

I decided to take Randy up on his challenge to try and improve his design for a field-sturdy mite washer. Although I didn't see much need to improve the basic design, I wanted to see if I could come up with some modifications on how it was built that might be of help.

I thought about this for a long time after hearing Randy discuss its use at a Boise, Idaho conference in December 2014. I like to tinker, so my mind got busy turning over some ideas until I had it fairly well worked out and ready to try.

This method is easy to replicate; takes away any guess work; allows for a fairly precise unit; and lends itself to assembly-line type production if you need to mass produce them. And no plastic welding!

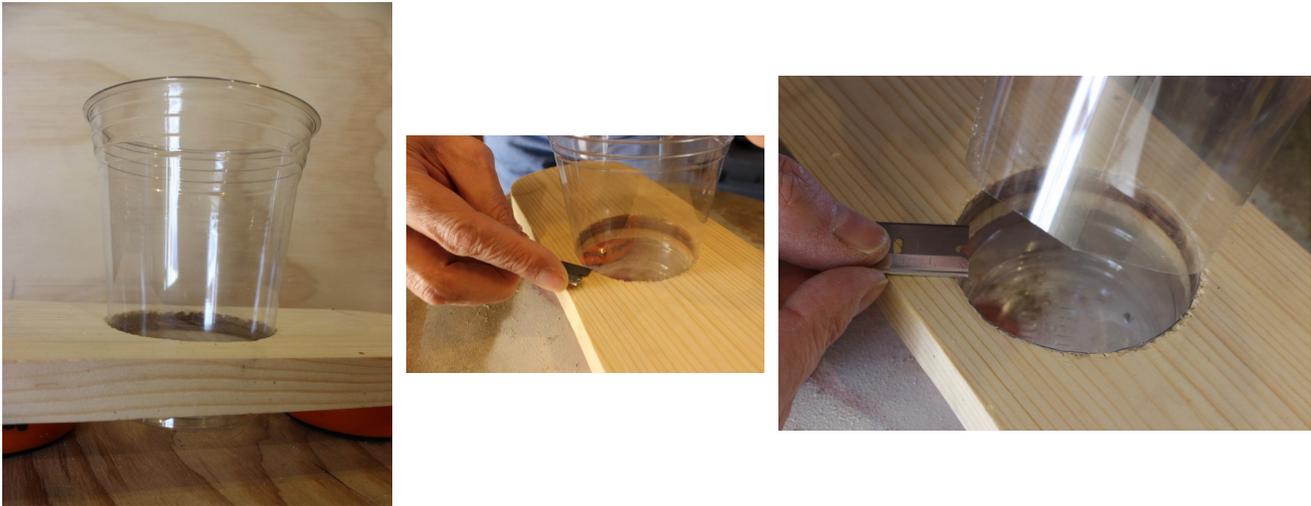
So, here it is.

### **Materials List:**

- Piece of 3/4" inch lumber sturdy enough to absorb some impact after drilling a 2 3/4" hole through it. I used a scrap of pine. You will also need a sacrifice board when drilling the hole.
- 2 3/4" (70mm) hole saw.
- Power drill.
- Shims or bench dogs to hold wood off the underlying surface.
- Clear plastic 16 oz. cups.
- Xacto knife, razor blade, pocket knife, or other sharp, narrow blade.
- #8 (1/8") galvanized hardware cloth.
- Rubber mallet.
- Snips or scissors to cut the hardware cloth, such as *Stanley FATMAX Multi-Purpose Snips*.
- Electric desktop cup warmer.
- 100% silicone household adhesive with a long applicator tip, such as DAP.
- Some form of weight that will fit inside the cup.

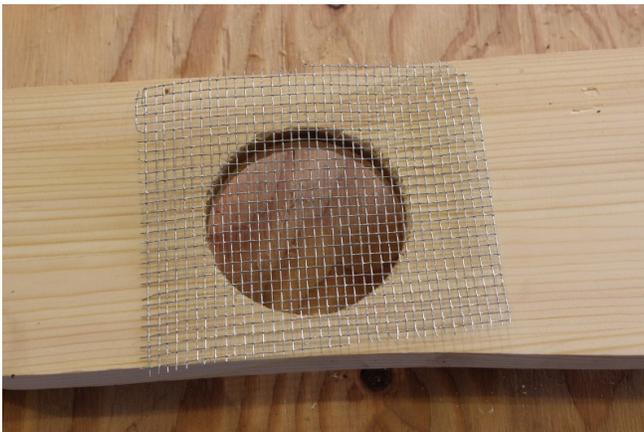
### **Steps:**

1. Place your piece of wood on top of a sacrifice board and secure it in place using bench clamps.
2. Drill a pilot hole in the center of the wood to allow you to safely use the hole saw, then install the hole saw into the drill and carefully drill a nice, clean 2 3/4" hole, being sure to drill into the sacrifice board to get nice clean edges all around. Clean off any jagged edges left by the saw and save the plug from the hole for later use. You have just made your template for both the cup and the screen. (See Figures 1 & 2)
3. Place your wood template on the shims or bench dogs so the hole is centered between them and raised up high enough to slip one of the plastic cups into the hole until it stops without contacting the surface below. (*Tip: If you want more precision, use a small level.*)
4. Using the blade, score the cup along the edge where wood and plastic meet and continue until the plastic has been cut all the way through. This may take a couple of passes. This gives you an even plane to cut the cup without having to measure a line and will sever the cup at the exact dimension of 2 3/4" across that Randy recommends (see Figure 1). (*Tip: I used a lazy susan I keep in the shop for small spray painting jobs to allow me to just spin the cup as I cut.*)



