camfil
AIR POLLUTION CONTROL

HELPFUL TIPS
for Selecting Dust Collector Filter Media

SELECTING THE BEST FILTER MEDIA FOR YOUR DUST COLLECTOR

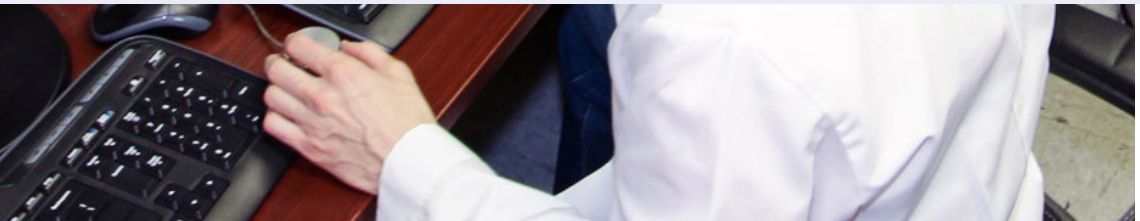
Dust collection systems are an important part of any manufacturing process, so they need to be sized and designed properly. One critical design component is specifying the proper filtration media, which requires analysis of the dust(s) in the process and all operating conditions.

Selecting the wrong filter media can put workers at risk. If the filtration efficiency is not high enough, workers will be exposed to more dust, threatening their health. Also, filtering the wrong amount of dust can create conditions that are ripe for explosions. **This eBook outlines five factors you should take into consideration about your dust and process.**

Listed below are the two basic filter media types most commonly used for cartridge filters. This media can be treated or layered with coatings, saturation or other medias to improve performance. It's possible to increase filtration efficiency and dust release by specifying the correct filter media.

Filter Media Types

- Cellulose/Nonwoven
- Spunbond/Synthetic



Dust Testing

Before selecting filter media for safe, optimal dust collector performance, you need to know more about the dust(s) being generated.

Two types of analysis will aid in the media selection process, which should be performed by a qualified testing lab:

Bench testing determines the physical properties of the dusts in the process, including particulate size, moisture content, weight, agglomeration, and cohesion levels. All of these properties should be considered, as well as the following process characteristics that occur when the dust is produced:

- Operating requirements
- Airflow and pressure drop conditions
- Temperature and humidity
- Location of the dust collector

Explosibility testing is required by OSHA's Combustible Dust National Emphasis Program. It relies on NFPA guidelines to determine your dust's flammability and explosivity. If testing finds the dust combustible, further tests are conducted to determine the rate of pressure rise that would be generated in the event of a deflagration or explosion. These characteristics not only help determine which media should be used, but also if any protection of the dust collector itself is required.

After testing, you are ready to narrow down the filter media options.

