

Dust Collection

Tips for choosing and configuring a



Woodworkers have been battling sawdust ever since the ancients invented the handsaw about 5,000 years ago. The Egyptians cleverly disposed of at least some woodworking debris by using it to stuff mummies, but this is not an option for today's woodworker.

In more recent times, the dust and chips created by woodworking machines has grown vastly more plentiful, finer, and more hazardous. Prolonged exposure can cause respiratory problems and has been linked to the development of some types of cancer. So keeping all of this material out of the air and off your tools and floor, and gathering it for disposal, have become more urgent and more challenging tasks.

Enter the dust collector.

A woodshop dust collector is a simple exhaust system. Its blower moves contaminated air through hose or ductwork to filters, which clean that air for recirculation back into the shop. The more effective the blower, the more ductwork you can add and still have enough suction at the other end to do the job.

For many woodworkers, a shop vacuum is the first dust collector. A shop vac can handle small amounts of fine debris like that produced by a 5-in. orbital sander or a router. But a shop vac moves small volumes of air, making it a poor choice for larger stationary machines.

Dust collectors generally belong to one of two families. Single-stage collectors carry the sawdust and other debris directly through the fan and into filter bags or cartridges. Two-stage cyclone collectors allow heavier debris to drop out of the airstream before it reaches the blower, meaning less work and abuse for the fan and filters.

The more air a dust collector moves, the more debris it can carry. Dust from a small hand sander might be captured effectively with as little as 100 cubic feet per minute (cfm), but a table saw might require 800 cfm. Also, the faster a collector moves the

Demystified

BY STEVE SCOTT

system to fit your needs

air, the heavier the debris it can carry. The lightweight dust from a small sander might need an airspeed of as little as 3,000 linear feet per minute. The coarser material produced by a planer often demands as much as 4,000 fpm. Finally, the more effective a dust collector's filters, the less fine dust will be returned to the air.

Dust-collection systems are like many other things in life: The safest approach is to plan for the worst. Some modestly powered dust collectors can deliver 800 cfm only if connected to a machine by less than 4 ft. of flexible hose. The bigger challenge lies in collecting dust from machines on the far side of the room. A key question

A shop vac isn't enough

Choices in dust collection range from light-duty shop vacs to powerful cyclone-style dust collectors. A shop vac might be your first dust collector, but it shouldn't be your last. Shop vacs can handle the dust from small tools, but are undermatched for the amount of waste that a stationary machine can throw. In choosing the collector, consider



how frequently you use machines that produce large volumes of dust and chips. You also should weigh whether you need a collector that can support long segments of ductwork.



SINGLE-STAGE DUST COLLECTOR

The strongest of these, 2-hp and 3-hp units, can collect dust effectively from a tablesaw or other large woodworking machine through several feet of duct or hose. Units rated at 1½ hp can deliver top performance only through a short length of hose. The 1-hp units shouldn't be relied on to clear all the debris from large machines. Prices range from \$150 for a 1-hp collector to \$500 for a 3-hp unit.

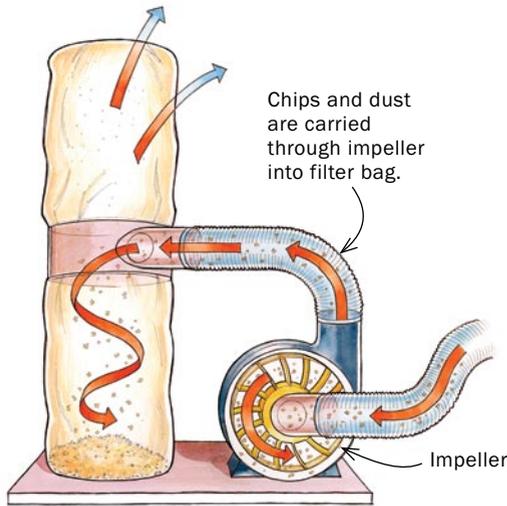


TWO-STAGE CYCLONE

These units move more air with the same horsepower as their single-stage counterparts, offering as much capacity as most home shops are likely to need. If you want complete freedom on shop layout and ductwork, this is your best bet. Prices start around \$750.

