lot of wood. Objectively, I did several trials comparing a 3” foam backed disc with a 2” Foam Ball Sander using a postal scale and stop watch. It was a tie. Subjectively the ball seems faster, perhaps because it’s easier to control.
- You can use it aggressively. I’ve pressed a 2” Foam Ball Sander into a bowl hard enough to almost stall a 3/8” air drill running at 100 psi.
- You can adapt cheap common abrasive discs to fit the ball yourself.

![Figure #01. The sanding pattern left by a foam backed 100 grit disc sander when the lathe is turning.](image1)

![Figure #02. The sanding pattern left by a 100 grit Foam Ball Sander when the lathe is turning.](image2)

![Figure #03: The sanding pattern left after spot sanding with a foam backed disc with the lathe stopped.](image3)
It's not magic, but I do like the results. [Fig05 & Fig06] show a before and after of a 9” pear bowl I did with an early version of the Foam Ball Sander. I deliberately started sanding the interior after a rough gouge cut. Nine easy minutes later I had a better surface than I usually get.

What

This article will show how to make a Foam Ball Sander, how to modify abrasive discs to fit the ball, and three different ways to attach the abrasive. It's a good idea to have at least some of the abrasive you intend to use on hand before making the Foam Ball Sander. Where ease of changing abrasive is paramount, Velcro is used to attach modified loop backed discs. If you want to be more aggressive (or bought cheap loop discs that delaminate easily) you can add mechanical holding power by pinning the ends of the abrasive leaves between washers. If durability is paramount you can use modified cloth backed abrasive discs held between washers.

Making

Mandrel

Plain for Velcro Only

If you want to make a Foam Ball Sander that has the abrasive attached with Velcro only, start by cutting a 3/8” plain steel rod to length. For bowl sanding you need the length to be about the diameter of the ball plus 1-1/2” (for instance about 3-1/2” for a 2” Foam Ball Sander). For sanding the inside of a vessel the length you need depends on the maximum depth of vessel. You can use drill rod, weldable steel, or the shank part of a long 3/8” bolt if you cut the head off.

Washer Backed for Mechanical & Reinforced Velcro

If you to use reinforced Velcro or a purely mechanical attachment, you need 3/8” rod that is at least partially threaded. 3/8” all-thread is the simplest thing to use, just cut to the same length you would for a plain mandrel. You will also need three 3/8” nuts and two washers. The size washer depends upon the size ball you want to make. I suggest using 5/16” plain washers (drill out to fit if necessary) for a 1” ball, and 3/8” fender washers for a 2” ball.

Prepare the washers. If you are making a Reinforced Velcro ball, cover one side of one washer with adhesive backed Velcro hook material. Cover the other washer with coarse (60 to 100 grit) abrasive. You could use PSA backed abrasive or spray adhesive with plain abrasive. A 3/8” hole punch will make this task much easier—lay the material hook or grit side down on the end grain of a scrap board, then whack the punch with a mallet.

If you are making a Mechanical Attachment ball, cover both washers with coarse abrasive.

Now assemble the mandrel. Spin a nut onto the all-thread about 2 inches. Drop the abrasive covered washer onto the all-thread with the abrasive away from the nut. Now add the other washer, so that the hook (or abrasive) side faces the abrasive of the first washer. Now spin two more nuts onto the all-thread.

The last two nuts will be locked in place by using two wrenches to tighten them against each other. For the 1” ball, lock them in place at the end of the all-thread [as in Fig07]. For the 2” ball, lock them in place ¾” from the end of the all-thread. Snug the other nut against the two locked nuts, holding the washers in place as in [Fig08]. You can cover the edges of the washer and last nut with a strip of masking tape to keep stray adhesive away [as in Fig08].
Figure #07. A mandrel for a Reinforced Velcro or Mechanical Foam Ball Sander, this one is set up for a 1” ball. It consists of 3/8” all-thread, two 3/8” nuts locked against one another at the end, and another 3/8” nut holding two washers against the locked nuts. If you look closely you’ll see this is a staged photo, the washers don’t have Velcro or abrasive on them.

Figure #08. A mandrel that has been mounted in a 4-Jaw chuck with #1 jaws, and taped to keep overspray of adhesive off where it’s not needed.

Foam & Shape

Mount the mandrel on your lathe with about ½” of mandrel plus the amount to be covered extending. A collet chuck is ideal for this, especially if you’re making a Foam Ball Sander for vessels, as you can choke up on the mandrel. You can also use #1 jaws on a 4-jaw chuck, or remove the top jaws from a 4-jaw chuck.

