

Choose a Dust Collection System for Your Needs*

A veteran of the industry analyzes which approaches to dust collection fit which applications.

A modern woodworking plant without an adequate dust collection system is akin to a wagon without wheels. And, contrary to the feelings of many, a good system need not be expensive and always adds to a company's bottom line. It protects the owner, the employee and the environment. It satisfies the insurance carrier, the fire department, OSHA (in-plant) and EPA (off-premises).

Equally important, effective dust collection increases product quality, enhances finishing operations, helps machinery and computers operate trouble-free, and, if designed correctly, is the cheapest method available of handling the significant amounts of waste so common in this industry.

But, unfortunately, there are poor systems out there, and they are losers. What may have been a "cheap" initial purchase can eat you alive before you get rid of it. As with any other machine, the real cost is the amortized value of every dime spent over a system's useful life. Electric power costs alone are easily ten times the initial cost of the collector itself.

So, when buying a dust collecting system—no matter its size—understand what you are buying and be sure it is designed to do what you need done.

When you compare and evaluate equipment over its useful life, you'll find that initial cost is generally the least important consideration. In a word, buy smart, not cheap.

TYPES OF COLLECTORS

There are only two commercially important collector types you need consider. Wet collectors, electrostatic collectors and paper cartridge collectors have had little success in the woodworking field; they just don't hack it. Cyclone collectors and fabric filter collectors dominate the field, and rightly so.

If your dust is relatively coarse, i.e. generated by "toothed" cutters such as saws, planers and routers, a modern high-efficiency cyclone is your best bet. It has the ability to efficiently handle large quantities of coarse dust—the output from this kind of machinery. If a small amount of fine dust also is present, a cyclone with an after-filter is best.

If your dust is almost all fine particles, i.e. sanding dust, choose a fabric collector.

If the dust is extremely fine, as in a wood-flour operation, it has long been accepted that this dust is [deflagratable \(explosive\)](#). In fact, the National Fire Prevention Association's NFPA Code #664—for wood shops—has remained essentially unchanged since its original issuance in 1931. That code spells out the unique requirements of equipment, ductwork, etc. for these plants. This article is too short to properly address these complex problems. But the writer recently authored a 12-page booklet on the subject of "Combustible Dusts," and it is available as noted below.

Figure #1

Cross section of a high-efficiency cyclone collector with blower

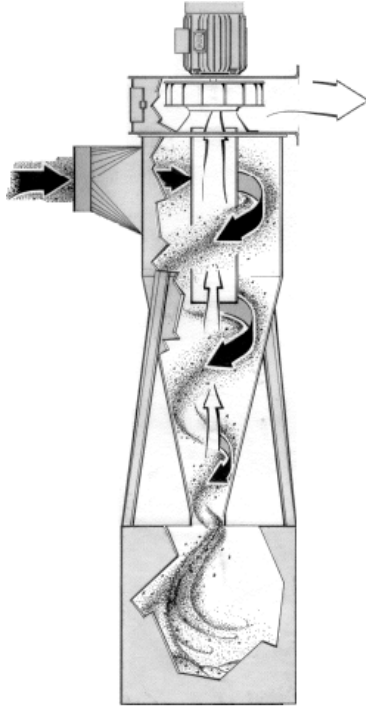
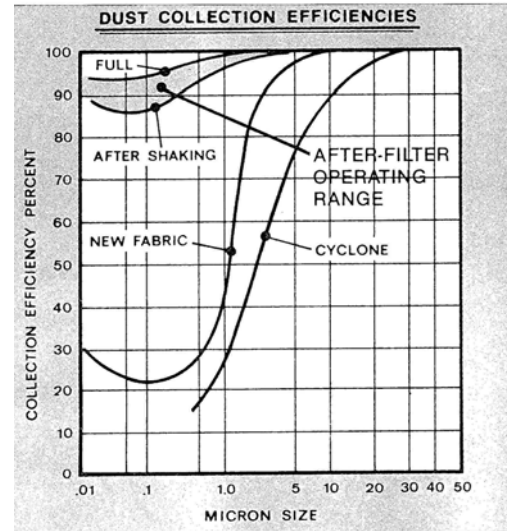


Figure #2

Table shows relative effectiveness of cyclone and fabric filter collectors



CYCLONE COLLECTORS

Modern high-efficiency cyclones generate internal "controlled tornados" (see Figure #1) that, by centrifugal force, fling the dust out of a whirling vortex into a drum or hopper. Note the Efficiency Curve in Figure #2 (from Dustvent) showing that above about 25 microns (.001" diameter) the separating efficiency is 100 percent. In fact, overall efficiencies of 95 percent to 98 percent or more are routinely obtained on various sawdust samples tested in our laboratory.

