envisionTEC

Technical Guide
Post Processing: Clear Materials

This guide lists the procedure for handling models after they print. See the Material Handling Technical Guide for more information about how to work with EnvisionTEC materials.

Supplies:

Cleaning
- ☐ Absorbant paper towels
- ☐ Air compressor system
- ☐ Extra material tray
- ☐ Garbage can
- ☐ Makeup or quality paint brush
- ☐ Neoprene gloves
- ☐ Isopropyl alcohol containers: two sealable one-quart sized containers minimum (DLP). 300 mm x 25 mm for 3SP.
- ☐ UV protecting goggle
- ☐ 99% Isopropyl alcohol
- ☐ Spray bottle

Finishing
- ☐ Electric handtool
- ☐ Files and rasps
- ☐ Needle-nose pliers
- ☐ Sandpaper
- ☐ Snips

Introduction
The process is broken down into removing residual (excess) material, removing majority of supports, curing, refining surfaces.

When to post-process
As soon as possible after the printer has completed its job.
Before exposing printed part to light for a prolonged amount of time.

Process
Before beginning: EnvisionTEC materials are specifically engineered to cure when exposed to light sources and must be handled with care. Be advised that each material is different and may require different handling throughout the 3D printing workflow. Be sure to follow post processing instructions completely before touching printed models.

Nitrile or neoprene gloves must be worn while in contact with any material in any stage before it has been cured. Material that has not been fully cured is still considered to be in its green stage. Avoid coming onto direct contact with material in this stage.

Latex gloves are not an appropriate substitute. Check to make sure that gloves are chemical-resistant before handling anything with them. Replace gloves with a clean pair if they become compromised in any way.

Remove models from the printer
When the print completes or ends, liquid material will runoff. Allow excess material to drain.

DLP Printers:
Remove the build plate from the printer. Hold a paper towel beneath it to help prevent dripping. Place the build platform on its side. Use an absorbent paper towel to wipe the sides of the build platform. The surfaces, excluding where the printed models are located, should be wiped until they show no signs of resin. There should be no shiny spots or lines that show where the material was. Do not use water or any cleaner to remove resin from the build platform. The screw in the top of the build platform must remain dry throughout this process.

The platform can now be tilted onto its handles for model removal. Brace the platform with one hand. Keep fingers and wrists away from the platform. Use a razor or scraper at a slight angle to gently remove models from the platform. Place the models on a paper towel as they detach. Wipe the build platform completely. There should be no visual indicator of the previous print on the surface of the build platform. Reinsert the build platform into the machine. Finger tighten the screw at the top of the platform to secure it in place with the lip of the platform facing outward.

3SP printers:
Vector / Xede / Xtreme Printers:
After the print has finished, raise the platform and allow the excess material to drain. The longer the platform drains, the more material is saved.

Next, remove the models from the build plate, utilizing a razor or scraper. Be sure to keep fingers and wrists away from the platform, and use a slight angle to gently remove models from the platform.

Place the models in a reusable container and carry the container to the post processing station.

Ultra Printers:
After the print has finished, raise the platform and allow the excess material to drain. The longer the platform drains, the more material is saved.

Remove the build plate from the printer by unlatching both platform latches. Next, pull towards the front of the Ultra and up to remove the build platform from the printer.

Place the build platform into the reusable container and carry the container to the post processing station.

Removing supports at this point can be helpful in cleaning the model properly. Leaving supports in more delicate areas is recommended to hold sensitive geometry in place until the models has been fully cured.

Cleaning Models
Bring the models to the post-processing space. There should be at least two containers; one as the dirty bath and the other as the clean bath. Each bath needs to be filled with enough 99% Isopropyl alcohol to fully submerge models.

This process varies from material to material. Please refer to material specific documentation for instructions focused on individual materials.

Submerge the models in the first bath of 99% Isopropyl alcohol for no longer than sixty seconds. Use a make-up brush while the model is submerged to help clean out smaller features of uncured material. Models may also be swished or gently stirred for agitation purposes. Remove the models and spray completely dry with compressed air. Examine each model for variations in the surface quality. Glossy sections will need to be focused on during the second rinse cycle.

Place models into the second, or clean, bath of 99% Isopropyl alcohol. Repeat the process by submerging parts for sixty seconds, then blowing each model dry. Repeat this step as needed until each

part has a uniform matte finish.
Spray off parts using the spray bottle filled with clean 99% Isopropyl alcohol. Hold the models over the clean bath to prevent waste.

Post-processing space maintenance
The post processing station must be kept away from the printer to prevent contamination. Keep a waste basket nearby for used paper towels, gloves, and any other waste accumulation.

The 99% Isopropyl alcohol needs to be replaced when the bottom of the container is no longer visible in the dirty container. Research to see if there is a local distributor of the alcohol that will accept the used medium back for recycling. Otherwise, absorb the contents of the container into paper towel and throw the paper towel into the garbage.