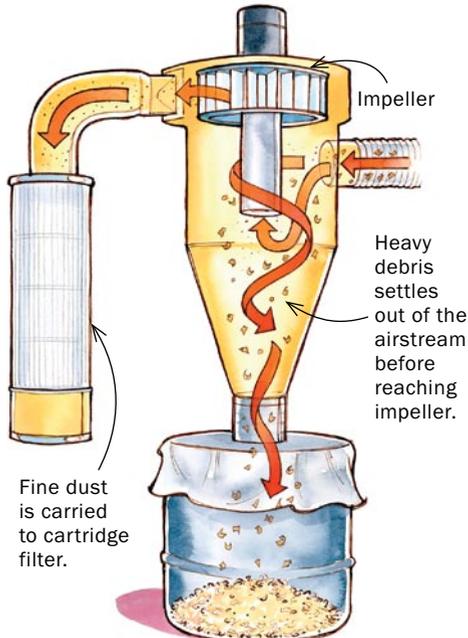
Single- or two-stage dust collector?

Both will do the job, if connected to the right hose/duct setup. The difference is a matter of cost and convenience.



SINGLE STAGE

A single-stage dust collector carries all of the debris past its impeller and then separates it into heavy chips and lightweight dust. It is the more affordable option.



TWO-STAGE CYCLONE

A two-stage cyclone allows larger debris to fall out of the airstream before it reaches the blower. This lets the fan spin more freely while being more efficiently shrouded, increasing airflow. The filter sees far less dust, and so doesn't need much maintenance.

to consider about any dust collector is how much ductwork it can support.

We tested a sampling of different-size collectors ranging from a 1-hp single-stage unit to 3½-hp cyclone. The testing protocol was similar to that used for our review of 1½-hp collectors (*FWW* #183, pp. 38-43). We used the results to estimate how much ductwork each machine might support while delivering the baseline performance of 800 cfm and 4,000 fpm.

Which equipment is right for you? This survey should help clarify your choices.

