

MiiCraft 50 3D Printer Best Practices

CNSI Innovation Workshop

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Introduction:

The following document is a summary of my experience using the MiiCraft 50 DLP 3D printer. I will outline practices for increasing the likelihood of successful prints, from design to post-curing.

Design Practices:

- Make the base at least 2 mm thick. Thin parts are susceptible to warping during curing (addressed further in *Curing Practices*).

- Foot print should not cover more than 70% of the max length and 60% of the max width. Large contact areas cause a violent snapping sound as a large portion of the teflon membrane releases simultaneously. The violent motion increases the likelihood of part failure.

- chamfer the bottom edge of the part (the face in contact with the build platform). I recommend a chamfer of .75 mm with an angle of 45 degrees. This geometry also facilitates removing the part from the build platform.

Printer Preparation:

- Thoroughly mix the resin inside the build tank before printing.

 - Use the bulb of a disposable pipette tip and gently run it through the bath to avoid damaging the teflon sheet.

 - The resin particles separate after approximately 24 hours. Use figure-8 motions to stir the resin, and confirm that swirls of separate oil are no longer visible. This process should take approximately 60 s

 - The far left and far right sides of the teflon sheet are unsupported. Take extra care when agitating resin in these regions, as it is more likely to deform the sheet (this is outside the print volume).

- Fill resin to just over (~1 mm) the 2nd step.

 - Filling it beyond this causes resin overflow when the build platform submerges.

 - Printing with resin levels below the second steps leaves an insufficient static pressure (from the reduced fluid column) to replenish the layer of resin between the build platform and the teflon layer.

-wait 10-15 minutes before printing to give bubbles a chance to disperse. Have not noticed a significant impact on print but it's a good practice to follow

-Lock down build platform and check printer for obstructions

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Slicer Software:

-Every time the software is closed/reopened, the printer connection must be re-established. The refresh icon is under the print menu.

Printer Controller Software:

-This menu can be accessed from the touch screen on the printer. If the touch screen is accessing this menu, the computer software will be unable to connect to the printer.

-Manually adjust the initial cure time and number of buffer layers. Increasing base layer cure and number of buffer layers are my chosen methods of addressing part adhesion issues. I've found ~100 seconds and 3 buffer layers to work well.

Printer:

-There is a "Pause" feature on the printer controller software, located at the center of a progress ring. After selecting "Pause", the printer will finish the current layer and then give you the option to "Inspect". Use the flashlight to inspect the build platform as it rises out of the resin. (The platform will be dripping resin but the resin drops will arrange differently around adhered prints).

-The right side of the print (facing the printer) is more likely to detach than the left side. During inspection, it is possible to tell if these corners are curling up. While the print is not likely to fully detach, it will impact the part quality and the job should be stopped.

-If no print is visible on the build platform, select "Abort" under the same menu. It is possible to reuse the build platform without repeating the cleaning process, but be mindful of dripping resin while cleaning the teflon sheet.

-prop open the yellow hazardous waste bin. The resin drips readily and it is important to move quickly with waste to avoid dripping resin, as the resin will stain.

-Clean the teflon sheet using a thin piece of plastic to gently slide along the sheet in the center of the build platform. It will take a couple of tries to catch the adhered 3D print. I recommend reaching into the resin bath once it has lifted off to grab the part (it is prone to falling off the plastic sheet used for removal).

-It is hard to inspect the teflon tank for scratches by yourself. I recommend having one person remove the tank and lift it while monitoring the level of the resin while another person inspects the clear sheet from the bottom

Curing Practices:

UV curing causes the exposed material to shrink. Due to the geometry of the UV curing station, an extended cure time will cause the print to warp. I recommend shorter bursts of curing at 2.5 or 5 minute intervals, flipping after each time. This prevents one side from shrinking significantly compared to the other.

I also recommend curing on a rack lifted off from the bottom of the UV curing drawer. The reflective surface of the curing drawer should also mitigate uneven exposure.