

# POWDER & BULK SOLIDS

The Source for Dry Processing and Bulk Handling Technology



## Key Considerations for an Industrial Dust Collector

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### What Is Good Flowability?

Materials need to pass through equipment in a controlled manner without getting stuck or changing in an undesirable way.  
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### Partnering with a Dust Collector OEM Delivers Long-Term Value

There are four key advantages you can gain by cultivating a partnership that goes well beyond your initial purchase order.

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### On-Demand Pulse Jet Cleaning: The Energy Savings Myth

ANSI/ASHRAE Standard 199-2016 specifies test methods to measure emissions, differential pressure, and compressed air consumption in pulse cleaned dust collectors under realistic operating conditions.

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### eSUPPRESSOR for Explosion & Isolation Systems

The eSUPPRESSOR by IEP Technologies is a high-rate discharge extinguisher used for explosion suppression and isolation systems. Its electro-mechanical actuating mechanism uses no pyrotechnic devices. The eSUPPRESSOR features pressure monitoring, lock-out/tag-out capability, and LED indication of device status. All safety functions are fully monitored. The eSuppressor has full redundancy and third-party SIL 2 certification.

IEP Technologies, Marlborough, MA 855-793-8407  
www.ieptechnologies.com



### Real-Time Inline Measurement

The new GTS Dsize offers real-time particle size measurement directly in the process stream — eliminating manual sampling and slow lab test needs. Designed for powders and bulk solids, Dsize continuously monitors grain size from 160 to 6,000  $\mu\text{m}$  and detects screen damage, overload, or clogging instantly. It has self-cleaning optics, no maintenance needs, and an intuitive software interface.

GTS Inc., Shalimar, FL 850-861-3388 www.onthelevel.com



# Key Considerations for Specifying an Industrial Dust Collector

By Andy Thomason, Camfil Air Pollution Control

When planning a new facility or expanding an existing one that processes, handles, and packages dry particulate matter, selecting the right dust collection system is a critical step requiring thoughtful research and careful evaluation. The right system helps to ensure effective dust control and compliance with safety and air quality regulations in industrial manufacturing and processing environments.

## Regulations & Standards for Air Quality, Worker Safety

Engineering and operations teams specifying a dust collection system need to navigate EPA and OSHA air quality and safety regulations. OSHA has established permissible exposure limits (PELs) for a wide range of dust types, from nuisance dust to hazardous substances, based on an 8-hour time-weighted average (TWA). These guidelines are available in detail on the OSHA website: <https://www.osha.gov/annotated-pels>.

When evaluating equipment, request a written guarantee from the dust collector supplier specifying the system's maximum emissions rate over an 8-hour TWA. A stated filter efficiency is not enough on its own. What matters most is that the system consistently maintains airborne dust levels within OSHA's regulatory limits.

## Combustible Dust Hazards

Combustible dust can be found across many manufacturing sectors, including agriculture, chemicals, food, paper, pharmaceuticals, textiles, and woodworking. Combustible dust explosions can occur without warning in various areas of a facility, but dust collectors are particularly high-risk locations because they hold large volumes of suspended combustible dust in a confined space.

To mitigate these risks, dust collection systems must comply with National Fire Protection Association (NFPA) standards, which aim to reduce fire and explosion hazards. Determining whether dust is combustible requires testing by a specialized combustible dust lab. If a dust sample is found to be combustible, its explosive index (Kst) and maximum pressure rise (Pmax) should be measured according to ASTM E 1226-10, the Standard Test

Method for Explosibility of Dust Clouds. Any dust with a Kst above zero is considered explosive, and most dusts meet this criterion. Additionally, some dust types will require more testing to determine minimum explosive concentration (MEC) and mechanical ignition energy (MIE).

If the dust has a Kst value greater than zero, the NFPA mandates that you conduct a dust hazard analysis (DHA) to evaluate risks and identify necessary fire and explosion protections. You can conduct a DHA internally or hire an independent consultant, but the authority having jurisdiction (AHJ) over your facility must review and approve the results. In addition, your dust collection equipment supplier will need the Kst and Pmax values to properly design and size explosion venting or suppression systems, ensuring safety and regulatory compliance.

## Understanding NFPA Standards

When specifying a dust collection system for your facility, it's essential that your team has a solid understanding of NFPA standards for managing combustible dust.