A single-stage portable works for smaller shops and budgets

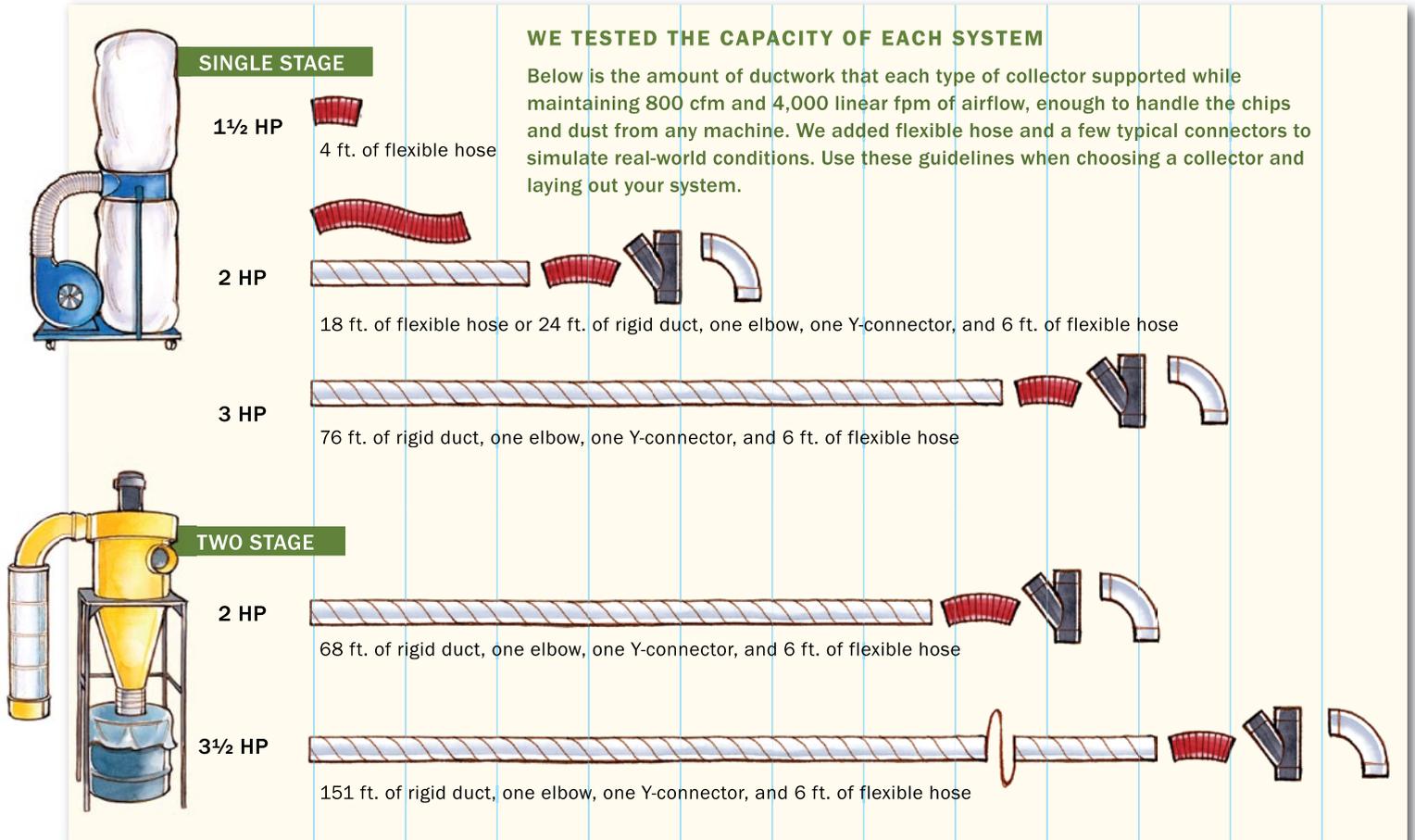
For a woodworker with a garage shop that includes a tablesaw, jointer, planer, and bandsaw, and with \$600 or less to spend on dust collection, the most practical choice is a single-stage dust collector.

A 1-hp collector is the least expensive, but you're likely to be disappointed with its performance—about 450 cfm at best. Unless your larger machines have perfectly efficient dust-collection hoods or ports (extremely rare), that's not enough.

The 1½-hp collectors are the most powerful units that run on standard 110v current.

WE TESTED THE CAPACITY OF EACH SYSTEM

Below is the amount of ductwork that each type of collector supported while maintaining 800 cfm and 4,000 linear fpm of airflow, enough to handle the chips and dust from any machine. We added flexible hose and a few typical connectors to simulate real-world conditions. Use these guidelines when choosing a collector and laying out your system.



They work well, given a minimum of flex hose and frequent cleaning of filters.

If you've got 220v power, though, consider stepping up one rung in class (and price). The 2-hp single-stage collector that we tested handled the equivalent of 18 ft. of flex hose before dropping below 800 cfm and 4,000 linear fpm.

Because the collector is mobile, you can wheel it from machine to machine, connecting it to each via a short length of hose. This ensures optimum performance at each machine, but sacrifices convenience.

An alternative is to park the collector in a central location and use Y-connectors, blast gates, and a couple of hose runs to connect it to your most frequent offenders. This approach lets you operate a variety of woodworking machines without undoing and redoing dust-collector connections. Put machines that generate less dust at the farthest end of the hose. Use a shop vac to handle the lightest-duty machines.

It's worth pausing at this point to say a few words about filters. Dust smaller than 10 microns—about half the thickness of this page—can be inhaled far more easily than expelled; once lodged in the lungs, it can cause a host of health problems.

