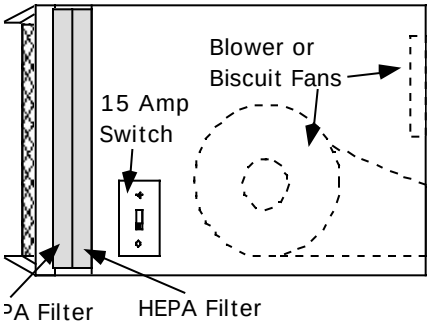
A LOW-COST AIR FILTER

This simple, low-cost project will result in you having a cleaner, safer and more pleasent place to do your woodworking. An air filter is a very good addition to a shop chip collection system. In my small shop, space is always a consideration. As the shop has a low ceiling, it is difficult to suspend equipment, such as a commercial air filter. So I built my own air filter to fit the space.

The air filter consists of a blower mounted in a box and a frame that I can insert a couple of 12"x12"x1" HEPA filters, plus a switch to turn it off and on. See the drawing below. Use two filters (one filter to catch the larger particles and one to do the real air cleaning). The filters are inexpensive — $4.00 to $8.00 depending on size. The filters you use are very important. A single or double furnace filter is NOT adequate to filter wood or other dust. The key here is the HEPA filter. You need to use a filter that gets 95% of 5 micron particles and 80% of 1 micron particles. The HEPA does this.

Another consideration is the amount of air flow and the size of your shop. Most standard commercial air filtering systems pull 600 to 800 cubic feet per minute (CFM) —enough for a 20' x 30' shop. A small squirrel cage blower handles this easily. If you use biscuit fans, a 20 x 30 square foot shop will need at least three 225 CFM fans to do the job. If your shop is large, use a blower —such as a take-out from a central HACV system. What you want to think about is the number of times per hour that your filtering system circulates the air — 8 to 10 times per hour is about the minimum. My combination of small shop and large blower circulates the air at up to 20 times per hour under ideal conditions (door and windows closed).

To calculate your shop's requirement, take the total cubic feet of your shop (length x width x height) and divide this by the CFM of the blower (or combination of fans) rating. Divide this result into 60. For example: 20' x 30' x 8' = 4,800; total of the CFM for the fans is 675 CFM, so 4,800 / 675 = 7.1 and 60 / 7.1 = 8.45 times per hour. If the result is at least 8, you are in business.

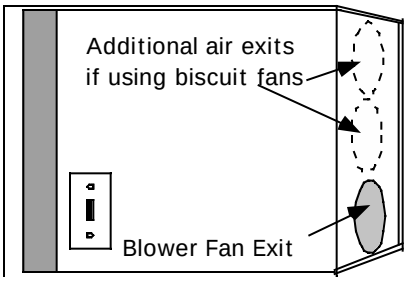


The box was built from 1/4" plywood with some scrap 1"x1" blocks on the inside as bracing. Thicker plywood can be used but the 1/4" works well and holds down weight. For the blower, I used a squirrel cage blower rescued from an old Jen-Air range top. You can also use biscuit fans, however, they make much more noise than a squirle cage blower —that's why blowers are used in HACV systems — they are quiet.

While the height and width of the box are determined by the size of the filters, the length can vary. The bigger your shop, the bigger the filters need to be to move sufficient air. The blower I used is about 18" long and 11" high, so I used a 24" length to give me adequate room for the blower, switch and slot frame for the filters.

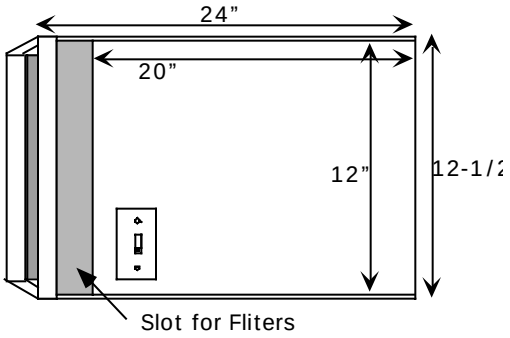
I cut two 12-1/2" x 24" lengths of 1/4" plywood for the top and bottom and one 12" x 20" for the front and a 12" x 24" piece for the back. The difference is so you can slide the filters into a slot in the box. I put guides on the inside of the box to secure the filters when installed and get a good tight fit. Internal bracing for the box consisted of some scrap 1" x 1" blocks tacked and glued to the inside where the sides of the box come together. I also used some blocks across the bottom and top to give the box rigidity. You also need to cut a piece for the rear to provide an exit for the air.

The seams of the box were sealed with carpenter's adhesive. The fasteners I used on the box were a combination of adhensive and finish nails.



Where the air exits the box, cut a hole in the plywood large enough in diameter to accommodate your fans or blower. If you use biscuit fans, surface mount them on the inside of the rear piece over the exit holes. See the drawing above. A blower needs to be mounted such that it's venturi tube exits to an appropriately sized hole.

Finally, I mounted a plastic electrical box and standard light switch into the box. These were wired to the blower. For electrical power, I used a molded business machine cord, cut off the female end and wired this to my switch. Any good electrical cord will work. But to be safe, always use a grounded three wire cord and plug. A variation here is a fan motor reostat. This allows you to vary the speed of the blower or fan motors to suit your needs. Use a standard reostat switch made for ceiling fans (available at Lowes and Home Depot) or a two to three speed pull switch. Additional filters won't hurt either. You can use charcoal filters that remove smoke, fumes and finishing oders or even washable and reusable electrostatic filters as well to add to the stack.



Position the air filter such that it provides a circulation of the shop. In other words, at one side of the shop. Mine is on a high shelf to one side and angled slightly into the room.

If I had used new purchased fans, the total cost would be about $45-$50 to build. As I already had the blower, my cost was about $15 for the plywood, switch and electrical cord with plug and filters. Commercially built dust filters cost $250-$500 depending on capacity. *Barry Humphus*