SHOP-TESTED

Dust Collectors Under $400

WOOD® magazine tester Jeff Hall adjusts the funnel on the end of the duct to create resistance during airflow testing.

Watch a FREE video explaining how the testing rig works and how we create a fan curve at woodmagazine.com/dctest

There's more to dust collection than just sucking up debris. We'll show you which machines do it best—and which ones return less fine dust to your shop's air.

Would you buy a dishwasher that didn't actually clean your plates and pots? How about a lawn mower that cuts only half the blades of grass it passes over? Of course not. You expect machines to perform their tasks.

We're with you. And that's why we say you should not spend your hard-earned money—and risk your health—on a dust collector that fails to trap fine dust—even dust too fine to see. In our test of 15 portable dust collectors, we found that all could move debris from the machine to the collection bags with varying success. However, nine of those units featured dust-capturing filtration so inferior, they merely recirculated much of the fine dust back into the air. And it's that breathable dust that medical studies have proved to be the most harmful to your health.

Dust collector basics

Before we get into filtration, it's important to understand how a dust collector works. The type we tested suck chips and dust into an impeller, which then spews them into bags strapped above and below a steel rim. The bottom bag collects what settles, while the top bag (and unfilled areas of cloth bottom bags) filters and traps the dust as air escapes through it.

A dust collector needs to move dust and chips at least 3,500 feet per minute to keep them suspended in the air and prevent them from settling in the duct. Multiplying the air speed by the area of the duct gives you cubic feet per minute (CFM), the performance spec cited most often in dust-collection discussions. Typical home woodworking machines have 4" dust ports and require a minimum airflow of 400 CFM.

But CFM is only one of two key factors in gauging dust-collector performance. The other is resistance, measured in inches of static-pressure loss. The very ductwork you need to channel the debris to the collector actually chokes that airflow, especially as you add length or change directions. For example, every elbow, wye, or reducer in your line creates resistance versus a similar setup with a straight duct of one size. The length of duct and material it's made of also adds resistance. (Ribbed flex-hose, for example, adds three times the resistance of smooth-walled metal duct, so it's important that you use as little of it as possible.)

We went high-tech to test these collectors

With assistance from Dr. Greg Maxwell of Iowa State University's engineering department, we created a testing apparatus using smooth-walled metal ductwork that we attached to each collector's port (shown at *left*). On the open end, we used a funnel-shaped stopper, threaded to an anchored bolt, to simulate different lengths and shapes of ductwork.

We utilized a pitot tube and manometer inside the duct to measure airflow (CFM) and resistance in inches of static-pressure loss (SP). These figures help pinpoint which collector will work for you. To determine the amount of SP loss you should expect to encounter, go to woodmagazine.com/spcalc, or read issue 119 (December 1999), pages 16–18.

Of the 15 units we tested, 11 have 6" inlet ports and the rest have 5" ports. All models come with a wye that mounts over the inlet and allows you to attach two 4" ducts. (All have a cap so you can close one of the 4" ports.) We tested each unit with 4" metal duct for a true apples-to-apples comparison (see chart at *right*), and also tested them with 5" or 6" duct to match their ports (*next page*). We found that each machine achieved greater suction with less resistance using the larger-size duct. (Using 5" and 6" duct or flex-hose, however, requires a greater minimum CFM level than 4" duct to keep debris in suspension.) If you intend to use 4" duct or flex-hose with a wye, plan to add blast gates near that wye so you can close off one duct while using the other. Leaving both open cuts your machine's suction capability in half.

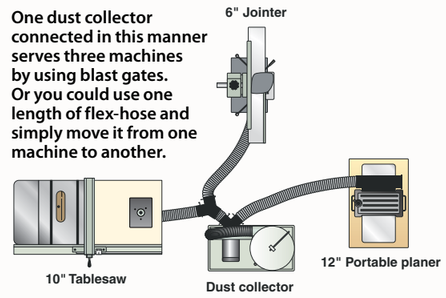
Know your dust-collection needs

How do you translate the values for airflow and resistance into finding the right dust collector? Start by determining how many machines you plan to hook up. If you're looking to install a duct system that will service your whole shop, these machines will not work for you. They're meant for short duct runs or dedicated hook-ups to only a few machines. (See the illustration at *right* for a simple three-machine setup.) For a central system, you'll need a more powerful dust collector or a cyclone.

