Dust Collector Purchasing Guide

U.S.
Air Filtration, Inc.

Thanks for downloading our Dust Collector Purchasing Guide eBook. *Our guide will help you identify the right dust collection system that will perform safely, efficiently, and reliably for many years to come.*

Identifying the right components and needs for your next dust collector can be an overwhelming process. Factors to consider include dust properties, airflow or volume requirements, dust collector design features, and air to cloth ratio.

Key Subjects

We've organized our guide into five key topics to guide your discovery:

1. *Dust Properties - Learn the dust properties you need to be aware of to help you find the right filter media and type of dust collector*
2. *Volume - Understand key variables for measuring volume or airflow requirements in your work environment in order to size your collector properly.*
3. *Air-to-Cloth Ratio - Learn why air to cloth ratio is important and how to find the right air-to-cloth ratio for your operation.*
4. *Dust Collector Styles - Learn about three most common dust collectors, their advantages and disadvantages.*
5. *Low Maintenance Design Features - Learn important dust collector design features that will help you save time and money in long term maintenance expenses.*
6. *Additional Resources - Learn more about combustible dust considerations and on demand cleaning.*

Thank you for allowing us to help with your discovery. If you have any further questions, please give us a call at 888-221-0312 or email us directly at info@usairfiltration.com to learn more.

Chris Watson

General Manager

US Air Filtration, Inc.

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DUST PROPERTIES

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Dust Properties and Your Work Environment

Do you know your dust? Consider your dust properties and characteristics of your work environment carefully to identify the best dust collection solution.

Dust Properties to Consider:

- **Size** - What is the size of the dust particles being filtered; fine or large?.
- **Density** – Is the dust low in density like wood dust or heavy in density like fine steel dust?
- **Chemistry** - Will you be filtering any abrasive dust? Corrosive dust?
- **Temperature** - Are you operating in a high heat environment? What is the operating or maximum temperature at your facility?
- **Moisture** - Is moisture or oil present in the dust?

Knowing your dust properties is the first step to help you determine the type of dust collector that is best suited for your unique application.

YOUR WORK ENVIRONMENT

The next step to finding the right dust collection solution is to consider your space constraints, emissions requirements and temperature of your airstream.

SPACE CONSTRAINTS

Dust collectors vary in height, width and depth depending on the application and the amount of dust being captured. Take note of any height or space restrictions in the work environment and take measurements of the space allotted for your collector along with the space available around the collector. Many dust collectors are top load which means you will need to allow space above the collector to replace and service the collector from the top of the unit.

EMISSIONS REQUIREMENTS

Depending on your application, your dust collector may require a permit with specific emissions requirements. These emissions requirements vary by state and are expressed as an efficiency percentage for cartridge collectors or an emission limit (e.g. lbs/hr or gr/dscf) for baghouses.

TEMPERATURE OF THE ENVIRONMENT

The temperature of the airstream will determine what type of filter media is required and will affect fan size. Temperatures greater than 260 degrees will require special filter media and changes to the dust collector fan. If the unit will be outside in a cold/extreme climate you will need to consider insulating the unit as well.

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VOLUME

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UNDERSTANDING VOLUME OR AIRFLOW REQUIREMENTS

CALCULATING YOUR AIRFLOW

After considering your dust properties, the next step is to consider your airflow or volume requirements. Calculating your airfolow correctly is critical to the long term health of your collector so your system will be efficient at capturing dust.

WHY IS VOLUME IMPORTANT?

If the volume of the system is too low, your system will not capture the dust effectively which can impact production and air quality. If the volume of your system is too high, your energy consumption costs will be higher and you may disrupt the process of your application.

HOW IS VOLUME MEASURED?

Dust collector volume is measured in cubic feet per minute or CFM. CFM is a measurement of airflow especially related to air conditioning, heating and ventilation environments like those requiring dust collection. In dust collector applications CFM measures the amount of air per minute that can be moved from a space.

VARIABLES TO CONSIDER

Work environments vary dramatically from one another based on several variables, and even very similar environments can require vastly different volume. To determine the right volume capabilities for your new dust collector, consider some of the following variables carefully.

