



Hydro Dipping 3D Prints

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<https://learn.adafruit.com/hydro-dip-3d-prints>

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Overview



Add Full color graphics to 3D Printed parts!

In this week's project, we're hydro dipping 3d printed parts.

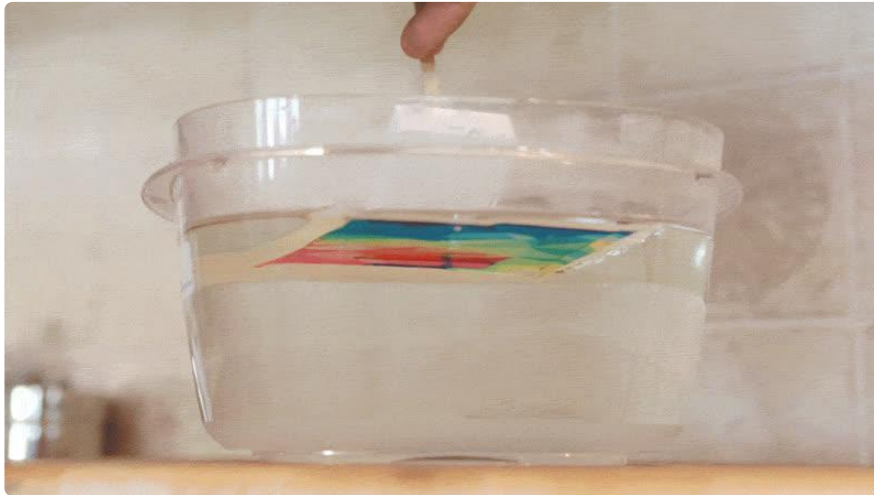
Hydro dipping also know as Water Drape Film, Water Transfer or Inkjet Water Slide Decal Transfer, is a post-processing technique that allows you to wrap graphics around objects. So with this method, you can add some pretty cool textures and full color graphics to your projects.

Hydro dipping is commonly used on machined and injection molded parts, but we found it also works great on 3d printed parts. So you're able to add high quality textures and graphics without lots of post processing. It even works with visible layer lines that you get with 3d printed parts.



Works on moving parts!

Images can actually wrap around 180° – so you can get some nice details on the sides and edges of your parts. We can even apply graphics to mechanical moving parts like this print in place, no bearing fidget spinner!



Here's how it works.

This type of PVA paper is called “Water Transfer Paper” and it’s mostly used for Hydro Dipping. PVA is the same material you can use for 3d printing dissolvable supports. It smells a lot like elmer's glue and dissolves fairly well in hot water. The paper has a shiny PVA side and a matted backing that is peeled away. The PVA film dissolves when it’s submerged in water. The ink then actually floats on the surface of the water. Once set, you can then dip an object over the ink and into the water. It's actually quite simple!





Here's some tools and supplies you'll need to start Hydro Dipping. Most of these you may already have. You can get the full list below:

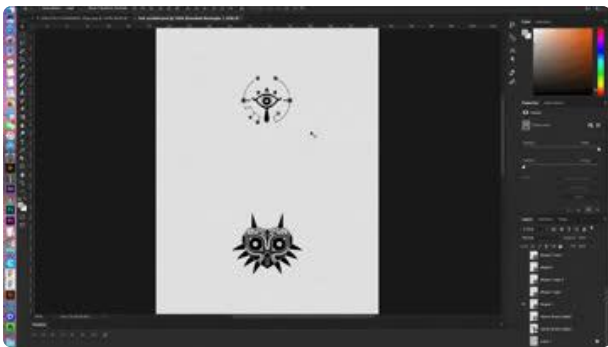
- Hot glue gun
- Masking Tape
- PVA Film Paper
- Container
- Sticks or Solid Core Wire
- 2D inkjet printer

