



DUST COLLECTOR FILTER MEDIA OPTIONS

**For Solid Dose Pharmaceutical
Manufacturing**





Every solid dose manufacturing process is unique and complex; no two operations are alike. Processes like mixing, blending, tableting and coating produce fugitive dusts that can contain active pharmaceutical ingredients (APIs). These dusts may become airborne during processing and can be hazardous to workers.

Although dust is often invisible to the eye, it can cause allergic reactions or other health problems, so companies must comply with OSHA's established permissible exposure limits (PELs), ACGIH threshold limit values (TLVs) and/or the occupational exposure limits (OELs) that they developed for their proprietary active ingredients.

In addition, most pharmaceutical dusts are combustible, which is why manufacturers use dust collection systems to contain them. However, the dust collectors themselves can be an explosion hazard if they are not designed correctly and equipped with the proper filter media and explosion controls. All facilities that produce and handle combustible dust must comply with NFPA standards.

Dust collectors and filters should be selected specifically for each application based on the type and duration of the process. For example, in tablet coating operations, airflows and pressures in the dust collector are typically higher than in those used for dry processes like tablet manufacturing. Also, the additional moisture produced may require special filter media and frequent filter changes if not properly designed.



This eBook explores the different types of dusts that solid dose manufacturers typically face and the filter media that works best for each.



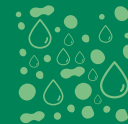
Toxic Dust



Dusts Sensitive to Static Charges



Allergens & Irritants



Hybrid Dusts



Hygroscopic Dust

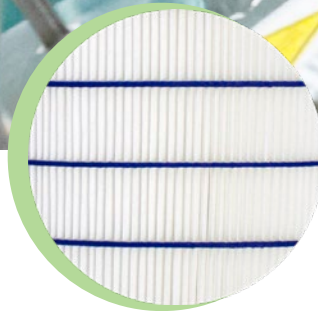


Nuisance Dust

Toxic Dust

Many facilities produce airborne dusts that contain potent compounds that are hazardous to workers. They can irritate the eyes and skin or travel deep into the lungs when inhaled, which can cause health effects. Under OSHA, companies must comply with the established PEL, TLV and/or OEL for workers. These values are defined as the maximum air concentration to which a worker can be safely exposed in an eight-hour shift, typically expressed in micrograms per cubic meter of air.

APIs like hormones and antibiotics can have extremely low exposure limits, some below 1.0 mcg/m^3 . Because of this, the EPA and OSHA typically require very high-efficiency filters, which can be achieved by using media that is specifically designed to meet these criteria, such as media that is chemically treated with a layer of nanofibers or PTFE.



HemiPleat®



**Dura-Pleat®
PTFE**

Allergens & Irritants

APIs like penicillin, antibiotics and oncology medications can cause serious issues for employees exposed to them. Workers can be allergic to the ingredient or they can become sensitized to the ingredient over time.

For dust that contains these APIs, OSHA may require high-efficiency dust collector filters made with nanofiber filter media—particularly when the air is being recirculated back into the building. Coating the media with a layer of nanofibers gives the base material larger pore sizes, which provides superior dust release and efficiency without increasing pressure drop.

Manufacturers can further prevent employee exposure to these APIs when changing out filter cartridges by using a bag-in/bag-out safe-change systems on their dust collector.

In addition, if the facility's dust collector is exhausting the dust directly outdoors, the EPA may require specific filtration.

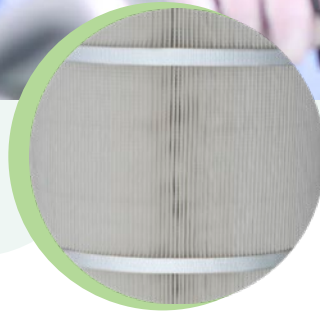


**HemiPleat
eXtreme**

Hygroscopic (Moisture Absorbing) Dust

Pharmaceutical applications like tablet coating, fluid bed drying and wash in place cycles can produce high levels of moisture that can make its way to the dust collector. Once in the dust collector filter cartridges, this sticky dust can cause the filters to plug prematurely thus dramatically shortening filter life.

