PHOTOGRAPH COURTESY OF SHUTTERSTOCK

A new dust collection system

Michael T Collins can breathe easy now his new dust collection system is working

1 If you use any form of power tool, you are going to generate sawdust and woodchips – lots of sawdust and woodchips. For me, the tools that make the most dust are, in no particular order, my tablesaw, router, planer, sander and bandsaw.

The way you handle this by-product of your craft is critical to the environment in which you work and, more importantly, your health and wellbeing.

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When I first started working wood it was all hand tools and pretty much all the sawdust and woodchips produced with hand tools is heavier than air and winds up, in short order, on the shop floor. This is not really a concern.

2 As I started using power tools in my work, I realised that there were more chips falling faster, but that the air was becoming laced with dust. Clearly visible in the sunlight, this dust seemed to linger in the air much longer, almost like smoke.

Note: The sizes of particles are usually described in microns, a metric unit of measurement where one micron is one-millionth of a metre, or 1in = 25400 microns, 1 micron = 1/25400in – that's pretty small. The human eye can see particles larger than 40 microns.

Typical size of sawdust is anywhere between 30-600 microns. To put this in perspective, the dots in this sentence are a little over 600 microns/0.6mm.


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PHOTOGRAPHS BY MICHAEL T COLLINS UNLESS OTHERWISE STATED

My containment journey

Disclaimer: This is not a scientific study of dust collection – there are plenty of articles by people far more qualified than me. This is simply my attempt to create an environment as free from dust as possible for my tablesaw, using parts I already had and those I could buy off the shelf, together with a little bit of ingenuity. ➤

3 My first major investment when setting up my wood shop was a contractor tablesaw and my first step was to add a dust bag under the blade. This really failed at its job and, as you can see, as much dust made it on to the floor as into the bag. I was still being covered in dust and woodchips at the end of a day working in the shop from the fine particles that were being thrown out and into the air.

Minimum protections

I had the good sense to realise that my existing set-up was not a healthy environment. However, it's pretty easy to get good fine-dust protection without much work or expense. A mask and good cross ventilation work and provide good protection. The mask must meet NIOSH (National Institute for Occupational Safety and Health –US) standards and fit properly. In the UK the equivalent agency is the HSE (Health & Safety Executive)

3M makes a series of masks that are approved respirator masks. If you can't stop the dust at least stop breathing it.

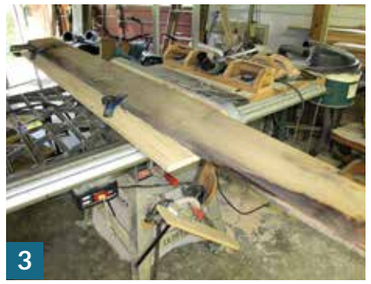
4 I use a couple of masks – a GVS SPR457 Elipse P100 Half Mask Respirator and a 3M Dual Cartridge Respirator Assembly. Both are NIOSH approved. These masks should go on before you start making dust and when not in use be kept away from being contaminated with dust getting inside them.

In addition, I crack the door and have a cheap 24in box fan placed in the window so that my work area has good cross ventilation. It's a little harder in the middle of winter, but with the heat on and the fan blowing I don't notice the cold.

5 I also have a ceiling-mounted dust filter that first filters the air at 5 microns and then a second filter stops 1 micron particles. I usually start this well before making dust and it stays on for two to four hours after.

6 In the spring I open the main doors of the shop and, with a box fan in the door, I use a leaf blower to blow all the dust from every surface (wearing a mask of course). The fan then blows it out into the yard – compressed air and a broom will also work.

