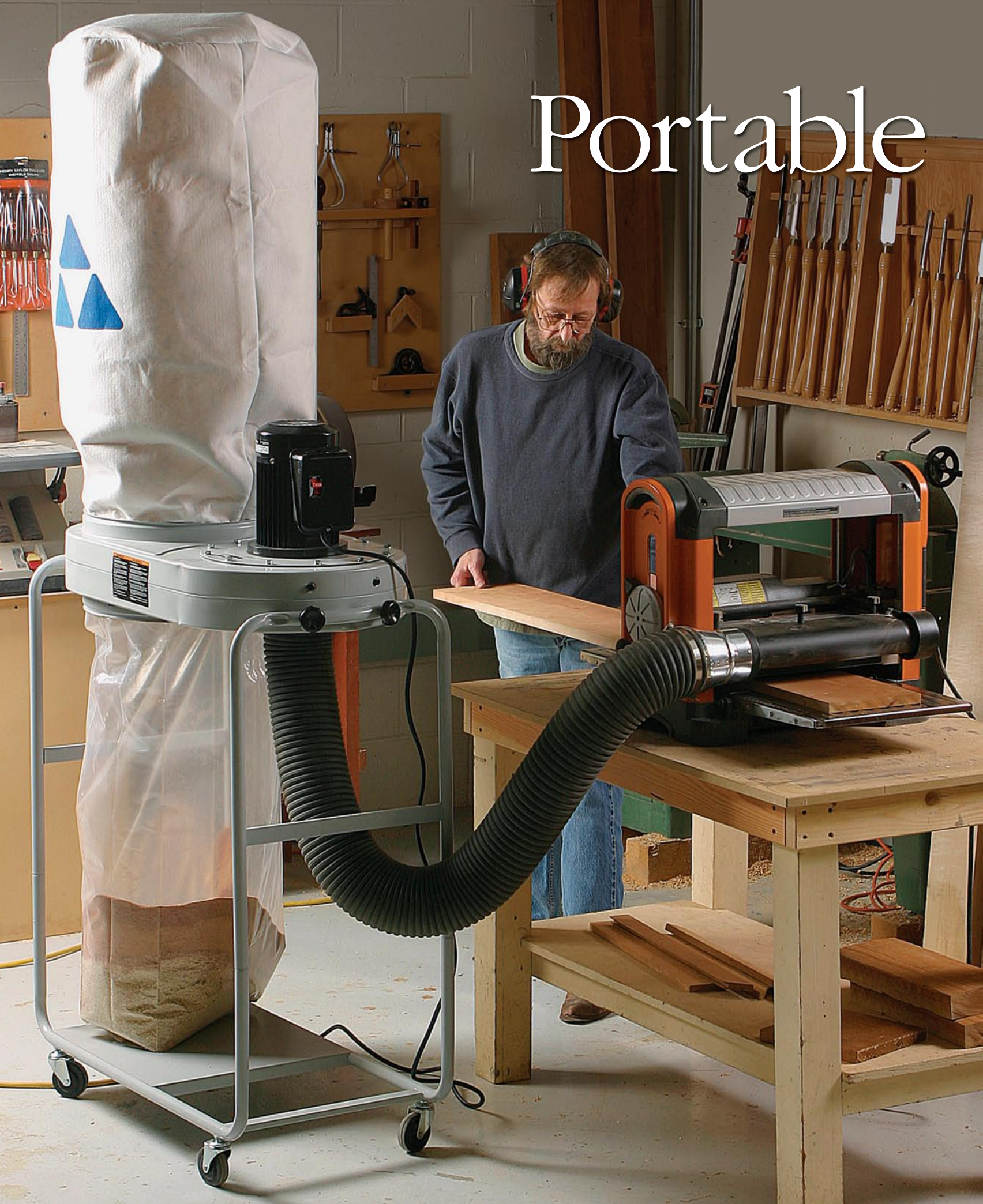

Portable

TOOL TEST

Dust Collectors

Affordable and mobile, 1½-hp machines can do the job if you follow two simple rules

BY MICHAEL STANDISH

With enough money and electricity, it's easy to get a dust collector strong enough to move mountains of chips through ducts connected to every machine in the shop. But even a modest dust collector, such as those tested for this article, can be a tremendous help provided you follow two rules: One, fit it with an effective filter; and two, don't treat it like a true central dust-collection system with long runs of ductwork.

