

The reasoning behind this project is like most guys on this site I've got sick of choking myself and don't have \$400+ to spend. I have trawled the web for some time now researching breathing apparatus and fresh air systems that would lend itself to an open source, maker / hobbyist type of build. The principle is not rocket science it's more like canary in a coal mine, you need a source of clean air which possibly is a higher than ambient pressure to help force out fumes.

For some reason fumes are like Bees they always head for your face, I have no idea why no matter what you do to avoid them they coming for you, simply using solder and an iron you can see the wisps of flux fumes heading straight for your face even if you lean back away from them. Now I'm no expert and have not done the math, if anyone would like to provide input or modification to this post then feel free, if it starts a discussion which leads to hundreds of DIY builds then that's hundreds of hobbyists wearing breathing protection who would otherwise weld, spray paint or sandblast without any protection at all.

There are some cheap compressed air attachments out there that retrofit to facemasks, I would seriously avoid them. Unless you can guarantee 100% dry filtered air then you are going from the effects of fume inhalation and ending up drowning which would be the result of breathing moisture from your air tank all day or even pneumonia. Heaven forbid you end up with H2S poisoning as a result of breathing in stagnant air from a rusty air tank.

So the fresh air systems, if you keep your equipment clean and dry you are simply breathing air from a clean position away from your work area as if you were snorkelling. With a large enough diameter hose you can simply breathe through a hose anyways if you add a duct and a small fan then you can give the air some force to create a positive pressure.

Most breathing apparatus use positive pressure as it prevents fumes and toxins being able to seep into the mask, If you have a poorly fitted mask or in the case of the design I'm about to present an open mask, then the force of the air exhausting from the face shield/mask will force the contaminated air away from your mouth and nose.

The closest to an affordable system I have found is the Hobby Fresh air system
<https://rivergear.com/product/fresh-air-respirator-the-hobby-air-i/>



I found a useful teardown of one of these units here
<https://youtu.be/i6klkgRZvzo>

This is a simple setup but I still would not pay \$400 for it, It is far cheaper to open the workshop door and work in the doorway. If this manufacturer and similar had priced it at \$200 then reluctantly I would consider buying such a system.

I did buy a JET Air filters which to be fair was close to \$400 (£299 in UK).



Design for a fresh air fed system.

There are two options that are being considered, as I'm predominantly looking for a ventilation system for welding the equipment has to be wearable with a mask. The first option is a standard of the shelf face mask which has a fresh air supply hose retrofitted to it. The second being to retrofit the air system to my welding mask being mindful that others may also wish to choose this method. Both of these options will use the same air pack.

The first stage is to understand how other manufacturers have achieved an air source, what features are offered i.e. a rechargeable battery pack, the mask itself.

The system needs a method of transporting the air from a clean area; a hose was selected similar to other designs. In order to provide air movement a ducted fan is required. The power pack is already readily available in the guise of a cheap 12v cordless drill. A face mask needs to be chosen which firstly will have durability, secondly looks professional and finally provides a simple method of interfacing to a clean air supply.

The mask that was chosen is by 3M, is easily affordable and readily available

<http://www.ebay.co.uk/itm/3M-7501-Small-Half-Face-Premium-Reusable-Dust-Mask-Respirator-2125-Filters/282449777628?ssPageName=STRK%3AMEBIDX%3AIT&trksid=p2057872.m2749.l2649>



A ducted fan is required which is light 12v for use with a battery pack and is small in size and preferably an off the shelf item. A travel hairdryer was chosen as the ducted fan component as it met the criteria and could easily be adapted as a cool air blower.



<http://www.ebay.co.uk/itm/12V-In-Car-Portable-Hair-Dryer-Folding-Handle-Compact-Camping-Festivals-SWHD/171837061586?ssPageName=STRK%3AMEBIDX%3AIT&trksid=p2057872.m2749.l2649>

In order to connect all of the parts together a 3D design needs to be created that can be 3D printed and able to be printed by anyone with access to a 3D printer.

Assembly

Fan:

Starting with the Travel Hairdryer, take it apart and discard the heating element and handle leaving the motor, fan and ducted body. Reuse the wire by soldering it back onto the motor; reassemble the ducted part of the hairdryer.

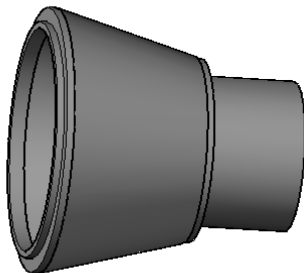
Hose:

The hose is a purchased length of NEW vacuum cleaner hose, do not use old hose unless it has been thoroughly cleaned, using old hose will result in contaminants and bacteria being blown into breathing air.

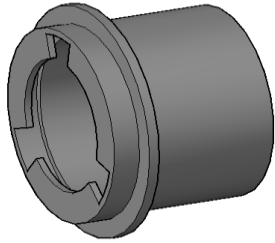
Printed Parts

3D printed parts are needed to connect the hose to the hairdryer and the facemask or welding mask.

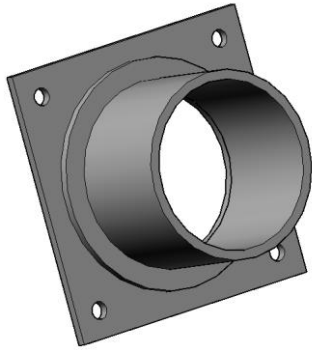
Ducted fan (hairdryer) to hose



Face mask Adapter (option 1) 3M face mask to Hose



For attaching the hose to a welding mask (option 2) really depends on chosen method, the initial plan was to attach hose to side of mask with a hole drilled through the mask to allow air through. This method meant that the mask was heavy on one side and pulled the mask, this would be uncomfortable and not very practical.



The second idea was to go vertically up the operators back and discharge the hose inside the mask at the top, the air would then blow passed the face and out the bottom of the mask.

Battery pack and charger

It could be possible to install a 3.5mm jack socket into the charger base so that a trailing lead could be connected to the 12v output. This would allow the user the option connecting the ventilation system to the charger removing the need for the battery; this would be useful for occasions where the battery is flat or when longer work periods would extend beyond that of a charged battery.