- How are you collecting dust?
- What is the size of the duct being used to collect the dust?
- Cubic feet of the work environment

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AIR-TO-CLOTH RATIO

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AIR-TO-CLOTH RATIO

Dust collector air-to-cloth ratio is a critical measure to ensure your air filtration system is performing efficiently.

What is Air-to-Cloth Ratio?

Air-to-cloth ratio, also known as air-to-media, is defined as a measurement of the amount of air passing through one square foot of filler media. Generally the lower your air-to-cloth ratio, the more effectively your system removes dust from the work environment. If you are operating at a higher air-to-cloth ratio, one of the common issues you may encounter is a decrease in suction. This is because a large amount of dust laden air is filtered by an insufficient amount of filter media. The dust cake on the bag builds up too quickly; resulting in a decrease in air flow through the filters and suction at pickup points.

How to Select or Calculate Air-to-Cloth Ratio

If you're sizing a new cartridge collector system and know what type of dust will be filtered and the air volume needed to properly ventilate the area or pickup points our Air-to-Cloth Guide listed below is a good place to start. The guide gives you a general recommendation on the air-to-cloth ratio for several different applications. To find the dust collector suited to your dust and air volume requirements simply:

1. Divide air volume of system by air-to-cloth ratio to get the total amount of filter area needed into the system.
2. Divide the total filter area by the filter area per filter to determine how many filters are needed in the dust collector
3. Find the dust collector model that best fits your application by number of filters and type of dust collector.

To calculate air-to-cloth ratio in your existing system, calculate the volume of air (CFM) and divide that number by the total filter area within your dust collector. For example, a sixteen filter cartridge collector pulling 7,000 CFM would have a 3.65:1 air-to-cloth ratio (7000 CFM / 16 filters x 120 ft2 per filter). Or in the case of a baghouse, a hundred filter baghouse pulling 10,000 CFM would have a 6.37:1 air-to-cloth ratio (10,000 CFM / 100 filters x 15.70 ft2 per filter). Environments with a large ventilation area or more pick up points require a higher air volume (CFM) to provide adequate suction which means more filter media to keep a similar air-to-cloth ratio.

To see which air-to-cloth ratio may be right for your project, take a look at our Air-to-Cloth Guide below which provides the recommended ratio for a wide variety of applications.

Dust Type	Explosive	Abrasive	Controlled Environment	Fire	A/C Ratio
Abrasive Blasting		√			
• Black Beauty		√			1.4
• All others		√			1.8
Activated carbon					2.5
Alfalfa	√			√	3.0
Alumina					2.5
Ambient air filtration					3.5
Arc washing (Gouging)				√	*
Asbestos					3.3
Baking powder			√		2.5
Barley (see Grain)				√	
Bauxite		√			2.0
Beet pulp	√	√		√	–
Bentonite		√	√		2.0
Beryllium					2.0
Boric acid					1.8
Bran	√			√	3.5
Brazing				√	2.2
Buffing & polishing				√	3.5*
Calcium carbonate					1.8
Carbon black	√			√	
• Fused	√			√	1.1
• Sintered	√			√	1.9
Cardboard					3.5
Cement		√			1.8
Ceramic		√	√		1.8
Chaff, grain	√	√		√	3.5
Chromium					1.5
Clay (& Brick & Marble)		√			1.8
Coal	√	√		√	1.8
Cocoa	√		√	√	1.8
Coffee	√			√	1.8
Coke	√	√		√	1.7
Composites					3.5
Corn meal	√			√	3.0
Corn starch	√		√	√	2.5
Corn sugar				√	2.0
Cutting				√	
• Laser				√	
Metal				√	1.1
Non-metal				√	1.1
• Oxyacetylene				√	1.4-1.7
• Plasma				√	1.1