To be effective, portable dust collectors must do three things: move air fast enough to transport big chips, shavings, and dust; move enough air to capture all the waste that woodworking machinery generates; and trap even the finest dust particles.

Without a first-class filter, a dust collector becomes a dust-recirculating pump, spewing contaminated air throughout the shop. The most pernicious dust particles measure only 1 micron—a millionth of a meter—or less. When inhaled, they contribute to afflictions ranging from chronic respiratory problems to various cancers. Some of the units we tested come with a 1-micron filter as standard equipment, but others offer it only as an extra-cost accessory. There are also 1-micron aftermarket filters you can buy (see sidebar, p. 41).

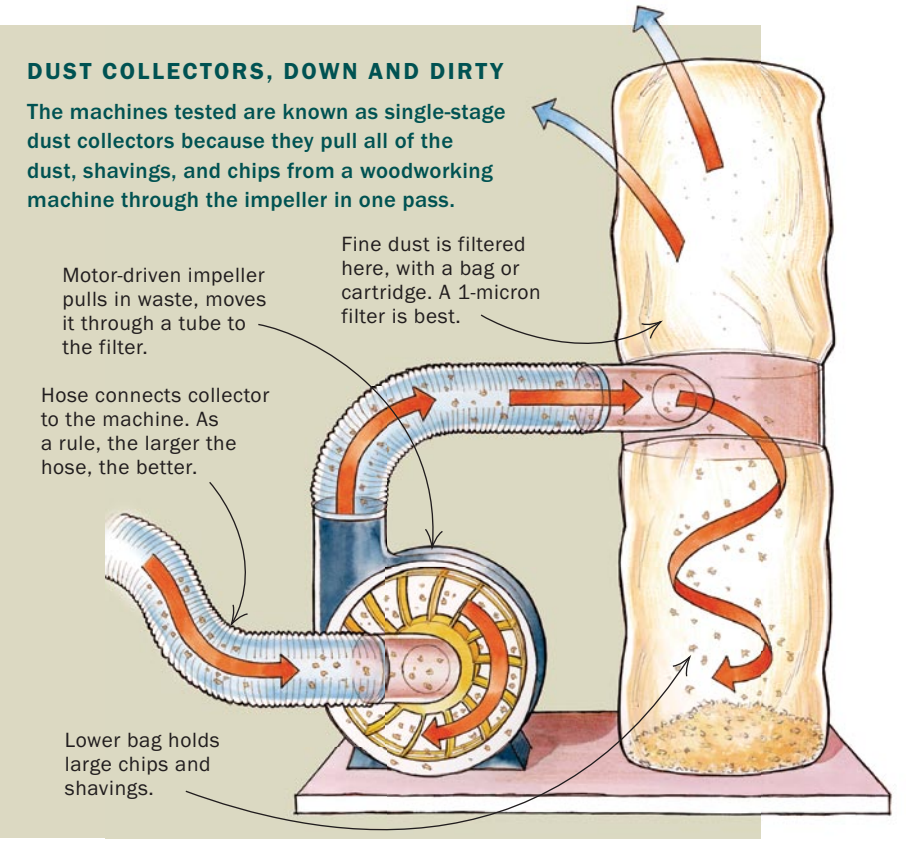
The 10 collectors tested are about the most powerful type available that run on normal 120v household current. They have a 1.5-hp motor driving an impeller to suck dust into the filter and the collection bags (see drawing, right). They're designed to handle the waste from a typical shop machine, but not from two machines at once. Some have a 6-in.-dia. intake port; others, a 5-in.-dia. port. These dust collectors look so much alike that you might think they came from the same factory. However, testing turned up some important differences. To fully appreciate those differences, you first need to understand the basics about moving air.

Dust Collection 101: A primer

Forcing air through a dust collector generates both static pressure and velocity pressure. Velocity pressure is produced by the moving air. Once you know the velocity pressure, you can calculate the speed of the moving air (in feet per minute, or fpm) and its volume (in cubic feet per minute, or cfm). Those are the two critical factors that determine whether the dust collector will do an adequate job in your shop.

Static pressure is essentially another term for resistance. Friction in ducts and hoses, turbulence in elbows and other bends, and congestion in the filter all contribute to static pressure.

