Aspirator (water powered vaccum pump)

Cederb

VIEW IN BROWSER

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Summary

An Aspirator that is support-free and easily printable with both FDM and (m)SLA.

Hobby & Makers > Tools

Tags: lab vacuum pump vaccum vaccuum venturi ejector vaccumnozzle vaccuumnozzle aspirator vacuumnozzle vacuumpump ifpeoplecouldjustspellvaccum vaccuumpump vaccumpump

A maker friend of mine needed an Aspirator for a lab experiment he was conducting, and I did not have one to lend him, so instead, I just designed one and printed it.

I have not done any extensive performance testing on it, but it worked sufficiently well for the experiments he was doing, so I did not get any complaints xD

I would suggest printing this on a resin printer if you can since the resins generally are less porous and water absorbent and the tolerances and smoothness do affect the performance, but I printed it on an FDM printer and it had no problems.

Print it with the larger inlet side towards the build plate. No support should be needed.

If you plan to use harsh chemicals, you will want to look into the chemical resistance of the polymers you are using, and possibly print this in PVDF (polyvinylidene difluoride) or PP (polypropene/polypropylene). This does increase the printing difficulty significantly though, during to these polymers being harder to print.

I designed the inner shape based on the findings in a science paper I found on aspirator venturi nozzle design, but I cannot seem to find this paper now 5 years down the line when I am finally uploading this.

If you need a more constant vacuum source (and you aren't using the vacuum for dangerous chemicals) combining this with a cheap water pump and a bucket of water is a good way of achieving this without wasting tap water.

The main difference between V1 and V2 is that the hose sizes are more standardized on the V2, which it is designed for rubber hoses somewhere between 8mm-3/8" ID hoses for the outlet and the vacuum side, and somewhere between 12mm-1/2" ID on the inlet side.

V3 is the most current one and was designed after the user Lorro commented below on having problems with small amounts of water getting into the vacuum side. This version has the mid-section lengthened about 10mm and the vacuum connection moved up by that amount to try to avoid this. It didn't fully solve his issue but made him able to get to higher vacuum levels, so this is the recommended version.

Model files

3d-printed-aspirator-v2.stl

Updated version only requiring two hose sizes instead of three, and is a bit stronger.

3d-printed-aspirator-v1.stl

3d-printed-aspirator-v3.stl

Updated version to solve user problems with small amounts of water getting into the vacuum side

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