My next investment was a 3HP cabinet saw that had a dust port. It was time to get serious about capturing all the dust, so I bought a cheap,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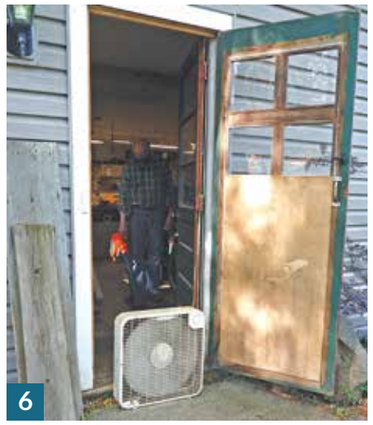
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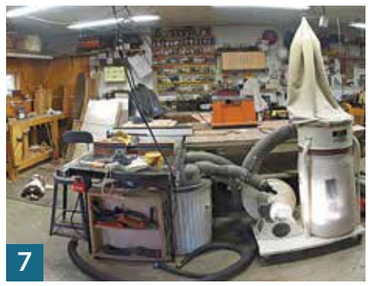
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single-stage dust collector that worked great, but the bag constantly needed emptying.

7 My father-in-law suggested adding a two-stage separator. This is simply a 100-litre bin connected with 100mm ribbed piping that sits between the dust collector motor and the tool – in my case the tablesaw. The separator is a specially designed lid that forces the air to spin inside the dustbin, causing the sawdust and woodchips to drop out of the air into the bin. Only the very smallest of particles make their way to the dust bag.

I used this configuration for about 10 years, adding a couple of extra hoses and some blast gates via a Y-fitting so that I could connect other tools. I was quite happy with the set-up – the bin was easy to empty (when I remembered). But, as my woodworking hours became longer and I was making more items, more fine dust than I wanted was making its way through the two-stage separator to the dust bag. Although the air quality was much better, the fine particles were able to make it through the upper bag, and about four times a year I would have to empty the dust bag, which was an unpleasant task.

8 There were several other issues with the design – it wasn't airtight and I couldn't see into the dustbin to check when it needed emptying. It would fill to the point that it over-spilled into the dust bag and, on some occasions, that too would fill up and the dust would start to migrate into the top bag, resulting in a real nightmare of a job.

And so I needed a new system – one that would work with my vast creation of sawdust and woodchips (and furniture, too).

New dust system set-up

The parts:

- 100-litre dustbin
- Oneida, Super Dust Deputy
- Wynn MERV 15, C-1425C air filter
- 6in rubber connector
- Length of 100mm PVC drainage pipe and a handful of clips
- 2 blast gates
- A Y-fitting

9 To start with, I completely dismantled my existing system with all its varied connectors and leaky seals.

10 The new system requires two doughnut-shaped pieces of 20mm ply, the first is a circle of wood that was about 50mm larger than the radius of the dustbin – this was cut using a shop-made circle jig on the bandsaw.

11 I then cut a hole in the middle, creating a 'doughnut', followed by cutting a second piece in the same way and again a hole was cut in the centre.

12 The outer diameter of this second piece was the exact diameter of the dustbin inner rim and created a perfect seal when pushed on to the dustbin. The two rings were screwed and glued together.

Both centre holes were slightly larger than the diameter of the bottom of the dust deputy. This was to ensure that dust could not collect on any existing ledges.

The motor/impeller, central dust inlet housing and the bag spring clip were the only parts that were to be reused from my previous system.

I started by setting the location of the dustbin in the most convenient location and raised it 50mm off the ground – this gave just enough clearance so I would be able to remove the bin to empty it easily.

13 Next the double-layered doughnut was attached to the bin with a seal made of draught excluder.

On top of this I added the Dust Deputy and secured it in place with the supplied foam seal. I had to use longer bolts, as those supplied were too short to go all the way through the doughnut.

The next step was to attach the 6in collar to the top of the Dust Deputy,


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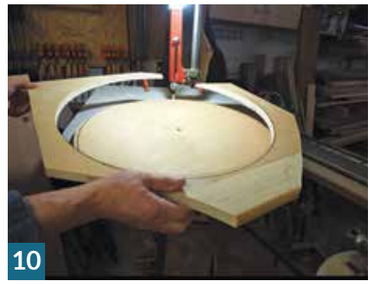
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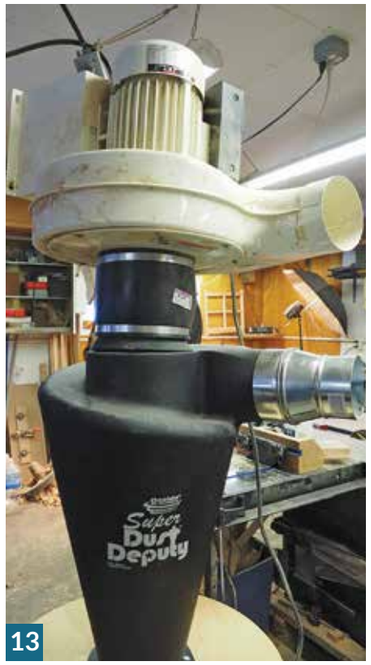