The new NFPA 660 — Standard for Combustible Dusts, effective December 6, 2024, is a comprehensive standard that consolidates NFPA regulations related to combustible dust into a single, unified guideline. By merging six separate NFPA standards, NFPA 660 aims to simplify compliance and provide clear, actionable guidance. It includes both fundamental principles and industry-specific requirements to help facilities manage combustible dust risks and enhance safety against fires and explosions. NFPA 660 is a living document, and the association is leaving room for additions; therefore, changes are expected.

In addition, NFPA 68 — Standard on Explosion Protection by Deflagration Venting outlines specific criteria for the design, location, installation, maintenance, and proper use of explosion venting systems and outlines detailed methods for calculating the correct size of explosion vents and discharge ducts. NFPA 69 — Standard on Explosion Prevention Systems extends beyond explosion venting to address the whole dust collection system. It includes inlet and outlet ducting, spark-extinguishing systems, and methods for preventing an explosion from traveling back into the building or to process locations upstream of inlet duct work.



## RIBBON/PADDLE/PLOW BLENDERS HANDLE POWDERS TO PASTES

Agitators forced through stationary materials impart shear needed to reduce agglomerates and blend pastes and slurries. Basic industrial units to state-of-the-art sanitary designs with heating/cooling jackets, liquid spray additions, and high-speed choppers/intensifiers. Capacities from 1 to 1,150 cu ft (.03 to 32 m<sup>3</sup>).



## VEE-CONE BLENDERS SANITIZE ULTRA-FAST, THOROUGHLY

Smooth internal surfaces free of baffles, shafts and bearings allow unobstructed material flow, plus complete discharge through a gate valve for rapid cleaning or sanitizing of the easy-access interior. Uniform blends are typically achieved in as little as 15 minutes with equal efficiency at fill volumes from 100% to 25% of capacity. Ideal for dry and granular materials.



## FLUIDIZED BED MIXERS BLEND ULTRA-FAST, GENTLY

MUNSON® Fluidized Bed Mixers feature two shafts with paddles that counter-rotate at high speeds to fluidize material, achieving homogeneous blends in 10 seconds to 2 minutes. Low shear forces minimize friction with little or no degradation and insignificant heat generation. Drop-bottom gates provide rapid discharge. Capacities from 0.21 to 283 cu ft (6 L to 8 m<sup>3</sup>).

# WORLD'S FASTEST BLENDING AND CLEAN UP

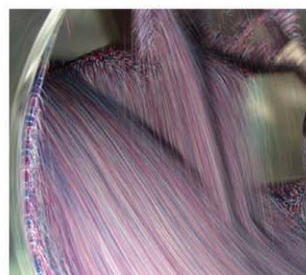
### No other bulk solids mixer offers these benefits:

- 100% Uniform blending and/or liquid additions in one to 2-1/2 minutes
- Total discharge with no segregation
- Ultra-gentle tumbling action (versus blades forced through batch)
- Ultra-low energy usage
- Equal efficiency from 100% to 15% of capacity
- No internal shaft or seals contacting material unlike other rotary mixers



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DETAILS  
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## LUMP BREAKERS REDUCE AGGLOMERATES, FRIABLE MATERIALS

Remove lumps and agglomerates from bulk foods. Dual rotors with three-point, single-piece breaking heads rotate with minimum clearance inside a curved, perforated bedscreen. On-size material exits through bedscreen apertures from 1/32 to 2-1/2 in. (0.8 to 63.5 mm) in diameter. Fits tight spaces between upstream and downstream process equipment.



## PIN MILLS REDUCE FRIABLE SOLIDS IN CONTROLLED SIZE RANGES

Coarse to fine grinding of friable powders, flakes and granules into controlled particle sizes at high rates per HP/kW. High-speed rotation of the inner disc creates centrifugal force that accelerates bulk material entering the central inlet of the opposing stationary disc through five intermeshing rows of pins. Desired tight particle size distribution obtained by controlling the rotor speed.