Dust Type	Explosive	Abrasive	Controlled Environment	Fire	A/C Ratio
Detergents	√		√	√	2.2
Diatomaceous earth					2.5
Dyes	√			√	1.3
Fertilizer	√		√	√	2.2*
Fiberboard	√			√	3.0
Fiberglass					3.5
Flour	√		√	√	2.0
Fly ash		√			1.8
Frit		√			1.8
Furnaces					*
Grain	√			√	
• Corn	√			√	3.5
• Rice		√		√	3.5
Granite		√			2.0
Graphite				√	2.0
Grinding					
• Aluminum	√			√	2.0
• Bake shoe				√	3.5
• Cast iron		√		√	1.8
• Composites					3.5
• Rubber				√	3.8
• Steel		√		√	2.0
• Titanium		√		√	1.0
Gypsum					2.5
Iron oxide (Rust)					1.8
Kaolin					1.5
Lead oxide					1.1
Lead powder					1.5
Leather	√			√	3.5
Lime					2.5
Lime, hydrated					1.8
Limestone					2.5
Lignite	√			√	2.0
Malt	√		√	√	3.0
Meal	√			√	3.0
Metal, powdered					2.5
Metallizing				√	
•Electric arc spray				√	.04
• Plasma arc spray				√	1.2
• Powder flame spray				√	1.2
• Wire flame spray				√	1.2

* Check with Facility

AIR TO MEDIA GUIDE

Dust Type	Explosive	Abrasive	Controlled Environment	Fire	A/C Ratio
Metallic fume					1.1
Mica (Rock)	√		√	√	2.0
Milk solids (Powders)					3.0
Oyster shell		√			1.8
Paint pigments	√			√	2.0
Paper	√			√	3.5
Pharmaceutical	√		√	√	
• Dry Powder	√		√	√	2.0
• Coating	√		√	√	2.0
Plaster			√		2.5
Powder coating	√	√		√	
• Black	√	√		√	1.0
• White & colors	√			√	2.5
• Teflon	√			√	1.8
Quartz		√			3.0
Rice	√	√		√	2.0
Rock, mineral					3.0
Rubber	√			√	1.8
Rye (Grain)	√			√	3.5
Salicylic Acid	√			√	1.8
Salt (Mineral)		√	√		3.5
Sand (Non foundry)		√			2.2
Sand (Foundry)		√			2.0
Selenium					1.8
Shale (Rock)		√			2.0
Silica		√			2.5
Silica, fumed					0.8
Silicates					2.2
Slate (Rock)		√			2.0
Soapstone					2.2
Soda ash		√			2.0

Dust Type	Explosive	Abrasive	Controlled Environment	Fire	A/C Ratio
Soldering (Welding)					1.8
Soybean (Grain)	√			√	3.0
Soybean meal	√			√	3.0
Starch	√		√	√	2.4
Surgical starch	√		√	√	1.0
Sugar (Glazed bags)	√		√	√	2.0
Talc					2.0
Talcum powder					2.0
Titanium (see application)	√	√		√	1.8
Titanium dioxide					2.2
Tobacco	√			√	3.0
Toner	√			√	1.2
Weld fume				√	1.8
• Source capture				√	1.7
Laser welding				√	1.7
Plasma arc welding	√			√	2.2
All others				√	3.5
• Ambient				√	2.1
Laser welding				√	2.1
Plasma arc welding				√	2.8
All others				√	2.2
Weld fume, soldering				√	3.0
Wheat (Grain)	√			√	
Woodworking	√			√	
• Sanding	√			√	4.0
• High speed cutting	√			√	4.0
• Low speed cutting & paning				√	-

Controlled Environment = 70° F (21° C). 40% RH
Explosive = Vents Required
Abrasive = AR Inlets Required
Fire = Sprinkler Header / Fire Media

* Check with Facility

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www.usairfiltration.com | info@usairfiltration.com
41591 Cherry St., Murrieta, CA 92562

Why is selecting the right Air-to-Cloth ratio important?

- Extends filter life
- Minimizes your operating costs
- Meets air quality goals and requirements
- Allows your dust collection system to perform at peak efficiency

What are the negative effects of improper Air-to-Cloth ratio?

- Poor venting which causes damage to equipment
- High pressure drops in differential pressure
- Impacts your air velocity
- Excessive use of compressed air

DANGERS OF AN UNDERSIZED COLLECTOR

Choosing a collector that is too small can cost you in long term maintenance costs. Some of the biggest problems we see people run into with an inappropriately sized dust collector are:

- Consistently clogged filters (reduced filter life)
- Increased downtime
- Higher maintenance and energy costs
- Decreased efficiency
- Increased compressed air consumption

To avoid the dangers of an undersized dust collector consider both CFM and air-to-cloth ratio carefully when designing your new unit.

