# What do you find to be the biggest wood dust collection problem and how would you solve it?

Today's woodworking industry is comprised of thousands of small shops. The shop owners are hard pressed to find someone to properly design their dust collection system. It seems the professional dust collector manufacturers do not want to spend time designing and quoting 3 HP to 15 HP systems. In addition, most of them are married to mechanical contractors that want to quote a turnkey project.

The dust collection budgets for small shops are usually quite limited, but would cover the purchase of a collector and the ducting. With the proper layout in hand, nearly 100% of the shops are capable of the install themselves, saving thousands of dollars.

The problem is, where do they go? If a collector is purchased mail order, they are left on their own. Most likely, the system will be installed incorrectly. The professional dust collector manufacturer typically will not work directly with the small shop or in some cases are selling the dust collector without providing the duct design! Professional engineers versed in wood shop dust collection systems do not seem to advertise in any woodworking publications. For a fee, the PE is able to provide the non-biased specifications with a blue print that includes duct design. Some companies offer a "do it yourself design guide", but many shop owners are fearful and don't want to attempt the exercise.

My solution is twofold. First, I would not allow a dust collector manufacturer or distributor to sell a dust collector over 3 HP without providing a proper duct design. Second, I would like to see one of the woodworking associations create a listing of PE's that are experienced and interested designing systems for wood shops that are out of the realm of a turnkey project. This will obviously require a national search, but I believe it is feasible. Small shop systems can be designed without a site visit as long as the shop owner provides the PE with all of the necessary data.

A dust collection system provides for the health, safety, and productivity of a shop. Let's make the pursuit of this objective easier for the small shop owner.



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# Fitting Tip

Many dust collection systems require a special fabricated round to round reducer or rectangle to round transition. It is very important to have an allowance when requesting such fittings. Let's say you have a blower outlet that measures 12" X 10" on the outside and you want to transition to 12" round duct. When requesting such a fitting, add 1/16" to the inside of the fitting. Example, rectangle to round transition, 12 1/16" ID X 10 1/16" ID to 11 15/16" OD for 12" ID round duct. We have added 1/16" for the end that fits over blower outlet and subtracted 1/16" from round end to fit into 12" ID duct.

In addition, let's say you have a blower inlet 12 1/8" OD and 11 3/4" ID and want to connect to 12" spiral pipe. Can't fit spiral pipe over, can't fit a spiral pipe to spiral pipe coupling into. If you request a custom reducer 12 1/8" ID to 11 15/16" OD for 12" ID round duct, you probably won't get it over the collar, way too tight. Add that 1/16" to the ID and request the custom reducer with 12 3/16" ID to 11 15/16" OD to fit into 12" ID round duct.

Proper fully welded dust collection fittings need a minor allowance. Even that minor allowance is a little tight, but that's good. Welded fittings are made of a minimum of 20 gauge sheet stock which creates a fairly solid fitting. I remember asking one customer how his custom reducer fit. He said," ok, but I had to slice the collar to get it on. I should have asked for a tweak larger." It was a shame to slice up a good quality fitting in order to fit it on the collar.



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## How much CFM will my dust collector deliver?

There are many woodworkers that buy a dust collector on the basis of a CFM number. Unfortunately, the air volume they are given is called **"free air delivery"**, which means there is not any pipe attached to the dust collector. This CFM number may very well be enough air to evacuate the machines, but when you add pipe to the collector you add resistance (static pressure). When resistance is put on a collector, the CFM delivery decreases. The actual air delivery of a dust collector is typically half of the **"free air"** factor once it is piped in. It is important to first find out your systems CFM and RESISTANCE (static pressure), then purchase the right collector. We have several tools to enable you to achieve this. A dust collector must be able to overcome the piping resistance and pull vacuum from the machines you need to operate simultaneously.

## What is Static Pressure?

Static Pressure is resistance to flow caused by friction and the channeling of airflow through a round pipe. If you turn on a dust collector without anything attached to it – spiral pipe, flexible hose, or filter bags, it will pull max volume at free air without any resistance. Attach filter bags and 10 feet of spiral pipe to the inlet and you have added resistance. Add 20 more feet of spiral pipe and so on – you increase resistance as you add more spiral pipe and fittings.

It is the dust collector's job to overcome the duct work resistance and pull the proper amount of CFM when you open a branch or branches in a central dust collection system. When you drink a soda with a regular straw it does not take much effort. If you have ever seen kids trying to drink a soda with a curly straw, they strain trying to get the soda to flow. They are trying to overcome the resistance of the long run.

You can run as much duct work in a system as long as the resistance has been compensated for and the CFM is delivered as required.

"Inches of Water" on a scale is used to measure the resistance in a duct system. It can be equated to the resistance to lift water by inches in a tube.