The machines in this test have 1½- and 2-hp motors, but to find out how less-potent dust collectors perform, we included a typical 1-hp unit in our testing. It did not fare well, failing to meet the 400 CFM minimum, as shown in the chart *below*. You might have luck using one of these units with a very short duct (6' or less), but you'll likely leave some debris behind.

TYPICAL SHOP SETUP FOR A PORTABLE DUST COLLECTOR

One dust collector connected in this manner serves three machines by using blast gates. Or you could use one length of flex-hose and simply move it from one machine to another.

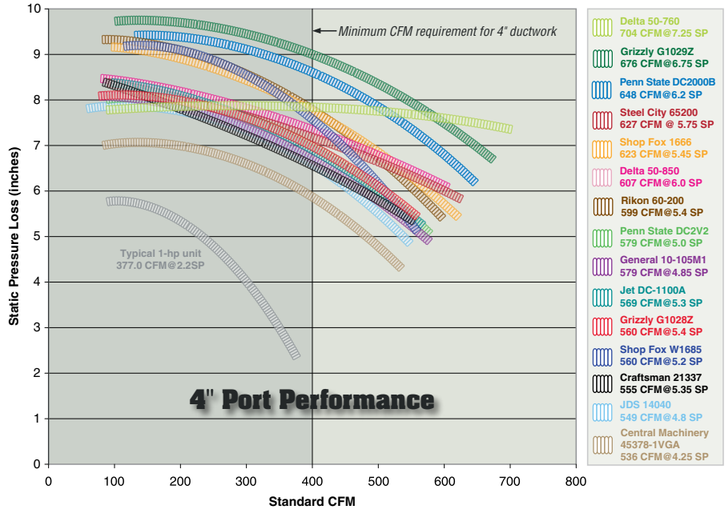


Filtration proves critical for you and the collector

Wood debris ranges from heavy particles (like planer chips) that quickly fall to the floor, to microscopic dust particles that remain suspended in the air for 30 minutes or longer and can't be seen without magnification. The smallest size

Two Units Deliver Adequate Airflow Over 8" Static Pressure

Dust collectors lose CFM as the amount of resistance (SP loss) increases. Select a model that operates at a high CFM rate for a given SP loss for your duct setup. Because you'll need to maintain at least 400 CFM in 4" duct to keep dust and chips in suspension, look for performance results to the right of the shaded area. Peak performance of each dust collector is noted at *right*.



a human eye can see is about 10 microns. (Human hair, by comparison, measures about 40–60 microns in diameter.)

These dangerous, breathable, ultrafine particles easily escape through the porous woven-cloth bags rated at 30-micron filtering efficiency. You should insist on at least a 5-micron filter media (bag or pleated cartridge), but a 1-micron filter proves even better. These finer filtration bags are made from thicker material (usually felt) and have more pinholes per square foot—to allow air to pass through—when compared with 30-micron woven cloth bags. So not only do these bags trap fine dust, but they also increase the collector's airflow by reducing resistance.

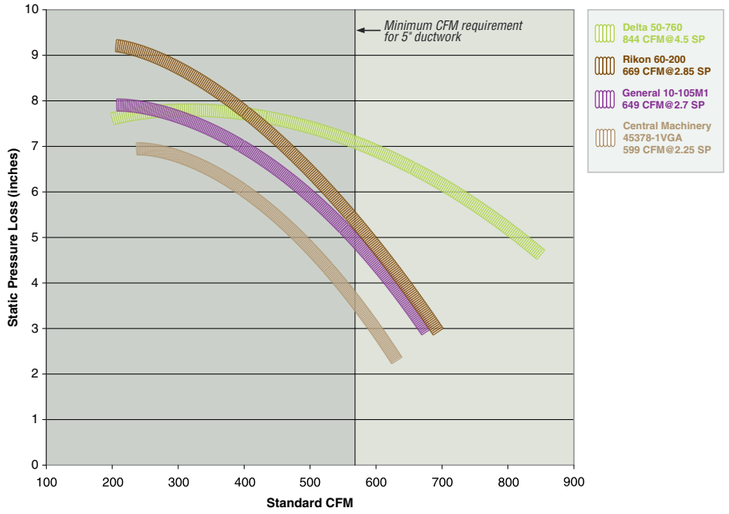
Five of the units we tested come standard with a 1-micron top bag, and of those, Penn State also includes a 1-micron bottom bag on both of its models. The other three (Delta 50-760, JDS 14040, and Steel City 65200) have nonporous plastic bottom bags. Delta's 50-850 comes with a 5-micron top bag and plastic bottom bag.