Where air is to be re-circulated back into the plant, a following after-filter is used (see Figure #3) to assure complete cleaning. More on these below.

Figure #3

Indoor cyclone-blower-after filter



FABRIC COLLECTORS

All fabric collectors sub-divide into two types - continuous and intermittent duty (see Figure #4). All operate identically; they pass dirty air through a permanent filter cloth and separate the dust on the cloth's surface. Filter paper, widely used in household vacuum cleaners, is cheap, but simply not rugged enough for industrial applications. Felted, woven or knitted cloths are used instead. The nuances of types, fabrics, permeability etc. are much too extensive for discussion here. Suffice it to say there are three basic rules:

1. Optimum efficiency depends on a dust-cake buildup on the filter surface. See the "new," "full" and "after-shaking" curves in Figure #2.
2. Air flow quantity depends on the filter area, the medium's permeability, the amount of dust buildup that occurs before filter cleaning and the power of the blower.
3. The more permeable the cloth, the less its collection efficiency, with or without a dust-cake.

Continuous duty collectors can theoretically operate forever. The pulse-jet type is the most common today, its patents having expired into the public domain.

When a continuous duty collector is operating, a shot of compressed air passes backwards through the medium, dislodging collected dust which then falls into a hopper below. Repetition keeps the filter "clean," and continuous operation results.

Real life is not as simple as this short explanation, but, in fact, these collectors do a good job. They cost more, have higher operating cost than intermittent collectors, and require very clean compressed air. If your operation never shuts down, they must be used.

Intermittent duty collectors are equally efficient, cost less and use a "stop and shake-or-shed" concept (see Figures #3 and #4) to clean the filters. Most operations shut down at noon, at coffee breaks, etc., and these intervals are adequate to allow filter cleaning by manual or electrical shaking. Cyclone after-filters, which handle only 2 percent to 5 percent of the dust not separated by the cyclone, often simply shed wood dusts when air flow stops. Figure #3 was photographed while the unit was running and the after-filter cloth is seen to be drum-fight. When the collector is shut down, the cloth relaxes and the dust inside the filters simply sheds into the drums below.

Figure #4

Outdoor fabric collector with integral blower re-circulating air back into the plant.



BLOWER DESIGN AND LOCATION

Blowers that precede any collector should be avoided. They ingest all the dust, chips and wood chunks, and only a "paddle wheel" type can handle this. Reputedly originated by Archimedes, this style is the noisiest, least powerful and least efficient design extant.

Conversely, downstream blowers that see only cleaned air can be designed to be quiet, powerful and efficient. They can use less power, move more air and make less noise, thus delivering a "bigger bang for the buck."

Do not believe that a larger horsepower unit is "better" or that "a blower is a blower." Nothing could be further from the truth than these two statements.

For the same air flow, the lowest horsepower is your best buy. Compare! Electricity has become expensive during the past 20 years. Electricity today can cost you \$320 per year per horsepower for a single-shift operation. If one collector uses 5HP less than another, it will save you \$1,600 per year, or \$24,000 over a 15-year useful life. Plug those numbers into your evaluations. They represent out-of-(your)-pocket costs—not pie in the sky.

Also, be sure to get a blower design guaranteed to vary in CFM delivery by not more than 10 percent even with a 50 percent error in estimated static pressures.

SYSTEM DESIGN

Use a source-capture system, and connect each machine to a carefully designed metal piping system leading to a conveniently located collector. Keep distances short and avoid elbows.

Size the collector for 75 percent or greater diversity, i.e. percent of total connected CFM requirement. Piping systems that try to handle smaller diversifies end up with starved machines, non-conveying, plugged pipes, etc.

Hand sanding operations are often best handled by powerful [downdraft benches](#), which, if properly designed, are modified fabric collectors that become islands of profitability in your plant.

Remember to pre-plan for your dust collection needs in the design stage. The lack of a good dust collecting system has overwhelmed more than one user, and the problem of scavenging a lot of "new-found" dust after an operation is under way is much more difficult than building in the dust collecting ability at the start. Estimate your dust quantities carefully and pre-plan your disposal methods.

Then, if you'll throw away your compressed air blow-off nozzles, you'll be prepared for OSHA's 5mg/cubic meter rule when and if it becomes final. In English units, this is one ounce (about enough volume to fill a 6 oz. coffee cup) of sawdust evenly distributed throughout a 20,023 square-foot plant that has 10-foot high ceilings—not very much dust.

Rosenquest and appeared in the April 1994 issue of "Wood Digest".

collectors cited in this article, contact us or click on the desired product.

- [Deflagratable \(explosive\) Dusts](#)
- [Dustvent Cyclone Dust Collectors](#)
- [Dustvent Fabric Collectors](#)
- [Dustvent Downdraft Systems](#)
- [Design of source-capture systems](#)

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