One more resistance analogy is from the old days of siphoning gas. Remember the resistance in the garden hose we had to overcome to get the gas flowing?



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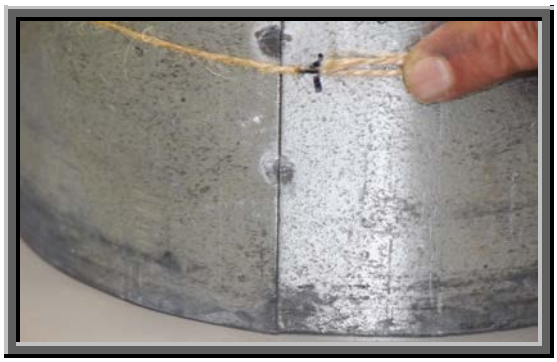
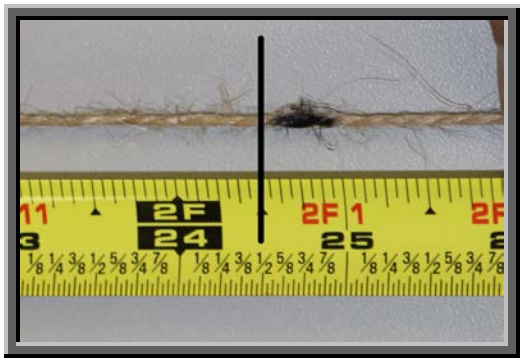
# Be sure to check inlet collar ID and OD

Blower and dust collector manufacturers do not adhere to standard dimensions on their inlet collars. Most of them, you cannot slip spiral pipe over or a coupling inside. It is critical that these two measurements (ID and OD) are relayed to your duct fabricator. A construction drawing might state the inlet is 12 inch in diameter, but not whether it is ID or OD. Even if it does, don't trust it. Have your equipment salesperson measure the inlet collar in the factory prior to shipping or field measure it yourself upon arrival.

It is important to get the actual circumferences. For the outside diameter (OD), wrap a string around the collar until it meets itself and measure the length. Then, divide by 3.14. The figure will be the actual outside diameter (OD).






For the inside diameter (ID), stick a piece of masking tape around the inside of the collar until it meets itself, pull it off, measure it, and divide by 3.14. It is a nightmare when the ductwork (spiral pipe, fittings and flexible hose) arrives and the installer cannot make the initial connection.

We find that over 75% of the time a simple custom adapter can easily be fabricated. From that point, the duct system is modular and spiral pipe, fittings and flexible will all connect with ease.



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# Innovation or Gimmick

Back in the early 80's I represented a dust collector product line. Their parent company was a leader in cartridge filters for various applications, such as engine and vehicle exhaust. After several years of research and development, the filter cartridge dust collector was introduced for fine dust filtration. The principle was to have the dust exposed to the outer pleats of cartridge where the maximum amount of surface area was located. Air was drawn through the core of the cartridge. Compared to bag filters, the cartridge provided a substantial amount of filter area in a confined space. The units provided as much filter area as a bag house and required a substantially smaller foot print. They were primarily designed for fine, dry dust. A shaker mechanism or air pulse was used to knock off any cake build up. Used properly, the cartridge filter was a major innovation to the dust collection industry. Today, there are many types of filter material and outside wrappers that can prevent cling, cake build up, and even collect mist. I applied several units to toner dust, graphite dust, glass bead dust, and lead dust, just to name a few.

Then, a few years ago, I noticed an ad for a woodworking dust collector company promoting the cartridge filter as an after filter for a cyclone. My immediate thought was, this is a misapplication. A couple months later, I noticed more ads for single stage dust collectors promoting them as a viable replacement for the upper filter bag. To my dismay, it seemed everyone jumped on the band wagon, right or wrong. At first, they were sold without a method for cleaning. I received feedback from customers that had purchased these collectors. Most said the filters were quickly getting clogged due to cake and cling. Within a short period of time, they were sold with an internal brush for cleaning. Then, came the feedback about the brushes. It appeared the cake was forced into the core filter material and clogging the pores. The replacement cost for the cartridges averaged from $200 - $300 a piece.
Some only lasted weeks and the best case I heard of was six months. These were woodworkers that used the collectors on a daily basis. Some guys were using compressed air to blow out the inside in order to use them. In some cases, this was done every other day.

Bag filter material offered today is substantially improved. There are 10 oz and 16 oz polyester felts with singe to avoid cling (1-5 micron range filtration), fabrics that control electrostatic build up, special surface treatments that improve performance, fabrics that extinguish sparks, and so on. The filter bag longevity with today's fabrics can be at least 5 years or more. If the air to cloth ratio and fabric is correct, I am convinced that the filter bag is substantially better than the reverse use of a filter cartridge. Certainly, those hundreds of dollars and hours of labor can be well spent elsewhere.