Static pressure, velocity pressure, and other airflow factors are interrelated. Change one and you change them all, because dust collection is a zero-sum game. Most important, if you increase velocity—which



How the dust collectors were tested

Season the filter. *To simulate real conditions in a repeatable way, the cartridge filter used with all the dust collectors was purposely loaded with about 10 lb. of diatomaceous earth, a fine mineral powder.*

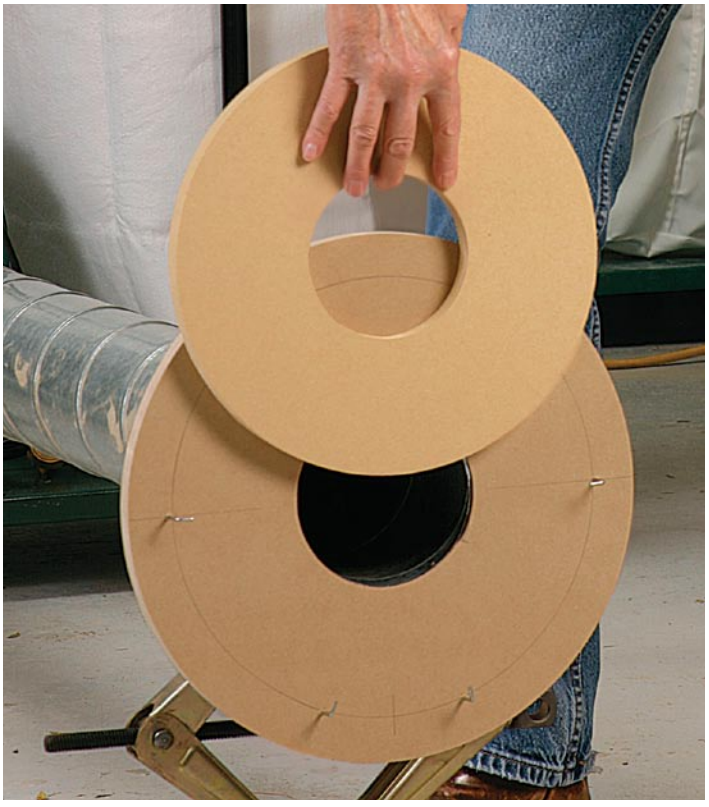
Read the numbers. *Instruments inserted into the duct leading to the dust collector registered the airspeed and the volume of air being moved.*

happens when you reduce the diameter of the duct—you decrease air volume. You'll move air faster, but you will move less of it. Worse, reducing the duct size exponentially increases the friction in the system. If you double the air's speed, you quadruple the friction. As friction continues to increase, the volume of air will continue to drop until the dust collector ceases to be effective. That's why you want as powerful a collector as possible. Every hose, elbow, and reducer that gets added to it reduces volume, velocity, or both.

Experts generally agree that a dust collector should deliver at least 3,500 fpm of velocity to effectively move the dust away from a single machine. A velocity of 4,000 fpm is optimum. You also want the machine to provide 800 cfm of air volume to collect the dust effectively. That's enough to accommodate a tablesaw or planer, machines that make very heavy demands on a dust-collection system.

Your dust collector might not be able to achieve that level of performance, however. You'll have to make compromises in the shop that will mean sacrificing some aspect of performance. The trick is to avoid making the system worse than it needs to be, so that it maintains an airflow strong enough to keep big chips moving and also enough air volume to draw in the finest dust.

The most common problem you're likely to face is how to mate a dust collector, which has a 5-in. or 6-in.



Constrict the airflow. *Restrictor plates with progressively smaller openings were placed on the open end of the duct to mimic the friction and turbulance of typical ducting.*

Photos, except where noted: Rodney Diaz; this page: Andy Engel; p. 38: Kelly J. Dunton; drawing: Stephen Hutchings

intake port, with a machine that has a 4-in. exhaust port. The collectors reviewed here come with a Y-fitting that attaches over the intake and provides a pair of 4-in. ports, so at first the solution seems obvious: Run a length of 4-in. hose from the machine to the collector.

However, that simple approach will reduce volume and increase friction and turbulence, possibly to levels at which the dust collector wouldn't be effective. I recommend a better approach:

First, move the dust collector as close to the machine as you can, to keep hose lengths as short as possible. Second, don't use the Y-fitting. Instead, use a hose that matches the dust collector's intake diameter (6-in. hose for a 6-in. inlet, for example). Fit the machine end with a tapered adapter, which minimizes turbulence (see photos, right). A short run of larger-diameter hose will keep air volume high while minimizing inefficiencies caused by friction.

Let your shop's size and layout guide decisions about how to connect the collector. Some people may find it handier to leave lengths of hose clamped to each machine, hooking each one to the collector as needed. Others may have an easier time with just one hose clamped to the collector and hooked to machines as they are used.