It helps to use filter cartridges with an open pleat design that promotes proper dust release. In addition, these applications often require moisture-resistant synthetic spunbond polyester media that may need an oleophobic treatment. This media can even withstand excess moisture generated from the wash in place cleaning process. The right selection can provide MERV 15/16 filtration even for very sticky dusts.



**Dura-Pleat
Hydro Oleophobic**



**Standard
Dura-Pleat**

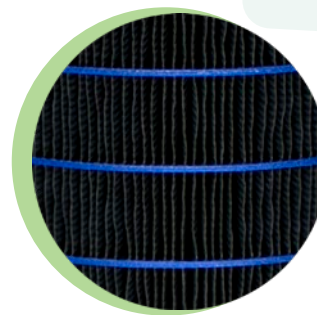


Dusts Sensitive to Static Charges

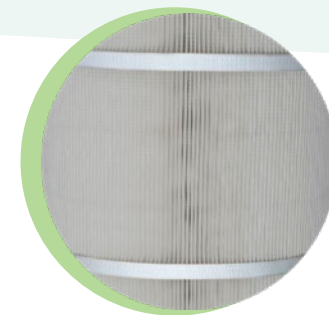
Nearly all pharmaceutical dusts are combustible. Even if the APIs used in a tablet or capsule are not combustible, the excipients used typically are. In fact, fillers like starches and cellulose can make up the highest percentage of most pharmaceutical powders.

This excipient-laden dust can build up static electricity when it moves through the dust collector. The dust particles can attach to filters with a strong electrical

bond, which prevents them from being released with pulse cleaning. But even worse, the dust may have a very low minimum ignition energy (MIE) that can cause an explosion inside the collector if it isn't dissipated. To safely conduct the charge and dissipate it, select a static-dissipative filter media impregnated with carbon or synthetic filter media coated with an aluminized material that is bonded to the filter pan.



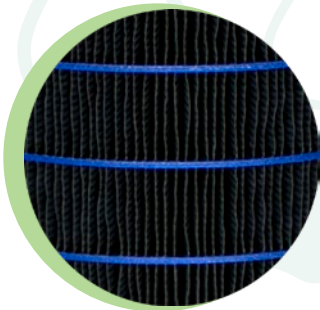
**HemiPleat
Carbon**



**Dura-Pleat
Aluminized**

Hybrid Dusts

Coating and fluid bed drying applications use both dry ingredients and wet organic solvents like alcohols that are flammable. This mixture produces dust that is very sensitive to static charges, so static-dissipative media along with the proper explosion protection devices are required to prevent combustible dust explosions within the dust collector.

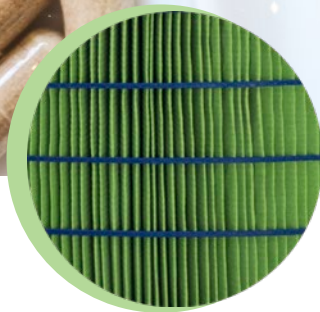


**HemiPleat
Carbon**

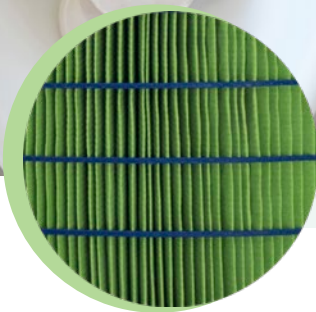


Nuisance Dust

Some pharmaceutical and nutraceutical dusts are not as hazardous to employees, but they can still cause the facility to become unnecessarily dirty and messy, which may cause a combustible dust issue. For example, manufacturing vitamins and protein powders produces extremely fine particles that can become airborne and eventually settle on floors, machinery and other surfaces. If standard filter media is not effective, a high-efficiency media may be required to provide optimal results particularly if the air is being recirculated back into the facility.