Types of Dust Testing

- Bench Testing
- Explosibility Testing

1 Particle Characteristics

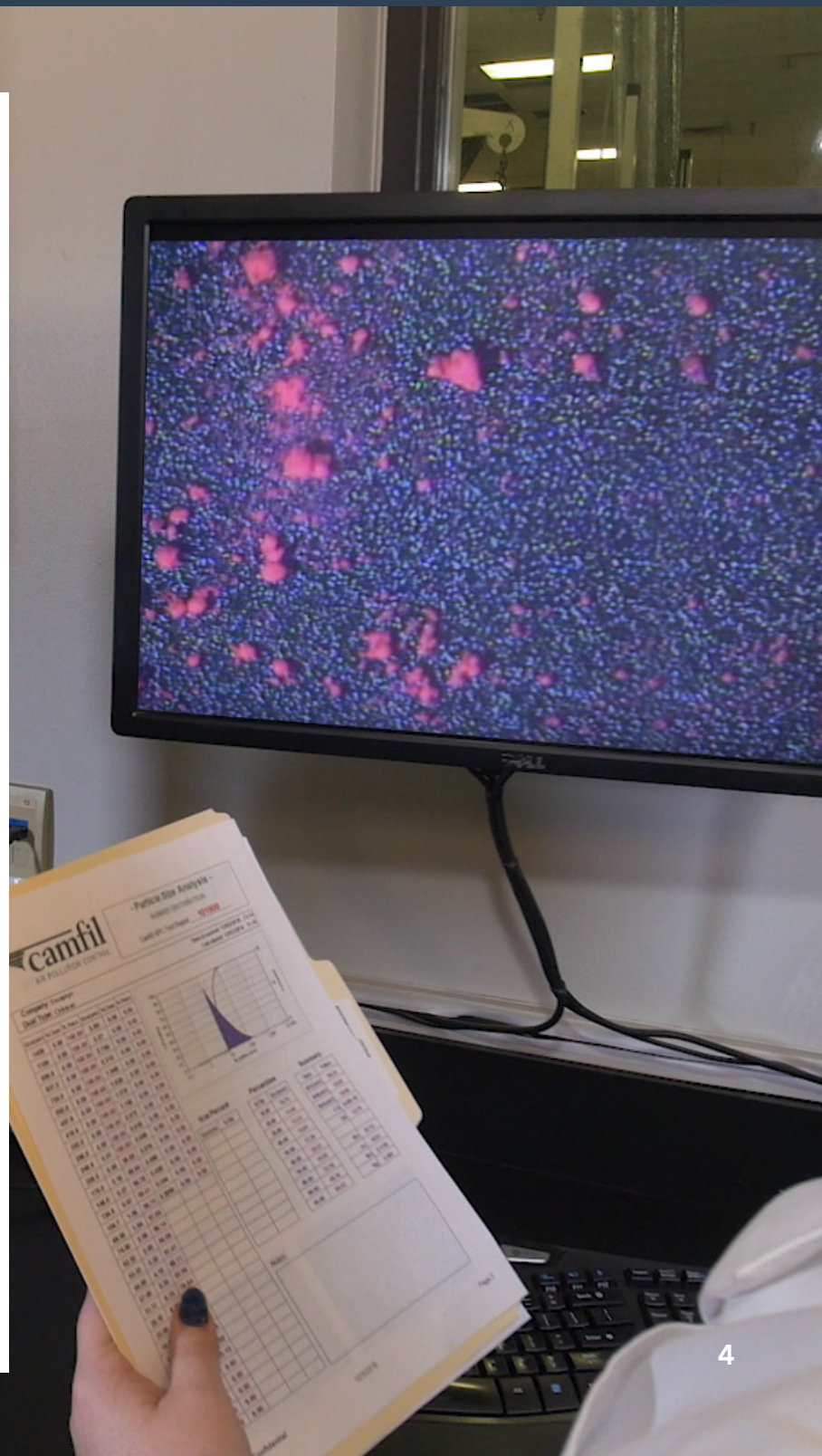
Dust particle characteristics help determine the most appropriate type of filter media. They also help determine the optimal air-to-cloth ratio for energy savings and operational efficiency. This helps you minimize maintenance problems, meet emissions requirements and get the longest possible filter life.

Air-to-cloth (ATC) ratio—defined as the cubic feet of air per minute to square feet of filter media—is an important factor for selecting the right media for a dry dust collector. ***Overly high ratios can result in inconsistent airflow and collection problems*** such as static pressure changes, shortened filter life, and too frequent triggering of the pulse cleaning system. A lower ATC ratio can minimize these problems, but if it becomes too low it can decrease manufacturing process efficiency.

> Air-to-cloth (ATC) ratio:
> *cubic feet of air per minute to square feet of filter media*

Visual analysis of the dust with a scanning electron microscope will reveal its structure. For example, formed silica has a crystalline structure with jagged edges, while metal particulates are often spherical. Understnanding the structure will help determine which media will provide the correct ATC ratio. Visual analysis can also reveal oil in the dust, which can cause serious problems with dry dust collectors. ***This type of dust may require the use of filter media with an oil-resistant coating.***

Analyzing the dust's relative abrasiveness helps to determine potential filter wear. For example, when capturing a highly abrasive dust, the collector must be designed with low inlet velocity. If iinlet velocity is too high, the dust can abrade the filter media and cause premature wear.



2 Particle Size

Dust particle size determines the filtration efficiency required to meet emissions standards.

Dust analysis also reveals the particle size distribution down to the submicron range. A dual-laser particle analyzer can pinpoint the dust's count (the number of particles of a given size) and the volume or mass spread. Sieve analysis is a related test that measures particle sizes greater than 100 microns.

All of these tests are important because your dust could include submicron particles mixed with much larger particles. Scientific testing ***is the only way to identify these tiny dust particles*** to help select the most appropriate filter media.

3 Combustibility and Static Electricity

Explosibility testing assesses whether a dust is combustible and helps to determine if static dissipative media or conductive filters are needed.

If your dust is combustible, the lab will conduct further analysis on dust cloud explosibility parameters to pinpoint the Kst (the deflagration index of a dust cloud, or rate of pressure rise) and Pmax (the maximum pressure in an unvented, contained explosion).

If your dust is found to be even slightly combustible, you will be required to use explosion venting equipment on your dust collector, along with the appropriate filter media. Fire-retardant media will extinguish itself if no other combustible material is present.

Anti-static (conductive) filter media is recommended when conveyed dusts generate static charges that require dissipation. Anti-static media should be used in explosive dust applications to reduce potential ignition sources and conform to NFPA guidelines.