Spread some newsprint over your lathe bed to protect the ways, and spray adhesive on the mandrel while turning the lathe slowly by hand [Fig09].

Figure #09. Spraying adhesive on a plain steel mandrel for a Velcro Only Foam Ball Sander.

The very nose of the Velcro only Foam Ball Sander will have a 3/8” hollow spot when applied. This doesn’t matter because the hollow will tend to close when shaping the ball, and because you should avoid using the nose dead on when sanding.

If you are using the Mechanical or Reinforced Velcro mandrel you will need to apply some foam to the center of the mandrel before winding the rest of the foam on. For the 1” ball, cut 4 circles of foam 5/8” in diameter. Spray adhesive on one side of the foam circles (hold them down with a finishing nail so the spray doesn’t blow them away) then stack them up on the end of the mandrel [as in Fig10].

For the 2” ball, cut a strip of foam that is ¼” wider than the distance from the last nut to the end of the all thread (1” if ¾” of all thread is exposed [Fig11]). Spray adhesive on the strip. Then wind the strip onto the exposed all thread until the level of the foam is equal to the diameter of the nuts [as in Fig12].

Figure #10. After applying four filler foam circles to the end of a 1” Reinforced Velcro or Mechanical mandrel.
Now cut a strip of foam to form the bulk of the ball. For the Velcro only mandrel this strip should be \( \frac{1}{2} \)" more in width than the intended diameter of the Foam Ball Sander. For the Mechanical or Reinforced Velcro, this strip should be the width of the distance from the washer to the end of the filler foam you just applied. Wind the foam onto the mandrel by turning the lathe by hand in the direction it normally runs (top towards you) [Fig13 & Fig14]. Keep winding the foam on until you’ve built up the foam to a diameter slightly greater than the finished Foam Ball Sander is to be [as in Fig15]. For larger balls you’ll probably need more than one strip. Take a coffee break now to let the adhesive cure a bit.

Now prepare to shape the ball. Remove the newsprint from the lathe bed so turning on your dust collector will be less exciting. To prevent the ball from unwinding while it’s being shaped, do half of the ball at a time, protecting the other half with tape. Wrap masking tape or a narrow ripped strip of duct tape all the way around the tailstock third of the foam [Fig16]. Turn on the lathe at a moderate to fast speed and also turn on your dust collector. Use coarse abrasive (80 or 100 grit) backed up with a wood scrap to shape the back half of the ball [as in Fig17]. First bring the un-taped portion of the ball to round, then shape the back of the ball [Fig18].
Stop the lathe. Gently remove the strip of tape protecting the tailstock end of the ball. Apply another strip around the headstock end of the ball. Restart the lathe and shape the front of the ball [Fig19 & Fig20]. Now stop the lathe again and remove the protective tape.

Check to make sure the ball is a diameter that will work with the abrasive you have (I suggest 3” discs for the 1” ball, 6” discs for the 2” ball). For the Velcro only mandrel, just make sure that a disc bent around the ball covers most of it [as in Fig21]. For a Mechanical only ball, check that the disc can extend over the washer on both sides of the disc. For the Reinforced Velcro ball you have to be more finicky, as the thickness of the Velcro hook layer will throw the measurement off. Cut a ¼” wide strip of Velcro hook material as long as the diameter of your disc. Leave the backing on, but attach it via the hooks to the loop side of your disc. Now wrap the disc around the ball so that the Velcro strip is against the ball, and make sure that the both sides of the disc can extend over the washer. If necessary reduce the diameter of the ball by sanding some more. You should be past the stage where the foam might tend to unwrap under power, so you don’t need to tape and shape half at a time.
Cover

Tape

Now cover the foam with duct tape to protect it. For the Velcro only mandrel I suggest starting with a couple of strips that extend on to the metal mandrel [as in Fig22] just to make sure the mandrel doesn’t start spinning freely within the foam. Finish up with a strip wrapped around the middle, other than that you can apply the tape in whatever fashion you like as long as it covers all the foam [Fig23]. Remove the mandrel from the lathe.

Velcro

Unless you’re making a mechanical only ball, now you can cover the ball with Velcro hook material. It doesn’t matter what pattern you use, so long as most of the ball is covered in an un-wrinkled fashion [Fig24]. Punched out circles seemed to be the most esthetically pleasing, but that probably isn’t the highest priority.

The Foam Ball Sander is now complete. [Fig25 shows a Velcro only 1” sander. Fig 26 shows a 1” Reinforced Velcro sander. Fig27 shows a larger Mechanical sander].