**HemiPleat
eXtreme**



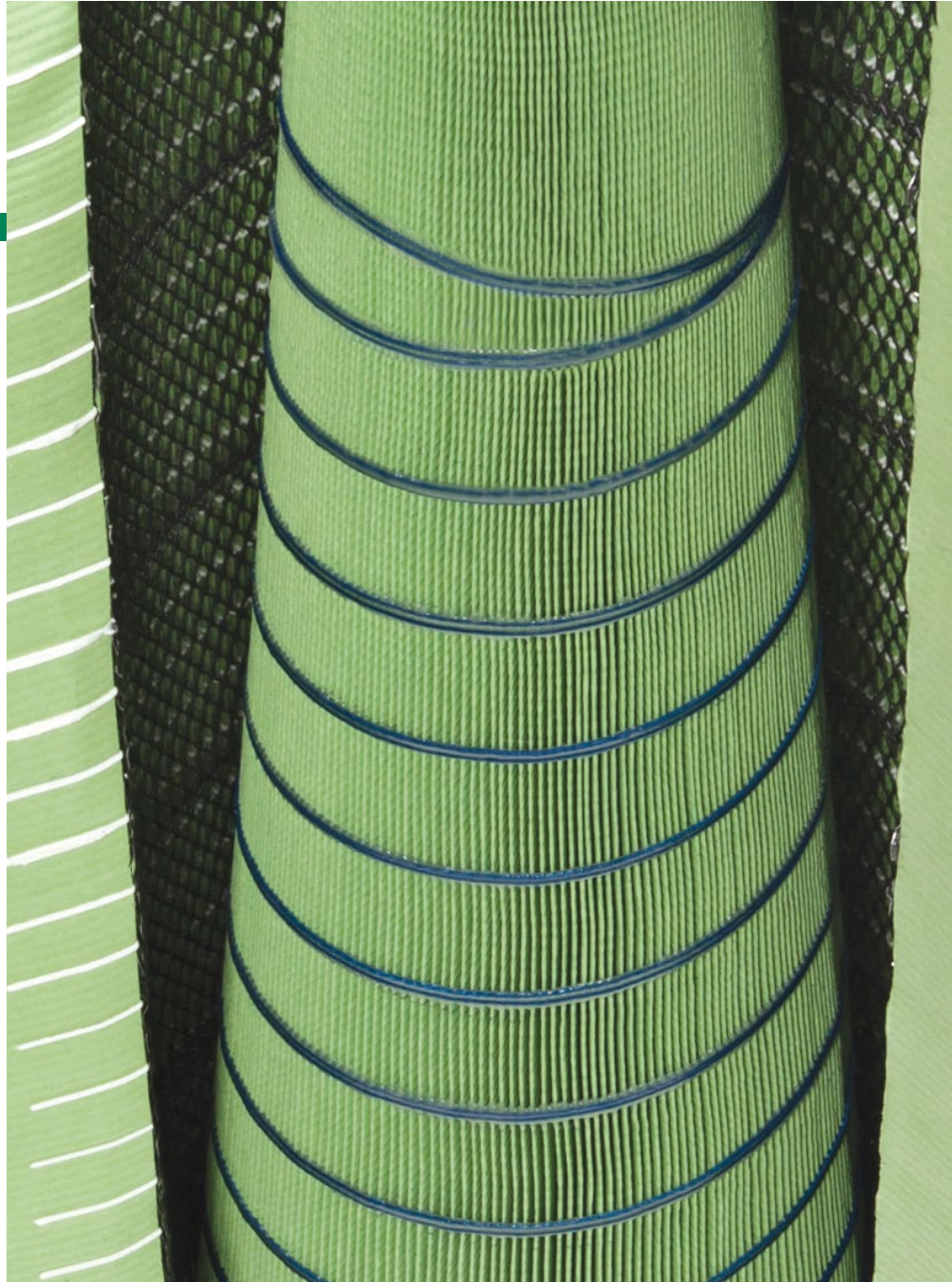
**HemiPleat
Green**

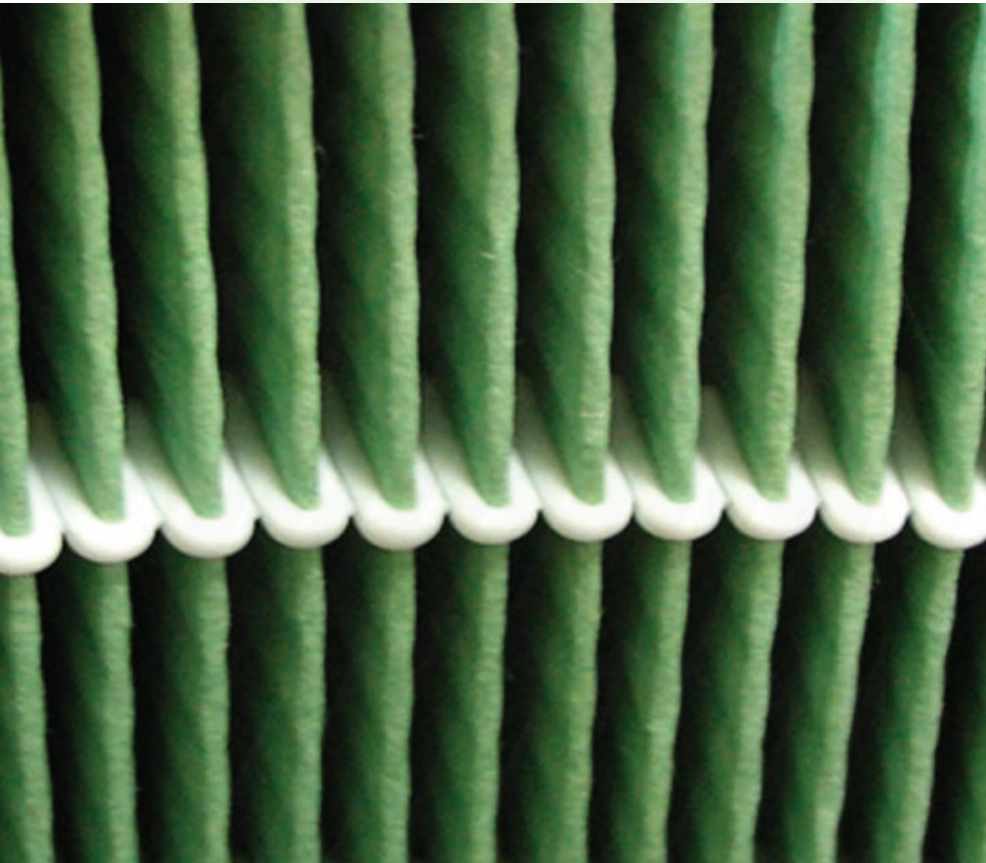
Filter Considerations Beyond Media

ATM Ratio

The filter media inside each filter cartridge is typically measured in square feet, so the air-to-media (ATM) ratio is simply the amount of air flowing through each square foot of filter media over a given time period. ATM ratio can make a big difference in dust collection performance. In general, the type of dust (dry vs. sticky), particle size and dust concentration determine the optimal ATM ratio. Using too high an ATM ratio causes excessive pulse cleaning, wasted compressed air and requiring frequent filter changes.

The ATM ratio will vary based on the particular requirements of each application, so discuss this with the equipment supplier, but a typical conservative ATM ratio for a pharmaceutical application can range from 1.5–2.5:1.





Pleating Technology

Most facility managers and engineers understand that more filter media is better because it lowers the ATM ratio, but packing as much media as possible into each cartridge is not always effective. Unless all that square footage is exposed to the airstream, it does not improve dust collection. This is because tightly packed pleats prevent the dust-laden air from reaching most of the media. In this scenario, most of the media remains unused and unavailable for filtering, so the filter can't load as much dust, and pulse cleaning is much less effective.

Plastic bead separators hold the pleats open and evenly spaced. Cartridges that use this type of open, breathable design maintain a lower pressure drop, use less compressed air and require less energy to operate the fan motor.



It is important to select the dust collection equipment and filter media that are best for each specific pharmaceutical process. Pharmaceutical dusts are challenging because they can be toxic, moist, sticky, allergenic or statically sensitive.

Selecting the proper filter media that can handle these ingredients ensures a safe environment because it minimizes both worker exposure to hazardous APIs and serious combustible dust incidents. And the right media minimizes downtime for dust collector housekeeping and filter change-outs.

For help selecting a dust collection system and filters for your application, visit camfilapc.com or call **833-938-0339**



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