Prepare Graphics

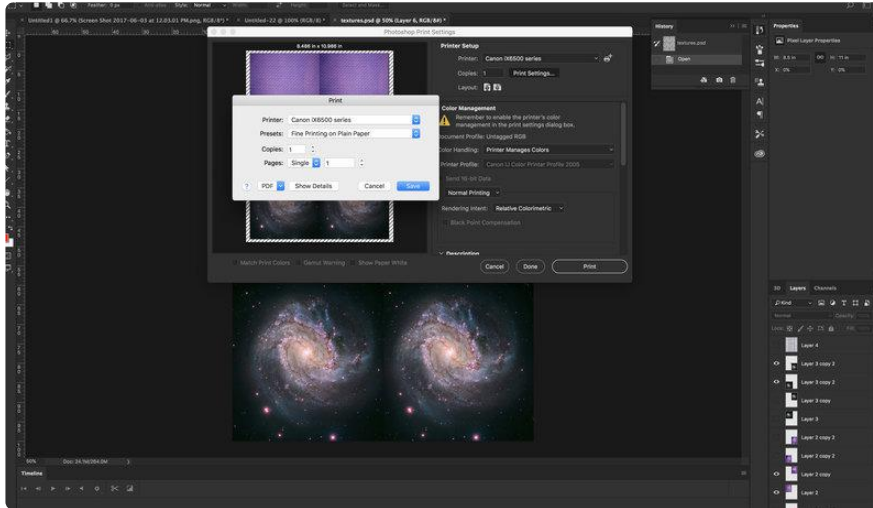


Modifying graphics to fit parts

We found transparent graphics to be problematic because it needs a good amount of ink to hold the image together as the PVA film dissolves.



So the best way to do transparent artwork is to simply add a light gray colored background. This is easy to do in software like photoshop or gimp.



For the best image resolution, to set your canvas resolution to at least 300 dpi and make sure to use the fine quality print setting for glossy paper. It's also a good idea to check that the size of our parts can actually fit within the graphics on the page. So a little forethought and planning goes a long way.



2D Printing graphics

We'll start by printing some graphics using a regular inkjet printer. We just need to print on the PVA side which is noticeably shiny.



Textures and graphics work well when they have contrasting colors. We found this works better on parts that are 3d printed with light colored filament because that allows the ink to look the best.

After printing our graphics, we need to cut the paper down to size so it can fit inside our container.



Adding a handle

When dipping your parts, we found our hands and fingers can get in the way. So to make this work better, we recommend hot gluing a stick of some kind to the part. This will temporarily act as a handle so we can dip without getting our fingers in the way.

While the hot glue dries, we'll prepare the container with water. We'll use hot water because that will help dissolve the PLA. Just make sure the container is large enough to fit your parts.

Hydro Dipping



Water Temperature

We'll use hot water because that will help dissolve the PLA. We set our faucet to the hottest setting and filled the container until the part can be completely submerged. Make sure the container is large enough to fit your parts.



Cut paper to size

After printing our graphics, we need to cut the paper down to size so it can fit inside our container.



Tape corners

We used masking tape to create a frame around the paper. This is really helpful because it makes separating the two layers easier.



The tape also helps keep the graphics together as the PVA film dissolves in water.

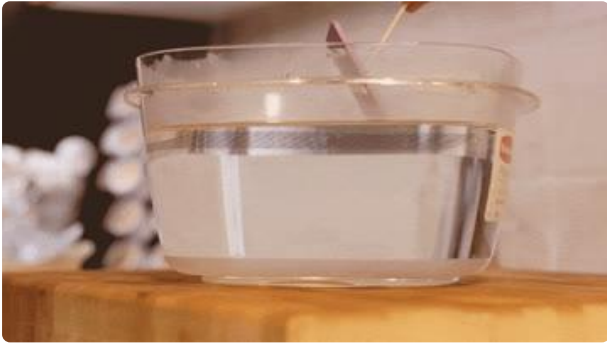
Peel backing

Now we can peeling away the backing from the paper. Start by carefully pulling on one of the corners and work your way through the whole piece.



Drape film

Use both hands to drape the film over the surface of the water with the ink side facing up. Within a couple of seconds, you'll notice wrinkles start to form. After 20 seconds or so, the wrinkles will smooth out and start to dissolve. That's the sign we're ready to dip.



Dip angle

It's really important to dip the part slowly and at a 45 degree angle. Gently lower the part into the water until it's completely submerged. Continue to keep your part submerged until the artwork has covered the part.



