Ductwork-Worthy Dust Collectors

As your collection of woodworking machines grows, so does the amount of sawdust you create, and with it, the nuisance of rolling a portable dust collector from machine to machine. On the other hand, a dust collector that services your entire shop through a system of fixed ductwork saves you that hassle, keeps your shop cleaner, and, with good filtration, reduces the amount of airborne dust that can damage your health. To collect debris through a duct network without clogging, a collector needs to generate at least 800 cubic feet per minute (CFM) of airflow. But what type of collector—see the sidebar on the next page—and which models do the job best? To find out, we tested a variety of machines capable of handling a full-shop duct system. Here’s what you need to know.

Job one: gather the dust

These machines work best when hooked to a 6”-8” duct network. So we tested each collector’s suction ability by measuring its airflow through 6”-diameter duct, the inlet sizes of four of the best units. Using a pitot tube (velocity meter) and manometer (pressure gauge), we measured each unit’s airflow (CFM) at various levels of resistance, measured in inches of static pressure (SP) loss. This method simulates the resistance that results from adding elbows, increasing duct length, and changing duct diameter to any shop duct network. From those figures, we generated fan curves, allow, to demonstrate each collector’s performance in increasingly challenging shop settings.

Experts deliver tech knowledge with an eye for woodworking

To deliver the most fair and accurate testing results, we hired Tom Brunback and Doug Lory, two woodworkers who earn their living as engineers with a major agricultural seed company. They helped us procure the right testing equipment and knew how to use it to analyze the performance of the collectors under real shop conditions.

Learn to tell dust collectors apart

A single-stage dust collector sucks dust and chips directly into its impeller, the fan that generates airflow. The impeller then blows debris into the “containment” portion of the machine. Heavier chips settle into the bottom bag or bags, while fine dust gets forced up into the top filter, a fabric bag or pleated canister. As the air passes through the filter, most dust becomes trapped inside. Single-stage collectors have either two bags/canisters (110 volts) or four bags/canisters (220 volts), sell for less than most two-stage cyclones, and work great if adequately equipped with efficient filters and hose/duct setups. But because everything passes through the impeller, large pieces, such as knots, small cutoffs, nails, or screws, can damage the fan, bags, or hose.

A two-stage dust collector, also known as a cyclone, routes dust-laden air through a cone-shaped cylinder that slows the air velocity and separates the heavier debris into a collection drum before it can get to the fan. The fine dust that remains airborne passes harmlessly through the impeller and into the filter, typically a pleated canister. Cyclones usually require 220 volts and either a wall-mount bracket or floor stand, but some smaller, portable units run on 110 volts and work best with short lengths (60’ or less) of dust or flex hose.

We tested nine 220-volt units priced from $675 to nearly $1,600, looking for the machine(s) best capable of sucking up dust through a ducted central-collection system—and then trapping it.

In this article,尘收集器提供充足的空气流量, 为您的系统提供足够的压力。基于该数据,压力损失通过图表绘制,并用线性图表示压力损失与流量的关系。为了能够准确评估收集器的表现,我们请了Tom Brunback和Doug Lory,两位木工工程师,他们利用自己在农业种子公司工作的经验,帮助我们选购合适的测试设备,并了解如何使用它来分析收集器的实际表现。
Building inside filters helps trap dust better

Contrary to what you might think, dust-collection filters actually perform at their worst when brand new. That's because trapped dust particles in the filter medium, called a dust cake, actually prevent larger particles from slipping through. But this also tends to reduce airflow because it forces air to pass through a thicker barrier. To improve suction that's dropped below your “normal” standard, knock the dust loose from the filters; if you're getting readings at 50%, 75%, or 90%, you'll have to add an additional 90° fitting to hook up another collector. Once you've calculated how much additional resistance you'll have to add, proceed with caution to avoid overloading the motor.

Maintaining at least 800 CFM:

Although all of the filters meet industrial air-quality standards, those that keep airborne particle counts low allow you to work in the shop longer without discomfort. So the lower and flatter the collector's performance line, the better air quality will be.