Do not pour liquid or uncured resin into any water system!

Use the clean bath as the new dirty bath and fill the emptied container with new 99% Isopropyl alcohol. Rotating containers helps to conserve supplies. Keep the make-up brush out of the 99% Isopropyl when not in use. Bristles deteriorate after being exposed for extended periods of time.

Optional Clean Repeat
Repeating wash procedure maybe necessary after removing supports that were trapping liquid and to ensure a dust free clean model before post curing. At this point there should not be any liquid remaining or the appearance of oily wet residue and part should be completely dry and slightly tacky to the touch.

Ensuring model is completely clean of uncured material and all IPA is dry before curing is essential to achieve a firm non-tacky surface.

Initial support system removal
Many models will be printed using a support system. This system needs to be removed using a sharp object such as an X-Acto knife or snips. Sever supports from the model at a safe distance from the supports contact point to the model. Remove everything but a 1-2 mm nub. This nub will be removed after the model cures and becomes more structurally sound. Cutting supports off too close to the model may remove portions of the model, causing surface pitting. Continue to wear gloves until models have been completely cured.

Repeat steps 3 - 4 if necessary to remove any remaining residual material.

Cure Models
Place the models in their recommended curing apparatuses. Follow the recommended program for each material / apparatus combination.
Curing times may vary depending on wall thickness and geometry of each model. More or less time maybe required to achieve desired results. Properly cured models should not feel tacky to the touch.

Curing options vary, based on chosen methods. EnvisionTEC only supports EnvisionTEC curing ovens. Any other post curing oven must be calibrated by the client and is not the responsibility of EnvisionTEC to support third party curing ovens.
Plug the curing apparatus into a surge protector or battery backup to help protect from electrical fluctuation.

DLP Curing:
Otoflash G171 post curing chamber: Lift the lid of the chamber and place fully dried models inside and space them away from one another so nothing is touching. Close the lid.
Power on machine and press the corresponding button below the screen to set the number of flashes for the cycle. To set to 2500, press the 1000 button twice and the 100 button five times. Press Start. The display will list the remaining number of flashes left for the cycle and will beep upon conclusion. Once the display reaches zero, let parts cool for at least fifteen seconds before opening the lid. Flip models so they cure evenly, being careful not to let them touch. Close the lid. The machine will display the previous flash count from the previous cycle. Press start to begin the next cycle. Repeat until the part is cured. Each material uses a different program. Contact EnvisionTEC for more details about flash count and cycle repetitions.

PCA 100: Open the front access door and place fully dried models inside and space them away from one another so nothing is touching. Close the front access door. Power on machine and press the corresponding buttons below the screen to set the number of minutes for the curing cycle. Press the start/stop curing cycle (yellow) button. The display will list the remaining number of minutes left for the curing cycle and will emit an energetic beep upon completion. Once the digital time display reaches zero, let parts cool for at least fifteen seconds before opening the front access door. Flip printed models so they cure evenly, being careful not to let them touch. Close the front access door. Repeat until the part is fully cured. Each material uses different settings to fully cure printed models. Refer to the PCA 100 Technical Guide for more information about how to operate the machine.

3SP Curing:
Ultra/ Xtreme UV Light Curing Apparatus: Lift the lid of the curing apparatus and place the fully dried models inside. Space them away from one another so that no models are touching.
The display on the machine reads the number of total minutes. Use the blue up-and-down arrows to adjust cycle time. When the cycle time is set, close the lid and press in the metal toggle switch to begin the curing cycle.
Once the display reaches zero, let the models rest for at least 15 seconds before opening the lid. Flip the models so that they cure evenly, being careful not to let the models touch one another.
Close the lid. The machine will display the curing cycle time from the previous cycle. Press start to begin the next cycle. Repeat until the model is cured. Each material uses a different program. Contact EnvisionTEC for more details about flash count and cycle repetitions.

FInishing
After post curing, finishing will involve using sandpapers and other tools necessary to smooth surface.

Initially, rough supports can be carefully removed using a fine Dremel bit and moving to sandpaper. Sanding should be progressively finer until surface reaches desired smoothness before proceeding to the polishing process. Sanding beginning with 400 grit sand paper and up to or beyond is recommended where utmost clarity is desired. Remember to sand in perpendicular directions with each new grit, this will avoid sanding grooves into the part. Buff with fine pumice and proceed to polishing with plastic polish.

Waxes from polishing compound must be removed before clear coating. Clear coating is typically used in trapped or hard to post-process areas. Mineral Oil can be LIGHTLY applied as a surface finish as well, though this will leave a slight oil residue if the part is handled. Keep clear parts away from sunlight to avoid discoloration. DO NOT allow parts to come in contact with water immediately after alcohol or acetone exposure. This will result in a hazy surface!