## Dust Collector Capabilities

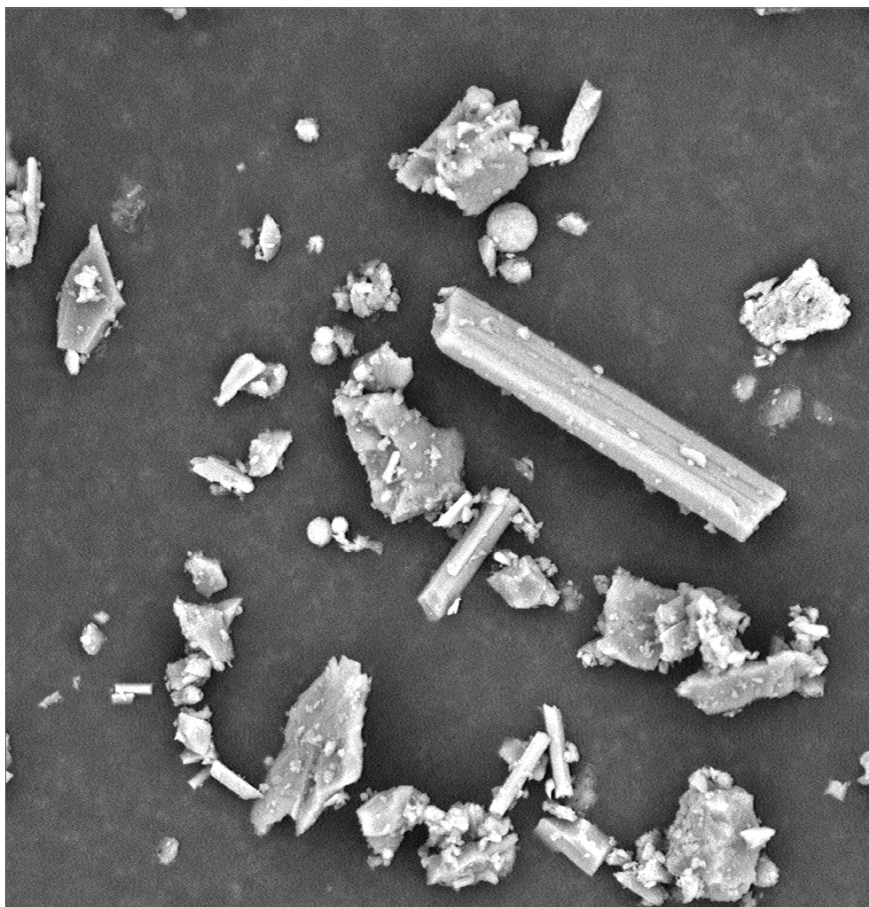
Emissions compliance and combustible dust hazards are crucial considerations, but you should also evaluate other factors when choosing a dust collector. The system may need to support additional objectives — such as reclaiming valuable materials, maintaining cleanliness in production areas, accommodating future plant changes, or improving performance of an older system.

A site survey can help identify specific requirements, including:

- Production processes
- Material to be collected
- Operating hours and conditions
- Electrical specifications
- Airflow and pressure needs
- Physical properties of the dust

Even common dust types can behave differently based on the specific process involved, so testing the dust sample — ideally from used filters — is essential. Dust testing can reveal important characteristics such as particle size distribution, shape (e.g., fibers, spheres, or crystals), combustibility, stickiness, and moisture absorption. Independent labs and equipment suppliers can perform a variety of bench tests to determine these traits.

A detailed site survey and dust analysis are the best ways to assess the filtration efficiency and pressure drop needed for the dust collector. This thorough approach helps you to select the most suitable collector design and filter media for your specific application.



*Magnified silica dust*

## Factors Affecting Dust Collector Performance

Choosing dust collection equipment that minimizes maintenance challenges is essential because reliability issues can often stem from mistakes in the initial selection or from plant modifications that impact performance.

A site survey and lab analysis generally provide sufficient data, but for applications with challenging dust types or strict emissions control requirements, full-scale dust collection testing may be necessary. This involves running a large dust sample (typically 55 gallons) through a full-size dust collector on a test rig to replicate actual operating conditions. This process allows for precise monitoring of parameters such as dust particle size, pressure drop, and real-time emissions.

Pressure drop is an important performance indicator for dust collectors. It is the difference in the pressure on the air-entering side and the air-exiting side of the cartridges. As dirty air moves through a dust collector's filter cartridges, dust particles get trapped in the filter media, so only clean air passes through. When the filter media becomes loaded with dust, it is more difficult for air to pass through, and the resistance increases. This high resistance is referred to as "high pressure drop."