Testing the collectors

Dust-collector manufacturers don't do a very good job of defining performance. For example, some manufacturers rate their hardware according to maximum developed static pressure, which is measured when the intake duct is completely closed off and the air is at a standstill. Designers and engineers might find that useful, but the rest of us probably would find it difficult to predict how much air a dust collector can move based on how much air it can stop. Other manufacturers test their hardware without filters or ductwork, producing a high but meaningless figure for air volume.

My tests put the best face on real-life performance. They show how each machine performs with a modest buildup of dust on the filter and a minimal amount of ductwork.

I used a high-efficiency cartridge filter from Wynn Environmental for all the testing, first seasoning it with a measured amount of fine mineral powder to mimic a full load of dust (see top photo, facing page). After I had finished testing one dust collector, I moved the cartridge to the next machine.

To measure air velocity and volume, I fitted a pitot tube and a digital manometer (devices for sampling and measuring air pressure) into short lengths of smooth-wall metal

Hoses, reducers, filters: What well-dressed collectors wear

SMART DUCTING MAXIMIZES POWER

As a rule, larger-diameter hose or duct is better. A 6-in. hose (top right) handles a larger volume of air than 5-in. or 4-in. hose. The smaller sizes speed up the air but move less of it. Every time you reduce the size of the hose, you increase friction; added friction eventually will outweigh gains from faster air movement.

The fittings you use to connect the dust collector with machines in your shop also make a difference. The Y-fitting supplied with the dust collectors I tested (above right) reduces hose diameter at the wrong end of the line. It's better to run larger hose with a tapered reducer (right) connecting it to the shop machine.

FILTERS: BAG VS. CARTRIDGE

Filter bags are not created equal. Some are made of loosely woven cloth and are effective only with relatively large particles—30 microns and larger. They allow the smallest, most hazardous particles to spew out into the shop at head level. You'll treat your lungs best if you outfit the dust collector with a 1-micron filter, either a bag or a cartridge. (I found the choice of bag or cartridge to have a negligible effect on air flow.)

A felted fabric bag has small pores to capture fine particles. If not offered as standard equipment, felt bags cost from $75 to $120. The biggest drawback is that the bag provides only about 15 sq. ft. of filter area, and needs frequent cleaning.

Cartridges have a pleated filter and thus a very large filter area, so they need to be cleaned much less frequently. Many also have a flapper inside to dislodge dust. However, some cartridge filters are costly; don't be surprised by prices of $200 or so. The Wynn filter I used was a relative bargain at $118.

—M.S.

Bridgewood BW-105A
www.wilkemachinery.com
717-764-5000

Craftsman 21337
www.sears.com/craftsman
800-377-7414

Delta 50-760
www.deltamachinery.com
800-438-2486

Delta 50-850
www.deltamachinery.com
800-438-2486

General 10-105
www.general.ca
819-472-1161

duct sized to allow intake turbulence to sort itself out while avoiding undue amounts of friction.

I then took a series of airflow readings on each machine, fitting the open end of the duct with progressively smaller restrictor plates, which steadily raised static pressure and reduced velocity. The graph at right shows how each dust collector's air-volume figures dropped as the openings in the restrictors became smaller.

Finally, I measured the noise each machine makes, taking readings 5 ft. from the motor and 5 ft. from the floor. All are very loud, from 79 to 85 decibels. With a dust collector in the shop, good hearing protection is a must.

So, what should you buy?

The Delta 50-760, the Grizzly, and the Jet delivered significantly better volume than the others, without sacrificing air velocity. I've designated them as the best overall machines.

Of those three, I think the Delta also offers the best value. It's the only one that comes with a standard 1-micron filter bag. You could outfit the Grizzly and the Jet with comparable bags, but that would add about $75 to the cost. Penn State Industries (which also sells its own dust collector) and Woodworker's Supply are two sources for 1-micron bags. Penn State also has a 1-micron cartridge compatible with the Jet; it won't fit the Grizzly collector, however.

