Aerodyne ENVIRONMENTAL

DUST COLLECTOR
FREQUENTLY ASKED QUESTIONS

VOLUME 2

When evaluating dust collection systems, there are many aspects to look at. This version of our Frequently Asked Questions focuses on some of the equipment and factors besides the actual dust collector that can affect the system's performance. Have a look through some of the common questions and answers to help with your overall outlook on how your dust collection system is performing.

Q1 What is the suggested maximum loading for dust collectors?

Dust collectors, such as baghouses and cartridge collectors, use bags or filters to separate the dust from the air. Since they use a fabric filter, too much dust over a short period of time can cause the unit to not work correctly. Baghouses with dust concentrations over 5-7 grains/cubic foot and cartridge collectors over 2 grains/cubic foot can have operational and maintenance issues. To calculate your loading you take the dust loading in the collector (lbs/hr) and multiply it by 7,000 grains per lb. You then calculate the total CF in an hour. You divide the grains per hour by the total airflow in an hour to get grain/ cubic foot.

EX: 2 lbs/hr dust loading in 1000 CFM

2 lbs/hr * 7000 grains/lb = 14,000 grains/hr

1000 CFM * 60 min/hr = 60,000 ft3/hr

(14,000 grains /hr) / 60,000 ft3/hr = 0.23 grains / ft3

If your loading is greater than the above values, you are overloading your dust collector. The filters will probably have a very short life. The airflow through your system decreases rapidly and dust is no longer being picked up at the pickup points. Filters – the most basic dust collectors. Disposable filters are effective with very low concentrations of dust particulate. Filters are replaced, once they are plugged up. Cyclone pre-filters can be used to increase filter life.

Q2 Why is particle size distribution so important?

The particle size distribution of a dust is important because dust collectors have gaps to let air through the filter while collecting the dust. Whether the gap is in a filter or the outlet of a cyclone, dust can escape through this gap and not be collected.

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Dust collectors have a removal efficiency curve, that will provide the expected removal of dust at a certain particle size. In order to accurately predict the removal efficiency of the dust collector, the particle size distribution must be compared to the removal efficiency curve and calculated.

Baghouse and cartridge collectors have very high removal efficiencies down to 1-2 micron dust sizes. That is the reason, the manufacturers don't ask for particle size distributions on many applications. Only at submicron particle sizes will they be needed. Cyclones on the other hand are less efficient and require particle size distributions on most applications.

Q3 What are the benefits of using a cyclone as pre-filter for a baghouse / cartridge collector?

If you are working with a high value material or product, have high maintenance costs to the baghouse/cartridge collector, or want to avoid cross-contamination, then you should investigate using a cyclone ahead of your baghouse or cartridge collector. The cyclone will allow you to recover the dust without contamination from the filters. The filters in a baghouse or cartridge collector use a dust layer built up on the filters to collect the dust from the airstream. During the process of filter cleaning, dust from this layer is dislodged and falls into the hopper. Any particulate from prior batches can cause contamination of the dust.

A cyclone, on the other hand, collects the dust and deposits it in the hopper continuously. There is very little dust buildup inside of a cyclone. This minimizes the chances of contamination from prior batches. Since there aren't any filters, a cyclone can be washed or wiped out to remove the prior batch particles.

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Q4 How does the fan wheel style affect my performance?

The exhaust fan could be the most important component in the dust collection system. It provides the motive force for the whole system. If it isn't performing as required, the system will fail. The proper fan impeller (wheel) must be used if the fan is to operate correctly.

There are three types of wheels/impellers:

a) Radial wheel (Ex. open material handling and material handling) - These wheels should be used when the fan is on the dirty side of a dust collector or after a dust collector where a large amount of dust remains in the airstream (ex. after drop out box). The wheel is designed so it can handle dust in the air. The open type wheel is used when there is a high dust loading and/or the dust is fibrous. Its design helps prevent the dust from wrapping around the wheel.

b) 2) Air handling wheel – The air handling wheel is designed for clean airstreams or extremely light dust loading. These wheels should always be used on the clean side of and dust collector and never on the dirty side. They are usually more efficient in air movement than the radial wheels.

c) 3) Axial wheel – These wheels are usually never used on dust collection systems. They will move a lot of air, but without much force behind them. If possible, stay away from axial fans on your dust collector system.

If you are having issues with the fan on your dust collector, check the wheel. Make sure you are using the proper type.

Q5 Why do you recommend differential pressure gages?

