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## Understanding your filter's air-to-media ratio for effective dust collection

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One of the key factors to keep your dust collector operating efficiently over its lifetime is the selection of the right filters and filter media. To determine which filter is right for your operation, you must understand the importance of a filter's air-to-media ratio, which this article will discuss.

Controlling the dust generated by powder and bulk solids processing and handling is crucial for employee safety, end product quality, and regulatory compliance. A high-efficiency dust collector designed specifically for your operation will filter hazardous and nuisance fugitive dust



calculate the appropriate ratio.

The air-to-media ratio of a filter is a calculation of the amount of air flowing through each square foot of filter media every minute. To calculate the air-to-media ratio for your dust collector, divide the airflow in cubic feet per minute (cfm) by the total square footage of the filter media in all of the cartridges. Generally, the more airflow and dust concentration you have, the more filter media you need. This means that greater volumes of airflow and dust require a lower air-to-media ratio.

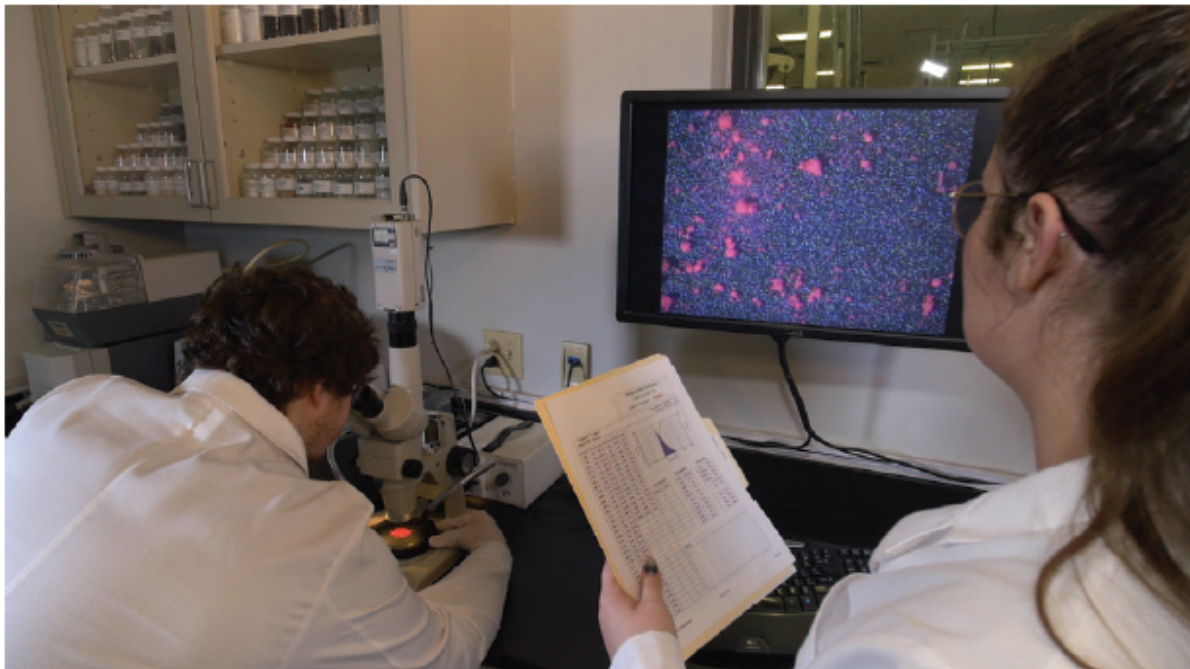
#### **Consequences of an improper air-to-media ratio**

Having an air-to-media ratio that is too low can cause the filter to quickly become overloaded with dust. When dust is driven deep into the filter media faster than the media can be pulse cleaned, negative pressure increases, and cleaning becomes less effective. As a result, the filters clog faster and need to be changed out more frequently. This increases the cost of consumables, requires maintenance downtime, and delays production. A low ratio can also lead to frequent and excessive pulse cleaning, which shortens filter life and increases energy costs.

While a higher air-to-media ratio can often minimize these problems, if the ratio becomes too high, or there's too much filter media for the volume of particulates collected, it can severely reduce the efficiency of your dust collector. These conditions cause the dust collector's motor to work at full load constantly, prematurely weakening the media. In addition, the required dust cake does not form. This is a problem because the dust cake allows the media to easily filter efficiently, as well as pulse clean effectively. The dust cake is the layer of dust that touches the filter cartridge first and acts as a protective layer for the media, giving it longer life. The dust cake also allows additional dust to pulse-clean off more easily because it isn't attached to the media.

#### **Dust analysis to determine air-to-media ratio**

Determining the right ratio can help your dust collector perform reliably for a year or more without filter changes while also lowering annual costs due to a combination of fewer filter changes, fewer filters purchased, and a reduction in associated maintenance. Having your



Your dust's characteristics, such as particle size, particle shape, abrasiveness, and more, play an important role in determining the proper air-to-media ratio.

Material testing performed with a scanning electron microscope (SEM) for visual analysis of the dust shape will reveal if your dust has a crystalline structure with jagged edges that can abrade media prematurely if the air-to-media ratio is too high. Some SEM machines can also break down the elements found in the dust, which can be important for determining how the material will react in different environments.

Dust sample bench testing is an excellent tool for knowing your dust better. Some dust collector equipment manufacturers have in-house dust testing labs and offer analysis as a value-added service to customers. In addition to providing the equipment manufacturers with dust samples, you will need to provide them with detailed application data, such as the process generating the dust, operating requirements, airflow and pressure drop conditions, temperature, and humidity.



can also vary from collector to collector and requires comparative analysis against the same or similar dust within a database collection of similar processes.

### **More media isn't always better**

Once you determine the right air-to-media ratio for your application, make sure the media in your filters is usable. Often, filter manufacturers try to pack as much media into their filters as possible by pleating the media to maximize the square footage of media that can fit into each cartridge. When pleats are packed too tightly, much of the media isn't usable because it's blocked from the airstream and unavailable for filtering. This means that the filter can't load as much dust, and pulse cleaning is much less efficient.



Don't pack your filter pleats too tightly or much of the media will be blocked from the airstream and unusable.



**For further reading:**

Find more information on this topic in articles listed under “Dust collection and dust control” in Powder and Bulk Engineering’s article index in the December 2019 issue or the article archive (<https://www.powderbulk.com/articles/>).

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