Separate film from part

Now we'll need to agitate the water by lightly shaking the part from side to side. This helps separate the artwork away from the rest of the film. Keep shaking until the excess ink has dissolved away. Then we can safely pull the part out of the water.



Dry Part

Use a fan to immediately start drying your part. You'll need to let parts dry for about an hour otherwise the ink will run and smudge.

Remove handle

After the part feels dry we can go ahead and remove the stick by peeling off the hot glue.



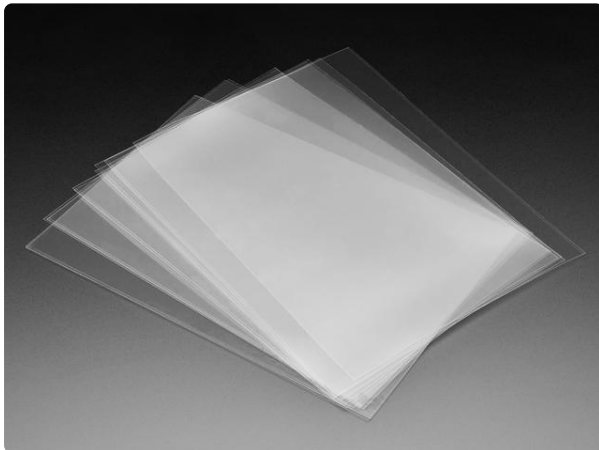
Seal graphics

Once the ink dries, it hardens and almost feels like nail polish. It's not scratch proof but it doesn't easily rub off, so we think it's durable enough for regular use. But if you need an extra layer of protection, you could use a coat of some type of protection spray.



And that's it! A super easy way to add full color graphics to your DIY projects! It's a lot of fun experimenting with different textures and graphics. Hydro dipping make parts look finished without spending a lot of time on sanding and painting.

I think the most difficult part about hydro dipping is trying to get precise alignment. So if you're trying to get labels or graphics perfectly centered, you might find it's a little challenging.



[Hydro Dipping Sheets - 10 Pack of A4 Size Sheets](https://www.adafruit.com/product/3539)

Hydro dipping is a fun, hands-on way of adding printed designs to any surface! This process can be done on any material that can hold the base coat and can be submerged...

<https://www.adafruit.com/product/3539>

Tips



Typical hydro dipping uses a two part activator solution. These are additional chemicals that are supposed to help when dipping. We did try using them, but when we did, our parts actually failed. We kept trying but ultimately we were able to do it without using any of the activators.



Here are a couple of tips we that found for getting good results:

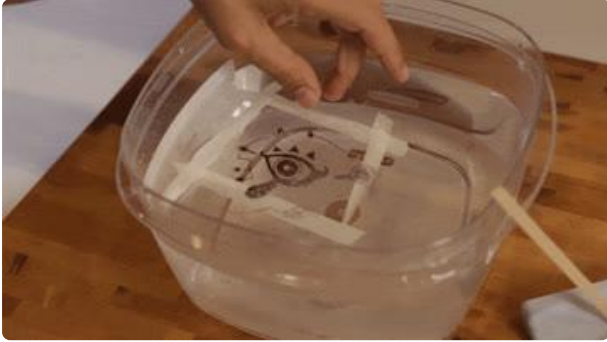
Drape on top

Make sure you dip your parts at a 45 degree angle. Once you've started dipping, don't stop! If you accidentally lift your part back up, you'll actually tear the film and ruin the graphics. So just remember to keep on dipping!



Drape with both hands

Next, make sure to use both hands when draping the paper on top of the water. Don't let water get on top of the paper or the whole thing sink.



Dissolve time

Don't wait too long for the paper to dissolve. It should only take about 20 seconds. After that the ink will completely separate and mix into the water.



Continue downward dip

Make sure you dip your parts at a 45 degree angle. Once you've started dipping, don't stop!

If you accidentally lift your part back up, you'll actually tear the film and ruin the graphics. So just remember to keep on dipping!



Dry time

Make sure to dry the part as soon as you take it out of the water, otherwise the ink will run and seep into the layer lines.

Try again!



It's totally OK if you mess up the first couple of tries. Don't worry because you can actually scrub off the ink – Just run water over the part, scrub off the ink with a paper towel and try again! So you won't ruin your parts as long as you quickly wash away the fail.