The differential pressure gage is an often overlooked piece of equipment on dust collectors, especially cyclones. By measuring the differential pressure across your dust collector, you are monitoring your system performance.

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If the differential pressure gage suddenly changes, it is telling you something has recently changed in your system. If you see a gradual change in the differential pressure, then it is telling you that the system is gradually changing.

A sudden change is telling you that the airflow has suddenly increased or decreased. This could be caused by a variety of reason (plugging of filters, opening of damper, closing of damper, etc.) When you see this happen, your removal efficiency will be affected so it's better to start identifying the issue before you are forced to.

A gradual change is telling you that the ductwork or filters are starting to plug up. This could be normal operating conditions or caused by a change in process. When you notice a gradual change in the pressure drop, schedule a maintenance inspection before it gets too drastic. That way you won't be forced shut down in an emergency.

Q6 What is a DHA?

With the release of NFPA 652 and 654, manufacturers that create dust in their processes are required to conduct a Dust Hazard Analysis if the dust is explosive. The Dust Hazard Analysis is retroactive, so all manufacturers are required, no one is grandfathered in.

The DHA should be as simple or as complex as the process and needs to be documented for OSHA. The main purpose of the DHA is to educate the owner and operators on the true hazards and dangers they are facing with their dust, and to make sure they take the proper precautions with it. The DHA is there as a tool to prevent loss of life, equipment, production time, and capital.

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Q7 Why do you recommend dampers?

Dampers are used in dust collection systems to control the airflow to specific branches of the ductwork. This is done by opening or closing the damper. Air, like water, travels the path of least resistance. By using a damper, you are changing the resistance to the air. Every dust collection system should have a manual damper near each hood/pickup point to balance the system. This makes sure that the system is properly operating. An unbalanced system could cause too much air to be pulled from one area (causing loss of product) while in another area not enough airflow is available to capture dust. Other times, a soft connect (space between flanges) is used to control airflow at a pickup point. However, this isn't very efficient. This keeps the airflow in that area constant, but it's picking up air from an area where it isn't required. A damper would work much better, since you are only moving the air in the area you need. Soft connects are only advantageous when you are looking to cool down an airflow using outside air. Dampers can also be used to shut off portions of the system that are not being used, thereby allowing a smaller system.

Q8 How does ductwork affect my system?

Ductwork is usually by far the largest component and often the most overlooked. Depending on the size of your system, the ductwork can span hundreds of feet and have dozens of side streams. The ductwork is like railroad tracks, it moves the dusty air from one place to another.

Often times, additional lines will be added to a dust collector system after installation. Without proper evaluation of the system, this could negatively affect the performance of the whole system.

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This means that just because the dust collector system was operating correctly before, it might not after an additional pickup point or hood is added. What happens is that when you add additional pickup points, you change the balancing of the system. This could change the airflow to each and every hood and pickup point in the system, so while the system was originally adequately venting an area, it might not after a change.

A few things can be done to address this, such as changing fan speed, adding dampers, modifying ductwork, etc. The main thing you need to keep in mind is that if you slow the airflow through ductwork too much, you begin to build up dust within the line. This will further restrict your airflow and become a fire / explosion hazard.

Q9 Do I have the right type of hood for my application?

The key to a proper operating dust collection system is that the right hoods and pickup points are used. An improperly designed hood will either not collect all the dust, or required more airflow than would efficiently work. The first could cause fire and/or explosion issues, while the 2nd will cause greater capital and operating costs. The first step is to check out the Industrial Ventilation Handbook (https://hubs.ly/H08Lh7p0). It will provide you with recommended hood designs, airflow requirements, etc. You can also contact engineering firms, consultants, and manufacturer representatives to help you select the proper hoods.

Think Differently

At Aerodyne, we approach problems differently, with unique technology and fresh perspectives that solve your tough dust challenges.

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Q10 I have a used dust collector; will it work in my application?

When dealing with used dust collectors, the best policy is to size your dust collection system as you would normally and then evaluate the used collector to see if it will work. This means, starting at your pickup points and sizing the hoods and calculating the required airflow. Then sizing the ductwork and calculating the static pressure required. You can then look at your used dust collector and see if it will work with your required airflow. If it will, then calculate the pressure drop through the dust collector and add it to the system drop and you can then evaluate the exhaust fan. Once you have confirmed that the used dust collector will work, it would be prudent to have it inspected and brought into working order. You can then begin operating.

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