Ironically, two units—General International's 10-105M1 (2 microns) and Grizzly's G1029Z (2.5 microns)—included fine-filtering top bags but offset them with 30-micron bottom bags that allowed fine dust to escape. After we shared test results with these companies, both elected to replace the bottom bags with plastic, effective immediately. (Grizzly's Bill Crofutt said the company will also replace both 30-micron bags on the G1028Z with a 2.5-micron top bag and plastic bottom bag.)

All other models except Rikon (10 microns) feature two 30-micron bags. If you want to upgrade the filtering efficiency, you can opt for bags or cartridge filters from most of these manufacturers, or you can buy much larger high-efficiency aftermarket bags that provide more surface area to filter dust and allow air to escape. (For a comparison of their performance, read "A high-efficiency top filter combined with a plastic bag below proves best" on *next page*.)

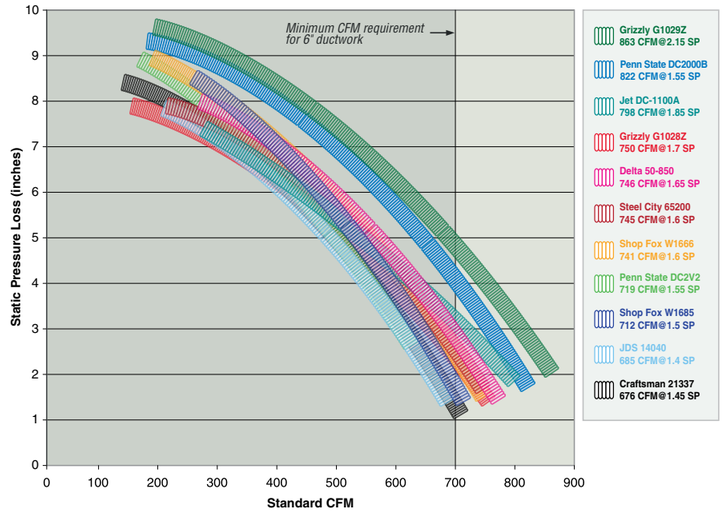
Delta Stands Out Against 5"-Port Peers

We tested the four dust collectors with 5" inlets using 5" duct, and the Delta 50-760 clearly outperforms the others. It achieves greater CFM and also overcomes higher SP losses. Peak performance of each dust collector is noted at *right*.



Not All Units Can Support 6" Ducts

Using 6" duct on those units with a 6" inlet, we found that more than half barely reach the minimum CFM level at static-pressure levels less than 3". The Grizzly G1029Z and Penn State DC2000B excel above the others. Peak performance of each dust collector is noted at *right*.



More factors to influence your buying decision

■ **Clampless bags mount easiest.** Securing the lower bag to the collector housing proves to be a two-handed job at best, and sometimes a third hand becomes necessary. We found the easiest to install were bags with a springy metal hoop [**Photo A**] sealed inside the bag's rim. These also produced a tight seal against dust leaks. Only the Delta 50-760 and Jet DC-1100A have such hoops.

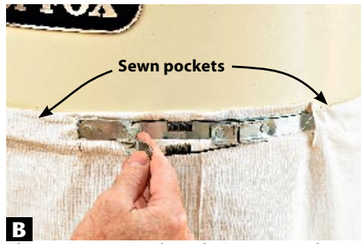
Next best is a continuous pocket around the bag, with the lever-action band clamp slipped into it [**Photo B**]. Some models use friction clips to hold the plastic bags in place [**Photo C**] while you tighten the band clamp around them—eliminating the need for a third hand. Bags with belt loops [**Photo D**] make bag changes difficult and tended to bunch and create dust leaks.

■ **They're all mobile, but...** Because these dust collectors are portable, they all have four swiveling casters, so you don't have to parallel-park them. But only two units, the Central Machinery and Delta 50-760, include handles for you to guide them around. Some have sturdy legs that bend away from the bottom bag that also serve reasonably well as handles. The majority proved wobbly but strong enough for their purpose.