Figure #21. Wrapping a disc around the ball to check that the size will be suitable.

Figure #22. Starting to apply duct tape. This a plain mandrel so I carried the duct tape onto the mandrel to strengthen the joint between mandrel and foam.

Figure #23. After applying duct tape over the whole ball. The last steps were to wrap a strip of duct tape around the covered part of the mandrel and the center of the ball.

Figure #24. Velcro partially applied. For this one I was using some small random scraps left over from another ball.

Figure #25. A completed Velcro Only Foam Ball Sander.

Figure #26. A completed Reinforced Velcro Foam Ball Sander.
A completed Mechanical Foam Ball Sander.

**Abrasive**

You can start with any source of abrasive you like, but it makes sense to start with discs because they are readily available and the pattern is round.

I’ve included two kinds of patterns for two sizes (1” and 2”) of Foam Ball Sanders [see Drawing1 and Drawing 2]. To conserve space the patterns are combined. To cut the abrasive with leaves that overlap, follow the black lines. To cut the abrasive with leaves that don’t overlap, follow the black straight lines and the red curved lines. The non-overlapping version looks a little neater, the overlapped version will last a little longer perhaps, and protect the underlying Velcro better.

**Cut**

The abrasive discs have to be modified to fit the ball. If you don’t have a scroll saw, then you’ll have to use trash scissors. Copy or print out the appropriate pattern [in Drawing 1] and cut it into a circle. You may wish to write the grit with marker in the center of each disc for easy identification. Arrange the abrasive discs you wish to cut out into a stack (you can probably cut a ½” stack at one time) with the abrasive facing down. Tape the stack together at the edges with masking tape [as in Fig28]. Now tape the pattern on to the top of the stack [Fig29]. Adding a plain paper disk on the bottom of the stack will make sliding the stack on the saw easier. Take the stack over to your scroll saw and mount a medium (#5 to #7) blade that you don’t mind ruining. Cut out the pattern [Fig31], then remove the pattern and any tape from the top and bottom pieces [Fig32].
Figure #30. Cutting the stack on a scroll saw. Yes, it trashes the blade. But scroll blades are cheap and you can cut several stacks with a blade.

Figure #31. The stack after cutting out.

Figure #32. A Velcro Only Foam Ball Sander loaded with overlapping pattern abrasive and the rest of the stack nearby.

Figure #33. After winding one rubber band around a Mechanical Foam Ball Sander and abrasive.

Figure #34. After winding the second rubber band on the Mechanical Foam Ball Sander.

Load

To load a Velcro only Foam Ball Sander, put the center of the abrasive on the top of the ball and press down the leaves of the abrasive one by one. If you are using an overlapping pattern you may have to tuck the last leaf under the first one.

To load a Reinforced Velcro Foam Ball Sander, first back off the nut and washer. Put the center of the abrasive on the top of the ball making sure it is centered well enough that all the leaves will overlap the Velcro covered washer. Press down the leaves one by one making sure the tips are pressed down on the Velcro covered washer. Tighten the nut so that the abrasive covered washer locks the abrasive in place even if the abrasive/loop delaminates.

To load a Mechanical Foam Ball Sander, first back off the nut and washer. Place the center of the abrasive on the top of the ball and hold it in place with one hand. Wind a rubber band around the middle of the ball to keep the abrasive in place [Fig33]. Now add another rubber band closer to the washer to bend the leaves inward [Fig34]. You can tug the leaves snug at this point. Drop the washer into place and tighten the nut to hold the abrasive in place [Fig35]. Even if it looks a little loose it will probably work just fine.
Using

Vessel

You can use a small Foam Ball Sander to sand the inside of a vessel. I wouldn’t suggest doing so when the wood is still wet, but if you sand the outside first the inside will probably be dry enough not to overly clog up the abrasive. You can also let the vessel dry and remount it on the lathe. Turning the lathe on at a very slow speed will make up for any wood movement while drying.

You can use the back third of the Foam Ball Sander to sand under the lip of the vessel [as in Fig36]. The side of the ball will sand the bulk of the sides of the vessel [Fig37 & Fig38]. Try to avoid straight on contact with the nose of the ball as much as possible except for the very bottom, as this will make the Foam Ball Sander unstable in the same fashion as a foam backed disc is all the time. Stop the lathe and blow out the interior regularly, and make sure any defects you can’t tolerate are gone before moving to a finer grit.

