



Dust control for woodturners

Frederick C Hill tackles the issue of how to keep air in the workshop as clean as possible

Dust is everywhere, you simply can't avoid it! Except for clinically cleaned areas, you are going to encounter dust consisting of a wide variety of items including biologicals (wood, fibres, viruses, bacteria, mould spores, etc.) and non-biologicals (asbestos, cement, rock dust, etc.) in every environment. Dust can be any particle that is small enough to float in the air.

Just how big are dust particles? Big ones range from 2.5 to 10 microns (a micron is one millionth of a metre) whereas small ones are less than 2.5 microns. HEPA filters are rated to take out 99.97% of dust particles that are 0.3 microns and larger, other filters aren't as good as this. Note that even a HEPA filter doesn't take out particles that are smaller than 0.3 microns (the smallest particles are normally about 0.01 microns but some, such as carbon black, can be as small as 0.001 microns).

Fortunately, the human body has evolved ways in which to deal with most of the dust we normally encounter. Dust enters our nose with the air we breathe. We have a long nose with nasal hairs that create air turbulence so that most of the incoming air touches the moist cells of the posterior portion of the nose and much of the dust is captured by that moisture. That which doesn't get captured in the nose is often picked up by the moist membranes that line the back of the nasal passage and the tubes associated with the lung. There are fine, hair-like projections (cilia) on the cells lining these tubes that beat upward and push the dust up the tubes and eventually into the throat where we can get rid of it by swallowing it or spitting it out. Even in the air-exchanging sacs (alveoli) at the very end of the tubes there are safeguards as we have specialised cells down there that literally eat the dust and, when full, it's propelled up the tubes by the cilia to the throat where we get rid of it. Thus, nearly all of the dust that we inhale in normal life gets handled by our system and is removed before it can get down into the alveoli and cause damage.

Several problems can occur with this system that prevent it from handling the dust we encounter:

- One, if we compromise this system it won't work properly. This occurs if we smoke or work in environments with toxic air-borne particles. Smoke is toxic to the cilia and cells lining these tubes and eventually destroys the cilia and changes the cells so that they no longer propel the mucus up the tubes. We still produce a lot of mucus but it remains down in the system until we cough it up. This problem can eventually be big as all of the toxic materials we inhale are trapped in the lungs and can't be removed. Wood dust is especially problematic in that it frequently contains toxins (that the tree uses to kill off invading critters - insects, fungi, bacteria, viruses) and these attack our vulnerable internal lung and can start us down the path to major lung problems (emphysema, lung cancer, etc.).
- A second problem is that the really fine dust particles (5 microns and smaller) frequently find their way down into the lungs more readily than do the big ones because they are so lightweight and, if our system is compromised, they lodge there and become local irritants that can cause major lung irritations.
- A third issue is that we woodworkers produce massive amounts of dust. Even when we feel we aren't in a dust-producing mode, we are moving things in our shops that have lots of dust that becomes airborne.
- A fourth one that I frequently point out is that some of us have chosen the wrong parents and grandparents! What I mean is that we have

inherited some very bad genetics that make us more vulnerable to problems associated with dust. Some of us are much more prone to respiratory ailments (well over a dozen lung ailments are hereditary, all of which can cause major problems when compounded with inhaled dust). There is not much you can do about this except take major precautions to avoid dust.

Thus, we need to be very engaged in preventing dust from entering our system. In order to do this we need to do as much as we can to prevent it from entering the air and to prevent it from entering our lungs. Since dust and wood chips go hand-in-hand, we need to address both issues in our shops. I have been a woodturner for over four decades and during that time have come up with a number of solutions for handling dust in the shop and elsewhere.

Remember, a system that is excellent at dust handling does no good if it isn't used. Whatever you settle on for dust control, be sure it is something you will use, not just something that looks good in a catalogue. Something you use 100% of the time that removes 80% of the dust is far better than something you use 50% of the time but that removes 100% of the dust (if-when) used.