(Continued on page 70)

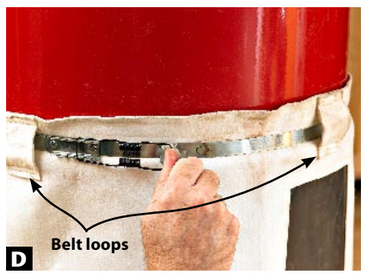
BAG MOUNTING METHODS FROM BEST TO WORST

A Simply twist Delta's metal hoop slightly and it pops loose; put it back with a similar twist.



B Clamps in sewn pockets that open in only one spot prove easy to use.

C Metal clips hold plastic bags while you secure the band clamp, which still takes two hands.



D Bags that rely on belt loops and a band clamp proved the most difficult to install.

A high-efficiency top filter combined with a plastic bag below proves best

To find out which combination of top filter media and bottom collection bag works best, we tried each option on the Jet DC-1100A. We paired up combinations of the standard 30-micron cloth bags, a plastic lower bag, a 5-micron filter bag (from Jet), a 2-micron cartridge filter (from Jet) [**Photo E**], and a 1-micron oversize bag (from American Fabric Filter, 800-367-3591 or americanfabricfilter.com).

As you see in the chart *below*, using a high-efficiency filter on the top and a nonporous plastic bag on the bottom added 40–80 CFM of airflow versus 30-micron bags. And although stepping up from a 5-micron to a 1-micron bag didn't improve airflow in our test, it will boost your shop's air quality. Some manufacturers told us they get greater airflow with cartridge filters versus standard-size bags. We were unable to test each collector with all filter and bag options.

But finer filtration and increased airflow come at a price. A cartridge typically costs $200–$250, three times as much as a high-efficiency bag. American Fabric Filter (AFF) custom-designs and manufactures oversize 1-micron bags ($60–$160) to fit each customer's dust collector and shop limitations (low ceilings, for example). These bags add filtration surface area, said AFF's Stan Wnukiewicz.

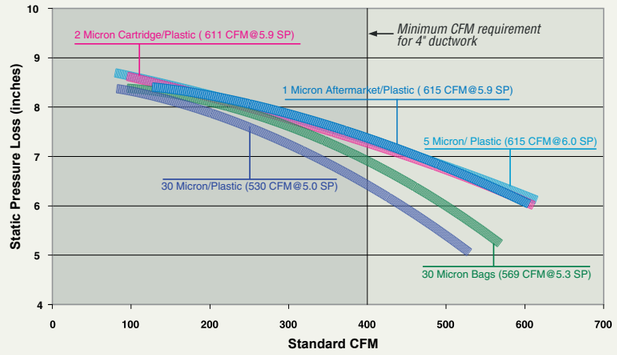
"You've got to have a large enough filter bag that won't inflate tight like a balloon," Wnukiewicz says. "If it does, all that air pressure will force the pores open and allow dust particles through, and that reduces suction. You also have to anticipate what that filter will be like in six months or a year after a lot of use. With pleated filters and porous bags, that dust gets forced into the fabric or pleats to the point where you might never get it out."

CARTRIDGE CLEANS QUICKLY

E Spin the handle of a cartridge filter to turn paddles inside that flip dust off the pleats.

Fine Filters Increase Airflow and Quality

Any high-efficiency filter medium paired with a plastic bottom bag gains CFM and overcomes more SP loss than any system using a 30-micron bag. Peak performance of each combination is noted using 4" duct.



Dusty trail leads to doctor's office

Tester Jeff Hall learned a tough lesson with wood dust while testing these collectors. Jeff has a sensitivity to walnut dust that gets his nose and sinuses running, but he purposely used walnut dust to season all of the bags before taking airflow and resistance readings, using it as a red flag that a particular machine might be leaking dust. And many of them did leak around fittings and seals. But what Jeff didn't count on was that the units with 30-micron bags actually forced much of the fine dust—including dust too fine to see—back into the air he was breathing. When his nose alerted him, he began wearing a respirator. But it was too late. So much dust got into his lungs that it caused a respiratory infection that lasted three weeks and required three rounds of antibiotics. The lesson: Filtering and trapping dust is critical, so use filtering media on your collector of 5 microns or less.

IMPELLER TRANSITION FACTORS INTO AIRFLOW

F The impeller on Delta's 50-760 blows dust and chips directly into the collection chamber without need for a jumper hose.

G The 6" hose on the Craftsman has a smooth transition from the impeller to the collection and filter bags.

H The 5" hose on Penn State's DC2V2 bends at almost a 90° angle—creating more resistance—when the impeller is powered.