You want to avoid high pressure drop because when resistance is increased, a lot of energy is needed to keep pulling the air through the filter. As a result, the fan motor on your dust collector has to work harder and use more energy. To help alleviate this problem, dust collectors use a method called reverse pulse cleaning to continually blow off the dust that builds up on the filters. Each pulse lowers pressure drop and energy use.

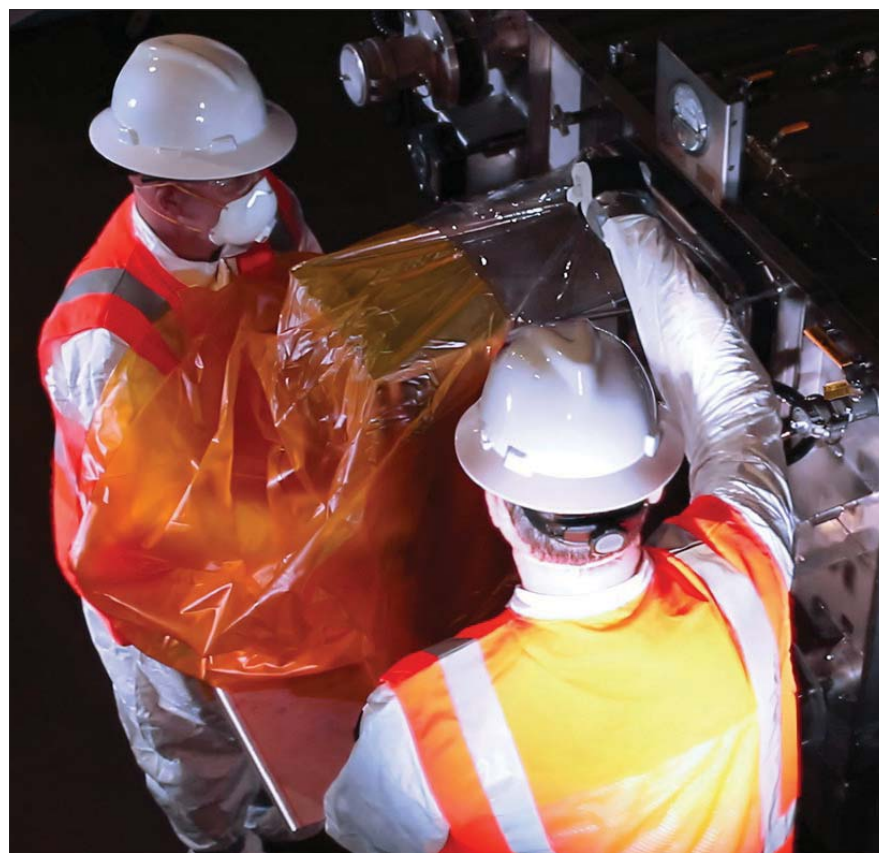
## Worker & Workplace Safety Options

While the primary role of a dust collector is to ensure worker and workplace safety, not all systems offer the same level of protection. When selecting a dust collector, consider these key safety features with your equipment supplier:

- OSHA-compliant railed safety platforms and caged ladders prevent slips and falls when workers access the collector for maintenance.
- Lock-out/tag-out doors prevent accidental door openings during a pulsing cycle risking exposure to hazardous dust.
- Bag-in/bag-out (BIBO) containment systems are required for highly toxic dust to protect workers from exposure during filter change-outs.
- User-friendly filter access ensures cartridges are easily accessible and slide in and out smoothly. Avoiding heavy, overhead filters reduces the risk of neck, back, and foot injuries during filter replacement.

Fire and explosion prevention is also essential and optimized using features and technologies such as flame-retardant filter media, spark arrestors, sprinkler systems, and approved explosion vents or deflagration control components.

For additional protection, consider a safety monitoring filter, which is a secondary bank of high-efficiency filters to prevent dust from re-entering the workspace in case of a primary filter leak. Recirculating systems, which use this type of filter, are cost-effective because they recycle air downstream, preventing the need to replace conditioned air and yielding significant energy savings. Additionally, in facilities with high ceilings, dust collectors can improve heating efficiency by drawing warm air from the ceiling and redistributing it at ground level.