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DUST COLLECTOR STYLES

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Baghouse Styles

Baghouses are ideally suited for large volume applications with airflow exceeding 1,000 CFM or when high temperature applications are above 375 degrees. In these environments, a baghouse will handle and most efficiently filter your dust laden air. There are several types or styles of baghouses available. Once you understand your dust properties, volume, and air-to-cloth ratio, you can determine the right baghouse style for your facility. Here is a summary of the pros and cons of the three most common baghouse styles: pulse jet baghouse, reverse air, or shaker style.

PULSE JET BAGHOUSE

Pros	Cons
Bags cleaned continuously while unit is in operation	Requires compressed air
Easy to maintain, low maintenance cost	Not ideal for high moisture applications (+20%)
Flexible Sizing and Configuration	Requires filter cages

REVERSE AIR BAGHOUSE

Pros	Cons
Low maintenance	Needs to be cleaned often
Gentle cleaning which allows for longer bag life	Residual dust build up is hard to remove
Units are typically compartmentalized into sections which allows them to be maintained without shutting down the entire baghouse	Filter bags are expensive compared to Pulse Jet bags
	Bags are typically custom made and not available in stock for quick shipment

SHAKER BAGHOUSE

Pros	Cons
Very simple to operate	Limited filter media options
Low initial investment cost	Not space efficient (takes up a large area)
Filters cleaned via shaker mechanism	Not suited for high dust loads
	Bags are typically custom made and not available in stock for quick shipment

What's the Right Type of Pulse Jet Dust Collector?

The three most common pulse jet dust collection systems are baghouses, cartridge collectors, and bin vents. Below is an overview of each type of pulse jet system and common applications for each:

Baghouses

Baghouses are typically the largest of the three types of dust collectors. They are well suited for large volume and high temperature applications. Baghouses are perform well for applications with high dust loads of more one 55 gallon a drum per day. The most common applications that use baghouses include:

- Wood
- Asphalt
- Cement
- Mining
- Foundries

Cartridge Collector

Cartridge Collectors are compact and very modular in design. These are best suited for applications with the following characteristics:

- Moderate or low dust (collecting less than one 55 gallon drum per day)
- High efficiency filtration requirements
- Space restraints or small footprint requirements
- Possibility of future plant expansion

The most common applications for cartridge collectors include:

- Welding
- Grinding
- Laser/Plasma Cutting
- Bulk Powder Processing

Listed here is a baghouse and cartridge collector comparison chart to help you determine which option may be best suited for your application.

	Baghouse	Cartridge Collector
Airflow Range (in CFM)	1,000+ CFM	500+ CFM
Dust Loading Per Day	More than 55 gallon drum	Less than 55 gallon drum
Temperature	Up to 500°F	Up to 180° F
Design Features	20-30 feet tall Pulse jet cleaning Reverse airflow cleaning (part that removes larger particles)	7-12 feet tall More compact for applications where space is limited Higher efficiencies
Common Applications	Wood · Metalworking · Mining Foundries · Tile · Drywall · Fiberboard Manufacturing	Welding · Plasma Cutting · Grinding · Bulk Powder Processing · Paint Booths
Type of Filter Media	Woven or felt	Pleated, non-woven

Bin Vent

Bin vents are usually used in applications where you are moving product from one location to another. Like a cartridge collector, bin vents are also compact, and designed for easy change-outs. They are designed to efficiently vent silos and tanks while minimizing product loss. Bin vents are frequently used in the following applications:

- Cement
- Agriculture
- Tank loading
- Conveyor Belt

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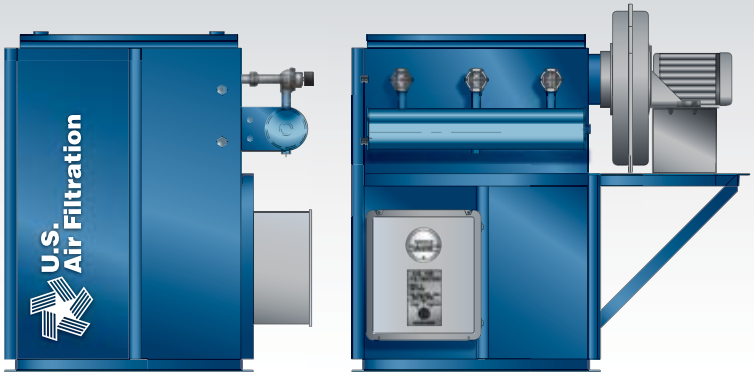
LOW MAINTENANCE DESIGN FEATURES



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LOW MAINTENANCE DESIGN FEATURES

To avoid the hassle of excessive and costly change-outs and maintenance consider important dust collector design features that will help you lower your long term maintenance and energy costs.