Common applications for anti-static filters include fumed silica dust; plastic, PVC or composite dusts; and carbon black/toner dusts.

Media with anti-static properties and open-pleat design enable better airflow through the cartridge and better cleaning characteristics, energy-efficient performance and long life.

Combustible Dust Classifications

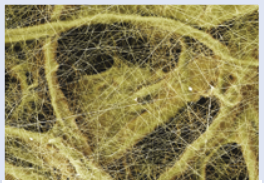
Dust Explosion Class	Kst	Characteristic
St-0	0	Not Explosible
St-1	<200	Weak to Moderately Explosible
St-2	201-300	Strongly Explosible
St-3	>300	Very Strongly Explosible

Combustible Dust Properties

- **Kst** – Deflagration index (bar-m/s)
- **Pred** – Reduced pressure after venting (bar)
- **Pstat** – Vent static burst pressure (psi)
- **Pmax** – Max pressure for an unvented dust explosion (bar)
- **(dp/dt)** – Rate of pressure rise (bar/s or psi/s)
- **Pes** – Enclosure strength = 2/3 of yield strength of weakest part or 2/3 of ultimate strength if deformation is allowed

4 Moisture Level

Moisture-absorbent (hygroscopic) dusts are sticky, which can cause filter media to clog.



Filter media with nanofiber coating

If the air is moist or humid, dust can become mud-like, packing the filter pleats. Traditional filter media and pleating are not appropriate for these applications, and will require constant filter replacement. However, wide-pleat cartridge filters can help prevent plugging, especially when coupled with the right media.

Close-up of wide-pleat cartridge filter media

If humidity is well controlled in an indoor manufacturing space, moisture won't pose a challenge. However, if the collector is located outside or in an area with fluctuating temperature and humidity, ***it may require filter media that can handle a wide range of environmental conditions***. Several effective solutions are available, including nanofiber media, which aids surface loading and release, spunbonded media, which handles heat and moisture better than cellulose-based products, and oleophobic and PTFE/Teflon™ coatings, which promote dust release.

In applications that have both hygroscopic dust and moisture, 100 percent spunbonded media is generally preferred. Moisture doesn't saturate this media, and it is typically washable. Instead of replacing the filters, you can remove them, rinse, dry and put them back into operation.

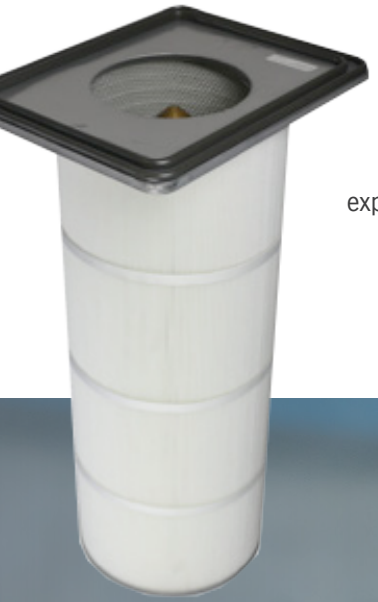
Filter Media Treatments

- Nanofiber
- Fire-Retardant
- Anti-Static
- PTFE or Teflon™

5 Operating Temperature

Both high and low operating temperatures affect dust collectors, so choose filter media that best suits your application.

Prolonged exposure to hot and cold temperatures can cause filter elements to break down, melt or become brittle. These elements include plastisol, urethane and other adhesives used in the filter construction. Once media becomes brittle or approaches the melting point, the reverse pulse-cleaning air blast can rupture the media, causing dust bypass.



Cellulose/nonwoven media is the most economical choice for dry dust collection applications at operating temperatures up to 160 °F (71 °C). Spunbond/synthetic media is lightweight, and able to handle dry applications with maximum operating temperatures ranging from 180 °F (82 °C) up to 250 °F (121 °C). These filters are washable and can recover from occasional exposure to moisture, but they are not intended for wet applications.

Controlling the dusts generated in manufacturing and processing operations helps keep your employees safe.

It also elevates your product quality, protects expensive equipment and helps you achieve and maintain regulatory compliance. A cartridge dust collector with high-efficiency filters is an accepted and proven engineering control. Be sure to select the right filter media to successfully remove hazardous contaminants and combustible dusts.

For further information, contact 1-800-479-6801 or 1-870-933-8048; email filterman@camfil.com or visit *www.camfilapc.com*.

camfil
AIR POLLUTION CONTROL

3505 South Airport Rd. Jonesboro, AR 72401 • (800) 479-6801 • filterman@camfil.com • **camfilapc.com**