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and then on top of this the motor assembly. This was the hardest/heaviest task and one that I really should have sought help to achieve.

At this point I had the maximum height of the main body, and just needed to move it to its permanent location.

The motor support

14 The motor supporting brackets were made using construction studs and braced using triangular construction. All the parts were secured in place with lag bolts.

The dustbin cover was secured to the wall with two brackets made from studs (this can be seen in image 23).

The filter support

15 I made another doughnut, using the same technique, rounding over the edge on the router table. ➤

16 This doughnut was attached to the wall using some brackets I had laying around.

17 This doughnut went between the bottom of the Wynn filter and the main housing.

18 The doughnut was screwed to the main housing with draught excluder between the two parts.

19 The Wynn filter was then secured to this doughnut with the supplied clips. The dust bag was also supplied with the Wynn filter and was secured to the lower half of the main housing with the spring clip from the original system. The two sections were then connected with a short piece of the original 150mm ribbed pipe and secured in place with clips.

20 To connect the Dust Deputy, with its 127mm intake, to the tablesaw I needed to use a reducer bringing it down to the standard 100mm ribbed piping. All these connectors were inherently loose fitting and needed to be sealed with foil tape.

Note: When transitioning down in size, it's better to use a tapered fitting rather than a stepped connector.

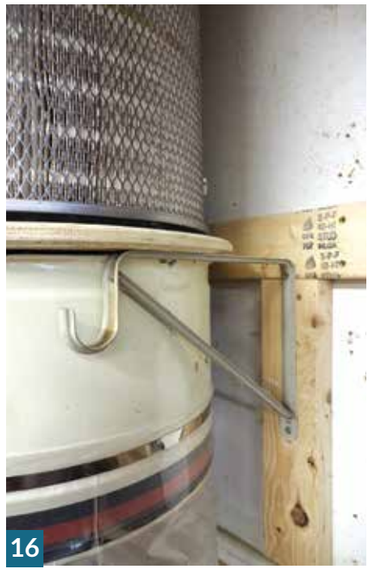
I used standard PVC drainage piping run to a Y under the tablesaw that branched to the main port and the tablesaw blade guard. I use more expensive flexible piping that is smooth on the inside and provides excellent flow and virtually little resistance.

21 This second pipe can also be used on the router table and the thickness planer. It's always a good idea to design a system that has room for expansion.

22 Air suction from the two pipes could be shut off with a couple of blast gates. The design of these gates was pretty poor and where the air could be sucked in was taped using foil duct tape.

Monitoring the system

I tested the system with a pile of sawdust and was very pleased to see that the dust bag had barely any dust in. But a brief test wasn't going to suffice. I needed a way to monitor the system for the two issues that I had been dealing with for far too long: how full was the dustbin and how clean was the filter at any one time?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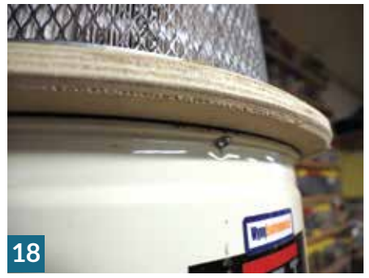
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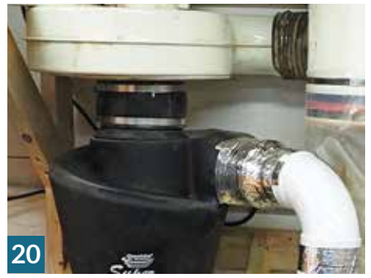
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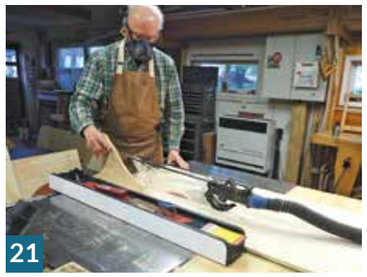
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23 To enable visibility into the system, I cut a window in the top of the dustbin cover and sealed a Perspex window in place.