Now return clean air to the shop

All the test models have filter bags or canisters rated to trap nearly all dust particles 2 microns or larger in size. To test each collector's filtering ability, we first “seasoned” all the filters by sucking up MDF dust to fully load the filter media, replicating filter performance months or years down the road. This built up a layer of dust inside the filter known as a dust cake. (See the illustration above left to understand the role a dust cake plays in a filter.) With that accomplished, we sanded MDF sheets—material consistency—with a drum sander, and used a digital particulate meter to measure the number of dust particles larger than 1 micron floating in the shop air during and after each pass.

As shown in the chart at left, the Orenda V-Systeem 3000 cyclone did the best job at trapping dust particles during use. The Penn State Tempest cyclone, Powertec, General International 10-210, and Laguna all performed well, too.

To help interpret these filtration data, we shared our test results with Patrick O'Shaughnessy, a professor in the University of Iowa's Department of Occupational and Environmental Health. Patrick told us that all of the air quality measurements shown are within the acceptable limits established by the National Institute for Occupational Safety and Health (NIOSH). However, our testers observed more throat and nasal irritation when testing the four units that demonstrated a steep rise in particle counts, as shown in the chart. Patrick also cautions that the performance of each collector could likely change—but still be relative from machine to machine—based on differences in collection rates, particle counts, as shown in the chart. Patrick also cautions that the performance of each collector could likely change—but still be relative from machine to machine—based on differences in collection rates, particle counts, and environmental conditions.

The Orenda V-Systeem 3000 features a large canister rated to trap nearly all dust particles larger than 1 micron. The Penn State Tempest cyclone, Powertec, General International 10-210, and Laguna all performed well, too.

So how big is a micron?

The dust-collection industry and health regulatory agencies measure air particles by microns. One micron equals .001 millimeter—far too small to see without magnification. By comparison, human hair typically measures about 40–60 microns in diameter. Dust particles smaller than 30 microns—most of them nearly invisible—can remain airborne for about 30 minutes before settling, so it's important to trap them before they get into the air. And some woodworkers are more sensitive to dust from different wood species, such as western red cedar, walnut, sapele, and imported varieties, so for them clean air proves even more critical.

Dust settling:

Dust settling is a major problem. Consider a single 10-micron dust particle that sits in the filter's medium. In the amount of time it takes for that particle to settle, it could bounce around the shop and be drawn back into the air by the collector's suction. This improved the air-quality reading with each fix, but will need to be monitored and maintained over time. And, a collector's high air velocity can force dust particles, especially those smaller than 3 microns, through the filter if air pressure in the filter is too great.

Finally, dump the dust

When the collection drum or bags fill with debris, you should be able to empty them without creating a dust cloud. Unfortunately, that's seldom the case. The Grizzly and Laguna cyclones make this easiest with steel drums on casters that conveniently roll out from under the machine in that configuration for a $400 upcharge.
DUST COLLECTORS SUITABLE FOR A ONE-MAN SHOP

<table>
<thead>
<tr>
<th>MANUFACTURER</th>
<th>MODEL</th>
<th>INLET DIAMETER, INCHES</th>
<th>DIAMETER, INCHES</th>
<th>MAX. FILTER MEDIUM RATING, MICRONS</th>
<th>FILTER MEDIUM RATING, MICRONS</th>
<th>COLLECTION DRUM/CAPACITY, GALLONS</th>
<th>FILTER MEDIUM RATING, MICRONS</th>
<th>INCLUDED ON BRACKET</th>
<th>OVERALL DIA. HOSES (INCHES)</th>
<th>INCLUDED ON BRACKET</th>
<th>SELLING PRICE (6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delta</td>
<td>50-761</td>
<td>B</td>
<td>B</td>
<td>C</td>
<td>A</td>
<td>B</td>
<td>B</td>
<td>C</td>
<td>2.5</td>
<td>3.5</td>
<td>$1,000</td>
</tr>
<tr>
<td>General</td>
<td>10-210</td>
<td>B</td>
<td>B</td>
<td>C</td>
<td>B</td>
<td>C</td>
<td>B</td>
<td>F</td>
<td>2.5</td>
<td>3.5</td>
<td>$870</td>
</tr>
<tr>
<td>Grizzly</td>
<td>Gr662Z</td>
<td>C</td>
<td>B</td>
<td>C</td>
<td>B</td>
<td>F</td>
<td>B</td>
<td>F</td>
<td>2.5</td>
<td>3.5</td>
<td>$675</td>
</tr>
<tr>
<td>JDS</td>
<td>Dust-Force 2500</td>
<td>B</td>
<td>B</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>B</td>
<td>F</td>
<td>2.5</td>
<td>3.5</td>
<td>$1,355†</td>
</tr>
<tr>
<td>Oneida Air</td>
<td>System 3000</td>
<td>R</td>
<td>B</td>
<td>B+</td>
<td>B</td>
<td>C</td>
<td>B</td>
<td>F</td>
<td>2.5</td>
<td>3.5</td>
<td>$1,300</td>
</tr>
<tr>
<td>Penn State</td>
<td>Tempest TEMPEST 1425SS</td>
<td>B</td>
<td>B</td>
<td>B</td>
<td>C</td>
<td>C</td>
<td>C</td>
<td>2.5</td>
<td>3.5</td>
<td>3.5</td>
<td>$1,355*</td>
</tr>
<tr>
<td>Powermatic</td>
<td>PM1900TX-CX1</td>
<td>A</td>
<td>A</td>
<td>C+</td>
<td>B+</td>
<td>B</td>
<td>C</td>
<td>F</td>
<td>2.5</td>
<td>3.5</td>
<td>$1,375*</td>
</tr>
</tbody>
</table>