*Bag-in/Bag-out containment system*

# DISCHARGE AND FILL

BULK BAG UNLOADERS AND FILLING SOLUTIONS



Vibra Screw Bulk Bag Unloaders and Bulk Bag Fillers provide a safe, dust-free and convenient way to handle, discharge and accurately fill bulk bags. They are available in many different configurations from basic units to complete systems for all styles of bags and discharge and filling requirements.

Bulk Bag Unloaders begin as a no-spill receiving hopper and frame for customer-supported bags. Complete systems might include an integral bag hoist and trolley and all necessary material-handling accessory equipment.

Bulk Bag Fillers offer an efficient and economical method of packaging a wide range of dry powders, granulated and flaked materials by weight or volume. They are designed to operate as either manual or automated systems.

Vibra Screw Unloaders and Fillers are commonly used on materials like fertilizer, food grains, seeds, flour, sugar, salt, animal feed, and industrial minerals and chemicals.

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### Impact on ROI

When evaluating the operating costs of cartridge-style dust collectors, it's crucial to consider the total cost of ownership (TCO) rather than just the initial price. Key cost factors include energy consumption, the price of filter cartridges and other consumables, and maintenance time.

### Reducing energy consumption

Dust collectors require electricity, with the largest portion going to the fan motor that drives airflow through the system. This airflow is replaced with conditioned (heated or cooled) air, adding to expenses. The energy used is directly related to the volume of air the motor circulates through the system, measured in cubic feet per minute (CFM).

Dust collectors operate as variable systems. At startup, filters experience a lower pressure drop, which can lead to higher-than-designed air-to-cloth ratios unless the fan is dampened back. Installing a variable frequency drive (VFD) with a static pressure controller enhances efficiency by managing airflow.

The controller adjusts to the specified CFM, reducing the fan motor's frequency (Hz) to maintain this flow rate. As filter resistance increases over time, the controller raises the motor's frequency to maintain the desired CFM, compensating for added static pressure.

### Lowering compressed air costs

Pulse cleaning technology is crucial for maintaining consistent airflow in dust collectors and improving their efficiency. These systems periodically blast compressed air to dislodge accumulated dust from filters when the pressure drop reaches a certain threshold, extending filter life and keeping pressure drop low.

However, generating compressed air is costly, making pulse cleaning one of the primary operational expenses for dust collection systems and a key area for cost savings. Advanced dust collectors can reduce compressed air usage by up to 50% compared to other models by pulsing less frequently.

A well-designed pulse cleaning system efficiently removes dust buildup from filter cartridges, reduces pressure drop, and de-



Pulse cleaning of filter cartridge

creases fan energy consumption, resulting in lower overall energy costs. Systems that optimize these factors deliver higher airflow while maintaining low pressure drop, aided by high-efficiency filter cartridges capable of handling increased airflows without compromising filtration effectiveness.

Properly designed premium filter cartridges generally last 50% longer than standard filters because they pulse clean more effectively and are able to maintain a consistent airflow and low pressure drop longer than standard filters.

In addition, selecting the right filter media for a cartridge-style dust collector is essential for optimal efficiency and durability. Premium cartridges are built with media tailored to the specific application and type of dust being collected. Depending on the requirements, coatings may be added for easier dust release, flame retardance, or conductivity. Properly chosen media helps to ensure a safer, cleaner work environment with reduced maintenance needs.

#### Final Thoughts

Specifying an industrial dust collection system is a complex task. By carefully evaluating the specific needs of your facility and considering factors such as material type, filter efficiency, and system design, you can select the best cartridge dust collector to improve indoor air quality and protect workers' health. Investing time in this research will enhance operational efficiency and ensure long-term compliance with environmental and operational standards. Work with a duct collector supplier that has the capability of testing the physical properties of your dust, along with knowledge of NFPA standards and industrial ventilation. To support your review of a dust collector's performance, ask your vendor for a copy of its ASHRAE 199 test. This test provides a real-world performance showing compressed air consumption, pressure drop performance, and emissions.