Many single-stage collectors come with woven fabric bags that, when new, capture particles as small as 30 microns. Their performance improves with use, as a layer of fine dust builds up on the filter surfaces. This works, but erratically: Plenty of hazardous dust escapes while the coating accumulates, and the coating will often release sudden puffs of ultrafine dust through the fabric and into the shop.

You will breathe easier with 1-micron filters, but they still require fairly frequent cleaning. In contrast, the accordion pleats of cartridge filters allow much more filter area in the same space, increasing intervals between cleanings by three to 10 times. A warning: Cartridge filters can be more delicate than cloth bags. A protective screen at the filter's intake is a good idea.

As a last word on single-stage collectors, there are more powerful units available. A 3-hp single-stage collector can be left in a corner and connected to a significant amount of pipe. The one we tested will provide sufficient airflow and velocity at the end of 76 ft. of ductwork, plus an elbow, a Y-connector, and 6 ft. of hose. On the downside, the collector will take up about 10 sq. ft. of shop space, and you'll



Two ways to use a single-stage collector

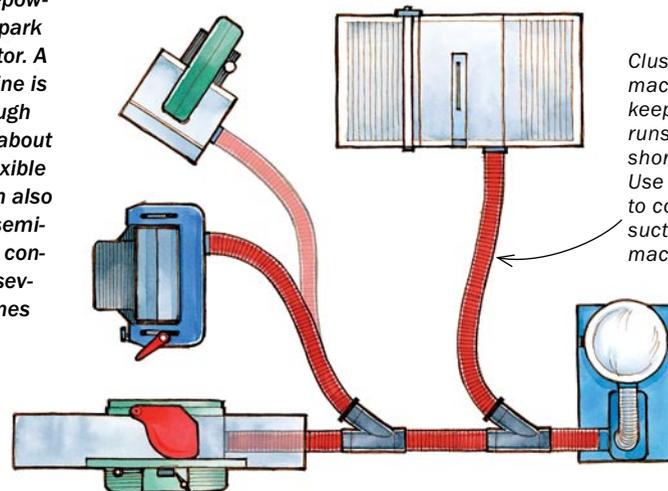
ONE MACHINE AT A TIME

Fitted with a short length of hose, a 1½-hp or 2-hp collector can be wheeled around the shop and connected to each machine as needed.



MULTIPLE MACHINES

More horsepower lets you park your collector. A 2-hp machine is strong enough to support about 18 ft. of flexible hose, which also allows for semi-permanent connection to several machines at once.



Cluster your machines to keep maximum runs of hose as short as possible. Use blast gates to concentrate suction on one machine at a time.

Bigger dust collectors offer more shop layout options



ONE-WALL LAYOUT

have four filter bags to clean, not just two. In addition, a collector in this 3-hp class costs about \$500. Upgrading the filter bags, which often is necessary, might cost another \$400. That's before ductwork.

Once you've reached that level of expense, it's worth considering a cyclone.

A cyclone is best for fixed ductwork

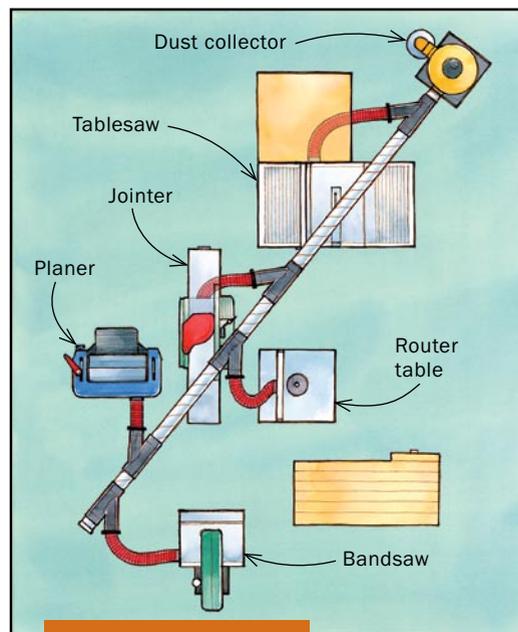
The cyclones we tested range in price from \$750 to \$1,200 and come with good cartridge filtration. Any of them can quickly move high volumes of air through enough ductwork to span the length and width of a two-car garage. Assuming you plan to spend \$2,000 or so, the purchase price leaves plenty of cash for adding that ductwork. Your choice should be guided by your own shop layout. How spread out are your machines?