At the point source (lathe) is probably the most difficult place to try to collect dust but, by far, the most important. Normally, dust collection devices are either in the way or difficult to position. After much thought and experimentation with this, I came up with a perfect solution for me, and possibly you also. I created a dust control duct system that is easy to position and very effective and, as an added bonus, not in the way.

Overview of dust collecting system

My solution (see photo 1 opposite) was to use single-wall galvanized steel gas stove chimney pipe flexible elbows to connect from the blast gate to where I want the vacuum. I use several of these, enough to get the vacuum from the blast gate to the spot on the lathe where I need vacuum. They are screwed together with short sheet metal screws. The reason I do this is so I can get into any section of the pipe in order to remove items that get sucked up into the vacuum. By using the elbows instead of straight pipe I can bend the pipe to whatever position I need to get the vacuum close to my work. Since my lathe has a sliding headstock, I have extenders that I use in order to get the end of the extraction tube as close to the dust source as possible. The extenders are aluminium dryer vent flexible elbows. I don't use the aluminium for the main part since it doesn't hold up when I twist and turn it much. I simply slip the aluminium extenders on and hold them in place with a friction fit. Because they are so lightweight, I can put as many as I need on the system and they easily stay in place. They bend easily and allow me to focus the vacuum spot on. Note that in the photo you see the metal pipe attached to a triple-wall (sewer and drain) pipe. There is a blast gate at this juncture that allows me to open or close the air flow.



Chicken wire guard

Back to the point of the screws in the galvanized gas chimney. I finally realised that I was sucking up way too many small items because of the efficiency of my system and having to take the pipe apart too many times. I now have one of my aluminium extenders with a chicken-wire screen to keep small items out of the system when I'm working with small items that I part off with the lathe (see photo 2).

Overhead piping for vacuum system

Let's get away from the lathe end and see how my vacuum system works (see photo 3). Overhead, I use triple wall HDPE 4in (ID) pipe for the main ductwork. This is available at good lumber yards here in the US. I attached it with metal band straps to the ceiling. My ceiling is sheet metal and is grounded, so probably provides grounding for the ductwork. You can use the myriad fittings for this pipe that are available at any good lumber yard or hardware store. I copied this design from a local lumber yard. I noticed it they didn't have any electrical grounding wire wrapped on its system and enquired about that. I was told that the triple wall HDPE doesn't have static electric issues. I wrapped a short copper wire on downtubes and have diligently checked to see if there is a static charge on the rest of the pipe (dust attached to the outside, etc.), but I don't see any evidence of that. If you want to be ultra-cautious, wrap braided copper wire around the entire pipe and ground it somewhere. Also, constantly check the pipe to be sure

that you aren't getting large amounts of dust sticking to the pipe as this may mean that you have a static charge issue that needs to be addressed.

Blast gate

I have the HDPE pipe routed from my vacuum system (see photo 4), which is in another room to each of the shop tools that need it. The downtubes from this vacuum system are the same HDPE pipe and are stopped with a blast gate. I use the self-cleaning blast gates sold by Lee Valley Tools as they don't fill up with dust and stick. Also, it is convenient with them to label the tab on each side as to which direction is open and which closed (I need no-brainer stuff in my shop in order to be efficient). For many of my machines I use a 4in PVC dust collection hose to connect to the dust port. I can open and close the appropriate blast gates quickly to control which machine gets the vacuum. With the lathe, this became a problem because I needed to place the vacuum tube at different positions often while turning a single piece, so I came up with the 4in galvanized steel stove chimney and aluminium extensions to fit the bill.

Vacuum switch

Since my system is used on several machines, I have several remote electronic switches (see photo 5) that I've attached with rare-earth magnets to every machine so I can turn the vacuum on and off remotely at each machine.