Listed below are some of the easy maintenance design features your dust collector should include.

Dust Collector Design Features for Easy Maintenance

- On-demand cleaning for reliable performance and reduced wear and tear
- Modular design with low profile options for easy expansion and access
- Filter change-outs performed outside or clean air side of the collector
- No special tools or equipment required to perform change-outs
- Quick removal access filter covers
- Change-outs performed in 30 minutes or less
- Standard filter sizes to ensure product availability and competitive prices
- Multiple filter options for a variety of applications

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06

ADDITIONAL RESOURCES

How to Prevent a Dust Collector Explosion

If you are dealing with combustible dust, you'll need to implement a preventive maintenance plan, which will help you avoid a serious dust collector emergency.

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ADDITIONAL RESOURCES

What is combustible dust?

Combustible dust can be defined as any fine material that has the ability to catch fire and explode when it's mixed with the proper concentration of air.

When can combustible dust create an explosion?

When the right conditions are in place, combustible dust can become hazardous and create an explosion. Dust can collect on multiple surfaces in a facility (e.g. ducts, crevices, dust collectors, equipment, etc.), and once this buildup of dust mixes with the right conditions, it only takes a small ignition source to create a significant explosion. There are even scenarios in which combustible dust can self-ignite. This usually results from static that builds up as the particulates rub against one another.

Who does it affect?

Combustible dust effects a wide variety of industries such agriculture, metalworking, mining, chemicals, plastics, pharmaceuticals, etc. Industries that are susceptible to combustible dust are regulated by OSHA standards and NFPA guidelines.

How can I prevent a dust collector fire?

Now that you know what conditions required for combustible dust, when it can happen, and who it effects, how do you limit or prevent a serious explosion from happening? Your best plan of action is going to include steps that are proactive instead of reactive. Here are the proactive steps you can take:

- OSHA Standards: Ensure you are meeting OSHA's set of standards regarding combustible dust. Industries that are susceptible to combustible dust are regulated by OSHA standards when you implement OSHA's set of standards, you are creating a safe working environment, avoiding property and economic loss from an explosion, and avoiding regulatory fines.
- NFPA Guidelines: Make sure you are meeting codes outlined by the NFPA (National Fire Protection Agency). The NFPA publishes a list of guidelines that will help you minimize injury or death from combustible dust. The following codes are related to the most combustible types of dust (e.g. sugar, wood, fine aluminum):
  - 664, Standard for the Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities
  - 484, Standard for Combustible Metals
  - 61, Standard for the Prevention of Fires and Dust Explosions in Agricultural and Food Processing Facilities
- Preventative Maintenance Plan: Properly maintain your facility and dust collector to help prevent a buildup of dust. Clean up any excess dust build up on your dust collector, other equipment, vents, and filters.
- Explosion Vents: Installing an explosion vent on your dust collector is one strategy that can minimize damage to your equipment and harm to employees should an explosion happen. The purpose is to relieve pressure in the dust collector caused by an explosion. Once the activation pressure is exceeded the vent(s) open safely relieving pressure.
- Explosion Latches: Latches operate under the same concept as explosion vents. Latches provide venting in the event of an internal explosion.

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SUMMARY

Selecting and pricing out a dust collection system involves careful consideration of each of the variables outlined above. Proper attention to these items is critical to ensuring your dust collector performs efficiently for many years to come and creates a clean, safe work environment for plant operators. Each dust collection application is unique, and it is possible that applications with very similar product characteristics or volume requirements may require a system that is vastly different due to the number of variables to consider. To help you engineer and select the correct system for your facility, consult with a dust collection engineering and manufacturing company with extensive experience designing systems for diverse applications.

If you have further questions unique to your application or would like to speak with an engineer, give us a call at 888-221-0312 or info@usairfiltration.com.