The 2-hp unit we tested, for instance, can support roughly 68 ft. of ductwork, one 90° elbow, one Y-connector, and 6 ft. of flex hose. As you might expect, the 3½-hp machine will handle larger loads. Tests show that it will deliver similar performance with up to 151 ft. of straight ductwork and the same elbow, Y-connector, and length of flex hose. There are larger cyclones on the market, but they provide more capacity than a home shop is ever likely to need. □

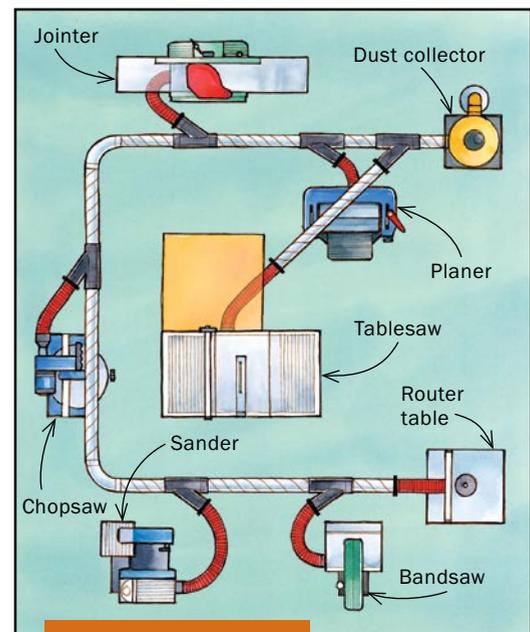
Michael Standish provided research and testing for this article.

THREE POSSIBLE DUCTWORK CONFIGURATIONS

Cyclone collectors are powerful enough to support permanent installations of fixed ductwork. Run ductwork along one wall (above) and use branches of duct or flexible hose to reach machines. A diagonal duct run (near right), mounted overhead, works well for tools in the middle of the room. A duct run around the shop's perimeter (far right) can be mounted overhead or on the walls and works best for tools positioned along the walls.



DIAGONAL LAYOUT



PERIMETER LAYOUT

Get the most from your system

Buying an appropriately sized collector for your woodworking machines is only the first step toward a cleaner shop. Here are several important ways to maximize the performance of your collector.

FILTERS

Replace 30-micron filter bags. A 1-micron bag is necessary to keep the finest dust from escaping back into the shop. Cartridge filters are just as effective but easier to keep clean.



DUST PORT

It's sometimes possible to fit a machine with an aftermarket dust outlet to improve dust pickup.



REDUCERS

For the best airflow, use hose and ductwork the same diameter as the collector's inlet. Use a reducing adapter to connect with woodworking machines that have smaller outlets. Install this fitting at or near the machine.



CONNECTORS

Because sharp turns reduce airflow, it's best to use 45° "Y" connectors to merge two branches of ductwork, rather than 90° "T" fittings.



TURNS

Keep elbows and Y-connectors to a minimum. For the best airflow, use the widest-radius elbows that you can.



BLAST GATES

Close off unused branches. Install at Y-connectors or at individual machines.

DUCTWORK

Smooth-walled metal duct carries air more efficiently than hose, but it's also more expensive and less flexible. In any case, use ductwork that matches the inlet diameter on your collector; airflow friction increases exponentially as duct size decreases.