*Figure 1 – Cup in the template, making the cut, and one completed*

5. Remove the cup and set aside.
6. Cut a piece of hardware cloth approximately 4" x 4" and center it over the hole in the wood template as seen in Figure 2.
7. Remove the drill bit from the hole saw and invert the saw part so the teeth are pointing up. Put it on the screen so it fits exactly over the hole. You are going to use it as your screen forming wedge.
8. Take a scrap piece of wood and put it over the teeth of the saw, then use the rubber mallet to pound the hole saw down into the hole by striking the wood, pushing the screen into the hole with it to a depth of  $\frac{1}{2}$  –  $\frac{3}{4}$ ". Be sure to drive it in evenly! (See Figure 2)



*Figure 2 – Screen in place and hammering to form*

9. Flip the wood template over and push the screen and hole saw back out the other side as in Figure 3.
10. Trim the edges of the screen, leaving about a  $\frac{1}{4}$ " collar. Your screen will now be the correct size and shape to fit down into the plastic cup.(See Figure 3)



**Figure 3** – Removing the screen and trimming it off

11. Push the screen down into the cup, collar up, to within about 1/8” of the bottom of the cup. You may need to adjust the collar in or out to get a tight, even fit. *(I found the waste plug from the hole saw cut worked nicely for doing this, by setting the cup with the screen on a flat surface and then pressing the plug against the screen bottom while also pushing it against the sides of the cup. You will likely have to push the screen back up in the cup a little after doing this.)*
12. Place the cup with the screen still in it on the cup warmer. The heat from the warmer should be just enough to curl the edges of the cup in under the screen, creating a nice rounded shoulder for it to rest on. You may need to tilt the cup slightly and rotate it while contacting the warm surface to get an even curve. (See Figure 4)



**Figure 4** – The screen in place and on the warmer shaping the cup base. You should end up with a rounded shoulder on the bottom as shown on the right.

13. Remove the cup from the heat and inspect the fit of the screen to the rounded shoulder you just created. This should accommodate a snug fit that will prevent the screen from slipping out the bottom of the cup.
14. Remove the screen and put a neat, even bead of silicone adhesive around the rounded shoulder at the bottom (inside) of the cup. This is why you need a long applicator tip! *(Tip: Don't use too much or it will get messy fast, but make sure you apply enough to contact the screen all the way around and also have some ooze up through the screen. Also, wear thin disposable gloves – silicone is hard to remove from skin!)* (See Figure 5)
15. Carefully slide the screen back into the bottom of the cup and press it evenly into the siliconed edges. Smooth out any oozing silicone, trying to ensure some of the silicone remains over the

top of the screen to get a better bond.

16. Put the waste plug in the bottom and then put your weight on the plug. This will press the screen firmly against the plastic shoulder and into the silicone as it dries.



*Figure 5 – Gluing it up and letting it dry. The photo on the right does not show the weight.*

17. Let the silicone dry for the recommended time (usually 3-4 hours).
18. Slip the finished screened cup into a non-screened cup, add alcohol and a cover and you are ready to wash some mites away!



*Figure 6 – The finished mite washer*

### **Additional Notes:**

- I was a little concerned about the long-term effects of the alcohol on the silicone, even though I knew from experience silicone is *hard* to break down. So, I filled the apparatus with 70% rubbing alcohol and let it set for 8 hours, checking every 2 hours for any degradation. It was perfect at the end of this time, so I poured the alcohol out and let the cup dry over night. Still as strong as ever, so I am calling this a success.
- If you need to make a lot of these, I suggest setting yourself up to get your cups and screens ready in batches then assembling them all at once so the silicone in the applicator nozzle doesn't dry up on you. The parts should be inter-changeable, so you can set this up as an assembly line if necessary.
- Don't leave too much of a collar on your screens to prevent mites from getting wedged behind them and messing up your counts, but leave them long enough (1/8 – 1/4" is about right) so they don't slide out the bottom of your cup while you are putting it together.
- Look for the hardware cloth at your local hardware store. The big box stores generally sell it in sizes either too wide or too narrow and in large rolls – if they even know what hardware cloth is! It is the same most of us use on screened bottom boards so you may have some around already.
- Wear gloves when handling the hardware cloth; it bites worse than any bee can sting!
- You could use a hot plate or any other evenly-heated surface to form the bottom of the cup. The cup warmer works nice because it seems to be just the right temperature, although it can't be adjusted and you have to constantly monitor your progress. I don't recommend using a narrow source of heat (like an open flame) because it will tend to warp the cup and ruin the fit with the screen.
- As for lids, I just tape the straw openings with a little Scotch tape on either side. Duct tape would probably be better, but the alcohol gums up the surface too much.
- I can make one of these in 10-15 minutes, probably quicker if I get in a groove.

I hope this helps someone out there. Good luck with your mites!

Larry Clamp, *Nampa, Idaho*