Vacuum system with Wynn HEPA filter

Many shop vacuums, while well meaning, are simply dust distributors. They have inadequate filters so allow much of the smaller dust to simply be blown through the filter and out into the air. If you don't have a well-maintained HEPA filter on your shop vac you need to add one. There are lots of ways to do this, such as purchasing a cyclone system or a separate dust separator. I modified my dust collector by putting HEPA filters and Thien baffles on it. I replaced the upper bag on my system with a Wynn HEPA filter (see photo 6). Also, the bottom bag was replaced with an impermeable plastic bag. This forces all the air out through the top pleated Wynn filter and the Thien baffle I installed allows the large stuff to go down into the bag along with the dust. This system is the poor-man's cyclone vacuum. The Thien baffle is a ¼in (6 mm) plywood disc that you make and install between the upper and lower bags on your large shop dust collector. It is a very simple solution that effectively separates the chips from the dust. The chips drop into the lower bag and the dust is trapped in the pleated Wynn filter.

Sanding dust capture

This system has served me very well (see photo 7). It allows me to collect nearly all the dust generated by my turning operation. One of the other benefits of this system is that I'm able to do most of my power sanding right at the lathe. I cut a piece of plywood to about a foot square (300mm) and attached a piece of low-pile carpet on top. I made the carpet oversize so enough hangs over that the pieces I'm sanding don't

touch the metal of the lathe and dent them. I glued a scrap of wood that just fits the lathe ways gap to the bottom of the board to stabilise it. Whenever I'm doing most of my sanding I turn on the vacuum and go at it right at the lathe.

Face mask

I've long had problems with fit of all of the various face masks that are available. I had one of the positive air flow types for at least 10 years and only took it out of the box a couple of times to use it. It was so uncomfortable for me to wear that I didn't use it. I sold it. If you aren't going to use a unit there is no reason to have it. There are dozens of masks available but I've not found one that fits my face properly, so I was breathing in lots of unfiltered air. If the face mask doesn't conform to the shape of your face or if you have a beard (even a day's stubble will do), you aren't going to get a tight seal and you will be breathing in unfiltered air.

For the past several years I've used the Resp-o-Rator snorkel (see photo 8) instead of a mask. One end of the Resp-o-Rator fits into the mouth and you breathe through that end. There are two plastic tubes that pass around the sides of your head and each ends in a large HEPA filter. One of the big advantages of this system is that you can hold the end in your mouth when you need it and easily drop it when you want to talk or are done with the dust. It also works equally well with all face shapes and beards.

Whatever system you use, it must be something that you are comfortable using and will use all of the time. If you buy the best system and don't use it all of the time because it is uncomfortable, etc. you lose.



Cleaning up

(See photo 9). You are all aware of the dreaded clean-up after working on a project. It's amazing how far those curly chips fly that you cut off of a piece when it is spinning on the lathe. And, since they can be a major source of dust in the shop, you need to get them cleaned up ASAP after each job. I solved this problem several years ago by getting the track system for privacy curtains that you see when you go into a hospital bedroom. Do a quick internet search for 'hospital privacy curtain track' and you will find several vendors. I found mine on eBay. I chose to use heavy, clear plastic sheets with plastic eyelets (Lee Valley has these) for the hooks that are provided with the track. Cut your sheet to the appropriate length to keep chips in check. I've found that going to about 18in (450mm) from the floor and the track being about 3ft (90 cm) away from the lathe in a U-shape, contains most of the chips. When I'm not using the lathe I generally bunch up the sheet and surround it with a ball bungee that I've attached to the edge to keep it out of the way.

Overhead dust collector

Years ago, I purchased one of the ceiling-mounted ambient air cleaners (see photo 10). I rarely use it because I'm able to get most of the dust right at the lathe. If you have a particularly dusty situation at the lathe, one of these might come into good use. However, you may want to save your money on this one. I've seen shops where the owner made their own system using a large fan and an air filter. Or, maybe better than that, simply draw the air out of your shop using a window fan and replace it with fresh air from another window.

HEALTH & SAFETY

There is no way you are going to escape breathing in dust (you are doing it now while you are reading this as you sit in your home office), but your breathing system should easily handle it if you use some common sense. If you have severe allergies to dust, perhaps you need to consider another hobby that doesn't produce as much dust. Your job in your shop should be to reduce dust as much as possible while still being able to have a great time. Enjoy woodturning but take adequate precautions to reduce inhalation of dust.