■ **"Jumper" hose adds resistance.** Fourteen of the 15 collectors we tested have the motor and impeller resting on the base just above floor level. (Only the Delta 50-760 [**Photo F**] has them located at midlevel.) Those 14 machines have 2–3' of flex-hose to transfer debris from the impeller to the bags, and that creates more drag to cut into overall performance. The Craftsman [**Photo G**], Delta 50-850, and Steel City models use 6" hose, which creates less resistance. (Our testing proved that larger-diameter duct created less resistance when compared with smaller duct.) All others use 5" hose. Still, because of variables such as fan size and shape and bags, some models with 5" hose outperformed the 6" units. We're confident those machines would perform even better with 6" hose. Five of the 5" models had extra-long hoses that resulted in near-right angles [**Photo H**] in use, restricting airflow.

■ **Foam strip helps seal leaks.** General International was the only manufacturer to include self-adhesive foam, used to line the rim where the bags mount. This proved effective at preventing dust leaks with the band clamps tightened.

Great Tip! You can do the same thing on any dust collector with inexpensive foam weatherstripping, available at home centers and hardware stores.

Gain airflow by adding an aerodynamic hood

While testing the 15 units with straight metal duct, Jeff Hall discovered that when he cupped his hands around the open end of the duct, the air velocity increased while static pressure decreased. So we decided to compare different inlet ports in search of an advantage.

We bought a common tapered dust hood and made a custom bell-mouth hood, shown at *right*. For the latter, Jeff laminated two pieces of ¾"-thick MDF, cut a 4" hole into the center, routed one edge of the hole with a 1" round-over bit, and then glued that piece to a standard 4" plastic port. (You can also buy these in metal or plastic.)

We tested these on several collectors, and found that on one of the lower-performing units, we gained nearly 100 CFM with the plastic dust hood and nearly 140 CFM with the MDF bell-mouth hood while dropping resistance nearly 1" SP. We achieved similar results with one of the top-performing collectors. The reason for the improvement? Air (and with it, dust) changes direction easier when it encounters smooth transitions versus perpendicular corners.

SMOOTH TRANSITION GAINS CFM

Adding either a bell-mouth hood or a tapered dust hood to any machine, such as this jointer, will increase dust removal.

Plastic or metal dust hoods and bell-mouth hoods sell for about $7–20 depending on size. (Many jointers come with a dust hood, as do some tablesaws.) But it's easy to make your own bell-mouth hood, using whatever dimensions fit your machine. If your machine has a straight port, you can remove it and replace it with a more aerodynamic hood.

You won't go wrong with either of these dust collectors

Our tests revealed three clear leaders in their ability to overcome static pressure losses while achieving high CFM: Delta's 50-760, Grizzly's G1029Z, and Penn State's DC2000B. We're naming the Grizzly and Delta as co-winners of our Top Tool award. Here's why:

The Grizzly outperformed all units by overcoming the most static pressure in 4" and 6" ducts and was second only to the Delta in maximum airflow. Its 2.5-micron top bag filters out most of the ultrafine dust, and with Grizzly making the switch to a plastic bottom bag, its overall performance should only improve. We tip our hat to Penn State for its fine-filtering bags, but its airflow performance proved slightly lower than that of the Grizzly.

But if you don't have the 220-volt hookup necessary for the Grizzly, you'll get great performance from the 110-volt Delta. It achieved the highest maximum CFM, has the easiest bag-changing system, and a superefficient 1-micron filter bag.

