Air-to-Cloth Ratio:How Dust Collectors Are Sized

There are two important elements to consider when it comes to dust collector sizing:

- Cubic Feet per Minute (CFM): This is a measure of airflow, or how much air the dust collector is able to move each minute. Your CFM requirements are determined by the size of the enclosure that it must clean and the volume of dust you produce. In general, source capture solutions—such as hooded robotic cells, fume guns, fume arms or crossflow tables—require lower CFM than ambient air filtration solutions, which must turn over air for the entire facility. But the speed with which you are producing particulates matters, too: high-production facilities that generate large volumes of fumes or dust will need to turn the air over faster than facilities with relatively little particulate in the air. A dust collector with higher CFM requires larger blowers and motors, resulting in higher up-front costs as well as higher energy costs over the life of the machine.
- Area of filter media: This is how much total filter media is in the dust collector, generally measured in square feet. The higher the CFM, and the more particulates you are generating, the more air filtration cloth media you will need.

How to Calculate Air-to-Cloth Ratio

Air-to-cloth ratio (or filter velocity) is simply the amount of air going through each square foot of filter media each minute. It is calculated by dividing the amount of airflow (CFM) by the amount of filter media in the dust collector. For example:

- A dust collector with airflow of 4,000 CFM and 2,000 square feet of filter media has an air-to-cloth ratio of 2:1.
- A dust collector with 2,000 CFM and 2,000 square feet of filter media has an air-to-cloth ratio of 1:1.
- A dust collector with 1,000 CFM and 2,000 square feet of filter media has an air-to-cloth ratio of 1:2.

Determining Air-to-Cloth Ratio Requirements

In general, applications producing large volumes of particulates will require more filter media than those producing fewer particulate. Expressed another way, we can say they require a *lower air-to-cloth ratio*.

- For high-production robotic welding, look for an air-to-cloth ratio between 1.5:1 and 2.1:1
- Most manual welding applications will require air-to-cloth ratios between 2.5:1 and 3.5:1.
- For most laser cutting applications, manufacturers should look for an air-to-cloth ratio between 1:1 and 1.6:1. Processes that produce heavier particulate loads—thicker materials, continuous production or higher velocity—may need even lower ratios, between 0.5:1 and 0.75:1.

The more particulates are in each cubic foot of air coming through the collector, the lower the air-to-cloth ratio will need to be. Source capture systems will usually require a lower air-to-cloth ratio than ambient systems, because particulates are more concentrated.

The Importance of the Right Ratio

It’s important to get the air-to-cloth ratio right when selecting a dust collector. If you have more filter media than you really need, you may be spending more on your dust collector than you need to. But skimping on filter media can have serious adverse impacts on filter life, equipment life, and the overall efficiency and effectiveness of your system.

When air-to-cloth ratio is too high (e.g., not enough filter media for the airflow and volume of particulates you are producing), dust is driven deeply into the filters faster than it can be pulsed off by the filter pulsing system. As dust accumulates, negative pressure builds up on the clean side of the filter, which makes it even harder for the pulsing system to push dust out of the filter and into the containment bin. This causes rapid filter clogging, significantly reducing filter life. Facilities will find that the costs of frequent filter replacements, in terms of both consumable costs and maintenance time, will rapidly outweigh any savings gained by choosing a dust collector with less filter media.