Making a manometer

The simplest version is a U-shaped tube half-full of coloured liquid, with one side of the tube connected directly to the dust filter, while the other end is exposed to atmospheric pressure. The difference in liquid levels represents the pressure differential.


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24 I connected one end to a 70mm PVC end cap with two holes drilled in the top – one 8mm for a bolt to secure it to the filter cover and one 9.5mm to secure an elbow connected to the tube.

Cotton balls were inserted in the end cap to stop dust escaping into the tube.

25 Two holes were drilled in the top of the filter lid for the bolt and the air to escape into the manometer.

Gauge the pressures

26 I then drew some parallel lines on a board at 5mm intervals. The tube was then attached to the board with wire and secured to the wall next to the filter.

27 With the tube connected, I turned on the system. This being a completely new system there was nothing to stop the air flowing through the filter and I had an equal pressure reading where the liquid in the tube was level. This level was marked on the gauge as 'normal'.

28 To simulate the worst-case scenario, a totally clogged filter, I covered the air filter with a plastic bag and sealing all the gaps with tape. The system was again turned on and I marked the liquid level on the gauge.

I now had the best and worst levels – I marked a level on the gauge between these two extremes where I should check the filter. All I needed to do now was keep an eye on the manometer to see when I needed to clean the filter.

29 As of May 2019 I have been using the new system for about two months and I am very pleased with the way it's performing – I can see when the dustbin is getting full and the dust bag has almost no dust in it. The manometer is still registering normal. I have looked inside the filter and, while there is a fine layer of dust on the fins, this is not impeding the airflow and after a full day in the wood shop I leave without being completely covered in dust.

Future changes

There are some changes that I will be making in the near future:

I want to replace 90° elbows with 45° elbows, creating a straighter run.

I will be making some custom ply blast gates – the metal and plastic type let in too much outside air.

I am considering replacing the plastic bag with a 20-litre bucket and adding a Thien baffle to prevent some of the finest particles travelling up into the filter.

And, lastly, I'll cover the tilt slot on the tablesaw where a lot of suction is lost.

Remember, the purpose for doing this complete redesign was to make the wood shop a healthier place to be for an extended period of woodworking, and to that end I feel I have achieved the goal. However, before every sawing job the mask and fan go on and stay on for about 10 minutes after I stop making dust – the bottom line is that your health is a significant reason to take a good look at your shop's dust control. ■


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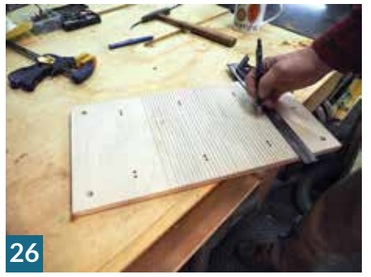
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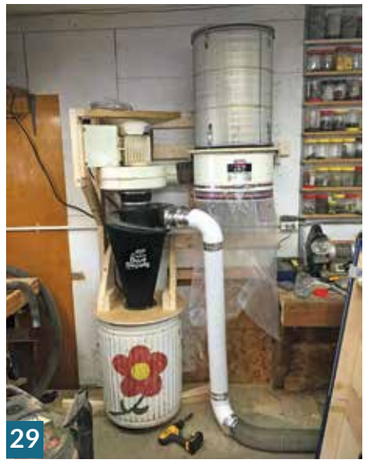
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US suppliers and resources:

Dick Wynn www.wynnenv.com/woodworking-filters
Dust deputy www.oneida-air.com

UK suppliers and resources:

www.toolovation.co.uk for Oneida products
www.addfiltration.co.uk for Microclene filtration products