Grizzly G1029Z

WOOD MAGAZINE TOP TOOL APPROVED

Delta 50-760

Written by **Bob Hunter** with **Jeff Hall**
Illustrations: **Tim Cahill**

COLLECTING THE DIRT ON DUST COLLECTORS UNDER $400

MANUFACTURER	MODEL	RATED HORSEPOWER	VOLTAGE (1)	AMP RATING (110V/220V)	MAXIMUM AMPS PULLED IN TEST	BLOWER INLET PORT DIAMETER, INCHES (2)	BOTTOM BAG CAPACITY (CUBIC FEET)	FILTRATION SIZE, MICRONS (TOP/BOTTOM) (3)	HEIGHT WITH BAGS INFLATED (INCHES)	BAG CLAMP STYLE, TOP/BOTTOM (4)	AIRFLOW PERFORMANCE	QUALITY OF BAG FILTRATION	ABSENCE OF DUST LEAKAGE	EASE OF CHANGING BAGS	EASE OF MOBILITY	EASE OF ASSEMBLY	NOISE LEVEL, DECIBELS	STANDARD	OPTIONAL	POWER CORD LENGTH, FEET	WEIGHT, POUNDS	WARRANTY, YEARS	COUNTRY OF ASSEMBLY (7)	SELLING PRICE (8)	PHONE	WEB
CENTRAL MACHINERY	45378-1VGA	2	110	14/7	12.1	5	5.35	30/30	79	P/P	C	D	B	A	A	C	81		ALL	6	100	90 DAYS	C	$220	800-423-2567	harborfreight.com
CRAFTSMAN	21337	1½	110/220	12/6	8.9	6	6.18	30/30	83	B/C	B-	D	B	B-	B+	A	82	H	B,D,M	8	108	1	C	300	800-383-4814	craftsman.com
DELTA	50-760	1½	110/220	15/7.5	16.2	5	4.07	1/P	86	H/H	A	A	A	A	A	A	84	H	ALL	8	100	2	T	350	800-223-7278	deltaportercable.com
	50-850	1½	110/220	12/6	9.1	6	5.09	5/P	83	B/C	B+	A-	B	A-	B+	A	84	H	ALL	8	100	2	T	390		
GENERAL INTERNATIONAL	10-105M1	1½	110/220	14/7	12.5	5	5.53	2/30	76	P/P	B	B-	A	A	B+	A	84		ALL	6	106	2	T	340	514- 326-1161	general.ca
GRIZZLY	G1028Z	1½	110/220	18/9	15.7	6	5.53	30/30	76	S/S	B	D	B	B	B-	A	84		ALL	6	115	1	T	240	800-523-4777	grizzly.com
	G1029Z	2	220	12	9.8	6	5.53	2.5/30	76	S/S	A	B-	B	B	B-	A	84	S	ALL	6	123	1	T	260		
JDS	14040	1½	110/220	16/8	14.8	6	5.53	1/P	76	P/C	B-	A	B	C	B	A	84		ALL	6	110	2	T	340	800-480-7269	jdstools.com
JET	DC-1100A	1½	110/220	11/5.5	11	6	5.27	30/30	79	B/H	B	D	A	A	B	A	85		ALL	6	110	5	T	330	800-274-6848	jettools.com
PENN STATE	DC2000B	2	110/220*	18/9	8.7	6	5.87	1/1	93	P/P	A	A	A	A	B	B	83	H	ALL	7	101	2	C	260	800-377-7297	pennstateind.com
	DC2V2	1½	110/220	18/9	12.4	6	5.53	1/1	76	B/B	B	A	A	C	B-	B	78	H	ALL	6	95	2	T	330		
RIKON	60-200	2	110	16	14	5	5.87	10/10	80	P/P	B+	C+	B	A	B	B	82		B,F,M	6	104	2	C	330	877-884-5167	rikontools.com
SHOP FOX	W1666	2	220	12	8.7	6	5.87	30/30	78	P/P	B+	D	A	A	B	B	84		B,D,H,M,R	8	107	2	C	290	800-840-8420	shopfox.biz
	W1685	1½	110	16	13.5	6	5.53	30/30	76	P/P	B	D	A	A	B	B	82		B,D,H,M,R	8	108	2	C	260		
STEEL CITY	65200	1½	110/220	14/7	11.3	6	6.3	1/P	83	B/C	B+	A	B	A-	B+	A	83	H	B,D,P	8	98	5	T	320	877-724-8665	steelcitytoolworks.com

1. (*) Tested at 220 volts. Units were tested at 110 volts unless prewired for 220 volts.
2. All models include a wye with two 4" ports.
3. (P) Nonporous plastic bottom bag
4. (B) Band clamp in belt loops
   (C) Band clamp with friction clips
   (H) Hoop enclosed in bag rim
   (P) Band clamp in continuous pocket
   (S) Band clamp with cinch straps
5. A Excellent
   B Good
   C Fair
   D Poor
6. (B) Blast gates
   (D) Dust hoods
   (F) Canister filter
   (H) Flexible hose
   (M) Finer-micron filtering bag
   (P) Plastic collection bag
   (R) Remote control
   (S) Separator lid for trash can
   (ALL) All of the above except separator
7. (C) China
   (T) Taiwan
8. Prices current at time of article production and do not include shipping, where applicable.