*Andy Thomason is a senior applications specialist with Camfil Air Pollution Control, a manufacturer of dust and fume collection equipment for challenging industrial applications. For more information call 800-479-6801, email [filterman@camfilapc.com](mailto:filterman@camfilapc.com), or visit <https://camfilapc.com>.*



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## ProductFocus

## Dust Collection &amp; Air Pollution Control



## Screw Conveyor With Dust Control Cover

AFC's SpiralFeeder flexible screw conveyor features an optional dust control cover. Devised to prevent fine powders from escaping into the work environment during material transfer, the dust control cover encloses the hopper to create a fully sealed system from infeed to discharge. Risk of worker exposure to airborne particulates and combustible dust explosions is significantly reduced. Ideal for safely transferring flour, sugar, carbon black, lime, alumina, bentonite clay, and other dry solids with light bulk densities, the dust-tight flexible screw conveyor also includes a dust sock to vent any air in the conveying system while keeping any fine particles inside the powder transfer conveyor. The screw auger conveyor automatically transfers powders, pellets, and other bulk materials from a hopper at floor level through an enclosed tube to discharge into a surge hopper, mixer, bag filler, container, or other location.

**Automated Flexible Conveyor Inc.**, Clifton, NJ 800-694-7271 [afcspiralfeeder.com](http://afcspiralfeeder.com)

## Self-Cleaning Air Filtration Technology

Air Cleaning Blowers (ACBs) eliminate the need for filter media by blowing and cleaning air simultaneously — making them a unique, sustainable alternative to traditional dust collection systems. Designed to perform in the world's toughest environments,



ACBs use patented technology to remove airborne particles — including powders, dust, fibers, and spores — without clogging or maintenance. This makes them ideal for use in powdered food packaging, production lines, compressor intakes, HVAC systems, and hazardous or remote facilities where filter replacement is difficult or costly. ACBs maintain consistent airflow and static pressure, never requiring filter elements to “load” before reaching effectiveness. Units are available in a wide range of sizes and configurations to meet both indoor and outdoor needs, with options for pressurization, explosion resistance, and corrosion protection.

**Air Cleaning Blowers LLC**, Selkirk, NY 518-635-4169  
[www.aircleaningblowers.com](http://www.aircleaningblowers.com)



## Feed Bin &amp; Bag Dump Station

The Coperion K-Tron's feed bin and bag dump stations are used to pre-condition the material for vacuum conveying before it enters the air stream. Feed bins are mostly positioned underneath bulk bag unloading stations or other process machinery, to buffer material for big bag changeover or for other purposes. The Coperion K-Tron P-Series feed bin and bag dump stations are constructed out of stainless steel for easy clean up. The modular structure

allows for upgrades from a feed bin to a bag dump station. The integration of fully fluidized cone eliminates flow problems. The bag dump station dust hoods come with vents for adaptation to central dust collection systems, as well as bag rest and easy opening hatch. An alternative bottom pick-up allows for washing and draining the feed.

**Coperion K-Tron**, Salina, KS 785-825-1611 [www.coperion.com](http://www.coperion.com)



## Fabric Filters for Downdraft Tables

American Fabric Filter Co.'s replacement fabric filters can be used in downdraft tables. The singed surface, 16 oz. scrim-supported felt used in the production of these filters captures even the finest dust, down to 1 micron, and prevents blinding and promotes self-cleaning. No shaker or paddle is necessary to clean the filter and keep it performing at peak level. Standard and custom-sized filters are available for OEM downdraft tables and systems converted from cartridges.

**American Fabric Filter**, Wesley Chapel, FL 800-367-3591  
[www.americanfabricfilter.com](http://www.americanfabricfilter.com)

## Industrial Dust Collectors

Camfil's Gold Series and Gold Series X-Flo dust collectors are best-in-class solutions for handling toxic and combustible dusts, smoke and fumes, even in heavy or fibrous loads. Backed by more than 25 years of global performance and engineered with crossflow technology, these systems deliver superior filtration with a low pressure drop, allowing for efficient airflow, reduced energy use and longer filter life. Gold Cone filter cartridges are positioned vertically in the dust collectors so that dust won't fall onto the filters below on its way to the hopper. All Gold Series dust collectors are built modularly for a near-limitless variety of configurations and airflow capabilities. When paired with Camfil's explosion protection accessories, including explosion vents, integrated safety monitoring filters and Stinger isolation valves, these systems meet or exceed NFPA and ATEX standards for combustible dust safety.

**Camfil Air Pollution Control**, Jonesboro, AR 800-479-6801  
<https://camfilapc.com>