Sanding a Bowl On the Lathe

Subjectively the Foam Ball Sander feels much nicer than a disc when sanding a bowl on the lathe. The only problem is that the chuck may prevent you from sanding the near the foot of the bowl and that you can’t sand details with a radius less than the radius of the ball.

When sanding the outside of a bowl it helps to have the bowl turning in reverse to maximize the speed of the abrasive relative to the wood [Fig39]. Avoid contacting the very nose of the ball.
Use the side of the ball as much as possible when sanding the inside of the bowl [Fig 40]. Have the lathe turning forwards. Angle the ball when sanding the bottom to avoid contacting the very nose of the ball [Fig 41]. You can stop the lathe and angle the ball to sand with the grain on the bottom of the bowl after each grit.

**Figure #39.** Sanding the outside of a bowl with the Foam Ball Sander. The bowl is turning in reverse. I couldn’t sand all the way to the foot because of the chuck.

**Figure #40.** Sanding the inside of a bowl with the Foam Ball Sander. The bowl is turning forward.

**Figure #41.** Sanding the bottom of a bowl with the Foam Ball Sander. Note that the ball has been angled to contact the side or front quadrant of the ball, not nose dead on.

**Figure #42.** Sanding the edge of a bowl with the Foam Ball Sander. If the lathe is turning forward then sand on the front edge.

**Figure #43.** Spot sanding a defect on the inside of a bowl with the Foam Ball Sander. Since the Foam Ball Sander is so stable in use I can hold the drill in one hand and the bowl in other rather than lock the spindle.

You can stop the lathe to do spot sanding of defects. Since the Foam Ball Sander is so stable, you don’t have to lock the lathe spindle, but instead hold the bowl in place with one hand and the drill with the other [Fig 43].

**Sanding a Bowl Off the Lathe**

If you reverse turn a bowl using a tailstock center for support and leave a small nub which is then cut or broken off, the Foam Ball Sander will almost instantly erase all the evidence. It’s easier to see what you’re doing with the 1” Foam Ball Sander.

You can use the Foam Ball Sander to sand the inside of a bowl off the lathe that has been finish turned while green and dried. Ordinarily I’m not a fan of finish turning bowls while green, as once you build up a stock of green rough turned bowls you don’t have to. But sometimes you need to hurry—maybe a thank you bowl for donated wood from someone with delayed gratification problems. I also don’t like sanding wet wood on the lathe—it tends to be slow, frustrating, and have high wastage rates for sandpaper. In my basement a finish turned from green bowl will dry in a week. If that’s not fast enough, a thin bowl will microwave dry easily. Try giving the bowl 2 minutes at 30% power (enough to make it warm) and let it cool. Weigh the bowl, then repeat until no weight change is seen.

You can also stop the lathe to do spot sanding of defects. Since the Foam Ball Sander is so stable, you don’t have to lock the lathe spindle, but instead hold the bowl in place with one hand and the drill with the other [Fig 43].

You can mount the Foam Ball Sander in a drill chuck in your lathe [Fig 44] if you use a draw bar. The only drawback to this method is that it’s hard to see what you’re doing. You could consider mounting the Foam Ball Sander on your drill press if you can rig up dust collection. I’ve heard that lateral stress is not especially good for a drill press. Since the Foam Ball Sander is so stable in use you can also just hand hold the bowl and drill while standing near
your lathe’s dust collector [Fig45]. The Foam Ball Sander isn’t especially efficient on the outside of a bowl when hand held, but you could use a pneumatic cushion drum sander, or apply the same foam trick in this article to a drum, or wait for the book…[Fig46]

Figure #44. Sanding the inside of a bowl that was finish turned green and dried in a microwave. This is an early version of a Foam Ball Sander. It’s held in a drill chuck held by a Special Purpose Mounting System which will be in the book. You could also use a collet chuck or a drill chuck with a draw bar to hold the Foam Ball Sander.

Figure #45. Sanding the inside of the bowl in Fig 44 by hand holding. It’s easier to see your progress this way. Perhaps the best way would be to clamp the bowl in a padded v-block.

Figure #46. The bowl in Fig44 and Fig45 after finishing. I sanded the outside of the bowl with a foam padded cylinder.

Materials & Tools

[Fig47]

Figure #47. Visual Materials List. Underneath the rest of the items is a pack of craft foam. Clockwise from the upper left are three mandrel materials; all thread, plain steel rod, and a 3/8” bolt; duct tape and masking tape; heavy duty self adhesive Velcro (from Wal*Mart); washers and nuts; abrasive on a scrap backing; 3M #77 spray adhesive; and an abrasive disc.

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