Two types, two good choices

When making a decision on which model to recommend, we put the most emphasis on airflow and filtration. We could not identify a clear advantage for one type of collector versus the other. The two best machines—one single-stage unit and one cyclone—would be welcome additions to any shop. That’s why we awarded two models our Top Tool award.

If you have or plan a duct system that demands high airflow to overcome static-pressure loss, then get the single-stage Powermatic PM1900TX-CX1. It delivered the most airflow, ranked near the top in fine-particle filtration, and has nearly twice the chip-storage capacity of the cyclones.

If you don’t require that much airflow but desire greater filtration ability, then go for the Oneida V-System 3000 cyclone. It proved best in our test at trapping dust, and its airflow should support a duct system for most typical home shops. The Oneida made an impression on us with its high-quality components, such as heavy-gauge steel and the smoothest-running impeller in the test, and seems best suited to stand up to years of use.

Penn State Tempest TEMPEST 1425SS, $1,355
800-377-7295, pennstatetool.com

At first, this Tempest managed to just fit under our 8’ ceiling. It delivers a great combination of airflow and filtration, but an impeller that rattles and shakes when coating down and a fiber cleansout that’s attached with just silicone causes us concerns about the machine’s longevity and future maintenance.

Powermatic PM1900TX-CX1, $1,300
800-276-6484, powermatic.com

With an 8’ visit and the best selection of the group, this machine provides lots of options for setting up a ductwork system. It’s well built with heavy-duty features and nice touches, such as an electronic starter with remote, a base wide enough to support bags full of chips and dust, and handle for ease maneuvering.

Following are the performance ratings for each model:

1. Excellent
   a. Pipework, flex-hose, and fittings
   b. Maximum airflow and filtration, but an impeller that rattles and shakes when coating down and a fiber cleansout that’s attached with just silicone

2. Good
   a. Zilber bags, 2 collection bags
   b. Stationary cyclone
   c. 2-cartridge filters, 2 collection bags
   d. Portable cyclone

3. Fair
   a. Aluminum
   b. Steel
   c. Dustwork, five hose, and fittings
   d. 1-number cartridge filters
   e. Filter collection drum
   f. Rain stand
   g. Noise reduce
   h. Remote control starter
   i. Steel collection drum
   j. Wall mount kit

ROLLOUT, TILT, TOSS IT

With this Grizzly G0440 and the Laguna, you empty the chips and dust by removing a disposable plastic bag inside the roll-out drum.

Penn State Tempest TEMP1425SS, $1,355
800-377-7295, pennstatetool.com

At first sight, this Tempest managed to just fit under our 8’ ceiling. It delivers a great combination of airflow and filtration, but an impeller that rattles and shakes when coating down and a fiber cleansout that’s attached with just silicone causes us concerns about the machine’s longevity and future maintenance.

Powermatic PM1900TX-CX1, $1,300
800-276-6484, powermatic.com

With an 8’ visit and the best selection of the group, this machine provides lots of options for setting up a ductwork system. It’s well built with heavy-duty features and nice touches, such as an electronic starter with remote, a base wide enough to support bags full of chips and dust, and handle for ease maneuvering.