

Nicks-Fix "Continuous IPA Filtration" system

The alcohol used to wash UV resin printed parts can get slimy as snot in no time at all; fortunately this issue now has a solution!

Who

Nick Wilson of the Youtube channel <https://www.youtube.com/@nicks-fix> posted a video about a new Continuous IPA Filtration system he had created. The breakthrough for me was seeing someone pair up the cheap water filters with an alcohol safe diaphragm pump to handle the pressure needed to use those cheap filters! (...and WHY didn't I think of that?)

Resin Printer Mods and Continuous IPA Filtration!

<https://www.youtube.com/watch?v=DfM1CXBOZns>

The Basics

1. Expose the resin containing alcohol to a UV light source
 - Creates a suspension of really tiny & very hard to remove, plastic particles within the alcohol
 2. Separating out these minuscule lightweight plastic bits is harder than one might expect
 - All of the other separation methods had some significant negative, from added cost or labor to increased exposure to chemicals
 - Nick's design used a diaphragm pump to push this nasty alcohol solution through some easily changeable water filters
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Background

I have made many unsatisfactory attempts to reclaim some usable alcohol from the resinous sludge left behind after washing resin prints. The only reliable solution found to date is exposing the mix to UV light, which fortunately & unfortunately hardens each super tiny dissolved particle of

resin, creating a gel like plastic/alcohol suspension that is not fun to separate and less fun to use.

- Cheese cloth - Soaks up the alcohol and can be wrung out to separate the solids
 - LOTS of time and effort splashing contaminated alcohol around
- Filter paper - Clogged almost immediately and didn't really trickle through even over time as I previously expected
 - No real additional drainage even when left in a sealed container for a month; it lost more to evaporation/condensation inside the box than drainage through the filter
 - I would have expected at least some wicking, but even that did not seem to occur here
- Cotton cloth - Used to "wick" from higher "dirty" container to lower "clean" container
 - This does work, but takes too long for my taste
- Waiting - Settling out solids takes longer than I am willing to wait
 - 90 days was not even a start!!!
 - Barely clearing up at the top, the particles seem happy wherever they are in suspension
- Vacuum filtering caused far too much loss of alcohol with my setup
 - I'm clearly not a chemist
- Chemical flocculants or coagulants
 - Alum is known to be a common coagulant used to neutralize the surface charge of particles, letting them clump or floc together and sink
 - I chose not to use any chemical additives that might aid in the precipitation of particles out of solution
 - My equipment cleaning routine uses the same alcohol, which leaves contamination as a risk
 - Introducing another chemical could ultimately affect the predictability of my resin printed parts

What

- Silicone tubing - flexible and mostly resistant to these specific chemicals
 - Gets alcohol from dirty container through the UV exposure and into the filters
 - Returns the cleaner alcohol back into a clean container
 - OR could be used to simply recycle from and to the same container making it progressively cleaner
- Hose barbs - hollow threaded fitting with a nozzle for the hose to slide over
 - Connects filters or pump to the silicone tubing
- Plumbing Nipples - Hollow tube with threads on each end
 - Connects filters to each other
 - Connects pump to filter
- Diaphragm pump - Liquid pump capable of moving alcohol without degradation
 - Santoprene diaphragm resists alcohol and resins
 - Pushes our alcohol through the system

- 3x - 10" x 2.5" water filter elements - 5 micron, 1 micron, and 1/2 micron stages
 - 5 micron - Does not clog as quickly as finer filters, so similar to a pre-filter
 - 1 micron - Using this as the final filter left a dusty haze on prints after a while
 - 0.5 micron - Turns out Nick was correct, this takes out everything I can detect EXCEPT COLOR
 - UV LED strips or other strong UV source
 - 405nm is ideal but close is probably close enough
 - Don't forget to cover these LEDs with something to prevent UV light from curing things we don't want cured
 - Gaffer tape was my chosen solution
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Why

Nick's continuous filter system enables me to run resin prints through my wash and cure station without additional alcohol rinses.

- Easily changeable filters
 - These water filters are fairly easy to change without getting contaminated alcohol everywhere
 - Replacement filters are reasonably priced at local hardware stores
- Better overall use of resources
 - Isopropyl alcohol requires boiling for it's concentration/creation requiring roughly 50MJ of energy per US gallon
 - 5 micron paper sediment filters each require roughly 4MJ of energy to manufacture
 - 1 micron filtering doubles to 8MJ required to replace both filters
 - Each set of filters can filter many gallons of alcohol (don't know how many liters of printed resin yet)
- Human time savings
 - My previous workflow (15 minute minimum):
 1. <1min - Parts have already been dripping for at least a few minutes, Tilt parts 45 degrees and drip for another few minutes
 2. <2min - Rinse in gooey slimy alcohol to get most of the excess resin off (Nasty alcohol)
 3. <variable> - Remove supports
 4. <2min - Run through a 30 minute wash cycle (medium cleanliness alcohol)
 5. <5min - Hand spray with New alcohol (unused alcohol)
 6. <5min - Dry with compressed air
 7. 30 min - Curing cycle in curing machine
 - New workflow (8 minute minimum):
 1. <1min - Parts have already been dripping for at least a few minutes, Tilt parts 45 degrees and drip for another few minutes
 2. <variable> - Remove supports

3. <2min - Run through a 30 minute wash cycle (clean? alcohol)
4. <5min -Dry with compressed air
5. 30 min - Curing cycle in curing machine

My solution

Beginning with a "popcorn tin" (aka: larger metal can with removable close fitting lid), I added UV led strip in a spiral down a cardboard tube in the middle of the can. The silicone tubing was then wrapped in a single layer tight spiral up the inside of the can, using the pressure of the tubing to hold itself up against the walls of the can. No adhesives used to hold the tubing in place, but I was careful to avoid any kinks in the tubing that would restrict the flow. This idea intends to exploit the shiny metal surface inside the can, hoping to gain some additional exposure from bouncing reflections inside; No clue if this helps, hinders, or is pointless but it sounded good.

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