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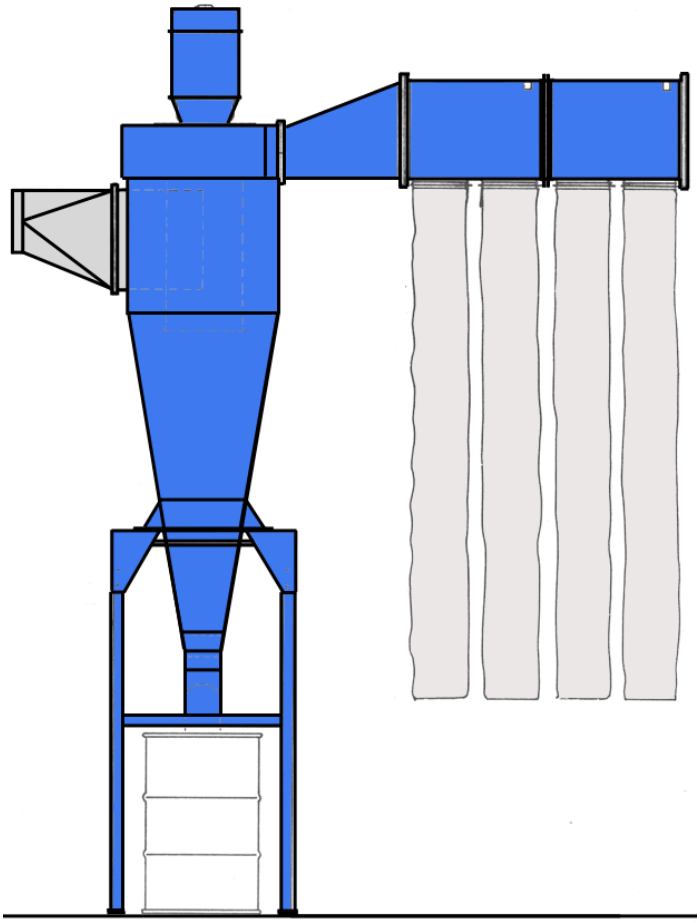
# TWO-STAGE DUST COLLECTOR

# (RECOMMENDED)

Since most woodworking dust contains coarse-sized and fine-sized particles, a two-stage dust collection system is generally recommended. A pull through two-stage dust collector consists of a first stage cyclone, a blower and a second stage after filter.

A cyclone separator is a cone shaped vessel into which the dust-laden air enters. The dust particles' inertia causes them to move toward the separators outer wall. As the dust particles proceed towards the outer wall the coarse-sized particles lose momentum. When velocity drops on the coarse-sized particles, gravity causes them to settle into the container below. The remaining fine dust exits through a central outlet at the top and into the blower. The blower then relays the fine dust to the after filter.



The longer the cyclone body and cone, the better the dust separation.

One major reason for using separator is so blower unit will only convey fine dust. Coarse wood dust particles and other debris hitting the blower impeller most likely will result in blower unbalance. This condition will ruin the blower very quickly. Also, a separator is used so that the after filter does not receive 100% of the dust-laden air.



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## Who designs dust collection systems?

Dust collection systems are designed by competent dust collector manufacturers', their qualified representatives, or independent air flow engineers. It is critical that you provide the following information to them in a neat and orderly fashion:

1. A scaled layout of your shop designating machinery locations and outlet sizes of the dust collection hoods. If a machine does not have a dust collection hood, note a brief description of the machine.
2. Ceiling height. Preferably running height of main duct. Obstructions, such as columns, beams, etc.
3. Preferred location of the dust collector.
4. Type of dust to be collected.
5. Note the amount of machines that will operate simultaneously in the worst case scenario.

## Tips:

- No one can adequately select a dust collector without first designing the piping system. Static pressure (resistance to flow) is an important factor. The dust collector must overcome the piping resistance and deliver the necessary amount of airflow that will be divvied up between the open branch ducts.

- Make sure your floor plan is concrete. Minor changes in machine locations will typically require a new piping design. Thus, do not move equipment after piping system is designed or it most likely will not operate correctly.

- Competent dust collector manufactures will normally be aware of various codes and regulations.

- Do not purchase a dust collector unless the salesman or one of his associates is capable of providing a piping schematic. Selling a dust collector is not as simple as taking an order and making a delivery.

- If you choose to design your own dust collection system using a “do it yourself” guide to determine CFM and Resistance, make sure you have it reviewed by an air flow engineer prior to purchasing your dust collector mail order.



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