The other machines fall too quickly below the 800-cfm threshold for effective dust pickup, or they never achieve that volume in the first place. □

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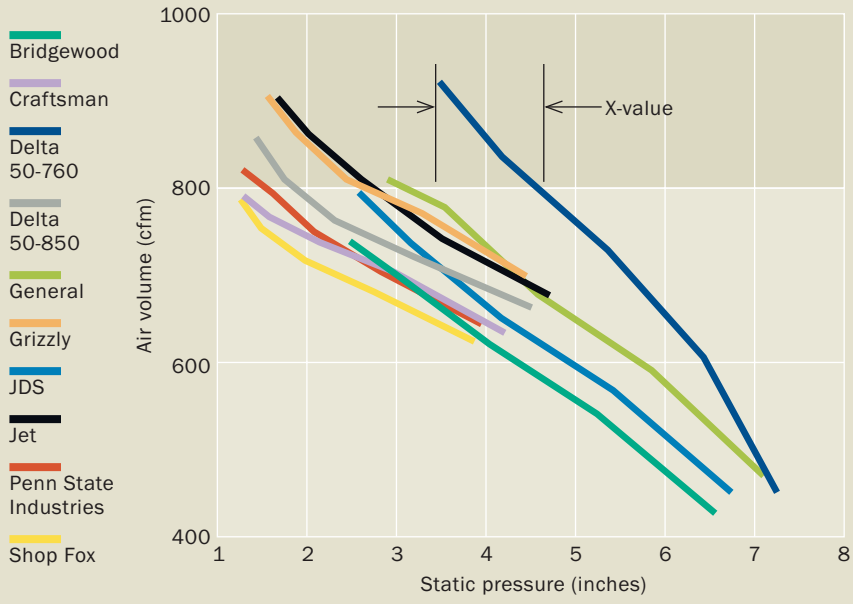
How the dust collectors performed

Each line in the graph describes the performance of one dust collector in my tests. The highest cfm readings for each collector are with a wide-open duct. The air-handling capability dropped as I gradually restricted the opening leading to the collector's intake port, increasing the static pressure. As a practical matter, a dust collector needs to provide 800 cfm or more in order to move all the dust, chips, and shavings that machines like tablesaws, jointers, and planers produce. The best collectors start above that baseline and stay above it the longest. The X-value illustrated below on one of the most powerful machines represents how much resistance (static pressure) can be added before a machine's performance falls below 800 cfm. The author's picks have the largest X-values.

In general, air volume on a machine with a 6-in. intake port drops at a slower rate than on a 5-in. model. In the shop, that inherent difference means that a 6-in. machine has the capacity to handle slightly longer hose.



Grizzly G1028Z
www.grizzly.com
800-523-4777

JDS Dust-Force
www.jdstools.com
800-480-7269

Jet DC-1100A
www.jettools.com
800-274-6848

Penn State Industries DC2V2
www.pennstateind.com
800-377-7297

Shop Fox W1685
www.woodstock
international.com
800-840-8420

MODEL	PRICE	INLET DIA.	NOISE	PERFORMANCE	STANDARD FILTER	OPTIONAL FILTER	ADDED FEATURES
Bridgewood BW-105A	$250	5 in.	80 db.	Fair	1-micron bag	Kit with 1-micron cartridge, disposal bags, $250	None
Craftsman 21337	$300	6 in.	85 db.	Fair	30-micron bag	None	None
Delta 50-760 (BEST OVERALL, BEST VALUE)	$290	5 in.	83 db.	Excellent	1-micron bag	None	Intake ports can be oriented to face up or down.
Delta 50-850	$280	6 in.	85 db.	Good	5-micron bag	1-micron bag, $90. Model 50-850A, $460, comes with 2-micron cartridge.	None
General 10-105	$350	5 in.	79 db.	Good	30-micron bag	2-micron bag, $55. 1-micron cartridge filter, $280.	Remote on-off switch, $100
Grizzly G1028Z (BEST OVERALL)	$270	6 in.	84 db.	Excellent	30-micron bag	2.5-micron bag, $25	Remote on-off switch, $45
JDS Dust-Force	$300	5 in.	80 db.	Fair	1-micron bag	5-micron bag, $60. 1-micron cartridge, $199.	Low-voltage blast gates for multiple hookups. Starter kit, $60
Jet DC-1100A (BEST OVERALL)	$350	6 in.	83 db.	Excellent	30-micron bag	5-micron bag, $80. Model DC-1100CK, $470, supplied with 2-micron cartridge.	Versions available with remote on-off switches.
Penn State Industries DC2V2	$300	6 in.	82 db.	Good	1-micron bag	1-micron cartridge, $169. Collector with 1-micron cartridge, $415.	Remote on-off switch, $50. muffler, $80.
Shop Fox W1685	$240	6 in.	86 db.	Fair	30-micron bag	2.5-micron bag, $50	Remote on-off switch, $40